Site Audit Report

0503-1914

771 Cudgen Road
Cudgen NSW

22 November 2019

56336/125255 (Rev 0)

JBS&G Australia Pty Ltd

www.jbsg.com.au

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 12 October 2017.

For information about completing this form, go to Part IV.

Part I: Site audit identification

Site audit statement no. 0503-1914

This site audit is a:

☑ statutory audit

❑ 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 **Andrew Lau**

Company **JBS&G**

Address **Level 1, 50 Margaret Street**

Sydney NSW Postcode **2000**

Phone **02 8245 0300**

Email **alau@jbsg.com.au**

Site details

Address **771 Cudgen Road**

Cudgen NSW Postcode **2487**

Property description

(Attach a separate list if several properties are included in the site audit.)

Lot 11 in DP 1246853

Local government area **Tweed Shire Council**

Area of site (include units, e.g. hectares) **19.38 ha (approx.)**

Current zoning **SP2 Infrastructure (Health Services Facility), 2(c) Urban Expansion, 1(b1) Agricultural Protection, 7(l) Environmental Protection (Habitat)**

Regulation and notification

To the best of my knowledge:

- ☐ ~~**the site is** the subject of a declaration, order, agreement, proposal or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*, as follows: (provide the no. if applicable)~~
  - ☐ ~~Declaration no.~~
  - ☐ ~~Order no.~~
  - ☐ ~~Proposal no.~~
  - ☐ ~~Notice no.~~

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

To the best of my knowledge:

- ☐ ~~the site **has** been notified to the EPA under section 60 of the *Contaminated Land Management Act 1997*~~

☑ the site **has not** been notified to the EPA under section 60 of the *Contaminated Land Management Act 1997*.

Site audit commissioned by

Name **Sue Folliott**

Company **Health Infrastructure c/o TSA Management**

Address **Level 15, 241 Adelaide Street**

Brisbane QLD Postcode **4000**

Phone **02 9276 1400**

Email sfolliott@tsamanagement.com.au

Contact details for contact person (if different from above)

Name **Stuart Clark**

Phone **02 9276 1400**

Email sclark@tsamanagement.com.au

Nature of statutory requirements (not applicable for non-statutory audits)

☐ ~~Requirements under the *Contaminated Land Management Act* 1997 (e.g. management order; please specify, including date of issue)~~

☐ ~~Requirements imposed by an environmental planning instrument (please specify, including date of issue)~~

☑ Development consent requirements under the *Environmental Planning and Assessment Act 1979* (please specify consent authority and date of issue)

State Significant Development SSD 9575, 11 June 2019

☐ ~~Requirements under other legislation (please specify, including date of issue)~~

Purpose of site audit

☑ **A1** To determine land use suitability

Intended uses of the land: Hospital

~~OR~~

~~☐ **A2** To determine land use suitability subject to compliance with either an active or passive environmental management plan~~

~~Intended uses of the land:~~

~~OR~~

~~(Tick all that apply)~~

- ~~☐ **B1** To determine the nature and extent of contamination~~
- ~~☐ **B2** To determine the appropriateness of:~~
  - ~~☐ an investigation plan~~
  - ~~☐ a remediation plan~~
  - ~~☐ a management plan~~
- ~~☐ **B3** To determine the appropriateness of a **site testing plan** to determine if groundwater is safe and suitable for its intended use as required by the *Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017*~~
- ~~☐ **B4** To determine the compliance with an approved:~~
  - ~~☐ **voluntary management proposal** or~~
  - ~~☐ **management order** under the *Contaminated Land Management Act 1997*~~
- ~~☐ **B5** To determine if the land can be made suitable for a particular use (or uses) if the site is remediated or managed in accordance with a specified plan.~~

~~Intended uses of the land:~~

Information sources for site audit

Consultancies which conducted the site investigations and/or remediation:

OCTIEF

Cavvanba Consulting

Titles of reports reviewed:

- Soil Sampling Analysis and Quality Plan, 771 Cudgen Road, Cudgen, NSW, OCTIEF Pty Ltd, Reference: Version 2.0, 10 August 2018 (OCTIEF 2018a).
- Preliminary and Detailed Site Investigation – 771 Cudgen Road, Cudgen, NSW 2487, OCTIEF Pty Ltd, Reference: Version 4, 17 October 2018 (OCTIEF 2018b).

- Remediation Action Plan, Tweed Valley Hospital site, 771, Cudgen Road, Cudgen NSW, OCTIEF Pty Ltd, Reference: Version 5, 1 February 2019 (OCTIEF 2019).
- Hazardous Material Register, 771 Cudgen Creek Road, Cudgen NSW, Cavvanba Pty Ltd, Reference: 18084, 19 November 2018 (Cavvanba 2018a).
- Asbestos Clearance Certificate 18084-CC04, 771 Cudgen Road, Cudgen NSW, Cavvanba Consulting Pty Ltd, Reference: 18084-CC04, December 2018 (Cavvanba 2018b).
- Soil Investigation Report – Residential House, 771 Cudgen Road, Cudgen NSW, Cavvanba Consulting Pty Ltd, Reference: 18084 R01 V2, 24 January 2019 (Cavvanba 2019a).
- Remedial Action Plan Addendum – Residential House, 771 Cudgen Road, Cudgen NSW, Cavvanba Consulting Pty Ltd, Reference: 18084 R02 V3, 24 January 2019 (Cavvanba 2019b).
- Soil Investigation Report – Farm Shed, 771 Cudgen Road, Cudgen NSW, Cavvanba Consulting Pty Ltd, Reference: 18084 R03 V2, 24 January 2019 (Cavvanba 2019c).
- Remedial Action Plan Addendum – Farm Shed, 771 Cudgen Road, Cudgen NSW, Cavvanba Consulting Pty Ltd, Reference: 18084 R04 V2, 24 January 2019 (Cavvanba 2019d).
- Soil Investigation Report – Residential House, 771 Cudgen Road, Cudgen NSW, Cavvanba Consulting Pty Ltd, Reference: 18084 R01 V3, 1 August 2019 (Cavvanba 2019f).
- Remedial Action Plan Addendum – Residential House, 771 Cudgen Road, Cudgen NSW, Cavvanba Consulting Pty Ltd, Reference: 18084 R02 V4, 1 August 2019 (Cavvanba 2019g).
- Groundwater and Soil Investigation, 771 Cudgen Road, Cudgen NSW, Cavvanba Consulting Pty Ltd, Reference: 19038 R02 V2, 22 August 2019 (Cavvanba 2019h).
- Remedial Action Plan Addendum – Farm Pit, 771 Cudgen Road, Cudgen NSW, Cavvanba Consulting Pty Ltd, Reference: 19038 R03 V2, 19 August 2019 (Cavvanba 2019i).
- Validation Data Quality Objectives and Sampling, Analysis and Quality Plan, Proposed Tweed Valley Hospital, 771 Cudgen Road, Cudgen NSW, Cavvanba Consulting Pty Ltd, Reference: 19038 R04 V1, 23 August 2019 (Cavvanba 2019j).
- Remediation Area Plan, B & P Survey Consulting Surveyors, ref: T16452, 9 August 2019.
- Work Health and Safety Plan, Delta Pty Ltd, 28 August 2019 (Delta 2019).
- Tweed Valley Hospital, Works Plan, Lendlease Building Pty Ltd, Reference: Rev3, 26 August 2019 (LLB 2019a).

- Tweed Valley Hospital, Management Plan – Hazardous Materials, Lendlease Building Pty Ltd, Reference: Rev7, 28 August 2019 (LLB 2019b).
- Validation report, 771 Cudgen Road, Cudgen NSW, Cavvanba Consulting Pty Ltd, Reference: 19038 R05 V2, 7 November 2019 (Cavvanba 2019k).

Other information reviewed, including previous site audit reports and statements relating to the site:

- Preliminary Site Investigation Contaminated Land, Due Diligence Summary Report – Shortlisted Sites, Tweed Valley Hospital Project, OCTIEF Pty Ltd, 28 June 2018 (OCTIEF 2018c).
- Additional Geotechnical Investigation, Proposed Tweed Valley Hospital, Lot 102 on DP870722, Cudgen Road, Kingscliff, Morrison Geotechnic, December 2018 (Morrison Geotechnic 2018).
- Cavvanba email correspondence dated 29 January 2019 (Appendix B), relating to an unexpected find comprising a concrete pit, concrete ramp, concrete drip pad and infilled pit and wastes (Cavvanba 2019e).
- Site Audit Statement no. 0503-1901 and accompanying Site Audit Report 0503-1901, 771 Cudgen Road, Cudgen NSW, Ref: 55264/117086 (Rev 0), 4 February 2019 (JBS&G 2019a).

Site audit report details

Title Site Audit Report 0503-1914, 771 Cudgen Road, Cudgen NSW	
Report no. 56336/125255 (Rev 0)	Date 22 November 2019

Part II: Auditor's findings

Please complete either Section A1, Section A2 or Section B, not more than one section. (Strike out the irrelevant sections.)

- Use **Section A1** where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land uses **without the implementation** of an environmental management plan.
- Use **Section A2** where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land uses **with the implementation** of an active or passive environmental management plan.
- Use **Section B** where the audit is to determine:
    - (B1) the nature and extent of contamination, and/or
    - (B2) the appropriateness of an investigation, remediation or management plan[1], and/or
    - (B3) the appropriateness of a site testing plan in accordance with the *Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017*, and/or
    - (B4) whether the terms of the approved voluntary management proposal or management order have been complied with, and/or
    - (B5) whether the site can be made suitable for a specified land use (or uses) if the site is remediated or managed in accordance with the implementation of a specified plan.

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

~~Section A1~~

I certify that, in my opinion:

The **site is 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):

Hospital

~~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:

- The site assessment activities and remediation and validation works are considered to have met the requirements of the Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd Edition) (EPA 2017).

- The site investigation activities identified lead, B(a)P and asbestos impacted soils in the vicinity of the residential house, farm pit and farm shed which required remediation or management under the proposed use as a hospital. Additionally, metals, TRH and naphthalene impacted water and concrete associated with the farm pit concrete sump feature and building and demolition waste in the vicinity of the farm dump required management.

- There were no levels of the identified contaminants of potential concern in groundwater which are considered to require remediation or management under the proposed use. There was no evidence of potential or actual migration of contaminants from the site which may result in unacceptable risks to surrounding human or ecological receptors.

- The RAP (OCTIEF 2019) and subsequent RAP addenda (Cavvanba 2019b, 2019d and 2019i) prepared for the site addressed the identified contamination issues as they relate to the proposed uses of the site. The remediation approach documented in the RAP and RAP addenda was checked by the auditor and was found to be

technically feasible, environmentally justifiable given the nature and extent of the identified contamination and consistent with relevant laws, policies and guidelines.

- The remediation works completed at the site included excavation and off-site disposal of impacted soils surrounding residential house, farm pit and farm shed as well as removal of water and concrete associated with the farm pit concrete sump feature, removal of building and demolition waste in the vicinity of the farm dump and removal of unexpected find relating to a glass bottle burial pit in the vicinity of the farm shed.

- Given the nature of the identified contamination and the remediation works undertaken, there was no evidence of potential or actual migration of contaminants from the site which may result in unacceptable risks to surrounding human or ecological receptors.

- The auditor considers that the remediation and validation works were generally completed in accordance with the requirements of the RAP (OCTIEF 2019), RAP addenda (Cavvanba 2019b, 2019d and 2019i), VSAQP (Cavvanba 2019j) and previous auditor advice.

- The site is considered suitable for residential with garden / accessible soil land use as defined in Section 3 of Schedule B7 NEPC 2013, consistent with the proposed sensitive land use as a hospital.

- The suitability of the site for the identified uses is not dependent on any ongoing management of contamination. However, as part of the normal process of construction management, should any unexpected finds be encountered during the development works, these should be addressed in accordance with the unexpected finds protocols documented in the RAP (OCTIEF 2019) and subsequent RAP addenda (Cavvanba 2019b, 2019d and 2019i).

Section A2

I certify that, in my opinion:

Subject to compliance with the **attached** environmental management plan[2] (EMP), the site is 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):

_____

EMP details

Title _____

Author _____

Date _____ No. of pages _____

EMP summary

This EMP (attached) is required to be implemented to address residual contamination on the site.

The EMP: (Tick appropriate box and strike out the other option.)

☐ requires operation and/or maintenance of **active** control systems[3]

☐ requires maintenance of **passive** control systems only[3].

[2] Refer to Part IV for an explanation of an environmental management plan.
[3] Refer to Part IV for definitions of active and passive control systems.

~~Purpose of the EMP:~~

~~Description of the nature of the residual contamination:~~

~~Summary of the actions required by the EMP:~~

~~How the EMP can reasonably be made to be legally enforceable:~~

~~How there will be appropriate public notification:~~

~~Overall comments:~~

Section B

Purpose of the plan[4] which is the subject of this audit:

I certify that, in my opinion:

(B1)

- ☐ The nature and extent of the contamination **has** been appropriately determined
- ☐ The nature and extent of the contamination **has not** been appropriately determined

AND/OR (B2)

- ☐ The investigation, remediation or management plan **is** appropriate for the purpose stated above
- ☐ The investigation, remediation or management plan **is not** appropriate for the purpose stated above

AND/OR (B3)

- ☐ The site testing plan:
  - ☐ **is** appropriate to determine
  - ☐ **is not** appropriate to determine

  if groundwater is safe and suitable for its intended use as required by the *Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017*

AND/OR (B4)

- ☐ The terms of the approved voluntary management proposal* or management order** (strike out as appropriate):
  - ☐ **have** been complied with
  - ☐ **have not** been complied with.

  *voluntary management proposal no.

  **management order no.

AND/OR (B5)

- ☐ 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

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

- ☐ 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 plan (**attached**):

*Strike out as appropriate

Plan title

Plan author

Plan date No. of pages

SUBJECT to compliance with the following condition(s):

Overall comments:

Part III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority (EPA) under the *Contaminated Land Management Act 1997.*

Accreditation no. 0503

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.

Signed 

Date 22 November 2019

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

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

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

The auditor is to complete either Section A1 or Section A2 or Section B of Part II, **not** more than one section.

Section A1

In Section A1 the auditor may conclude that the land is *suitable* for a specified use or uses 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 investigation or remediation or management of the site was needed to render the site fit for the specified use(s). **Conditions must not be** imposed on a Section A1 site audit statement. Auditors may 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.

Section A2

In Section A2 the auditor may conclude that the land is *suitable* for a specified use(s) subject to a condition for implementation of an environmental management plan (EMP).

Environmental management plan

Within the context of contaminated sites management, an EMP (sometimes also called a 'site management plan') means a plan which addresses the integration of environmental mitigation and monitoring measures for soil, groundwater and/or hazardous ground gases throughout an existing or proposed land use. An EMP succinctly describes the nature and location of contamination remaining on site and states what the objectives of the plan are, how contaminants will be managed, who will be responsible for the plan's implementation and over what time frame actions specified in the plan will take place.

By certifying that the site is suitable subject to implementation of an EMP, an auditor declares that, at the time of completion of the site audit, there was sufficient information satisfying guidelines made or approved under the *Contaminated Land Management Act 1997*

(CLM Act) to determine that implementation of the EMP was feasible and would enable the specified use(s) of the site and no further investigation or remediation of the site was needed to render the site fit for the specified use(s).

Implementation of an EMP is required to ensure the site remains suitable for the specified use(s). The plan should be legally enforceable: for example, a requirement of a notice under the 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*.

Active or passive control systems

Auditors must specify whether the EMP requires operation and/or maintenance of active control systems or requires maintenance of passive control systems only. Active management systems usually incorporate mechanical components and/or require monitoring and, because of this, regular maintenance and inspection are necessary. Most active management systems are applied at sites where if the systems are not implemented an unacceptable risk may occur. Passive management systems usually require minimal management and maintenance and do not usually incorporate mechanical components.

Auditor's comments

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.

Section B

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 the appropriateness of a site testing plan in accordance with the *Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017*, and/or whether the terms of an approved voluntary management proposal or management order made under the CLM Act have been complied with, and/or whether the site can be made suitable for a specified land use or uses if the site is remediated or managed in accordance with the implementation of a specified 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. The condition must not specify an individual auditor, only that further audits are required.

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.

Part III

In **Part III** the auditor certifies their 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

- the **NSW Environment Protection Authority**:
  nswauditors@epa.nsw.gov.au or as specified by the EPA

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

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0503-1914

771 Cudgen Road
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Table of Contents

List of Tables

Appendices

Abbreviations

Term	Definition
As	Arsenic
AST	Aboveground Storage Tank
Cd	Cadmium
Cr	Chromium
Cu	Copper
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
B(a)P	Benzo(a) pyrene
DO	Dissolved oxygen
DP&E	NSW Department of Planning and Environment
DQO	Data Quality Objectives
EC	Electrical conductivity
EH	Redox potential
EIL	Ecological Investigation Level
EPA	New South Wales Environment Protection Authority
Hg	Mercury
HIL	Health Based Investigation Level
LOR	Limit of Reporting
MAH	Monocyclic Aromatic Hydrocarbon
Ni	Nickel
OCP	Organochlorine Pesticide
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PCB	Polychlorinated Biphenyls
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percentage Difference
SAR	Site Audit Report
SAS	Site Audit Statement
TPH	Total Petroleum Hydrocarbons
UST	Underground Storage Tank
Zn	Zinc

1. Introduction

1.1 Introduction and Background

Andrew Lau of JBS&G Australia Pty Ltd (JBS&G) was engaged by TSA Management on behalf of Health Infrastructure (HI, the client) on 29 April 2019 to conduct a site audit at the proposed Tweed Valley Hospital located at 771 Cudgen Road, Cudgen, NSW, 2487 (the site). The site is legally identified as Lot 11 in DP 1246853 and encompasses an area of 19.38 hectares (ha). Refer to **Appendix C** for the site layout.

