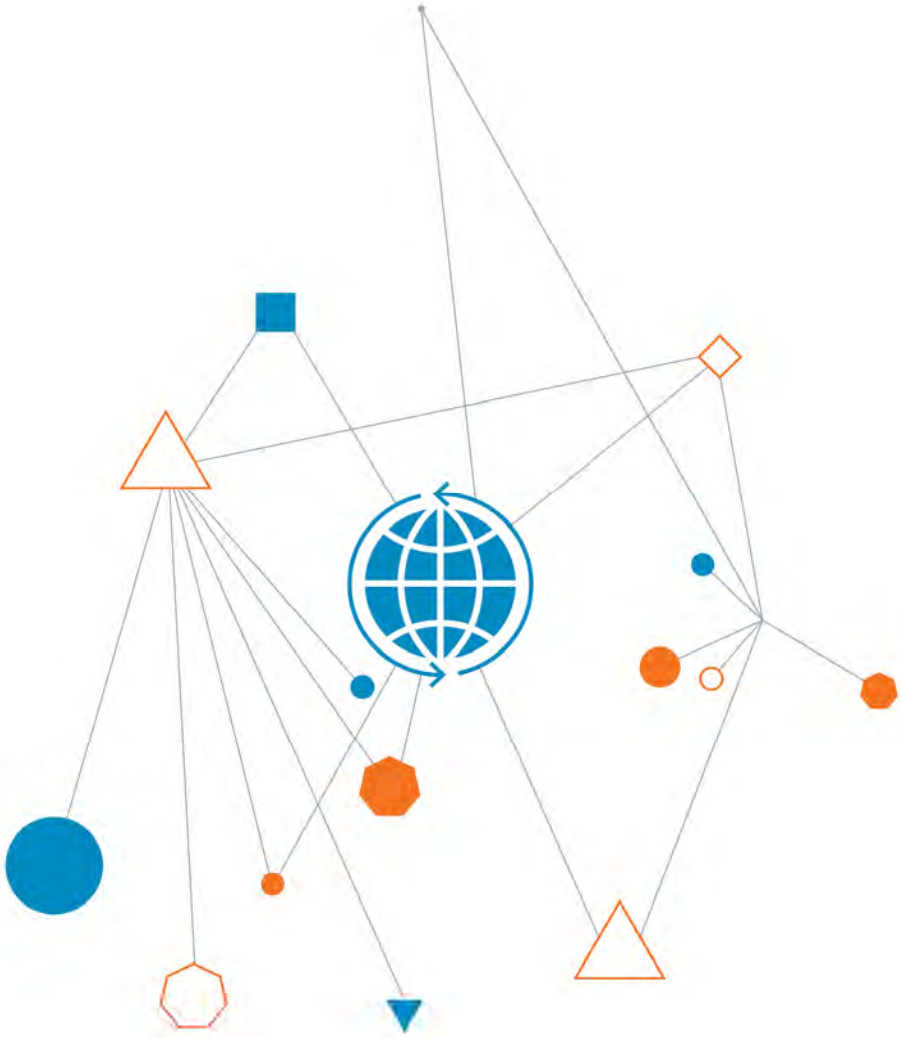
Mastergroup Lot 11 Trust

Site Audit Report & Site Audit Statement

Richards Road, Riverstone, NSW Lot 11, DP816720,

20 December 2013



When you think with a global mind problems get smaller

Record of Distribution

SITE AUDIT REPORT &
SITE AUDIT STATEMENT
RICHARDS ROAD, RIVERSTONE, NSW

REPORT DATE: 20 December 2013
REPORT REF: ENAURHOD01027AA-SAR

Prepared for:

Mastergroup Lot 11 Trust
PO Box 525 Cammeray NSW 2062

NSW EPA Accredited Site Auditor	 Dr Michael Dunbavan Senior Principal NSW EPA Accredited Site Auditor (Accreditation No. 0804)

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Abbreviations

ACM	Asbestos Containing Material
bgs	below ground surface
BH	Bore hole
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CLM Act	NSW *Contaminated Land Management Act 1997*
DEC	Department of Environment and Conservation, which is succeeded by the Environment Protection Authority, NSW
DQI	Data quality indicator
DQO	Data quality objective
EPA	Environment Protection Authority of New South Wales
LOR	Limit of Reporting
m, m^2	Metres, square metres
mg/kg	milligrams per kilogram
NATA	National Association of Testing Authorities
OCP	Organochlorine Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCoC	Potential Contaminants of Concern
QA, QC	Quality Assurance, Quality Control
RPD	Relative Percent Difference
SAQP	Sampling, Analysis and Quality Plan
SAR	Site Audit Report
SAS	Site Audit Statement
SIL	Soil Investigation Level

TP	Test Pit
TPH	Total Petroleum Hydrocarbon
UCL	Upper Confidence Limit

DEFINITIONS

95th percentile UCL	Value having 95% probability that the true arithmetic mean of the average contaminant concentration within the sampling area will not exceed the stated value.

Health Investigation Levels (HILs)

HIL-A or Residential A	Land use defined by the ASC NEPM (2013) (and the National Environment Health Forum) as – Residential with gardens / accessible soil (home-grown produce <10% fruit and vegetable intake, (no poulty), also includes children's daycare centres, preschools and primary schools.

Health Screening Levels (HSLs)

HSL A	Land use defined by the ASC NEPM (2013) as – HIL-A, low density residential dwellings.
HSL B	Land use defined by the ASC NEPM (2013) as – HIL-B, high density apartment blocks.

Ecological Investigation Levels (EILs)

EIL – Urban ressdiential areas and public space	Defined in the ASC NEPM (2013) as – EIL for 80% protection level

Ecological Screening Levels (ESLs)

ESL – Urban ressdiential areas and public space	Defined in the ASC NEPM (2013) as – ESL for 80% protection level

NSW Site Auditor Scheme
SITE AUDIT STATEMENT

A site audit statement summarises the findings of a site audit. For full details of the site auditor's findings, evaluations and conclusions, refer to the associated site audit report.

This form was approved under the* Contaminated Land Management Act 1997 *on 31st October 2012. For more information about completing this form, go to Part IV.

PART I: Site audit identification

Site audit statement no. ...NSW 009

This site audit is a **non-statutory audit*** within the meaning of the *Contaminated Land Management Act 1997.*

Site auditor details (as accredited under the *Contaminated Land Management Act 1997*)

Name ...Michael Dunbavan Company Coffey environments Australia Pty Ltd.

Address ...Level 19, Tower B, Citadel Towers, 799 Pacific Highway.....

.....Chatswood NSW..... Postcode .....2067...

Phone .....02 9406 1006..... Fax .....02 9406 1002.....

Site details

Address .....Richards Road.....

.....Riverstone NSW..... Postcode .....2765...

Property description *(attach a list if several properties are included in the site audit)*

.....Part Lot 11 in DP 816720.....

.....

.....

Local Government Area ... ...Blacktown City Council.....

Area of site (e.g. hectares) .....66.2 Hectares . Current zoning .....1(a) General Rural....

To the best of my knowledge, the site **is not*** the subject of a declaration, order, agreement, proposal or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985.*

Declaration/Order/Agreement/Proposal/Notice* no(s)

.....

**Strike out as appropriate*

Site audit commissioned by

Name ...Mark Robertson..... Company .....Mastergroup Lot 11 Trust.....

Address .....PO Box 525.....

.....Cammeray NSW..... Postcode .....2062.....

Phone .....0417 770 051..... Fax .....

Name and phone number of contact person (if different from above)

.....

Purpose of site audit

☐ ~~A. To determine land use suitability *(please specify intended use[s])*~~

.....

OR

☐ ~~B(i) To determine the nature and extent of contamination, and/or~~

☐ ~~B(ii) To determine the appropriateness of an **investigation/remedial action/management plan***, and/or~~

☑ B(iii) To determine if the land can be made suitable for a particular use or uses by implementation of a specified **remedial action plan/~~management plan~~*** *(please specify intended use[s])*

.....Low density residential development (Residential A).....

Information sources for site audit

Consultancy(ies) which conducted the site investigation(s) and/or remediation

.....Sydney Environmental & Soil Laboratory Pty Ltd.....

Title(s) of report(s) reviewed .....

- Environmental & Earth Science Pty Ltd 2003, 'Site Investigation for Riverstone Meatworks Effluent Treatment Ponds, Riverstone, NSW', Report No. 103070, June 2003
- Environmental Investigation Services 2013, 'Report to SESL Australia Pty Ltd on Preliminary Groundwater Screening for Future Development at Part of Lot 11 in DP816720, Off Riverstone Parade, Riverstone NSW', Report No. E26522KBrpt, June 2013
- SESL Australia Pty Ltd 2012c, 'Phase 1 Preliminary Site Investigation for Richards Road, Riverstone (Lot 11 DP816720), Report No. C7185.Q3041.B23331 FB PSI, November 2012 [partial review only].
- SESL Australia Pty Ltd 2013a, 'Interim Audit Advice 01 – Comment on SESL Consolidated Site Investigation Report, Lot 11, Richards Road, Riverstone', Letter Ref: FA Auditor Response, 2 April 2013.

Strike out as appropriate

- SESL Australia Pty Ltd 2013b, 'Sampling, Analysis and Quality Plan for Richards Road, Riverstone, NSW, Lot 11 DP816720', Report No. C6868.Q3190.B25449 DA SAQP, May 2013, Draft [Draft SQAP].

- SESL Australia Pty Ltd 2013c, 'Interim Audit Advice 07 – Comment on SESL Results from Additional Sampling and Analysis, Lot 11, Richards Road, Riverstone', Letter Ref: Response for Interim Audit Advice 07, 14 August 2013.

- SESL Australia Pty Ltd 2013d, 'Consolidated Investigation for Richards Road, Riverstone, NSW (Lot 11 DP816720)', Report No. C6868.Q3222.B25854 FB CSI, December 2013, [CSI Report].

- SESL Australia Pty Ltd 2013e, 'Addendum Report to Consolidated Investigation for Richards Road, Riverstone, ', Report No. C6868.Q3222.B25854 FB CSI Addendum, December 2013 [CSI Addendum].

- SESL Australia Pty Ltd 2013f, 'Remediation Action Plan for Richards Road, Riverstone NSW 2765, Lot 11 DP816720', Report No. C6868.Q3450.B28321 FB RAP, December 2013 [RAP].

    - Other information reviewed (including previous site audit reports and statements relating to the site) SESL 2010, Review of Environmental Factors: Lot 11 DP 816720, Report Reference: C5377.B15157.FB REF, dated August 2010.

    - SESL 2011a, Post Application Assessment: Lot 11 DP 816720, Report Reference: C5377.B17054.FA Riverstone Paddock B, PAA, dated April 2011.

    - SESL 2011b, Review of Environmental Factors: Lot 11 DP 816720, Report Reference: C5377.B17887.FA REF, dated May 2011.

    - SESL 2011c, Post Application Assessment: Lot 11 DP 816720, Report Reference: C5377.B19206.FA Riverstone Paddock C, PAA, dated August 2011.

    - SESL 2012a, Post Application Assessment: Lot 11 DP 816720, Report Reference: C5377.B20744.FA Riverstone Paddock E, PAA, dated January 2012.

Site audit report

Title .....Site Audit Report & Site Audit Statement, Richards Road, Riverstone, NSW.....

Report no. ...ENAURHOD01027AA-SAR..... Date .....20 December 2013.....

**Strike out as appropriate*

PART II: Auditor's findings

Please complete either Section A or Section B, **not** both. *(Strike out the irrelevant section.)*

Use Section A where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land use(s).

Use Section B where the audit is to determine the nature and extent of contamination and/or the appropriateness of an investigation or remedial action or management plan and/or whether the site can be made suitable for a specified land use or uses subject to the successful implementation of a remedial action or management plan.

Section A

☐ **I certify that, in my opinion, the site is SUITABLE for the following use(s)** *(tick all appropriate uses and strike out those not applicable):*

- ☐ Residential, including substantial vegetable garden and poultry
- ☐ Residential, including substantial vegetable garden, excluding poultry
- ☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
- ☐ Day care centre, preschool, primary school
- ☐ Residential with minimal opportunity for soil access, including units
- ☐ Secondary school
- ☐ Park, recreational open space, playing field
- ☐ Commercial/industrial
- ☐ Other *(please specify)* .....

subject to compliance with the following environmental management plan *(insert title, date and author of plan)* **in light of contamination remaining on the site:**

.....

.....

.....

OR

☐ **I certify that, in my opinion, the site is NOT SUITABLE for any use due to the risk of harm from contamination.**

Overall comments

.....

.....

.....

.....

Section B

Purpose of the plan[1] which is the subject of the audit

To describe the nature and extent of remediation required on the site and a plan for making the site suitable for intended future residential development.....

I certify that, in my opinion:

☑ **the nature and extent of the contamination HAS/~~HAS NOT~~* been appropriately determined**

AND/~~OR~~

☑ **the investigation/remedial action plan/management plan* IS/~~IS NOT~~* appropriate for the purpose stated above**

AND/~~OR~~

☑ **the site CAN BE MADE SUITABLE for the following uses** *(tick all appropriate uses and strike out those not applicable)*:

- ☑ Residential, including substantial vegetable garden and poultry
- ☑ Residential, including substantial vegetable garden, excluding poultry
- ☑ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
- ☑ Day care centre, preschool, primary school
- ☑ Residential with minimal opportunity for soil access, including units
- ☑ Secondary school
- ☑ Park, recreational open space, playing field
- ☑ Commercial/industrial
- ☐ Other *(please specify)* .....

if the site is remediated/~~managed~~* in accordance with the following remedial action plan/~~management plan~~* *(insert title, date and author of plan)*

SESL Australia Pty Ltd 2013f, 'Remediation Action Plan for Richards Road, Riverstone NSW 2765, Lot 11 DP816720', Report No. C6868.Q3450.B28321 FB RAP, December 2013.....

subject to compliance with the following condition(s):

NONE.....

.....

[1] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

**** Strike out as appropriate***

Overall comments

Details of the Remedial Action Plan may require review and amendment in consideration of a specific development concept or plan for the site. .....

.....

.....

.....

PART III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* **(Accreditation No. .....0804.....)**.

I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the *Contaminated Land Management Act 1997,* and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Michael Dunbavan

Signed ..... Date ...20 December 2013.

PART IV: Explanatory notes

To be complete, a site audit statement form must be issued with all four parts.

How to complete this form

Part I identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remedial action or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use(s) of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A or Section B of Part II, **not** both.

In **Section A** the auditor may conclude that the land is *suitable* for a specified use(s) OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further remediation or investigation of the site was needed to render the site fit for the specified use(s). Any **condition** imposed should be limited to implementation of an environmental management plan to help ensure the site remains safe for the specified use(s). The plan should be legally enforceable: for example a requirement of a notice under the *Contaminated Land Management Act 1997* (CLM Act) or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of the *Environmental Planning and Assessment Act 1979*.

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

In **Section B** the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or whether land can be made suitable for a particular land use or uses upon implementation of a remedial action or management plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

In **Part III** the auditor certifies his/her standing as an accredited auditor under the CLM Act and makes other relevant declarations.

Where to send completed forms

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to:

EPA (NSW)
Contaminated Sites Section
PO Box A290, SYDNEY SOUTH NSW 1232
nswauditors@epa.nsw.gov.au

AND

the **local council** for the land which is the subject of the audit.

1 Introduction

1.1 Site Audit Details

Coffey Environments Australia Pty Ltd (Coffey) was engaged by Mastergroup Lot 11 Trust to provide site audit services, in accordance with the Contaminated Land Management Act (1997), for the site located at Lot 11 DP816720, Richards Road, Riverstone, NSW. Dr Michael Dunbavan, an employee of Coffey and a NSW EPA Accredited Site Auditor, conducted the audit.

Table 1.1: Audit Details

Name of Site Auditor	Dr Michael Dunbavan
Date of first appointment as a Site Auditor under the NSW Contaminated Land Management Act (1997):	9 July 2008
Auditors Accreditation Number	0804
Auditors Contact Details	Coffey Environments Australia Pty Ltd Level 19, Tower B, Citadel Towers, 799 Pacific Highway, Chatswood NSW 2067 T: (02) 9406 1206 F: (02) 9406 1002
Address of Audited Site:	Richards Road, Riverstone, NSW
Site Identification	Part Lot 11, DP816720
Local Government Authority	Blacktown City Council
Size of the Audit Area	66.2Ha
Previous Zoning	Not applicable
Current Zoning	General Rural 1(a) under Blacktown City Council Local Environmental Plan (LEP) 1988 published at council website on 27 November 2013.
Proposed Zoning	As current zoning *The site is proposed to be rezoned as Rural Small Holding (RU4) under the draft LEP 2013. Council has proposed a number of amendments to the draft LEP 2013 which has not been finalised.*
Use or Uses of the Site that Potentially may have Given Rise to Contamination	Range of past uses including: wastewater treatment, grazing and agricultural uses, uncontrolled filling, waste burial and animal husbandry operated by a former meatworks facility adjacent to the site.
Current Use to which the Site is being put	The site is currently not occupied and most of the site structures have been demolished. The site is used for cattle grazing at a low stocking rate.
Intended uses of the Site	Residential

Type of Audit	☐ Statutory	☑ Non-statutory
Completion Date of Audit	20 December 2013	
Intended Land Use	Residential	
Person requesting the Audit	Mr Mark Robertson representing Mastergroup Lot 11 Trust	

1.2 About the Site Audit Process

Site auditors are accredited by the NSW Environment Protection Authority (EPA) to review the work of contaminated land consultants. The *Contaminated Land Management Act 1997* (CLM Act) calls these reviews 'site audits' and defines a site audit as an independent review:

- That relates to investigation or remediation carried out (whether under the CLM Act or otherwise) in respect of the actual or possible contamination of land; and
- That is conducted for the purpose of determining any one or more of the following matters:
    i. The nature and extent of any contamination of the land
    ii. The nature and extent of the investigation or remediation
    iii. Whether the land is suitable for any specified use or range of uses
    iv. What investigation or remediation remains necessary before land is suitable for any specified use or range of uses
    v. The suitability and appropriateness of a plan of remediation, a long-term management plan, a voluntary investigation proposal or a remediation proposal.

The main products of a site audit are a 'site audit statement' and a 'site audit report'.

A **site audit statement (SAS)** is the written opinion of the site auditor, on an EPA approved form, comprising the essential findings of a site audit. The site audit statement allows the site auditor to provide sign off under either Part A or Part B of the SAS as follows:

A. To determine land use suitability

OR

B(i) To determine the nature and extent of contamination, and/or

B(ii) To determine the appropriateness of an investigation/remedial action/management plan or report, and/or

B(iii) To determine if the land can be made suitable for a particular use or uses by implementation of a specified remedial action plan/management plan or report

Before issuing a site audit statement, the site auditor must prepare and finalise a **site audit report (SAR)**. The site audit report must be clearly expressed and presented and contain the information, discussion and rationale that support the conclusions in the site audit statement.

In some circumstances a site audit is required by law. These audits are known as **'statutory site audits'** and may be carried out only by site auditors accredited under the CLM Act 1997. A statutory site audit is one that is required by:

- A regulatory instrument issued under the CLM Act, including EPA agreements issued by EPA to voluntary proposals
- The NSW *Environmental Planning and Assessment Act 1979*, including an environmental planning instrument or development consent condition

- Any other Act.

1.3 Background to this Audit

The audit has been conducted to determine the appropriateness of the contaminated site investigation and remedial action plan for future residential development.

This site audit is therefore a **non-statutory site audit**.

The objective of the site audit is covered under **Section B** of the site audit statement as follows:

> B(iii) To determine if the land can be made suitable for a particular use or uses by implementation of a specified remedial action plan/management plan or report

1.4 Scope of the Audit

The following reports are the subject of this Site Audit:

- Environmental & Earth Science Pty Ltd 2003, 'Site Investigation for Riverstone Meatworks Effluent Treatment Ponds, Riverstone, NSW', Report No. 103070, June 2003
- Environmental Investigation Services 2013, 'Report to SESL Australia Pty Ltd on Preliminary Groundwater Screening for Future Development at Part of Lot 11 in DP816720, Off Riverstone Parade, Riverstone NSW', Report No. E26522KBrpt, June 2013
- SESL Australia Pty Ltd 2012c, 'Phase 1 Preliminary Site Investigation for Richards Road, Riverstone (Lot 11 DP816720), Report No. C7185.Q3041.B23331 FB PSI, November 2012 [partial review only].
- SESL Australia Pty Ltd 2013a, 'Interim Audit Advice 01 – Comment on SESL Consolidated Site Investigation Report, Lot 11, Richards Road, Riverstone', Letter Ref: FA Auditor Response, 2 April 2013.
- SESL Australia Pty Ltd 2013b, 'Sampling, Analysis and Quality Plan for Richards Road, Riverstone, NSW, Lot 11 DP816720', Report No. C6868.Q3190.B25449 DA SAQP, May 2013, Draft [Draft SQAP].
- SESL Australia Pty Ltd 2013c, 'Interim Audit Advice 07 – Comment on SESL Results from Additional Sampling and Analysis, Lot 11, Richards Road, Riverstone', Letter Ref: Response for Interim Audit Advice 07, 14 August 2013.
- SESL Australia Pty Ltd 2013d, 'Consolidated Investigation for Richards Road, Riverstone, NSW (Lot 11 DP816720)', Report No. C6868.Q3222.B25854 FB CSI, December 2013, [CSI Report].
- SESL Australia Pty Ltd 2013e, 'Addendum Report to Consolidated Investigation for Richards Road, Riverstone, ', Report No. C6868.Q3222.B25854 FB CSI Addendum, December 2013 [CSI Addendum].
- SESL Australia Pty Ltd 2013f, 'Remediation Action Plan for Richards Road, Riverstone NSW 2765, Lot 11 DP816720', Report No. C6868.Q3450.B28321 FB RAP, December 2013 [RAP].

The Auditor has issued 14 no. interim audit advices which are summarised in Table 1.2. Copies of the interim audit advice are included in Appendix B.

Table 1.2: Summary of Interim Audit Advice

Interim Advice (IA) Number (Date)	Report(s) / Issues covered in the IA	Outcome
IA01 (29 Jan 2013)	• Draft CSI Report, dated Dec 2012 • EES 2003 • Sections 5 to 9, SESL 2012	SESL revised the following the items for approval: • Conceptual site model • Number of Areas of Environmental Concern (AECs) • Potential contaminants of concern (PCOCs) associated with each AEC. • Proposed sampling densities • SAQP
IA02 (18 Feb 2013)	• Revised AECs and PCOCs	The Auditor was satisfied with the identified AECs and provided further advice on PCOCs.
IA03 (25 Feb 2013)	• Proposed sampling densities	The Auditor provided further advice on the proposed sampling densities.
IA04 (28 Feb 2013)	• Revised Sample Densities	The Auditor provided further advice on the proposed sampling densities.
IA05 (23 Apr 2013)	• Response to IA01	The Auditor provided additional comments and requested SESL to incorporate comments raised in IA02 to IA05 in a revised CSI Report.
IA06 (20 Jun 2013)	• SAQP	The Auditor requested an Addendum SAQP to be prepared. *(SESL proceeded with the detailed site investigation [DSI] without submitting an Addendum SAQP for review.)*
IA07 (8 Aug 2013)	• DSI results	The Auditor reviewed the DSI data and noted that SESL addressed issues raised in IA02 to IA05. The Auditor requested that the data be present in a manner consistent with the SAQP.
IA08 (9 Sep 2013)	• DSI Results Master Sheet 140813	SESL addressed the majority of comments made in IA07 which allowed the Auditor to undertake an initial review of the DSI data. Further investigation was required to be undertaken to delineate the lead impact identified at the former animal husbandry structure (AEC11/Structure BA).
IA09 (24 Sep 2013)	• IA07 • Draft CSI Report, dated Aug 2013	SESL clarified with the Auditor the identity of AECs and provided a tabulated summary of samples collected and analysed, which enabled the Auditor to review the Draft CSI report (Aug 2013). The Auditor identified that a number of data gaps based on the investigation results and requested further delineation to be undertaken at AEC8 and

Interim Advice (IA) Number (Date)	Report(s) / Issues covered in the IA	Outcome
		AEC11
IA10 (25 Nov 2013)	• Draft CSI Report, dated Nov 2013	The Auditor noted that SESL has addressed the comments made in IA09 and that the previously identified data gaps were resolved. There were a number of outstanding issues associated with the presentation of the Draft CSI report. The Auditor requested for an Addendum CSI report to be prepared to limit the scale of changes to the CSI Report.
IA11 (3 Dec 2013)	• Draft RAP, dated Nov 2013	The Auditor provided comments on the draft RAP and requested RAP be revised.
IA12 Rev1 (16 Dec 2013)	• Draft CSI and Addendum Reports, Dec 2013	The Auditor provided comments on the draft CSI and addendum reports requested the reports be revised.
IA13 (16 Dec 2013)	• Draft RAP, dated Dec 2013	The Auditor provided comments on the draft RAP and requested RAP be revised.
IA14 (17 Dec 2013)	• Acceptance of Final CSI Report, CSI Addendum and RAP	No further action required.

A copy of each Interim Advice is included in Appendix B.

The Auditor addressed the following developments during the review process:

- The PSI Report was included as an appendix of the Draft CSI Report (dated December 2012). The Auditor noted the site history information was included in the CSI Report, however the limited soil investigation conducted as part of the PSI was described in the CSI Report only. The Auditor reviewed Sections 5 to 9 of the PSI report to assess the appropriateness and usability of the data set which formed the basis on this opinion on the requirement of the SQAP.
- The Auditor requested for an Addendum SAQP to be prepared for review but SESL commenced the investigation without finalising the SAQP. The Auditor subsequently reviewed investigation data provided by SESL and required additional investigation to be undertaken to delineate the identified impacts. The Auditor considered that the absence of a final SAQP does not materially affect the outcome of this Audit.
- The following reports were also provided to the Auditor as appendices to the Draft CSI Report (dated December 2012). The Auditor noted that these reports were prepared to assess the impact of treated grease trap waste application on part of the site and considered these reports were not prepared for the purpose of contamination assessment and thereby were not reviewed as part of this Site Audit:
    - SESL 2010, Review of Environmental Factors: Lot 11 DP 816720, Report Reference: C5377.B15157.FB REF, dated August 2010.

- SESL 2011a, Post Application Assessment: Lot 11 DP 816720, Report Reference: C5377.B17054.FA Riverstone Paddock B, PAA, dated April 2011.
- SESL 2011b, Review of Environmental Factors: Lot 11 DP 816720, Report Reference: C5377.B17887.FA REF, dated May 2011.
- SESL 2011c, Post Application Assessment: Lot 11 DP 816720, Report Reference: C5377.B19206.FA Riverstone Paddock C, PAA, dated August 2011.
- SESL 2012a, Post Application Assessment: Lot 11 DP 816720, Report Reference: C5377.B20744.FA Riverstone Paddock E, PAA, dated January 2012.

The Auditor also notes that the following report was provided in the Consolidated Report:

- SESL 2012c, Contamination Assessment for Richards Road, Riverstone, NSW (Lot 11 DP 816720), Report Reference: C6868.Q2777.B20640 FB Riverstone Mastergroup, dated December 2012.

The Auditor considered this report did not include the necessary information for the Auditor to assess the quality and usability of the data provided in this report.

The Auditor also noted two previous assessments which may have included assessment of the whole or part of the site. Copies of these reports were not provided to the Auditor for review:

- Environmental Health Services 1992, Environmental Audit, Wm Angliss Meatworks, Riverstone, NSW.
- Flour Daniel GTI (Australia) Pty Ltd 1997, Environmental Site Assessment, Roadmaster Haulage, Richards Avenue, Riverstone, NSW.

1.5 Limitations of the Audit

The SAR and SAS express the opinion of the auditor regarding the Audit Site from a contamination perspective at the time of the completion of the audit (stated in Section 1.1). **If the assessment of the Audit Site and/or associated reports are subsequently altered, then the auditor's opinion may change.**

The auditor does not normally carry out any independent sampling or chemical analyses of soil, groundwater and other media during an audit, but relies on the analysis and reporting completed by the environmental consultant(s), where it has been demonstrated to be adequate for the intended purpose by reference to quality indicators listed in various guidelines made or endorsed by EPA and the auditor's observations of the consultant's activities in environmental investigation.

The assessment of the Audit Area and review of associated reports cited in this SAR and SAS is based on the results of sampling at discrete locations and times. It should be recognised that investigations / studies, including those substantially following guidelines made or approved by EPA, are often statistically based, and there is always some uncertainty in such studies. Thus, whilst the audit has been prepared in accordance with the professional standards expected of an auditor, as with any assessment based on discreet sampling, it is possible that unexpected conditions or unidentified contamination exists in localised areas of the audit site.

The SAR has been prepared in accordance with the NSW DEC (2006) *Guidelines for the NSW Site Auditor Scheme* (2nd edition), and other advice given to auditors by EPA from time to time. These guidelines have been prepared by EPA under the CLM Act.

2 Site Details

2.1 Site Description

The property is described as Richards Road, Riverstone NSW and is identified as Lot 11 in DP 816720. The property surrounded by rural residential properties and natural bush to the south, Eastern Creek to the north and east and rural land to the west. The property has an approximate area of 154Ha.

A copy of the Survey Plan for the property is included in Appendix A. The property is divided into three sections:

- Lease area for excavation which is located in the middle of the property (shaded area on the Survey Plan);
- Area bound between the lease area for excavation and Eastern Creek; and
- Area to the south / south-west of the lease area for excavation.

The Audit Area is identified as Part Lot 11 in DP 816720 and occupies 66.2 Ha. The Audit Area excludes the portion of Lot 11 which is subject to development constraints due to potential for flooding by Eastern Creek.

A site location plan is provided in Figure 1. The Audit Area is shown in Figure 2.

2.2 Site Condition

SESL (2013d) reported that the site was mainly general rural land utilised for cattle farming and crop grazing. The main site features include:

- A waste water treatment system comprising two settling ponds and two anaerobic ponds located in the south-western corner of the site, which was operated by the former abattoir located to the east of the site;
- Two farm dams;
- Various dumping and filling areas;
- A former shed and a former pumphouse located in the centre of the site;
- Remnants of the former animal husbandry structures operated by the abattoir; and
- Private access roads running in the central and northern portion of the site.

A site visit was made by the Site Auditor on 21 January 2013. The Auditor's observations are summarised below:

- The site was generally fenced and unused with the exception of cattle grazing;
- The two settling ponds were partially dry. The anaerobic ponds were located approximately 3 to 4 metres above the surrounding ground level and supported a dense growth of reeds;
- Asbestos cement drainage pipes were observed at several locations around the settlement ponds;
- Ash materials were observed as a surface layer on the access road;

- Remnants of former buildings were observed on the east side of the ponds, with concrete slabs in several locations. No buildings were noted within the vicinity. Visual signs of abattoir operation were not noted.
- Farm dams, probably to provide drinking water for cattle, were observed at a few locations along natural drainage lines across the site. A shed was present in the central portion of the site.
- No signs of plant stress were noted during the site visit.

2.3 Surrounding Environment

SESL (2013d) reported that the site is located within a general rural area with agricultural land bordering to the north and west of the site. Eastern Creek runs from the north-west border of the property boundary to the south-east border with a gully flowing through the centre property from north to south.

A commercial building (Roadmaster Pty Ltd) is located to the immediate east of the property boundary, followed by the railway line. Residential and commercial properties are located on the other side of the railway line.

Auditor's Opinion

Based on the information provided by Mastergroup Pty Ltd to the Auditor during the initial site meeting on 21 January 2013, the abattoir (historically owned and operated by Riverstone Meatworks Pty Ltd) was located on the east bank of Eastern Creek, to the east of the site.

The site was used for wastewater treatment, cattle grazing and animal husbandry activities. The Auditor understands that the effluent was transferred to the site via aboveground pipes which were removed from the site prior to the commencement of this Site Audit. The former structures and/or sheds were likely to be associated with animal husbandry activities. No other uses of the site, except for a trial of application of treated grease trap waste to land, appear to have occurred during the past decade.

The Auditor notes that SESL has considered potential contaminating activities associated with the former use of the site in association with abattoir operations, and activities on the site since abattoir operations ceased, which are discussed in Section 5 of this report.

2.4 Proposed Development

The Auditor understands that the intended land use is residential although no concept for development is available at the time of Site Audit.

2.5 The Local Environmental Plan

Blacktown Local Environmental Plan 1988

As noted in Table 1.1, the site is currently used 1(a) General Rural under the Blacktown Local Environmental Plan 1998[1].

[1] Although there is a Draft Blacktown Local Environmental Plan (2013), the Council has made a number of amendments to the DLEP based on their assessment of the public submissions which will be presented to Council. The DLEP will not be finalised until the amendments be resolved.

The objectives of this zone are:

- To ensure that actual or potential agriculturally productive land is not withdrawn unnecessarily from production;
- To ensure that development in rural areas is carried out in a manner that minimises risks from natural hazards and does not unreasonably increase demand from public services;
- To provide for urban support functions; and
- To ensure that development within the rural zones does not hinder the proper and orderly development of any future urban lands.

Uses Allowed under the Blacktown Local Environmental Plan 1998

Development that does not require consent

- Nil

Development which requires consent

- Any purpose other than a purpose included in Item 2 or 4 of the matter relating to this zone

Prohibited

Amusement centres; animal boarding establishments where dogs are kept; auction rooms; brothels; boarding houses; bulk stores; bulky goods retail establishments; caravan parks; child care centres; commercial premises; detached dual occupancies; exhibition homes; exhibition villages; hardware stores; hazardous industries; hazardous storage establishments; highway service centres; industries (other than rural industries or extractive industries); integrated housing; junk yards; manufactured home estates; medium density housing; methadone dispensaries; mineral sand mines; mines; mixed businesses; mortuaries; motels; motor showrooms; offensive industries; offensive storage establishments; plant and equipment hire establishments; professional offices; refreshment rooms, residential flat buildings; service centres; service stations; shops; storage yards; transport terminals; warehouses.

3 Soil Stratigraphy and Hydrogeology

3.1 Topography and Hydrology

Information related to the topography and hydrology is summarised in SESL (2013d):

The elevation across the site is approximately 6m to 24m Australian Height Datum (AHD) from north to south of the site. The topography of the area in the vicinity of the site is an alluvial valley defined by both South Creek and Eastern Creek.

The site is generally undulating down towards Eastern Creek to the north-east. SESL stated that soil material excavated from creating the two larger aerobic ponds were potentially used to raise the level of the anaerobic ponds.

Auditor's Opinion

The Auditor checked the topographic map which indicated that the site is sloping to the north-east toward Eastern Creek. The Auditor also noted that the two anaerobic ponds area situated approximately 3-4m above the ground level during the site walkover.

3.2 Site Geology

SESL (2013d) indicated that the site likely to be underlain by the Ashfield Shale of the Wianamatta Group consisting of laminite and dark grey siltstone, Bringelly Shale consisting of shale with occasional calcareous claystone, laminite and infrequent coal, and Minchinbury Sandstone consisting of fine to medium grained quartz lithic sandstone.

3.3 Acid Sulfate Soil

ES (2013d) reviewed the NSW Natural Resource Atlas Maps for the site, which indicated that the site posed a Class 5 risk because of its proximity of a Class 1 to Class 4 risk area. However, due to the site elevation and site geology, it was not expected that acids sulphate soils are present within the site.

3.4 Site Hydrogeology

EIS (2013) conducted a groundwater bore search of groundwater bore summary records available on the NSW Office of Water website. Twelve groundwater bores were found to be located within approximately a 5m radius of the site, of which eleven of the bores were installed for monitoring purposes only. The exception was bore GW111756, located approximately 2.75km north-west of the site, was registered for domestic uses. A review of the bore log was undertaken by EIS which indicates that there are two water bearing zones at depths of approximately 15m and 133m. The thickness of these zones was approximately 200m and the yield was reported to be relatively low.

EIS considered that groundwater is not likely to be a significant source for abstraction purposes in the immediate vicinity of the site. A perched aquifer located in the shallow subsurface but was not considered to be a resource due to high salinity, poor water quality and low yield.

Auditor's Opinion

The Auditor is of the opinion that the soil stratigraphy and hydrogeology summarised above (based on information provided by SESL (2013d) and EIS (2013) are generally adequate for the purpose of the studies reviewed in this Site Audit. The information is generally consistent with the Auditor's review of published information; site observations and review of bore logs provided by the consultant.

Based on the site topography, the Auditor is of the opinion that a groundwater mound is likely to be present in the south-western corner of the site as a result of infiltration from the anaerobic ponds which are located approximately 3 to 4m above the surrounding ground surface.

The Auditor is of the opinion that future beneficial use of groundwater at the site is unlikely given the reported low yield and high salinity of the shale water bearing zone.

4 Site History

SESL (2013d) provided a review of historical uses of the site which included:

- Title records showed that the site was owned by Robert Richards and his estate and B. Richards and Sons Limited until 1921. Riverstone Meat Company purchased the site in 1921 and developed the abattoir and cattle farming operation until 1994. The current owner, Mastergroup Lot 211 Pty Ltd (successor to Roadmaster Haulage Pty Ltd) acquired the site in 1994.
- The 1947 and 1956 aerial photographs indicate that the site was mainly used for rural purposes with a number of farm sheds scattered around the site. The four effluent treatment ponds are present in the 1975 aerial photograph, indicating that the system was constructed between 1970 and 1975. Demolition of some ancillary buildings on-site also appears to have occurred around this time. Since 1975, no other significant changes were noted with respect to the site appearance.

Section 149 (2) Planning Certificates states that the site is not in conservation area, does not include critical habitat, has not been proclaimed to be within a mine subsidence district, does not contain an item of environment heritage, not affected by road widening / alignment, and there are no notices under the *Coastal Protection Act 1979*.

The land has not been declared to be significantly contaminated land and is not subject to a management order / an approved voluntary management proposal / an ongoing maintenance order under the *Contaminated Land Management Act 1997*.

The site is shown flood prone on mapping provided by the Department of Planning and is bushfire prone under the *Rural Fires and Environmental Assessment Legislation Amendment Act 2002*.

NSW WorkCover records indicated no record of any licence to store dangerous goods on the site.

Site inspection found several asbestos cement drainage pipes around the effluent ponds. Additionally, a line of asbestos cement pipes were observed adjacent to the road to the north of the western pond which were reported by SESL to have been removed by licensed contractor prior to site investigation. Other pipes in the pond walls remain on-site.

SESL provided reports on soil condition after application of treated grease trap waste in various parts of the site and the property by Applied Organics with the consent of Mastergroup. These reports indicated no residual impact which would affect the suitability of the land for future residential use. The Auditor understands that the trial application was terminated due to unacceptable odour from the application area affecting neighbouring residential properties.

Auditor's Opinion

The site history prepared by SESL (2013d) drew on information from:

- Title records – current and historical (past and present use which may identify potential contamination source)
- Historical aerial photographs
- Council records (Section 149 planning certificate)
- NSW WorkCover dangerous goods licensing records
- Site walkover

The Auditor is of the opinion that the above sources comprise a reasonable basis for reviewing the site history and are consistent with sources recommended in ASC NEPM (2013) and NSW EPA (1997).

After review of the available information and conducting a site walkover, the Auditor considers that the site history provided by SESL (2013) to be generally acceptable for the purpose of the investigation.

5 Areas of Environmental Concern and Potential Contaminants of Concern

5.1 On-site Sources

Based on the site history and site observations, SESL (2013d) indicated that the Areas of Environmental Concern (AECs) and their associated Potential Contaminants of Concern (PCoCs) at the site were:

Table 5.1 On-site AECs and PCoCs (reproduced from SESL, 2013d)

No.	AEC	Description	PCoCs
1	Settling Ponds	The settling ponds were constructed as part of the wastewater and irrigation system for the meatworks facility in 1974. After the meatworks operation ceased, the settling ponds remained.	• Nutrients (Nitrogen & Phosphorus) • pH & Electrical Conductivity • Sodium Sulfate • Calcium Carbonate
2	Anaerobic Ponds	The anaerobic ponds were constructed as part of the wastewater and irrigation system for the meatworks facility in 1974. After the meatworks operation ceased, the anaerobic ponds remained. Effluent treated in the anaerobic ponds was released to the settling ponds.	• Nutrients (Nitrogen & Phosphorus) • pH & Electrical Conductivity • Sodium Sulfate • Calcium Carbonate
3	Agricultural land	Paddocks that have been used for livestock grazing since the late 1800's and biosolids were applied in a few paddocks to improve the soil quality in recent years.	• Heavy Metals • Organochlorine Pesticides
4	Asbestos Pipes	Former piping associated with the anaerobic and settlement ponds is suspected to be asbestos containing material.	• Asbestos
5	Access Roads	Access roads across the site to paddocks included a surface layer of cinders to improve trafficability in wet weather.	• Heavy Metals • Polycyclic Aromatic Hydrocarbon • Alkalinity
6	Farm Dams	Potential for contaminated sediment mobilized in runoff from agricultural or animal waste to accumulate in farm dams on site.	• Heavy Metals • Nutrients (Nitrogen & Phosphorus) • Polycyclic Aromatic Hydrocarbon

No.	AEC	Description	PCoCs
			• pH & Electrical Conductivity
7	Potential filling in Paddock	Site observation and historical photos shows soil disturbance in the southwest part of the site indicating potential for burial of waste materials using shallow landfills.	• Heavy Metals • Polycyclic Aromatic Hydrocarbon • Total Recoverable Hydrocarbon • Organochlorine Pesticide • Polychlorinated Biphenyls • Asbestos
8	Former dumping site	A potential former dumping (stockpile) site located to the east of the anaerobic ponds was identified from previous investigation and historical aerial photographs.	• Polycyclic Aromatic Hydrocarbon • Total Recoverable Hydrocarbon • Organochlorine Pesticide • Polychlorinated Biphenyls • Asbestos
9	Former dumping site	Another potential former dumping (stockpile) site located to the north of the farm shed was identified from previous investigation and historical aerial photographs.	• Polycyclic Aromatic Hydrocarbon • Total Recoverable Hydrocarbon • Organochlorine Pesticide • Polychlorinated Biphenyls • Asbestos
10	Former shed	A former shed located close to the roads between paddocks was demolished when the meatworks operation closed at 1994.	• Polycyclic Aromatic Hydrocarbon • Total Recoverable Hydrocarbon • Organochlorine Pesticide • Polychlorinated Biphenyls • Asbestos
11	Former meatworks facility and associated buildings	The former dairy or feed lot facility on site consists of multiple structural buildings and sheds. Almost all of the buildings with the exception of two sheds were demolished when the operation closed at 1994.	• Heavy Metals • Sodium Sulfate • Calcium Carbonate • Asbestos
12	Potential filling of former dam	Historical aerial photos showed three former dams were partially or completely filled and leveled.	• Heavy Metals • Nutrients (Nitrogen & Phosphorus) • pH & Electrical Conductivity

No.	AEC	Description	PCoCs
			• Sodium Sulfate
13	Groundwater at settling ponds	The settling ponds were part of the waste irrigation system when the abattoir was in operation. This poses concerns if the former wastewater within the pond could potentially impact groundwater beneath the settling ponds.	• Heavy Metals • Nutrients (Nitrogen & Phosphorus) • pH & Electrical Conductivity

Locations of these AECs are provided in Figure 2.

Auditor's Opinion

The Auditor considers that the AECs and PCoCs identified by SESL (2013d) are consistent with identified historical activities and the current condition of the site. The sources of potential contamination and the majority of the associated contaminants are also consistent with the Auditor's experience on similar sites where activities are associated with agriculture, cattle grazing and industrial sites. The Auditor notes that summary information relevant to cattle holding yards associated with abattoirs is not provided in NSW DUAP (1998).

Overall, the Auditor is of the opinion that the identified AECs and PCoCs are adequate for the purpose of this site investigation.

5.2 Off-site Sources

Off-site sources are not detailed in SESL (2013d). However, based on the information provided in the report, the Auditor considers that off-site sources of potential contamination in the vicinity of the site include:

- The main meatworks facility located on the east bank of Eastern Creek, to the east of the site. Based on anecdotal information provided by Mastergroup, the Auditor understands that from the early 1970s effluent from the abattoir was transferred through above-ground pipes to the site and pumped into the anaerobic ponds for treatment and surplus treated effluent was used to irrigate paddocks to the northeast of the ponds (EES 2003). Similarly, the ash material present on the access roads was likely to be sourced from coal-fired boiler which operated as part of the abattoir.
- The site may have been used for disposal of general waste materials, such as demolition rubble, which arose from time to time during operation of the abattoir. There is no evidence for continual disposal to landfill and no evidence that the site may have been used for disposal of putrescible wastes (that is, animal residual).