The proposed Tweed Valley Hospital Project is understood to consist of:

- Delivery of a new Level 5 major referral hospital to provide the health services required to meet the needs of the growing population of the Tweed-Byron region, in conjunction with the other hospitals and community health centres across the region.
- Master planning for additional health, education, training and research facilities to support these health services, which will be developed with service partners over time. These areas will be used initially for construction site/ compound and at-grade car parking.
- Delivery of the supporting infrastructure required for the new hospital, including green space and other amenities, campus roads and car parking, external road upgrades and connections, utilities connections, and other supporting infrastructure.

A remedial action plan (RAP, OCTIEF 2019) and subsequent RAP addenda (Cavvanba 2019b and 2019d) were prepared for the site to address identified contamination issues associated with former residential/agricultural land use. These documents were reviewed and formed the basis of Site Audit Statement (SAS) and Site Audit Report (SAR) issued by Andrew Lau on 4 February 2019 (Audit Number 0503-1901).

Conclusions drawn by the Auditor as part of the abovementioned SAS and SAR stated that that remediation and validation procedures outlined in the RAP (OCTIEF 2019) and RAP addenda (Cavvanba 2019b and 2019d) were considered appropriate to make the site suitable for the proposed uses, subject to the following:

- A Validation Sampling Analysis and Quality Plan (VSAQP), Work Health and Safety Plan (WHSP), Asbestos Management Plan (AMP) and Emergency Response Procedures for the site must be reviewed and accepted by site auditor prior to commencement of remediation works;
- The validation report must be reviewed and accepted by a site auditor following successful completion of site remediation/validation and prior to occupation of the site; and
- A SAS supported by a SAR confirming site suitability for the proposed use must be issued by the site auditor following successful completion of site remediation/validation and prior to occupation of the site.

The proposed Tweed Velley Hospital Project was since approved for development under the State Significant Development SSD 9575 granted by the Minister for Planning on 11 June 2019. Development conditions of consent required the preparation of a soil and groundwater investigation report, a RAP (for any additional contamination identified) and various management plans requiring review and endorsement by the Site Auditor prior to certification of site works. The required documents were prepared by the remediation consultant (Cavvanba) and others as listed in **Section 1.4** for auditor review. Site remediation and validation activities were subsequently undertaken as documented in Cavvanba (2019k). These reports have been reviewed by the auditor and form the basis of this SAR.

Andrew Lau is a Site Auditor accredited by the NSW Environment Protection Authority (EPA) under the Contaminated Land Management Act 1997 (CLM Act 1997) (Accreditation Number 0503). The audit was completed with the assistance of Kane Mitchell and Sahani Gunatunge, JBS&G's experienced audit assistants. The audit reference number is 0503-1914.

1.2 Objectives of the Site Audit

The objectives of this site audit were to:

- Independently review additional soil and groundwater investigation reports, remedial action plans, site management plans and VSAQP;
- Independently review validation report following completion of on-site remediation works;
- Prepare a SAR and issue a SAS providing an opinion that the site is suitable for the proposed hospital use (as detailed above in **Section 1.1**).

In accordance with the requirements of the CLM Act 1997, the site audit was undertaken with consideration to:

- The provisions of the CLM Act, Regulations and subsequent amendments;
- The provisions of any environmental planning instruments applying to the site; and
- Relevant guidelines made or approved by the EPA (**Appendix A**).

1.3 Type of Audit

The site is currently subject to planning approval as a State Significant Development SSD 9575, with approval issued on the 11 June 2019. Development consent conditions have been imposed by the Minister for Planning, with specific conditions and requirements regarding the engagement of a site auditor stipulated in condition B8. This condition specifically requires the engagement of a Site Auditor accredited by the NSW Environment Protection Authority under the Contaminated Land Management Act 1997, for the full duration of additional soil investigation works / additional contamination assessment (as required by this development consent), the remediation works programme, post remedial validation works and preparation and / or implementation of management plans.

As such, the site audit has been conducted as a statutory audit. Site Audit Notification (SAN) number 0503-1914 was sent to the EPA on 17 June 2019, with receipt confirmation provided by the EPA on 18 June 2019 (EPA Reference DOC19/520155).

1.4 Documents Reviewed

The following documentation was reviewed as part of the site audit:

- *Soil Sampling Analysis and Quality Plan, 771 Cudgen Road, Cudgen, NSW*, OCTIEF Pty Ltd, Reference: Version 2.0, 10 August 2018 (OCTIEF 2018a).
- *Preliminary and Detailed Site Investigation – 771 Cudgen Road, Cudgen, NSW 2487*, OCTIEF Pty Ltd, Reference: Version 4, 17 October 2018 (OCTIEF 2018b).
- *Remediation Action Plan, Tweed Valley Hospital site, 771, Cudgen Road, Cudgen NSW,* OCTIEF Pty Ltd, Reference: Version 5, 1 February 2019 (OCTIEF 2019).
- *Hazardous Material Register, 771 Cudgen Creek Road, Cudgen NSW,* Cavvanba Pty Ltd, Reference: 18084, 19 November 2018 (Cavvanba 2018a).
- *Asbestos Clearance Certificate 18084-CC04, 771 Cudgen Road, Cudgen NSW,* Cavvanba Consulting Pty Ltd, Reference: 18084-CC04, December 2018 (Cavvanba 2018b).

- *Soil Investigation Report – Residential House, 771 Cudgen Road, Cudgen NSW,* Cavvanba Consulting Pty Ltd, Reference: 18084 R01 V2, 24 January 2019 (Cavvanba 2019a).
- *Remedial Action Plan Addendum – Residential House, 771 Cudgen Road, Cudgen NSW*, Cavvanba Consulting Pty Ltd, Reference: 18084 R02 V3, 24 January 2019 (Cavvanba 2019b).
- *Soil Investigation Report – Farm Shed, 771 Cudgen Road, Cudgen NSW,* Cavvanba Consulting Pty Ltd, Reference: 18084 R03 V2, 24 January 2019 (Cavvanba 2019c).
- *Remedial Action Plan Addendum – Farm Shed, 771 Cudgen Road, Cudgen NSW*, Cavvanba Consulting Pty Ltd, Reference: 18084 R04 V2, 24 January 2019 (Cavvanba 2019d).
- *Soil Investigation Report – Residential House, 771 Cudgen Road, Cudgen NSW,* Cavvanba Consulting Pty Ltd, Reference: 18084 R01 V3, 1 August 2019 (Cavvanba 2019f).
- *Remedial Action Plan Addendum – Residential House, 771 Cudgen Road, Cudgen NSW*, Cavvanba Consulting Pty Ltd, Reference: 18084 R02 V4, 1 August 2019 (Cavvanba 2019g).
- *Groundwater and Soil Investigation, 771 Cudgen Road, Cudgen NSW*, Cavvanba Consulting Pty Ltd, Reference: 19038 R02 V2, 22 August 2019 (Cavvanba 2019h).
- *Remedial Action Plan Addendum – Farm Pit, 771 Cudgen Road, Cudgen NSW*, Cavvanba Consulting Pty Ltd, Reference: 19038 R03 V2, 19 August 2019 (Cavvanba 2019i).
- *Validation Data Quality Objectives and Sampling, Analysis and Quality Plan, Proposed Tweed Valley Hospital, 771 Cudgen Road, Cudgen NSW*, Cavvanba Consulting Pty Ltd, Reference: 19038 R04 V1, 23 August 2019 (Cavvanba 2019j).
- *Remediation Area Plan*, B & P Survey Consulting Surveyors, ref: T16452, 9 August 2019.
- *Work Health and Safety Plan*, Delta Pty Ltd, 28 August 2019 (Delta 2019).
- *Tweed Valley Hospital, Works Plan*, Lendlease Building Pty Ltd, Reference: Rev3, 26 August 2019 (LLB 2019a).
- *Tweed Valley Hospital, Management Plan – Hazardous Materials*, Lendlease Building Pty Ltd, Reference: Rev7, 28 August 2019 (LLB 2019b).
- *Validation report, 771 Cudgen Road, Cudgen NSW,* Cavvanba Consulting Pty Ltd, Reference: 19038 R05 V2, 7 November 2019 (Cavvanba 2019k).

The following documents were also considered during the site audit:

- *Preliminary Site Investigation Contaminated Land, Due Diligence Summary Report – Shortlisted Sites, Tweed Valley Hospital Project*, OCTIEF Pty Ltd, 28 June 2018 (OCTIEF 2018c).
- *Additional Geotechnical Investigation, Proposed Tweed Valley Hospital, Lot 102 on DP870722, Cudgen Road, Kingscliff*, Morrison Geotechnic, December 2018 (Morrison Geotechnic 2018).
- Cavvanba email correspondence dated 29 January 2019 (**Appendix B**), relating to an unexpected find comprising a concrete pit, concrete ramp, concrete drip pad and infilled pit and wastes (Cavvanba 2019e).
- Site Audit Statement no. 0503-1901 and accompanying Site Audit Report 0503-1901, 771 Cudgen Road, Cudgen NSW, Ref: 55264/117086 (Rev 0), 4 February 2019 (JBS&G 2019a).

Additional correspondence relating to the site audit is provided in **Appendix B**.

1.5 Site Inspections

Table 1.1: Summary of Audit Inspections

Date	Attendance	Purpose
2 August 2018	Kane Mitchell (JBS&G)	Site inspection to observe site layout and condition.
12 November 2019	Stuart Derham (JBS&G)	Site inspection following remediation works.

1.6 Chronology of Site Assessment Works

The process of the assessment and audits undertaken at the site has been chronologically listed in **Table 1.2**.

Table 1.2: Summary of Investigation and Audit Works Undertaken at the Site

Date	Purpose
27 July 2018	Commencement of the site audit (0503-1901).
August 2018	Development of a draft soil sampling analysis and quality plan (SAQP) by the OCTIEF to provide framework for contaminated land assessment works required to address a Stage 2 Contamination Assessment. Based on comments provided by the site auditor, a final report was issued on 10 August 2018 (OCTIEF 2018a).
October 2018	Completion of a combined preliminary and detailed site investigation (PSI/DSI) by OCTIEF. The scope of works comprised a desktop review of site history, intrusive soil investigation via 50 hand auger sample locations, groundwater sampling from one monitoring well and surface water and sediment sampling from onsite storage dam and subsequent laboratory analysis for identified contaminants of potential concern (COPCs). Based on comments provided by the site auditor, a final report was issued on 17 October 2018 (OCTIEF 2018b).
November 2018	Preparation of a hazardous material register (Cavvanba 2018a) for the residence and garage.
December 2018	Preparation of a remediation action plan (RAP) providing a summary of identified site contamination issues, description of proposed remediation and soil management programs, procedures and standards to be followed during preliminary works and redevelopment to ensure successful remediation of the site. Based on comments provided by the auditor, the final RAP was issued on 1 February 2019 (OCTIEF 2019).
December 2018	Assessment of farm dump area containing inert waste and subsequent visual clearance (Cavvanba 2018b).
December 2018	Completion of an additional soil investigation for potential lead and organochlorine pesticide (OCP) contamination issues associated with the residential house footprint. The scope of works comprised soil sampling via 22 test pit locations and subsequent laboratory analysis. Based on comments provided by the auditor, the final report was issued on 24 January 2019 (Cavvanba 2019a). Preparation of a RAP Addendum to address contamination issues associated with the residential house footprint. Based on comments provided by the auditor, the final report was issued on 24 January 2019 (Cavvanba 2019b).
January 2019	Completion of an additional soil investigation for potential contamination issues associated with the farm shed including asbestos containing material (ACM), lead and OCPs (Cavvanba 2019c). Temporary site management works were undertaken prior to demolition of the farm shed. Subsequently, soil sampling was undertaken via 21 test pits and subsequent laboratory analysis. Based on comments provided by the auditor the final report was issued on 24 January 2019 (Cavvanba 2019c). Preparation of a RAP Addendum to address contamination issues associated with the residential house footprint. Based on comments provided by the auditor, the final report was issued on 24 January 2019 (Cavvanba 2019d).
24 January 2019	Preparation of an Interim Audit Advice (0503-1901-1) confirming the status of the site audit.
4 February 2019	Preparation of a Section B site audit statement (0503-1901) and accompanying site audit report (JBS&G 2019a) confirming the site can be made suitable for the proposed uses subject to remediation as outlined in the RAP (OCTIEF 2019) and subsequent RAP addenda (Cavvanba 2019b and 2019d).
29 April 2019	Commencement of site audit (0503-1914) relating to site remediation.

Date	Purpose
August 2019	Preparation of amended Soil Investigation Report (Cavvanba 2019f) and RAP (Cavvanba 2019g) prepared for the residential house and garage to reflect an isolated aldrin and dieldrin impact identified within shallow soil beneath the garage slab.
August 2019	Completion of a groundwater and soil investigation as documented in Cavvanba (2109h). The scope of works comprised soil sampling via 31 boreholes/ test pits targeting specific infrastructure/ landuse practices including the farm pit, farm shed, residential house, farm dam and farm dump.
August 2019	Preparation of RAP Addendum (Cavvanba 2019i) to address contamination issues associated with the Farm Pit and a validation sampling, analysis and quality plan (VSAQP, Cavvanba 2019j) to outline the validation requirements relating to remediation of the farm pit, farm shed and residential house.
August 2019	Preparation of an Interim Audit Advice (0503-1914-002) based on review of consultant's reports and various management plans prior to commencement of site remediation.
September-October 2019	Completion of site remediation works by Delta Group Pty Ltd (the Civil Contractor) with asbestos removal works undertaken by Aztech Services under the supervision of the validation consultant (Cavvanba). Remediation works were undertaken between 5 September-17 October 2019.
November 2019	Preparation of validation report (Cavvanba 2019k) documenting the validation works completed at the site.
November 2019	Preparation of SAS (0503-1914) and Site Audit Report (JBS&G 2019b) confirming the remediation and validation works were completed in accordance with the RAP, subsequent RAP addenda and VSAQP and that the site is suitable for the proposed hospital use.

2. Site Description

2.1 Site Identification

The site details have been summarised in **Table 2.1** and described in further detail in the following sections. Plans identifying the subject site has been presented in **Appendix C**. The site location and lay out is shown in **Appendix D**.

Table 2.1: Summary Site Details

Street Address	771 Cudgen Road, Cudgen, NSW
Property Description	Lot 11 in DP 1246853
Parish	Cudgen
County	Rous
Local Government Area	Tweed Shire Council
Property Size	19.38 ha
Zoning	SP2 Infrastructure (Health Services Facility) 2(c) Urban Expansion 1(b1) Agricultural Protection 7(l) Environmental Protection (Habitat)
Previous Use	Agricultural
Current Use	Development Site
Proposed Use	Tweed Valley Hospital

2.2 Site Condition

At the time of the detailed site investigation undertaken in June 2018, the consultant (OCTIEF 2018) reported that the site was primarily used for agricultural production, with cultivated paddocks covering approximately 16 ha of the site. The site was described as unfenced and irregular in shape with a residential building on the southern site boundary with access from Cudgen Road. The residential building was observed to be in good condition. The Chemical storage/equipment shed was observed on the southern property boundary to the east of the residential building. Some evidence of general weathering/degradation was observed on the main and vehicles sheds. An undeveloped wetland was observed in the northern/north-western portion of the site.

Additional observations made by the consultant (OCTIEF 2018b) are summarised below.

- A small farm dump was located on the edge of the vegetated area in the northwest corner of the site. A visual inspection of the dump identified only inert building materials such as fencing posts, and paving bricks, however due to extensive coverage by vegetation the full extent of the dump could not be clearly determined.
- No ground staining to suggest potential soil contamination was identified onsite.
- Asbestos guttering in poor condition was noted along the western side of the site shed, with isolated fragments of asbestos containing material (ACM) noted adjacent to the northwest corner of the shed.
- Chemical storage onsite was limited to 10L and 20L containers of pesticides/herbicides (Dimethoate, Serenade Prime and Banjo) and motor oil and bags of fertiliser.
- Above ground diesel storage tank (approx. 1000L) was noted adjacent to farm shed, tank appeared in reasonable condition.
- A farm dam was identified on the edge of the vegetated area in the northern portion of the site, it was noted that the pump associated with the storage dam runs on mains power.
- A paddock of custard apple trees was identified in the north east corner of the property.

At the time of the additional investigations documented in Cavvanba (2019a and 2019c), the following observations were reported by the consultant:

- The grass surface was observed to be in good condition around the edges of the residential building and the farm shed with no visible staining or contamination present;
- Potential lead paint was identified inside the residential house; and
- fragments of ACM were observed along the north eastern edge of the farm shed.

As documented email correspondence dated 29 January 2019 (Cavvanba 2019e), an unexpected find comprising a concrete pit, concrete ramp, concrete drip pad and infilled pit and wastes was identified on 29 January 2019 (**Appendix B**).

At the time of subsequent groundwater and soil investigation (Cavvanba 2019h), the following observations were made relating to the farm pit, farm shed, residential house, farm dump and farm dam:

- The farm pit feature comprised a concrete slab which drained into an adjacent pit approximately 1.1m in depth. Green staining was observed on the surface of the concrete slab. The pit was observed to be partially filled with liquid and contained general waste including hypodermic syringes, buckets, Styrofoam and rags. The grass surface surrounding the concrete slab was observed to be in good condition with no visible staining. The auditor notes that the farm pit denotes the concrete sump feature previously identified as the potential cattle/ sheep dip.
- The farm shed and residential house and adjacent garage were demolished at the time of the inspection with approximately 200mm of clean gravel identified within the former building footprints, underlain by geofabric material. The grass surface surrounding the former building footprints was observed to be in good condition with no visible staining.
- The farm dump feature contained sporadic waste materials from fly-tipping, consisting of corrugated iron, cement sheeting, plastic hosing, star pickets and bricks on the ground surface along the north-western corner of the farm dump extending over approximately 500 m^2. The grass surface was observed to be in good condition in proximity to the waste with no visible staining observed.
- The farm dam was covered in vegetation and the water was identified to be clear with no odour or sheen. A detailed survey identified the depth of the dam to be approximately 1.5 m. Native bushland was present to the north and patch of grass located to the south of the dam was in good condition with no visible staining observed.

2.3 Topography

The consultant (OCTIEF 2018b) reported that based on a review of NSW Six Maps, the cultivated area of the site has an elevation between 25 m AHD to the south east and 8 m AHD to the north. The site was described as gradually sloping to the north.

2.4 Soils and Geology

The consultant (OCTIEF 2018b) reported that a review of the Tweed Heads 1: 250 000 map indicated that the site is underlain by Lamington Volcanics from the Tweed Range-Lamington area. This consists of basalt with members of rhyolite, trachyte, tuff, agglomerate and conglomerate.

The consultant (OCTIEF 2018b) also reviewed the Department of Land and Water Conservation 1:100000 Murwillumbah to Tweed Heads Soil Landscape Series (Sheet 9541-9561), which described the landscape as a 'Residual Landscape' of low undulating hills and rises on tertiary basalt plateau. The soils were defined as Krasnozems (red to brown, acidic, strongly structured clay soils), with the Krasnozems specific to the area characterised as red, self-mulching, moderate plasticity clays with topsoil depths of 20-40 cm and total soil depth of 1-2 m.

Based on intrusive conditions encountered at the site during environmental and geotechnical investigations, the consultant (OCTIEF 2018b) identified the subsurface profile at the site typically comprised red brown silty clay with fine gravel to a depth of 0.15m underlain by red brown silty clay including fine to coarse gravel and extremely weathered basalt fragments to maximum depth of 3.6 m bgs further underlain by zones of high strength basalt and highly weathered clayey material. No fill material was encountered in the hand augers locations advanced during the OCTIEF (2018b) investigation.

During subsequent soil investigation in the vicinity of residential building, Cavvanba (2019a) observed dark brown to red silty clay material underlying the house, to a maximum depth of 0.6m bgs. Based on the review of the consultant's sample description notes, the auditor notes that anthropogenic inclusions of glass and tile were identified at test pits TP01, TP02, TP03, TP04, TP13 and TP14.

The soil investigation in the vicinity of the farm shed (Cavvanba 2019c) identified dark brown to red silty clay material underlying the shed to a maximum depth of 0.3 m bgs with anthropogenic inclusions of plastic and nails identified at TP43.

2.5 Acid Sulphate Soils

The consultant (OCTIEF 2018b) reported that a review of online Tweed Maps (2018) indicates that the site is within an acid sulfate soil area. The consultant (OCTIEF 2018b) further reported that majority of the site is reported to be within a Class 5 area, with the northern most part of the site listed as Class 2, and a middle length classified as Class 3.

Under Clause 7.1 of the council's Local Environment Plan 2015, development consent is required to undertake works on land shown as being Class 1 -5 on the Acid Sulfate Soil Planning Maps. The consultant (OCTIEF 2018b) considered that based on a preliminary review of information, the development would not trigger Class 5 provisions and therefore acid sulfate soil investigation and/or management was considered not to be required.

2.6 Hydrology

The consultant (OCTIEF 2018b) reported that a review of Tweed Maps – Flood Information Overlay Map indicates that the northern (currently undeveloped) area of the site is within a designated flood affected area. The consultant (OCTIEF 2018b) reported that the closest surface water bodies to the site are Wommin Bay approximately 1km to the north east of the site and Cudgen Creek, approximately 800m to the south east.

2.7 Hydrogeology

The consultant (OCTIEF 2018b) described the site as situated within the Lamington Volcanics basalt, a fractured rock aquifer overlying the New England Fold Belt. Yields were noted to be moderate (up to 5 L/s) but may be higher in highly fractured areas. The aquifer is typically recharged by rainfall infiltration resulting in groundwater with low concentrations of dissolved constituents.

The consultant (OCTIEF 2018b) conducted a review of the NSW Office of Water groundwater bore database and reported that seven registered groundwater bores were located within a 500 m radius of the site. The results of the search are summarised in **Table 2.2**, below.

Based on limited investigation of groundwater completed in OCTIEF (2018b), the consultant reported that groundwater was encountered at approximately 10.5 m bgs occurring in the basalt aquifer. Based on the more recent groundwater investigations (Cavvanba 2019h and 2019k), the consultant noted that standing water levels ranged between 0.370 to 14.531 m AHD, with the groundwater anticipated to flow to the north. The consultant (Cavvanba 2019h) reported that drilling observations and gauging results were indicative of unconfined conditions.

Table 2.2: Summary of Registered Groundwater Bores (OCTIEF 2018b)

Registered No.	Date Registered	Standing Water Level (m bgs)	Aquifer Geology	Distance from Site	Use
GW307808	No data available			450 m NE	Unknown
GW304908	3/11/2004	3	0-5 m: sand grains (lithic)	475 m NE	Domestic
GW065030	16/10/1989	12	0-15 m: clay 15-17 m: weathered rock 17-20 m: basalt 20-24 m: weathered basalt 24-30 m: clay and sandstone	100 m South	Irrigation
GW047693	1/3/1980	NA	0-4.57 m: soil 4.57-14 m: shale	100 m South	Irrigation
GW047692	1/10/1980	NA	0-1.2 m: soil 1.2-7.6 m: clay, decomposed basalt 7.6-11.3 m: clay 11.3-21.3: basalt	100 m South	Irrigation
GW044188	1/1/1945	6	0-4.57m: soil 4.57-12.19 m: shale	100 m South	Domestic
GW069108	7/3/1991	NA	0-10 m: clay 10-13 m: basalt 13-16 m: clay 16-21 m: basalt 21-33 m: clay 33-40 m: basalt 40-47 m: clay 47-54 m: granite	150 m SW	Farming

2.8 Surrounding Environment

The consultant (OCTIEF 2018b) reported that the site is surrounded by the following:

- North – agricultural farm land to north-west; undeveloped land.
- East – low/medium density residential.
- South – open farmland and TAFE buildings (education facility).
- West – farmland and dense forest.

2.9 Climate

The consultant (OCTIEF 2018b) described the climate as moderate year-round, and provided the following statistics:

- mean maximum temperatures ranging from 20.5 °C in July to 28.1 °C in January/February;
- mean minimum temperatures ranging from 11.6 °C in July to 21.8 °C in January; and
- mean monthly rainfall ranging from 55 mm in September to 266 mm in February, with an average annual rainfall of 1 740 mm.

2.10 Audit Findings

The information provided by the consultant (OCTIEF 2018b and OCTIEF 2019) in regard to site condition and surrounding environment has been checked against, and generally meets the requirements of OEH 2011.

The auditor notes that at the time of the detailed site investigation (OCTIEF 2018b) the site was identified as Lot 102 in DP 870722 encompassing an area of 23.23 ha. Based on information provided in the RAP (OCTIEF 2019) including concept development plans (as provided in **Appendix C**), it is understood that the site is currently legally identified as Lot 11 in DP 1246853 encompassing an area of 19.38 ha.

The information provided regarding the site condition and surrounding environment was also consistent with the observations made during a site inspection conducted by the site auditor's assistant on the dates indicated in **Section 1.5**.

Overall, the information provided by the consultant (OCTIEF 2018b) in relation to site condition and the surrounding environment is considered adequately complete for the purposes of assessing the contamination status of the site.

3. Site History

3.1 Site History Information Sources

The consultant (OCTIEF 2018b) completed a comprehensive desktop investigation, including: interviews with relevant staff/ site owner; review of historical environmental reports pertaining to the site; review of historical aerial photographs; review of historical certificates of title; review of publicly available local government records; review of information held by the NSW State Library; and available local historical information.

Relevant historical information from the consultant's report (OCTIEF 2018b) is summarised as follows:

- The site was undeveloped prior to being cleared and utilised for agricultural purposes sometime after 1944 but prior to 1962.
- The site was believed to have been used for sugarcane farming, with an area of plantation to the north of the cropped area described between 1986 and 2003.
- The site was purchased by the current owners in 2010 and has been used for sweet potato farming since that time.

3.2 Aerial Photographs

The consultant (OCTIEF 2018b) reviewed historical aerial photographs for the site and surrounding areas, with the provided information summarised in **Table 3.1,** below.

Table 3.1: Summary of Historical Aerial Photograph Review

Date	Site Specific Observations	Surrounding Land Observations
1944	The site was undeveloped, no structures or site clearing were visible.	The immediate surrounding area was also undeveloped, with no visible clearing or structures adjacent to the site, with the exception of Cudgen Rd running past the southern site boundary.
1962	The site had been cleared and was being utilised for agricultural use. The cleared area appeared to match the current dimensions of the cropped area onsite. House and shed were visible on the site. No other structures were identified.	Surrounding properties to the west and south had also been cleared and were being used for agricultural use.
1976	The site appeared unchanged from the previous photo – cropping was still visible in all cleared areas of the site.	Surrounding properties to the west and south appeared unchanged and were still being used for agricultural use. Residential development was visible to the east of the site.
1986	Some paddocks along the western site boundary appeared to no longer to be actively cropped. Trees / plantation trees were visible on some of the paddocks on the northern side of the agricultural area onsite.	Surrounding properties to the west and south appeared unchanged and were still being used for agricultural cropping. A temporary water storage dam was adjacent to the eastern site boundary.
1995	No evidence of active cropping was visible, some plantation trees still visible on the same paddock.	Surrounding properties to the west and south appear unchanged and were still being used for agricultural cropping. Further residential development was visible to the south east of the site.
2003	Active cropping of the central paddocks onsite. Plantation trees on central northern paddock appeared to have been removed	TAFE campus was now visible to the south east of the site.

The consultant (OCTIEF 2018b) concluded that the results of the historical aerial photograph review identified ground disturbance on site and in neighbouring areas, associated with agricultural activities, has potential for soil contamination associated with pesticide storage and usage practices on the properties.

3.3 Tweed Shire Council Records

The consultant (OCTIEF 2018b) submitted a Contaminated Lands Search Request to Tweed Shire Council and received a response on 6 July 2018 stating:

- A radial search by the council revealed no known cattle dip sites within 200 m of the subject property; and
- Records revealed no known potentially contaminating activities at the subject property.

3.4 Current and Historical Title Search

The consultant (OCTIEF 2018b) conducted a title search for the property to identify historical site owners and associated potentially contaminating activities. Based on the title documentation, the initial title for the land was issued in 1881 and 1889 to Henry Robert Gazala and William warner Julius, respectively. Title documents indicate that the land has remained privately owned and as of 2010, Duane John Joyce and Kerry Douglas Prichard have been joint tenants.

3.5 NSW State Library Search

An online search of the NSW State Library for records pertaining to the site was undertaken by the consultant (OCTIEF 2018b) on 11 June 2018. No relevant records regarding potential sources of land contamination were identified.

3.6 NSW EPA Records

The consultant (OCTIEF 2018b) conducted a search of available NSW EPA online information databases, including the POEO register and the list of NSW Contaminated Sites Notified to EPA, with the following findings:

- A search of the POEO register did not identify any licences referring to the subject site or sites within close proximity to the site.
- A search of the list of NSW Contaminated Sites Notified to EPA did not identify any locations related to the subject site or sites within close proximity to the site.

3.7 Personnel Interviews

The consultant (OCTIEF 2018b) summarised the following anecdotal information provided by the site owner, at the time of the site inspection undertaken on 14 June 2018:

- Since purchase of the site in 2010, the current owner has predominantly used the site for sweet potato farming.
- No animals have been grazed at the property during the current ownership.
- The previous owner has used the site for growing sugar cane.

3.8 Previous Environmental Investigations

3.8.1 Desktop Reports

The consultant (OCTIEF 2018b) identified two historical desktop reports prepared during the site selection process for the proposed Tweed Valley Hospital referred to as HMC 2017 and Charter 2018, which identified the following:

- Broadacre intensive cropping across the cleared part of site may have been subject to agrichemical applications.
- 2-3 structures near Cudgen Road may have been used for storage/mixing of chemicals and storage of fuel.

- Further investigation in the form of detailed site inspection, additional site history and soil investigation was recommended prior to confirming site suitability, subject to final location of proposed development.

No further information was provided regarding the reports. The auditor notes that these reports were not made available for review and as such, do not form part of the current audit.

3.8.2 Due Diligence Summary Report (OCTIEF 2018c)

A due diligence summary report which included information pertaining to the site was produced in June 2018, as documented in OCTIEF (2018c). The desktop component of the assessment was summarised in **Section 3.8.1**, above. In addition to the desktop summary, a site inspection and limited soil sampling was undertaken. The relevant findings of the site inspection and soil sampling works were incorporated into the PSI/DSI (OCTIEF 2018b) as discussed in **Section 2.2** and **Section 7.2** respectively. The following conclusions were made in OCTIEF (2018c) regarding potential contamination at the site:

- Motor oil and chemical storage on site consisted of 20L drums and containers. These chemicals were stored on a cement floor and are considered unlikely to have resulted in environmental contamination. Low risk remains regarding historical storage practices.
- Potential asbestos guttering along the shed poses a low environmental risk.
- Small farm dump identified appears to be inert general waste and considered low risk.
- Analytical results from preliminary soil sampling reported no concentrations of contaminants of potential concern exceeding health-based investigation levels.
- Soil sample collected during the preliminary site investigation from adjacent to the onsite shed reported zinc concentrations above the environmental investigation levels considered a low risk.

The due diligence report recommended the clearance of vegetation overgrowing small farm dump identified to allow detailed inspection/sampling of materials.

3.8.3 Hazardous Material Assessment (Cavvanba 2018a)

A hazardous material assessment of the residence and attached garage was undertaken by Cavvanba in November 2018, as documented in Cavvanba (2018a). The hazardous material register identified lead paint on internal walls and the ceiling within the premises. Sampling of external building panelling indicated that the external paint was not lead paint. No ACM was identified within the premises.

3.9 Audit Opinions

The site history information provided by the consultant (OCTIEF 2018b) has been checked against, and generally meets the requirements of OEH 2011, with some exceptions as noted below.

The consultant did not undertake a search of the CLM register. For completeness, the auditor conducted a search of available NSW EPA online databases on 23 January 2019 and 23 October 2019, including a search of the CLM register, as well as updated searches of the list of NSW Contaminated Sites Notified to EPA and the POEO register, with the following findings (search records provided in **Appendix F**).

- A search of the CLM register did not discover any notices related to the subject site or sites within close proximity to the site.
- A search of the POEO register did not identify any licences referring to the subject site or sites within close proximity to the site.

- A search of the List of NSW Contaminated Sites Notified to EPA did not identify any locations related to the subject site or sites within close proximity to the site.

Additionally, the consultant did not undertake a search of relevant heritage databases. For completeness, the auditor undertook a search of the Australian and NSW Heritage databases on 23 January 2019 which did not identify any heritage items listed on site (search records provided in **Appendix F**).

Further, the consultant did not complete a SafeWork NSW site search for Schedule 11 Hazardous Chemicals on premises. However, the auditor notes that the consultant (OCTIEF 2018b) undertook a detailed site inspection and interviews with site personnel confirming the location of known fuel/ chemical storage equipment. As such the absence of these records does not affect the outcomes of this audit.

The auditor considers that the extent of the site history information presented by the consultant (OCTIEF 2018b) is generally sufficient for identifying contamination issues at the site as part of the site investigation process.

4. Conceptual Site Model

The National Environment Protection (Assessment of Site Contamination) Measure, NEPC, 1999 (as amended 2013, NEPC 2013) identifies a conceptual site model (CSM) as a representation of site related information regarding contamination sources, receptors, and exposure pathways between those sources and receptors. The development of a CSM is an essential part of all site assessments and remediation activities.

NEPC (2013) identified the essential elements of a CSM as including:

- Known and potential sources of contamination and contaminants of concern including the mechanism(s) of contamination;
- Potentially affected media (soil, sediment, groundwater, surface water, indoor and ambient air);
- Human and ecological receptors;
- Potential and complete exposure pathways; and
- Any potential preferential pathways for vapour migration (if potential for vapours identified).