Activities on surrounding properties to the north and east of the site are isolated from the site by Eastern Creek. Activities on surrounding properties to the south and west of the site are associated with cattle grazing and rural residential occupation and are considered to pose low to negligible risk of causing contamination on the site.

Auditor's Opinion

The Auditor considers that although SESL (2013d) did not discuss potential for off-site sources of contamination in detail, SESL did not omit any such potential sources either. The Auditor considers that effluent and other waste materials brought onto the site are recognised through assessment of on-site potential contamination, and that other off-site potential sources of contamination are either isolated from the site or present low to negligible risk for causing contamination on the site. Thus, assessment of potential off-site sources of contamination is considered adequate for the purposes of this investigation.

6 Investigation History

6.1 Environmental & Earth Sciences (2003)

Environmental & Earth Sciences Pty Ltd (EES) was engaged by Stockland to undertake a site investigation on the effluent treatment ponds and adjacent area to the northeast used for irrigation of treated effluent. At the time of investigation, EES reported that the site comprised agricultural paddocks with the exception of the treatment ponds. EES indicated that the investigation area was levelled during the construction of the ponds and that the excavated materials were used as berms around the ponds. Additionally, EES also noted that three dumping areas were reported during previous investigations. The areas were located to the north, north-west and east of the ponds. EES indicated that the two dumping areas located to the north and north-west of the ponds were not apparent. EES was notified about the potential presence of the dumping area located to the east of the pond after site investigation was completed and consequently this area was not investigated. Additionally, groundwater was not assessed as it was not encountered during the investigation.

Twenty-two (22) boreholes were drilled during fieldwork to a depth of up to 2.4m below ground level (mbgl) and forty-six (46) discrete soil samples were collected.

EES summarised the analytical plan as follows:

- TPH / PAH – four discrete and three composite soil samples;
- OCP – four discrete and three composite soil samples;
- Asbestos – two soil samples;
- Nitrate / Phosphate – one discrete and ten composite soil samples
- Heavy metals – two discrete and 14 composite soil samples.

Results from analysis were compared to health-based investigation levels for low density residential and recreational setting (values adopted from ASC NEPM [1999]). TPH results were compared to site criteria adopted from the NSW EPA (1994) Guidelines for Assessing Service Station Sites. Based on the results, EES indicated that:

- Heavy metals were below the adopted site criteria;
- Nitrate and phosphate concentrations were reported and EES indicated that if mobilised, these nutrient levels could cause an unacceptable environmental impact to surface water in Eastern Creek;
- TPH was not detected, except in one composite sample from the aerobic pond, which was likely attributable to natural organic compounds (such as algae);
- Traces of DDT and breakdown compound DDE were detected in one composite sample and one individual sample, which EES attributed to likely use as an insecticide in abattoir operations; and
- Asbestos was not detected in the two soil samples analysed.

EES concluded that the site is “suitable for reclassification as residential with no remediation necessary based on results to date”. EES noted that “the high nitrate and phosphate values within the ponds and the irrigated area were an environmental risk if surface water mobilised them into the groundwater or nearby creeks, therefore it is recommended that good vegetative cover of these areas was maintained”. EES also noted that “the fill areas and berms surrounding the effluent ponds were considered to be unconsolidated and the filled areas would require further analysis prior to or during development in accordance with NSW EPA guidelines, furthermore due to the local soil landscape, effective drainage should be included in the development”.

Auditor's Opinion

The Auditor notes that the investigation area limited within the aerobic and anaerobic ponds and the an area to the northeast. The investigation did not cover the entire Audit Area.

Composite sampling was used by EES. The Auditor notes that subsamples used to make a composite sample should not be more than 20 metres apart (Section 6 in NSW EPA Sampling Design Guidelines, 1995), and this recommended distance was substantially exceeded for the 14 composite samples used.

The Auditor considers that composite samples used in this investigation are unlikely to be representative of the area associated with the individual sample locations. The Auditor considers that results from composite sampling and analysis should be treated as preliminary only.

6.2 Preliminary Site Investigation – SESL (2012)

A Preliminary Site Investigation (PSI) was conducted by SESL Australia for the site in August 2012 to assess the site's suitability for the proposed residential development. SESL indicated that the scope of works for the PSI involved:

- Comprehensive desktop review on the historical activity on site based on selected aerial photographs and Certificates of Title;
- Searches for information held by relevant State Authorities in relation to contaminated land;
- Obtaining information pertaining to the site's environmental setting including the proximity of the site to sensitive receptors and information on site geology;
- Review of previous environmental assessment done on site;
- Identify the potential contamination caused by past or present activities on site;
- Site inspection to identify site characteristics that may indicate contamination to support findings of historical data review.
- Preliminary sampling conducted at effluent ponds to determine if there is potential contamination caused by the ponds system and provide additional environmental data to previous investigations conducted for pre and post Treated Grease Trap Waste assessment on site;
- Laboratory chemical analysis by NATA accredited laboratories in accordance with chain of custody procedures;
- Assessment of field and laboratory analytical results limited to the adopted criteria for the site;
- Preparation of a PSI report detailing findings in accordance with Office of Environment and Heritage (OEH) guidelines for reporting contaminated sites;
- Identify the need to conduct further assessment;
- Determine if site is suitable for proposed development; and
- Proposed suitable remedial and validation strategies if required.

Based on the information reviewed, SESL indicated that the site was used historically for cattle grazing, wastewater treatment and sheds possibly used as a dairy or feed lot associated with the former abattoir to the east. Effluent ponds comprising two smaller anaerobic ponds and two larger settling ponds are located in the southwest corner of the site.

Based on the preliminary sampling of soil from the base of the settling ponds, SESL concluded that the soils within the ponds did not indicate potential contamination that could pose potential harm to

human health. In summary the site investigation identified the following potential environmental concern:

- The potential weathering of lead and/or zinc from building materials used in former sheds on site;
- The potential use of asbestos containing materials (ACM) within eaves, roofs and insulation of the former historic structures and drainage pipes on site;
- The identification of bonded ACM at isolated locations on site (top levy bank of the settling pond furthest to the west);
- The use of cinders (likely bottom ash from coal fired boilers at the former abattoir) as a road surface layer; and
- Potential heavy metals and nutrient contamination due to former agricultural activities and current cattle grazing on site.

SESL considered that "a detailed environmental investigation was required to representatively characterise the site".

Auditor's Opinion

The Auditor notes that this report was prepared for the entire property boundary. SESL has undertaken a site history review and conducted a limited soil sampling around the effluent ponds. The report was prepared prior to the appointment of the Site Auditor.

The Auditor recognises several data gaps in the site history section and notes that the soil sampling was limited to surface sampling only.

The Auditor considers that the information presented is insufficient to characterise the site and that this report identified the need for further assessment works.

6.3 Consolidated Site Investigation – SESL (2013d)

Scope and design of investigation

A Consolidated Site Investigation (CSI) report was prepared by SESL based on several investigations conducted for the site in relation to land and groundwater contamination. SESL summarised the scope of works for the CSI as:

- Review of previous site investigations;
- Review of historical information of the site from previous reports, supplemented by other historical information obtained recently;
- Summarise previous site investigations as part of a consolidated report;
- Detailed inspection of the site and immediate surrounds for indicators of potential land contamination;
- Identification of AECs and applicable contaminants of concern;
- Development of a Conceptual Site Model (CSM);
- Development of a Sampling, Analysis and Quality Plan (SAQP) in for detailed contamination assessment of the site;
- Soil sampling and analysis as outlined in the SAQP and a preliminary groundwater investigation; and

- Reporting the CSI findings in accordance with NSW EPA guidelines for reporting contaminated sites.

The CSI identified that historical land use on site was predominantly associated with the former meatworks facility to the east of the site, being effluent treatment, cattle grazing and isolated instances of land disposal of waste materials.

SESL identified thirteen AECs associated with the historical activities on-site which are described in Section 5.

Subsequent to the identification of the AECs, SESL prepared a Sampling, Analysis and Quality Plan (SAQP) which was reviewed by the Auditor (covered in Interim Advice IA01 to IA04, included in Appendix B). The SQAP was not formally issued and approved by the Auditor prior to investigation works, however the Auditor provided his opinions on the sampling densities and analyses for each AEC during the SQAP preparation which SESL adopted for the investigation.

Soil investigation

SESL carried out the first round soil investigation between April and July 2013 and the scope of works is summarised in Table 6.1. AEC 13 relates to groundwater and is not included in Table 6.1.

Table 6.1 Summary of Soil Investigation Program (First Round, April to July 2013)

AEC	Number of Sampling Points
1 - Settling Ponds	Sixteen sediment samples were collected from the western aerobic pond. No sampling was undertaken on the eastern pond due to poor weather condition. (WSP1 to WSP16)
2 - Anaerobic Ponds	Twenty sediment samples were collected from both anaerobic ponds (AP1 to AP20)
3 - Agricultural land	Surface samples were collected from 50 locations across the paddock, based on a sampling grid of 1 sample per hectare. (A1 to I12)
4 - Asbestos Pipes	Three surface samples were collected from four sampling locations in the vicinity of the effluent ponds (AP_ASB1 to AP_ASB4, WSP_ASB1 to WSP_ASB4, ESP_ASB1 to ESP_ASB4 and ASB S1 to ESP ASB4).
5 - Access Roads	Sixteen soil samples were collected along the existing access road based on a sampling density of 1 sample per 100m (Road B1 to Road F8).
6 - Farm Dams	Two dams were identified where three sediment samples (Dam#1 and Dam #2)
7 - Potential filling in Paddock	Twenty surface samples were collected from 20 locations (JF1 to JF20). Additionally, five test pits were excavated to visually delineate the lateral and vertical extents of the fill material within this AEC. (Test pits JF1 to JF5)
8 - Former dumping site (east of anaerobic pond)	Nine surface samples were collected from nine locations (JE1 to JE9).
9 - Former dumping site	Seven surface samples were collected from seven locations (JE1 to JE7). Twelve test pits (Test pits JE1 to JE12) were excavated to facilitate sampling.
10 - Former shed	Five surface samples were collected from five locations (BG1 to BG5).

AEC	Number of Sampling Points
11 - Former meatworks facility and associated buildings	Eight structures were identified and investigated individually: • BA1 to BA23 • BB1 to BB12 • BC1 to BC9 • BD1 to BD7 • BE2 to BE27 • BF2 to BF5 • BH1 to BH7 • BI1 to BI13
12 - Potential filling of former dam	Three filling areas were identified and investigated: • JA1 to JA5 • JB1 to JB5 • JC1 to JC8 • Additionally test pits were also excavated to visually delineate the lateral and vertical extents of the fill material.

The Auditor reviewed the first round of the investigation results and noted that further assessment works were required to delineate the lead and zinc impacts identified as well as the extents of the fill material in parts of the site (as summarised in interim advice IA08, included in Appendix B). The groundwater assessment conducted by EIS is discussed in Section 6.4.

At the Auditor's request, SESL undertook further investigation in October 2013. SESL summarised the scope of works for the second round of investigation as follows:

Table 6.2 Summary of Soil Investigation Program (Second Round, October 2013)

AEC	Scope of Additional Investigation
AEC 7 – Potential filling in Paddock	Five test pits were excavated to visually delineate the lateral and vertical extents of the fill material within this AEC. (Test pits JF1 to JF5)
AEC 8 – Former dumping site	Eleven (11) test pits were excavated to visually delineate the lateral and vertical extents of the fill material within this AEC. (Test pits JE13 to JE23)
AEC 11 – Former meatworks facility	• BA22 to BA44 – Twenty-three (23) test pits were excavated to delineate the lead impact in soils identified during the first round of investigation. • BC10 to BC26 – Twenty-seven (27) test pits were excavated to delineate the zinc impact in soils identified during the first round of investigation. • BE10 to BE27 – Eighteen (18) test pits were excavated to delineate the copper and zinc impact in soils identified during the first round of

	investigation.

Groundwater investigation

Environmental Investigation Services Pty Ltd (EIS) was engaged by SESL to undertake a preliminary groundwater screening (PGS) for the site. The work was confined to the immediate vicinity of the existing effluent ponds.

EIS (2013) summarised the scope of works as:

- Drilling and installation of seven groundwater monitoring wells at selected locations in the investigation area;
- Survey the monitoring well locations to allow assessment of groundwater flow direction;
- Well development and subsequent groundwater sampling; and
- Data interpretation and reporting.

Groundwater results were compared to ANZECC (2000) trigger values for 95% protection in freshwater ecosystems, indicating that:

- Concentrations of arsenic, cadmium, copper, nickel, zinc and iron were reported at concentrations above the adopted GIL;
- Nutrients and other physical parameters were reported below the GILs; and
- E.Coli and Faecal coliforms were detected of approximately 4,000CFU/100ml and total coliforms of approximately 800 CFU/100ml.

Based on the fieldwork and analytical results, ESI concluded that:

- The groundwater contour indicated that two groundwater mounds were present in the vicinity of MW1 and MW6;
- The mounds may have been caused by recharge from the adjoining ponds;
- Enteric bacteria may be present in a low lying area to the east of the investigation area;
- The results indicated that effluent ponds have had an impact on the groundwater especially in the vicinity of MW1, MW3 and MW6; and
- Based on the subsurface conditions, the impact was likely to be localised.

The Auditor reviewed the groundwater results provided by EIS through SESL in June 2013. The Auditor referred to well construction details and noted that the groundwater monitoring wells were drilled into the underlying shale bedrock with standing water level occurring in the overlying residual clay soil. The Auditor is of the opinion that any water infiltration from the ponds is likely to be detected within the clay above the shale. Groundwater samples collected by EIS were collected at the midpoint of the screened interval which corresponds to the shale bedrock. Consequently, potential impacts to groundwater in residual soil may not have been identified from this initial sampling.

Consideration of construction details for the seven monitoring wells showed that six of those wells had a portion of the screened interval within the residual clay soil. Thus, low flow sampling which does not depress the water level should provide a representative sample of groundwater from the residual clay. The Auditor required SESL to conduct a second round of groundwater sampling using this approach. This was undertaken by SESL in July 2013. Results obtained from the second round of groundwater sampling indicated potential for difference in results based on a reduction in electrical conductivity in wells MW4, MW5 and MW7, however, no similar consistent pattern was observed in concentrations of heavy metals in groundwater.

Results and interpretation

Soil and groundwater samples were analysed to address potential contaminants of concern discussed in Section 5. A copy of summary tables of analytical results is included in Appendix D.

Results from the analysis of soil samples were compared to the Residential A setting as adopted in ASC NEPM (2013) [HIL-A], health screening levels (HSL-A and B), relevant ESLs and calculated EILs and indicated that:

- At AEC 4, asbestos cement pipes at the eastern evaporation pond and both anaerobic ponds had weathered to an extent where free fibres were detected within soil material in the surrounding area.
- At AEC 8, the presence of fill material and disturbed ground were identified at various locations within this AEC. These areas were located to the immediate east of the anaerobic ponds and progressed further east until Testpit JE23 as well as further south to the edge of the Eastern Settling Pond. Buried waste (drums, ACM etc.) was identified in the area located to the east of anaerobic ponds.
- At AEC 11, lead in soil was reported at six sampling locations at concentrations more than 2.5 times HIL-A indicating remediation is required (locations BA3, BA10, BA11, BA22, BA32 and BA36). Bonded ACM fragments were also identified in the vicinity of BA and between locations BA9, BA22, BA25 and BA30.
- Zinc in soil was reported with 95th percentile upper confidence limit concentrations above the calculated EIL at the three former structures within AEC 11. The main impacted areas are located around BA, BB, BC, BE, BF and BH.
- Aesthetically unacceptable material (i.e. ash deposits, brick, concrete, etc.) identified in fill layers in AEC 8, AEC 9 and AEC 11 must be removed. An ash layer was also identified on the surface of the access road (AEC 5), which SESL did not consider that would pose an unacceptable health risk and which could be mixed with soil on the site to mitigate aesthetic impact.

The groundwater table was mounded beneath the ponds in the southwest part of the site, indicating some recharge by infiltration from the ponds. Groundwater results obtained from the two monitoring rounds were compared to the GIL for the protection of freshwater ecosystems as detailed in ASC NEPM (2013) and indicated that groundwater quality did not appear to be impacted by the infiltration.

SESL (2013d) concluded that “based on the scope and findings of this CSI, SESL considered that the site can be made suitable for the proposed low density residential development, subject to the management / remediation of the contamination identified on-site that may be undertaken during site development”.

6.4 CSI Addendum SESL (2013e)

In response to the Auditor’s interim advice (IA10), SESL (2013e) prepared an addendum to the CSI Report to address certain comments raised by the Auditor. This is considered as part of the SESL (2013d) Report and that Auditor’s review of the CSI Addendum is integral to review of the CSI Report.

Auditor’s Opinion

The Auditor reviewed the EES (2003) and SESL (2012) reports to as relevant background information for the soil and groundwater investigations described in SESL (2013d and 2013e).

The Auditor considers that the combined outcomes of the investigations reported by SESL (2013d, 2013e) and EIS (2003) provide an adequate assessment of the site contamination in the context of its intended residential use. The Auditor is satisfied with the site history review, description of site setting and surroundings and identification of AECs and associated potential contaminants of concern.

The initial round of site characterisation was based on the SAQP which was not formally issued and approved by the Auditor prior to implementation. The Auditor requested additional sampling and analysis to delineate emerging soil impact following review of the first round of soil and groundwater results and is satisfied that the current understanding of site contamination meets the purpose of this investigation.

The Auditor agrees with the outcomes of contamination assessment and that five regions, mostly in the southwest corner of the site, equire remediation. Aesthetic conditions associated with the ash surfacing along the access road are included. Aesthetic conditions in other remediation regions may emerge as being unacceptable during remediation works.

The Auditor considers that infiltration from the ponds appears to have created a local mound in the groundwater table, but that the quality of groundwater shows no apparent impact. Thus, no further groundwater investigation appears warranted. The Auditor agrees with SESL that no groundwater remediation works will be required for the site.

The Auditor notes that the Audit Area covers approximately 66 Ha and is aware that other unknown potentially contaminating activities might have occurred within the Audit Area. This uncertainty is addressed through inclusion of an Unexpected Finds procedure in the Remedial Action Plan.

7 Environmental Assessment Criteria

7.1 Soil Investigation Levels

The purpose of this Site Audit is to assess if the site can be made suitable for the proposed residential use. Although no concept for development was available during the Site Audit, the Auditor understands that the site is intended for residential development.

The soil investigation level (SILs) used by SESL (2013d) were adopted from ASC NEPM (2013):

- HIL-A (or Residential A) for land use defined as *residential with gardens / accessible soil (home-grown produce <10% fruit and vegetable intake, (no poulty), also includes children's daycare centres, preschools and primary schools.*
- HSL-A and -B (low-high / density residential) based on the predominant soil texture from the soil profile and depth of which samples were collected based on each AEC.
    - Sandy soils were identified for AECs 5 to 8 and 11 to 12.
    - Clayey soils were identified for AECs 9 to 11.
- EILs - The 'urban residential and public open space' setting was adopted by SESL in deriving EILs for arsenic, DDT and naphthalene. EILs for copper, nickel, lead and zinc were derived using procedures described in Schedule B1 of ASC NEPM (2013). EILs were separately derived for 'former structure' (AEC 11) and 'paddocks' (remainder of the site) due to difference in soil properties.
- ESLs – The 'urban residential and public open space' setting was adopted by SESL, taking into consideration of soil texture (fine / coarse) as described in Schedule B1 of ASC NEPM (2013).

For the assessment of asbestos, SESL has adopted 'zero tolerance' as the site criterion.

Intended residential use of the land requires consideration of aesthetic conditions, which should be acceptable to a future owner / occupant of a residential lot. In particular, staining, soil consistency, odours and presence of foreign materials were identified for consideration by SESL.

7.2 Groundwater Investigation Levels

SESL (2013d, 2013e)

Given the nearest receiving water body is Eastern Creek, which is a highly degraded freshwater ecosystem and given that other beneficial uses of groundwater were considered unlikely due to high total dissolved solids in groundwater, SESL (2013e) considered that the freshwater trigger values from Table 1C in Schedule B1 of ASC NPEM (2013) were the most suitable groundwater investigation levels (GILs) for the site.

EIS (2013)

The GILs used by EIS (2013) were adopted from:

- ANZECC (2000) trigger values for protection of 95% species;
- NHMRC (2011) – Australian Drinking Water Quality Guidelines;
- Sydney Water (2012-2013) – Sydney Water Acceptance Standards Trade Waste to Sewer; and
- ANZECC (2000) – Level for NSW Lowland Rivers for nutrient and inorganic compounds.

Auditor's Opinion

SILs

The Auditor agrees that because the site is intended for future residential development, and no other planning information is available, the entire site of approximately 66 hectares should be assessed using SILs relevant to the Residential A setting, as described in Schedule B1 of the ASC NEPM (2013).The selection of SIL requires consideration of EILs / ESLs and HILs / HSLs. The size of the site means that the consistency of soil and fill material across the site varies so that the applicable EIL will vary accordingly. The Auditor is satisfied that SESL has made appropriate selections for SILs which are expected to be conservative.

SESL has adopted 'zero tolerance' as the assessment criterion for asbestos. The Auditor as acknowledges that other HSLs for asbestos impact are provided in Table 7 of Schedule B1 of ASC NEPM (2013), however, application of the Table 7 HSLs requires an appropriate density of sampling and assessment for different types of asbestos (Bonded ACM, Fibrous asbestos and Asbestos fines). Such appropriate results for asbestos impact assessment were not available for this study and the Auditor accepts the "zero tolerance" criterion adopted by SESL for investigation.

SESL's consideration of aesthetic conditions in disturbed areas was appropriate for the site and acceptable to the Auditor.

GILs

The Auditor notes differences between the GILs adopted by SESL and EIS, however, given the apparent lack of impact of historical operation of the effluent treatment system on groundwater quality in the southwest corner of the site, these differences are not material.

The Auditor agrees with application of ANZECC (2000) freshwater trigger values for the protection of 95% species which is consistence with guidance in Schedule B1 of the ASC NEPM (2013). The Auditor considers that the Eastern Creek habitat is highy degraded due to adjacent land clearing and agricultural use of land and urban development of land in the creek catchment. Thus, use of protection for 95% species trigger values is acceptable.

The Auditor notes that SESL or EIS did not propose a criterion for faecal coliform. The Auditor considers that the results for analysis of faecal coliform showed presence of microbes at low levels which do not indicate that microbial contamination is an issue oif concern to be addressed by detailed investigation. The Auditor considers that the absence of this criterion does not affect the outcome of the investigation.

In summary, the Auditor considers that environmental assessment criteria adopted by SESL and EIS (groundwater only), and the values (or qualities) nominated for those criteria were appropriate in the context of intended future residential development of the site and were selected from relevant EPA endorsed guidelines.

8 Evaluation of Sampling, Analysis and Quality Plan

Reports identified as SESL2013a and SESL 2013b were reviewed regarding the appropriateness of the sampling, analysis and quality plan for the site.

8.1 Data Quality Objectives

SESL (2013d) provided their Data Quality Objectives (DQOs), field and laboratory quality assurance (QA) and quality control (QC) measures. DQOs were prepared in with reference to the seven step process described in Appendix IV NSW DEC (2006).

Based on the Auditor's review, the approach adopted by SESL to define DQOs through seven step process is described in Table 8.1.

Table 8.1 Auditor's Interpretation of the DQOs adopted by SESL (2013d)

Step 1: State the problem	The land is intended for future residential development and has previously been used for activities which have the potential to contaminate the land.
Step 2: Identify decision	Is the site suitable for the intended residential development, and if otherwise, what actions are required to make the site suitable for that future use.
Step 3: Identify inputs to the decision	Inputs are results from investigation and relevant soil and groundwater investigation levels
Step 4: Define the study boundaries	The lateral extent addressed the area subject to audit and the vertical extent was generally 0.5m into natural soil, including areas of fill material, and to approximately 15m below ground surface for groundwater assessment.
Step 5: Develop a decision rule	Type, extent and reliability of results need to be demonstrated to be acceptable through quality assurance processes. Soil analytical results were compared against the SILs, supplemented by calculation of the 95 percentile upper confidence limit (UCL) of the arithmetic mean of the relevant data set where an individual result, or results, was above the SIL. Where potentially unacceptable risk to human health or ecological values is indicated by exceedance of SILs, then remediation or other management will be proposed. Similarly, asbestos impacts must be eliminated by removal from the site. Unacceptable aesthetic conditions are addressed through management or removal of materials from the site.
Step 6: Specify limits on decision error	Areas of identified soil impact were assessed using a sampling density which exceeded the minimum recommended by EPA guidelines. Statistical analysis was used to demonstrate that the probability of the average concentration of a contaminant had less than 5% chance of exceeding the relevant SIL.
Step 7: Optimise the design	This was achieved by design of an appropriate sampling plan after

for obtaining data	SESL's review of the site history and site inspection.

EIS did not establish DQOs for the groundwater assessment. However, given that the locations of the groundwater monitoring wells were reviewed and agreed by the Auditor prior to the fieldwork and that sufficient QA/QC samples were analysed during sampling, the Auditor considers that this is sufficient.

Auditor's Opinion

The Auditor considers that the Data Quality Objectives used by SESL and EIS on planning and implementing the soil and groundwater investigations are adequate and consistent with EPA endorsed guidelines.

8.2 Soil and Sediment Sampling and Analysis

The following elements of the sampling and analysis program outlined in the SESL (2013d and 2013e) were assessed:

- Sampling pattern
- Sampling depth
- Laboratory analysis
- Field methodology

Maps 3 to 13 in SESL (2013d) show sampling locations and are reproduced for reference in Appendix C. Sampling reported by EES (2003) and SESL (2012) were not assessed below and the data were used to develop the investigation scope only.

Sampling Pattern

SESL stated that sampling locations were based on based on a judgemental sampling pattern to assess the identified AECs. The Auditor notes that sampling patterns were generally undertaken in accordance with the SAQP, with the exception of the AEC 1 because the eastern settling pond was holding water.

The Auditor calculated the sampling densities for AECs 7 to 10 and 12 are approximately 1 sample per 300 to 500m^2. Sampling was undertaken in rough grid patterns for AECs 1, 2 and 6. AEC 5 (access road) was sampled at a a linear spacing of 100m. At AEC 4, sampling was undertaken at the wall bund where asbestos cement pipes were identified, as well as in the western end of the access road (ASB S1) where an asbestos pipe was previously located. At AEC 11, sampling was undertaken around the perimeters of each former structure (where feasible) at a minimum frequency of 1 sample every 10 to 15m and that at least 1 sample was collected on each side of each structure.

The second round of investigation focused on delineation sampling at locations of identified impacts. This was undertaken at AECs 4, 8 and 11.

The NSW EPA (1995) Sampling Design Guidelines recommends for sites larger than five hectares are usually sub-divided into smaller areas for more effective sampling which was adopted by SESL in this investigation through assessment of each AEC.

Sampling Depth

During the first sampling round, sampling locations were generally extended to depths not more than 0.5m below ground surface due to the use of hand tools for boring. Most of the samples were labelled as 'Sample location – surface' and the borehole logs did not indicate sample depth.

The Auditor reviewed the borehole logs prepared by SESL and notes that fill materials, with the exception of AEC 5, AEC 8, AEC 9 and AEC 11, were relatively shallow which is consistent with the historical activities at the site and site observations.

The thicknesses of the ash fill along the access road (AEC 5) was not established at each sampling location.

The Auditor notes that test pits were excavated at AECs 8, 9 and 11 during the second sampling round where the depths of sampling points were extended through fill materials to expose natural undisturbed soil.

Laboratory Analysis

The analytical suite requested was consistent with that stated in the SAQP.

Field Methodologies

The Auditor considers that the use of hand augering as the only means of accessing the subsurface for the first round of soil sampling resulted in data gaps, which were addressed to the Auditor's satisfaction through the second round of sampling and analysis. The excavation of test pits in disturbed areas during the second sampling round also reduced uncertainty about the nature and extent of foreign materials included in fill material, particularly in AEC 8.

SESL stated that:

- hand tools were decontaminated prior to use in each borehole and between sampling to prevent cross contamination. Decontamination included removing adhered soil with a brush, washing with Decon 90, distilled water, and drying with a clean cloth or left to air dry.
- each soil sample was placed in a sample bag or a glass jar, then stored in a chilled container pending transport to a laboratory under Chain of Custody (COC) procedures'. Relevant sample receipts and chain of custody records are included in Appendix E to SESL (2013d).

The Auditor notes that samples were mostly handled in accordance with AS 4482.1-2005 and relevant guidelines such as Schedule B2 in ASC NEPM (2013). Departures from standard reported by laboratories were mainly associated with incomplete COC details (no sample dates provided on COC) and use of inappropriate sample containers (using sample bags for organic analysis). The Auditor checked sampling dates provided in borehole logs against the sample receipt dates and found that samples were extracted within holding times.

The Auditor notes that field screening for volatile organic compounds (VOC) was not usedduring sampling, however the site history and condition of the site indicated a low likelihood for the presence of VOCs.

Auditor's Opinion

The Auditor considers that:

- sampling pattern adopted by SESL is generally acceptable and consistent with NSW EPA (1995).
- The combined results from two sampling rounds provided sufficient information for vertical delineation of fill thickness and soil impacts.
- The analytical suite requested was consistent with that stated in the SAQP.
- The field methodology employed is not expected to compromise the usability of the laboratory results.

8.3 Surface Water and Groundwater Sampling and Analysis

The following elements of the sampling and analysis program outlined in the SESL (2013d and 2013e) and EIS (2013) were assessed:

- Sampling design
- Well installation s
- Field sampling
- Laboratory analysis

Maps 7 and 14 in SESL (2013d) showed sampling locations and these are reproduced for reference in Appendix C.

Sampling locations – Surface Water

SESL reported that one surface water sample was collected from each of two farm dams defined as AEC 6.

Sampling locations - Groundwater

The Auditor notes that groundwater assessment was undertaken in the southwest part of the site in the vicinity of the effluent ponds to assess the potential impacts to groundwater quality as a result of potential effluent infiltration.

The Auditor considers that impacted soil identified in other AECs in the southwest part of the site are unlikely to impact the underlying groundwater quality given the thickness of natural clay soil overlying shale bedrock and relatively deep groundwater table (approximately 8 to 10 m bgs).

Monitoring well construction

EIS, as a sub-contractor of SESL, installed seven (7) groundwater monitoring wells to depths between 8.6m and 15m bgs. Groundwater wells were installed across the contact zone between shale bedrock and residual clay soils, which the Auditor considers to be against good practice.

The Auditor considers that these wells should have been terminated at the base of the residual clay stratum where groundwater table (perched or otherwise) is likely to occur, particularly if infiltration from the ponds has occurred. The Auditor notes that MW2 was screened entirely within the shale bedrock.

To obtain groundwater samples that were reasonably likely to represent water from the residual clay immediately above the shale, the Auditor required SESL to undertake a second round of groundwater monitoring using low flow sampling with gauging of groundwater level to ensure that drawdown in the well was avoided. Groundwater results obtained from both rounds of sampling were reviewed by the Auditor and are discussed in Section 11.2.

Surface water sampling

SESL (2013d) indicated that surface water samples were collected directly into the appropriate laboratory supplied bottles with the correct preservation.

Groundwater sampling

The Auditor reviewed the groundwater sampling activity described in EIS (2013) and SESL (2013e).

Specifically, SESL (2013e) indicated that depth to groundwater was monitored during purging and sampling at each well to ensure no unacceptable drawdown. SESL was not able to provide appropriate field records to demonstrate monitoring of water levels during purging and sampling nor for measurement of water quality parameters during purging. The Auditor considers that this lack of information is non-compliant with minimum performance requirements.

SESL and EIS indicated that decontamination procedures were undertaken between samples, including water level meter and flow cell used for measuring field water quality parameters. Disposable tubing was used with the peristaltic pump for well purging and sample collection. Samples were collected directly into laboratory supplied preserved bottles, then stored in a chilled container pending transport to a laboratory under Chain of Custody (COC) control. Sample receipt notices and chain of custody records are provided in Appendix E to SESL (2013d) and in EIS (2013).

Laboratory analysis

The analytical suite requested was consistent with that stated for soils in the SAQP and as discussed with the Auditor, with particular reference to potential for microbial contamination..

Auditor's Opinion

The Auditor concludes that:

- the location of groundwater monitoring wells generally met the objective for assessment of potential impact of infiltration of water from effluent ponds.
- given the shallow depth of surface water and the artificial empoundment, field sampling was generally adequate for the purpose of this investigation.
- groundwater sampling was probably in a manner to provide appropriate samples for analysis, but that field records were not made to demonstrate that minimum requirements were met.
- In summary, sampling of surface water and groundwater is generally acceptable. The results are reasonably expected to represent water quality from the respective AEC.

9 Evaluation of Quality Assurance and Quality Control

Items for field QA/QC, laboratory QA/QC and QA/QC data evaluation listed in Section 3.1 of NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (NSW OEH, 2011) were considered by the Auditor in preparation of comments in this section.

9.1 Field QA/QC - Soil

SESL (2013d) states qualifications of key staff for this investigation to demonstrate competence in planning and undertaking field sampling.

Description of decontamination procedures are provided in SESL (2013d), together with sampling logs and chain of custody records. The Auditor notes that information was not complete in all aspects.

Duplicate and triplicate field QC samples collected by SESL were summarised in SESL (2013e) and the relevant table listing Relative Percent Difference (RPD) values is reproduced in Appendix D. A summary of the frequency of this type of QC sample for soil sampling is provided in Table 9.1. The Auditor notes that the required frequency for this type of QC sample is 10%, with an equal proportion of duplicate (intra-laboratory) and triplicate (inter-laboratory) samples. Reference to the RPD table included in SESL (2013e) shows 14 RPD values were above the performance limit of 50%, with 11 of those instances attributable to very low reported concentrations of the particular metal. Thus, the deficiency of field QC samples is mitigated by demonstrated reliability of available QC results.

Analysis for organic compounds in soil generally resulted in no reportable concentrations, which is consistent with potential contamination from historical activities and observation of current conditions on the site. Consequently, the deficiency of QC samples for this class of contaminants is unlikely to affect the outcome of this investigation.

Additionally, SESL included three decontamination rinsate samples and one trip blank. Lead was reported in one of the rinsate samples collected during the sampling at AEC 3, Agricultural Land, where lead was naturally occurring and reported at concentrations between 10 and 53 mg/kg. Copper and zinc were detected in both rinsate samples prepared during the sampling at AEC 3, where copper and zinc were also attributed to natural occurrence in the large majority of samples. No trip spike was used.

Collection of field QC outcomes is summarised in Table 9.1.

Table 9.1 Summary of Field QC Outcomes – Soil

Analyte	Primary Soil Sample	Duplicate / Triplicate	Duplicate / Triplicate Frequency	Calculated RPD Duplicate / Triplicate	Rinsate Sample	Trip Blank
Metals[1]	228	8/5	4%/2%	<LOR to 111% / <LOR to 153%	2	1
Lead	238	13/5	5%/2%	2% to 73% / 33% to 131%	3	1
Zinc	251	11/5	4%/2%	0% to 111% / 27% to 149%	2	1
PAH	98	2/3	2%/3%	<LOR to 95% /	-	1

Analyte	Primary Soil Sample	Duplicate / Triplicate	Duplicate / Triplicate Frequency	Calculated RPD Duplicate / Triplicate	Rinsate Sample	Trip Blank
				27% to 174%		
BTEX	74	1/2	1%/3%	<LOR / <LOR	-	-
TRH[2]	74	1/2	1%/3%	100% / 0 to 117%	-	-
OCP	124	3/4	2%3%	<LOR / <LOR	2	-
PCB	74	1/2	1%/3%	<LOR / <LOR	-	-

Notes:

1. Metals included arsenic, cadmium, chromium, copper, nickel and mercury
2. TRH included all C6-C10, >C10-C16, >C16-C34 and >C34-C40
3. NA = not analysed.

Auditor's Opinion

The Auditor acknowledges that the frequency of QC samples for QA assessment of investigation data is substantially below that for compliance with the Australian Standard AS4482.1-2005. The available data indicates that the existing data has relatively low inherent variability, and that many of the contaminants of potential concern are present at low concentrations or are not detected, particularly organic compounds.

Thus, the Auditor concludes that the deficiency in QC measures is unlikely to result in a Type II error in assessment of results; that is accepting that results indicate no unacceptable risk of environmental harm when the opposite is actually the case.

9.2 Field QC – Surface Water and Groundwater

Field QC samples collected by SESL and EIS were summarised in SESL (2013e) and EIS (2013) which are summarised in tables in Appendix D.

SESL collected one blind duplicate surface water sample from one of the farm dams in AEC 6, however no QC samples were collected by SESLduring the second round of groundwater sampling. No rinsate sample, trip blank or trip spike was included.

EIS collected one duplicate and one triplicate sample as part of groundwater sampling activities and one rinsate sample was also collected. A trip blank or trip spike was not included.

A summary of the frequency of this type of QC sample for surface water and groundwater sampling is provided in Table 9.1.

Table 9.2 Summary of Field QC Outcomes – Surface Water and Groundwater

Analyte	Primary Water Sample	Duplicate / Triplicate	Duplicate / Triplicate Frequency	Calculated RPD Duplicate / Triplicate	Rinsate Sample	Trip Blank / Trip Spike
SESL						
Metals[1]	8	1/0	12.5% / 0	<LOR to 67% / NA	-	-
PAH	1	1/0	100% / 0	<LOR / NA	-	-
TN	8	1/0	12.5% / 0	13% / NA	-	-
TP	8	1/0	12.5% / 0	<LOR / NA	-	-
EIS						
Metals[1]	7	1/1	14% / 14%	<LOR to 14% / <LOR to 85%	1	-

Notes:

1. Metals included arsenic, cadmium, chromium, copper, lead, nickel, mercury, zinc and iron
2. NA – Not Analysed

Auditor's Opinion

Given the low number of primary samples, the Auditor considers that the frequency of QC samples included in this part of the investigation was consistent with industry standards and guidelines endorsed by NSW EPA. The Auditor notes that Appendix C, Assessment of Data Quality, in Schedule B2 of the ASC NEPM (2013) recommends the same QA approach regardless of environmental medium under investigation.

9.3 Laboratory QC

Soil Analyses

SESL used the services of the following laboratories as primary laboratories for the following analyses:

- SESL – metals, OCPs and physical and inorganic parameters (TN, TP, pH, EC, sodium, $CaCO_3$, total alkalinity);
- Eurofins-mgt – BTEX, TRH, PAH, PCBs;
- Sonic – microbiology; and
- ALS Global – lead (batch 27878 only).

The Auditor notes that Eurofins-mgt sub-contracted asbestos analysis to ASET.

SESL employed Envirolab as the secondary laboratory for soil analysis.

Surface and Groundwater Analyses

SESL submitted surface water samples from AEC 6 to Eurofins-mgt for analysis, but used Envirolab for analysis of the second round of groundwater samples.

EIS used Envirolab and Sonic as the primary laboratories, and NMI as the secondary laboratory for analysis of the first round of groundwater samples.

Laboratory certificates and documentation

Laboratory methods are listed in the certificates appended to the SESL (2013d) and EIS (2013). The laboratories were NATA accredited for the chemical analyses undertaken.

Laboratory methods referenced in reports were in-house NATA accredited methods and a summary of the extraction and reference to the analytical procedures was provided.

Details of estimated quantitation limits (EQL), acceptance limits for QC data and QC results were provided with each laboratory report.

Laboratory QC included laboratory duplicate, method blanks, laboratory control samples, surrogate spikes and internal standards.

Auditor's Opinion

The Auditor considers that the laboratory QC is adequate for the analyses undertaken and for the purpose of this investigation.

10 Data Quality Indicators

Data quality indicators (DQIs) relate to both field and laboratory procedures. A summary of DQIs relevant to the particular investigation is provided in SESL (2013d, 2013e) and EIS (2013). Performance of the overall sampling and analysis program against DQIs recommended in Appendix V, Quality assurance and quality control, of DEC (2006) was assessed by the Auditor and a summary of findings is presented in Table 10.1.

Table 10.1 Assessment of General Data Quality Indicators

Completeness A measure of the amount of useable data (expressed as %) from a data collection activity				
Field considerations	Check	Laboratory considerations	Check	Comments
All critical locations sampled	✓	All critical samples analysed according to SAQP	✓	Two sampling rounds were required to achieve a satisfactory outcome. Detailed field records were incomplete in some aspects.
All samples collected (from grid and at depth)	✓	All analytes analysed according to SAQP	✓	
SOPs appropriate and complied with	✓	Appropriate methods and PQLs	✓	
Experienced sampler	✓	Sample documentation complete	No	
Documentation correct	No	Sample holding times complied with	✓	
Comparability The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event				
Field considerations	Check	Laboratory considerations	Check	Comments
Same SOPs used on each occasion	No	Sample analytical methods used (including clean-up)	✓	NATA laboratory used for analysis of soil samples was consistent, and this represented the large majority of samples submitted for analysis.
Experienced sampler	✓	Sample PQLs (justify/quantify if different)	✓	
Climatic conditions (temperature, rainfall, wind…)	✓	Same laboratories (justify/quantify if different)	No	
Same types of samples collected (filtered, size fractions....)	✓	Same units (justify/quantify if different)	✓	
Representativeness The confidence (expressed qualitatively) that data are representative of each media present on the site				
Field considerations	Check	Laboratory considerations	Check	Comments
Appropriate media sampled according to SAQP	✓	All samples analysed according to SAQP	✓	Two sampling rounds were required to achieve a satisfactory outcome.
All media identified in SAQP sampled.	✓			

Table 10.1 (continued) Assessment of General Data Quality Indicators

Precision A quantitative measure of the variability (or reproducibility) of data				
Field considerations	Check	Laboratory considerations	Check	Comments
SOPs appropriate and complied with	Part✓	Analysis of:		Substantial deficiency in frequency of QC field duplicate samples, however, generally low levels of contamination on the site mitigated the likelihood of a Type II error.
		Intra-laboratory and inter-laboratory duplicates	Part	
		field duplicates	Part	
		laboratory-prepared volatile trip spikes	N/A	
Accuracy (bias) A quantitative measure of the closeness of reported data to the true value				
Field considerations	Check	Laboratory considerations	Check	Comments
SOP appropriate and complied with	✓	Analysis of		
		field blanks	No	
		rinsate sample	Part	
		reagent blank	✓	
		method blank	✓	
		matrix spike	✓	
		matrix spike duplicate	✓	
		surrogate spike	✓	
		reference material	✓	
		laboratory control sample	✓	
		laboratory-prepared spikes	✓	

Auditor's Opinion

Completeness of investigation was achieved through two rounds of sampling and analysis.

Frequency of field QC samples and completeness of field records was substantially below requirements of Australian standards and EPA endorsed guidelines.

The Auditor considers that the nature of potential contamination of the site and the low inherent variability of impacts to soil are sufficiently mitigating factors so that the results presented in SESL (2013d) and SESL (2013e) are adequate for assessment of the suitability of the site for the intended residential development.

11 Evaluation of Site Assessment Results

11.1 Soils

Results

A summary of the number of samples analysed, number of sampling locations and statistical analysis for each analyte for each AEC are provided in Appendix D. A brief discussion of the results and the Auditor's opinion is provided below.

Discussion

AECs 1 and 2 – Settling and Anaerobic Ponds

SESL indicated that high levels of nutrients (nitrates, phosphates and sulfur) and salts were reported in the sediment samples collected from the ponds, which are mostly likely due to the processing of effluent from the former abattoir located to the east of the site.

Furthermore, SESL reviewed the average pH results from both the settling and anaerobic ponds and compared to the pH results for soils sampled in AEC 3, Agricultural Land. SESL indicated that the materials were within a neutrally occurring pH range for the area.

SESL noted that the sampling could not be undertaken at the eastern settling pond due to the presence of accumulated stormwater. Based on site observation, SESL indicated that "sediment material from both eastern and western ponds were consistent. Both ponds were used alternately for the former wastewater treatment system and therefore are expected to exhibit characteristics".

SESL also indicated that while samples were not analysed for heavy metals, PAHs and OCPs, these compounds were reported as not detected (organic compounds) or present at natural concentrations (metals) by EES (2003), and therefore did not warrant further investigation.

SESL concluded that high levels of nutrients and salts are unlikely to pose harm to human health, but may potentially pose environmental risk if mobilised into Eastern Creek.

Auditor's Opinion

The Auditor accepts that the condition of soils in the settling ponds (AEC 1) and anaerobic ponds (AEC 2) do not warrant further investigation or remediation. The current form of the settling ponds will almost certainly be altered substantially by bulk earthworks during future development of the site so that nutrients and salts will be mixed with other soils which will reduce likelihood of mobilisation into storm runoff..