Based on the known contamination, each of the elements of the CSM are discussed in the following sections.

4.1 Sources of Contamination

Based on a review of site history review, the consultant (OCTIEF 2018b) identified the following potential sources of contamination:

- potential for the release of chemicals into the environment resulting from poor chemical storage or waste disposal practices;
- potential for the release of chemicals into the environment resulting from agricultural practices;
- asbestos building materials in onsite structures;
- above ground diesel tank;
- onsite farm dump; and
- onsite surface water storage dam.

In addition, the consultant (OCTIEF 2019) also identified the potential for a cattle dip to be present based on anecdotal information provided by an external stakeholder during the development assessment and consultation process.

Potential sources of contamination identified during subsequent groundwater and soil investigation (Cavvanba 2019h) included the farm pit, farm shed, residential house, farm dam and farm dump.

Based on the identified sources of contamination the following contaminants of potential concern were identified:

- Total recoverable hydrocarbons (TRH);
- Benzene, toluene, ethyl benzene, xylenes (BTEX);
- Polycyclic aromatic hydrocarbons (PAHs);
- Heavy metals;

- Volatile organic compounds (VOCs);
- Organochlorine pesticides and organophosphorus pesticides (OCPs/OPPs); and
- Asbestos.

4.2 Potentially Affected Media

Potentially affected media considered in the preliminary conceptual site model included soil, groundwater, surface water and sediment.

4.3 Potential Human and Ecological Receptors

The consultant (OCTIEF 2018b) considered the following ecological receptors as relevant to the site:

- wetland in the north-east of the site; and
- groundwater.

The consultant (OCTIEF 2018b) considered the following human receptors as relevant to the site:

- maintenance/construction workers; and
- future site users (staff and patients).

4.4 Potential Exposure Pathways

The consultant (OCTIEF 2018b) considered the following potential exposure pathways:

- contaminated soil impacts affecting the quality of surface water runoff, consequently impacting on ecological receptors associated with the wetland;
- atmospheric dispersion of contaminated soil impacting ecological receptors;
- contaminants in soil leaching to groundwater;
- the lateral migration of potentially contaminated groundwater to impact ecological receptors associated with the wetland; and
- inhalation of asbestos fibres degraded ACM by maintenance/construction workers and future site users.

4.5 Potentially Complete Exposure Pathways

The consultant (OCTIEF 2018b) provided an assessment of potentially complete exposure pathways at the site based on the investigations conducted, as summarised in **Table 4.1.**

Table 4.1: Potentially Complete Exposure Pathways (OCTIEF 2018b)

Potential Source	Pathway	Receptor	Assessment of Completeness
Contaminated Soil	Surface water runoff	Ecological receptors	Unlikely - elevated zinc concentrations relatively minor and of limited extent.
	Atmospheric dispersion	Ecological receptors	Unlikely - elevated zinc concentrations relatively minor and of limited extent.
	Leaching to groundwater	Ecological receptors	Unlikely - elevated zinc concentrations relatively minor and of limited extent. Additionally, the depth to groundwater is >10m.
Contaminated Groundwater	Lateral migration of groundwater	Ecological receptors of wetland	Unlikely – concentrations of zinc identified in groundwater considered likely to be indicative of regional background conditions.

Asbestos Containing Materials	Inhalation of fibres	Maintenance/construction workers; future site users	Friable asbestos and/or asbestos fines were detected in surface soil sample HA1. Some bonded ACM was also observed which could release fibres if inappropriately managed. Area is limited in extent (associated with outbuildings).

4.6 Audit Findings

The consultant identified a number of potential contamination issues at the site and based on the site history review and investigations completed, and the auditor considers that list of COPCs identified by the consultants appropriate for assessing the contamination status of the site. The consultant also appropriately considered both human and ecological receptors and subsequent potential exposure pathways.

The consultant (OCTIEF 2018b) did not consider preferential pathways. However, based on the nature of contamination identified at the site being in solid form (i.e. asbestos, zinc and lead), this is not considered to affect the outcome of this audit.

The auditor also notes that the refined CSM prepared in OCTIEF (2019) as part of development of the RAP generally meets the requirements of NEPC 2013. Further, a refined graphical CSM was presented in the VSAQP (Cavvanba 2019j) identified all potential contamination sources that required further assessment and/or remediation as part of the site remediation works.

The Auditor concurs with the consultant's (Cavvanba 2019k) conclusion that all potential sources of contamination at the site have been removed, and that the updated graphical CSM presented provided an appropriate representation of site conditions upon completion of site remediation.

Overall, the auditor considers that the identified potential contamination issues, and in consideration of the potentially contaminated media investigated, remediated and validated by the consultant are considered appropriate for assessing the suitability of the site for the intended land use.

5. Sampling Analytical and Quality Program

An assessment of quality assurance and quality control (QA/QC) has been undertaken by the consultants, OCTIEF (2018b) and Cavvanba (2019a, 2019c, 2019f, 2019h and 2019k) by developing data quality indicators (DQIs), broadly based on the seven-step process referred to in NEPC 2013.

As part of the previous audit (Audit Ref: 0503-1901), the auditor undertook a review of the QA/QC undertaken by the consultants, OCTIEF (2018b) and Cavvanba (2019a and 2019c). A number of data quality issues were identified in relation to the groundwater and surface water investigation completed at the site (OCTIEF 2018b), specifically relating to the absence of filtering prior to metals analyses. As such, the auditor considered the groundwater and surface water data collected during the investigation to be indicative only. Notwithstanding, the sampling, analytical and quality protocols undertaken by the consultants were considered to be adequately reliable for the purpose of assessing the contamination status of the site; and reliable and useable for the purpose of the audit.

The auditor has undertaken a review of the QA/QC undertaken by the consultant during subsequent investigation and validation works completed at the site (Cavvanba 2019f, 2019h and 2019k), which has been summarised in **Tables 5.1** against the PARCC parameters (precision, accuracy, representativeness, comparability and completeness).

Table 5.1 Data Usability Assessment (Cavvanba 2019f, 2019h and 2019k)

Parameter	DQIs	Requirement	Auditor Assessment
Field and Lab QA/QC			
Precision	Intra-laboratory duplicates (blind)	Collected at a rate of 1 per 20 samples. Analysed for primary contaminants of concern. RPDs less than 50%.	Soil duplicate rates were incorrectly calculated in Cavvanba (2019f) and for completeness, were recalculated by the auditor. Soil duplicates were identified to have been collected and analysed at a rate of 8.6 % for lead and 11.1% for OCPs and were within DQI. RPDs for lead in soil ranged from 4-54%, however, the auditor notes that RPDs were not reported by the consultant for OCPs where non-detects were reported for the primary and/or duplicate sample. For completeness, RPDs were recalculated by the auditor as ranging between 0-178%. The consultant attributed the elevated RPD with respect to lead in soil to inherent variability associated with metal concentrations in the soil matrix. The RPD exceedances relating to OCPs were not discussed. The auditor considers the elevated RPDs to be indicative of the variability of concentrations of the fill and concentrations being close to the laboratory LOR. As such, the auditor considers this minor non-conformance not to affect the outcome of this audit. The consultant did not use the higher duplicate sample results as part of the data set. However, the auditor notes that the reported concentrations were only marginally above the laboratory limit of reporting (LOR) and were below the site assessment criteria. As such, the auditor considers this minor non-conformance not to affect the outcome of this audit. Soil duplicates were collected at a rate of 6.25% and were analysed for primary COPCs (including metals, TRH, BTEX, PAH, PCB and OCP) with the exception of asbestos during Cavvanba (2019h) investigation works. Taking into consideration that asbestos is a commonly tested analyte and the nominated laboratory (ALS) held NATA accreditation for asbestos analysis, the laboratory reported levels can be considered to be

Parameter	DQIs	Requirement	Auditor Assessment
			reliable and do not strictly require further assessment by blind/split duplicates. Hence the absence of inter-laboratory duplicates in Cavvanba (2019h) is a minor non-conformance and does not affect the findings of this audit. RPDs ranged from 0-67 % with elevated RPDs reported for lead and mercury. The consultant attributed the elevated RPD with respect to lead in soil to inherent variability associated with metal concentrations in the soil matrix. The auditor concurs and finds the elevated RPDs not to affect the outcome of this audit. Soil duplicate rates were incorrectly calculated in Cavvanba (2019k) and for completeness, were recalculated by the auditor. Soil duplicates were identified to have been collected and analysed for main COPCs including: lead (6%), asbestos (5%) and PAHs (20%) and were within DQI. RPDs were reported between 0-35% within DQI. Primary and duplicate pair VS60/VQS13 analysed for asbestos were not in agreement, however the positive detection was considered as part of site remediation works.
			Groundwater duplicates were collected at a rate of 20% during Cavvanba (2019h) and analysed for the main contaminants of concern. RPDs ranged from 0-13 % and were within the DQI. Groundwater duplicates were collected at a rate of 20% during Cavvanba (2019k) and analysed for the main contaminants of concern. RPDs ranged from 0-40 % and were within the DQI.
			Surface water duplicates were collected during Cavvanba (2019h) at a rate of 50% and analysed for primary COPCs. RPDs were reported between 0-181%. RPD exceedances were reported for chromium, TRHs $C_{16} – C_{34}$, naphthalene and total PAHs. The consultant used the higher duplicate sample results as part of the data set and considered the RPDs to be acceptable and not impact the outcome of the investigation.
Precision	Inter-laboratory duplicates (spilt)	Collected at a rate of 1 per 20 samples. Analysed for primary contaminants of concern. RPDs less than 50%.	Soil duplicate rates were incorrectly calculated in Cavvanba (2019f) and for completeness, were recalculated by the auditor. Soil duplicates were identified to have been collected and analysed at a rate of 8.6 % for lead and 11.1% for OCPs and were within DQI. RPDs in soil ranged from 13-128%. The consultant attributed the elevated RPD with respect to lead in soil to inherent variability associated with metal concentrations in the soil matrix. The RPD exceedances relating to OCPs were not discussed. The auditor considers the elevated RPDs to be indicative of the variability of concentrations of the fill and concentrations being close to the laboratory LOR. Soil duplicates were collected at a rate of 6.25% and were analysed for primary COPCs (including metals, TRH, BTEX, PAH, PCB and OCP) with the exception of asbestos during Cavvanba (2019h) investigation works. Taking into consideration that asbestos is a commonly tested analyte and the nominated laboratory (ALS) held NATA accreditation for asbestos analysis, the laboratory reported levels can be considered to be reliable and do not strictly require further assessment by blind/split duplicates. Hence the absence of inter-

Parameter	DQIs	Requirement	Auditor Assessment
			laboratory duplicates in Cavvanba (2019h) is a minor non-conformance and does not affect the findings of this audit. RPDs ranged from 0-107 % with elevated RPDs reported for metals. The consultant attributed the elevated RPD with respect to lead in soil to inherent variability associated with metal concentrations in the soil matrix. The auditor concurs and finds the elevated RPDs not to affect the outcome of this audit. Soil duplicate rates were incorrectly calculated in Cavvanba (2019k) and for completeness, were recalculated by the auditor. Soil duplicates were identified to have been collected and analysed for main COPCs including: lead (6%), asbestos (5%) and PAHs (20%) and were within DQI. RPDs were reported between 0-7% within DQI
			Groundwater duplicates were collected at a rate of 22% during Cavvanba (2019h) and analysed for the main contaminants of concern. RPDs ranged from 0-13 % and were within the DQIs. Groundwater duplicates were collected at a rate of 20% during Cavvanba (2019k) and analysed for the main contaminants of concern. RPDs were reported at 0 % and were within the DQI.
			Surface water duplicates were collected during Cavvanba (2019h) at a rate of 50% and analysed for primary COPCs. RPDs were reported between 0-88%. RPD exceedances were reported for chromium, TRHs $C_{16} – C_{34}$, naphthalene and total PAHs. The consultant used the higher duplicate sample results as part of the data set and considered the RPDs to be acceptable and not impact the outcome of the investigation.
	Laboratory duplicates	One per batch. RPDs less than 50%.	Laboratory duplicates were undertaken by the primary and secondary laboratories. The analysis of laboratory duplicates was within the expected frequency. A review of lab reports provided by Cavvanba (2019f) indicated that RPDs were generally within DQI with the exception of OCP compounds in work order ES1837028 reported between 0-56.1%. The consultant considered the elevated RPD not to detract from the data sets precision as all samples collected and analysed for OCPs were below the adopted site assessment criteria. However, the auditor notes that an isolated exceedance was reported for concentration of aldrin and dieldrin in sample TP30_0.1. The auditor considers this non-conformance and the RPD exceedance not to affect the outcome of this audit.
Accuracy	Field rinsate blanks	Collected at a rate of 1 per piece of decontaminated sampling equipment. Analysed for primary contaminants of concern. Laboratory results below the laboratory limit of reporting (LOR).	Rinsate blanks were not collected from sampling equipment utilised during Cavvanba (2019f and 2019h). However, the consultant noted that decontamination procedures to prevent cross contamination between samples included use of dedicated sampling equipment, otherwise decontamination of the sampling equipment between each sampling location (using DECON 90) and the use of dedicated sampling containers provided by the

Parameter	DQIs	Requirement	Auditor Assessment
			laboratory. Additionally, new disposable nitrile gloves were worn by field staff during handling of samples. The auditor considers the sampling methods employed by the consultant are unlikely to have resulted in significant cross-contamination between sample locations and a review of the available analytical data does not indicate that this has occurred. Rinsate blanks were not collected during the validation program (Cavvanba 2019k). The consultant reported that this was considered acceptable as single use sampling equipment was used. The auditor concurs and considers the omission of rinsate blanks to be a minor non-conformance not affecting the outcome of this audit.
Accuracy	Trip blanks	Collected at a rate of 1 per day of sampling where primary contaminants of concern include volatiles. Analysed for volatiles of concern. Laboratory results below laboratory LOR.	No trip blanks were collected during Cavvanba (2019f) investigation works. The consultant noted that samples were placed immediately into chilled eskies following collection and delivered directly to the laboratory therefore limiting the chance for loss volatile compounds. The auditor notes that volatile compounds were discounted as COPCs during the Cavvanba (2019f) investigation. As such, the auditor considers that the omission of trip blanks not to affect the outcome of this audit. Three trip blanks were collected during Cavvanba (2019h), with laboratory results reported below LOR. Trip blanks were not collected/analysed as part of for laboratory batch ES1922153. As corresponding samples were only analysed for PAHs, the auditor considers the omission of trip blank not to affect the outcome of this audit. Two trip blanks were collected during the validation program (Cavvanba 2019k) with laboratory results reported below LOR.
	Trip spike	Collected at a rate of 1 per batch where primary contaminants of concern include volatiles. Laboratory results / recovery within 30 % of the spiked concentration.	No trip spikes were collected during Cavvanba (2019f) investigation works. The consultant noted that samples were placed immediately into chilled eskies following collection and delivered directly to the laboratory therefore limiting the chance for loss volatile compounds. The auditor notes that volatile compounds were discounted as COPCs during the Cavvanba (2019f) investigation. As such, the auditor concurs that the omission of trip spikes not to affect the outcome of this audit. Three trip spikes were collected during Cavvanba (2019h), with laboratory results reported 75-100%. Trip blanks were not collected/analysed as part of for laboratory batch ES1922153. As corresponding samples were only analysed for PAHs, the auditor considers the omission of trip blank not to affect the outcome of this audit. Two trip spikes were collected during the validation program (Cavvanba 2019k) with laboratory results reported 78-91%.
Accuracy	Laboratory surrogate spikes	Surrogate spikes to be performed as required by NATA accreditation,	Surrogate recoveries ranged from 19.8-138 % and were within laboratory control limits.