AEC 3 – Agricultural Land

Fifty surface soil samples were analysed for heavy metals and OCPs and compared to the adopted HILs and EILs. Based on the results, SESL indicated that:

- Heavy metal results were reported at concentrations either below the respective LOR (generally cadmium and mercury) or below adopted HILs and EILs; and
- OCPs were reported at concentrations below LOR, with the exception of DDD/DDE/DDT and Aldrin and Dieldrin were reported at very low concentrations in three soil samples (A3 Surface, A4 Surface and B4 Surface), and substantially below adopted HILs and EILs.

Borehole logs recorded a layer of ash material at five locations (C7, D7 and E6 to the northeast of the access road junction, F5 to the southwest of the access road junction and I8 in the middle on the southern boundary of the site) and ash in soil at G6 in the southeast part of the site. If the observed ash layer has similar appearance to ash material used as a surface layer on the current access roads, then its presence in a layer would not be aesthetically acceptable for future residential use of the land.

Auditor's Opinion

While heavy metals and OCPs concentrations were reported below the respective HILs and EILs, the Auditor reviewed the borehole logs and notes that ash was present within the fill material in parts of the paddock. The Auditor considers that the presence of ash may not aesthetically acceptable for the proposed residential land use.

AEC 4 – Asbestos Pipes

Three soil samples were collected adjacent to AC pipes around the effluent ponds and analysed for asbestos from each of the following locations:

- Four locations around the western settling ponds;
- Four locations around the eastern settling ponds;
- Two locations in the northern section of the northern anaerobic pond;
- Two locations in the northern section of the southern anaerobic pond; and
- One location at the section of the access road to the north of the western settling pond.

SESL reported that asbestos was detected in:

- Two samples collected from the eastern settling pond contained bonded ACM and three samples contained asbestos fines (as loose fibres);
- Asbestos fines (as loose fibres) were identified in four samples collected from northern anaerobic pond; and
- Asbestos fines (as loose fibres) were identified in one sample collected from southern anaerobic pond.

Based on the results, SESL indicated that "the presence of loose asbestos fibres within soil samples indicates that the former piping infrastructure had disintegrated leading to ACM contamination". SESL concluded that the area contaminated with asbestos should be remediated with asbestos contaminating materials be removed for off-site disposal and this should be undertaken during initial site establishment.

The Auditor notes that sampling locations appear to have targeted the outlet end of the AC pipes, which would be expected to show a higher potential for dispersal of weathered ACM, but that this does not preclude asbestos impact at the inlet end of the AC pipes.

Auditor's Opinion

The Auditor concludes that the sampling and analysis around AC pipes in AEC 4 indicates that these pipes have weathered in place and that the soil surrounding the pipes must be suspected of having asbestos impact, regardless of the results of current sampling and analysis. The AC pipes require removal by an appropriately licensed contractor.

AEC 5 – Access Road

Sixteen surface soil samples collected from the access road were analysed for heavy metals, PAHs and total alkalinity. Based on the results, SESL indicated that:

- Heavy metals and PAHs is samples were reported at low concentrations or below LOR and substantially below adopted HILs and EILs; and
- Naphthalene was not detected and no odours were observed during sampling.

SESL indicated that "all samples were compliant with the adopted HIL". Additionally, ash material, described mostly as black coarse sandy gravel, was also identified in a layer generally between 0.1m and 0.25m thick on the surface of the access road. While the ash material is not considered to pose an unacceptable human health risk, SESL recommended that the ash material may be mixed with surrounding soil during earthworks to address an unacceptable aesthetic condition.

Auditor's Opinion

The Auditor agrees with SESL's assessment of materials on access roads on the site.

AEC 6 – Dams in Paddocks A and C

Sediment from the two dams located within this AEC was sampled by SESL. Three sediment samples were collected from each dam for the analysis of heavy metals, total nitrogen, total phosphorus, pH and electrical conductivity. PAH was also analysed for Dam 1 located within Paddock C due to its proximity to the access road where ash material is present as a surface layer.

Soil analytical results indicated that:

- Heavy metals were reported at concentrations either below the respective LOR or adopted HIL and EIL;
- Naphthalene, benzo(a)pyrene and total PAH was reported below LOR in the sediment samples collected from Dam 1 in the sediment samples analysed; and
- SESL commented that nutrient levels were slightly elevated, with sediment samples collected from the dam located within Paddock C reporting higher levels of nutrients in comparison with soil samples from Paddock A. Sediments were found to be generally acidic, which was consistent with those sampled from the effluent ponds.

Auditor's Opinion

The Auditor agrees with SESL's assessment of sediments in dams in AEC 6.

AEC 7 – Potential Filling

Twenty surface soil samples were collected from AEC 7 in the northwest part of the ite for the analysis of heavy metals, BTEX, TRH, PAH, OCP, PCB and asbestos. Soil analytical results indicated that:

- Heavy metals were detected at concentrations either below the respective LOR or adopted HILs and EILs;
- BTEX, PAH, OCP and PCB were reported below the respective LOR;
- TRH fractions were reported below the LOR;
- and
- Asbestos were not detected in the soil samples analysed.

SESL indicated that results for all analytes were substantially below the adopted SILs.

The Auditor notes that five test pits (Testpit JF1 to JF5) were excavated to establish the thickness of the fill material within this AEC, which was observed to vary between 0.2m and 0.35m. No soil samples were collected from these test pits. Consequently, the materials sampled from hand auger borings are considered to be representative of the fill material in this area.

The Auditor notes that the laboratory reports report TPH C_{10}-C_{36} between 51 and 79 mg/kg for samples JF1, -3, -4, -7 and -9, which were below the LOR for TRH C_{16}-C_{34} of 100mg/kg. The Auditor

also notes the “some ash” material was observed mixed with soil but not as a distinct layer at hand auger location JF9 and test pits JF2 and JF5.

Auditor’s Opinion

The Auditor considers that this area of fill material is a shallow surface feature which has very low concentrations of organic compounds and isolated occurrence of lead and zinc which are indicative of contamination but which do not present an unacceptable risk to human health or the environment. Asbestos was not identified in the 20 samples analysed, and no evidence of building materials was observed in the fill which would indicate an increased likelihood of the presence of undetected asbestos.

AEC 8 - Former Dumping Area to the east of the Anaerobic Pond

Nine surface soil samples were collected during the first round of sampling and analysed for heavy metals, TRH, BTEX, PAHs, OCPs, PCBs and asbestos. Soil analytical results indicated that:

- Heavy metals were reported at concentrations below either the respective LOR, HILs or EILs, with the exception of:
    - Zinc at concentrations of 860mg/kg and 1,900 mg/kg in soil samples collected from JE3/below a drum and JE9/1.5m, exceeding the adopted EIL of 610mg/kg;
    - JE9/1.5m is considered to be a hotspot given the concentration was reported greater than 250% of the adopted EIL. This hotspot was delineated vertically and laterally;
    - The 95th percentile UCL average concentration of zinc for the initial nine surface samples was calculated using Procedure D in NSW EPA (1995) to be 194 mg/kg which is less than the adopted EIL.
- BTEX, TRH, PAH, OCP and PAH were reported at concentrations either below the respective LOR or adopted HILs, HSLs, ESLs and EILs.
- Asbestos was encountered during test pitting at JE1. The sample was submitted for analysis and confirmed to be bonded ACM (Chrysotile and Amosite asbestos). Bonded ACM was also observed in Test pit JE8 between 0.8m and 1m depth. Excavation was abandoned due to the presence of asbestos.
- Fill material was delineated using test pitting, and an additional 32 samples were collected to represent the bulk of the fill material. As materials were present in the most areas of fill. The 95th percentile UCL average concentration of zinc for 41 samples was calculated using Procedure G in NSW EPA (1995) to be 211 mg/kg which is less than the adopted EIL.
- SESL recommended that the aesthetically unacceptable materials (predominantly buried waste which has the potential to be impacted by ACM) should be removed as part of remediation works.

Auditor’s Opinion

The Auditor generally agrees with SESL that aesthetically acceptable materials (buried waste and ash fill) and asbestos should be excavated and disposed off-site. The Auditor notes that fill material has the potential to be impacted by ACM at more than the two locations reported during investigation..

AEC 9 – Former Dumping Area (North of Shed)

Seven surface soil samples were collected from the AEC for the analysis of heavy metals, BTEX, TRH, PAH, OCP, PCB and asbestos. Soil analytical results indicated that:

- Heavy metals and PAHs were reported at concentrations either below the respective LOR or adopted HILs and EILs;
- BTEX, OCP and PCB were reported below the respective LOR;
- TRH C_6-C_{10} and >C_{10}-C_{16} were reported at concentrations below the respective HSLs and ESLs;
- Concentrations of TRH >C_{16}-C_{34} and/or >C_{34}-C_{40} were reported at low concentrations in soil samples collected at JD1, JD4 to JD7; and
- Asbestos was not identified.

Three test pits (identified as JD1 to JD3) were excavated to establish the thickness of the fill material within this AEC, which was found to vary between 0.25m and 0.4m. No soil samples were collected for analysis from these test pits. Consequently, the materials sampled from hand auger borings in the top 0.3m of the fill are considered to be representative of the fill material in this area.

Auditor's Opinion

The Auditor considers that fill material in AEC 9 does not to pose an unacceptable risk to human health or to the environment.

AEC 10 – Former Shed

Five surface soil samples were collected from the AEC for the analysis of heavy metals, BTEX, TRH, PAH, OCP, PCB and asbestos. Soil analytical results indicated that:

- Heavy metals were detected at concentrations either below the respective LOR or adopted HILs and EILs;
- PAHs were reported below the respective LOR and adopted HILs and EILs;
- BTEX, OCP and PCB were detected below the respective LOR;
- TRH C_6-C_{10} and >C_{10}-C_{16} were detected below the respective HSLs and ESLs;
- Concentrations of TRH >C_{16}-C_{34} and/or >C_{34}-C_{40} were detected in soil samples collected at BG2, BG3 and BG5; and
- Asbestos was not identified.

Auditor's Opinion

The Auditor considers that fill material in AEC 10 does not to pose an unacceptable risk to human health or to the environment.

AEC 11 – Former Structures

SESL stated that there are seven former structures associated with likely former animal husbandry activities (such as milking) at the site.

Ninie soil samples were analysed for heavy metals and asbestos in the initial round of sampling. A second round of sampling, generating an additional 41 samples, was necessary to delineate lead and/or zinc impact to soil around certain structures. The structures were denoted by SESL as BA, BB, BC, BE, BF, BH and BI. Structure (BF) is separated from the others and is a former pump house to the northwest of the anaerobic ponds. Results from analysis of soil samples are discussed in sections below:

- At Structure BA, lead was reported at concentrations exceeding HIL-A in 16 soil samples, six of which were considered to be hotspots (reported concentrations greater than 250% of HIL-A).

SESL indicated that the 95th percentile UCL average concentration for lead was 521mg/kg which exceeded HIL-A (300mg/kg). Further sampling was undertaken to delineate lead impacts. Zinc was also reported above the EIL. SESL indicated that the 95th percentile UCL average concentration for zinc was 609mg/kg which exceeded the EIL (340mg/kg). Lead and zinc impacts were generally located to the east and south of the former structure. Asbestos was also encountered to the east of structure BA. Other heavy metals were reported at concentrations either below the respective LOR, HILs or EILs. Buried waste materials, including brick fragments, glass and ash, and fragments of AC sheet were encountered during investigation which was generally limited to the upper 0.3m. Natural soils were observed at a depth of 0.5m below ground surface.

- At Structure BB, SESL indicated that heavy metals were generally reported below the respective HILs or EILs, with the exception of zinc, where concentrations were reported above the adopted EIL. SESL indicated that the 95th percentile UCL average concentration for zinc was 383mg/kg, slightly above the EIL of 340mg/kg.
- At Structure BC, SESL indicated that heavy metals were generally reported either below the respective LOR, HILs or EILs, with the exception of surface soil sample collected at BC6 where lead was reported at concentration above HIL-A. This exceedance was delineated vertically. Zinc concentrations were also reported to be above the EIL where the 95th percentile UCL average concentration was calculated to be 1,173mg/kg, well above the EIL of 340mg/kg. No asbestos was observed during investigation. Ash material mixed with other soil like material was observed at four out of 27 sampling locations, with these observations being isolated occurrences.
- At Structure BD, heavy metal concentrations were reported below the respective HILs. Zinc was reported at a concentration slightly above the adopted EIL at BD4, but the 95th percentile UCL average concentration for zinc was calculated to be 326mg/kg, slightly below the EIL. No asbestos was observed during investigation. Ash material was observed as a layer of fill along the northern and eastern sides of structure BD.
- At Structure BE, heavy metal concentrations were reported below the respective HILs. Zinc was reported at a concentration above the EIL along the perimeters of the structure, and the 95th percentile UCL average concentration for zinc was calculated to be 629mg/kg, which is above the EIL. No asbestos was observed during investigation. Ash material was observed as a layer of fill along the southern and eastern sides of structure BE and at an isolated location south of the southeast corner of structure BE..
- At Structure BF, heavy metal concentrations were reported below the respective HILs. Zinc was reported at a concentration slightly above the EIL at BF3, and the 95th percentile UCL average concentration for zinc was calculated to be 389mg/kg, above the EIL. No asbestos was observed during investigation.
- At Structure BH, heavy metal concentrations were reported below the respective HILs. Zinc was reported in soil samples collected at the eastern and southern borders of the former structure, and the 95th percentile UCL average concentration for zinc was calculated to be 389mg/kg, above the adopted EIL. No asbestos was observed during investigation. Ash material was observed as a layer around the four sides of structure BH..
- At Structure BI, SESL noted that the structure consists of two building footprints that appeared to be formerly connected. Heavy metal concentrations were reported below the respective HILs. Zinc was reported at a concentration slightly above the EIL at BI13, but the 95th percentile UCL average concentration for zinc was below the EIL. No asbestos was observed during investigation. Ash fill was observed on the northern side of BI adjacent to BC, and at two isolated locations on

the southern side of BI. PAH was analysed for selected samples of ash fill material and results were reported below HILs for total PAH and benzo(a)pyrene TEQ.

Auditor's Opinion

The Auditor notes that lead concentrations in soil around structure BAwere above the HIL-A. The lead impact was delineated vertically and laterally. Asbestos impact and zinc impacted soil above the EIL were also identified at Structure BA, generally to the east and south of the structure. Ash fill was also identified.

The Auditor notes asbestos and lead contamination appears to be concentrated at Structure BA which are likely to be associated with the historical activities though the actual past usage of this structure is not known. Nevertheless,

In addition to structure BA, SESL indicated that zinc impacts above the EIL identified at structures BB, BC, BE, BF and BH require remediation.

As fill materials have been observed around the former structures and potential for unacceptable aesthetic conditions will need consideration during the remediation process.

The Auditor considers that contamination around the remnants of structures in AEC 11 has reasonably been delineated for the purpose of this assessment and that sufficient data have been obtained by SESL to propose the nature and extent of remediation.

AEC 12 – Potential Filling of Former Dam

Three former dams were identified by SESL and denoted as JA, JB and JC. Surface soil samples were collected at each of the dams and analysed for heavy metals, and nutrients. Heavy metals in soils were reported at concentrations either below the respective LOR or adopted HILs and EILs.

Test pitting was undertaken to establish vertical extent of fill materials which was found to vary between 0.3m and 0.6m in area JA in AEC 12, and no fill material was observed in areas JB and JC. A sample of fill material from a depth of 0.3m below ground surface was collected from test pit JA5 and was analysed for PAH, heavy metals, OCPs, TRH, PCBs and asbestos. SESL reported that all results were below LOR for organic compounds and substantially below the respective HILs and EILs for metals. No asbestos was identified in the sample.

Auditor's Opinion

The Auditor considers that fill material in AEC 12, observed only in area JA, does not to pose an unacceptable risk to human health or to the environment.

11.2 Surface Water and Groundwater

Results

Surface water results for samples collected from two shallow farm dams in AEC 6 by SESL (2013d) are summarised in Appendix D. Surface water samples were analysed for heavy metals, TN, TP, pH, EC and PAH.

Groundwater results obtained by EIS (2013) and SESL (2013d, 2013e) are summarised in Appendix D. Groundwater samples were analysed for heavy metals, TN, TP, pH, EC and microbes in both rounds.

Discussion – Surface Water

SESL (2013d) indicated that surface water samples collected from both dams were both alkaline which is likely due to a moderate accumulation of soluble salts. Metal results were compared to

ANZECC (2000) for the protection of 95% species in freshwater ecosystem and concentrations of copper and nickel were above trigger values. SESL concluded that "the elevated metals and nutrient levels from the dam water are potentially impacted from runoffs from agricultural paddocks and animal waste. However, these levels do not pose potential harm to human health, but may pose environmental risk if discharged into a natural watercourse".

Auditor's Opinion

The Auditor considers that the presence of low concentrations of heavy metals in surface water, with concentrations of copper and nickel above trigger values, attributable to natural occurrence. The Auditor notes that trigger values for both cooper and nickel may be adjusted upwards for hardness for freshwater species. .Given the relatively small volume of water held in farm dams and the distance of the dams from Eastern Creek, the Auditor considers that the quality of water in the farm dams does not pose an unacceptable ecological risk, nor human health risk.

Discussion – Groundwater

EIS (2013) indicated that the results showed "the groundwater is generally acidic with elevated metals (arsenic, cadmium, copper, nickel, zinc and iron) and ammonia above the adopted GIL. E.Coli and faecal coliform were also analysed and the results exceeded the levels as provided in the ANZECC Guidelines for secondary contact". EIS concluded that "the settling ponds have impacted on the groundwater within the vicinity of MW1, MW3 and MW6. However, due to the subsurface condition of clay and shales material, EIS considered the groundwater impact is localised".

The Auditor required SESL to undertake a second groundwater sampling event to target the water quality in residual clay just above shale. SESL stated that the results area "generally consistent with the initial groundwater sampling with the exception of bacterial concentrations."

SESL concluded that "the preliminary groundwater assessment had identified the groundwater is impacted by the effluent ponds, however the natural low permeability of clay and shale material on-site indicates the impact may potentially be localised, and the removal of the ponds and therefore the source, will results in groundwater returning to normal conditions over time".

Auditor's Opinion

The historical presence of effluent treatment ponds in the southwest part of the site has resulted in formation of a local groundwater mound. Thus, groundwater appears to flow radially away from beneath the ponds and regionally is expected to flow to the north and east toward Eastern Creek.

Groundwater in the southwest part of the site is acidic and saline. The reported concentrations of heavy metals in groundwater are considered to be natural and not associated with historical use of the site. The acidity and salinity of groundwater means that future beneficial use of groundwater is negligible.

12 Evaluation of Remedial Action Plan

12.1 Outline of the Remedial Action Plan

Based on the findings of investigation, SESL (2013d) recommended remediation works to make the site suitable for intended residential development. The proposed remediation and validation works are described in the Remedial Action Plan (RAP) prepared by SESL (2013f), titled:

SESL 2013f, Remedial Action Plan, Lot 11 DP816720, Richards Road, Riverstone, NSW, prepared for Mastergroup Lot 11 Pty Ltd, Report Ref: C6868.Q3450.B28321 FA RAP, dated December 2013.

The purpose of the RAP was to:

- Provide a plan of remediation for the site to reduce unacceptable risk of contamination to impact on human and ecological health;
- Establish remediation acceptance criteria that are appropriate for low density residential use of the site in the context of identified contamination; and
- Demonstrate that the proposed remediation strategy is compliant with state and local government and planning statutes and compliant with NSW EPA endorsed guidelines under Section 105 of the *Contaminated Land Management Act 1997* and properly addresses issues relating to site environmental management, community relations and contingency planning.

SESL identified five areas requiring remediation works:

- AEC 4 – asbestos cement pipes
- AEC 8 – former filling area
- Structure BA - AEC 11 – lead impacted soils and bonded ACM fragments
- Structure BA, BB, BC, BE, BF and BH – zinc impacted soils
- AEC 5, AEC 8, AEC 9 and AEC 11 – aesthetically unacceptable material

SESL stated that groundwater remediation is not required as groundwater quality did not appear to be impacted by infiltration.

With reference to SEPP 55 – Remediation of Land, Planning Guidelines (DUAP / EPA 1998), SESL state that the proposed remediation works would be classed as Category 2, which do not require formal development consent. Remediation works are consistent with Blacktown City Council's development control plan.

The RAP provided information on:

- Introduction
- Site Description
- Conceptual Site Model
- Remediation Design
- Remediation Methodology
- Validation Plan
- Quality Assurance and Quality Control Plan
- Site Environmental Controls
- Contingency Planning

- Work Health and Safety
- Community Consultation and Liaison
- Conclusion
- Limitations

12.2 Auditor's Assessment of RAP

The NSW DEC (2006) Guidelines for the NSW Site Auditor Scheme provides guidance on the RAP requirements. In particular it is indicated that "a site auditor must be satisfied that any proposed or completed remediation is technically feasible, environmentally justifiable and consistent with relevant laws, polices and guidelines. Where an auditor is satisfied of these matters, they must document the reasoning in the site audit report".

Technical Feasibility of Remediation

The Auditor notes that, after appropriate removal of ACM and clearance, remediation works are essentially civil earthworks which are:

- not constrained by existing services, buildings nor other infrastructure;
- relatively shallow, mostly being less than 1m deep and not more than 2.5 m deep;
- on land that is not subject to flooding nor at risk of land subsidence;
- in soil like materials which are amenable to excavation with use of impact tools such as rock hammers;
- above the natural water table so that dewatering for excavation is not required;
- not reliant on chemical or biological treatment to reach a remediation endpoint.

Given the above, the Auditor considers that the proposed remediation is technically feasible.

Environmental Justification

The Auditor notes that the contaminants requiring remediation, being asbestos and heavy metals, are not amenable to destruction, but may be treated on site through stabilisation or solidification. This latter treatment option generally increases the bulk of contaminated materials and the presence of treated material will probably constrain the potential future use of a portion of the site.

The fate of unsuitable material is currently disposal to landfill, which would deplete landfill capacity and require use of non-renewable energy for transport of materials to landfill. Specific circumstances at the time of remediation may allow soil materials, not impacted by asbestos nor foreign materials, may be amenable to use as construction fill on a site with a less sensitive future use provided that a specific exemption for its reuse was obtained.

Ash fill materials on the site are proposed for reuse by mixing with other soils so that the aesthetic quality of the soil / ash mixture is acceptable for future residential land use.

The Auditor considers that the environmental benefits resulting from the proposed remediation works are greater than the environmental costs of achieving the outcome.

Consistent with Relevant Laws, Polices and Guidelines

The Auditor notes that the RAP:

- has given appropriate consideration to relevant planning and environmental laws;
- has made specific reference to SEPP 55 – Remediation of Land and to relevant parts of Blacktown City Council's development control plan;

- has been prepared with reference to guidelines made or endorsed by NSW EPA under Section 105 of the NSW *Contaminated Land Management Act 1997*.

Auditor's Opinion

The Auditor is satisfied that the proposed remediation is technically feasible, environmentally justifiable and consistent with relevant laws, polices and guidelines.

13 Assessment of Risk

13.1 Residual Risk

The on-site potential contamination sources were investigated and documented by SESL (2013d, 2013e) and EIS (2013). A conceptual site model (CSM) was developed based on the information obtained from the investigation.

ASC NEPM (2013) states that the CSM "is a representative of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors".

The Auditor reviewed the CSM prepared by SESL and considers the CSM met the ASC NEPM (2013) requirements. The Auditor notes that the known areas requiring remediation have generally been adequately identified.

The Auditor considers that any other contamination on the site would be appropriately managed through use of the unexpected finds procedure described in the RAP. Due to the nature of contaminated site investigations, in site conditions cannot be known completely and no assessment program can eliminate all uncertainty concerning the condition of a site,.

An unexpected finds protocol (UFP) is included in the RAP (SESL 2013f) which provides a generalised procedure in the instance where unexpected contamination be encountered during remedial works. An UFP is likely to be prepared following the completion of the remediation and validation activities to specifically address unexpected contamination which may potentially be encountered during site development.

Auditor's Opinion

The Auditor is satisfied that after appropriate implementation of the RAP, including validation, that residual risk due to contamination remaining on the site would be acceptable for the intended future residential development.

13.2 Evidence of or Potential for Migration of Contaminants

Based on the investigation findings and site observation, contamination identified during the investigation, including lead and zinc impacted soils, ash containing fill materials, bonded ACM and asbestos fines and buried foreign, appear to be localised in the vicinity of the contamination source. The clayey consistency of natural soils on the site offer natural attenuation for any lead or zinc which may be mobilised by natural weathering processes. Furthermore, groundwater quality does not appear to be impacted by infiltration of effluent ponds.

Auditor's Opinion

The Auditor considers that there is insufficient evidence suggesting that migration of contamination is occurring. The Auditor is of the opinion that the risk for migration of contaminants from the site is low to negligible.

14 Conclusion

Based on the reports reviewed by the Auditor, discussion and Auditor's opinions presented in this report, the Auditor concludes that:

- The Site warrants remediation in certain n areas in the southwest part and can be made suitable for future residential development by proper implementation of relevant parts of the Remediation Action Plan issued by SESL, dated December 2013.

15 Purpose and Limitations of the Report

This report has been prepared for Mastergroup Lot 11 Trust. The purpose of the report is to provide an independent audit of site assessment and proposed remediation at the site by environmental consultants and to identify whether the site can be made suitable for its intended future use, with respect to land contamination.

An assessment of the suitability of site soil, fill, groundwater or other media for any other purpose including, but not limited to, offsite disposal, geotechnical and/or agricultural purposes was not undertaken.

It is the nature of contaminated site investigation that the degree of variability in site conditions cannot be known completely and no sampling and analysis program can eliminate all uncertainty concerning the condition of the site. Professional judgement must be exercised in the collection and interpretation of the data.

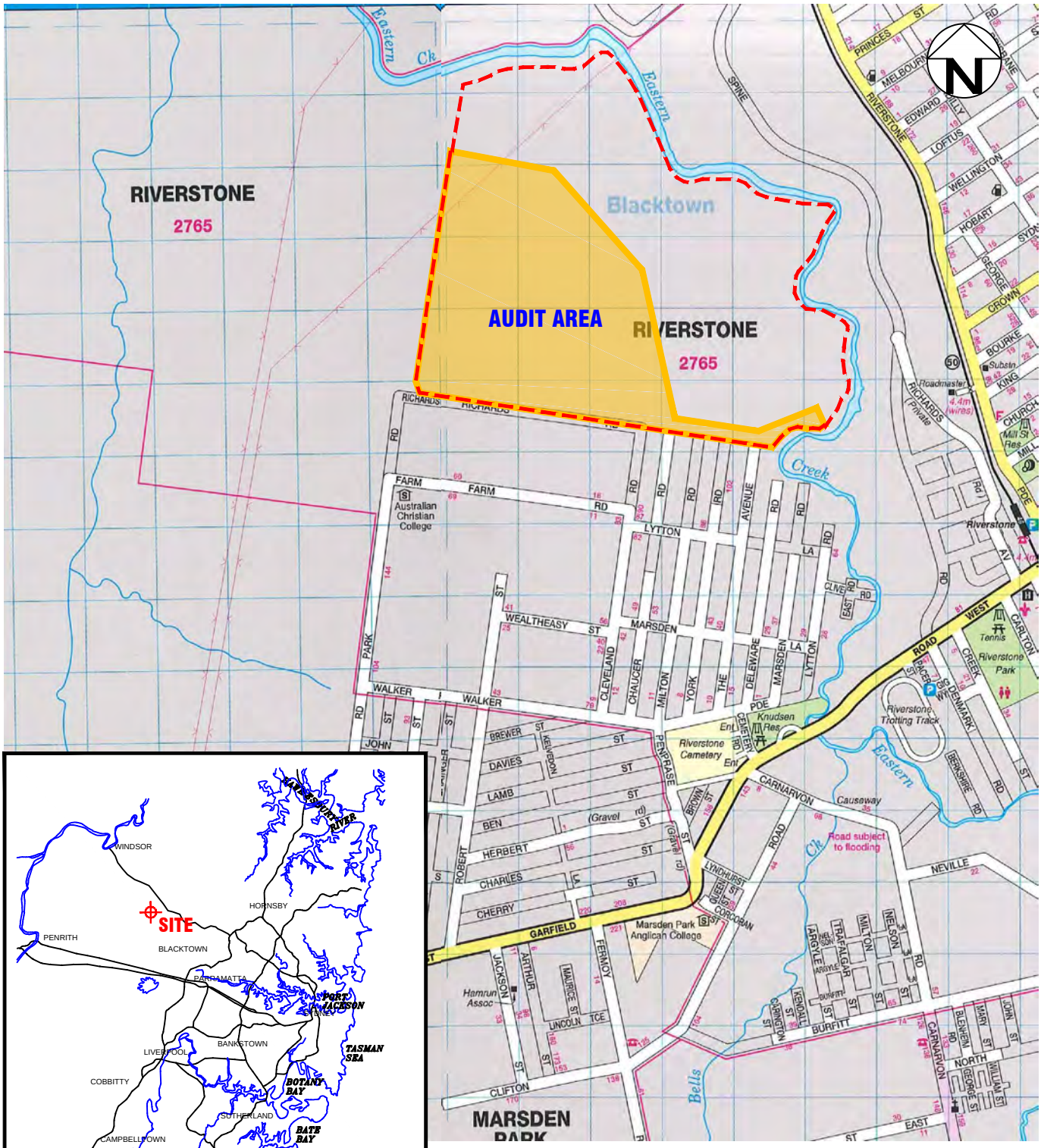
In the conduct of this review, particular reliance has been placed on data provided by the client and its consultants. The consultants included limitations in their report and this audit must also be subject to those limitations. Further there can be no responsibility for areas over which there was no control or are not reasonably able to be checked.

In conducting this review and preparing the report, current guidelines for assessment and management of contaminated land were followed. This work has been conducted in good faith in accordance with the auditor's understanding of the client's brief and generally accepted practice for environmental consulting regarding contaminated land.

It is not possible to present all data in this document which could be of interest to the readers. Readers are referred to the referenced investigation reports for further data.

No warranty, expressed or implied, is made as to the information and professional advice included in this report. Anyone using this document does so at their own risk and should satisfy themselves concerning the applicability for any other particular use and where necessary should seek expert advice in relation to the particular situation.

Figures



GENERAL AREA MAP

SOURCE: UBD STREET DIRECTORY GREGORYS
SYDNEY, NEW SOUTH WALES
48TH EDITION, 2013, MAP: 126 & 127

LEGEND

AUDIT AREA

PROPERTY BOUNDARY

200 0 200 600 1000

Scale (metres) 1:20,000

drawn	MV
approved	MD
date	17/12/13
scale	AS SHOWN
original size	A4

coffey

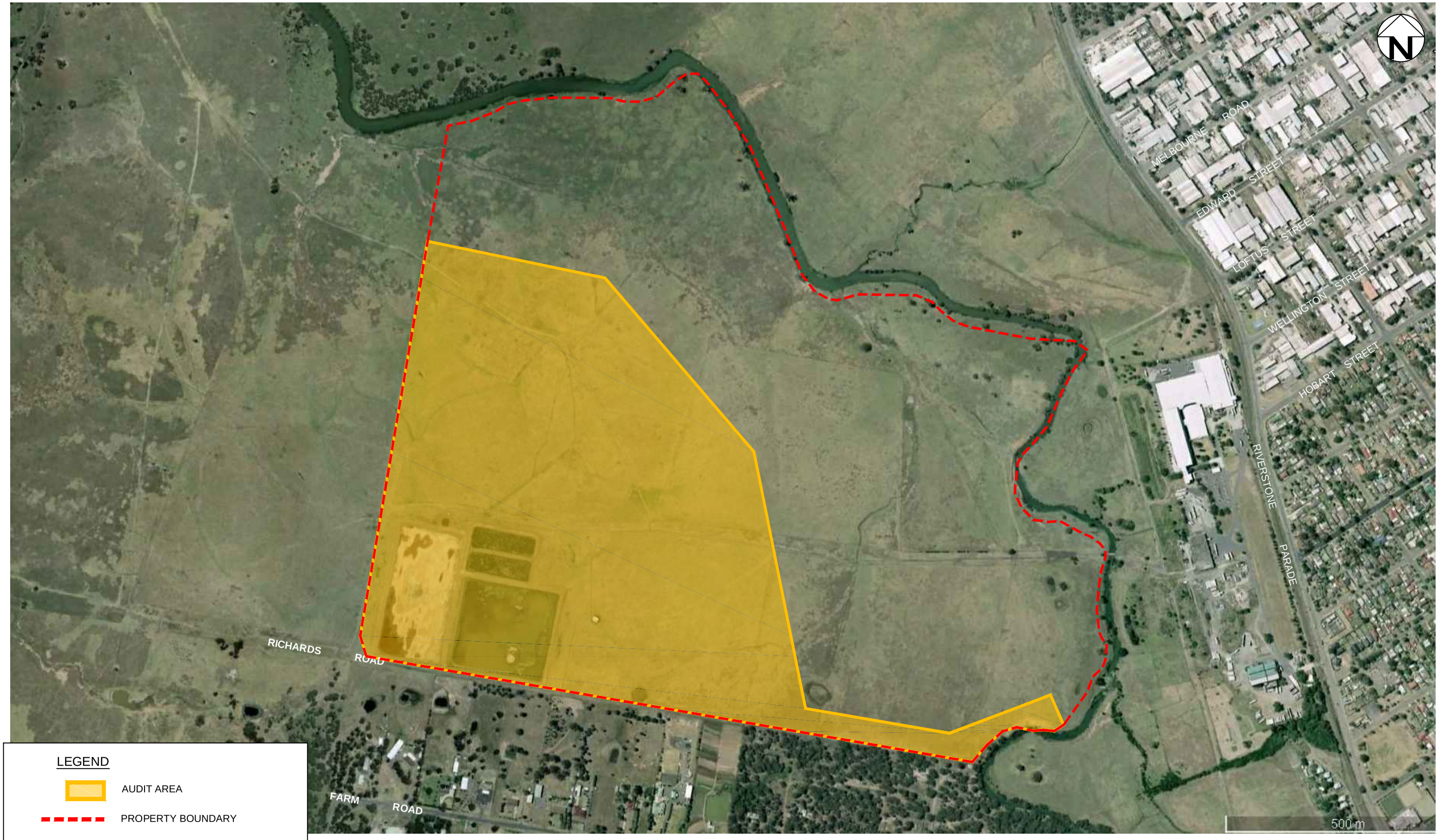
client: MASTERGROUP LOT 11 TRUST

project: SITE AUDIT
LOT 11, DP 816720, RICHARDS ROAD, RIVERSTONE, NSW

title: SITE LOCALITY MAP

project no: ENAURHOD01027AA-D01 | figure no: FIGURE 1 | rev: A

PLOT DATE: 19/12/2013 10:25:46 AM DWG FILE: F:\ENV\PROJECTS\ENAURHOD\ENAURHOD01 AUDIT\ENAURHOD01000-01099\ENAURHOD01027 LOT 11, THE AVENUE, RIVERSTONE\ENAURHOD01027AA\FIGURES\ENAURHOD01027AA-D01.DWG



LEGEND

AUDIT AREA

PROPERTY BOUNDARY

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PLOT DATE: 19/12/2013 10:25:21 AM

revision	no.	description	drawn	approved	date

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.2.2041
AERIAL IMAGE ©: 2013 AEROMETREX
2013 WHEREIS SENSIS PTY LTD

100 0 100 200 300 400

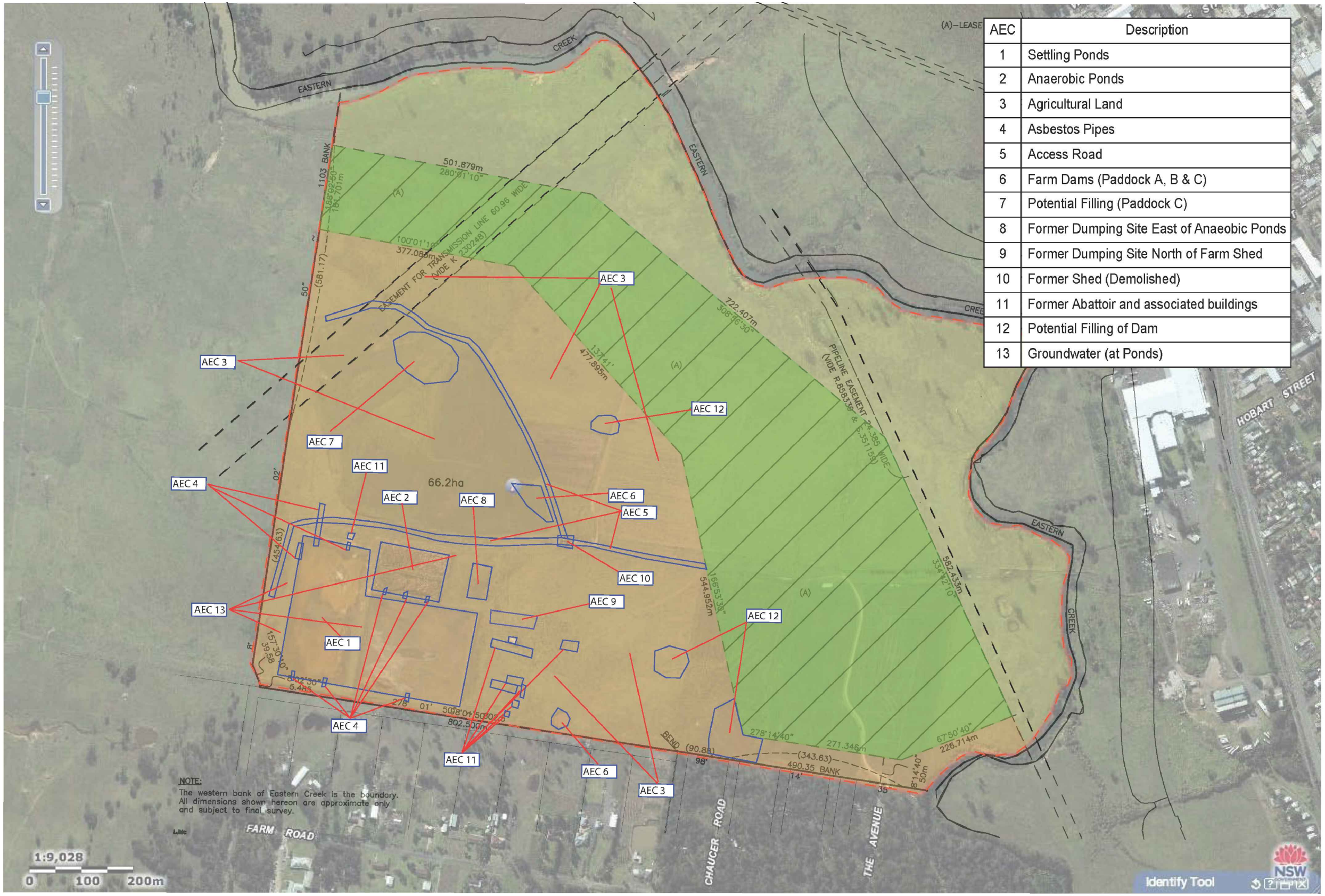
Scale (metres) 1:7,500

drawn	MV
approved	MD
date	17/12/13
scale	AS SHOWN
original size	A3

coffey

client:	MASTERGROUP LOT 11 TRUST		
project:	SITE AUDIT LOT 11, DP 816720, RICHARDS ROAD, RIVERSTONE, NSW		
title:	AUDIT AREA		
project no: ENAURHOD01027AA-D01	figure no: FIGURE 2	rev: A	

AEC	Description
1	Settling Ponds
2	Anaerobic Ponds
3	Agricultural Land
4	Asbestos Pipes
5	Access Road
6	Farm Dams (Paddock A, B & C)
7	Potential Filling (Paddock C)
8	Former Dumping Site East of Anaeobic Ponds
9	Former Dumping Site North of Farm Shed
10	Former Shed (Demolished)
11	Former Abattoir and associated buildings
12	Potential Filling of Dam
13	Groundwater (at Ponds)



SOURCE: (SESL, 2013d)

Legend: Audit Area | Proposed Lease Area | Remaining Lot Area

revision	no.	description	drawn	approved	date

SESL AUSTRALIA

100 0 100 200 300 400

Scale (metres) 1:7,500

drawn	MV
approved	MD
date	17/12/13
scale	AS SHOWN
original size	A3

coffey

client: MASTERGROUP LOT 11 TRUST

project: SITE AUDIT
LOT 11, DP 816720, RICHARDS ROAD, RIVERSTONE, NSW

title: AREAS OF ENVIRONMENTAL CONCERN

project no: ENAURHOD01027AA-D01 | figure no: FIGURE 3 | rev: A

PLOT DATE: 19/12/2013 10:25:08 AM DWG FILE: F:\ENV\PROJECTS\ENAURHOD\ENAURHOD01 AUDIT\ENAURHOD01000-01099\ENAURHOD01027\AA\FIGURES\ENAURHOD01027AA-D01.DWG

PLOT DATE: 19/12/2013 10:24:22 AM DWG FILE: F:\ENV\PROJECTS\ENAURHOD\ENAURHOD001 AUDIT\ENAURHOD001000-01099\ENAURHOD01027 LOT 11, THE AVENUE, RIVERSTONE\ENAURHOD01027AA\FIGURES\ENAURHOD01027AA-D01.DWG

revision	no.	description	drawn	approved	date

SOURCE: (SESL, 2013e)

20 0 20 40 60 80 100

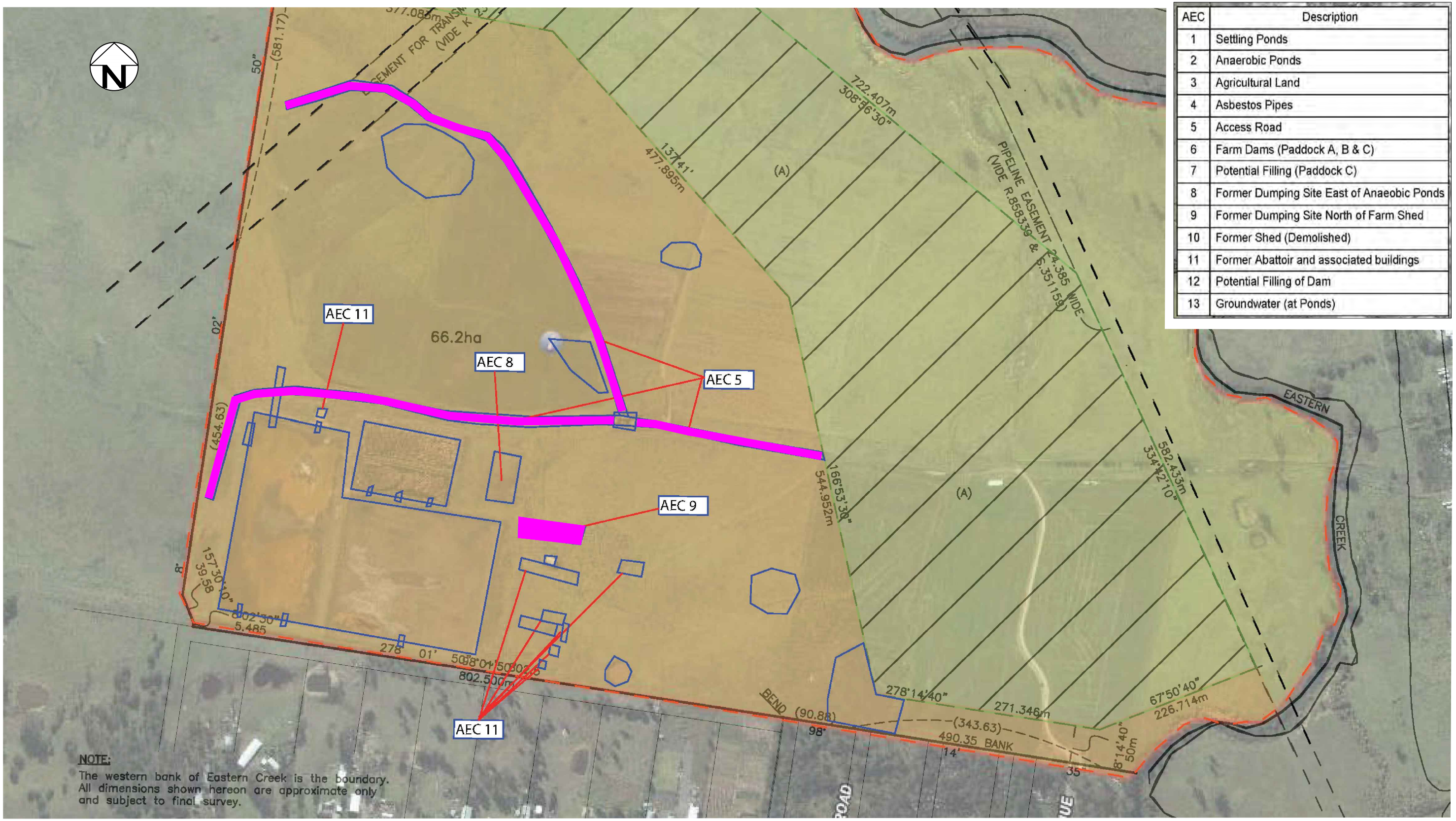
Scale (metres) 1:2,000

drawn	MV
approved	MD
date	17/12/13
scale	AS SHOWN
original size	A3

coffey

client:	MASTERGROUP LOT 11 TRUST		
project:	SITE AUDIT LOT 11, DP 816720, RICHARDS ROAD, RIVERSTONE, NSW		
title:	SOIL EXCEEDANCES MAP - AEC 4, AEC 8, AEC 11 (AREAS REQUIRING REMEDIATION)		
project no:	ENAURHOD01027AA-D01	figure no: FIGURE 4A	rev: A

AEC	Description
1	Settling Ponds
2	Anaerobic Ponds
3	Agricultural Land
4	Asbestos Pipes
5	Access Road
6	Farm Dams (Paddock A, B & C)
7	Potential Filling (Paddock C)
8	Former Dumping Site East of Anaeobic Ponds
9	Former Dumping Site North of Farm Shed
10	Former Shed (Demolished)
11	Former Abattoir and associated buildings
12	Potential Filling of Dam
13	Groundwater (at Ponds)



SOURCE: (SESL, R02, 2013)

Legend: Audit Area | Proposed Lease Area | Remaining Lot Area | Area Requiring Remediation

revision no.	description	drawn	approved	date

50 0 50 100 150 200 250

Scale (metres) 1:5,000

drawn	MV
approved	MD
date	17/12/13
scale	AS SHOWN
original size	A3

client: MASTERGROUP LOT 11 TRUST

project: SITE AUDIT
LOT 11, DP 816720, RICHARDS ROAD, RIVERSTONE, NSW

title: LOCATIONS OF AESTHETICALLY UNACCEPTABLE MATERIALS
AREAS REQUIRING REMEDIATION (AEC5 & AEC9)

project no: ENAURHOD01027AA-D01 | figure no: FIGURE 4B | rev: A

PLOT DATE: 19/12/2013 10:24:56 AM DWG FILE: F:\ENV\PROJECTS\ENAURHOD\ENAURHOD01 AUDIT\ENAURHOD01000-01099\ENAURHOD01099\ENAURHOD01027 LOT 11, THE AVENUE, RIVERSTONE\ENAURHOD01027AA\FIGURES\ENAURHOD01027AA-D01.DWG

Appendix A

Map 3 - Proposed Lease Area

(A)—LEASE AREA FOR EXCAVATION

M.G.A. NORTH (ZONE 56)

EASTERN CREEK

EASTERN CREEK

EASTERN CREEK

1103 BANK

188°02'50" 16.701m

501.879m 280°01'10"

(A)

EASEMENT FOR TRANSMISSION LINE 60.96 WIDE (VIDE K 230248)

100°01'10" 377.083m

50" (581.17)

722.407m 308°36'30"

137°41' 477.895m

(A)

PIPELINE EASEMENT 24.385 WIDE (VIDE R.858339 & 5.351159)

582.433m 334°21'10"

166°53'30" 544.952m

(A)

66.2ha

02' (454.63)

8° 157°30'10" 39.58

8°02'30" 5.485

278° 01' 50" 802.500m

98°04'50" 802.5

BEND (90.88)

98° 14' (343.63) 490.35 BANK

278°14'40" 271.346m

67°50'40" 226.714m

8°14'40" 50m

35"

NOTE:

The western bank of Eastern Creek is the boundary. All dimensions shown hereon are approximate only and subject to final survey.