Parameter	DQIs	Requirement	Auditor Assessment
		generally per sample analysed. Recoveries to be within 70-130 % or 10-140 % (phenols and OCPs only).	
	Laboratory method blanks	Laboratory method blanks to be performed as required by NATA accreditation, generally 1 blank per batch. Results to be below laboratory LOR.	All laboratory method blanks < LOR.
	Laboratory control samples (LCS)	LCS to be performed as required by NATA accreditation, generally one per 20 samples per batch. Recoveries to be within 70-130 % or 30-130 % (phenols only).	LCS recoveries reported in Cavvanba (2019f) ranged from 72-128 % and were within the laboratory control limits. LCS recoveries reported in Cavvanba (2019h) ranged from 48.6 – 122% and were generally within the acceptable criteria with the exception of recoveries reported in batch ES1920868 for organochlorine pesticides (N-2-Fluorenyl, chrysene, beta-Endosulfan and ethion) PAHs (acenaphthylene, anthracene and naphthalene) and TRH C_{10}-C_{16}. The consultant considered the LCS recoveries to be acceptable as they were marginally outside the DQI limits and concentrations of OCPs excluding DDD+DDE+DDT were all below detection limit in the corresponding laboratory batches. The auditor concurs with the consultant findings and considers the LCS exceedances to be minor non-conformances and does not affect the findings of this audit.
	Laboratory matrix spikes (MS)	MS to be performed as required as NATA accreditation, generally one per 20 samples per batch. Recoveries to be within 70-130 % or 30-130 % (phenols only).	MS recoveries reported in Cavvanba (2019f) ranged from 73.9-120 % and were within the laboratory control limits. MS recoveries reported in Cavvanba (2019h) ranged from 22.8-128% and were generally within the acceptable criteria with the exception of recoveries reported in batch ES1920868 and ES1920749 for mercury, zinc PAH/phenols, OCPs, PCBs and TRHs. The consultant considered the MS recoveries to be acceptable as concentrations of the constituents were reported to be below the adopted criteria for all samples in the corresponding laboratory batch. The auditor concurs that this is a minor non-conformance and does not impact the outcome of this audit. MS outliers were reported in batch ES1922275 (surface water) for PAH/Phenols, pesticides, PCBs and TRHs. The consultant considered this not to affect the outcome of the investigation, as an acceptable recovery was obtained for LCS which indicates sample matrix interference. The auditor concurs with the consultant findings and considers the MS exceedances not to affect the findings of this audit. MS recoveries reported in Cavvanba (2019k) were within the laboratory control limits with the exception of recovery reported for Sulfate as SO4 – Turbidimetric in batch ES1929619. The laboratory reported that MS recovery not determined due to background level greater than or equal to 4x spike level. Given the

Parameter	DQIs	Requirement	Auditor Assessment
			analyte, the auditor considers the MS outlier not to affect the findings of this audit.
Analytical Schedule and Sampling Methodology			
Representativeness	Soil sampling locations	Samples to be collected on a representative basis consistent with the CSM.	As part of the soil investigation in the vicinity of the residential building Cavvanba (2019a), a total of 22 test pits were reportedly advanced across the investigation area with a total of 30 samples collected. As part of additional aldrin and dieldrin characterisation beneath the garage slab Cavvanba (2019f), additional 10 test pits were advanced. As part of the targeted soil investigations completed by Cavvanba (2019h), a total of 31 boreholes/ test pits were advanced at the site targeting the residential house (demolished), farm pit (concrete sump feature), farm shed (demolished), farm dam and farm dump. The number of soil sampling locations and the rationale adopted by the consultants during the additional site investigations (Cavvanba 2019f and 2019h) provided sufficient coverage of the investigation areas.
	Soil sampling depths and intervals	Soil sampling depths should be consistent with the anticipated distribution of contamination as detailed in the consultant's CSM.	During Cavvanba (2019a) investigation, soil samples were collected from 0.1m, 0.3m and 0.6m bgs. The sampling depth were generally appropriate to assess the vertical extent of lead/OCP contamination in the investigation area, with numerous sampling locations extending to the natural soils. As part of additional aldrin and dieldrin characterisation beneath the garage slab (Cavvanba 2019f), additional 10 test pits were advanced with samples collected at 0.1 m bgs at each location to further assess previous impact identified at TP30_0.1. As such, the soil sampling depths completed in Cavvanba (2019f) were appropriate to delineate the previously identified impact at TP30 and characterise the soils underlying the garage slab. During the Cavvanba (2019h) investigation, boreholes/test pits were advanced in reworked natural and natural soils to a maximum depth of 1.2 m bgs. The sampling depths and intervals at each of the sampling locations were appropriate given the identified potential contamination sources and the site geology. Based on the nature of remediation works completed at the site, impacted soil has been removed from the site with the final validation samples all collected from residual fill and natural soils which all complied with the remediation acceptance criteria (Cavvanba 2019k).
	Soil sampling methodology	Soil samples to be collected using a methodology which is appropriate for the primary contaminants of concern.	During Cavvanba (2019f) investigation, the consultant reported that soil samples were collected using stainless steel hand tools, ensuring that soil sampled had not been in direct contact with the hand tool. During Cavvanba (2019h) investigation, sample locations targeting the farm pit, farm shed and residential house soil samples were advanced using an excavator. Soil samples were collected from the centre of the excavator bucket, ensuring that soil sampled had not been in direct contact with the bucket. Soil sample locations targeting the farm dam and farm dump were advanced using a hand auger due to limited access within these areas, ensuring that soil sampled had not been in direct contact with the hand tool.

Parameter	DQIs	Requirement	Auditor Assessment
			Sampling for asbestos was undertaken in accordance with the WA DoH 2009 and NEPC 2013 by the consultant (Cavvanba 2019h). Validation samples were collected from the base and walls of remedial excavations (Cavvanba 2019k). The consultant reported that soil samples were collected by hand, using hand tools or directly from the centre of a hand auger. A new pair of gloves were used for the collection of each samples.
	Groundwater sampling locations	Groundwater sampling locations to assess areas of concern, allow for lateral delineation of contamination and assess the groundwater flow direction.	Additional groundwater investigation was undertaken by the consultant (Cavvanba 2019h) to evaluate the potential impact of groundwater contamination present onsite. Four groundwater monitoring wells (MW01 – MW04) were installed in the vicinity of farm shed and farm pit and two additional groundwater monitoring wells (MW05 and MW06) were installed in the vicinity of the farm dump and farm dam as follows: • MW01 installed approximately 10 m east of farm pit/concrete structure (upgradient location). • MW02 installed directly adjacent to farm pit. • MW03 installed to the north-west of the farm pit (downgradient location) • MW04 installed downgradient of the farm shed and pit. • MW05 installed adjacent to the farm dam. • MW06 installed adjacent to the farm dump. The number and locations of monitoring wells installed was sufficient to provide an assessment of groundwater conditions at the site, particularly the potential areas of concern and associated potential contaminants of concern.
	Groundwater well construction	Wells to be constructed in accordance with the current version of the Minimum Constructions Requirements for Water Bores in Australia and screened to target the likely contaminated portion of the water column.	Groundwater monitoring wells (MW01-MW04) were installed using a track-mounted drill rig with combination of solid flight auger and air hammer to a maximum depth of 17 m bgs. These wells were screened within the underlying basalt aquifer. Groundwater monitoring wells MW05 and MW06 were installed using a hand auger to a maximum depth of 1.5 m bgs and screened within silty clay likely to be underlain by the basalt aquifer. The consultant noted that all wells were screened in the first water bearing zone encountered. All wells were constructed of 50 mm diameter Class 18 uPVC casing and screen, with a bentonite seal above the screen. The consultant (Cavvanba 2019h) provided borehole logs detailing the construction of the well. Based on the review of consultant's borehole logs, the auditor considers that the monitoring wells were installed correctly, and the groundwater data are representative of site conditions.
Representativeness	Groundwater sampling methodology	Groundwater samples to be collected approximately 7 days after well installation and development. Groundwater samples to be collected using low flow methods (where it can be	Following installation, the monitoring wells were developed using a disposable bailer where a minimum of three well volumes were removed from the well. Following development, the monitoring wells allowed to equilibrate for five days prior to sampling (Cavvanba 2019h). Two groundwater monitoring events were completed as documented in Cavvanba (2019h and 2019k). All wells were inspected for the presence of LNAPL and

Parameter	DQIs	Requirement	Auditor Assessment
		demonstrated that this is appropriate), or by purging at least 3 well volumes, until field parameters have adequately stabilised.	gauged prior to sampling. Wells were purged during sampling to ensure representative samples were collected. The consultant reported that sampling of wells MW01 – MW04 was completed using a disposal bailer with little agitation or disturbance as possible and the sample containers for the more turbidity-sensitive analytes (i.e. the VOC vials) were filled first. Sampling of well MW05 was completed using a peristaltic pump. Monitoring well MW06 was noted to be dry (Cavvanba 2019h and 2019k). Field parameters, including pH, temperature, conductivity, redox potential and dissolved oxygen were measured during purging using a water quality meter. The consultant provided field notes with groundwater purging information. Review of field documentation identified that purging continued until the water quality parameters were generally stabilised, prior to collection of samples. The consultant's field documentation did not indicate if samples obtained for metals analysis were filtered in the field, however, review of the laboratory reports identified that groundwater samples were 0.45 µm filtered prior to analysis. Taking into consideration the above, the auditor considers that the groundwater sampling method adopted by the consultant was generally considered appropriate and not likely to affect the representativeness of the data.
	Surface water sampling methodology	Surface water samples should be collected in accordance with the requirements of AS/NZS 5667.6-1998.	Surface water sampling was conducted using an unpreserved bottle attached to an extendable pole and gently submerged into the water body at the farm dam to a depth of approximately 1 m, ensuring minimal disturbance of the underlying sediment was achieved. The sample was then decanted into an appropriate laboratory prepared preserved bottle where necessary The auditor considers that the surface water sampling method adopted by the consultant was generally appropriate.
	Soil, sediment groundwater and surface water sampling containers	Soil samples to be collected into laboratory supplied, clean unpreserved Teflon lined jars. Groundwater samples to be collected into laboratory supplied, clean and appropriately preserved sampling containers.	The consultant (Cavvanba 2019f, 2019h and 2019k) reported that soil/sediment samples were immediately placed in laboratory supplied samples jars with no headspace. Bulk soil samples collected for analysis of asbestos during the sampling works were collected in plastic zip-lock bags accordance with the WA DoH 2009 sampling protocols. The consultant (Cavvanba 2019h and 2019k) reported that all groundwater samples were collected into laboratory supplied bottles. Surface water sampling was conducted using appropriately laboratory prepared and supplied sample bottles and quickly capped with no headspace remaining to minimise the loss of any volatiles. All samples were placed directly into chilled eskies and transported to the laboratory under chain of custody documentation.
	Soil and groundwater sampling equipment decontamination	Soil sampling equipment to be decontamination between sampling locations or between sampling depths; and	The consultant (Cavvanba 2019f, 2019h and 2019k) reported that decontamination procedures to prevent cross contamination between samples included use of dedicated sampling equipment, otherwise decontamination of the sampling equipment between each sampling location (using DECON 90).

Parameter	DQIs	Requirement	Auditor Assessment
		monitoring well locations where significant contamination is encountered.	Groundwater sampling was conducted using a dedicated disposable bailer/tubing. The auditor considers the sampling methods employed by the consultants during the investigation works are unlikely to have resulted in significant cross-contamination between sample locations and a review of the available analytical data does not indicate that this has occurred.
Representativeness	Soil sample contamination screening	Soil samples to be screened for contamination via visual / olfactory observations and photo-ionisation detector (PID) measurement.	The consultant (Cavvanba 2019f) did not provide test pit logs, however, included a summary of sample descriptions including relevant observations. The consultant (Cavvanba 2019h) provided test pit/borehole logs detailing observations of material types, visual observations and sample depths. The consultant (Cavvanba 2019h) provided PID calibration records and stated that no PID detection were noted relating to material in the vicinity of the farm dump, however, PID measurements were not provided on test pit logs and PID screening results for remainder of the site were not provided. The consultant (Cavvanba 2019k) provided a summary of validation sample descriptions with sample depths and observation types. Given the site history, the lack of significant volatile contamination at the site and the extent of remediation works undertaken, the absence of field VOC screening is not considered to affect the representativeness of the data.
	Sample storage and transport	Samples to be placed in an insulated container and chilled. Samples to be transported to laboratory under chain of custody conditions.	All samples were transported in ice-cooled chests under chain of custody conditions, to laboratories that were NATA accredited for the analysis performed.
	Laboratory sample receipt advice	No damaged containers. No samples submitted in containers which have not been chilled. No samples to be submitted without sufficient times to comply with recommended holding times.	Laboratory sample receipt advice provided by the nominated laboratories confirmed that all samples were received in suitable condition. Review of laboratory sample receipt advice identified that the sample temperature on receipt was between 4.1-21.1 °C. The auditor notes that there is a potential for volatilisation to have occurred in these samples. However, with consideration to the analysed contaminants of concern, this is a non-conformance not considered to affect the outcome of this audit.
Representativeness	Holding times	Samples to be extracted and analysed within recommended holding times.	A review of the consultant's COC documentation and laboratory reports indicates that all samples were extracted and analysed within their holding times for all analyses undertaken.
	Analytical Method	Samples to be analysed using NATA accredited methodology.	Laboratories used during investigation works (Cavvanba 2019f and 2019h) and site validation (Cavvanba 2019k) included: ALS (primary) and Envirolab (secondary). Laboratory certificates indicate that the laboratories were NATA accredited.

Parameter	DQIs	Requirement	Auditor Assessment
			The auditor notes that the laboratory LOR used for analysis of water samples for B(a)P, OCPs and PCBs was higher than the adopted groundwater investigation levels (GILs) in Cavvanba (2019h). The consultant undertook additional groundwater monitoring as part of site validation (Cavvanba 2019k) including appropriate LOR for OCPs for comparison against assessment criteria. Whilst noting that laboratory LORs for B(a)P and PCB remained higher than GILs, given the absence of significant B(a)P and PCB contamination in soil and the extent of remediation works undertaken at the site, the auditor considers this non-conformance not to affect the outcome of this audit.
	Sampling, analysis and quality plan completeness	100 % of sampling, analysis and quality plan to be implemented.	It is noted that an SAQP was not prepared for auditor review for investigation works completed as a part of Cavvanba (2019f and 2019h). Review of these reports was undertaken by the auditor (**Appendix B**) with no further investigation works required indicating the suitability of the with no further investigation works required with the exception of validation works on completion of site remediation. Following preparation of the RAP and RAP addenda, a VSAQP (Cavvanba 2019j) was prepared and implemented as part of the validation works and reviewed as part of this site audit.
Complete-ness	Field documentation	All relevant field documentation to be collated including sampling logs and calibration records.	The consultant (Cavvanba 2019f) did not provide test pit logs, however, provided a summary of sample descriptions including relevant observations. The consultant (Cavvanba 2019h) provided calibration records, test pit/ borehole logs, groundwater purging data and relevant site plans showing the locations of all sampling locations. The consultant (Cavvanba 2019k) provided calibration records, soil validation sample descriptions, groundwater purging data and relevant site plans showing the locations of all sampling locations.
	Laboratory documentation	All relevant laboratory documentation to be collated, including chain of custody records, sample receipt advice and analytical reports.	The consultant (Cavvanba 2019f, 2019h and 2019k) provided all relevant COC documentation; laboratory sample receipt advice; and full laboratory certificates in the reports.
	Critical sample validity	All critical sample data to be valid.	The auditor considers that the data is considered reliable for the purpose of the investigation.
	Sampling, analysis and quality approach	Adequately comparable sampling, analysis and quality approach to be used throughout the project.	The auditor considers that the data is comparable, as consistent sampling methods were employed throughout the direction of the investigation works and subsequent validation program. One consistent consultant engaged for the investigation works, and validation program (Cavvanba). Furthermore, consistent field staff were employed by

Parameter	DQIs	Requirement	Auditor Assessment
	Sampler	Samplers used throughout the project to have sufficient experience.	the consultant during each phase of investigation and validation works. All laboratory analysis was undertaken by NATA accredited laboratories.

5.1 Audit Findings

The quality assurance/quality control measures employed by the consultant (Cavvanba 2019f, 2019h and 2019k) were checked and found, overall, to generally adequately comply with the requirements outlined in OEH 2011, NEPC 2013 and EPA 2017.

The laboratory QA/QC results have been reviewed and the results indicate that the analytical laboratories were achieving adequate levels of precision and accuracy. As such, the sampling, analytical and quality protocols undertaken by the consultant were considered to be adequately reliable for the purpose of assessing the contamination status of the site; and is reliable and useable for the purpose of this audit.

6. Assessment Criteria

6.1 Soil Criteria

As the site is to be used for health services (i.e. Tweed Valley Hospital), guidelines for residential land use (sensitive receptors) were adopted by OCTIEF (2018b) and Cavvanba (2019c, 2019f, 2019h and 2019k).

The consultants (OCTIEF 2018b, Cavvanba 2019c, 2019f, 2019h and 2019k) adopted the following soil assessment criteria sourced from National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPC 2013):

- Health Investigation Levels: HIL A – residential with garden / accessible soil (home grown produce < 10 % fruit and vegetable intake, no poultry), and includes children's day care centres, preschools and primary schools.
- Health Screening Levels: HSL A/B – residential, low to high density, for assessment of vapour inhalation risk, clay soils.
- Ecological Investigation Levels: EIL- urban residential/ public open space and areas of ecological significance.
- Ecological Screening Levels: ESL – urban residential/ public open space and areas of ecological significance; fine-grained soils.

In relation to ecological receptors, the consultant (OCTIEF 2018b) calculated site-specific EILs as further discussed in **Section 6.4**, with consideration to the proposed land use and the presence of the wetland area in the northern portion of the site being considered as an area of high ecological value. As part of subsequent site investigations documented in Cavvanba (2019h) and site validation works (Cavvanba 2019k), the consultant adopted site specific ecological criteria based on urban residential/ public open space calculated using pH of 6.1, CEC of 5.7 cmol/kg, and organic carbon content of 4.4% based on average laboratory results.

As part of OCTIEF (2018b) investigation, the consultant adopted HSL A for asbestos contamination in soil (0.01% w/w for bonded ACM; for friable asbestos (FA) and asbestos fines (AF), where quantifiable, a screening level of 0.001 % w/w; and no visible asbestos on the ground surface). As part of subsequent site investigations documented in Cavvanba (2019f and 2019h) and site validation works (Cavvanba 2019k) site specific asbestos screening criteria were adopted with consideration to the proposed use of the site is a public hospital. Site specific asbestos criteria comprised no visual observations of ACM as well as no presence of asbestos fibres in soil.

The consultants (OCTIEF 2018b, Cavvanba 2019c, 2019f and 2019h) also considered aesthetic issues as part of site investigation works. As part of site remediation and validation, the consultant (Cavvanba 2019k) conducted an aesthetic assessment in accordance with NEPC 2013.

6.2 Groundwater and Surface Water Criteria

The consultant noted that registered groundwater bores exist within 100 m of the site which are used for domestic and irrigation purposes, and therefore the consultant (OCTIEF 2018b) has compared groundwater and surface water results to drinking water and irrigation guideline values.

The consultant (OCTIEF 2018b) adopted the following surface water/groundwater assessment criteria sourced from NEPC (2013) and Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018):

- Default guideline values (DGVs) for freshwater – 99% level of species protection (ANZG 2018).

- Short term trigger values (STVs) for Primary Industries – irrigation and general on-farm use (ANZECC/ARMCANZ 2000).
- Groundwater Investigation Levels (GILs) for freshwaters applicable to typical slightly-moderately disturbed systems sourced from ANZECC/ARMCANZ 2000 (NEPC 2013).
- Drinking water criteria sourced from Australian Drinking Water Guidelines NHMRC 2011 (NEPC 2011).

As part of additional groundwater investigations undertaken as documented in Cavvanba (2019h and 2019k), the consultant considered the canal located to the north of the site to be the receiving water body which was identified as a disturbed ecosystem (urban catchment), and therefore reported that 95% species protection was appropriate for the assessment of site groundwater conditions. The consultant (Cavvanba 2019h) adopted surface water/groundwater assessment criteria sourced from NEPC (2013) including the following:

- GILs for freshwaters applicable to typical slightly-moderately disturbed systems sourced from ANZECC/ARMCANZ 2000.
- Groundwater HSLs for Vapour Intrusion HSL A&B (low-high density residential) for silt.
- Drinking water criteria sourced from NHMRC (2011).
- Recreational criteria based on guidance provided in NHMRC (2008).

6.3 Sediment Criteria

The consultant (OCTIEF 2018b) adopted the following assessment criteria from ANZG (2018):

- Toxicant Default Guideline Values (DGV) for Sediment Quality.
- Guideline Value – High.

6.4 Audit Findings

The soil, groundwater, surface water and sediment criteria adopted by the consultants (OCTIEF 2018b, Cavvanba 2019c, 2019f, 2019h and 2019k) have been checked against, and were generally consistent with, criteria endorsed by the EPA appropriate for the proposed land use and potential ecological receptors relevant to the site.

As part of the OCTIEF (2018b) assessment, composite soil samples comprising four discrete samples were collected, and as such, the consultant (OCTIEF 2018b) divided relevant assessment criteria by a factor of four. To eliminate the potential for the adjusted guideline value to be below background concentrations, only the added contaminant limits (ACLs) were divided by four. The auditor considers that the modification of soil assessment criteria for assessment of composite samples was appropriate.

The consultant (OCTIEF 2018b) did not provide adequate explanation as to what soil physical and chemical values were utilised in the calculation of site-specific EILs. For completeness, the auditor has calculated appropriate EILs and compared to those utilised in OCTIEF (2018b).

The following soil parameters were utilised for calculation of the Added Contaminant Limits (ACL) for site-specific EIL derivation:

- mean pH value calculated from five analysed soil samples: pH 7.52 (utilised 7.5 in calculations);
- mean CEC value calculated from five analysed soil samples: 9.22 cmol/kg (utilised CEC value of 5 rather than 10 in calculations as three of the five samples exhibited CEC values <10); and

- clay content of ≥10% utilised in calculations as soils were consistently described as clay, indicating a clay content of >40%.

The consultant (OCTIEF 2018b) considered HA-0.15 to represent background conditions, and therefore the following values were adopted as Ambient Background Concentrations (ABC): chromium (total): 18 mg/kg; copper: 71 mg/kg; lead: 11 mg/kg; nickel: 37 mg/kg; and zinc: 170 mg/kg.

Table 6.1: Site Specific EILs Calculated by the Auditor

Metal	Auditor Calculated EIL (mg/kg) Areas of Ecological Significance	Consultant Calculated EIL (mg/kg) Areas of Ecological Significance	Auditor Calculated EIL (mg/kg) Urban Residential and POS	Consultant Calculated EIL (mg/kg) Urban Residential and POS
Chromium (total)	148	150	418	420
Copper	261	260	631	650
Lead	481	480	1 111	1 100
Nickel	42	70	67	200
Zinc	220	220	400	400

With the exception of the consultant's calculated urban residential/POS EIL for nickel, the consultant's EILs were generally consistent with the EILs calculated by the auditor. The discrepancy has not affected the interpretation of the data as no concentration of nickel identified exceeded the more sensitive 'areas of ecological significance' value.

The auditor notes that site specific EILs derived in subsequent site investigation (Cavvanba 2019h) and site validation (Cavvanba 2019k) were comparative to the above EILs and were generally conservative in the absence of background concentrations. The auditor notes that EIL for Nickel adopted in Cavvanba (2019h) and Cavvanba (2019k) was 50 mg/kg and 140 mg/kg respectively. The discrepancy has not affected the interpretation of the validation data as no concentration of nickel identified exceeded the more conservative value.

The consultant (OCTIEF 2018b) adopted ANZG 2018 upper guideline values (GV-high) for investigation of sediments. In accordance with guidance provided in ANZG 2018, the auditor notes that GV-high values should only be used as an indicator of potential high-level toxicity problems and not as a guideline value to ensure protection of ecosystems. However, the consultant also adopted the appropriate ANZG 2018 toxicant DGVs for the assessment of sediments, and as such, the application of both guidelines values is considered not to affect the interpretation of data. The auditor notes that in subsequent investigations, the consultant (Cavvanba 2019h) did not reference appropriate sediment assessment criteria. For completeness, the auditor has assessed the sediment data against the correct criteria below in **Table 7.6**.

The auditor notes that the consultant (OCTIEF 2018b) adopted NEPC 2013 groundwater investigation levels (GILs) for freshwater which represent the values for slightly-moderate disturbed ecosystems, adopted from the superseded ANZECC/ARMCANZ 2000 guidelines. The auditor notes that the consultant also adopted the more sensitive 99% freshwater criteria from current ANZG 2018 guidelines with consideration to the presence of the wetland area in the north eastern portion of the site being considered an area of high ecological value. As such, the application of both guidelines is considered not to affect the interpretation of data.

During the more recent groundwater investigations (Cavvanba 2019h and 2019k), the consultant adopted NEPC 2013 GILs for freshwater adopted from the superseded ANZECC/ARMCANZ 2000 guidelines. However, given the reported groundwater conditions representative of background conditions, the auditor considers this omission not to affect the outcome of this audit. Whilst reference has been made to Groundwater HSLs for commercial/industrial land use within the reports (Cavvanba 2019h and 2019k), the auditor is satisfied that HSL A& B (low-high density

residential) was adopted in the assessment of data, consistent with the proposed sensitive use of the site for health services.

Overall, the auditor considers that the soil, groundwater, surface water and sediment criteria adopted by the consultants were appropriate for assessing the contamination status of the site.

7. Site Investigation Results

7.1 Field Observations

A summary of observations made during the field investigations OCTIEF conducted in 2018 are summarised below.

- The general soil profile encountered across the site during the environmental and geotechnical investigations was described as red brown silty clay with fine gravel to a depth of 0.15m underlain by red brown silty clay including fine to coarse gravel and extremely weathered basalt fragments to maximum depth of 3.6 m bgs, further underlain by zones of high strength basalt and highly weathered clayey material.
- No fill materials, staining or odours were observed during hand auguring undertaken for the environmental investigation.
- PID measurements ranged from 0.0 to 0.2 ppm, consistent with laboratory results which did not identify volatile contamination of soils.
- ACM was observed on the soil surface in the vicinity of sampling location HA1, which was subsequently sampled for laboratory analysis.
- Groundwater was encountered during the geotechnical investigations at depths greater than 10 m bgs.
- A summary of groundwater quality parameters measured at GW1 in August 2018 is provided as follows:
    - pH measured at 6.03;
    - EC measured at 178 µS/cm, indicative of freshwater conditions;
    - Redox measured at -66.3 mV; and
    - Dissolved oxygen measured at 5.27 mg/L.
- A summary of surface water quality parameters measured within the storage dam during August 2018 is provided as follows:
    - pH ranged from 7.22 to 7.23;
    - Redox ranged from -136.6 mV to -137.2; and
    - Dissolved oxygen ranged from 7.23 to 8.32 mg/L.

A summary of observations made during the subsequent soil investigations (Cavvanba 2019a, 2019c and 2019f) are summarised below.

- Grass surface was observed to be in good condition around the edges of the residential building and farm shed with no visible staining or contamination identified.
- Potential lead paint was identified inside the residential building.
- ACM fragments were observed along the north eastern edge of the farm shed and at sample location TP32 on ground surface.

A summary of observations made during groundwater and soil investigation undertaken by Cavvanba (2019h) are summarised below.

- The soil profile encountered in investigated areas was comprised of either natural or disturbed natural soils, consisting of dark brown to red silty clay to maximum depths of 1.1

m bgs, underlain by light grey basalt rock to the maximum explored depth of 17.0 m bgs. Disturbed natural soils were encountered in the vicinity of the farm shed.

- Standing water levels were measured to range between 0.370 m AHD and 14.531 m AHD. Groundwater was inferred to flow to the north, consistent with the site topography. The monitoring well installed at the farm dump (MW06) was found to be dry following installation.
- A summary of groundwater quality parameters is provided below. No odours or sheen was reported in during the groundwater investigations. The groundwater underlying the site was described as relatively neutral, oxygenated and slightly reducing.
    - pH ranged from 6.24 to 7.06;
    - Redox ranged from 338 mV to 363;
    - Dissolved oxygen ranged from 0.88 to 3.48 mg/L; and
    - EC ranged from 0.275 to 0.426 mS/cm.

7.2 Farm Dump Area Visual Assessment

As reported in OCTIEF (2018b), a small farm dump was located on the on the edge of the vegetated area in the northwest corner of the site. A visual inspection of the area identified only inert building materials such as fencing posts, and paving bricks, however due to extensive coverage by vegetation the full extent of the dump could not be clearly determined at the time. An asbestos clearance inspection of the farm dump area and sampling/analysis of identified fibrous cement sheets was conducted by a SafeWork NSW Licensed Asbestos Assessor (LAA), Benjamin Wackett (LAA000132) on 13 December 2018. An asbestos clearance certificate ref: 18084-CC04 (Cavvanba 2018b) was subsequently issued for the farm dump area confirming that fibrous cement sheeting did not contain asbestos and no other potential asbestos was observed during the inspection.

7.3 Soil Analytical Results

7.3.1 PSI/DSI (OCTIEF 2018b)

A detailed soil investigation was undertaken by OCTIEF (OCTIEF 2018b). The consultant (OCTIEF 2018b) provided summary tables (**Appendix E**) in addition to detailed laboratory reports and chain of custody documentation.

A summary of the soil analytical results, in comparison to the adopted soil investigation levels (as provided in **Section 6.1**) is provided in **Table 7.1**, as follows.

Table 7.1: Summary of Soil Analytical Results (mg/kg) (OCTIEF 2018b)

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Metals			
Arsenic	3.7	24	No exceedance
Cadmium	< 0.4	2.6	No exceedance
Chromium (Total)	10	31	No exceedance
Copper	16	99	No exceedance
Lead	8.5	74	No exceedance
Mercury	< 0.1	0.4	No exceedance
Nickel	10	37	No exceedance
Zinc	110	1 600	'Shed' (1 600 mg/kg) and HA4-0.15 (530 mg/kg) exceeded EILs for areas of ecological significance (220 mg/kg) and urban residential/POS (400 mg/kg). HA2-0.15 (270 mg/kg) and HA17-0.15 (200 mg/kg) exceeded EIL for areas of ecological significance.
Volatile Organic Compounds (VOCs)			
Benzene	< 0.1	< 0.1	No exceedance

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Toluene	< 0.1	< 0.1	No exceedance
Ethylbenzene	< 0.1	< 0.1	No exceedance
Total Xylenes	< 0.3	< 0.3	No exceedance
1.1.1.2-Tetrachloroethane	< 0.5	< 0.5	No exceedance
Bromobenzene	< 0.5	< 0.5	No exceedance
Carbon Tetrachloride	< 0.5	< 0.5	No exceedance
Chloroform	< 0.5	< 0.5	No exceedance
Total Recoverable Hydrocarbons (TRH)			
TRH C_6-C_{10} (F1)	< 20	< 20	No exceedance
TRH C_6-C_{10} Fraction	< 20	< 20	No exceedance
TRH > C_{10}-C_{16} Fraction	< 50	< 50	No exceedance
TRH > C_{10}-C_{16} (F2)	< 50	< 50	No exceedance
TRH > C_{16}-C_{34} (F3)	< 100	180	No exceedance
TRH > C_{34}-C_{40} (F4)	< 100	< 100	No exceedance
Polycyclic Aromatic Hydrocarbons (PAHs)			
Benzo(a)pyrene (BaP)	< 0.5	< 0.5	No exceedance
Anthracene	< 0.5	< 0.5	No exceedance
Pyrene	< 0.5	< 0.5	No exceedance
Naphthalene	< 0.5	< 0.5	No exceedance
Chrysene	< 0.5	< 0.5	No exceedance
Total PAHs	< 0.5	< 0.5	No exceedance
Organochlorine Pesticides (OCPs)			
DDE+DDD+DDT	< 0.05	0.56	No exceedance
Aldrin + Dieldrin	< 0.05	< 0.05	No exceedance
Heptachlor	< 0.05	< 0.05	No exceedance
Endrin	< 0.05	< 0.05	No exceedance
Methoxychlor	< 0.05	< 0.05	No exceedance
Organophosphorus Pesticides (OPPs)			
Chlorpyriphos	< 0.2	< 0.2	No exceedance
Diazinon	< 0.2	< 0.2	No exceedance
Fenthion	< 0.2	< 0.2	No exceedance
Ronnel	< 0.2	< 0.2	No exceedance
Trichloronate	< 0.2	< 0.2	No exceedance
Asbestos in Soil			
AF/FA (2 – 7 mm)	< 0.001%	0.021%	Exceedance to HSL A at HA1-0-0.1 (0.021%)
AF/FA (<2 mm)	< 0.001%	0.010%	Exceedance to HSL A at HA1-0-0.1 (0.010%)

7.3.2 Additional Soil Investigations (Cavvanba 2019c, 2019f and 2019h)

A soil investigation of the residential building and attached garage was undertaken by the consultant (Cavvanba 2019a). The report was amended as Cavvanba (2019f) to reflect an isolated aldrin and dieldrin impact identified within shallow soil beneath the garage slab. A soil investigation of the Farm Shed was undertaken following demolition of the structure as documented in Cavvanba (2019c). Subsequently, a soil investigation was undertaken targeting the residential house (demolished), farm pit (concrete sump feature), farm shed (demolished), farm dam and farm dump.

The consultant (Cavvanba 2019c, 2019f and 2019h) provided summary tables (**Appendix E**) in addition to detailed laboratory reports and chain of custody documentation.

A summary of the soil analytical results, in comparison to the adopted soil investigation levels (as provided in **Section 6.1**) is provided in **Table 7.2**, as follows.