LJMc

CLIENT

MASTERGROUP

PROJECT

PLAN OF PROPOSED LEASE AREA AND EASEMENT FOR EXCAVATION IN LOT 11 IN DP 816720

NOTES

The title boundaries shown hereon were not marked at the time of survey and have been determined by plan dimensions only and not by field survey.
Services shown hereon have been located where possible by field survey. If not able to be so located, services have been plotted from the records of relevant authorities where available and have been noted accordingly on the plan. Where such records do not exist or are inadequate a notation has been made hereon.
Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services.

PPP/CF	LPL	DD/MM/YY	COMMENT

LANDPARTNERS
built environment consultants

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e sydney@landpartners.com.au
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ISO 9001:2008 FS 535063

HEIGHT DATUM: N/A	LOCAL AUTHORITY: BLACKTOWN
HEIGHT ORIGIN: N/A	SCALE: 1:4000 (A2)
MERIDIAN: 56	CONTOUR INTERVAL: N/A
CO-ORD SYSTEM: MGA	SURVEYOR: GKO — DATE OF SURVEY: 17/10/11
CCAD FILE: 73030	DRAWN: LJMc — DATE: 17/10/11
AUTOCAD FILE: 73030	CHECKED: GKO — DATE: 17/10/11
ARCHIVE FILE: 73030	APPROVED: LPL — DATE: 17/10/11

PLAN NUMBER

SY073030.000

SHEET 1 OF 1

Appendix B

coffey environments
SPECIALISTS IN ENVIRONMENTAL,
SOCIAL AND SAFETY PERFORMANCE

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Level 19, Tower B, Citadel Tower 799 Pacific Highway
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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**29 January 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA01**
cc	**Ryan Jacka, SESL**	Pages	**1 of 8**
Subject	**Interim Audit Advice 01 - Review of SESL Consolidated Site Investigation Report Lot 11, Richards Road, Riverstone**		

Dear Mark:

The advice presented in this document represents interim advice only, and does not constitute a Site Contamination Audit Report or Site Contamination Audit Statement. The advice provides the opinion of the Auditor based on the knowledge that is available at the time of this advice. A Site Contamination Audit Report and Site Contamination Audit Statement will be issued at the end of the Audit process, when the Auditor is satisfied all relevant matters have been adequately addressed to the satisfaction of the Auditor. This advice does not pre-empt or constrain the final outcome(s) of the audit or any conditions that may be placed by the Auditor in the Site Contamination Audit Report or Site Contamination Audit Statement.

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

The Auditor has reviewed:

- SESL, Consolidated Site Investigation for Richards Road, Riverstone, NSW (Lot 11 DP 816720), Report Reference: C6868.Q2953.B24257 FA CSI, dated December 2012 [Consolidated Report].

The Auditor has also reviewed the following report which was included as an Appendix to the Consolidated Report:

- Environmental & Earth Sciences Pty Ltd (EES), Site Investigation of Riverstone Meatworks Effluent Treatment Ponds, Riverstone, NSW, Report Reference: 103070, dated June 2003 [EES Report].

The Auditor has conducted a partial review of the following report which was included in the Appendices of the Consolidated Report:

- SESL, Phase 1 Preliminary Site Investigation for Richards Road, Riverstone, NSW (Lot 11 DP 816720), Report Reference: C7185.Q3041.B23331 FB PSI, dated November 2012 [PSI Report].

The Auditor notes that the site history information was included in the Consolidated Report, however the limited soil investigation conducted as part of the PSI was described in the Consolidated Report only. The Auditor has reviewed Sections 5 to 9 of the PSI report to assess the appropriateness and usability of the data set which forms the basis on this opinion on the requirement of further assessment works.

The Auditor notes that the following reports were also included as Appendices to the Consolidated Report has and that these reports are not included in this audit. The Auditor notes that these reports were prepared to assess the impact of treated grease trap waste application on part of the site and considers these reports were not prepared for the purpose of contamination assessment and thereby were omitted from this review:

- SESL, Review of Environmental Factors: Lot 11 DP 816720, Report Reference: C5377.B15157.FB REF, dated August 2010.
- SESL, Post Application Assessment: Lot 11 DP 816720, Report Reference: C5377.B17054.FA Riverstone Paddock B, PAA, dated April 2011.
- SESL, Review of Environmental Factors: Lot 11 DP 816720, Report Reference: C5377.B17887.FA REF, dated May 2011.
- SESL, Post Application Assessment: Lot 11 DP 816720, Report Reference: C5377.B19206.FA Riverstone Paddock C, PAA, dated August 2011.
- SESL, Post Application Assessment: Lot 11 DP 816720, Report Reference: C5377.B20744.FA Riverstone Paddock E, PAA, dated January 2012.

The Auditor also notes that the following report was provided in the Consolidated Report:

- SESL, Contamination Assessment for Richards Road, Riverstone, NSW (Lot 11 DP 816720), Report Reference: C6868.Q2777.B20640 FB Riverstone Mastergroup, dated December 2012 [Contamination Assessment].

The Auditor considers the Contamination Assessment report does not include the necessary information to facilitate the Auditor to assess the quality and usability of the data provided in this report. The Auditor has not reviewed this report.

The Auditor understands that the purpose of the audit is to determine the appropriateness of contaminated site investigation and planned remediation that has been carried out on a portion of the site (66.2 hectares, being 43% of Lot 11) for proposed residential development. The proposed residential development will involve the subdivision of 500 lots for low density residential use.

The purpose of this Interim Audit Advice is to provide an opinion to Mastergroup regarding the appropriateness and adequacy of the above report prepared by SESL for the purpose of this audit and to identify the Auditor's areas of concern to be addressed by SESL to achieve purpose positive outcome of the audit.

1 GENERAL COMMENTS

The Auditor considers that both the CSI and PSI Reports were prepared to a standard which is below the requirements as detailed in the NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (2011).

The Auditor is concerned that the site conceptual model substantially lacked detail to facilitate site characterisation and that insufficient information is provided to assess the suitability for the allowable uses of the site for the proposed residential development.

The Auditor identified fundamental deficiencies in the reviewed SESL reports, specifically:

- The proposed area for residential development (i.e., the audit area) is not precisely defined. The Auditor requires a plan showing surveyed boundaries of the audit area and would accept an existing surveyed plan annotated with coordinates for change points comprising the boundary of the development area within Lot 11. The Auditor notes the survey plan included in Appendix A of the Combined Report, but this plan does not clearly indicate the proposed boundary for residential development.
- The Auditor considers that the reported review of the site history is not clearly presented and that all areas of environmental concern (AECs) have not been clearly identified. The Auditor notes that the EES Report has included additional site history information and AECs which were omitted from the Consolidated and PSI Reports. The Auditor's observations across the site on 21 January 2013 confirmed that the SESL conceptual site model was deficient.
- Additionally, the Auditor considers the previous assessment report review was not conducted to the expected standard and notes contradicting information between the Consolidated Report and PSI Report. The existing soil data collected at the site was not clearly present in the Consolidated Report.
- Given the above deficiencies, the Auditor considers that additional work is required to develop a conceptual site model and a sampling and analysis plan to address information gaps. The Auditor requires a revision to a level consistent with NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (2011).
- The audit area covers an approximate area of 66 hectares and the site history information identifies a number of past and current potentially contaminating activities. The Auditor considers that a list of AECs is required to be prepared based on the existing information. The Auditor understands that an AEC is a portion of the site which includes a potential environmental hazard, or is the location of a potentially contaminating activity has occurred, so that the contamination status of this area warrants assessment which is not necessarily the same as the assessment appropriate for the remainder of the site. For example, coal ash has been used in the surface layer of vehicle tracks in parts of the site. Coal ash represents an environmental hazard with associated heavy metals, polycyclic aromatic hydrocarbon compounds and alkalinity. Thus, these vehicle tracks, and any other areas where coal ash has been placed on the site comprise an AEC.
- Assessment of chemicals of potential concern (COPCs) requires clarification. The Consolidated Report includes a historical title search results but the Auditor does not consider that the COPCs provided in the Consolidated Report include all the past and current COPCs on-site. The Auditor requires relevant COPCs be included for each of the AECs identified across the site. Information on chemicals of potential concern typically associated with various operations is listed in Appendix A of Managing Land Contamination – Planning Guidelines, SEPP 55 – Remediation of Land (DUAP/EPA, 1998).
- Based on the Auditor's observations of the site (visited on 21 January 2013), the Auditor has noted the remnants of a former agricultural operation associated with cattle, possibly a milking facility, in the middle of the southern half of Paddock A on the site. The remnants comprise brick building rubble and reinforced concrete footings and slabs. Assessment of soil in this vicinity was not included in either Consolidated or PSI Reports.
- The Auditor notes that composite sampling was used by both EES and SESL. Composite sampling has disadvantages for contamination assessment in that results may lead to inconclusive results due to uncertainty about the maximum concentration present in any one subsample in a composite sample. The Auditor notes that subsamples used to make a composite sample should not be more than 20 metres apart (Section 6 in NSW EPA Sampling Design Guidelines, 1995), and this recommendation would also limit the effectiveness of composite sampling in assessment of a site covering a large area.

- The Auditor has also noted several suspected asbestos cement pipes on the surface of the ground in a line going north from the western settling pond which were not described in the site walkover sections of either Consolidated or PSI Reports.
- The Auditor considers that the description of observed site features reported by SESL was not comprehensive nor accurate and that some AECs may be omitted from the assessment. The Auditor is concerned that the outcome of contamination assessment may be found to be inadequate during Auditor review if development of the conceptual site model and sampling and analysis plan is not thorough.
- A sampling and analysis plan, including quality assurance, is not demonstrated for field activities in either Consolidated or PSI Reports.

The Auditor's specific comments on the Consolidated Report are listed in Section 2.

2 DETAILED COMMENTS – CONSOLIDATED REPORT

No.	Report Section	Auditor's Comment
1	1.1	The Auditor requires that the objectives be specific to the site. In particular, SESL's objectives do not include the context of future residential use of the land.
2	1.2	The Auditor requires more information regarding the qualifications and experience of the assessment team.
3	2.1 and 2.2	The information in Figure 1 and Figure 2 does not meet the purpose of those figures and is not to the standard recommended in NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (2011). Maps should be provided at a scale which is amenable to interpretation of the map and a scale bar should be provided. For example, Figure 1 may be presented at a scale of 1: 15,000. Site features described in Section 2.3 should be indicated on Figure 2. The Auditor requires revision of Figures 1 and 2.
4	2.4.1	SESL mentions "previous landfilling activity", however, the following sentence describes bulk earthworks for construction of settling ponds. The Auditor requests clarification of the term landfilling.
5	2.4.2	No geology, hydrogeology and hydrology information was included in this section. The Auditor notes that a groundwater bore search is conducted and the result is described in Section 4.7. The Auditor requires additional information be included in Section 2.4.2.
6	2.4.3	SESL mention the presence of a "number of farm dams" scattered across the property. The Auditor requests that these dams be identified on Figure 2 and that the number of dams be stated in this section.
7	2.5	The Auditor notes that the EES report contains some site history information and requires relevant information be included in this report.
8	2.5.2	The boundary included in the historical aerial photographs refers to the overall property boundary, not the investigation boundary. The Auditor

No.	Report Section	Auditor's Comment
		requires the investigation boundary (i.e., the area subject to this audit process) to be shown. Section 2.5.2 needs to be revised to distinguish developmental history that had occurred on-site and the surrounding area. The Auditor requires the identified areas of the environmental concern to be clearly identified and described, with associated chemicals of potential concern. The Auditor requires clarification of the use(s) of the buildings described as "the former abattoir on site".
9	2.7	The Auditor requests that this search be extended to include notifications under Section 60 of the CLM Act and also to the issue of any Environmental Protection Licence for the site.
10	2.9	The Auditor requires discussion of the basis for selection of chemicals of potential concern. Given the Auditor's comments above regarding a conceptual site model, the Auditor is not satisfied that sufficient information has been obtained to develop a reliable chemical inventory. The Auditor also expects the list of chemicals be established after information from the site walkover and the previous assessment are described.
11	2.10	The Auditor requires the above identified data gaps to be addressed in the integrity assessment. The assessment should also include and assess information obtained from site walkover and previous report findings which are currently omitted from the report.
12	3.0	The Auditor notes that all not relevant information (for example, site history information, scope of intrusive investigation) was included in the summary. The Auditor requires relevant information be included in this section. The previous sampling locations should also be included in Map 1 of this report.
13	3.1	The Auditor notes that soil sampling has been undertaken by SESL to assess the effect on soil of application of Treated Grease Trap Waste. The reports were considered and Auditor concluded that the reports do not satisfy recommended guidelines for review in contamination assessment.
14	4.0	The Auditor considers the information presented for site reconnaissance was incomplete and did not meet the recommendations in NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (2011). The Auditor is concerned that additional suspected ACM pipes were observed by the Auditor, chemical storage should be taken broadly to include accumulation of chemicals through waste disposal and/or application, application of ash for surfacing vehicle tracks is not identified and no evidence was found by the Auditor that general waste was collected from the site "during Council waste collection services"..

No.	Report Section	Auditor's Comment
15	4.6	Section 4.6 should form part of Section 2.4.
16	4.7	Paragraph 1 – the Auditor disagrees with the statement and notes that the statement contradicts the information provided in Section 3.0. A targeted soil investigation was conducted by EES in 2003. The Auditor does not accept SESL's comment that "groundwater contamination is not expected on site" because of the inadequacy of SESL's description of the site and potentially contaminating activities. Preliminary groundwater assessment is warranted, as described in NSW EPA Guidelines for the Assessment and Management of Groundwater Contamination (DEC 2007).
17	4	The Auditor considers that this section contains insufficient information to facilitate the development of site conceptual model and sampling and analytical plan. The Auditor expects the following be included in this section: site processes (in reasonable detail) having potential to contaminate the land, typical chemicals associated with those activities, waste (non-liquid and liquid) management, historical incidents including newspaper archival material and anecdotal information in relation to historical site activities and development. The Auditor requests revision of this section.
18	5.1	The section states the objective of the report and does not contain sufficient information regarding the proposed redevelopment. The Auditor requires clarification of the nature of proposed residential development.
19	5.2	The Auditor notes that the list of chemicals in Tables 4 and 5 may require revision after the conceptual site model is prepared. The Auditor also notes that the current issue of NHMRC Drinking Water Guidelines is 2011 and that a criterion for asbestos may need to be included.
20	6.0	The Auditor requires all sampling locations mentioned in this Section of the report be clearly indicated on a sampling location plan. The maps provided in the Compilation Report do not provide sample identification for each sampling point. The EES sampling locations were not included in Map 1 and the Auditor requires additional information regarding the composite sampling locations.
21	6.1	The Auditor notes that four of the five sampling locations for the Contamination Assessment appeared to be in disturbed ground (settling pond walls) and sampling locations were not identified in the PSI report. No borehole logs were provided for the sampling locations for the Contamination assessment and "boreholes" for the PSI were only in the top 0.15m of soil. Regarding the EES Report, the Auditor considers that composite samples for locations within the settling ponds are separated

No.	Report Section	Auditor's Comment
		horizontally by a distance substantially greater than that recommended in the NSW EPA Sampling Design Guideline (1995) and that composite samples outside of the settling ponds are unlikely to be representative. The Auditor concludes that results from composite sampling and analysis should be treated as preliminary only and should not be relied on for the purposes of assessment of the suitability of the site for the proposed residential development.
22	6.2	The Auditor notes that the SESL sampling points included those sampled for the Treated Grease Trap Waste Application. Using the available information, the Auditor was not able to confirm that samples were collected in an area where the material had been applied. The Auditor considers that the sampling density is substantially below that relevant to future residential use of the land for this type of AEC.
23	7.0	The Auditor requires development of a detailed conceptual site model comprising identification of Areas of Environmental Concern and associated chemicals of potential concern and a sampling and analysis plan for additional intrusive investigation to address information gaps for characterising the site.
24	7.1	The Auditor considers that current data is not sufficient to support SESL's conclusion that the site is "suitable for the proposed residential development".

3 CLOSURE

The Auditor understands that the site has largely been used for grazing purposes as a holding area for cattle pending processing in the adjacent former abattoir. Such use of the land is not expected to result in persistent contamination. However, a variety of potentially contaminating activities and/or site features have been identified which warrant specific assessment given the proposed redevelopment of a portion of the site for standard residential use. Based on the reviewed reports, the Auditor's main concerns are:

- Have all the past potentially contaminating activities and the associated chemicals been identified for the proposed residential area? Based on the observations made by the Auditor during the site visit and the information provided in the EES Report, some AECs have not been identified and addressed in the previous assessment.
- Previous investigations were concentrated around the effluent ponds and areas of application of treated grease trap waste. The sampling density for the previous investigations is considered too sparse in the context of the proposed residential development which is expected to create residential blocks of approximately 500m^2. Other features on the site have not been investigated, including suspected ACM pipes to the north of the western settlement pond, the surroundings of former buildings in the middle of the southern half of Paddock A, coal ash material used for surfacing vehicle tracks and farm dams and other areas of land disturbance.
- The previous investigation results do not appear to be collated in a manner to facilitate the identification of data gaps and the planning for additional intrusive works to address those data gaps.

- Groundwater quality has not been assessed. Given the presence of the effluent ponds and the recommendation for at least a preliminary assessment of groundwater quality, the Auditor expects inclusion of groundwater assessment.

The Auditor requires the following actions be undertaken:

- Prepare a plan to scale showing identified AECs on-site, similar to the example prepared by the Auditor and provided separately.
- A sample location plan showing all the existing sampling locations to scale and a table, or tables, showing consolidated analytical results, and information regarding individual samples used for composite sampling.
- Identify potential chemicals of concern associated with AECs, identify data gaps for site characterisation, and develop a Sampling, Analysis and Quality Plan.
- A Sampling, Analysis and Quality Plan be prepared based on:
    - The conceptual site model including AEC plan and associated COPCs.
    - To confirm the absence / presence of hotspots within the AECs, the Auditor prefers that the sampling densities at the identified AECs be consistent with Table A of the NSW EPA Sampling Design Guideline (1995).
    - The Auditor understands the potential for contamination is considered to be low for the remainder of the site, and would consider a sampling density for 1 sampling location per hectare. However, should contamination be identified, the Auditor may require additional sampling be undertaken.
- The Auditor requires that suspected ACM pipes be identified to the extent practicable. Based on the Auditor's experience with management of such pipes, the Auditor recommends that identified pipes be removed by a qualified asbestos contractor and clearance certificates be provided as part of site characterisation. Following pipe removal, Mastergroup's environmental consultant should validate soil / fill at locations where pipes were damaged in place or during removal, to confirm that asbestos fibres are practically not detected at those locations.

The Auditor requires a response from SESL, regarding the comments and concerns presented in this Interim Audit Advice. Please contact the undersigned if you need to clarify any of the comments.

The Auditor suggests that any plan for additional sampling be discussed to ensure that Auditor concerns are addressed.

For and on behalf of Coffey Environments Australia Pty Ltd

M. Dunbavan.

Michael Dunbavan

Senior Principal - NSW EPA Accredited Site Auditor

coffey environments
SPECIALISTS IN ENVIRONMENTAL,
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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**18 February 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA02**
cc	**Ryan Jacka, SESL**	Pages	**1 of 2**
Subject	**Interim Audit Advice 02 - Comment on Areas of Environmental Concern and Contaminants of Potential Concern Lot 11, Richards Road, Riverstone**		

Dear Mark:

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The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

The Auditor has reviewed:

- SESL, Areas of Environmental Concern and Contaminants of Potential Concern for Lot 11, Richards Rd, Riverstone, letter dated 15 February 2013, with 2 figures attached.

The Auditor is satisfied with the site plan defining the audit area.

The Auditor has reviewed the description of Areas of Environmental Concern (AECs) and the identification of those areas on the site plan overlaid on an aerial photograph. The Auditor notes that AECs 10 and 11, which are associated with structures or former structures on the site, should cover an area which extends at least 5 metres out from the footprint of the (former) structure. The Auditor is satisfied with the description of AECs.

The Auditor has reviewed information in table 1 which lists Contaminants of Potential Concern (COPC) for each AEC. The Auditor notes that for:

- AEC 6 – PAHs need only be included in analysis for the northern area where ashy material may have collected in sediment due to run-off from the Access Road (AEC5); and
- AEC 8 – OCP/PCB and Asbestos only need be included in analysis if building rubble or scrap machinery is observed during assessment.

The Auditor is satisfied with the definition of COPCs.

Please contact the undersigned if you need to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

Michael Dunbavan

Senior Principal - NSW EPA Accredited Site Auditor

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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**25 February 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA03**
cc	**Ryan Jacka, SESL**	Pages	**1 of 5**
Subject	**Interim Audit Advice 03 - Comment on Proposed Sample Densities for Lot 11, Richards Road, Riverstone**		

Dear Mark:

The advice presented in this document represents interim advice only, and does not constitute a Site Contamination Audit Report or Site Contamination Audit Statement. The advice provides the opinion of the Auditor based on the knowledge that is available at the time of this advice. A Site Contamination Audit Report and Site Contamination Audit Statement will be issued at the end of the Audit process, when the Auditor is satisfied all relevant matters have been adequately addressed to the satisfaction of the Auditor. This advice does not pre-empt or constrain the final outcome(s) of the audit or any conditions that may be placed by the Auditor in the Site Contamination Audit Report or Site Contamination Audit Statement.

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

The Auditor has reviewed:

- SESL, Proposed Sample Densities for Lot 11, Richards Rd, Riverstone, letter dated 21 February 2013, with 1 figures attached.

The Auditor has reviewed the proposed sample densities for Areas of Environmental Concern (AECs) with reference to the relevant site map provided by SESL and to NSW EPA Sampling Design Guidelines (1995). The Auditor is not satisfied with proposed sampling densities for all AECs and provides comments and requests that SESL revise sample densities accordingly. The Auditor notes that sketches for certain AECs showing distribution of sample locations are also requested.

AEC	Feature	Auditor's Comment
1	Settling Ponds	<u>Pond Walls</u> Based on the Auditor's experience, the walls around these ponds are almost certainly derived from clayey soils sourced from the area covered by the ponds, and should not include waste materials or imported fill. Thus, the Auditor does not require sampling of the pond walls. The Auditor requires visual inspection of the pond walls (inside and outside of the ponds) for evidence of possible inclusion of foreign materials in the pond walls. The Auditor notes that ACM pipes in the pond walls are a separate AEC. <u>Pond Base</u> The Auditor considers that the proposed sampling density is too sparse for the 3 to 4 hectare coverage of each pond. The Auditor requires a minimum of 16 samples for each pond, with the distribution fanning out from and more concentrated in the low point of the pond. The Auditor requires a Sketch showing proposed sample distribution for AEC 1.
2	Anaerobic Ponds	<u>Pond Walls</u> The Auditor's comments regarding sampling in AEC 1 also apply to AEC 2. The Auditor requires visual inspection of the pond walls (inside and outside of the ponds) for evidence of possible inclusion of foreign materials in the pond walls. The Auditor notes that ACM pipes in the pond walls are a separate AEC. <u>Pond Base</u> The Auditor understands that for current site conditions, sampling of the base of these ponds is practical. Given this limitation to access, the Auditor requires a minimum of 10 samples for each pond from sediment accumulated on the walls. Sample locations should be evenly distributed around the pond and samples should be taken below the water level.
3	Agricultural Land	The Auditor accepts the proposed sampling for undisturbed natural ground. If disturbed ground is identified at a sampling location, then investigation should continue to the top of natural undisturbed ground. For depth of disturbed ground greater than 0.3m, additional samples should be collected at every 0.5m depth (from the surface), and one sample of undisturbed ground should be collected. The Auditor requires a Sketch showing proposed sample distribution for AEC 3.

4	ACM Pipes	The Auditor accepts the proposed sample density, and notes that samples should be collected from the area where rainfall runoff may have carries asbestos fibres which may have weathered from the ACM pipes.
5	Access Road	The Auditor accepts the proposed sample density.
6	Farm Dams in Paddocks A, B & C	The Auditor accepts the proposed sample density.
7	Potential Filling (Paddock C)	The Auditor accepts the proposed number of sampling locations. Sampling locations should be evenly distributed across the AEC. If fill material or disturbed ground is identified at a sampling location, then investigation should continue to the top of natural undisturbed ground. For depth of fill material or disturbed ground greater than 0.3m, additional samples should be collected at every 0.5m depth (from the surface), and one sample of undisturbed ground should be collected.
8	Former Dumping Site East of Anaerobic Ponds	The Auditor accepts the proposed number of sampling locations. Sampling locations should be evenly distributed across the AEC. If fill material or disturbed ground is identified at a sampling location, then investigation should continue to the top of natural undisturbed ground. For depth of fill material or disturbed ground greater than 0.3m, additional samples should be collected at every 0.5m depth (from the surface), and one sample of undisturbed ground should be collected.
9	Former Dumping Site North of Farm Shed	The Auditor accepts the proposed number of sampling locations. Sampling locations should be evenly distributed across the AEC. If fill material or disturbed ground is identified at a sampling location, then investigation should continue to the top of natural undisturbed ground. For depth of fill material or disturbed ground greater than 0.3m, additional samples should be collected at every 0.5m depth (from the surface), and one sample of undisturbed ground should be collected.
10	Former Shed (demolished)	The Auditor accepts the proposed number of sampling locations. Sampling locations should be evenly distributed across the AEC. If fill material or disturbed ground is identified at a sampling location, then investigation should continue to the top of natural undisturbed ground. For depth of fill material or disturbed ground greater than 0.3m, additional samples should be collected at every 0.5m depth (from the surface), and one sample of undisturbed ground should be collected.

11	Former Abattoir and Associated Buildings	The Auditor considers that the proposed number of sampling locations is too few. The Auditor requires a minimum of 9 sample locations per building, including a sample within the building footprint. The Auditor has attached a sketch with his suggested approach to sample design for buildings in AEC 11. If fill material, disturbed ground or potentially contaminated material is identified at a sampling location, then investigation should continue to the top of natural undisturbed ground. For depth of fill material, disturbed ground or potentially contaminated material greater than 0.3m, additional samples should be collected at every 0.5m depth (from the surface), and one sample of undisturbed ground should be collected. The Auditor requires a Sketch showing proposed sample distribution for AEC 11.
12	Potential Filling of Dam	The Auditor considers that the proposed number of sampling locations is too few. The Auditor requires a minimum of 5 sample locations for the two smaller areas and 8 sample locations for the largest area. Sampling locations should be evenly distributed across the AEC. If fill material or disturbed ground is identified at a sampling location, then investigation should continue to the top of natural undisturbed ground. For depth of fill material or disturbed ground greater than 0.3m, additional samples should be collected at every 0.5m depth (from the surface), and one sample of undisturbed ground should be collected.
13	Groundwater (at Ponds)	The Auditor accepts the proposed number of sampling locations. The Auditor requires a Sketch showing proposed sample distribution for AEC 13.

Please contact the undersigned if you need to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

Michael Dunbavan

Senior Principal - NSW EPA Accredited Site Auditor

Attachment: Sketch of suggested sampling design for AEC 11

coffey

Computations project no: ER01027AA sheet of

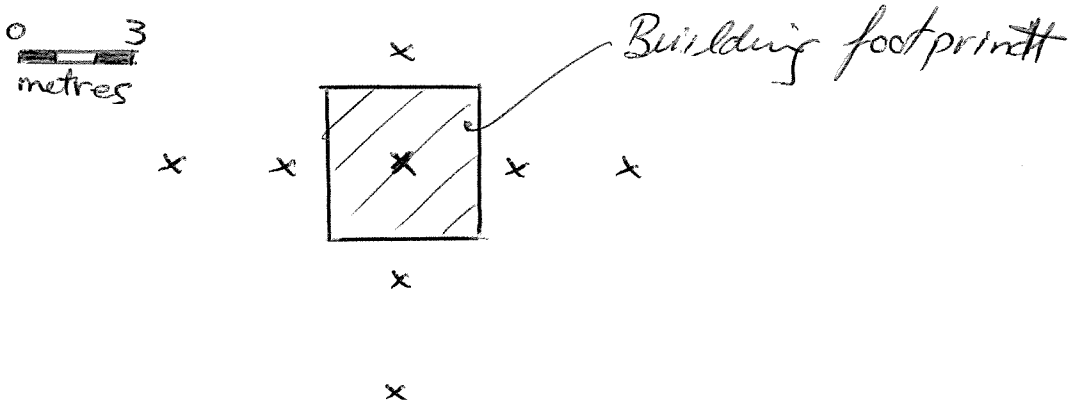
client: Mastergroup	office: Chatswood
principal:	date: 25 Feb 2013
project: Lot 11, Richards Road	by: N Dunbavan
location: Riverstone	checked:

SKETCH

AEC 11 – Suggested Sampling Location Design

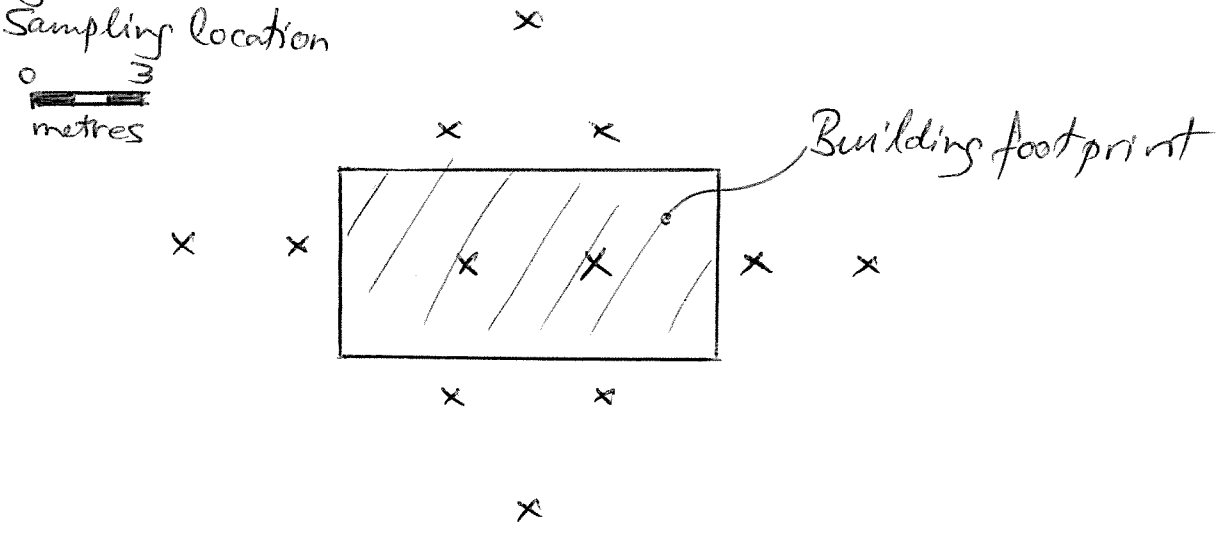
Small Building

× Sampling location



Larger Building

× Sampling location



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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**28 February 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA04**
cc	**Ryan Jacka, SESL**	Pages	**1 of 4**
Subject	**Interim Audit Advice 04 - Comment on Revised Sample Densities for Lot 11, Richards Road, Riverstone**		

Dear Mark:

The advice presented in this document represents interim advice only, and does not constitute a Site Contamination Audit Report or Site Contamination Audit Statement. The advice provides the opinion of the Auditor based on the knowledge that is available at the time of this advice. A Site Contamination Audit Report and Site Contamination Audit Statement will be issued at the end of the Audit process, when the Auditor is satisfied all relevant matters have been adequately addressed to the satisfaction of the Auditor. This advice does not pre-empt or constrain the final outcome(s) of the audit or any conditions that may be placed by the Auditor in the Site Contamination Audit Report or Site Contamination Audit Statement.

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

The Auditor has reviewed:

- SESL, Revised Sample Densities for Lot 11, Richards Rd, Riverstone, letter dated 27 February 2013, with 5 maps attached.

The Auditor has reviewed the revised sample densities for Areas of Environmental Concern (AECs) with reference to the relevant maps showing distribution of sampling locations provided by SESL and to NSW EPA Sampling Design Guidelines (1995). The Auditor is generally satisfied with revised sampling densities for all AECs and provides comments and requests that SESL reconsider certain sample numbers and locations which are described below. The Auditor appreciates the rapid response of SESL to Interim Advice 03 and attention to detail in SESL's response.

AEC	Feature	Auditor's Comment
1	Settling Ponds	Revised sampling plan and proposed sampling locations are acceptable to the Auditor.
2	Anaerobic Ponds	Revised sampling plan and proposed sampling locations are acceptable to the Auditor.
3	Agricultural Land	Revised sampling plan and proposed sampling locations are acceptable to the Auditor.
4	ACM Pipes	Revised sampling plan and proposed sampling locations are acceptable to the Auditor.
5	Access Road	Proposed sampling locations are acceptable to the Auditor.
6	Farm Dams in Paddocks A, B & C	Proposed sampling locations are acceptable to the Auditor. The Auditor suggests that at each location: • one sediment sampling location represent inflow to the dam; and • one sediment sampling location represent outflow from the dam. Sampling location for water (if applicable) will be governed by safety considerations; however, the water sample should not include sediment stirred up by the sampling process.
7	Potential Filling (Paddock C)	Revised sampling plan and proposed sampling locations are acceptable to the Auditor.
8	Former Dumping Site East of Anaerobic Ponds	Revised sampling plan and proposed sampling locations are acceptable to the Auditor.
9	Former Dumping Site North of Farm Shed	Revised sampling plan and proposed sampling locations are acceptable to the Auditor.
10	Former Shed (demolished)	Revised sampling plan and proposed sampling locations are acceptable to the Auditor.
11	Former Abattoir and Associated Buildings	Revised sampling plan and proposed sampling locations for the smaller building footprints are acceptable to the Auditor. The Auditor considers that the number and distribution of sampling locations is insufficient for the largest building footprint. The Auditor requests that the number of sampling locations be increased from 16 to 21, and the the distribution of these locations resemble that shown on the attached sketch.
12	Potential Filling of Dam	Revised sampling plan and proposed sampling locations are acceptable to the Auditor.

13	Groundwater (at Ponds)	Revised sampling plan and proposed sampling locations are acceptable to the Auditor, except for the location of the monitoring well proposed for the wall separating the two settling ponds. The Auditor requests that this location be moved to the north by approximately 50m so that it is close to the southwest corner of the Anaerobic Ponds.

Please contact the undersigned if you need to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

M. Dunbavan

Michael Dunbavan

Senior Principal - NSW EPA Accredited Site Auditor

Attachment: Sketch of suggested sampling design for AEC 11

coffey environments
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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**23 April 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA05**
cc	**Ryan Jacka, SESL**	Pages	**1 of 2**
Subject	**Interim Audit Advice 05 - Comment on SESL Response to Interim Audit Advice 01 - Consolidated Investigation Report**		

Dear Mark:

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Preamble

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

Background to this Interim Advice

The Auditor has reviewed:

- SESL, Re: Interim Audit Advice 01 – Review of SESL Consolidated Site Investigation Report, Lot 11, Richards Rd, Riverstone, letter dated 2 April 2013, with 4 maps attached.

The Auditor has considered responses provided by SESL to 24 specific comments listed in Interim Audit Advice 01 (IA01), dated 29 January 2013. The Auditor is generally satisfied that the responses provided by SESL address the specific comments made in IA01. SESL's letter of 2 April 2013, together with additional information provided by SESL, and reviewed by the Auditor, address the Auditor's general comments in IA01. Additional information relevant to this Interim Advice is discussed in Interim Audit Advices IA02, IA03 and IA04.

Auditor Comment

The Auditor notes several issues for editorial attention by SESL, and these are listed with reference to items as numbered in IA01 as follows:

- Item 14, Section 4.1: The Auditor notes that SESL states that analysis of samples of ash/coal used for road surfacing "will ensure it does not contribute to contamination". If taken literally, this statement is not defensible because analysis of samples, regardless of sampling density, simply cannot prevent contamination. The Auditor suggests that the purpose of analysis of samples from this ashy material would be to assess its contribution, if any, to environmental risk from historical land use.
- Item 14, Section 4.2: the material of the pipes is correctly described as asbestos cement.
- Item 14, Section 4.4: The Auditor notes the reference s to the term "landfill" or "landfilling" by Australian environmental regulators is made predominantly in the context of disposal of waste materials. The Auditor is reasonably certain that SESL's use of this term is not in the context of waste disposal and that SESL's use of this term may be misunderstood. Consequently, the Auditor suggests that SESL's use of the term "landfilling" be replaced by a reference to bulk earthworks, or earthworks cut and fill.
- Item 14, Section 4.5: The intention of the Auditor's comment was to consider possible sources of waste generated on-site, or brought onto the site, as potential sources of contamination. The concern is not the management of any waste which may be generated on the site, but the potential for any such waste to represent a potential source of land contamination.
- Item 16, Section 4.7: The Auditor does not agree with SESL's wording of the second sentence of the first paragraph because this statement is too broad and implies a level of contamination assessment which has not occurred. The Auditor considers that the previous investigations found no impediment to possible residential development of the land and SESL should consider use of similar wording in this place.
- Item 18, Section 5.1: The Auditor suggests that the second sentence should be reworded to convey SESL's meaning more clearly.

Closing

The Auditor does not require a formal response to the comments in this IA05, but expects that the issues described would be included in SESL's contaminated site investigation report developed from the initial Consolidated Site Investigation Report. The Auditor prefers that each of the points raised above are addressed, and requires the point regarding Item 16 to be addressed.

Please contact the undersigned if you need to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

Michael Dunbavan

Senior Principal - NSW EPA Accredited Site Auditor

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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**20 June 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA06**
cc	**Ryan Jacka, SESL**	Pages	**1 of 7**
Subject	**Interim Audit Advice 06 - Comment on SESL Sampling, Analysis and Quality Plan**		

Dear Mark:

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1 PREAMBLE

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

2 BACKGROUND TO THIS INTERIM ADVICE

The Auditor has reviewed:

- SESL, Sampling, Analysis and Quality Plan for Richards Road, Riverstone, NSW 2765, Lot 11 DP816720, Report C6868.Q3190.B25449 DA SAQP, dated 8 May 2013

The Auditor has previously reviewed the proposed sampling densities for a Phase 2 Detailed Site Investigation (Phase 2 DSI). Auditor's comments were provided in interim audit advices IA03 and IA04.

The National Environment Protection (Assessment of Site Contamination) Measure 1999 (revised 2013) has been endorsed by NSW EPA under Section 105 of the NSW *Contaminated Land Management Act (1997)*. The Auditor understands that the NSW EPA has indicated a one-year transition period where either version of the NEPM may be used. The Auditor recommends application of the revised NEPM with associated investigation levels for human-health, ecology and groundwater. This recommendation is made so that future reference to SESL's contamination assessment will not require reconsideration of that information because guideline values from the revised NEPM were not used.

3 GENERAL COMMENTS

The Auditor considers that the SAQP was prepared to a standard which generally meets relevant parts of NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (1997).

The Auditor has concerns about certain aspects of the draft SAQP, specifically:

- The SAQP does not include a site plan showing the location and extent of areas of environmental concern (AECs).
- The identified AECs are not consistent with those accepted by the Auditor (IA04), specifically:
    - AEC1 Settling Ponds and AEC 2 Anaerobic Ponds, are now combined as AEC 1;
    - AEC 7 Potential Filling in Paddock C, is now AEC6 – Potential Filling in Paddock; and
    - AEC8 Dumping Site East of Farm Shed and AEC9 Dumping Site North of Farm Shed, are now combined as AEC 7 (Former Dumping Site).
- The potential contaminants of concern (PCOCs) listed in Table 4 of the SAQP are not consistent to the list accepted by the Auditor (IA04), specifically:
    - AEC 5 – Farm Dams – PAH should be included if ashy materials are identified.
    - AEC 6 – Potential Filling in Paddock, OCPs, PCBs and asbestos should be included for building rubbles and scrap machinery only.
    - AEC 7 – Former dumping site –heavy metals are missing
    - AEC 8 – Former farm shed – heavy metals are missing
    - AEC 9 – former meatworks facility and associated buildings – NaSO4 and CaCO3 were not identified as PCOCs.
    - AEC 10 – potential filling of former dam - NaSO4 was not identified as a PCOC.
- The Auditor notes that SESL has changed the agreed sampling densities for the following AECs:
    - AEC 9 – the Auditor required 21 sampling locations for the largest structure.
    - AEC 11 – the Auditor has required the proposed groundwater monitoring well located in the centre of the settling pond to be moved to 50m north to target the anaerobic pond, if possible.
- Insufficient information was completed to assess the proposed methodologies to be adopted for the investigation, specifically:
    - Based on the information provided in various sections of the SAQP, hand tools (including hand augers and shovels) are proposed to be used for soil sampling. Given that the site is underlain by predominately clayey soils and/or weathered shale, the Auditor is concerned that the use of hand tools may not allow the target depth be reached. Areas of disturbed ground or filling should be investigated by trenching using a backhoe or excavator to provide sufficient subsurface exposure to observe possible variability in fill material.
    - The Auditor notes that SESL intends to use a sub-contractor for groundwater assessment. The Auditor requests SESL to provide:
        - The name, qualifications and experience of the sub-contractor.
        - Proposed drilling method and well installation details. Please note that drillers installing groundwater wells must be licensed with NSW Office of Water.