Table 7.2: Summary of Soil Analytical Results (mg/kg) (Cavvanba 2019c, 2019f and 2019h)

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Metals			
Arsenic	<5	19	No exceedance
Cadmium	<1	11	No exceedance

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Chromium	5	46	No exceedance
Copper	14	2540	Farm Pit Exceedance at SL01_0.1 (209 mg/kg), SL02_0.1 (2220 mg/kg), SL03_0.1 (2540 mg/kg) and SL04_0.1 (120 mg/kg) to EIL (120 mg/kg) (**Cavvanba 2019h**). Farm Shed Exceedance at SL14_1.0 (142 mg/kg) to EIL (120 mg/kg) (**Cavvanba 2019h**).
Lead	15	1600	Residential House: Exceedance at TP01_0.1 (1090 mg/kg) and TP01_0.3 (1600 mg/kg), TP02_0.1 (1070 mg/kg) to HIL A (300 mg/kg) and EIL urban residential and open space (1100 mg/kg) (**Cavvanba 2019f**). Exceedance at TP02_0.3 (838 mg/kg), TP02_0.6 (324 mg/kg), TP03_0.1 (502 mg/kg), TP03_0.3 (416 mg/kg), TP04_0.1 (324 mg/kg), TP06_0.1 (317 mg/kg) to HIL A (300 mg/kg) (**Cavvanba 2019f**). Exceedance at SL21_0.1 (347 mg/kg) and SL22_0.1 (385 mg/kg) to HIL A (300 mg/kg) (**Cavvanba 2019h**).
Nickel	4	99	Farm Pit Exceedance at SL02_0.1 (99 mg/kg) to EIL (50 mg/kg) (**Cavvanba 2019h**).
Zinc			Farm Pit Exceedance at SL01_0.1 (3700 mg/kg), SL02_0.1 (3490 mg/kg), SL04_0.1 (347 mg/kg), SL08_0.1 (899 mg/kg) and SL11_0.1 (3980 mg/kg) to EIL (330 mg/kg) (**Cavvanba 2019h**). Farm Shed Exceedance at SL13_0.1 (1050 mg/kg), SL15_0.1 (402 mg/kg) and SL17_0.1 (1190 mg/kg) to EIL (330 mg/kg) (**Cavvanba 2019h**). Farm Dump Exceedance at SL26_0.1 (331 mg/kg), SL28_0.1 (465 mg/kg) and SL28_0.5 (502 mg/kg) to EIL (330 mg/kg) (**Cavvanba 2019h**).
TRH			
F1 C6-C10	<10	-	No exceedance
F2 >C10-C16	<50	120	Farm Pit Exceedance at SL01_0.1 (120 mg/kg) to ESL (120 mg/kg) (**Cavvanba 2019h**).
F3 >C16-C34	<100	2170	Farm Pit Exceedance at SL02_0.1 (2170 mg/kg) to ESL (1300 mg/kg) (**Cavvanba 2019h**).
F4 >C34-C40	<100	180	No exceedance
BTEX			
Benzene	<0.2	-	No exceedance
Toluene	<0.5	-	No exceedance
Ethylbenzene	<0.5	-	No exceedance
Xylenes	<1	-	No exceedance
PAHs			
Benzo(a)pyrene	<0.5	4.7	Farm Pit Exceedance at SL11_0.1 (4.7 mg/kg) to ESL (1300 mg/kg) (**Cavvanba 2019h**).
Naphthalene	<0.5	-	No exceedance
Carcinogenic PAHs	<LOR	7.1	Farm Pit Exceedance at SL11_0.1 (7.1 mg/kg) to HIL A (3 mg/kg) (**Cavvanba 2019h**).
Total PAHs	<LOR	71.3	No exceedance
OCPs			
DDE+DDD+DDT	< 0.05	9.07	No exceedance
Aldrin + Dieldrin	< 0.05	10.6	Residential House: TP30_0.1 (10.6 mg/kg) to HIL (6 mg/kg) (**Cavvanba 2019h**).
Heptachlor	< 0.05	< 0.05	No exceedance
Endrin	< 0.05	< 0.05	No exceedance

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Methoxychlor	< 0.05	< 0.05	No exceedance
Asbestos in Soil			
Asbestos Detected	Non-detect	Detect	Farm Shed Chrysotile and crocidolite asbestos detected above reporting limit of 0.1 g/kg at TP32_0.1 (**Cavvanba 2019c**). Crocidolite asbestos detected below reporting limit of 0.1 g/kg at TP33_0.1 (**Cavvanba 2019c**). Chrysotile and crocidolite asbestos detected above reporting limit of 0.1 g/kg at SL16_0.1 (**Cavvanba 2019h**).

7.4 Groundwater Analytical Results

One monitoring well (GW1) installed for geotechnical purposes was sampled by the consultant (OCTIEF 2018b) during August 2018. During subsequent investigations undertaken by Cavvanba (2019h), an investigation of groundwater conditions was undertaken using monitoring wells (MW01 – MW04) installed in the vicinity of farm shed and farm pit and monitoring wells (MW05 and MW06) installed in the vicinity of the farm dump and farm dam.

The consultants provided summary tables (**Appendix E**) in addition to detailed laboratory reports and chain of custody documentation.

A summary of the groundwater analytical results, in comparison to the adopted groundwater investigation levels (as provided in **Section 6.2**) is provided in **Table 7.3**, as follows.

Table 7.3: Summary of Groundwater Results (mg/L) (OCTIEF 2018b and Cavvanba 2019h)

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Metals			
Arsenic	< 0.001	< 0.001	No exceedance
Cadmium	< 0.0002	< 0.0002	No exceedance
Chromium	< 0.001	< 0.001	No exceedance
Copper	0.001	0.002	Exceedance in GW01 (0.002 mg/L) to 99% freshwater DGV **(OCTIEF 2018b)**.
Lead	< 0.001	< 0.001	No exceedance
Mercury	< 0.0001	< 0.0001	No exceedance
Nickel	< 0.001	0.001	No exceedance
Zinc	0.018	0.02	Exceedance in GW01 (0.018 to 0.02 mg/L) to 99% freshwater DGV **(OCTIEF 2018b)**. Exceedance in MW01 (0.008 mg/L), MW03 (0.01 mg/L), MW04 (0.015 mg/L) and MW05 (0.008 mg/L) to freshwater GIL **(Cavvanba 2019h)**.
Mercury	0.05	0.45	Exceedance in MW01 (0.45 mg/L), MW03 (020 mg/L), MW04 (0.24 mg/L) and MW05 (0.12 mg/L) to freshwater GIL **(Cavvanba 2019h)**.
OCPs			
DDE+DDD+DDT	< 0.0001	< 0.0001	No exceedance
Aldrin + Dieldrin	< 0.0001	< 0.0001	No exceedance
Heptachlor	< 0.0001	< 0.0001	No exceedance
Endrin	< 0.0001	< 0.0001	No exceedance
Methoxychlor	< 0.0001	< 0.0001	No exceedance
OPPs			
Chlorpyriphos	< 0.02	< 0.02	No exceedance
Diazinon	< 0.002	< 0.002	No exceedance

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Fenthion	< 0.002	< 0.002	No exceedance
Ronnel	< 0.002	< 0.002	No exceedance
Trichloronate	< 0.002	< 0.002	No exceedance
PCBs			
PCBs	<0.001	<0.001	No exceedance
TRH			
F1 C6-C10	<0.02	<0.02	No exceedance
F2 >C10-C16	<0.1	<0.1	No exceedance
F3 >C16-C34	<0.1	0.41	No exceedance
F4 >C34-C40	<0.1	<0.1	No exceedance
Naphthalene	<0.002	<0.002	No exceedance
BTEX			
Benzene	<0.001	<0.001	No exceedance
Toluene	<0.002	<0.002	No exceedance
Ethylbenzene	<0.002	<0.002	No exceedance
Xylenes	<0.002	<0.002	No exceedance
PAHs			
Benzo(a)pyrene	<0.0005	<0.0005	No exceedance
Carcinogenic PAHs	<0.0005	<0.0005	No exceedance
Total PAHs	<0.0005	<0.0005	No exceedance

7.5 Surface Water Analytical Results

Two surface water samples (WS01 and WS02) were collected by the consultant (OCTIEF 2018b) from the onsite storage dam during August 2018. One surface water sample (SW_DAM) was collected from the dam and one water sample (SW-DIP) was collected from inside the farm pit feature during Cavvanba (2019h).

The consultants provided summary tables (**Appendix E**) in addition to detailed laboratory reports and chain of custody documentation.

A summary of the surface water analytical results, in comparison to the adopted investigation levels (as provided in **Section 6.2**) is provided in **Table 7.4**, as follows.

Table 7.4: Summary of Surface Water Results (mg/L) (OCTIEF 2018b and Cavvanba 2019h)

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Metals			
Arsenic	< 0.001	0.004	No exceedance
Cadmium	< 0.0002	0.0033	Exceedance at SW-DIP (0.0033 mg/L) to freshwater and drinking water GILs **(Cavvanba 2019h)**.
Chromium	< 0.001	0.005	Exceedance at SW-DIP (0.005 mg/L) to freshwater GIL **(Cavvanba 2019h)**.
Copper	< 0.001	1.23	Exceedance at WS01 (0.012 mg/L) to 99% Freshwater DGV **(OCTIEF 2018b)**. Exceedance at SW-DIP (1.23 mg/L) to freshwater GIL **(Cavvanba 2019h)**.
Lead	< 0.001	0.022	Exceedance at SW-DIP (0.022 mg/L) to freshwater and drinking water GILs **(Cavvanba 2019h)**.
Mercury	< 0.0001	< 0.0001	No exceedance
Nickel	0.002	0.017	Exceedance at WS01 (0.017 mg/L) to 99% Freshwater DGV **(OCTIEF 2018b)**.
Zinc	0.01	4.82	Exceedance at WS01 (0.077 mg/L) and WS02 (0.01 mg/L) to 99% Freshwater DGV **(OCTIEF 2018b)**.

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
			Exceedance at SW-DIP (4.82 mg/L) and SW_DAM (0.018 mg/L) to freshwater GIL **(Cavvanba 2019h)**.
Mercury	<0.00004	<0.00004	No exceedance
OCPs			
DDE+DDD+DDT	< 0.0001	< 0.0001	No exceedance
Aldrin + Dieldrin	< 0.0001	< 0.0001	No exceedance
Heptachlor	< 0.0001	< 0.0001	No exceedance
Endrin	< 0.0001	< 0.0001	No exceedance
Methoxychlor	< 0.0001	< 0.0001	No exceedance
OPPs			
Chlorpyriphos	< 0.02	< 0.02	No exceedance
Diazinon	< 0.002	< 0.002	No exceedance
Fenthion	< 0.002	< 0.002	No exceedance
Ronnel	< 0.002	< 0.002	No exceedance
Trichloronate	< 0.002	< 0.002	No exceedance
PCBs			
PCBs	<0.001	<0.001	No exceedance
TRH			
F1 C6-C10	<0.02	0.14	No exceedance
F2 >C10-C16	<0.1	6.62	No exceedance
F3 >C16-C34	<0.1	28.2	No exceedance
F4 >C34-C40	<0.1	<0.1	No exceedance
Naphthalene	<0.002	0.0455	Exceedance at SW-DIP (0.0455 mg/L) to freshwater GIL **(Cavvanba 2019h).**
BTEX			
Benzene	<0.001	<0.001	No exceedance
Toluene	<0.002	<0.002	No exceedance
Ethylbenzene	<0.002	<0.002	No exceedance
Xylenes	<0.002	<0.002	No exceedance
PAHs			
Benzo(a)pyrene	<0.0005	<0.0005	No exceedance
Carcinogenic PAHs	<0.0005	<0.0005	No exceedance
Total PAHs	<0.0005	1.2	No exceedance

7.6 Sediment Analytical Results

Two sediment samples (SED01 and SED02) were collected by the consultant (OCTIEF 2018b) from the onsite storage dam during August 2018. One sediment sample (SS01) was taken from the dam by Cavvanba (2019h).

OCTIEF (2018b) did not tabulate the results but provided detailed laboratory reports and chain of custody documentation. Cavvanba (2019h) provided summary tables (**Appendix E**) in addition to detailed laboratory reports and chain of custody documentation.

A summary of the sediment analytical results, in comparison to the adopted investigation levels (as provided in **Section 6.3**) is provided in **Table 7.5**, as follows.

Table 7.5: Summary of Sediment Results (mg/kg) (OCTIEF 2018b and Cavvanba 2019h)

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Metals			
Arsenic	< 2	4.7	No exceedance
Cadmium	< 1	< 1	No exceedance
Chromium	< 5	19	No exceedance
Copper	< 5	82	Copper in SED01 (82 mg/kg) exceeded DGV (65 mg/kg) **(OCTIEF 2018b)**
Lead	< 5	10	No exceedance

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Mercury	< 0.1	0.1	No exceedance
Nickel	< 5	28	Nickel in SED01 (28 mg/kg) exceeded DGV (21 mg/kg) **(OCTIEF 2018b)**
Zinc	< 5	129	No exceedance
Alkali Metals			
Potassium	640	1 000	-
Nutrients			
Nitrate + Nitrite (as N)	< 5	< 5	-
Total Kjeldahl Nitrogen (as N)	2 900	3 700	-
Total Nitrogen (as N)	2 900	3 700	-
Phosphorous	1 300	1 800	-
OCPs			
DDE+DDD+DDT	< 0.05	< 0.05	No exceedance
Aldrin + Dieldrin	< 0.05	< 0.05	No exceedance
Lindane	< 0.05	< 0.05	No exceedance
Endrin	< 0.05	< 0.05	No exceedance
OPPs			
Chlorpyriphos	< 0.2	< 0.2	-
Diazinon	< 0.2	< 0.2	-
Fenthion	< 0.2	< 0.2	-
Ronnel	< 0.2	< 0.2	-
Trichloronate	< 0.2	< 0.2	-

7.7 Concrete Analytical Results

Two samples (CS_01 and CS_02) were collected and analysed of the concrete of the farm pit during Cavvanba (2019h). All COPC concentrations were reported below the laboratory LOR and/or site assessment criteria with the exception of the following:

- Copper concentration reported in sample CS_02 at 12,200 mg/kg in exceedance of the HIL A (6000 mg/kg);
- Zinc concentration reported in sample CS_01 (1360 mg/kg) and CS_02 (1590 mg/kg) in exceedance of the EIL (330 mg/kg); and
- TRH F3>C16 - C34 fraction reported in sample CS_01 (7830 mg/kg) and CS_02 (9440 mg/kg) in exceedance of the ESL (1300 mg/kg).

7.8 Consultant's Interpretations and Conclusions

The consultant (OCTIEF 2018b) provided the following discussion of results, conclusions and recommendations:

- Targeted soil sampling was undertaken in vicinity of the main site shed (HA1, HA2), vehicle shed (HA4), farm dump (HA6 and HA7) and dam pump house (HA5). Analytical results reported no concentrations above human health assessment criteria. Samples HA4-0.15 (530 mg/kg) and HA2-0.15 (270 mg/kg) reported concentrations of zinc above the ecological assessment criteria, as did the shed surface sample (1 600 mg/kg) conducted during preliminary sampling in June 2018. Weathered galvanised steel sheeting was noted on the main and vehicle sheds in the vicinity of these samples locations and was considered a likely potential source of the reported zinc concentrations.
- HA17 was the only composite sample collected across the cultivated area on site that reported concentrations above the adopted assessment criteria. The concentration of zinc (200mg/kg) exceeded the adjusted EIL for areas of ecological significance. Additional analysis of each of the four discrete samples (HA17-1 to HA17-4) that comprised the

composite sample HA17 was undertaken, and the discrete samples reported zinc concentrations below EIL.

- Asbestos guttering on the western side of the chemical / equipment shed was noted to be in relatively poor condition, and other ACM was observed on the western edge of the shed roof and against the western wall of the shed. ACM fragments were also noted on the surface adjacent to the western side of the shed, and the material appeared somewhat degraded. The surface soil sample collected from this area (HA1-0-0.1m) reported concentrations of asbestos fines above the adopted assessment criteria. No visible ACM in surface soils should be present for residential and open space land use, and both the NEPM and workplace Health and Safety (WHS) regulations require removal of visible ACM prior to any work activities that may disturb it. Any areas containing asbestos impacts requiring off-site disposal would require appropriate classification in accordance with the Waste Classification Guidelines: Part 1 - Classifying waste (NSW EPA, 2014) prior to disposal offsite to an appropriately licenced facility.
- Anthropogenic wastes were noted in a small farm dump in the north western corner of the site, visual assessment and soil analytical testing indicate the material in this area is inert waste, however some portions of the dump could not be assessed during the PSI/DSI due to vegetation growth.
- The groundwater well installed onsite intersected a basalt aquifer with static groundwater level approximately 10.5m below ground surface (gauged during geotechnical site works). Minor concentrations of zinc and copper detected in the groundwater sample above the adopted assessment criteria were considered likely to be indicative of naturally occurring background concentrations in the regional groundwater.
- The surface water samples collected from the storage dam onsite (WS01 and WS02) reported zinc, nickel and copper (WS01) concentrations above the respective freshwater GILs and 99% species protection levels (ANZG 2018). These concentrations were considered typical of general runoff, and not to be indicative of any significant contamination to the surface water.
- Sediment sample SED01 reported arsenic, copper and nickel concentrations exceeding the default sediment guideline values (DGV). The concentrations identified were comparable to the surface soil concentrations across the cultivated area of the site and were not considered to be indicative of any significant contamination in the dam sediments.

The consultant provided the following discussion of results, conclusions and recommendations relating to the residential house and farm shed investigations as documented in Cavvanba /920109a, 2019c and 2019f):

- The consultant (OCTIEF 2018b) concluded that a Remediation Action Plan (RAP) be developed for the area of ACM impacted soil on the western side of the main site shed, in accordance with SEPP 55 and relevant NSW guidelines and legislation and include appropriate protocols for removal and appropriate disposal of all remaining ACM associated with the main shed.
- The consultant (Cavvanba 2019a) concluded that lead concentrations exceeding SAC were present underneath the residential building in all four samples locations to 0.3 m bgs; approximately 1 m from the eastern wall of the residential building, in the southern portion associated with TP06 to 0.1 m bgs; and extending to 0.6 m bgs at TP02. Based on decreasing lead concentrations with depth observed at TP02, the consultant noted that exceedances of SAC will not extend below 0.7 m bgs. The consultant recommended that remediation and/or management is required based on the concentrations of lead detected in the vicinity of the residence.

- The consultant (Cavvanba 2019f) undertook additional characterisation of shallow soils underlying the garage slab with respect to the isolated aldrin and dieldrin impact identified at TP30 at 0.1 m bgs. The consultant undertook statistical analysis of the aldrin and dieldrin data set and concluded that no remediation was required in this area.
- The consultant (Cavvanba 2019c) concluded that asbestos contamination was identified assumed to be limited to approximately 1 m from the north-eastern wall of the farm shed; approximately 3 m from the south-western wall of the farm shed; and no deeper than 0.3 m bgs. The consultant noted that delineation of asbestos in soil has not been completely achieved for the farm shed as investigation beyond the immediate perimeter adjacent to TP32 was not undertaken due to presence of an access road. The consultant recommended that remediation and/or management is required based on the detection of asbestos fibres and observation of ACM in the soil around the former farm shed.