- Proposed well construction details and number of sampling rounds should be provided. The Auditor notes that peristaltic pumps should not be used for sampling where the groundwater is more than 5m below the top of the well casing.

- The data quality objectives (DQOs) section (Section 5.0) seems to stray from the guidance provided in Appendix IV of NSW DEC (2006).
- A specific QA/QC plan was not included.
- The Auditor requires Groundwater Assessment Criteria (GAC) be included in the SAQP.

The Auditor's specific comments on the SAQP are listed in Section 4.

4 SPECIFIC COMMENTS – SAQP

No.	Report Section	Auditor's Comment
1	1.1	The Auditor notes that the SAQP is relevant to a portion of Lot 11 in DP 816720 rather than the entire lot.
2	1.2	The Auditor suggests that the objective of an SAQP is to define the DQOs for the investigation and the appropriate field investigation methodology.
3	3.0 and Table 4	The Auditor notes that the number of AECs is less than those reviewed and approved previously by the Auditor. The Auditor notes that some AECs have been combined. A figure showing the areas covered by each AEC and clear labelling of AEC is required. The Auditor also notes that Heavy Metals are omitted as PCOC from AEC 7 and AEC 8 and requires these be added. The Auditor notes that chloride salts are introduced for AEC 9 and AEC 10 and requests basis for this inclusion.
4	4.0, bullet points	Bullet 2 – AEC 11 is groundwater and sampling design should be discussed in Bullet 5. Bullet 3 – chloride salts are included – please clarify. Bullet 4 – PAHs are included – please clarify. Bullet 5 – PAHs and Bacteria are included – please clarify. Bullet 6 – Reporting is not a part of the SAQP, however, the quality assurance process for field and laboratory results should be described. Bullet 7 – not relevant to SAQP.
5	4.0, 4th and 5th bullet points	PAH was not included in Table 4. Please clarify.
6	4.0, 6th bullet point	The reporting requirement should be detailed in a separate section. Please revise.
7	4.1,	The Auditor does not agree that sampling on a 100m square grid over agricultural land has the potential to detect a 61.6m diameter hotspot. The Auditor's calculation gives a diameter of 118m. Please clarify this matter.

No.	Report Section	Auditor's Comment
8	4.1, Table 5	AECs 6 - 10 – where disturbed ground is observed, sampling should continue 0.5m into undisturbed natural ground. One sample should be collected at the top of undisturbed ground and a second at 0.5m into undisturbed ground, with the upper sample being scheduled for analysis and the lower sample being held in reserve. AEC 9 – the Auditor has previously required 21 sampling locations in and around the largest structure. Please revise. .
9	4.1, Table 6	AEC 1 – the number of samples is half what it should be. The Auditor notes that there are two settling ponds and two anaerobic ponds. AEC 3 – sampling interval should be limited to the immediate surface soil and sample size should be approximately 50g. AEC 6, 7 and 10 – The sampling depth will depend on the depth of fill. At each location, a surface sample should be collected and additional samples collected each 0.5m depth of fill and one sample from top of undisturbed soil and another 0.5m into undisturbed soil.
10	4.2	The Auditor notes that groundwater will be assessed by an external contractor. The Auditor requests that SESL provide groundwater well construction, development and sampling details,and the contractor's qualifications and experience in undertaking the groundwater assessment. The Auditor considers that analysis for bacteria in groundwater is not appropriate.
11	4.3.1, bullet points	Bullet 1 - Sampling intervals described are not consistent with those in Table 5 – please clarify. Bullet 2 – The Auditor requests clarification about assessment of filled or potentially filled areas for which he considers use of hand augers or other boring methods inappropriate. Also please clarify decontamination process should soil samples be collected directly from hand auger. Bullet 3 – please justify why no field screening is to be undertaken around former structures.
12	4.3.3	The Auditor requires the wells to be surveyed such that the inferred groundwater flow direction can be assessed. The Auditor notes that a licence for aquifer interference (well installation) may be required under NSW Office of Water Aquifer Interference Policy.
13	4.3.6	Please confirm if test pit will be excavated. The Auditor accepts the use of mains water for decontamination process and suggests that one sample be collected for reference. The Auditor requests specification of the frequency of collection of equipment rinsate samples.

No.	Report Section	Auditor's Comment
14	4.3.7	The Auditor notes that SESL has set an acceptance limit of 30% for RPD which is at the lower end of the range stated in Table 4 of AS4482.1-2005. The Auditor suggests that SESL reconsider this limit and the Auditor's experience shows that 50% is a practical limit for concentrations above 10 times LOR.
15	4.3.8	Please nominate which laboratories will be used for this investigation.
16	4.3.9	The Auditor suggests that the acceptable outcome is no detectable analytes. If detection is reported, then discussion of the occurrence is made on a case by case basis.
17	4.3.10	The Auditor suggests that laboratory duplicates are used to indicate the potential influence of sub-sampling as part of laboratory preparation. Laboratory accuracy is indicated by laboratory spike and spike duplicate samples.
18	4.3.11	Representativeness is a measure of confidence (expressed qualitatively) that data are representative of each medium present on the site. Please revise this section. Please clarify how sample representativeness will be achieved for groundwater and surface water.
19	4.3.12	Comparability is the confidence (expressed qualitatively) that data may be consider to be equivalent for each sampling and analytical event. This DQI is more relevant to environmental monitoring programs which extend over months to years during which time sample quality may be influenced by changes in weather conditions and changes in sampling staff and/or procedures.
20	4.3.13	Completeness is a measure of the amount of usable data (expressed as %) from a data collection activity and not to do with the data entries. The Auditor suggests that the aim should be 100% complete, with explanation and assessment of impact otherwise.
21	5.2.1	Please confirm if the site will be redeveloped for '*mixed residential and commercial centre*'.
22	5.2.2	This step should identify if the chemical characteristic of each media will potentially pose an unacceptable risk to future users of the site. Please revise.
23	5.2.3	The Auditor also suggests that site historical information, site observations and field measurements are an important part of the decision inputs. Quality assurance from relevant data and applicable soil and water investigation levels are also relevant. The Auditor also notes that SESL has proposed well survey to be undertaken to facilitate groundwater assessment. This should also be included in Section 4.2.
24	5.2.4	The vertical site boundary should be stated as a reference to depth into undisturbed natural soil. The vertical boundary for groundwater is

No.	Report Section	Auditor's Comment
		approximately 2m below the water table. Please also clearly state the extent of the horizontal boundary.
25	5.2.5	The decision rule for the investigation is to assess the site suitability for future residential use, taking the following into consideration: • PCOCs identified based on site history review; • Usability of collected data; • Procedure adopted to assess usable data, in the instance where concentrations exceed applicable assessment criteria. The use of statistical analysis is acceptable and should be undertaken in accordance with the procedures described in the NSW EPA (1995) Sampling Design Guidelines. The Auditor considers that this section does not provide a clear statement of decision rules. These rules are concisely presented by using an "If [condition A] occurs, then [action B] will be taken. For example: *If reported concentrations of a contaminant in soil exceed the investigation level, then that group of results will be analysed statistically to estimate the 95% UCL of the average.* *If the estimated 95% UCL of the average of a contaminant in soil exceeds the investigation level, then that contaminant will be identified as requiring further assessment for potentially unacceptable environmental risk.*
26	5.2.6	The Auditor refers to Procedure B in the NSW EPA (1995) Sampling Design Guidelines which provides a test for sample number required to have confidence in a set of results being compared to a numerical criterion. The Auditor also notes that use of the 95% UCL of the average value is a means of limiting a decision error. The Auditor requests revision of this section.
27	5.2.7	This section should describe how the sampling design was selected to optimise outcomes (sufficient data for a lower number of samples). Please revise this section accordingly.
28	6.0	The Auditor notes that SESL has included discussions which add little value to this section. The Auditor suggests revision of this section to include the applicable soil and water assessment criteria only: • Soil– Columns 1 and 5 in Appendix II of the NSW EPA (2006) Guidelines for the NSW Site Auditor Scheme. • Soil threshold concentrations for TPH and BTEX in Table 3 of NSW EPA (1994) Guidelines for Assessing Service Station Sites. • Asbestos – WA DoH (2006) • Groundwater and surface water –groundwater acceptance criteria (GAC) should be derived taking into consideration of the beneficial

No.	Report Section	Auditor's Comment
		use on-site, as detailed in NSW DECC (2007) Guidelines for the Assessment and Management of Groundwater Contamination.
29	7.0	The Auditor considers this section is not necessary.

5 CLOSING

The Auditor acknowledges that SESL has completed sampling and analysis on the site. Consequently, there appears to be little benefit in revision of this SAQP in detail. The Auditor requests an addendum to the SAQP which includes:

- A plan (or plans) of the site showing AECs and sampling locations, and the reason for any reduction in number of sampling locations from that previously agreed by the Auditor.
- A description of soil sampling, which includes sampling in fill material and disturbed ground.
- A table listing numbers of soil samples scheduled for analysis of PCOC and associated field QC samples and analysis and the reason for any reduction in number of analyses from that previously agreed by the Auditor.
- A table listing numbers of groundwater and surface water samples scheduled for analysis of PCOC and associated field QC samples and analysis and the reason for any reduction in number of analyses from that previously agreed by the Auditor.
- A description of the method of construction, development, gauging and sampling groundwater monitoring wells.
- A assessment of relevant environmental values for groundwater based on NSW EPA Guidelines for the Assessment and Management of Groundwater Contamination and a table listing Groundwater Acceptance Criteria (or similar)

Please contact the undersigned if you need to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

M. Dunbavan

Michael Dunbavan

Senior Principal Environmental Consultant
NSW EPA Accredited Site Auditor

coffey

Computations project no: ER01027AA sheet of

client: Mastergroup | office:

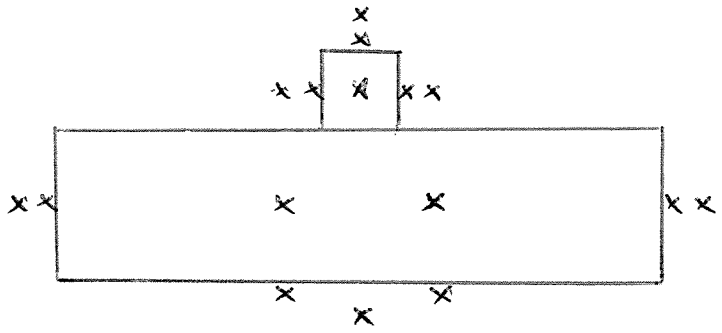
principal: | date: 27 Feb 2013

project: Lot #11, Richards Rd | by: M Dunbavan

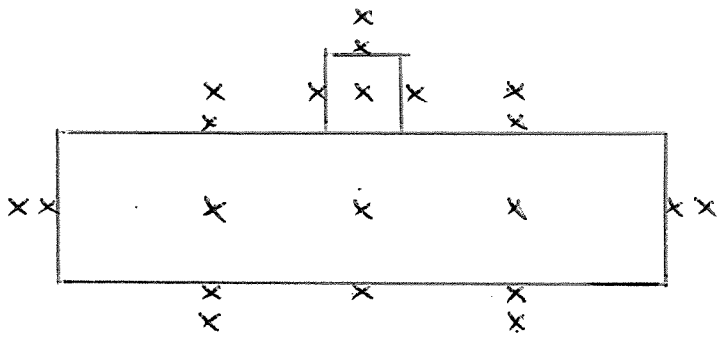
location: Riverstone | checked:

AEC 11 – Largest Footprint only.

SESL Proposed : 16 locations



Auditor request : 21 locations



ER01027AA-DA04.

Fiona Wong

From: Michael Dunbavan
Sent: Friday, 5 July 2013 6:41 PM
To: Ryan Jacka; Kelly Lee
Cc: Mark Robertson
Subject: FW: Lot 11, Richards Road, Riverstone - preliminary review of results from soil and groundwater sampling and analysis

Ryan and Kelly – in addition to my comments on soil sampling, I offer brief comment on groundwater sampling results.

EIS appear not to have a good understanding of the purpose of DQOs. I suggest the following as an indicator of where your report should be heading regarding DQOs for groundwater.

1 State the problem
Has historical use of the ponds as an effluent treatment system impacted groundwater which may affect future development of the site for residential purposes?

2 Identify the decisions
Direction of groundwater flow; depth of groundwater below the surface, quality of groundwater

3 Identify inputs to decision
Environmental values of groundwater (refer to DEC 2007 guidelines); site hydrogeology – note water bearing zones in soil and shale (soil is of interest); structure of ponds, especially depth of anaerobic ponds – note water in anaerobic ponds has a material influence on groundwater contours; water quality guidelines

4 Define the study boundaries
Horizontal – ponds and immediate surrounding land; top of shale or 15m, whichever is shallower

5 Develop a decision rule
Is data relevant and reliable for the purpose of this study?
If yes, then continue. If no, then obtain relevant and reliable data.
Is an impact to groundwater apparent?
If yes, then is what is the potential risk arising from that impact and will that impact persist? If no apparent impact, no further enquiry.
If risk is potentially unacceptable, does it extend beyond the current study boundary?
If yes, then addition investigation is warranted. If no, then move to next decision point.
When impact is delineated, is remediation or management warranted?
If yes, then recommend such action. If no, then study concludes.

6 Specify limits on decision errors
Identify factors that could result in a false outcome and discuss what indicators define acceptable results

7 Optimise design for obtaining data
More sampling? More wells?

I am concerned that the data obtained by EIS may not be relevant. Given that the focus of groundwater assessment should be in the soil zone (and not in the shale), the current data is not relevant because 6 of the 7 samples represent water taken from shale.
Fortunately, the construction of the wells means that 6 of 7 wells are capable of providing relevant samples, while MW2 is screened only in the shale.
As part of additional sampling for data gaps in soils, I also request a second round of groundwater sampling, using a low flow sampling method (such as a variable speed peristaltic pump), with monitoring of the standing water level in the well to ensure that pumping is not causing drawdown. Based on the observed depths to water and well construction logs, I require that the extraction point for water during sampling be:

Well number	Depth below top of casing

1	4.0m
2	Not sampled
3	3.5m
4	4.5m
5	4.0m
6	5.5m
7	6.0m

Microbiology should be included for each sample as well as other analytes identified in the SAQP.

Please call if you have questions.

Regards

Dr Michael Dunbavan
Senior Principal Environmental Consultant

NSW EPA Accredited Site Auditor

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coffey

From: Michael Dunbavan
Sent: Friday, 21 June 2013 2:05 PM
To: 'Ryan Jacka'; 'Kelly Lee'
Subject: Lot 11, Richards Road, Riverstone - preliminary review of results from soil and groundwater sampling and analysis

Ryan and Kelly:

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Interim audit advice does not pre-empt or constrain the final outcome(s) of the audit or any conditions that may be placed by the Auditor in the Site Audit Report or Site Audit Statement.

The following comments are made with reference to the revised NEPM guidelines.

AEC 6 – Sediment from Dams
I notes that the pH measured (using both CaCl2 and H2O solutions) is relatively low. I would appreciate SESL's comment on pH typically found in similar residual soils around Sydney. The pH value has an influence on EILs for copper and zinc and both of these metals have concentrations across the site which may be of concern for future urban development.

AEC 2 – Paddocks
Refer to note above regarding influence of pH on EILs for copper and zinc. Arsenic does not exceed the revised EIL.

AEC 5 – Roads
Location F6 may be worth further consideration. I note that this location is close to the shed identified as BG. I suggest that results from BG and F6 be combined (specific plan to scale showing sampling locations) and to consider need for additional assessment.

AEC 4 – Asbestos Containing Materials
Locations where asbestos was detected in soil will require delineation. The sample identity could not be clearly interpreted. I understood the AP, ESP and WSP prefix as a reference to the particular pond and the numeral after ASB appears to identify the particular location for the pond, however the meaning of the last numeral escapes me.

AECs 7, 8, 9 and 12 – areas of filling or other placement of materials
Results are reported for surface samples only. This is different from what we agreed previously, which was that fill material would be excavated through to natural undisturbed soil with samples of fill being taken at the surface and every 0.5m depth and the top of natural soil and at 0.5m into natural soil would also be sampled. Unless you have lots more results, or no fill material was identified, there is more sampling to do.

AEC 11 – Former Buildings
EILs for copper and zinc in soils in close proximity to former buildings needs to be established for this site. I will accept that soils in close proximity to former buildings represent old suburbs in a low traffic area, for the purpose of selecting the ABC component of the EIL. Cadmium values above the provisional phytotoxicity level of 3mg/kg require discussion.
Elevated concentrations of zinc require delineation on the southern and western sides of BE and on the eastern side of BC. Copper may also require delineation, depending on the relevant value of EIL.
The elevated concentration of nickel at BG1 warrants consideration.
Elevated concentrations of lead within the BA building footprint and to the south and east require delineation at the surface and also at depth to the south.
Asbestos requires delineation to the east of BA.

Groundwater
Issues of concern are arsenic in MW5, iron and ammonia in all 7 wells, NOx in MW7 and E. Coli in MW3.
The reliability of the samples will depend on the development and purging of the wells. I note that wells were mostly 15m deep with very long screened sections. Consequently, one well volume of water would be about 26L, giving a purge volume up to 78L. That's a lot of work. I really need to see the field records for development and purging to decide about this issue.

For and on behalf of Coffey Environments Australia Pty Ltd

Dr Michael Dunbavan
Senior Principal Environmental Consultant

NSW EPA Accredited Site Auditor

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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**8 August 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA07**
cc	**Ryan Jacka, SESL**	Pages	**1 of 3**
Subject	**Interim Audit Advice 07 - Comment on SESL Results from Additional Sampling and Analysis**		

Dear Mark:

The advice presented in this document represents interim advice only, and does not constitute a Site Contamination Audit Report or Site Contamination Audit Statement. The advice provides the opinion of the Auditor based on the knowledge that is available at the time of this advice. A Site Contamination Audit Report and Site Contamination Audit Statement will be issued at the end of the Audit process, when the Auditor is satisfied all relevant matters have been adequately addressed to the satisfaction of the Auditor. This advice does not pre-empt or constrain the final outcome(s) of the audit or any conditions that may be placed by the Auditor in the Site Contamination Audit Report or Site Contamination Audit Statement.

1 PREAMBLE

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

2 COMMENT ON RIVERSTONE UPDATED RESULTS

The Auditor requested his assistant, Fiona Wong, to provide a summary of the consistency of the additional sampling and analysis with the gaps in data identified previously in review of SESL reports. This preliminary review of the Riverstone Detailed Site Investigation (DSI) results found some unexpected divergence from the agreed SAQP. The Auditor notes that the information provided is simply a collection of data, and is not in a report format which is suitable for Auditor review. To allow Auditor comment on the adequacy of the additional data in meeting the agreed SAQP, the Auditor provides the following comments and also requests additional information.

Identity of AECs

The Auditor notes that the identified AECs are not consistent with those accepted by the Auditor (IA04 and IA06), specifically:

AEC 11 – Groundwater at Ponds, is now AEC 1

AEC 1 – Asbestos at Pond, is now AEC 4

AEC 2 - Agricultural Land, is now AEC 2 Paddocks

AEC 3 - Roads, is now part of AEC 2 Paddocks

AEC 4 – Access Road, is now AEC 5 Road

AEC 5 - Farm Dams, is now AEC 6 Dams

AEC 6 - Potential Filling in Paddock, is now and AEC 7 – Filling and AEC 12 Dam Filling

AEC 7 – Former Dumping Area, are now AECs 7 to 9 Former Potential Dumping Area

AEC 8 - Former Farm Shed and AEC 9 – Former Meatworks facility, are now AEC 10 and AEC 11 – Former structure

AEC10 – Potential Filling of Former Dam, is now AECs 8 and 9 Former Dumping Areas

AEC 3 is not listed in the DSI table.

The Auditor requires SESL to provide a site plan clearly identifying each AEC, with AEC number and name next to each location. While the Auditor notes that the previously identified AECs have been included in the additional investigation, the change in AEC numbering is inconsistent with the agreed SAQP. For the purpose of the Audit, the AEC numbering system should be consistent.

Completeness of Sampling and Analysis

The Auditor requires an update of 'Summary of Soil Sampling Pattern and Analysis' table (based on Table 6 in the SESL's SAQP) to reflect the following:

- List of samples collected at each AEC, including location and depth of each sample and a description of each sample (at least distinguish between undisturbed soil and fill/disturbed soil); and
- Analyses undertaken for listed samples (may be provided in a separate table for simpler presentation).

Divergence from Agreed SAQP

The Auditor notes the following divergence from the from the agreed sampling plan and requests explanation for each item:

- Use of a hand auger as the main sampling method for the soil intrusive program, except for AECs 8, 9 and 12 (JA to JE samples). The Auditor required investigation of the full depth of fill material.
- No sampling was undertaken in the Eastern Pond.
- Based on the sample location plans, the sampling pattern at the former meatworks facility is different from the agreed sampling plan (BA to BE, BH and BI).
- Locations of the BG samples and sample BF10 were not included on the relevant plan.
- The analytical program was different from that agreed with the Auditor.
- Quality control did not meet the agreed program in that insufficient field duplicate samples and no equipment rinsate samples were collected and analysed.
- Specific details for groundwater sampling are required to demonstrate that the agreed sampling protocol was used. This is important for assessment of the useability of the groundwater results.

3 CLOSING

The Auditor requests that the adequacy of sampling and analysis be determined before additional resources are allocated for interpretation of results, and subsequent Auditor review of SESL's report on the additional assessment.

Please contact the undersigned to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

Michael Dunbavan

Senior Principal Environmental Consultant
NSW EPA Accredited Site Auditor

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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**9 September 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA08**
cc	**Ryan Jacka, SESL**	Pages	**1 of 2**
Subject	**Interim Audit Advice 08 - Comment on SESL Results presented in Riverstone Master Sheet 140813**		

Dear Mark:

The advice presented in this document represents interim advice only, and does not constitute a Site Contamination Audit Report or Site Contamination Audit Statement. The advice provides the opinion of the Auditor based on the knowledge that is available at the time of this advice. A Site Contamination Audit Report and Site Contamination Audit Statement will be issued at the end of the Audit process, when the Auditor is satisfied all relevant matters have been adequately addressed to the satisfaction of the Auditor. This advice does not pre-empt or constrain the final outcome(s) of the audit or any conditions that may be placed by the Auditor in the Site Contamination Audit Report or Site Contamination Audit Statement.

1 PREAMBLE

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

2 COMMENT ON RESULTS IN RIVERSTONE MASTER SHEET 140813

The Auditor notes that SESL has addressed the majority of comments made by the Auditor in Interim Advice 07, dated 8 August 2013. The Auditor also notes that the following comments relate only to the results presented in the SESL spreadsheet identified as *Riverstone Master Sheet 140813*, and the this Interim Advice does not provide the Auditor's comment on the associated DSI Report.

Conformity with NEP (Assessment of Site Contamination) Amendment Measure (No. 1)

These guidelines are referred to as the Amended NEPM, for convenience in this Interim Advice.

The Auditor notes that values for EILs do not appear consistent with those expected to be derived from the Amended NEPM. Detailed comment will be made on this issue with reference to the DSI Report.

Results for hydrocarbons should be presented as TRH fractions only. Results for PAHs should include concentration as B[a]P TEQ and include reported concentrations of constituent PAHs.

Spreadsheet for Agricultural Land AEC3 appears to have a data entry error with apparent transposition of data in the lower half of the page.

The Auditor notes that the current Riverstone Master Sheet 140813 does not meet reporting standards described in Schedule B2 of the Amended NEPM.

AEC 11 – Structure BA

The Auditor notes that the additional sampling identified substantial impact by lead at concentrations well above the relevant Health-based Investigation Level (300mg/kg). Impact by asbestos and zinc also occurred at certain locations where lead impact was identified. The Auditor notes that the lead impact to the south and east of Structure BA has not been delineated laterally and in some locations vertically. Delineation of this impact and preparation of an appropriate Remedial Action Plan would be required before the Auditor would consider issuing a Site Audit Statement that the site could be made suitable for future residential development.

3 CLOSING

The Auditor will provide comment on SESL's CSI Report in the next few days.

Please contact the undersigned to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

M. Dunbavan.

Michael Dunbavan

Senior Principal Environmental Consultant
NSW EPA Accredited Site Auditor

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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**24 September 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA09**
cc	**Ryan Jacka, SESL**	Pages	**1 of 9**
Subject	**Interim Audit Advice 09 - Comment on SESL Response to Interim Audit Advice IA07 and Draft Consolidated Site Investigation Report, August 2013**		

Dear Mark:

The advice presented in this document represents interim advice only, and does not constitute a Site Contamination Audit Report or Site Contamination Audit Statement. The advice provides the opinion of the Auditor based on the knowledge that is available at the time of this advice. A Site Contamination Audit Report and Site Contamination Audit Statement will be issued at the end of the Audit process, when the Auditor is satisfied all relevant matters have been adequately addressed to the satisfaction of the Auditor. This advice does not pre-empt or constrain the final outcome(s) of the audit or any conditions that may be placed by the Auditor in the Site Contamination Audit Report or Site Contamination Audit Statement.

1 PREAMBLE

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

The Auditor has received and reviewed:

- SESL Response to Interim Audit Advice 07, letter dated 14 August 2013, with Attachment A being Revised DSI AEC Map and DSI Sampling Maps, and Attachment B SESL Results Summary Spreadsheet; and
- Draft Consolidated Site Investigation for Richards Road, Riverstone NSW 2765, Lot 11 DP816720.

2 COMMENT ON SESL RESPONSE TO INTERIM AUDIT ADVICE IA07

Information provided to the Auditor by SESL has clarified the identity of AECs and provided a tabulated summary of samples collected and analysed. Other comments made by the Auditor have been resolved by SESL confirming that additional information to basic analytical results will be included in the Consolidated Site Investigation Report under preparation. The few errors identified by the Auditor in certain sample plans and certain tabulated results were corrected by SESL with amended items being reissued.

The Auditor accepts that comments made in IA07 have been addressed sufficiently for the Auditor to progress to review of a draft Consolidated Site Investigation Report.

3 COMMENT ON DRAFT CONSOLIDATED SITE INVESTIGATION

3.1 General Comments

The Auditor was provided with the text of this draft report and Appendices A and part of Appendix E. The Auditor acknowledges that information in other appendices listed in the table of contents appears to be the same as some information in appendices in the December 2012 issue of this report.

The Auditor's experience of reviewing plans and reports which have become fragmented through various revisions is that the effort required to review such documents is noticeably more than that for review of a complete issue of a new version. Given that the Auditor has identified the need for additional targeted investigation to delineate contamination in certain areas of the site, the Auditor requests that any subsequent version of this Consolidated Site Investigation report be issued as a "stand alone" document.

The Auditor considers that the standard of reporting does not meet that described in Schedule B2, Guideline on Site Characterisation, of National Environment Protection (Assessment of Site Contamination) Measure as amended (NEPC 1999), referred to in this advice as the amended NEMP. In particular, the provision of analytical results for soil samples in a series of spreadsheets and as a laboratory certificate for groundwater samples is not acceptable. The draft report does not include description of soil or groundwater sampling methods and does not include an adequate QA/QC assessment. Other deficiencies in the draft report are described in the following section.

3.2 Specific Comments

Item	Report Section	Comment
1	1.0	Background The Auditor understands that the investigation area is a portion of Lot 11 in DP 816720.
2	1.0	Background The NEPM issued in 1999 has been repealed and should not be retained in the list of guidelines.
3	2.2	Surrounding Land Use The Auditor notes that properties to the south of the site are more accurately described as rural residential land.

Item	Report Section	Comment
4	2.3	Site Layout and Infrastructure The Auditor notes that the system of ponds in the southwest corner of the site comprise two smaller settling ponds and two larger evaporation ponds. The purpose of these ponds appears to have been for effluent treatment from the abattoir, and that irrigation may have been used when natural evaporation was less than the rate of effluent being added to the system. The Auditor also notes that three high voltage electricity transmission towers are located in the northwest part of Lot 11, with one tower being within the site near the western boundary. The Auditor requests clarification of descriptions of these features.
5	2.4.2	Geology, Hydrology & Hydrogeology The presence of "four settlement ponds" in the southwest corner of the site is noted, however, the potential influence of these ponds on local hydrogeology is not identified. This issue should be included.
6	2.4.3	Proximity to Local Sensitive Environments The Auditor is unable to identify the features that make a gully and several farm dams on the site a "sensitive environment", particularly when broad redevelopment of the site for suburban housing is intended. The Auditor seeks clarification.
7	2.5.2	Other Available Historical Site Information The Auditor considers that the information discussed is not about the site, but relates to the neighbouring abattoir. The Auditor requests that included information be relevant to the site.
8	5	Relevant Guidelines for Contamination Assessment and Management The Auditor requires that guidelines for groundwater and surface water be included in this section.

Item	Report Section	Comment
9	5.0	Relevant Guidelines The Auditor notes that the NEPM issued by NEPC in 1999 has been repealed and that the amended NEPM issued in 2013 has guidelines in 9 parts of Schedule B. The Auditor requests revision of the section, and consequently the first paragraph of Section 5.2 is no longer required and should be deleted.
10	5.2.1	Health Investigation Levels (HILs) In the paragraph following the list of exposure settings, the term "general land" is not clear and should be replaced by "essentially vacant land", or a similar term.
11	5.2.2	Health Screening Levels (HSLs) The Auditor notes that HSLs are also provided for Naphthalene. The Auditor also notes that the definition of soil texture in Table A1 of AS 1726 defines coarse texture soils as having less than 50% of particles (by weight) greater than 63mm and less than 50% of particles below 75µm. Fine texture soils are defined as having more than 50% of particles below 75µm, and the distinction between silt and clay is based on the Liquid Limit for the soil. The Auditor requests amendment according to the above detail.
12	5.2.3	Ecological Investigation Levels (EILs) The Auditor notes that the approach using summation of ABC and ACL to provide an EIL is applicable to metals and metalloids, and does not apply to DDT and Naphthalene.
13	5.2.3	Ecological Investigation Levels (EILs) With reference to Table 12, the Auditor considers that average values for CEC and pH should be presented to one decimal place to be consistent with the results used, and the average CEC for Paddocks should be 26.8 (typographic error). The Auditor's calculations indicate that the EIL for zinc for Paddocks soils should be 390mg/kg and for soils around structures should be 750mg/kg. The Auditor found that the NEPM Toolbox calculator did not always agree with the value calculated with linear interpolation using relevant tables in Schedule B1 of the amended NEPM. The Rounded EIL for Lead in Paddocks should be 1100mg/kg.

Item	Report Section	Comment
14	6	Summary & Discussion of Consolidated Results Sampling maps provided in Appendix A should include the AEC numbers relevant to each map and maps should be individually numbered with clear references included in the text of this section.
15	6.0	Field Investigation Summary This section must include a description of soil and groundwater sampling methods. The Auditor acknowledges that the SAQP describes the plan for investigation, however, this section must report what sampling methods were used and provide reasons for any substantial departure from the SAQP.
16	6.1	Settling Ponds and Anaerobic Ponds Area (AEC1 and AEC2) Regarding the note to Table 13 about no samples being collected in the Eastern Pond, the Auditor requires brief discussion on why the results from the Western Pond appear to be representative of the Eastern Pond also.
17	6.1	Settling Ponds and Anaerobic Ponds Area (AEC1 and AEC2) In the final paragraph of this section, the Auditor notes that the site is proposed for future residential use and that elevated salt in surface soils may be harmful to vegetation being established on residential lots. The Auditor requires discussion of this potentially adverse characteristic.
18	6.2	Agricultural Paddocks (AEC3) The Auditor notes that in the third paragraph, reference to the initial NEPM is no longer relevant. The Auditor also notes that discussion of the potential for sheep or cattle dips on the site must be clarified through evidence from historical records and site observations. This uncertainty cannot remain given the objective of this investigation.
19	6.3	Asbestos Pipes (AEC4) With reference to the headings in Table 14, the Auditor requests clarification of the meaning of a sampling location being "positive for asbestos". In particular, the Auditor asks how many samples would need to have detected asbestos for the location to be considered "positive for asbestos".

Item	Report Section	Comment
20	6.4	Access Roads (AEC5) The Auditor requires that the screening level assessment for results be made using the amended NEPM. In particular, the assessment of PAHs requires calculation of Benzo[a]pyrene TEQ. This comment applies to subsequent sections where PAH analysis is reported.
21	6.4	Access Roads (AEC5) The Auditor notes that the logs for boreholes in AEC5 indicate that no natural material was encountered at any location. The Auditor requests that SESL review these logs, given the advantage offered by observations from test pits conducted across the site.
22	6.5	Farm Dams (Paddocks A and C – AEC6) The Auditor suggests that the last sentence in the final paragraph be amended so that it does not imply that water from farm dams will be discharged to a local water course. That is, the words "when discharge" should be replaced with "if discharge".
23	6.6	Potential Filling in Paddock (AEC7) The Auditor requires that AEC7 be labelled on the relevant sampling maps for boreholes and test pits in Appendix A. This requirement also applies to other AECs illustrated on the same sampling plans.
24	6.6	Potential Filling in Paddock (AEC7) The Auditor notes that the logs for boreholes in AEC7 indicate that no natural material was encountered at any location. The Auditor requests that SESL review these logs, given that observations from five test pits conducted in AEC7 indicate natural materials occurring at depths shallower than 0.3m. The Auditor also requests that SESL review the log for test pit JF4, where the presence of "fossilised wood" is noted in natural material.
25	6.7	Former Dumping Site : East to Anaerobic Ponds (AEC8) The Auditor notes that the lateral extent of fill material in AEC8 is not delineated. Given the inclusion of a variety of foreign materials in this fill, the Auditor requires delineation of this disturbed area.

Item	Report Section	Comment
26	6.10	Former Meatworks Facility and Associated Buildings (AEC11) With reference to Table 17 the Auditor notes the following: • Structure BA – the extent of lead contamination around the south and east sides of the footprint is not delineated horizontally, and in some local areas vertically also. The extent of asbestos impact around BA9, BA22 and BA25 is not necessarily confined to a triangle defined by those locations and additional inspection of the surrounding area is required. • Structure BB – regarding observation for asbestos, the Auditor suggests that the wording "in all boreholes" be amended to read "in any borehole". This suggestion for rewording applies subsequently to the same comment made in Table 17 for other structures. • Structure BC – assessment of zinc concentrations against the EIL should include calculation of upper confidence limits of the average where applicable. This approach should be extended to other metals where applicable and to results for other structures described in Table 17. • Structure BC – SESL reported ash materials observed in fill, but the summary of laboratory results does not show analysis for PAHs. This outcome also applies to structures BD, BE, BH and BI. The omission of analysis for PAHs requires explanation and justification. • Structure BH – fill material comprising sand and ash was not delineated vertically at locations BH1, BH2 and BH6 and horizontal extent has not been delineated beyond BH6. • Structure BI - fill material comprising loam and ash was not delineated vertically at location BI1 and horizontal extent has not been delineated beyond BI3 and BI6. The log for BI9 indicates observation of fill material, however the comment is that a slab was present at that location. The Auditor requires that SESL address the issues raised above regarding information presented in Table 17.

Item	Report Section	Comment
27	6.11	Potential Filling of Former Dam (AEC12) The Auditor notes that borelogs for investigations in areas JB and JC indicate fill material at least to the depth of investigation (0.3m), except for location JB5 where fill thickness was reported to be 0.15m. Logs for test pits in areas JB and JC report no fill material. The Auditor requires that these logs be reviewed and this difference be resolved.
28	6.11	Potential Filling of Former Dam (AEC12) SESL states that the three areas "could have been impacted by past flood events" and that anecdotal evidence of the site being "impacted by flooding events at least sixty (60) times" had occurred. The Auditor notes that the three areas comprising AEC12 are within the site and thus are expected to be above the 100 years return period flood level. The Auditor does not question that the northern and eastern parts of Lot 11 could have been frequently inundated and that natural depressions may have held water temporarily due to accumulated surface run-off. However, the link with flooding events, other than the associated wet weather, seems unlikely. The Auditor requests that SESL reconsider that final paragraph of Section 6.11.
29	6.12	Groundwater at Settling Ponds Area (AEC13) Summary of results from the two monitoring rounds must be presented in a table and compared with relevant water quality criteria. The Auditor requires this section to be rewritten.
30	6.13	QA/QC Procedures and Results The Auditor considers that the contents of this section is inadequate and refers to the expected contents as described in Appendix C of Schedule B2 in the amended NEPM. The Auditor requires this section to be rewritten.
31	7.2 7.3	Fate and Transport Potential Surrounding Receptors This discussion does not consider the intended future use of the site for suburban residences. The human receptors are not identified, and are expected to include construction workers and residents on properties to the south of the site. Future residents of the site could be exposed through consumption of vegetables grown in home gardens.

Item	Report Section	Comment
32	8	Conclusions & Recommendations The Auditor does not disagree with the Conclusions and Recommendations, except for: • Constraint of the extent of asbestos material impact near structure BA to a triangle defined by locations BA9, BA22 and BA25; and • The conclusion regarding management of zinc impacts around structures BA, BC and BE which has not been justified. The Auditor notes that area JE in AEC8 contains fill with foreign materials that has not been delineated, and that lead impact to the south and east of structure BA in AEC11 also requires delineation.

4 CLOSING

To achieve the objective of providing a satisfactory Site Audit Statement to Mastergroup, the Auditor requires:

- delineation of contaminated areas as discussed above; and
- revision of this draft report to a standard consistent with current guidelines, including Schedule B2 of the amended NEPM; and
- preparation of a Remediation Action Plan to address areas of unacceptable contamination.

Please contact the undersigned to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

M. Dunbavan.

Michael Dunbavan

Senior Principal Environmental Consultant
NSW EPA Accredited Site Auditor

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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**25 November 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA10**
cc	**Ryan Jacka, SESL**	Pages	**1 of 11**
Subject	**Interim Audit Advice 10 - Comment on Draft Consolidated Site Investigation Report, November 2013**		

Dear Mark:

The advice presented in this document represents interim advice only, and does not constitute a Site Contamination Audit Report or Site Contamination Audit Statement. The advice provides the opinion of the Auditor based on the knowledge that is available at the time of this advice. A Site Contamination Audit Report and Site Contamination Audit Statement will be issued at the end of the Audit process, when the Auditor is satisfied all relevant matters have been adequately addressed to the satisfaction of the Auditor. This advice does not pre-empt or constrain the final outcome(s) of the audit or any conditions that may be placed by the Auditor in the Site Contamination Audit Report or Site Contamination Audit Statement.

1 PREAMBLE

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified as Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

The Auditor has received and reviewed:

- Draft Consolidated Site Investigation for Richards Road, Riverstone NSW 2765, Lot 11 DP816720, November 2013 (reference C686.Q3222.B25854 DC CSI)

This document is referred to as the Draft CSI Report for the purpose of this interim advice.

2 COMMENT ON DRAFT CONSOLIDATED SITE INVESTIGATION

2.1 General Comments

The Auditor considers that the standard of the reporting does not meet that described in Schedule B2, Guideline on Site Characterisation, of National Environment Protection (Assessment of Site Contamination) Measure as amended (NEPC 1999), referred to in this advice as the ASC NPEM. In particular,

- the draft report does not include description of soil or groundwater field methods, decontamination procedures and does not include an adequate field QA/QC assessment
- sampling handling procedure does not meet the requirement as set out in ASC NEPM
- the adopted soil and groundwater assessment criteria were not tabulated. Justification of the groundwater assessment criteria was not provided.
- Divergence from the Auditor approved SAQP, particularly the number of QA/QC samples collected, does not meet the requirements as set out in ASC NEPM.

Other areas of concern to the Auditor in the draft CSI report are described in the following section.

2.2 Specific Comments

Item	Report Section	Comment
1	5.1	Proposed Development This information should be included in Section 1 also with amendment of the Draft CSI Report.
2	5.2.2	Health Screening Levels (HSLs) The Auditor has previously commented on this section in his last interim advice. The Auditor notes that SESL has not stated which HSL criteria were adopted for the assessment. HSLs should be selected based on the highest proportion of the soil texture from the soil profile and the depth at which the sample was collected. The Auditor requests the adopted HSLs criteria be tabulated and clearly presented in an Addendum to the Draft CSI Report.
3	5.2.4	Ecological Screening Levels (ESLs) The Auditor requests the adopted ESLs be provided for review in an Addendum to the Draft CSI Report.
4	5.2.5	Groundwater Investigation Levels (GILs) SESL has stated that the values in Table 1C of the ASC NEPM (2013) are adopted as the GILs for this investigation. There are three sets of criteria in Table 1C – freshwater, marine water and drinking water criteria. The Auditor requests the appropriate criterion be adopted as GILs for the site. Please also provide justification on the selected criterion in an Addendum to the Draft CSI Report.
5	5.4	The Auditor notes that the SEPP55 was issued by the Department of Urban Affairs and Planning in 1998, not the NSW EPA in 1997.
6	6.2	Sampling regime – Asbestos Sampling methodology and sample handling procedure should

Item	Report Section	Comment
		be provided. The Auditor requests the information on the specific sampling approach be provided for review in an Addendum to the Draft CSI Report.
7	6.3	Sampling regime – water The Auditor has previously required SESL to provide the sampling methodology for review. In particular, the Auditor has specified the following information be provided: • Rationale of the groundwater monitoring well network • Rationale as to why a second monitoring round was required. • SESL indicates that 'a second round of groundwater sampling was conducted at six of the monitoring wells to observe the flow of water above the shale layer. The Auditor requests the following information be provided to assist his audit process: ○ The reason for not sampling MW2 during the second round should be stated. ○ Detailed description of sampling demonstrating that low flow sampling aims were met, particular no substantial reduction in groundwater level. ○ For low flow sampling methodology, samples are generally collected after water quality parameters are stabilised. Parameters are recorded on field notes, together with the volume of water being purged from the well prior to sampling. • Monitoring well installation and development procedure, including management of surplus soil and groundwater, was not provided. The Auditor requests this information be summarised for his review in an Addendum to the Draft CSI Report.
8	6.4	Sampling collection – Soil The Auditor requests further clarification on sampling methodology: • Please describe what visual indicators were used to prompt selection of sample location and/or sampling interval(s) at any particular sampling location. • Describe sample recovery and tools used for sample collection. • State why headspace screening was not used. • Indicate if soil logging was undertaken during sampling.

Item	Report Section	Comment
		• Describe management of excavated soil and restoration of sampling locations. The Auditor requests this information be provided for his review in an Addendum to the Draft CSI Report.
9	6.6	Decontamination procedure The Auditor has reviewed the decontamination procedure and requests further clarification on the following: • Was any equipment used during groundwater sampling which required decontamination (eg. Water level indicator, water quality meter)? The Auditor requests this information be provided for his review in an Addendum to the Draft CSI Report.
10	7.0	Table 14 Data Quality Objectives The Auditor considers that the description of the first three steps in the DQO process do not identify the fundamental issues which are: 1. The land is proposed for redevelopment for residential use, which is more sensitive than its historical commercial use and holding paddocks and waste water treatment facility and other ancillary uses associated with a near-by abattoir. 2. The goal of the study is to demonstrate that the land is suitable for the proposed redevelopment, or otherwise that part of the land warrants further investigation or remediation to make it suitable for the proposed redevelopment. 3. Additional inputs are health-based and ecological investigation levels and screening levels for soil and groundwater which are relevant to residential land use. The Auditor requests amendment to Table 14 in the Draft CSI Report accordingly.
11	7.2	Field and Laboratory Quality Assurance Program • Clarify primary and secondary laboratories used for analysis of soil, asbestos and groundwater/surface water, as applicable. • The Auditor notes that no sampling dates were provided on the COC. Confirm what time delay, if any, between sampling and receipt of samples at laboratories. • The rate of collection of field duplicates should have been at least 1 in 10 primary samples, with an approximately equal numbers of blind replicates (intra-laboratory) and split (inter-laboratory) samples as described in AS 4482.1-2005,

Item	Report Section	Comment
		Section 8. • Discussion of QA using Relative Percent Difference as an indicator should be supported by a separate table showing primary and QC sample results and associated RPD values. Any RPD value outside of the acceptable limit should be discussed. Similarly, any performance under laboratory QC that is outside the acceptable limit should also be discussed. • QA performance outside other DQIs should also be discussed. For example, detection of copper and zinc in two rinsate samples for soil sampling in AEC 3. The Auditor requests this information be provided for his review in an Addendum to the Draft CSI Report.
12	7.3	Table 15 – Summary of Sample Analysis Table 15 should include a breakdown of the types of QC samples; that is, field duplicates and triplicates, trip blanks, equipment rinsate samples etc. A discuss of reporting (Section 7.3) is not relevant to QA/QC analysis and this section should be deleted except for the reference to Table 15 which should transfer to the end of Section 7.2. The Auditor requests amendment to Table 15 in the Draft CSI Report to provide details of QC sample types and deletion of Section 7.3.
13	8.1	AEC 1 and AEC 2 The Auditor notes that SESL states that '*the results obtained from both SESL and EES initial investigations show the effluent ponds assessed are compliant with the thresholds determined in HIL-Residential A*'. The Auditor requires brief discussion of the consolidated results for AEC 1 and AEC 2 regarding indicators of nature and level of contamination to support the conclusion presented. Lengthy discussion is not required and reference to background levels (based on other samples collected as part of this study) should be included where appropriate. The Auditor requests this information be provided for his review in an Addendum to the Draft CSI Report. The Auditor has reviewed the results obtained from AEC 1 and AEC 2 by SESL and notes that only TN, TP, pH, CaCO3, EC and sodium were analysed. Table 15 indicates that heavy metals were analysed but the results are not provided. The Auditor requests clarification regarding analysis of heavy metals for soil samples from AEC 1 and AEC 2, and either amendment of Table 15 in the Draft CSI Report or addition of results for heavy metals to results tables for AEC 1 and AEC 2 in

Item	Report Section	Comment
		Appendix E.
14	8.2	AEC 3 The Auditor found data entry errors in the AEC 3 Result Table. Results for lead, mercury and nickel were not entered correctly for Batch 25916. The Auditor requests amendment of this table in the Draft CSI Report.
15	8.3	AEC 4 The Auditor notes that Map 6 indicates the location AP4 was negative for asbestos, however, the inset indicates the opposite. The Auditor requires clarification and amendment of Map 6. The Auditor notes that results from asbestos analysis are not useful for assessment against HSLs listed in Table 8. The Auditor requires discussion regarding the recommendation for clean-up in the context of the stated HSLs. The Auditor requests this information be provided for his review in an Addendum to the Draft CSI Report.
16	8.4	AEC 5 The Auditor notes addition of discussion of the vertical extent of fill material at certain sample locations, but no conclusion is provided about the vertical extent of fill material for AEC 5 in general in this section of the Draft CSI Report. The Auditor requests that naphthalene results be included in the result table for AEC 5 in the Draft CSI Report. The Auditor also notes that the symbol 'rpt' was present next to the nickel and zinc results in the laboratory report 374466 for soil sample Road F3 surface. The Auditor also notes that benzo(a)pyrene TEQ is reported as <0.5 for sample Road F6 Surface, when the concentration of B(a)P is reported as 1.1mg/kg, highlighting an error in calculation of B(a)P TEQ for this report. Similar errors may also have occurred for samples Road E6 Surface and Road F8 Surface. The Auditor requests revision of the laboratory report for Batch 25921. The Auditor notes that B(a)P TEQ is indicated as 0.6 mg/kg in the results table for AEC 5, however the laboratory report indicates <0.5mg/kg. The Auditor requests explanation for difference between the two sets of results. The Auditor requests this information be provided for his review in an Addendum to the Draft CSI Report.
17	8.5	AEC 6 The Auditor requests further clarification on the following: • The Auditor notes that pH has slightly exceeded the lowland

Item	Report Section	Comment
		river trigger values of 6-8 for three samples (two primary and one duplicate). Comment on the likely cause of alkalinity, given that the natural soil on the site is acidic. The Auditor requests this information be provided for his review in an Addendum to the Draft CSI Report. • The Auditor requests that naphthalene results be included in the result table for AEC 6 in the Draft CSI Report. • The Auditor notes that B(a)P TEQ is indicated as 0.6 mg/kg for samples from Dam 1 in the results table for AEC 6, however the laboratory report indicates no detection of PAHs. The Auditor requests justification for difference between the two sets of results (as requested for Item 16). • Explain why PAH was not analysed for sediment samples collected from Dam 2. • The Auditor notes that results for TP and TN in soil were provided in the results table for AEC 6 but corresponding results are not provided in the laboratory reports and the COC record does not show request for these analyses in soil samples. Please clarify the source of the additional results reported in the summary table for AEC 6. The Auditor requests this information be provided for his review in an Addendum to the Draft CSI Report.
18	8.6	AEC 7 Observation of ash is reported at testpits JF1, JF2 and JF5. The Auditor requests explanation for absence of samples from this material which was different from that observed in other testpits in AEC 7 and also was not identified in the 20 hand auger borings in that area. The Auditor requests this information be provided for his review in an Addendum to the Draft CSI Report.
19	8.7	AEC 8 While the Auditor notes that SESL has confirmed the lateral and vertical extents of fill material, except to the northeast from testpit JE9. At the end of paragraph 2, the statement that "No asbestos containing materials were identified with the AEC" is incorrect because the logs for testpits JE1 and JE8 record the observation of "asbestos" and the results summary table for AEC 8 confirms asbestos was identified in a sample from location JE1. The third paragraph in this section confirms presence of "asbestos containing fragments". The Auditor requests deletion of the last sentence in paragraph 2 of this section in the Draft CSI Report.

Item	Report Section	Comment
20	8.10	AEC 11 - Structure BA The Auditor has reviewed the data and has noted the following issues: • The Auditor notes that results from asbestos analysis are not useful for assessment against HSLs listed in Table 8. The Auditor requires discussion regarding the recommendation for clean-up in the context of the stated HSLs (as requested for Item 15). • The asbestos report for batch 26094 was not included for review. • Naphthalene results should be included in the result table in the Draft CSI Report and compared against EIL. • Based on the auditor's calculation, the 95% UCL for the average concentration of zinc is 609mg/kg which is not materially different from SESL's calculation of 621mg/kg.
21	8.10	AEC 11 - Structure BB The Auditor found the Coefficient of Variation was 0.99 for the 13 data points for zinc from Structure BB. Thus, the 95% UCL for the average concentration of zinc of 383mg/kg is acceptable statistically, and slightly exceeds the EIL of 340mg/kg.
22	8.10	AEC 11 - Structure BC The Auditor requests confirmation that the 95% UCL for the average concentration of lead is below HIL Residential A in the Draft CSI Report.
23	8.10	AEC 11 - Structure BD Based on the auditor's calculation, the 95% UCL the average concentration of zinc is 326mg/kg which is lower that the calculated EIL.
24	8.10	AEC 11 - Structure BE Based on the auditor's calculation, the 95% UCL for the average concentration of zinc is 629mg/kg which is not materially different from SESL's calculation of 610mg/kg.
25	8.10	AEC 11 - Structure BH The Auditor notes that additional hand auger bores were excavated to delineate the lateral and vertical extents of the ash / fill material (BH6a to BH6g, BH7 to BH9). Logs were also provided for BH10 to BH12 but the locations of these borings are not shown on Map 11. Explain the context and observations from these additional 3 auger borings.

Item	Report Section	Comment
		The Auditor requests this information be provided for his review in an Addendum to the Draft CSI Report.
26	8.10	AEC 11 - Structure BI The last sentence in the 6th bullet point is incomplete and appears to be a carry-over from discussion of results from structure BH. This text should be removed from the Draft CSI Report.
27	8.11	AEC 12 The Auditor notes that results for TP and TN in soil were provided in the results table for AEC 12 but corresponding results are not provided in the laboratory reports and the COC record does not show request for these analyses in soil samples. Please clarify the source of the additional results reported in the summary table for AEC 12 (as requested for Item 17).
28	8.12	AEC 13 The Auditor notes that generally higher copper concentrations were reported from the second sampling round. The Auditor notes that the criterion used for ammonia is overly conservative for acidic water. The Auditor notes that comparison of pH and EC measurements for the two sampling rounds shows general agreement (within 10%) for pH values, except for MW5, and a consistently lower EC value with a significant reduction (difference greater than 10%). This finding is considered to support local recharge of the regional aquifer in the shale by seepage from the ponds, however, the rate of water movement is expected to be very slow so that this infiltration does no influence the function of the ponds as predominantly evaporation ponds.
29	8.13	QA/QC Procedure and Results This section should present a discussion of the Data Quality Indicators described in Sections 7.1 and 7.2, with particular reference to the design targets set out in the SAQP. Comparison of information should be tabulated where appropriate (eg, number of samples planned and number actually collected, etc). The Auditor requests this information be provided for his review in an Addendum to the Draft CSI Report.
30	9.0	Conceptual Site Model The Auditor accepts the general form of the Conceptual Site Model, however some of the details are subject to comment, specifically: • Contaminants of concern include aesthetically unacceptable

Item	Report Section	Comment
		materials buried within the top 3m below the final soil profile. These materials include concrete slabs, large rocks, drums general waste etc. • The Auditor is not convinced that the source of heavy metals (particularly copper, lead and zinc) is leaching from fill materials. Fill impacted by these heavy metals occurs over a relatively small proportion of the site, and would not be expected to affect groundwater quality given the locally affected flow direction taking surface infiltration away from the majority of the monitoring wells. • The Auditor suggests that there is an important distinction between friable asbestos and respirable asbestos. Asbestos poses a risk to human health only when it is respirable. • Migration pathways for contaminants are important, however, the aspect of more importance is the potential exposure pathways. For example, for remediation contractors potential exposure pathways include inhalation of contaminated dust or respirable asbestos fibres, and incidental dermal contact and ingestion of contaminated soil and/or surface water. • Potential receptors are individuals and ecological systems which may be affected by contamination from the site. Thus, the receptors associated with remediation earthworks would be remediation contractors, visitors to the site and the community members living around the site. An ecological system which is a potential receptor is the habitat of Eastern Creek. The Auditor requires revision of this section of the Draft CSI Report in consideration of the above comments.
31	10.0	Conclusions and Recommendations The Auditor generally agrees with the conclusions and recommendations listed by SESL. The Auditor considers that the very poor condition of exposed asbestos cement pipes requires immediate action to stabilise the exposed ACM because there is no plan for removal of that contaminant. For clarity, the Auditor considers that immediate risk reduction is warranted, which is at the minimum stabilisation of the weathered ACM, pending removal during site redevelopment. The Auditor requests that removal of aesthetically unacceptable materials in certain parts of fill material also be included in recommendations. The Auditor considers that the ash layer currently used for road surfacing within the site would be aesthetically unacceptable if the ash material were concentrated

Item	Report Section	Comment
		in one location, and that mixing of this material with soil during earthworks would be an acceptable solution. The Auditor requires revision of this section in the Draft CSI Report in consideration of the above comments.

3 CLOSING

To achieve the objective of providing a satisfactory Site Audit Statement to Mastergroup, the Auditor requires:

- Response to requests for amendment of the Draft CSI Report and issue of an Addendum to the Draft CSI Report (to limit the scale of change to the CSI Report); and
- preparation of a Remediation Action Plan to address areas of unacceptable contamination, which includes aesthetic considerations.

Please contact the undersigned to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

Michael Dunbavan

Senior Principal Environmental Consultant
NSW EPA Accredited Site Auditor

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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**3 December 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA11**
cc	**Ryan Jacka, SESL**	Pages	**1 of 11**
Subject	**Interim Audit Advice 11 - Comment on Draft Remedial Action Plan, November 2013**		

Dear Mark:

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1 PREAMBLE

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified as Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

The Auditor has received and reviewed:

- Draft Remedial Action Plan for Richards Road, Riverstone NSW 2765, Lot 11 DP816720, 28 November 2013 (reference C6868.Q3450.B28321 DB RAP)

This document is referred to as the Draft RAP for the purpose of this interim advice.

2 COMMENT ON DRAFT RAP

2.1 General Comments

The Auditor considers that the standard of the reporting does not meet that described in NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (1997 as issued 2011). In particular, the RAP does not include:

- An adequate summary of the contamination on the site;
- A conceptual site model;

- The basis for selection of the proposed remediation methodology;
- A validation sampling plan that is specific to the proposed remediation;
- Aspects of quality assurance, including Data Quality Indicators, that are specific to the validation works;
- An adequate procedure for addressing unexpected finds;
- Appropriate consideration of community consultation; and
- An appropriate conclusion.

Specific areas of concern to the Auditor in the draft RAP are described in the following section.

2.2 Specific Comments

Item	RAP Section	Comment
1	1	Introduction The Auditor requests revision of the Introduction to provide a context for the RAP, which should include statements about: • Intended future residential development – currently in Section 1.3; • A very brief statement on past use of the land and activity that has resulted in contamination; and • Requirement for remediation to make the site suitable for its intended future use. The Auditor notes that the management of risk is a remediation option, but in certain cases, reduction of risk is required by means other than management. The Auditor notes that no development is proposed, but that future residential development of the site is intended. The structure of this section may be in three parts; Background, Objectives and Stakeholders. This Stakeholders section should nominate key stakeholders including environmental consultant, remediation contractor details etc.
2	1.2	Objectives The Auditor agrees with the stated overall objective of the Draft RAP. The Auditor considers that the "main objectives" require clarification, specifically: • Bullet 1 – the objective is to provide a plan of remediation, because to "remediate" is to "clean up", and risk reduction also applies to potential ecological impacts. • Bullet 2 – for reasons discussed above, "management criteria" should be replaced by "remediation acceptance

Item	RAP Section	Comment
		criteria". • Bullet 3 – the meaning of the term "acceptable" is not clear, and this should be replaced by reference to compliance with state and local government environmental and planning statutes and also with guidelines endorsed by NSW EPA under Section 105 of the Contaminated Land Management Act 1997. Schedule B2 of the ASC NEPM gives clear guidance that OH&S issues are beyond the scope of contaminated site investigation, and the Auditor considers that this guidance extends to remediation works. OH&S matters are addressed under legislation recently enacted for Workplace Health and Safety. Schedule B2 does require inclusion of protection of the environment as part of site works. • Bullet 4 – the meaning of this item is not clear. • The requirement to address unacceptable aesthetic conditions is not clear.
3	1.4	Outline of the RAP The Auditor requests inclusion in the list of headings for a summary of the previous contamination findings and a conceptual site model.
4	2.1	Site Location and Ownership The Auditor suggests combining Sections 2.1 and 2.2, into a New Section 2.1, Site Identification. The second paragraph in Section 2.1 should be removed and reference to Table 1 should be added to the first paragraph. Renumbering of subsequent subsections in Section 2 will be required.
5	2.4	Site Layout and Infrastructure The Auditor notes that the two larger ponds are designed as evaporation ponds and not aerobic ponds, and requests change to line 2 of the first paragraph.
6	2.5.2	Geology, Hydrology and Hydrogeology Paragraph 2 - the relevant geological mapping sheet should be referenced in this section. Paragraph 5 – please include a summary of conclusions reached about groundwater flow rate and direction from the previous investigation.
7	2.10	Summary of Previous Investigations The Auditor notes SESL has only provided a copy of the CSI

Item	RAP Section	Comment
		conclusions and recommendations. The Auditor requests SESL to provide a summary of the PSI and CSI reports. The summary should include: • Scope of works undertaken • Results and interpretation • Conclusions regarding areas requiring remediation The areas of environmental concern (AECs) should be defined, and the nature and extent of contamination warranting remediation should be described. This description should clearly describe contamination; for example, in the first bullet point the term "former water infrastructure" does not clearly describe AC pipes, and where they are located. Reference to specific areas of contamination should be supported by reference to a figure. The Auditor notes that NSW EPA reporting guidelines require that previous results from investigations be summarised in table form and including sample location and depth and exceedance of investigation levels.
8	2.11	Soil Contamination Description The Auditor suggests that the heading be amended to "Extent of Remediation". While the Auditor accepts numbering of the remediation areas as Remediation Area 1, 2, etc., the relevant AEC numbers should be included to provide a clear connection to information in the CSI Report. The Auditor notes that addressing the aesthetic condition of ash material on road surfaces must be included in this discussion.
9	New Section	The Auditor requires inclusion of a new section before Section 3 which describes the Conceptual Site Model.
10	3	Remediation Acceptance Criteria The Auditor considers that this section is substantially inadequate and must be rewritten. Specifically, the basis for selection of RAC must be clearly explained and should include: • A table listing all selected RAC and references; • Rationale for and appropriateness of the selected RAC; and • Assumptions and limitations of RAC.
11	4.1	Please include the AEC numbering discussed in Item 8. While the Auditor agrees that the ash material used for road surfacing may be incorporated into existing soil during site preparation as a remediation measure, validation of this measure is still required. The Auditor requests amendment of this

Item	RAP Section	Comment
		paragraph.
12	4.2	The Remediation Goal should be the same as the objectives of the RAP, ie, to render the site suitable for its intended residential development. The Auditor requests this section to be revised.
13	4.3	Assessment Criteria The Auditor requires that information from this section be included in Section 3. Terms used should be consistent; that is, remediation acceptance criteria rather than assessment criteria.
14	4.4	Selection of Remediation Strategy The Draft RAP provides the NSW EPA endorsed remediation hierarchy. This section does not discuss nor recommend any selection of strategy. The Auditor notes that the remediation objective is broad and that the remediation strategy should provide a general approach to achieving the remediation objective. Evaluation of remediation options is then used to identify a preferred method for implementing to achieve the remediation objective. The Auditor requires this section to discuss and recommend a remediation strategy.
15	4.5	Waste Classification This section should be discussed as part of the validation program. The Auditor requests that this be relocated, potentially to Section 6.3. The Auditor suggests that existing results from soil characterisation be considered in preparation of waste classification certificates.
15	4.6	Remediation Options While SESL has included a list of remedial options, there is no discussion on the remediation option evaluation process. A discussion on option evaluation should be included in the RAP. A table format is considered sufficient given bioremediation is not considered to be suitable in this case. The Auditor also notes that SESL has identified reuse of ash material from road surfaces during site preparation. Should this option be adopted, this needs to be evaluated and included as one of the preferred options. Please note Monitored Natural Attenuation is generally not applicable for the types of contamination warranting remediation and this approach does not appear to be an "option".

Item	RAP Section	Comment
16	4.7	Compliance with Regulatory Requirement The Auditor reviewed this section and considers that SEPP 55 does apply for Category 2 Remediation Work because the relevant Local Government Authority must be given 30 days' notice in writing before commencement of works and must also be notified at the completion of remediation works. Section 4.7.2 should be amended accordingly. Blacktown City Council Development Control Plan, Part Q – Contaminated Land Guidelines apply and must be included in this section. Similarly, the NSW Protection of the Environment Operations Act 1997 applies and must be included in this section.
17	5.1	Overview The Auditor notes that Excavation and Reuse is applicable to management of the ash material used on road surfaces. This should be amended accordingly. As discussed for Item 2, OHS matters are addressed separately and the second paragraph should be deleted.
18	5.2.1	Remediation Region 1 – Former Structure BA Remediation Methodology The Auditor notes that the vertical extent of remediation is not defined. The datum for the "Approx. Co-ordinates" listed on Map 1 in Appendix should be defined. The co-ordinates should be written to a realistic accuracy and the units of measurement identified. The relevance of points 1 to 4 on Map 1 should be explained clearly and near the beginning of this section. Removal of asbestos impacted material from Region 1 can only be undertaken by a Class A licensed asbestos removal contractor with a permit for such work on the site. The Auditor suggests that an alternate to stockpiling should be included; for example, placement directly into plastic lined skip bins pending waste classification and proper disposal. The Auditor notes that the section describing Waste Classification may be renumbered with reference to Item 14. The Auditor notes that that the asbestos impacted area of Region 1 must be cleared by an Occupational Hygienist before other remediation and validation work can proceed. The Auditor notes that the 95%ile upper confidence limit for the average concentration of lead is the relevant statistic for comparison with the relevant HIL. As ash material was encountered in some sampling locations

Item	RAP Section	Comment
		near the edge of the remediation area (eg BA37, -38 and -43), the Auditor requests that PAH are included validation program in the vicinity of these locations. The Auditor requires that this section be updated accordingly.
19	5.2.2	Remediation Region 2 – Asbestos Pipes and Surrounding Soils Remediation Methodology The Auditor notes that the AC pipe locations identified on Map 2 for Remediation Region 2 do not include location ASB S1 on the north side of the road in AEC4 in the CSI Report (refer to Map 6). The Auditor requires clarification of impact at location ASB S1. Asbestos cement pipes and potentially impacted soil should be removed by Class A licensed asbestos removal contractor only. This area can only be backfilled after clearance is provided by an occupational hygienist and validation for asbestos fines in soil. The Auditor notes that the section describing Waste Classification may be renumbered with reference to Item 14. The Auditor requires that this section be updated accordingly.
20	5.2.3	This section should be updated in accordance to comments made in Item 18, except for comments directly related to asbestos impacted fill.
21	5.2.4	This section should be updated in accordance to comments made in Item 18, including comments directly related to asbestos impacted fill.
22	New Section	The removal of ash fill material should be discussed this section as Remediation Region 5. The Auditor requests this to be included in the RAP. A detailed methodology for material reuse should be included.
23	5.3	This section should be transferred to Section 8.
24	6.2	Validation Sampling Regime The Auditor considers that this section requires substantial revision to meet its intended purpose. The Auditor refers SESL to Section 4 of NSW EPA (1995) Sampling Design Guidelines, and also Schedules B1 and B2 of the ASC NEPM for validation of asbestos removal. The Auditor appreciates that each Remediation Region is different and that sampling design for validation will need to be optimised for each Region. In particular, the Auditor notes: • Region 1 requires validation for PAHs at selected locations, and visual validation for removal of foreign materials. • Region 2 requires validation of soil around the pipes to

Item	RAP Section	Comment
		demonstrate that any asbestos fibres released by weathering have also been removed. • Region 3 requires visual validation for removal of foreign materials. • Region 4 requires visual validation for removal of foreign materials. • Suggested Region 5 (roads) requires visual validation for removal/blending of ash materials. • Validation of imported fill material needs to be specified – refer to Section 4 of NSW EPA (1995) Sampling Design Guidelines. • Validation of fill material sourced from on-site needs to be specified. • A specific validation sampling design for each region should be prepared to provide an reasonable estimate of the numbers of samples and analytes tested so that the validation SAQP can be made specific to the site rather than being its current generic form. The Auditor accepts that the validation sampling design is likely to require change to match actual conditions during remediation.
25	6.3	Disposal Certification This section should be replaced by transferring the current text from Section 4.5.
26	6.4	Site Validation Report This should outline the content of the Report.
27	7.1	Data Quality Objectives The Auditor requires that Table 4 be amended to briefly describe the relevant features / issues for this RAP. In particular: • Step 1 – the problem is the need for remediation in four regions in the southwest corner of the site so that the site can be made suitable for future residential development. • Step 2 – the goal is to demonstrate that proper implementation of the RAP has made the site suitable for future residential development. • Step 3 – groundwater is not an issue. • Step 4 – describe the boundaries of each remediation region, including the vertical boundary. • Step 5 – list contaminants of concern for each remediation region.

Item	RAP Section	Comment
		• Step 6 – comparison with RAC is insufficient; this step requires performance criteria for the validation data. For example, the 95%ile UCL for the average concentration of lead must not exceed the HIL for Residential A. Analytical results must be provided in NATA endorsed reports, etc. • Step 7 – briefly outline the sample design and sampling and analytical methods.
28	7.2	Data Quality Indicators and Data Evaluation The Auditor notes that SESL's performance in this area for the contamination investigation was below acceptable levels and that a higher standard of planning is required for QA/QC under the RAP to overcome the deficiencies in the CSI report. As discussed in the previous item for DQOs, DQIs need to be specific to validation for this RAP. The current description is generic and specific indicators, quantified where applicable, must be developed. The Quality Assurance aspect of this section needs to clearly define the actions to be taken if targets for data quality indicators fail to be met. The Auditor requires substantial revision of this section.
29	8	Site Environmental Controls The Auditor has reviewed this section and notes the following: • Text from Section 5.3 Remediation Schedule should be included in this section. • Based on earlier comment about the relevance of WHS matters to an RAP, the Auditor suggests that an Asbestos Management Plan should be prepared as a separate document by the asbestos removal contractor for asbestos removal which is addressed under WHS legislation. Consequently, parts of Section 8.2 relevant to asbestos removal should be deleted. A statement regarding separate provision of an Asbestos Management Plan should be included. • Similarly, information on respiratory protection in Section 8.2.7 should be deleted because this issue should be addressed in a Site-specific Safety Plan. • Section 8.6 related to Groundwater is not applicable to the proposed works and should be deleted, together with the reference to this issue in Section 8.1. • The last bullet point in Section 8.9 relates to asbestos in stockpiles, which should be an issue addressed in the

Item	RAP Section	Comment
		Asbestos Management Plan and not in this section. The Auditor requests revision of Section 8 according to the comments in this item.
30	9	Contingency Planning 9.2 Increased Volumes of Materials • Both environmental consultant and remediation contractor should be involved in review of the remediation strategy, because any change in remediation works will directly impact on sampling design for validation. • Any change in remediation strategy should be notified to Blacktown City Council, and to the Auditor (if applicable). 9.3 Unexpected finds The Auditor notes that, by definition, unexpected finds are chemicals or conditions which generally are not included in the RAP. Consequently, such chemicals or conditions are not discussed in the RAP and cannot "be appropriately managed in accordance with the RAP". The purpose of contingency for unexpected finds is to provide a procedure for management of a situation where an unexpected find emerges. This procedure usually follows a process of isolation of the affected area, identification of the chemical / condition, assessing the extent of the unexpected find, preparing plans to address any unacceptable risk arising from the unexpected find, amending the RAP to include additional remediation and validation and then implementing the agreed plan. 9.4 Control of Dust This is an environmental control measure which should be part of Section 8.4. The Auditor notes that a contingency is something unforeseen and that raised dust is something that is reasonably foreseeable for remediation works which are predominantly earthworks. 9.5 Spills and Leaks As above, the Auditor considers that the conditions discussed in this section are reasonably foreseeable and are not contingencies. This section should be included in Section 8 as part of Site Environmental Controls.
31	10	Based on earlier comment about the relevance of WHS matters to an RAP, the Auditor suggests that most of this section should be prepared as a separate document for approval by the Principal Contractor. The Auditor notes that Section 10.3 should be retained in the RAP. The Auditor does not agree that Council is the person to

Item	RAP Section	Comment
		decide "if a community liaison strategy is required". The Auditor notes that Schedule B8 of the ASC NEPM provides a guideline for this issue and also notes that the community surrounding the site is a key stakeholder for any activity that occurs on the site including current use for cattle grazing. The Auditor requires substantial revision of the section on community consultation and liaison.
32	11	The Auditor notes that the conclusion must address the remediation objective. That is, does SESL consider that implementation of this RAP will achieve the objective? The information presented is a basic summary of certain points made within the RAP, but does not make any "conclusion" about the adequacy nor effectiveness of the RAP. The Auditor requires substantial revision of the conclusion.

3 CLOSING

To achieve the objective of providing a satisfactory Site Audit Statement to Mastergroup, the Auditor requires:

- Revision of the current version of the Remediation Action Plan as discussed in general and in detail above.

Please contact the undersigned to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

Michael Dunbavan

Senior Principal Environmental Consultant
NSW EPA Accredited Site Auditor

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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**16 December 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA12 rev1**
cc	**Ryan Jacka, SESL**	Pages	**1 of 3**
Subject	**Interim Audit Advice 12 Revision 1 - Comment on Final CSI Report and Addendum to CSI Report, December 2013**		

Dear Mark:

The advice presented in this document represents interim advice only, and does not constitute a Site Contamination Audit Report or Site Contamination Audit Statement. The advice provides the opinion of the Auditor based on the knowledge that is available at the time of this advice. A Site Contamination Audit Report and Site Contamination Audit Statement will be issued at the end of the Audit process, when the Auditor is satisfied all relevant matters have been adequately addressed to the satisfaction of the Auditor. This advice does not pre-empt or constrain the final outcome(s) of the audit or any conditions that may be placed by the Auditor in the Site Contamination Audit Report or Site Contamination Audit Statement.

1 PREAMBLE

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified as Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

The Auditor has received and reviewed:

- Consolidated Site Investigation for Richards Road, Riverstone NSW 2765, Lot 11 DP816720, December 2013 (reference C6868.Q3222.B258541 FA CSI); and
- Addendum for Consolidated Site Investigation Report, Lot 11, Richards Road, Riverstone, 11 December 2013 (reference C6868.B258541 FA CSI Addendum).

These documents are referred to as the CSI Report and the CSI Addendum, respectively, for the purpose of this interim advice.

2 GENERAL COMMENTS

The Auditor considers that, when the cited documents are considered together, the standard of the reporting generally meets that described in NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (1997 as issued 2011). The Auditor considers that the large majority of comments

made on the Draft CSI Report in Interim Audit Advice 10 (issued 25 November 2013) have been addressed satisfactorily and require no further action. However, there are several issues that the Auditor considers must be addressed to avoid confusion, uncertainty and/or possible unnecessary remediation by a person referring to these documents as part of planning for remediation of the site.

Specific issues are described in the following section.

3 SPECIFIC ISSUES

3.1 Specific Issues in the CSI Addendum

- In the first paragraph of Item 2 on page 1, Item 3 on page 2 and Item 4 on page 3, the reference to Schedule B7 in the ASC NEPM is incorrect and the correct reference is to Schedule B1.
- In Item 5 regarding validation of excavated areas after removal of asbestos impacted fill, amend the text in this section as follows:
    - Refer to types of asbestos as defined in Section 11.1 of Schedule B2 in the ASC NEPM. That is, use "Bonded ACM and Fibrous Asbestos" instead of "ACM fragments".
    - In Bullet 3, include words to the effect that the volume of soil required for screening for Bonded ACM and Fibrous Asbestos is 10 litres. Refer to Section 11.3.2 in Schedule B2 of the ASC NEPM.
    - In Bullet 3 also, Bonded ACM identified should be placed in a separate bag from Fibrous Asbestos, and the 500mL soil sample is for analysis of Asbestos Fines.
    - In Bullet 4, samples do not require chilling.
- The text of Item 11 is in direct conflict with Remediation Action Criteria described in Table 8 of the CSI Report and requires modification. Referring to the Auditor's Item 15 in IA10, the request for clarification related to current information on identification of asbestos not be suitable for comparison to the nominated RAC in Table 8 of the CSI Report. The Auditor suggests that the identification of existing asbestos impact has been assumed to exceed the RAC nominated in Table 8. If the "zero tolerance" approach is taken, then there is no purpose in retaining the RAC listed in Table 8.
- Regarding the second paragraph of Item 14, to the extent practicable, provide a description of the appearance of ash material observed in test pits (colour, texture, layering) and a comment on material in the same vertical interval as ash in immediately adjacent auger boreholes.
- In Item 16, Precision and Accuracy, the reference to "RFDs" is incorrect and should be "RPDs".
- Regarding the RPD Table in Annexure A, the Auditor requires the following amendments:
    - Correction of values entered as concentrations of mercury and lead (which have been transposed) for results in Batches 25921, 25854, 27079 (3 different duplicates), 26094 (3 different duplicates), 26115 and 26955.
    - Use of levels of significant figures which are consistent with the values provided in the relevant laboratory report.
    - Concentrations reported for Total PAHs, particularly at the low levels reported for this site, are considered by the Auditor to be not amenable to assessment of RPD and should not be included in the table.

3.2 Specific Issues in the CSI Report

- Executive Summary, regarding paragraph 1 on page 2; replace "for residential and agricultural activities (former abattoir)" with "for commercial purposes being cattle grazing, animal husbandry and waste water treatment associated with operations of a former abattoir to the east of the site".
- Executive Summary, regarding paragraph 2 on page 2; the Auditor considers that inclusion of the words "meatworks facility" is likely to imply that the site was the place of a slaughterhouse and/or a meat processing factory. The Auditor considers that information on site history does not imply such use and requires change of this description.
- Section 7.2.4; the Auditor considers that the duplicate sampling frequency was not consistent with that described in the SAQP. However, the actual duplicate sampling frequency for lead did achieve the 1 in 10 requirement. Given that lead impact in soil is the dominant driver of human health on the site, together with asbestos impact, the general deficiency in meeting the duplicate frequency target for all analytes considered does not compromise this assessment.
- Table 21, Structure BC; the Auditor requires that the consultant confirm that the 95%UCL of the average concentration of lead at the location is below the HIL – Residential A value. This request was not completed in response to Item 22 in IA10.
- Section 10, Conclusions and Recommendations; regarding the 5th bullet point, the Auditor does not agree that "ash deposits" identified in fill layers in AECs 8, 9 and 11 "must be removed". As for AEC 5, ash material will need to be mixed with surrounding soil / fill material at the site if the presence of that ash material is aesthetically unacceptable.
- Site Maps – the locations of Test Pits must be added to relevant site Maps.
- Appendix D, last table; the changes required to the RPD Table in Annexure A to the CSI Addendum must also be made to the associated table in Appendix D.
- The EIS (2013) Preliminary Groundwater Screening Report should be included as an appendix to the CSI Report.

4 CLOSING

To achieve the objective of providing a satisfactory Site Audit Statement to Mastergroup, the Auditor requires:

- Revision of the CSI Report and CSI Addendum as discussed in detail above.

Please contact the undersigned to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

M. Dunbavan

Michael Dunbavan

Senior Principal Environmental Consultant
NSW EPA Accredited Site Auditor

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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**16 December 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA13**
cc	**Kelly Lee, SESL**	Pages	**1 of 4**
Subject	**Interim Audit Advice 13 - Comment on Final Remedial Action Plan for Richards Road, Riverstone NSW 2765, Lot 11 DP 816720**		

Dear Mark:

The advice presented in this document represents interim advice only, and does not constitute a Site Contamination Audit Report or Site Contamination Audit Statement. The advice provides the opinion of the Auditor based on the knowledge that is available at the time of this advice. A Site Contamination Audit Report and Site Contamination Audit Statement will be issued at the end of the Audit process, when the Auditor is satisfied all relevant matters have been adequately addressed to the satisfaction of the Auditor. This advice does not pre-empt or constrain the final outcome(s) of the audit or any conditions that may be placed by the Auditor in the Site Contamination Audit Report or Site Contamination Audit Statement.

1 PREAMBLE

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified as Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

The Auditor has received and reviewed:

- Remedial Action Plan for Richards Road, Riverstone NSW 2765, Lot 11 DP816720, December 2013 (reference C6868.Q3450.B28321 FA RAP).

This document is referred to as the RAP for the purpose of this interim advice.

2 GENERAL COMMENTS

The Auditor considers that the standard of the reporting generally meets that described in NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (1997 as issued 2011). The Auditor considers that the large majority of comments made on the Draft RAP in Interim Audit Advice 11 (issued 3 December 2013) have been addressed satisfactorily and require no further action. However, there are several issues, described in the following section, that the Auditor considers must be addressed to avoid confusion, uncertainty and/or possible unnecessary remediation by a person referring to these documents as part of planning for remediation of the site.

3 SPECIFIC ISSUES IN THE RAP

- Section 1.1 on page 6:
    - The Auditor understands that most developments pass through a concept stage before progressing to design. Thus, to clarify that Mastergroup has not prepared a concept for this site the Auditor requests replacement of "design plans" with "concept drawings", and replacement of "at the time this RAP" with "when this RAP was prepared".
    - The Auditor seeks to avoid any misunderstanding about the location of abattoir operations, which were not on the site, and that the site was used for ancillary activity only. Consequently, in paragraph 3, the Auditor requests replacement of "the former abattoir operation" with "former operation of an abattoir to the east of the site".
- Table 1 on page 7:
    - The Auditor considers that naming specific parties as stakeholders is not appropriate, given that Mastergroup intend to divest the site for development by others. The Auditor requests replacement of the current Table 1 with:

Property Owner / Developer
Remediation Contractor
Civil Works Contractor
Environmental Consultant
Site Auditor - Contamination
Blacktown City Council
Local Community and Neighbours

- Section 2.1 on page 8:
    - The Auditor notes that the first sentence is the only reference to The Avenue, other locality references to Richards Road, Riverstone. To avoid potential confusion, the Auditor requests deletion of the first sentence in Section 2.1.
- Table 5 on page 21:
    - Referring to the second last row in Table 5, the Auditor notes that structure BB, BF and BH should be included in this list and requests amendment of this item. This change is consistent with structures listed in Section 4.1.
    - Referring to the last row in Table 5, the Auditor notes that ash materials in AECs 8, 9 and 11 only require removal if that material presents an unacceptable human health risk or is aesthetically unsuitable. The Auditor requests appropriate amendment of the description.
- Section 4.1 on page 25:
    - Regarding Remediation Region 5, that Auditor suggests clarifying the purpose of mentioning ash materials in other AECs. Thus, the Auditor requests deletion of: "other areas are identified as" and addition to the end of the sentence of: "may also require similar treatment if found to be aesthetically unsuitable".
- Table 6 on page 28:

- The Auditor notes that the RAC for Nickel is controlled by the EIL for Nickel (220 mg/kg), and that the RAC for BaP TEQ should be 3 mg/kg. The Auditor requests amendment of these two entries in Table 6.

- Section 4.4.1.1 on page 30:
  - The Auditor considers that the part of this item which discusses bioremediation is not particularly and that discussion should relate to solidification / stabilisation as potential on-site treatment processes. The Auditor requests replacement of the last two sentences of this item with: "For the contaminants driving remediation on this site, biological treatment is not practical. Chemical and mechanical treatments fall under the category of solidification and stabilisation. This type of treatment retains immobilised contaminants on the site, but usual results in constraints to development of the affected portion of the land and also requires implementation of an on-going Environmental Management Plan."
  - Referring to the corresponding entry for On-Site Treatment in Table 8, in the first bullet under Discussion, replace "will not" with "may" and, and replace "bioremediation" with "solidification or stabilisation', Similarly, in the Conclusion, replace "unsuitable" with "partially suitable".
- Section 6.2.3 on page 41:
  - The Auditor confirmed that the 95% UCL for the average concentration of copper in Remediation Region 3 is less than the RAC of 140 mg/kg. Thus the inclusion of copper in paragraph 2 of this section and an associated entry for Step 5, Region 3 in Table 9 is unnecessary and the Auditor requests its deletion from both locations.
- Section 6.2.5 on page 42:
  - The Auditor considers that the first sentence in this section is redundant and requests its deletion.
- Table 10 on page 55:
  - The Auditor notes that lead and zinc are commonly occurring contaminants in fill material and that copper is also commonly detected but at lower added concentrations. Consequently, for the purpose of validation, the Auditor requires analysis of samples from Remediation Regions 1, 3 and 4 for copper, lead and zinc.
- Section 9.3 on page 65:
  - The Auditor notes the lack of a consultation step in the process of management of unexpected finds. Thus, the Auditor requests insert of a new fifth bullet point being: "Consult with the Site Auditor, Council and any other stakeholder, as appropriate".
- Section 9.4 on page 66:
  - Regarding procedures proposed for occurrence of "excessive" odours, the Auditor was unable to confirm SESL's reference to "NSW EPA Ground Level Concentration criteria" and requests detail of this information. The Auditor also notes that occupational Exposure Standards are not applicable at a site boundary where potential impact on neighbours or the public may result.

4 CLOSING

To achieve the objective of providing a satisfactory Site Audit Statement to Mastergroup, the Auditor requires:

- Revision of the RAP as discussed in detail above.

Please contact the undersigned to clarify any of the comments.

For and on behalf of Coffey Environments Australia Pty Ltd

Michael Dunbavan

Senior Principal Environmental Consultant
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Fax Transmission

To	**Mr Mark Robertson**	From	**Michael Dunbavan**
Fax No	**by email**	Date	**17 December 2013**
Company	**Mastergroup Pty Ltd**	Reference	**ENAURHOD01027AA-IA14**
cc	**Kelly Lee, SESL**	Pages	**1 of 2**
Subject	**Interim Audit Advice 14 - Acceptance of Final CSI Report, CSI Addendum and Remedial Action Plan for Richards Road, Riverstone NSW 2765, Lot 11 DP 816720**		

Dear Mark:

The advice presented in this document represents interim advice only, and does not constitute a Site Contamination Audit Report or Site Contamination Audit Statement. The advice provides the opinion of the Auditor based on the knowledge that is available at the time of this advice. A Site Contamination Audit Report and Site Contamination Audit Statement will be issued at the end of the Audit process, when the Auditor is satisfied all relevant matters have been adequately addressed to the satisfaction of the Auditor. This advice does not pre-empt or constrain the final outcome(s) of the audit or any conditions that may be placed by the Auditor in the Site Contamination Audit Report or Site Contamination Audit Statement.

1 PREAMBLE

The Auditor has been engaged by Mastergroup Pty Ltd to undertake a non-statutory audit regarding the appropriateness of contaminated site investigation and planned remediation for future residential development of a portion of the property known as Lot 11, Richards Road, Riverstone, which is identified as Lot 11, DP 816720 (the site). The Auditor understands that Mastergroup Pty Ltd appointed Sydney Environmental & Soil Laboratory Pty Ltd (SESL) as environmental consultant for the site contamination assessment.

The Auditor has received and reviewed:

- Consolidated Site Investigation for Richards Road, Riverstone NSW 2765, Lot 11 DP816720, December 2013 (reference C6868.Q3222.B258541 FB CSI); and
- Addendum for Consolidated Site Investigation Report, Lot 11, Richards Road, Riverstone, 11 December 2013 (reference C6868.B258541 FB CSI Addendum).
- Remedial Action Plan for Richards Road, Riverstone NSW 2765, Lot 11 DP816720, December 2013 (reference C6868.Q3450.B28321 FB RAP).

2 GENERAL COMMENTS

The Auditor considers that the standard of the reporting generally meets that described in NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (1997 as issued 2011). The Auditor considers that comments made on the "FA" versions of the listed documents in Interim Audit Advice 12

rev 1 and 13 (both issued 16 December 2013) have been addressed satisfactorily and require no further action.

3 CLOSING

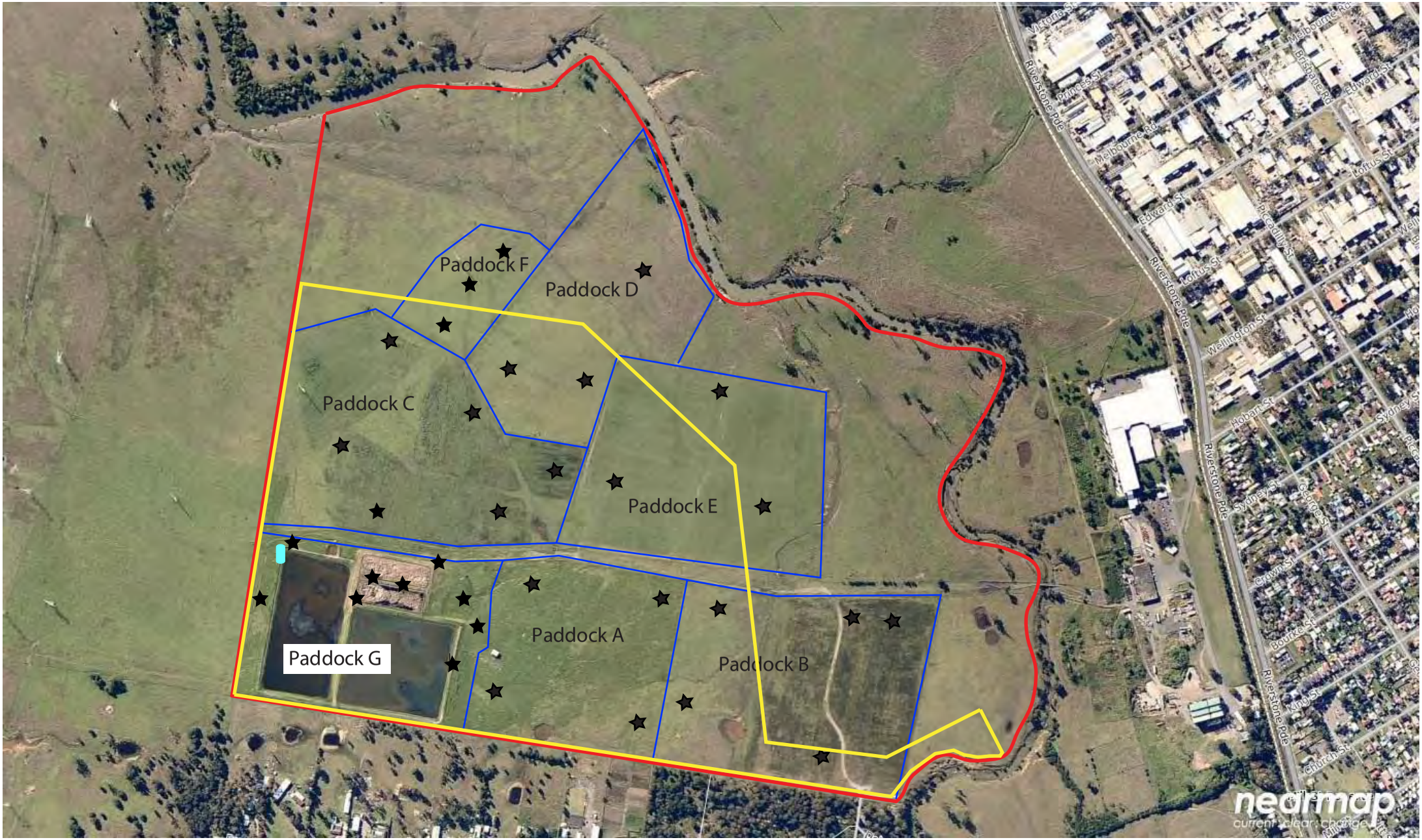
The Auditor is preparing a Site Audit Statement and Site Audit Statement for issue to Mastergroup and appreciates the intense effort made by SESL during the past few weeks to reach this milestone.

For and on behalf of Coffey Environments Australia Pty Ltd

Michael Dunbavan

Senior Principal Environmental Consultant
NSW EPA Accredited Site Auditor

Appendix C



Title: Map 1 - SESL Sampling Location & Site Layout

Report: C6868.Q2953.B24257 CSI

Location: Richards Road, Riverstone NSW 2765 (Lot 11 DP 816720)

Date: December 2012

Revision: R01

100m

Legend:

- Property Boundary
- Asbestos Pipe Location
- ★ Previous SESL Approximate Sampling Location
  Please note some composite sampling location are not included
- Paddock Boundary
- Investigation area/ Proposed lease area

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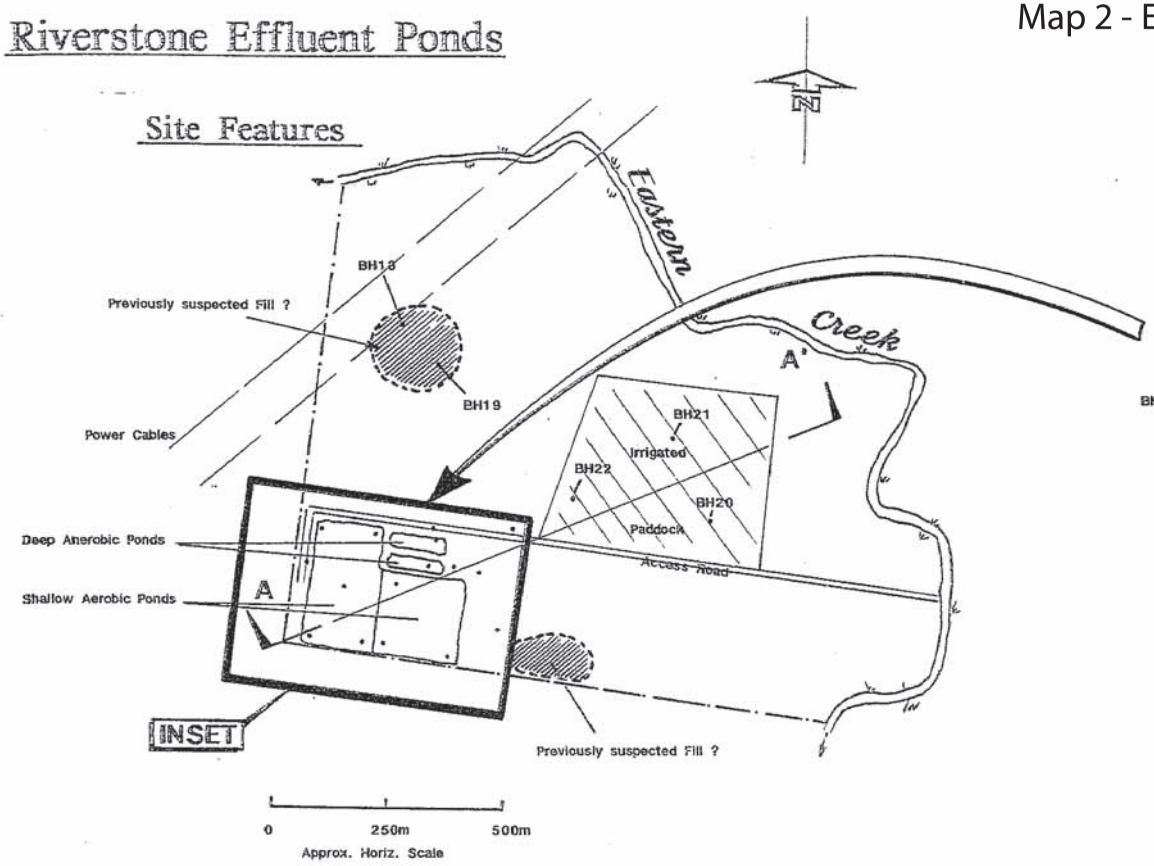
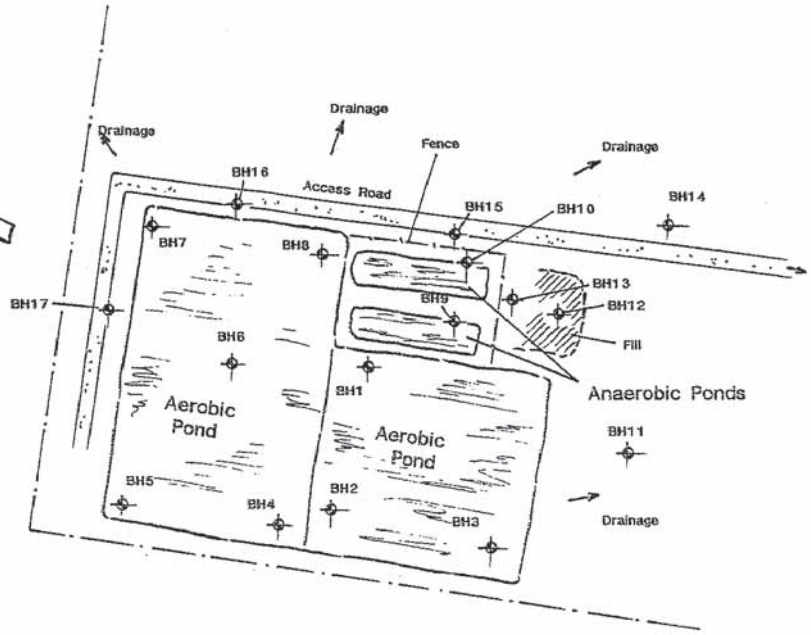
AUSTRALIA'S MOST TRUSTED EARTH SCIENCE SERVICES

Riverstone Effluent Ponds

Map 2 - Environmental & Earth Sciences Sampling Location

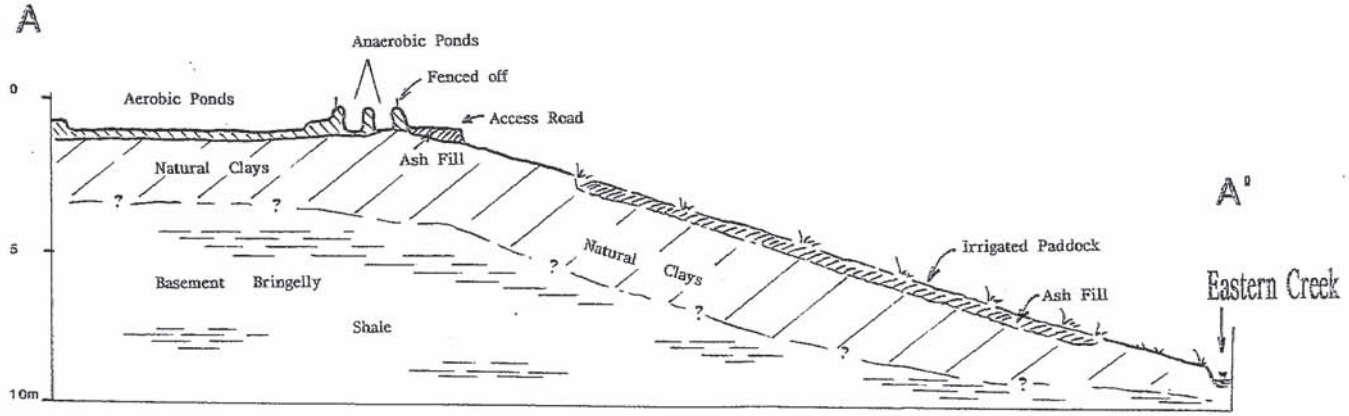
Site Features





INSET DETAIL – (Schematic Only)

Borehole Locations



Cross-Section A-A' Inferred Stratigraphy

Client: Stockland			
Title: Site Features, Borehole Locations & Inferred Stratigraphy		Drawn: TJ	Fig. 2
		Project Manager: MC	
Location: Riverstone, NSW		Approved:	Date: May03
ENVIRONMENTAL & EARTH SCIENCES PTY LTD			

Job No. 16070 ... by ... 29/5/03

SESL AUSTRALIA
Environment & Soil Sciences

Title: Map 4 - AEC1 and AEC2:Settling Ponds and Anaerobic Ponds

Report: Riverstone Detailed Site Investigation

Address: Lot 11, Richards Road, Riverstone

Legend: ★ Approximate Sampling Location

Date: November 2013 Revision: R02

SESL AUSTRALIA
Environment & Soil Sciences

Title: Map 5 - AEC 3 and AEC 5 - Agricultural Land and Access Road

Report: Riverstone - Detailed Site Investigation

Address: Lot 11, Richards Road, Riverstone

Date: Novembert 2013

Revision: R02

Legend: ★ Approximate Soil Sampling Location for access roads

★ Approximate Soil Sampling Location for agricultural paddocks

SESL AUSTRALIA
Environment & Soil Sciences

Title: Map 6 - AEC 4 - Asbestos Pipes

Report: Riverstone - Detailed Site Investigation

Address: Lot 11, Richards Road, Riverstone

Legend: Approximate Sampling Location for Asbestos Sample (Positive)
Approximate Sampling Location for Asbestos Sample (Negative)

Date: November 2013

Revision: R03

AEC6 - Dam 1

AEC7 - JF

AEC 12 - JA

AEC12 - JB

AEC8 - JE

AEC9 - JD

AEC6 - Dam 2

AEC12 - JC

66.2ha

Title: Map 7 - AEC 6, 7, 8, 9 and 12: Dams, Potential Fill, Dumping and Former Dam

Report: Riverstone Detailed Site Investigation

Address: Lot 11, Richards Road, Riverstone

Legend: Approximate Soil Sampling Location

Approximate Surface Water Sampling Location

Approximate Sediment Sampling Location

Date: November 2013 Revision: R01

0m 200m

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Environment & Soil Sciences

Title: Map 8 - AEC 7 and 12: Testpits location for fill area and former dam.

Report: Riverstone Detailed Site Investigation

Address: Lot 11, Richards Road, Riverstone

Legend: ★ Approximate Testpit Location

Date: November 2013 Revision: R01

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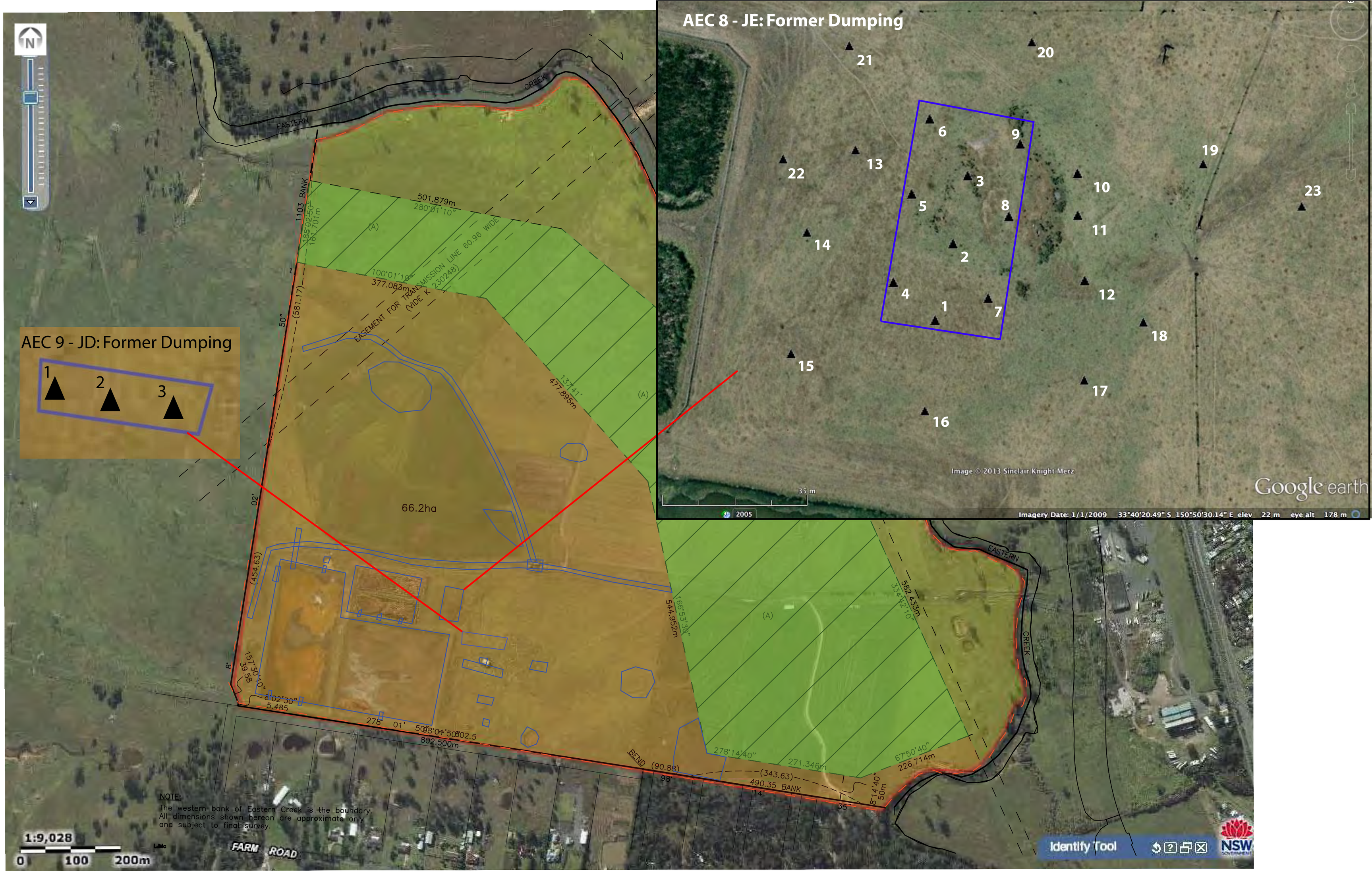

0m 200m

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Environment & Soil Sciences

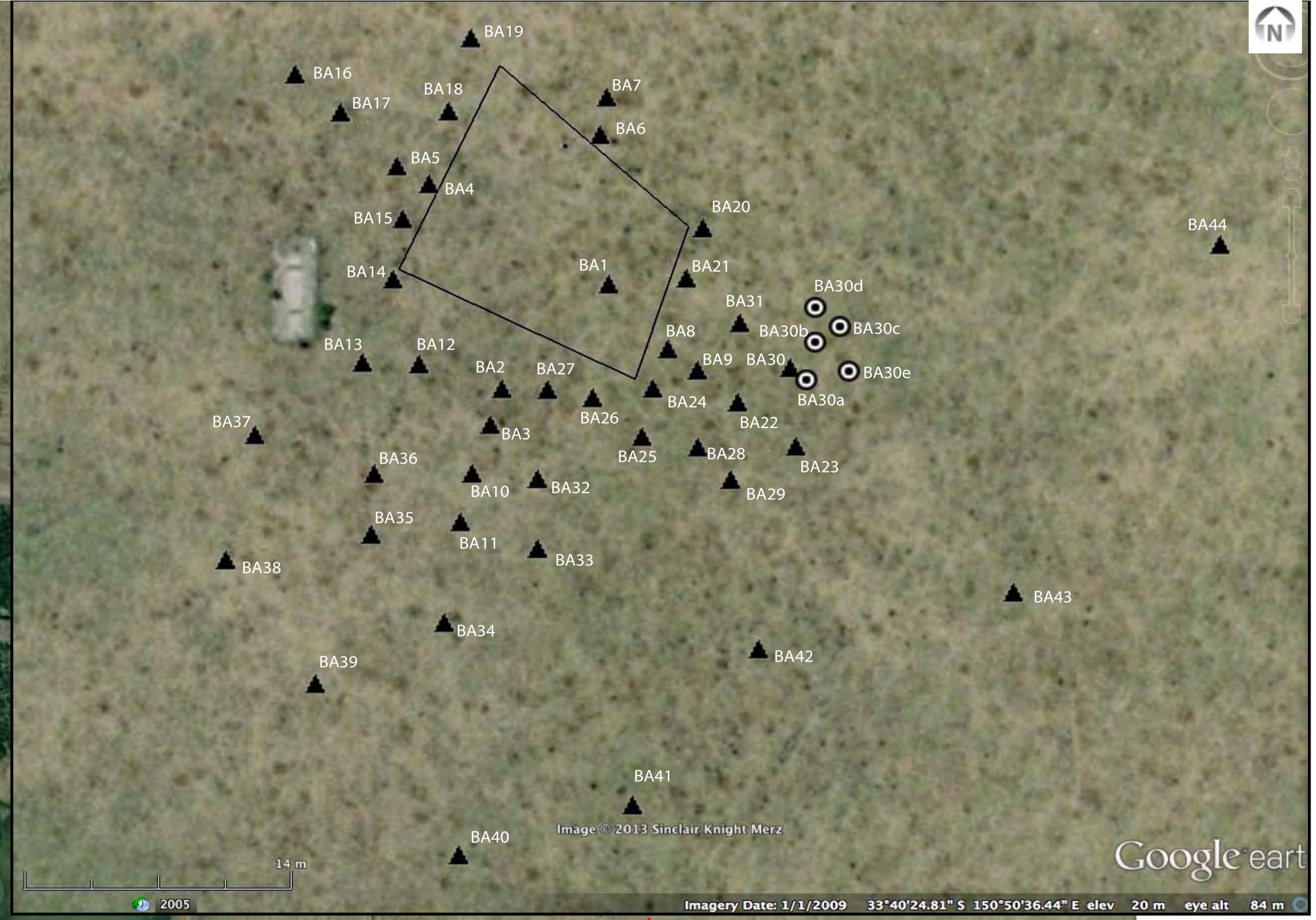
Title: Map 9 - AEC 8 and 9: Testpits location for former dumping area

Report: Riverstone Detailed Site Investigation

Address: Lot 11, Richards Road, Riverstone

Legend: ▲ Approximate Testpit Location

Date: November 2013 Revision: R01



Title: Map 10 - AEC11 Former Structure BA and Current Structure BF

Report: Riverstone Detailed Site Investigation

Date: November 2013

Revision: R01

Address: Lot 11, Richards Road, Riverstone

Legend: ▲ Approximate Soil Sampling Location ⊙ Borehole Location for Asbestos Containing Material Delineation

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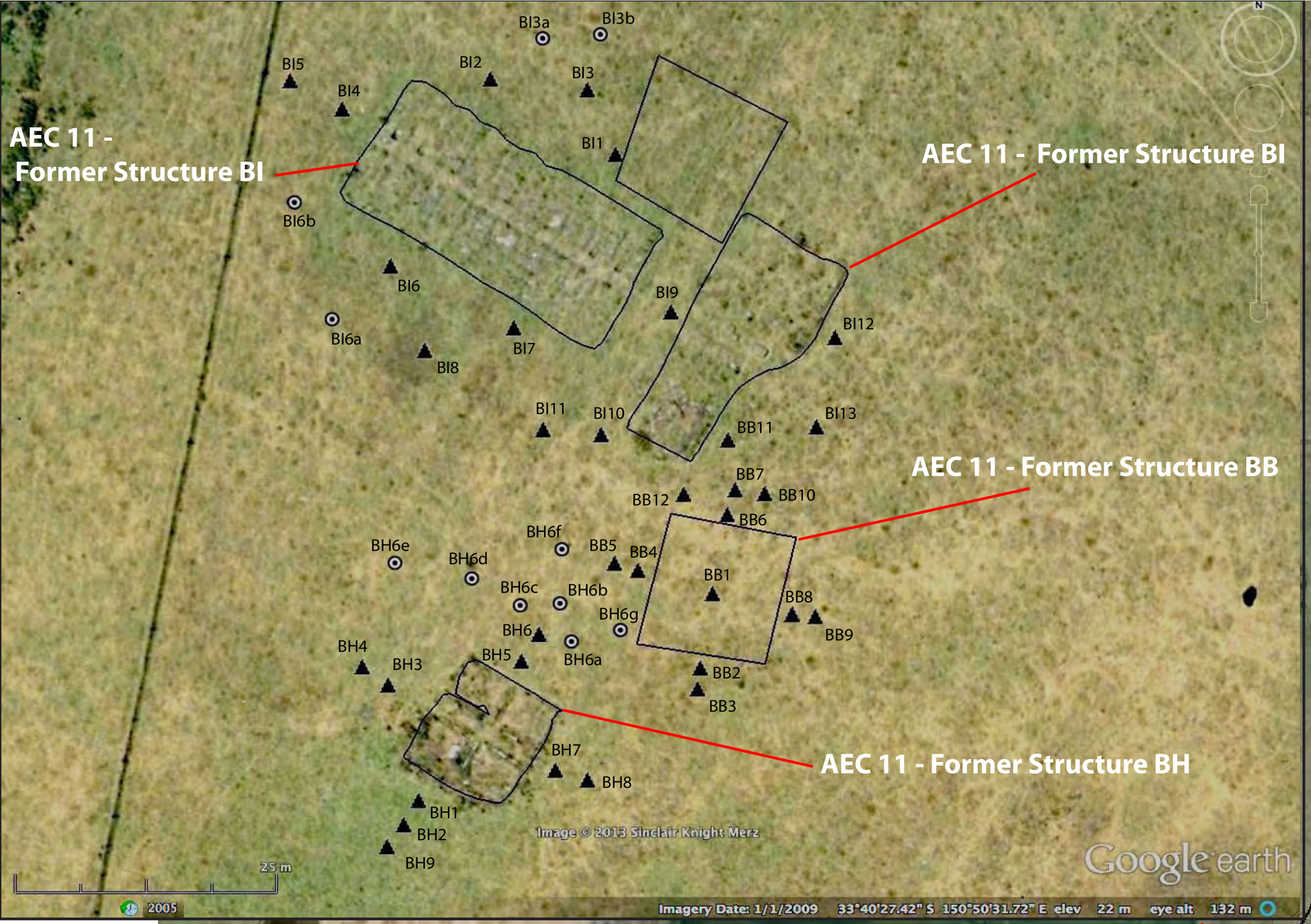
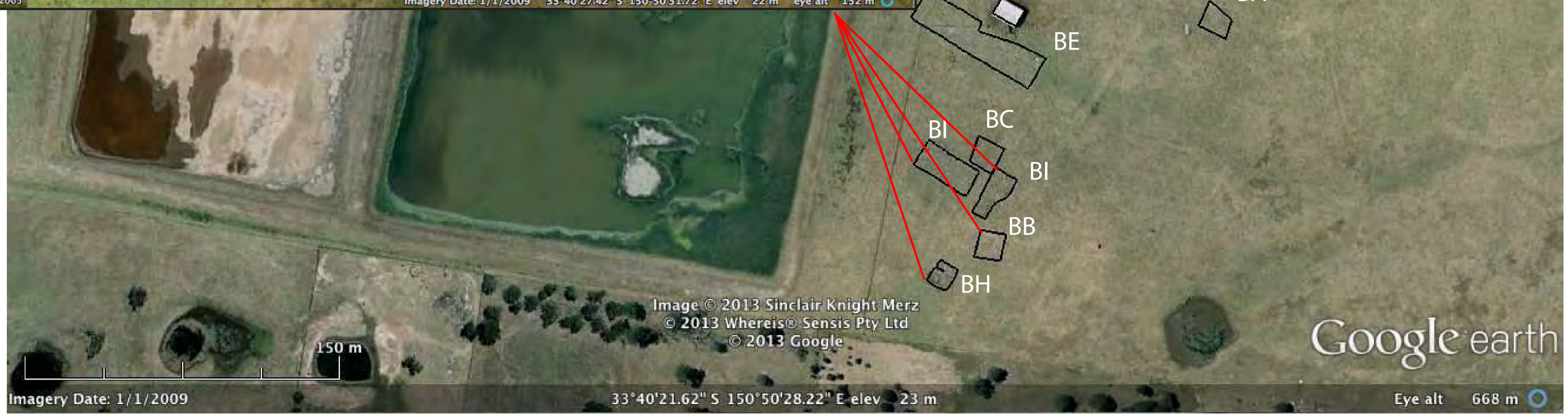
Environment & Soil Sciences





Title: Map 11 - AEC11 Former Structure BB, BH and BI

Report: Riverstone Detailed Site Investigation

Date: November 2013

Revision: R00

Address: Lot 11, Richards Road, Riverstone

Legend: ▲ Approximate Soil Sampling Location

◉ Borehole Location for Fill Material Delineation

AEC 11 - Former Structure BC

BC12
BC10
BC13
BC11
BC7
BC5
BC6
BC4
BC14
BC15
BC16
BC1
BC17
BC27
BC8
BC9
BC26
BC2
BC18
BC23
BC22
BC20
BC19
BC3
BC24
BC21
BC25

Image © 2013 Sinclair Knight Merz
Google earth
10 m
2005
Imagery Date: 1/1/2009 33°40'26.55" S 150°50'32.04" E elev 23 m eye alt 67 m

BA
BI
BC
BI
BB
BH

Image © 2013 Sinclair Knight Merz
© 2013 Whereis® Sensis Pty Ltd
© 2013 Google
Google earth
150 m
Imagery Date: 1/1/2009 33°40'21.62" S 150°50'28.22" E elev 23 m Eye alt 668 m

Title: Map 12 - AEC11 Former Structure BC

Report: Riverstone Detailed Site Investigation

Address: Lot 11, Richards Road, Riverstone

Date: November 2013

Revision: R00

Legend: ▲ Approximate Soil Sampling Location

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Environment & Soil Sciences

AEC 11 - Current Structure BD

AEC 11 - Former Structure BE

BE22 BE10 BD3 BD4 BD5 BE13 BE12 BD2 BE14 BD6 BD7 BE9 BE8 BD1 BE1 BE15 BE7 BE2 BE16 BE19 BE17 BE3 BE4 BE6 BE20 BE21 BE5 BE27 BE23 BE22 BE24 BE25 BE26

25 m

© 2013 Whereis® Sensis Pty Ltd
Image © 2013 Sinclair Knight Merz
© 2013 Google

Google earth

Imagery Date: 1/1/2009 33°40'24.66" S 150°50'31.92" E elev 23 m Eye alt 136 m

AEC10 - BG

1 2 3 4 5

BD BA BE BI BC BI BB BH

150 m

Image © 2013 Sinclair Knight Merz
© 2013 Whereis® Sensis Pty Ltd
© 2013 Google

Google earth

Imagery Date: 1/1/2009 33°40'21.62" S 150°50'28.22" E elev 23 m Eye alt 668 m

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Environment & Soil Sciences

Title: Map 13 - AEC 10 and 11 Former Structure BE and Current Structure BD & BG

Report: Riverstone Detailed Site Investigation

Address: Lot 11, Richards Road, Riverstone

Legend: ▲ Approximate Soil Sampling Location

Date: November 2013 Revision: R02

Title: Map 14 - AEC 13: Groundwater Monitoring Wells

Report: Riverstone Detailed Site Investigation

Address: Lot 11, Richards Road, Riverstone

Legend: ★ Approximate Groundwater Sampling Location

0m 200m

Date: November 2013 Revision: R01

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Environment & Soil Sciences

Appendix D

AEC 1 - Settling Ponds

Batch#	Sample Name	Total Nitrogen (%)	Total Phosphorus (%)	Sodium (Na) (mg/L)	CaCO3 (%)	pH in H2O (pH units)	pH in CaCl2 (pH units)	EC (dS/m)
26319	WSP1	1.11	0.37	1608	0.5%	6.1	5.9	6.63
26319	WSP2	1.19	0.43	1219.1	0.5%	6.1	5.9	4.71
26319	WSP3	0.48	0.17	560.2	0.3%	6.1	5.9	2.65
26319	WSP4	0.11	0.04	215.2	0.1%	5	4.5	1.03
26319	WSP5	1.03	0.45	921.4	0.4%	5.3	5.2	4.07
26319	WSP6	0.1	0.05	272.8	0.1%	4.7	4.4	1.2
26319	WSP7	0.11	0.04	171	0.1%	4.9	4.4	0.81
26319	WSP8	0.13	0.07	385.1	0.1%	4.6	4.4	1.67
26319	WSP9	0.1	0.05	229.6	0.1%	4.8	4.4	1.02
26319	WSP10	0.13	0.14	255.7	0.2%	5.3	4.9	1.2
26319	WSP11	0.13	0.11	234.9	0.1%	5	4.6	1.07
26319	WSP12	0.14	0.06	311	0.1%	4.4	4.1	1.34
26319	WSP13	0.12	0.11	290.2	0.1%	4.8	4.6	1.4
26319	WSP14	0.15	0.2	295.3	0.2%	5.1	4.8	1.41
26319	WSP15	0.15	0.2	651.6	0.1%	4	3.9	2.87
26319	WSP16	0.07	0.05	234.6	0.1%	4.5	4.1	1.09

	Total Nitrogen	Total Phosphorus	Sodium (Na)	CaCO3	pH in H2O	pH in CaCl2	EC
	(%)	(%)	(mg/L)	(%)	(pH units)	(pH units)	(dS/m)
No of samples	16	16	16	16	16	16	16
HIL-A	NA	NA	NA	NA	NA	NA	NA
EIL	NA	NA	NA	NA	NA	NA	NA
Min	0.07	0.04	171	0.1%	4.0	3.9	0.81
Max	1.19	0.45	1608	0.5%	6.1	5.9	6.63

AEC 2 - Anaerobic Ponds

Batch#	Sample Name	Total Nitrogen (%)	Total Phosphorus (%)	Sodium (Na) (mg/L)	CaCO3 (%)	pH in H2O (pH units)	pH in CaCl2 (pH units)	EC (dS/m)
26149	AP1	2.62	0.1	294.9	2.5%	5.5	5.1	1.39
26149	AP2	1.83	0.08	157.1	1.5%	5.7	5.2	0.89
26149	AP3	2.71	0.13	307.7	2.9%	6.1	5.7	1.46
26149	AP4	2.22	0.09	147.8	2.0%	5.9	5.4	0.81
26149	AP5	1.71	0.14	136	1.7%	5.5	5.1	0.86
26149	AP6	2.66	0.14	194.7	2.9%	5.8	5.4	1.3
26149	AP7	2	0.1	252.5	1.6%	5.6	5.1	1.24
26149	AP8	2.69	0.1	236.9	2.3%	5.7	5.3	1.23
26149	AP9	2.54	0.11	235.3	2.2%	5.5	5.1	1.3
26149	AP10	2.52	0.1	165.5	2.6%	5.8	5.4	1.13
26149	AP11	2.03	0.09	221.9	1.9%	6	5.4	0.86
26149	AP12	0.49	0.11	62.5	0.2%	5.2	4.2	0.3
26149	AP13	0.34	0.07	41.8	0.4%	5.3	4.3	0.19
26149	AP14	2.24	0.11	204.3	1.9%	5	4.6	1.16
26149	AP15	0.93	0.33	39.6	0.6%	4.9	4.5	0.37
26149	AP16	0.68	0.26	58.5	0.2%	5	4.1	0.29
26149	AP17	1.24	0.11	96.9	0.9%	5.8	5.1	0.45
26149	AP18	0.58	0.19	88	0.2%	5.2	4.4	0.42
26149	AP19	1.05	0.29	44	0.2%	5.3	4.2	0.21
26149	AP20	0.43	0.06	19.2	0.1%	4.9	3.8	0.11

	Total Nitrogen (%)	Total Phosphorus (%)	Sodium (Na) (mg/L)	CaCO3 (%)	pH in H2O (pH units)	pH in CaCl2 (pH units)	EC (dS/m)
No of samples	20	20	20	20	20	20	20
HIL-A	NA	NA	NA	NA	NA	NA	NA
EIL	NA	NA	NA	NA	NA	NA	NA
Min	0.34	0.06	19.2	0.1%	4.9	3.8	0.11
Max	2.71	0.33	307.7	2.9%	6.1	5.7	1.46

AEC 3 - Agricultural Land

Batch#	SampleName	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)
25902	A1 Surface	10	<0.4	11	16	17	<0.05	9.3	29
25902	A2 Surface	2.6	<0.4	11	9	11	<0.05	<5	25
25902	A3 Surface	33	<0.4	9.5	21	46	0.09	<5	140
25902	A4 Surface	49	0.5	16	32	50	0.24	5.8	160
25902	B2 Surface	10	<0.4	6.2	12	14	<0.05	<5	46
25902	B4 Surface	70	0.5	13	24	44	0.14	<5	180
25902	B5 Surface	23	<0.4	12	6	22	<0.05	<5	35
25902	C1 Surface	30	<0.4	15	18	24	<0.05	5.9	59
25902	C2 Surface	3.4	2.3	13	86	16	0.24	9.1	96
25902	C4 Surface	11	0.4	5	20	22	0.07	<5	68
25902	C5 Surface	22	<0.4	6.1	13	33	<0.05	<5	69
25902	C6 Surface	9.4	<0.4	5.3	5	14	<0.05	<5	13
25902	C7 Surface	15	<0.4	11	51	22	0.08	7.1	43
25902	D1 Surface	30	<0.4	5.7	13	28	<0.05	7.1	72
25902	D2 Surface	15	0.5	6.7	18	23	0.06	<5	56
25902	D3 Surface	6.2	0.5	17	27	10	<0.05	40	51
25902	D4 Surface	23	0.8	15	50	43	0.44	8.9	180
25902	D5 Surface	15	0.5	<5	20	29	0.07	7.8	71
25902	D6 Surface	24	<0.4	11	11	27	<0.05	7.2	48
25902	D7 Surface	15	<0.4	8	14	23	0.1	6.8	51
25902	E1 Surface	15	0.4	8.1	14	18	<0.05	8.1	42
25902	E2 Surface	16	0.5	5.9	25	30	0.06	<5	62
25902	E3 Surface	17	0.8	13	59	53	0.14	6.4	220
25902	E4 Surface	14	<0.4	8	14	17	<0.05	<5	44
25902	E5 Surface	40	0.6	13	27	40	0.18	9	110
25902	E6 Surface	2.6	<0.4	<5	33	11	0.14	19	46
25902	E7 Surface	17	0.6	21	16	28	<0.05	9.3	47
25902	E8 Surface	23	0.8	33	31	34	0.1	17	110
25916	F5 Surface	4.8	<0.4	12	16	14	<0.05	7.8	130
25916	F6 Surface	15	<0.4	33	15	22	<0.05	5.5	43
25916	F7 Surface	12	<0.4	34	17	31	<0.05	6.2	42
25916	F8 Surface	9.8	<0.4	32	9	23	<0.05	<5	24
25916	G6 Surface	12	<0.4	17	25	32	<0.05	7.3	140
25916	G7 Surface	10	<0.4	21	17	13	<0.05	<5	26
25916	G8 Surface	24	<0.4	43	12	27	<0.05	<5	56
25916	G9 Surface	6.9	<0.4	11	13	16	<0.05	<5	56
25916	H5 Surface	5.8	<0.4	14	16	12	<0.05	<5	29
25916	H6 Surface	16	<0.4	31	25	28	<0.05	7.9	150
25916	H7 Surface	21	<0.4	25	22	23	<0.05	6.8	59
25916	H8 Surface	8.4	<0.4	27	13	29	<0.05	<5	84
25916	H9 Surface	7.1	<0.4	16	17	37	<0.05	<5	72
25916	I5 Surface	6.2	<0.4	13	16	19	<0.05	<5	52
25916	I6 Surface	10	<0.4	21	33	36	<0.05	6.3	56
25916	I7 Surface	9	<0.4	20	15	22	<0.05	6.2	24
25916	I8 Surface	7.1	<0.4	8.3	42	48	<0.05	7.2	74
25916	I9 Surface	7	<0.4	15	13	20	<0.05	<5	33
25916	I11 Surface	6	<0.4	14	8	16	<0.05	<5	16
25916	I12 Surface	8.9	<0.4	23	18	36	<0.05	7	45
25916	I13 Surface	9.1	<0.4	20	17	34	<0.05	8.4	48
25916	I14 Surface	7.5	<0.4	28	16	42	<0.05	6.5	40

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)
HIL-A	**100**	**20**	**100***	**6000**	**300**	**40**	**400**	**7400**
EIL	**100**	**-**	**-**	**220**	**1100**	**-**	**270**	**610**
No of samples	50	50	50	50	50	50	50	50
Min	2.6	<0.4	<5	5	10	<0.01	<5	13
Max	70	2.3	43	86	53	0.44	40	220
Mean	15.7	0.5	15.8	22	27	0.08	7.4	69

AEC 4: Asbestos Pipes

Batch#	Sample#	Sample Name	Asbestos Detection	Types
26149	28	AP ASB1 1	Absent	
26149	29	AP ASB1 2	Present	Chrysotile Fibres
26149	30	AP ASB1 3	Absent	
26149	31	AP ASB2 1	Present	Chrysotile and Amosite fibres
26149	32	AP ASB2 2	Present	Chrysotile and Amosite fibres
26149	33	AP ASB2 3	Present	Chrysotile and Amosite fibres
26149	34	AP ASB3 1	Present	Chrysotile and Amosite fibres
26149	35	AP ASB3 2	Absent	
26149	36	AP ASB3 3	Absent	
26149	37	AP ASB4 1	Absent	
26149	38	AP ASB4 2	Absent	
26149	39	AP ASB4 3	Absent	
26149	40	WSP ASB1 1	Absent	
26149	41	WSP ASB1 2	Absent	
26149	42	WSP ASB1 3	Absent	
26149	43	WSP ASB2 1	Absent	
26149	44	WSP ASB2 2	Absent	
26149	45	WSP ASB2 3	Absent	
26149	46	WSP ASB3 1	Absent	
26149	47	WSP ASB3 2	Absent	
26149	48	WSP ASB3 3	Absent	
26149	49	WSP ASB4-1	Absent	
26149	50	WSP ASB4-2	Absent	
26149	51	WSP ASB4-3	Absent	
26149	52	ESP ASB1 1	Present	Chrysotile and Amosite fibres
26149	53	ESP ASB1 2	Absent	
26149	54	ESP ASB1 3	Absent	
26149	55	ESP ASB2 1	Present	Chrysotile and Amosite fibres
26149	56	ESP ASB2 2	Present	Chrysotile and Amosite fibres
26149	57	ESP ASB2 3	Absent	
26149	58	ESP ASB3 1	Present	Chrysotile (Fragment cement)
26149	59	ESP ASB3 2	Present	Chrysotile (Fragment cement)
26149	60	ESP ASB3 3	Absent	
26149	61	ESP ASB4 1	Absent	
26149	62	ESP ASB4 2	Absent	
26149	63	ESP ASB4 3	Absent	
25921	18	ASB1 S1	Absent	
25921	19	ASB1 S2	Absent	
25921	20	ASB1 S3	Absent	

AEC 6 - Farm Dams

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	PAH_Total (mg/kg)	Napthalene (mg/kg)	BaP TEQ (mg/kg)	Total Nitrogen (%)	Total Phosphorus (%)	pH in H2O (pH units)	pH in CaCl2 (pH units)	EC dS/m
HIL/HSL-A		**100**	**20**	**100**	**6000**	**40**	**300**	**400**	**7400**	**300**	**3**	**3**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
EIL/ESL		**100**	**-**	**-**	**220**	**-**	**1100**	**270**	**610**	**-**	**170**	**-**	**-**	**-**	**-**	**-**	**-**
25854	Dam #1 Sediment #1	7.1	<0.4	13	28	0.08	34	12	120	<1	<0.5	<0.5	0.54	0.37	6.8	6.2	0.23
25854	Dam #1 Sediment #2	23	<0.4	25	20	0.09	26	7	73	<1	<0.5	<0.5	0.39	0.22	6.7	6.2	0.3
25854	Dam #1 Sediment #3	8.2	<0.4	17	12	<0.05	17	<5	29	<1	<0.5	<0.5	0.26	0.1	6.3	5.5	0.15
25854	Dam #1 Water #1	0.012	<0.0001	0.001	0.006	<0.0001	0.001	0.013	<0.005	<0.002	-	-	15mg/L	<0.1mg/L	8.7	-	0.02
25854	Dam #1 Water #1d	0.012	<0.0001	0.001	0.006	<0.0001	0.002	0.013	0.006	<0.002	-	-	17mg/L	<0.1mg/L	9	-	1.81
25916	Dam 2 Sed 1	9.2	<0.4	29	16	<0.05	16	6.3	44	-	-	-	0.16	0.06	6.4	5.7	0.07
25916	Dam 2 Sed 2	10	<0.4	25	19	<0.05	16	<5	19	-	-	-	0.13	0.03	5.4	4.6	0.16
25916	Dam 2 Sed 3	13	<0.4	28	20	<0.05	23	7.7	45	-	-	-	0.2	0.05	6.1	5.4	0.15
25916	Dam #2 Water #1	<0.005	<0.0005	<0.005	<0.005	<0.0001	<0.005	<0.005	<0.005	-	-	-	9.2mg/L	0.7mg/L	8.3	-	0.68

Notes:
Statistical analysis was not undertaken due to insufficient sample size.
- = Not sampled

AEC 5 - Access Roads

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Total PAH (mg/kg)	BaP TEQ (mg/kg)	Napthalene (mg/kg)	Total Alkalinity (as CaCO3) (mg/kg)
25921	Road B1 Surface	<2	<0.4	<5	10	<0.05	6.8	14	23	<1	0.6	0.5	810
25921	Road B2 Surface	6.5	<0.4	14	12	<0.05	10	30	52	<1	0.6	0.5	450
25921	Road B3 Surface	10	<0.4	15	17	<0.05	18	31	44	<1	0.6	0.5	3700
25921	Road B4 Surface	11	<0.4	25	24	<0.05	21	8.5	37	<1	0.6	0.5	1500
25921	Road C5 Surface	6.8	<0.4	7.9	17	<0.05	11	21	30	<1	0.6	0.5	3900
25921	Road D5 Surface	5.2	<0.4	7.5	18	<0.05	<5	28	35	<1	0.6	0.5	1500
25921	Road E6 Surface	6.2	<0.4	8	11	<0.05	13	24	40	1.2	0.6	0.5	1200
25921	Road G1 Surface	22	<0.4	24	16	0.05	35	6.4	100	<1	0.6	0.5	1100
25921	Road F1 Surface	3.8	<0.4	<5	7	<0.05	8.3	22	33	<1	0.6	0.5	330
25921	Road F2 Surface	16	<0.4	5.2	16	0.05	26	20	69	<1	0.6	0.5	670
25921	Road F3 Surface	9.9	<0.4	<5	7	<0.05	10	38	31	<1	0.6	0.5	550
25921	Road F4 Surface	6.5	<0.4	<5	9	<0.05	15	35	35	<1	0.6	0.5	370
25921	Road F5 Surface	14	<0.4	5.7	13	<0.05	19	5	26	<1	0.6	0.5	<50
25921	Road F6 Surface	6.3	<0.4	12	52	<0.05	16	53	72	9.2	0.6	0.5	4700
25921	Road F7 Surface	6.5	<0.4	<5	10	<0.05	10	15	23	<1	0.6	0.5	380
25921	Road F8 Surface	<2	<0.4	<5	7	<0.05	7.5	27	28	1.4	0.6	0.5	130

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Total PAH (mg/kg)	BaP TEQ (mg/kg)	Napthalene (mg/kg)	Total Alkalinity (as CaCO3) (mg/kg)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**300**	**40**	**400**	**7400**	**300**	**3**	**3**	**-**
EIL/ESL	**100**	**-**	**-**	**220**	**1100**	**-**	**270**	**610**	**-**	**-**	**170**	**-**
No of samples	16	16	16	16	16	16	16	16	16	16	16	16
Min	<2	<0.4	<5	7	<0.05	<5	5	23	<1	0.6	<0.5	130
Max	22	<0.4	25	52	0.05	35	53	100	9.2	0.6	<0.5	4700
Mean	8.4	0.4	9.6	15.4	0.05	14.5	24	42	1.6	-	-	1334

AEC 7 - Filling in Paddock C

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	PAH_Total (mg/kg)	Napthalene (mg/kg)	BaP TEQ (mg/kg)	Asbestos (detection)
26034	JF1 Surface	25	1.1	28	43	0.11	28	13	90	<1	<0.5	<0.5	Absent
26034	JF2 Surface	28	2	36	71	0.18	37	19	130	<1	<0.5	<0.5	Absent
26034	JF3 Surface	19	0.9	13	43	0.15	22	8.8	78	<1	<0.5	<0.5	Absent
26034	JF4 Surface	31	1.3	27	42	0.12	25	11	78	<1	<0.5	<0.5	Absent
26034	JF5 Surface	12	1.6	19	65	0.28	18	9.3	57	<1	<0.5	<0.5	Absent
26034	JF6 Surface	17	1.3	37	30	0.07	18	7	34	<1	<0.5	<0.5	Absent
26034	JF7 Surface	14	1.2	18	42	0.11	19	7.8	77	<1	<0.5	<0.5	Absent
26034	JF8 Surface	19	1.5	19	58	0.17	24	9.4	85	<1	<0.5	<0.5	Absent
26034	JF9 Surface	22	0.9	14	45	0.13	26	7.9	120	<1	<0.5	<0.5	Absent
26034	JF10 Surface	15	0.5	13	32	0.08	18	6.1	84	<1	<0.5	<0.5	Absent
26034	JF11 Surface	15	1	18	42	0.1	12	5.5	43	<1	<0.5	<0.5	Absent
26034	JF12 Surface	25	1	30	23	<0.05	26	5.5	41	<1	<0.5	<0.5	Absent
26034	JF13 Surface	24	0.9	32	29	<0.05	18	7.3	42	<1	<0.5	<0.5	Absent
26034	JF14 Surface	16	0.6	19	33	0.05	17	15	57	<1	<0.5	<0.5	Absent
26034	JF15 Surface	27	0.6	17	34	0.11	33	8.7	140	<1	<0.5	<0.5	Absent
26034	JF16 Surface	20	0.9	22	33	0.06	17	6.4	51	<1	<0.5	<0.5	Absent
26034	JF17 Surface	19	1.3	42	25	0.06	25	7.9	29	<1	<0.5	<0.5	Absent
26034	JF18 Surface	23	2.2	34	98	0.25	32	12	110	<1	<0.5	<0.5	Absent
26034	JF19 Surface	29	1.3	37	40	0.09	28	10	92	<1	<0.5	<0.5	Absent
26034	JF20 Surface	25	0.9	16	120	0.09	100	34	510	<1	<0.5	<0.5	Absent

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Total PAH (mg/kg)	Napthalene (mg/kg)	BaP TEQ (mg/kg)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**300**	**40**	**400**	**7400**	**300**	**3**	**3**
EIL/ESL	**100**	**-**	**-**	**220**	**1100**	**-**	**270**	**610**	**-**	**170**	**0.7**
No of samples	20	20	20	20	20	20	20	20	20	20	20
Min	12	0.5	13	23	<0.05	12	5.5	29	<1	<0.5	<0.5
Max	31	2.2	42	120	0.28	100	34	510	<1	<0.5	<0.5
Mean	21	1.2	25	47	0.12	27	10.6	97	-	-	-

AEC 8 - Former Dumping East to the Anaerobic Ponds - Fill Material

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	PAH_Total (mg/kg)	Napthalene (mg/kg)	BaP TEQ (mg/kg)	Asbestos (mg/kg)
26034	JE1 Surface	13	0.6	21	16	0.05	25	<5	78	<1	<0.5	0.6	Absent
26034	JE2 Surface	12	<0.4	8.2	38	0.06	35	21	120	<1	<0.5	0.6	Absent
26034	JE3 Surface	19	<0.4	9.7	42	0.05	30	14	87	<1	<0.5	0.6	Absent
26034	JE4 Surface	6.8	<0.4	11	10	<0.05	17	<5	59	<1	<0.5	0.6	Absent
26034	JE5 Surface	12	0.7	17	48	0.06	50	28	390	<1	<0.5	0.6	Absent
26034	JE6 Surface	9.1	0.8	24	35	0.05	94	14	120	2.6	<0.5	0.6	Absent
26034	JE7 Surface	9.1	0.6	15	18	0.05	22	<5	93	<1	<0.5	0.6	Absent
26034	JE8 Surface	13	0.4	19	17	0.06	22	7.5	68	1.3	<0.5	0.6	Absent
26034	JE9 Surface	22	0.7	16	48	0.1	61	22	160	1.2	<0.5	0.6	Absent
27079	JE1 1000mm	7.6	<0.4	16	8.7	<0.05	13	<5	32	<0.5	<0.5	0.6	Absent
27079	JE1 1500mm	7.2	<0.4	16	5.8	<0.05	7.2	<5	<5	<0.5	<0.5	0.6	Absent
27079	JE1 1800mm	7.4	<0.4	9.9	9.8	<0.05	6.4	<5	<5	<0.5	<0.5	0.6	Absent
27079	JE2 1000mm	6.9	<0.4	19	<5	<0.05	13	<5	7.4	<0.5	<0.5	0.6	Absent
27079	JE2 1500mm	10	<0.4	24	11	<0.05	22	<5	7.8	<0.5	<0.5	0.6	Absent
27079	JE2 2000mm	11	<0.4	12	5.9	<0.05	11	<5	23	<0.5	<0.5	0.6	Absent
27079	JE3 Capping	5.4	<0.4	9.7	18	<0.05	17	36	82	<0.5	<0.5	0.6	Absent
27079	JE3 Drums	6.8	<0.4	32	26	<0.05	14	46	110	<0.5	<0.5	0.6	Absent
27079	JE3 Below Drums	9.3	0.6	26	14	<0.05	96	13	**860**	<0.5	<0.5	0.6	Absent
27079	JE3 1000mm	9.5	<0.4	<5	19	<0.05	22	56	98	<0.5	<0.5	0.6	Absent
27079	JE3 1500mm	9	<0.4	18	6.9	<0.05	10	<5	8.1	<0.5	<0.5	0.6	Absent
27079	JE4 1000mm	6.2	<0.4	16	<5	<0.05	9.4	<5	22	<0.5	<0.5	0.6	Absent
27079	JE4 1500mm	6.9	<0.4	12	12	0.06	22	5.9	68	<0.5	<0.5	0.6	Absent
27079	JE4 2000mm	6.3	<0.4	5.9	<5	<0.05	<5	<5	<5	<0.5	<0.5	0.6	Absent
27079	JE5 1000mm	14	<0.4	17	6.6	<0.05	13	<5	19	<0.5	<0.5	0.6	Absent
27079	JE5 1500mm	13	<0.4	17	<5	<0.05	9.3	<5	17	<0.5	<0.5	0.6	Absent
27079	JE5 2000mm	14	<0.4	25	11	<0.05	18	5.1	46	<0.5	<0.5	0.6	Absent
27079	JE6 700mm	4.7	<0.4	15	7.5	<0.05	11	<5	49	<0.5	<0.5	0.6	Absent
27079	JE8 1000mm	6.9	<0.4	<5	12	<0.05	12	<5	100	<0.5	<0.5	0.6	Absent
27079	JE9 1000mm	3.6	<0.4	<5	12	0.05	7.9	<5	98	2.9	0.5	0.6	Absent
27079	JE9 1500mm	7	1	7.9	14	<0.05	19	5.5	**1900**	<0.5	<0.5	0.6	Absent
27079	JE9 2000mm	<2	<0.4	<5	5.9	<0.05	<5	<5	63	<0.5	<0.5	0.6	Absent
27079	JE12 1000mm	12	<0.4	24	11	<0.05	15	<5	13	<0.5	<0.5	0.6	Absent
27079	JE12 1500mm	14	<0.4	9.7	18	<0.05	9.7	<5	8.6	<0.5	<0.5	0.6	Absent

	As_HM (mg/kg)	Cd_HM (mg/kg)	Cr_digest (mg/kg)	Cu_HM (mg/kg)	Pb_HM (mg/kg)	Hg_HM (mg/kg)	Ni_HM (mg/kg)	Zn_HM (mg/kg)	Total PAH (mg/kg)	Napthalene (mg/kg)	BaP TEQ (mg/kg)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**300**	**40**	**400**	**7400**	**300**	**3**	**3**
EIL/ESL	**100**	**-**	**-**	**220**	**1100**	**-**	**270**	**610**	**-**	**170**	**0.7**
No of samples	32	32	32	32	32	32	32	32	32	32	32
Min	3.6	<0.4	<5	<5	<0.05	6.4	<5	<5	<0.5	<0.5	0.6
Max	22	1	32	48	0.1	96	56	**1900**	2.6	<0.5	0.6
Mean	9.6	0.5	14.9	16	0.05	23	11	91	0.8	-	-

AEC 8 - Former Dumping East to the Anaerobic Ponds - Natural Soil

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	PAH_Total (mg/kg)	Napthalene (mg/kg)	BaP TEQ (mg/kg)	Asbestos (mg/kg)
27079	JE1 Asbestos												**Present**
27079	JE3 2000mm	4.7	<0.4	7.1	5.7	<0.05	5.1	<5	<5	<0.5	<0.5	0.6	Absent
27079	JE5 2300mm	4.6	<0.4	6.3	6.5	<0.05	<5	<5	<5	<0.5	<0.5	0.6	Absent
27079	JE6 1000mm	12	<0.4	23	8.3	<0.05	14	<5	5.5	<0.5	<0.5	0.6	Absent
27079	JE7 1000mm	4.9	<0.4	9.2	<5	<0.05	7.2	<5	7.1	<0.5	<0.5	0.6	Absent
27079	JE7 1500mm	5.2	<0.4	13	15	<0.05	15	<5	29	<0.5	<0.5	0.6	Absent
27079	JE7 2000mm	6.8	<0.4	13	7.3	<0.05	6.9	<5	5.7	<0.5	<0.5	0.6	Absent
27079	JE7 2500mm	3.2	<0.4	<5	6.7	<0.05	<5	<5	<5	<0.5	<0.5	0.6	Absent
27079	JE7 3000mm	<2	<0.4	<5	5.6	<0.05	<5	<5	<5	<0.5	<0.5	0.6	Absent

Notes:

BOLD Exceedances are highlighted and BOLD

AEC 9 - Former Dumping North of Shed

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	PAH_Total (mg/kg)	Napthalene (mg/kg)	BaP TEQ (mg/kg)	Asbestos (detection)
26034	JD1 Surface	8.9	0.5	19	12	<0.05	16	<5	46	<1	<0.5	0.6	Absent
26034	JD2 Surface	4.9	<0.4	9.3	11	<0.05	18	5.1	42	<1	<0.5	0.6	Absent
26034	JD3 Surface	9.5	0.7	25	15	0.06	37	<5	26	<1	<0.5	0.6	Absent
26034	JD4 Surface	5.7	<0.4	13	20	<0.05	26	7	100	<1	<0.5	0.6	Absent
26034	JD5 Surface	7.3	<0.4	10	17	<0.05	31	<5	67	<1	<0.5	0.6	Absent
26034	JD6 Surface	3.7	<0.4	6.2	26	0.08	28	30	93	<1	<0.5	0.6	Absent
26034	JD7 Surface	5.8	<0.4	9	21	<0.05	25	6.5	93	<1	<0.5	0.6	Absent

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Total PAH (mg/kg)	Napthalene (mg/kg)	BaP TEQ (mg/kg)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**300**	**40**	**400**	**7400**	**300**	**3**	**3**
EIL/ESL	**100**	**-**	**-**	**220**	**1100**	**-**	**270**	**610**	**-**	**170**	**0.7**
No of samples	7	7	7	7	7	7	7	7	7	7	7
Min	3.7	<0.4	6.2	11	<0.05	16	<5	26	<1	<0.5	0.6
Max	9.5	0.7	25	26	0.08	37	30	100	<1	<0.5	0.6
Mean	6.5	0.5	13.1	17	0.1	26	9.1	67	-	-	-

AEC 10 - Former Shed

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Total PAH (mg/kg)	Naphthalene (mg/kg)	BaP TEQ (mg/kg)	Asbestos (detection)
26149	BG1 Surface	8.6	<0.4	7.3	15	0.07	26	10	62	<1	<0.5	0.6	Absent
26149	BG2 Surface	8.3	<0.4	58	31	<0.05	13	100	65	<1	<0.5	0.6	Absent
26149	BG3 Surface	3.4	<0.4	<5	11	0.15	18	10	58	<1	<0.5	0.6	Absent
26149	BG4 Surface	13	<0.4	11	10	<0.05	31	7.4	51	<1	<0.5	0.6	Absent
26149	BG5 Surface	11	<0.4	15	14	<0.05	57	10	60	<1	<0.5	0.6	Absent

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Total PAH (mg/kg)	Napthalene (mg/kg)	BaP TEQ (mg/kg)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**300**	**40**	**400**	**7400**	**300**	**3**	**3**
EIL/ESL	**100**	**-**	**-**	**220**	**1100**	**-**	**270**	**610**	**-**	**170**	**0.7**
No of samples	5	5	5	5	5	5	5	5	5	5	5
Min	3.4	<0.4	<5	10	<0.05	13	7.4	51	<1	<0.5	0.6
Max	13	<0.4	58	31	0.15	57	100	65	<1	<0.5	0.6
Mean	8.9	-	19.3	16.2	0.1	29	27.5	59	-	-	-

AEC 11 - Former Structure BA- Fill Material

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)	Total PAH (mg/kg)	BaP TEQ (mg/kg)	Asbestos (detection)	CEC -	pH (pH Units)	pH Ca Cl (pH Units)
26094	BA1 Surface	16	<0.4	10	50	0.06	550	6	400	7.6	0.7	-	-	Absent	-	-	-
26094A	BA1 300mm	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-
26094	BA2 Surface	11	<0.4	8.4	46	0.07	420	7.4	290	3.4	1.1	-	-	Absent	-	-	-
26094A	BA2 300mm	-	-	-	-	-	310	-	-	-	-	-	-	-	-	-	-
26094	BA3 Surface	20	<0.4	14	41	0.08	360	9	400	6.8	0.7	-	-	Absent	-	-	-
26094A	BA3 300mm	-	-	-	-	-	430	-	-	-	-	-	-	-	-	-	-
27878	BA3 350-400mm	-	-	-	-	-	828	-	-	-	-	-	-	-	-	-	-
26094	BA4 Surface	9.1	3.3	17	38	0.34	290	8.8	1300	6	0.8	-	-	Absent	-	-	-
26094	BA5 Surface	12	<0.4	7.9	25	0.09	170	6.7	280	11.1	0.4	-	-	Absent	-	-	-
26094	BA6 Surface	<2	<0.4	<5	7.7	<0.05	20	19	61	4	0.2	-	-	Absent	-	-	-
26094	BA7 Surface	29	<0.4	20	60	<0.05	75	33	140	4.3	0.5	-	-	Absent	-	-	-
26094	BA8 Surface	10	<0.4	7.5	22	<0.05	660	<5	380	5.4	0.7	-	-	Absent	-	-	-
26094A	BA8 300mm	-	-	-	-		63	-	-	-	-	-	-	-	-	-	-
26094	BA9 Surface	7.6	<0.4	5.4	28	0.06	680	5.9	440	4.4	0.7	-	-	Absent	-	-	-
26094A	BA9 300mm	-	-	-	-	-	180	-		-	-	-	-	-	-	-	-
26094	BA9 Surface (fragment)	-	-	-	-	-		-		-	-	-	-	**Present**	-	-	-
26917	BA10 Surface	-	-	-	-	-	1000	-	680	-	-	-	-	-	15.3	6.3	5.4
26917A	BA10 300mm	-	-	-	-	-	140	-	100	-	-	-	-	-	-	-	-
26917A	BA11 Surface	-	-	-	-	-	1500	-	1000	-	-	-	-	-	-	-	-
26917	BA12 Surface	-	-	-	-	-	570	-	570	-	-	-	-	-	-	-	-
26917A	BA12 300mm	-	-	-	-	-	280	-	130	-	-	-	-	-	-	-	-
26917A	BA13 Surface	-	-	-	-	-	280	-	250	-	-	-	-	-	-	-	-
26917	BA15 Surface	-	-	-	-	-		-	180	-	-	-	-	-	-	-	-
26917A	BA16 Surface	-	-	-	-	-		-	130	-	-	-	-	-	-	-	-
26917	BA17 Surface	-	-	-	-	-		-	1500	-	-	-	-	-	-	-	-
26917A	BA17 300mm	-	-	-	-	-		-	38	-	-	-	-	-	-	-	-
26917	BA18 Surface	-	-	-	-	-		-	34	-	-	2.5	0.6	-	-	-	-
26917	BA21 Surface	-	-	-	-	-	170	-	250	-	-	-	-	-	-	-	-
26917	BA22 Surface	-	-	-	-	-	2100	-	1900	-	-	-	-	**Present**	-	-	-
26917A	BA22 300mm	-	-	-	-	-	820	-	530	-	-	-	-	-	-	-	-
27878	BA22 400-450mm	-	-	-	-	-	20	-		-	-	-	-	-	-	-	-
26917A	BA23 Surface	-	-	-	-	-	270	-	460	-	-	-	-	-	-	-	-
26917	BA24 Surface	-	-	-	-	-	130	-	74	-	-	-	-	-	-	-	-
26917	BA27 Surface	-	-	-	-	-	190	-	170	-	-	-	-	-	-	-	-
27878	BA28 Surface	-	-	-	-	-	272	-		-	-	-	-	-	-	-	-
27878	BA29 Surface	-	-	-	-	-	717	-		-	-	-	-	-	-	-	-
27878A	BA29 300mm	-	-	-	-	-	76	-		-	-	-	-	-	-	-	-
27878	BA30 Surface	-	-	-	-	-	336	-		-	-	-	-	-	-	-	-
27878A	BA30 300mm	-	-	-	-	-	297	-		-	-	-	-	-	-	-	-
27878	BA31 Surface	-	-	-	-	-	508	-		-	-	-	-	-	-	-	-
27878A	BA31 300mm	-	-	-	-	-	214	-		-	-	-	-	-	-	-	-
27878	BA32 Surface	-	-	-	-	-	2170	-		-	-	-	-	-	-	-	-
27878A	BA32 300mm	-	-	-	-	-	573	-		-	-	-	-	-	-	-	-
27878	BA33 Surface	-	-	-	-	-	252	-		-	-	-	-	-	-	-	-
27878	BA34 Surface	-	-	-	-	-	442	-		-	-	-	-	-	-	-	-
27878A	BA34 300mm	-	-	-	-	-	289	-		-	-	-	-	-	-	-	-
27878	BA35 Surface	-	-	-	-	-	418	-		-	-	-	-	-	-	-	-
27878A	BA35 300mm	-	-	-	-	-	269	-		-	-	-	-	-	-	-	-
27878	BA36 Surface	-	-	-	-	-	1080	-		-	-	-	-	-	-	-	-
27878A	BA36 300mm	-	-	-	-	-	291	-		-	-	-	-	-	-	-	-
28068	BA37 Surface	-	-	-	-	-	41	-		-	-	-	-	-	-	-	-
28068	BA38 Surface	-	-	-	-	-	260	-		-	-	-	-	-	-	-	-
28068	BA39 Surface	-	-	-	-	-	38	-		-	-	-	-	-	-	-	-
28068	BA40 Surface	-	-	-	-	-	78	-		-	-	-	-	-	-	-	-
28068	BA41 Surface	-	-	-	-	-	90	-		-	-	-	-	-	-	-	-
28068	BA42 Surface	-	-	-	-	-	160	-		-	-	-	-	-	-	-	-
28068	BA43 Surface	-	-	-	-	-	78	-		-	-	-	-	-	-	-	-
28068	BA44 Surface	-	-	-	-	-	49	-		-	-	-	-	-	-	-	-

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**40**	**300**	**400**	**7400**	**-**	**-**
EIL/ESL	**100**	**-**	**-**	**140**	**-**	**1200**	**170**	**340**	**-**	**-**
No of samples	9	9	9	9	9	52	9	26	9	9
Min	<2	<0.4	<5	7.7	<0.05	18	5.9	34	3.4	0.2
Max	29	3.3	20	60	0.34	**2170**	33	**1900**	11.1	1.1
Mean	14	0.7	10.6	35.3	0.1	414	12	450	5.9	0.6
Std Dev	-	-	-	-	-	460	-	476	-	-
CoV	-	-	-	-	-	1.11	-	1.06	-	-
Count	-	-	-	-	-	52	-	26	-	-
t95	-	-	-	-	-	1.675	-	1.675	-	-
95UCL	-	-	-	-	-	521	-	**606**	-	-

AEC 11 - Former Structure BA - Natural Soils

Batch#	Sample Name	As_HM (mg/kg)	Cd_HM (mg/kg)	Cr_digest (mg/kg)	Cu_HM (mg/kg)	Hg_HM (mg/kg)	Pb_HM (mg/kg)	Ni_HM (mg/kg)	Zn_HM (mg/kg)
27878	BA1 400-450mm	-	-	-	-	-	37	-	-
27878	BA2 400-450mm	-	-	-	-	-	40	-	-
28068	BA3 1000-1200mm	-	-	-	-	-	18	-	-

Notes:

BOLD Exceedances are highlighted and BOLD

AEC 11 - Former Structure BB

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)	Asbestos (detection)	CEC -	pH (pH Units)	pH Ca Cl (pH Units)
26094	BB1 Surface	13	<0.4	8.1	23	<0.05	62	6.9	130	5.2	0.7	Absent	-	-	-
26094	BB2 Surface	3.6	<0.4	<5	19	<0.05	30	14	54	8.6	0.3	Absent	-	-	-
26094	BB3 Surface	6.7	<0.4	14	36	<0.05	34	13	61	2.9	0.3	Absent	-	-	-
26094	BB4 Surface	10	<0.4	<5	21	<0.05	68	11	150	13.4	0.7	Absent	-	-	-
26094	BB5 Surface	4.3	<0.4	<5	20	0.05	57	8.7	150	4	0.9	Absent	-	-	-
26094	BB6 Surface	12	0.6	5.3	34	<0.05	170	20	530	6	3.7	Absent	-	-	-
26094	BB7 Surface	18	0.5	7.1	43	0.05	250	27	630	6	4	Absent	-	-	-
26094	BB8 Surface	11	<0.4	10	15	<0.05	52	5	78	4.5	0.3	Absent	-	-	-
26094	BB9 Surface	18	<0.4	10	18	<0.05	57	6.5	120	2.1	0.4	Absent	-	-	-
26917	BB10 Surface	-	-	-	-	-	-	-	380	-	-	-	20.8	7.7	7
26917	BB11 Surface	-	-	-	-	-	-	-	89	-	-	-	-	-	-
26917	BB12 Surface	-	-	-	-	-	-	-	840	-	-	-	-	-	-
26917A	BB12 300mm	-	-	-	-	-	-	-	130	-	-	-	-	-	-

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**40**	**300**	**400**	**7400**	**-**	**-**
EIL/ESL	**100**	**-**	**-**	**140**	**-**	**1200**	**170**	**340**	**-**	**-**
No of samples	9	9	9	9	9	9	9	13	9	9
Min	3.6	0.5	5.3	15	0.05	30	5	54	2.1	0.3
Max	18	0.6	14	43	0.05	250	27	840	13.4	4.0
Mean	11	1	9	25	0	87	12	257	6	1.3
Std Dev	-	-	-	-	-	-	-	255	-	-
CoV	-	-	-	-	-	-	-	1	-	-
Count	-	-	-	-	-	-	-	13	-	-
t95	-	-	-	-	-	-	-	2	-	-
95UCL	-	-	-	-	-	-	-	**383**	-	-

AEC 11 - Former Structure BC

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)	Asbestos (detection)	CEC -	pH (pH Units)	pH Ca Cl (pH Units)
26115	BC1 Surface	6.1	<0.4	8.1	11	<0.05	40	<5	130	17.2	0.6	Absent	-	-	-
26115	BC2 Surface	4.1	0.6	5.5	24	<0.05	100	10	**580**	8.5	1.8	Absent	-	-	-
26115	BC3 Surface	5.4	0.7	8.6	31	0.05	90	13	**570**	12.8	1.7	Absent	-	-	-
26115	BC4 Surface	3.5	<0.4	7.7	19	<0.05	29	7.8	110	22.7	0.3	Absent	-	-	-
26115	BC5 Surface	13	<0.4	13	30	<0.05	40	46	260	27.2	0.7	Absent	-	-	-
26115	BC6 Surface	12	<0.4	11	19	0.05	**350**	6.5	320	8.5	0.9	Absent	-	-	-
26115A	BC6 300mm	-	-	-	-	-	13	-	-	-	-	-	-	-	-
26115	BC7 Surface	19	<0.4	23	9.9	<0.05	98	8.7	140	5.7	0.8	Absent	-	-	-
26115	BC8 Surface	20	4.6	28	25	0.06	93	24	**3200**	8.7	4.2	Absent	-	-	-
26115	BC9 Surface	5.8	2.8	<5	30	<0.05	77	12	**3000**	3.4	5	Absent	-	-	-
26917	BC11 Surface	-	-	-	-	-	37	-	-	-	-	-	-	-	-
26917	BC12 Surface	-	-	-	-	-	20	-	-	-	-	-	-	-	-
26917	BC14 Surface	-	-	-	-	-	160	-	-	-	-	-	-	-	-
26917A	BC16 Surface	-	-	-	-	-	-	-	120	-	-	-	-	-	-
26917	BC17 Surface	-	-	-	-	-	-	-	**2000**	-	-	-	18.5	6.9	6.2
26917A	BC17 300mm	-	-	-	-	-	-	-	350	-	-	-	-	-	-
26917	BC18 Surface	-	-	-	-	-	-	-	**910**	-	-	-	-	-	-
26917A	BC18 300mm	-	-	-	-	-	-	-	94	-	-	-	-	-	-
26917A	BC19 Surface	-	-	-	-	-	-	-	**700**	-	-	-	-	-	-
26917A	BC22 Surface	-	-	-	-	-	-	-	**1600**	-	-	-	-	-	-
26917	BC23 Surface	-	-	-	-	-	-	-	**1300**	-	-	-	-	-	-
26917A	BC23 300mm	-	-	-	-	-	-	-	120	-	-	-	-	-	-
26917	BC24 Surface	-	-	-	-	-	-	-	**560**	-	-	-	-	-	-
26917A	BC24 300mm	-	-	-	-	-	-	-	340	-	-	-	-	-	-
26917A	BC25 Surface	-	-	-	-	-	-	-	**1700**	-	-	-	-	-	-
26917	BC26 Surface	-	-	-	-	-	-	-	250	-	-	-	-	-	-

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**40**	**300**	**400**	**7400**	**-**	**-**
EIL/ESL	**100**	**-**	**-**	**140**	**-**	**1200**	**170**	**340**	**-**	**-**
No of samples	9	9	9	9	9	13	9	22	9	9
Min	3.5	<0.4	<5	9.9	0.05	13	<5	94	3.4	0.3
Max	20	4.6	28	31	0.06	**350**	46	**3200**	27.2	5
Mean	10	1.2	12	22	0.05	88	15	834	13	2
Std Dev	-	-	-	-	-	89	-	924	-	-
CoV	-	-	-	-	-	1.01	-	1.11	-	-
Count	-	-	-	-	-	13	-	22	-	-
t95	-	-	-	-	-	1.782	-	1.721	-	-
95UCL	-	-	-	-	-	132	-	**1173**	-	-

Notes:

BOLD Exceedances are highlighted and BOLD

AEC 11 - Former Structure BD

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)	Asbestos (detection)
26094	BD1 Surface	6	<0.4	5.3	30	<0.05	21	7.9	250	826.5	2.2	Absent
26094	BD2 Surface	6.4	<0.4	8.2	25	<0.05	68	5.5	260	39.7	0.9	Absent
26094	BD3 Surface	3.9	<0.4	<5	22	<0.05	29	<5	110	4.8	0.5	Absent
26094	BD4 Surface	<2	<0.4	5.1	34	<0.05	22	8.9	**390**	35.3	1.4	Absent
26094	BD5 Surface	<2	<0.4	<5	23	0.05	22	6.5	200	102.6	1.2	Absent
26094	BD6 Surface	<2	<0.4	<5	26	<0.05	26	8.9	330	29.5	1.1	Absent
26094	BD7 Surface	<2	<0.4	<5	31	<0.05	21	9.3	280	29.5	3.9	Absent

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**40**	**300**	**400**	**7400**	**-**	**-**
EIL/ESL	**100**	**-**	**-**	**140**	**-**	**1200**	**170**	**340**	**-**	**-**
No of samples	7	7	7	7	7	7	7	7	7	7
Min	3.9	<0.4	5.1	22	<0.05	21	5.5	110	4.8	0.5
Max	6.4	<0.4	8.2	34	0.05	68	9.3	390	826.5	3.9
Mean	5	-	6	27	-	30	8	260	153	1.6
Std Dev	-	-	-	-	-	-	-	90	-	-
CoV	-	-	-	-	-	-	-	0.35	-	-
Count	-	-	-	-	-	-	-	7	-	-
t95	-	-	-	-	-	-	-	2	-	-
95UCL	-	-	-	-	-	-	-	326	-	-

Notes:

BOLD Exceedances are highlighted and BOLD

AEC 11 - Former Structure BE

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)	Asbestos (detection)	CEC -	pH (pH Units)	pH Ca Cl (pH Units)
26094	BE2 Surface	7.3	0.6	11	110	0.06	140	17	1000	10.9	5.5	Absent			
26094	BE3 Surface	12	<0.4	15	69	<0.05	49	11	370	11.3	2.2	Absent			
26094	BE4 Surface	3.6	<0.4	5.9	59	<0.05	71	15	260	7.3	1.5	Absent			
26094	BE5 Surface	18	1	13	250	0.06	120	9.8	1400	9.6	6.3	Absent			
26094	BE6 Surface	13	<0.4	13	30	<0.05	50	<5	350	15.1	0.5	Absent			
26094	BE7 Surface	8.8	2.8	8.4	84	<0.05	64	6.2	1500	9.8	1.4	Absent			
26094	BE8 Surface	20	0.7	13	180	<0.05	64	6.5	660	11.8	4.4	Absent			
26094	BE9 Surface	8.6	2.1	5.9	87	<0.05	63	8	1000	21.5	1.8	Absent			
26917	BE10 Surface								56				10.6	5.6	4.9
26917	BE12 Surface				15				160						
26917	BE14 Surface								80						
26917	BE16 Surface				12				49						
26917	BE19 Surface								48						
26917A	BE20 Surface								480						
26917	BE21 Surface								510						
26917A	BE21 300mm								36						
26917	BE23 Surface								41						
26917	BE25 Surface				10				110						
26917	BE27 Surface								330						

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**40**	**300**	**400**	**7400**	**-**	**-**
EIL/ESL	**100**	**-**	**-**	**140**	**-**	**1200**	**170**	**340**	**-**	**-**
No of samples	8	8	8	11	8	8	8	19	8	8
Min	3.6	<0.4	5.9	10	<0.05	49	<5	36	7.3	0.5
Max	20	2.8	15	250	0.06	140	17	1500	21.5	6.3
Mean	11	1.1	11	82	0.05	78	10	444	12	3
Std Dev	-	-	-	-	-	-	-	464	-	-
CoV	-	-	-	-	-	-	-	1.04	-	-
Count	-	-	-	-	-	-	-	19	-	-
t95	-	-	-	-	-	-	-	2	-	-
95UCL	-	-	-	-	-	-	-	**629**	-	-

Notes:

BOLD Exceedances are highlighted and BOLD

AEC 11 - Former Structure BF

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)	Asbestos (detection)
26115	BF2 Surface	17	<0.4	11	16	0.07	31	<5	85	15.7	0.4	Absent
26115	BF3 Surface	<2	<0.4	6.7	54	<0.05	19	9.1	**440**	110.5	1.1	Absent
26115	BF4 Surface	3.1	<0.4	6.2	15	0.06	23	10	140	52.7	1.4	Absent
26115	BF5 Surface	15	<0.4	12	20	<0.05	28	6.5	120	50.5	0.6	Absent

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Na_mgL (mg/L)	CaCO3 (%)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**40**	**300**	**400**	**7400**	**-**	**-**
EIL/ESL	**100**	**-**	**-**	**140**	**-**	**1200**	**170**	**340**	**-**	**-**
No of samples	4	4	4	4	4	4	4	4	4	4
Min	<2	<0.4	6.2	15	0.06	19	<5	85	15.7	0.4
Max	17	<0.4	12	54	0.07	31	10	440	110.5	1.4
Mean	9.3	-	9.0	26	0.06	25	8	196	57	1
Std Dev	-	-	-	-	-	-	-	164	-	-
CoV	-	-	-	-	-	-	-	0.84	-	-
Count	-	-	-	-	-	-	-	4	-	-
t95	-	-	-	-	-	-	-	2	-	-
95UCL	-	-	-	-	-	-	-	**389**	-	-

Notes:

BOLD Exceedances are highlighted and BOLD

AEC 11 - Former Structure BH

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Napthelene (mg/kg)	Total PAH (mg/kg)	BaP TEQ (mg/kg)	CEC -	pH (pH Units)	pH Ca Cl (pH Units)
26917	BH1 Surface	4.3	0.7	14	19	<0.05	47	7.2	370	-	-	-	11.7	5.9	5
26917	BH2 Surface	12	<0.4	44	5.5	<0.05	14	<5	32	-	-	-	-	-	-
27878	BH2 400mm	-	-	-	-	-	-	-	-	<0.5	<0.5	0.6	-	-	-
26917	BH3 Surface	3.2	0.5	9.4	22	<0.05	72	7.9	210	-	-	-	-	-	-
26917	BH6 Surface	<2	<0.4	<5	18	<0.05	37	7.6	110	-	-	-	-	-	-
26917	BH7 Surface	7.1	0.9	22	42	<0.05	120	15	360	-	-	-	-	-	-

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**40**	**300**	**400**	**7400**
EIL/ESL	**100**	**-**	**-**	**140**	**-**	**1200**	**170**	**340**
No of samples	4	3	5	5	5	5	4	5
Min	<2	<0.4	<5	5.5	<0.05	14	7.2	32
Max	12	0.9	44	42	<0.05	120	15	370
Mean	5.7	0.6	18.9	21.3	-	58.0	9.4	216.4
Std Dev	-	-	-	-	-	-	-	150
CoV	-	-	-	-	-	-	-	0.69
Count	-	-	-	-	-	-	-	5
t95	-	-	-	-	-	-	-	2
95UCL	-	-	-	-	-	-	-	**359**

Notes:

BOLD Exceedances are highlighted and BOLD

AEC 11 - Former Structure BI

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Napthelene (mg/kg)	Total PAH (mg/kg)	BaP TEQ (mg/kg)	CEC -	pH (pH Units	pH Ca Cl (pH Units)
26955	BI1 Surface	11	<0.4	14	35	0.07	95	24	290	-	-	-	12.1	6.6	5.8
26955	BI2 Surface	9.3	0.4	14	18	0.06	83	<5	110	-	-	-	-	-	-
26955	BI3 Surface	5.8	0.4	14	19	<0.05	28	7.2	82	<0.5	<0.5	0.6	-	-	-
26955	BI4 Surface	12	0.4	12	22	0.06	36	<5	120	-	-	-	-	-	-
26955	BI5 Surface	8	<0.4	12	15	<0.05	19	<5	59	-	-	-	-	-	-
26955	BI6 Surface	10	<0.4	13	51	0.11	68	6.7	150	<0.5	7	0.6	-	-	-
26955	BI7 Surface	6.3	<0.4	8.3	20	<0.05	32	12	140	-	-	-	-	-	-
26955	BI8 Surface	16	0.5	17	33	0.06	55	12	160	-	-	-	-	-	-
26955	BI10 Surface	6.5	<0.4	7.7	25	0.06	50	7.5	140	<0.5	3.6	0.6	-	-	-
26955	BI11 Surface	7.6	0.6	13	19	<0.05	31	6.4	170	-	-	-	-	-	-
26955	BI13 Surface	10	0.9	18	35	0.08	120	9.1	**360**	<0.5	5.7	0.7	-	-	-

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**40**	**300**	**400**	**7400**
EIL/ESL	**100**	**-**	**-**	**140**	**-**	**1200**	**170**	**340**
No of samples	11	11	11	11	11	11	11	11
Min	5.8	<0.4	7.7	15	<0.05	19	<5	59
Max	16	0.9	18	51	0.11	120	24	360
Mean	9.3	0.5	13.0	26.5	0.06	56.1	9.1	161.9
Std Dev	-	-	-	-	-	-	-	88
CoV	-	-	-	-	-	-	-	0.55
Count	-	-	-	-	-	-	-	11
t95	-	-	-	-	-	-	-	2
95UCL	-	-	-	-	-	-	-	210

Notes:

BOLD Exceedances are highlighted and BOLD

AEC 12 - Potential Filling in Former Dams

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	pH (Unit)
26034	JA1 Surface	18	0.6	21	11	<0.05	6	22	46	6.1
26034	JA2 Surface	8.1	<0.4	11	12	<0.05	5.1	17	47	6.5
26034	JA3 Surface	14	<0.4	15	10	<0.05	<5	18	31	7.2
26034	JA4 Surface	12	0.7	22	20	<0.05	6.8	23	55	7.8
26034	JA5 Surface	15	0.6	24	12	<0.05	5.3	22	39	6.7
27079	JA5 300mm	15	<0.4	19	13	<0.05	12	21	21	-

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	pH (Unit)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**300**	**40**	**400**	**7400**	**-**
EIL/ESL	**100**	**-**	**-**	**220**	**1100**	**-**	**270**	**610**	**-**
No of samples	6	6	6	6	6	5	6	6	5
Min	8.1	<0.4	11	10	<0.05	<5	17	21	6.1
Max	18	0.7	24	20	,0.05	12	23	55	7.8
Mean	14	0.5	19	13	-	7	21	40	6.9

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	pH (Unit)
26034	JB1 Surface	8.6	0.5	14	12	<0.05	<5	21	40	6.2
26034	JB2 Surface	7.3	<0.4	11	21	<0.05	<5	23	46	6.2
26034	JB3 Surface	10	0.5	22	22	<0.05	<5	23	40	5.6
26034	JB4 Surface	10	0.8	23	16	<0.05	<5	39	35	5.9
26034	JB5 Surface	20	1.1	41	14	<0.05	<5	30	60	6.2

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	pH (Unit)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**300**	**40**	**400**	**7400**	**-**
EIL/ESL	**100**	**-**	**-**	**220**	**1100**	**-**	**270**	**610**	**-**
No of samples	5	4	5	5	5	5	5	5	5
Min	7.3	0.5	11	12	<0.05	<5	21	35	5.6
Max	20	1.1	41	22	<0.05	<5	39	60	6.2
Mean	11	0.7	22	17	-	-	27	44	6.0

Batch#	Sample Name	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	pH (Unit)
26034	JC1 Surface	12	1	44	9	<0.05	<5	30	17	5.9
26034	JC2 Surface	9.5	<0.4	25	15	<0.05	<5	17	18	5.6
26034	JC3 Surface	6.4	0.5	22	19	<0.05	<5	18	19	5.4
26034	JC4 Surface	9.3	0.5	22	11	<0.05	<5	24	20	5.5
26034	JC5 Surface	9	0.5	28	8	<0.05	<5	18	12	5.8
26034	JC6 Surface	6.9	<0.4	21	10	<0.05	<5	22	21	5.8
26034	JC7 Surface	5.9	<0.4	18	16	<0.05	<5	41	26	5.6
26034	JC8 Surface	7.1	0.4	21	7	<0.05	<5	18	10	5.7

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	pH (Unit)
HIL/HSL-A	**100**	**20**	**100**	**6000**	**300**	**40**	**400**	**7400**	**-**
EIL/ESL	**100**	**-**	**-**	**220**	**1100**	**-**	**270**	**610**	**-**
No of samples	8	8	8	8	8	8	8	8	8
Min	5.9	<0.4	18	7	<0.05	<5	17	10	5.4
Max	12	1	44	19	<0.05	<5	41	26	5.9
Mean	8	0.5	25	12	-	-	24	18	5.7

AEC 13: Groundwater Assessment

Report#		ANZECC	91146 (EIS)	91146 (EIS)	91146 (EIS)	91146 (EIS)	91146 (EIS)	91146 (EIS)	91146 (EIS)
Sample Name			MW1	MW2	MW3	MW4	MW5	MW6	MW7
Date Sampled			22/05/2013	22/05/2014	22/05/2015	22/05/2016	22/05/2017	22/05/2018	22/05/2019
Arsenic	(ug/L)	24	1	1	3	4	**30**	1	<1
Cadmium	(ug/L)	0.2	**0.3**	0.2	**1.2**	0.2	**0.4**	**1.1**	**1.8**
Chromium	(ug/L)	1	<1	<1	<1	<1	<1	1	<1
Copper	(ug/L)	1.4	**3**	**10**	**2**	**2**	**4**	**7**	1
Lead	(ug/L)	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	(ug/L)	3.4	<1	<1	<1	<1	2	1	<1
Nickel	(ug/L)	11	**140**	**130**	**290**	**61**	**340**	**180**	**65**
Zinc	(ug/L)	8	**470**	**260**	**310**	**51**	**130**	**260**	**110**
Iron	(ug/L)	300*	**33000**	**220000**	52	210	**8100**	**27000**	53
Total Nitrogen	mg/L	0.5^	1.8	2.5	1.1	2.1	1.5	1.4	11
Total Phosphorus	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
NOx as N in water	mg/L	40^	<0.005	<0.005	0.03	0.06	<0.005	0.08	10
Ammonia as N in water	mg/L	20^	0.93	1.4	0.54	1.7	0.93	0.45	0.47
Phosphate as P in water	mg/L	N/A	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.017
E. coli	CFU/100mL	N/A	<10	<10	4000 Approximate	<100 NBO	<10	<10	<10 NBO
Faecal Coliforms	CFU/100mL	N/A	<10	<10	4000 Approximate	<100 NBO	<10	<10	<10 NBO
Total Coliforms	CFU/100mL	N/A	<10	<10	800 Approximate NBO	10 Approximate NBO	60 Approximate	<10	<1 NBO
Faecal Streptococci	CFU/100mL	N/A	<10	<10	<10	<10	<10	<10	<10

Report#		ANZECC	26950 (SESL)	26950 (SESL)	26987 (SESL)	26987 (SESL)	26987 (SESL)	26987 (SESL)
Sample Name			MW1	MW3	MW4	MW5	MW6	MW7
Date Sampled			17/07/2013	17/07/2013	18/07/2013	18/07/2013	18/07/2013	18/07/2013
Arsenic	(ug/L)	24	1	2	<1	6	3	<1
Cadmium	(ug/L)	0.2	**0.4**	1	<0.1	**1.2**	**0.9**	**1.7**
Chromium	(ug/L)	1	<1	**2**	<1	<1	1	<1
Copper	(ug/L)	1.4	**9**	**19**	**4**	**39**	**53**	**22**
Lead	(ug/L)	0.06	<0.05	**0.17**	<0.05	<0.05	<0.05	<0.05
Mercury	(ug/L)	3.4	1	3	<1	**30**	**5**	<1
Nickel	(ug/L)	11	**140**	**220**	**180**	**320**	**200**	**44**
Zinc	(ug/L)	8	**660**	**380**	**150**	**680**	**320**	**120**
Iron	(ug/L)	300*	**43000**	**1200**	**67000**	**23000**	**37000**	<10
Total Nitrogen	mg/L	0.5^	**1.6**	**1.3**	**2.6**	**2.4**	**1.4**	**24**
Total Phosphorus	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
NOx as N in water	mg/L	40^	0.006	0.03	<0.02	<0.005	<0.005	17
Ammonia as N in water	mg/L	20^	0.77	1.1	0.94	1.2	0.28	0.31
Phosphate as P in water	mg/L	N/A	<0.005	<0.01	<0.05	<0.005	<0.005	0.023
E. coli	CFU/100mL	N/A	<10	<10	<1	<1	10 Approximate	170
Faecal Coliforms	CFU/100mL	N/A	<10	<10	1 Approximate	<1	10 Approximate	85
Total Coliforms	CFU/100mL	N/A	<10	20 Approximate	1	<1	10 Approximate	190
Faecal Streptococci	CFU/100mL	N/A	20 Approximate	<10	<1	<1	1	2

Notes:

BOLD Exceedances are highlighted and BOLD

* Low reliability trigger vale

^ SE Australia Lowland River Trigger Value