The consultant (Cavvanba 2019h) provided the following discussion of results, conclusions and recommendations relating to additional investigation relating to the farm pit, farm shed, residential house, farm dump and farm dam:

- Exceedances to ecological criteria were identified in soil, however having regard to the localised nature of impact (farm pit and farm shed), absence of indicators relating to vegetation stress and future landscaped areas likely having imported topsoil/growing media, further investigation or remediation of isolated ecological exceedances was not considered to be warranted.
- B(a)p TEQ was detected in excess of the human health criteria in one soil investigation location adjacent to the concrete slab associated with the farm pit requiring remediation/management.
- Elevated concentrations of metals and TRH $C_{10} – C_{40}$ were reported within the farm pit water considered to be associated with fuels, oils, grease and solvents historically used within the area. Elevated copper and TRH F3 concentrations were reported in concrete samples collected from the farm pit was considered to be associated with the historic use of the farm pit and effect of chemical impregnation of the surface of the concrete rather than a feature of the concrete batching. The consultant reported that the farm pit water and concrete were required to be removed and disposed off-site at a facility licensed to receive the waste.
- Asbestos in soil identified in the vicinity of the former farm shed in exceedance of site-specific criteria and was considered attributable to ACM, rather than a friable asbestos source such as pipe lagging or loose insulation, and therefore was not considered to pose a friable risk. These findings did not change the proposed remedial scope for the farm shed footprint as outlined in Cavvanba (2019d).
- Lead concentrations identified in shallow soils underlying the former residential house in exceedance of human health criteria. These findings did not change the proposed remedial scope for the residential house footprint as outlined in Cavvanba (2019b).
- Soil and surface water Investigations targeting the farm dam did not identify potential impacts requiring remediation in this area.
- Soil investigations undertaken in the vicinity of the farm dump did not identify potential impacts requiring remediation in this area. The consultant noted that general waste material identified posing an aesthetic issue will be lawfully removed off-site.
- The monitoring well installed at the farm dump was found to be dry following installation. However, in the absence of PID detections or odours were identified associated with this material, absence of soil impact in the farm dump and the absence of any soil or

groundwater impact in the downgradient farm dam, the risk associated with contamination was considered to be low.

- Concentrations of metals (zinc and mercury) were identified in groundwater in excess of freshwater criteria. These were considered to be representative of background conditions as evidenced by concentrations reported in the upgradient MW01 monitoring well. Low level TRH detections were reported in groundwater, below adopted assessment criteria. This was considered to pose a low contamination risk based on the absence of BTEX/PAH detected in groundwater indicating that the source was not petroleum related. Further the consultant noted that no gross TRH contamination was identified during soil investigations and no sheen was observed during surface water and groundwater investigations. The consultant noted that the above conclusions were based on a limited data set (i.e. single groundwater monitoring event). The consultant recommended that further groundwater sampling should be undertaken as part of site validation works to investigate the exceedances of criteria for zinc and mercury, the presence of low-level detections of TRH, water type as well and trace level OCPs for comparison against site criteria.

7.9 Audit Findings

The consultants (OCTIEF 2018b and Cavvanba 2019a, 2019c, 2019f and 2019h) provided tables and a summary of results that were generally accurate and complete.

Relevant site plans provided by the consultants (OCTIEF 2018b and Cavvanba 2019a, 2019c, 2019f and 2019h) adequately identified the sampling locations relevant to the main site features such as boundaries and street frontage and have been produced to scale. Site plans produced by the consultants are included in **Appendix D**.

A review of the laboratory reports and associated chain of custody documentation indicates that samples were received appropriately, with no discrepancies noted. The laboratory procedures were generally appropriate for the identified potential contaminants of concern and the adopted site assessment criteria against which the results were compared. Review of analytical data provided in Cavvanba (2019h) identified that laboratory LOR used for analysis of water samples for B(a)P, OCPs and PCBs was higher than the adopted groundwater investigation levels (GILs). The auditor notes that the consultant (Cavvanba 2019k) undertook an additional round of groundwater monitoring following site remediation works as discussed in **Section 8**, including trace level OCP analysis for comparison against assessment criteria. The auditor further notes that trace level analysis was not undertaken for B(a)P and PCB analysis, however, given the absence of significant B(a)P and PCB contamination in soil and the extent of remediation works undertaken at the site as discussed in Section 8, the auditor considers the raised LORs not to affect the overall reliability of the groundwater data and does not affect the assessment of the extent and nature of groundwater contamination at the site.

The consultant (Cavvanba 2019h) provided PID calibration records and stated that no PID detection were noted relating to material in the vicinity of the farm dump, however, PID measurements were not provided on test pit logs and PID screening results for remainder of the site were not provided. Given the site history, the lack of significant volatile contamination at the site and the extent of remediation works undertaken, the absence of field VOC screening is not considered to affect the representativeness of the data. Review of information provided by the consultant (Cavvanba 2019h), indicates that groundwater sampling was undertaken following suitable purging of the wells and the sample collected was generally clear and free of any turbidity. Furthermore, no hydrocarbon sheens or odours were noted during the sampling.

The consultant's (OCTIEF 2018b) concluded that the minor concentrations of zinc identified in excess of EILs are likely to be associated with degradation of the galvanised steel noted in the vicinity of the sample locations (sheds), and that the area of impact is relatively minor and isolated. The consultant

stated that the site was considered suitable for the proposed use from a chemical contamination perspective. The auditor concurs that remediation of isolated ecological exceedances was not warranted, however, notes that subsequent soil investigations at the site (Cavvanba 2019a and Cavvanba 2019c) identified lead impact in soil in the vicinity of residential building, in exceedance of adopted human health criteria. The results were incorporated into consideration of the proposed remedial strategy outlined in the RAP addendum (Cavvanba 2019b), as discussed in **Section 8**, and is considered appropriate for the purposes of this audit. Ecological exceedances of heavy metals (copper, nickel and zinc), TRH F2, TRH F3 and B(a)P were reported in shallow soil at select locations across the site (Cavvanba 2019h). Due to the absence of any ecological impacts identified as part of the site investigations, the exceedances of the EILs are considered by the auditor to not warrant any further assessment or management.

The Cavvanba (2019a) report was amended as Cavvanba (2019f) to reflect an isolated aldrin and dieldrin impact identified within shallow soil beneath the garage slab. Based on the results of the soil investigation and statistical assessment, the auditor concurs with the consultant that the reported soil impact beneath the garage slab is unlikely to realise any unacceptable health and ecological risks to the proposed development, hence soil remediation is not considered to be warranted in this area.

The auditor concurs with the consultant's (OCTIEF 2018b) conclusion that the identified ACM and concentrations of AF/FA identified are likely to be associated with the degradation of ACM associated with the various sheds. The results were incorporated into consideration of the proposed remedial strategy outlined in the RAP (OCTIEF 2019), as discussed in **Section 8,** and are considered appropriate for the purposes of this audit.

Further, the soil investigation undertaken by Cavvanba (2019c) identified additional asbestos impacts to the southeast of the farm shed. The auditor notes that the Cavvanba (2019c) asbestos investigation was limited and did not comprise 500 mL samples in conformance with NEPC 2013/ WA DoH 2009 requirements. Further, asbestos impact was not laterally delineated due to the presence of an access road beyond TP32 and only one sample was analysed at depth of 0.3 m bgs to delineate the extent of vertical impact. Investigation results from both OCTIEF (2018b) and Cavvanba (2019c) including limitations of these assessments were incorporated into consideration of the updated indicative remedial extent outlined in the RAP addendum (Cavvanba 2019d), as discussed in **Section 8**, and is considered appropriate for the purposes of this audit.

The auditor concurs that findings of Cavvanba (2019f and 2019h) do not change the proposed remedial scope for the residential house and farm shed footprint as outlined in Cavvanba (2019b and 2019d). The consultant (Cavvanba 2019h) stated that B(a)P impact identified in the vicinity of the farm pit required remediation/management. The results were incorporated into the proposed remedial strategy outlined in the RAP addendum developed for the farm pit (Cavvanba 2019i), as discussed in **Section 8** and is considered appropriate for the purposes of this audit.

A limited groundwater assessment was completed as part of OCTIEF (2018b) where one monitoring well (GW01) installed for geotechnical purposes was sampled as part of the investigation. The consultant (OCTIEF 2018b) concluded that the minor concentrations of copper and zinc identified as exceeding 99% protection level freshwater guidelines are likely to be reflective of regional aquifer conditions, rather than indicative of groundwater contamination beneath the site. As part of the previous audit undertaken at the site (Audit Reference: 0503-1901), the auditor noted that groundwater samples collected by the consultant (OCTIEF 2018b) were not appropriately filtered in the field prior to heavy metals analysis as required under the guidelines. Due to the data quality issues identified above, the auditor considered the groundwater data obtained from the investigation to be indicative only and not suitable quality for comparison against the nominated criteria. However, based on risk-based factors outlined in NEPC (2013) in relation to consideration of

groundwater impacts, and the absence of significant soil impacts at the site, the auditor considered that broader groundwater investigations were not warranted at the time.

Additional groundwater monitoring was undertaken by the consultant (Cavvanba 2019h) as part of subsequent site investigations undertaken in accordance with development consent requirements. Concentrations of metals (zinc and/or mercury) in site groundwater exceeded the adopted freshwater criteria. The auditor concurs with the consultant (Cavvanba 2019h) that these metals are likely representative of background groundwater conditions and so do not require any further assessment or management as per the requirements of ANZECC/ARMCANZ 2000. An additional groundwater monitoring round was undertaken by the consultant to reaffirm the findings of Cavvanba (2019h) including analysis of TRH silica gel clean up, major ions and trace level OCP as discussed in **Section 8** and is considered appropriate for the purposes of this audit.

The minor concentrations of copper and nickel identified in sediment sample SED01 as exceeding DGV were considered by the consultant (OCTIEF 2018b) to be consistent with the concentrations of these metals identified in surface soils at the site, and therefore not to be indicative of contamination of storage dam sediments. The auditor concurs with this conclusion and notes that additional investigation of farm dam sediments was undertaken by Cavvanba (2019h). The consultant (Cavvanba 2019h) did not compare the sediment analytical results against ANZG (2018) toxicant DGVs for sediments. For completeness, the auditor has assessed the sediment data against the correct criteria above in **Table 7.5,** with no results identified in exceedance of site criteria.

The consultant (OCTIEF 2018b) reported that concentrations of zinc, nickel and copper identified in surface water sample WS01 as exceeding freshwater 99% species protection levels, were considered typical of general runoff to the onsite storage dam, and not to be indicative of any significant contamination to the surface water. As part of the previous audit undertaken at the site (Audit Reference: 0503-1901), the auditor noted that surface water samples were not filtered by the consultant prior to analysis for heavy metals and as such, was not suitable for comparison against the nominated criteria. In the absence of significant soil impacts at the site, the auditor considered the surface water quality to be representative of general runoff conditions.

Additional investigation of surface water within the farm dam and farm pit was undertaken by the consultant (Cavvanba 2019h) as part of subsequent site investigations undertaken in accordance with development consent requirements. Surface water impacts requiring remediation were not identified within the farm dam. Elevated concentrations of metals and TRH was identified within the farm pit water and considered to be associated with fuels, oils, grease and solvents historically used within the area. The results were incorporated into the proposed remedial strategy outlined in the RAP addendum developed for the farm pit (Cavvanba 2019i), as discussed in **Section 8** and is considered appropriate for the purposes of this audit.

Elevated copper and TRH concentrations reported in concrete samples collected from the farm pit (Cavvanba 2019h) and was considered to be associated with the historic use of the farm pit and effect of chemical impregnation of the surface of the concrete rather than a feature of the concrete batching. The results were incorporated into proposed remedial strategy outlined in the RAP addendum developed for the farm pit (Cavvanba 2019i), as discussed in **Section 8** and is considered appropriate for the purposes of this audit.

The consultants reported that the site investigation reports (OCTIEF 2018b and Cavvanba 2019a, 2019c, 2019f and 2019h) have been prepared to meet the requirements of the *State Environmental Planning Policy No 55 – Remediation of Land* (SEPP 55) and the accompanying *Managing Contaminated Land: Planning Guidelines* (DUAP 1998). The auditor is satisfied that the requirements of SEPP 55 and DUAP 1998 have been adequately addressed in the site investigation reports.

The conclusions reached by the consultants in relation to contamination issues are considered appropriate and meet the requirements of the site audit. Overall, the consultant reports (OCTIEF

2018b and Cavvanba 2019a, 2019c, 2019c and 2019h) is considered to have obtained and reported results in a manner which enables conclusions to be drawn regarding the need for remediation (as discussed in **Section 8**) and therefore meets the requirements of the site audit.

8. Remediation and Validation

8.1 Remediation Objective

The consultant reported that the objective of the RAP (OCTIEF 2019) is to document the processes required to address soil contamination to achieve the remediation goals which include:

- Remediate the site to a level suitable for the for the proposed future land use (i.e. hospital use);
- Remove any unacceptable risk to human health and environment associated with contaminated material; and
- Ensure protection of the remediation team, surrounding community and the environment throughout the remediation works.

8.2 Remediation Options

The consultant (OCTIEF 2019) undertook an appraisal of remediation/management options. In accordance with NEPC 2013, the consultant (OCTIEF 2018b) summarised the preferred hierarchy of options for site remediation/management as follows:

- On-site treatment of contamination so that the contaminant(s) are either destroyed or the associated hazard is reduced to an acceptable level; then
- Off-site treatment of contamination so that the contaminant(s) are either destroyed or the associated hazard is reduced to an acceptable level, after which the formerly contaminated material is returned to the site.

If the above cannot be implemented, other options that should be considered include:

- Removal of contaminated material to an approved site or facility (such as a landfill), followed, where necessary by the reinstatement of formed excavations using clean fill; then
- Consolidation and isolation of the contaminated material on-site by containing the contaminated material within a properly designed barrier.

The consultant (OCTIEF 2019) also noted that if remediation is likely to cause a greater adverse effect than would occur should the site be left undisturbed, then remediation should not proceed.

8.3 Preferred Remediation Approach

The consultant (OCTIEF 2019) reported that to meet the remedial goal of remediating the site to a level suitable for the proposed land use (hospital) the adopted remedial method is excavation and offsite disposal.

Physical removal and disposal of asbestos that may be disturbed by the site works was the preferred strategy and considered consistent with regulatory requirements. The consultant (OCTIEF 2019) also noted that the preferred remedial option would include the removal of hazardous building materials by an appropriately licenced asbestos removalist in accordance with the requirements of the Work Health and Safety Act and Regulation 2011 and the Code of Practice – How to Safely Remove Asbestos (December 2011).

Following completion of additional investigations, the following RAP addenda were prepared by the consultant (Cavvanba) and presented for auditor review:

- Following identification of lead impacted soil in the vicinity of the residence as documented in Cavvanba (2019a), a RAP addendum (Cavvanba 2019b) was prepared.
- Following identification of additional asbestos impacts in the vicinity of the farm shed as documented in Cavvanba (2019c), a RAP addendum (Cavvanba 2019d) was prepared.

- Following identification of B(a)P impacted soil in the vicinity of the farm pit including, farm pit water and concrete impacted with metals, TRHs and naphthalene, a RAP addendum (Cavvanba 2019i) was prepared.

With consideration to the site remediation objectives established in the RAP (OCTIEF 2019), the RAP addenda (Cavvanba 2019b, 2019d and 2019i) identified the preferred remediation strategy for lead, asbestos and B(a)P impacted soils as excavation and off-site disposal. Additionally, the preferred remediation strategy for the farm pit (Cavvanba 2019i) comprised vacuum suction and off-site disposal of heavy metal, TRH and naphthalene impacted water followed by excavation and disposal of the heavy metal and TRH impacted concrete sump feature.

8.4 Remediation and Validation Activities

The consultant (Cavvanba 2019k) stated that remediation works were undertaken between 5 September and 17 October 2019. The consultant (Cavvanba 2019k) further stated that the remedial works outlined in the RAP and RAP addenda were implemented by Delta Group Pty Ltd (the Civil Contractor) with asbestos removal works undertaken by Aztech Services and environmental oversight provided by Cavvanba Consulting.

The consultant (Cavvanba 2019k) stated that a surveyor (B&P Surveys) marked out the remediation area for the farm pit, farm shed and residential house using previous survey data. Additionally, an asbestos removal zone was established by Aztech Services at the farm shed during each stage of remediation.

8.4.1 Soil Waste Classification for Off-site Disposal

To assist the off-site disposal of contaminated soils at licensed landfill facilities, the validation consultant (Cavvanba 2019k) completed waste classification of materials within remedial areas associated with the farm pit, farm shed and residential house. The consultant stated that the following letters were submitted to the Queensland Department of Environment and Science (DES) which provided the basis for waste classification of material designated for off-site disposal, with the waste classification reports provided as part of the validation report:

- Request for a disposal permit for contaminated soil, 771 Cudgen Road, Cudgen NSW 2487 (Ref. 19038 L02).
- Request for additional volume, disposal permit for contaminated soil, 771 Cudgen Road, Cudgen NSW 2487 (Ref. 19038 L04).

The following waste classifications were established in general accordance with EPA (2014) Waste Classification Guidelines Part 1: Classifying waste:

- Soil/concrete at the farm pit was classified as general solid waste (non-putrescible).
- Soil surrounding the farm shed was classified as general solid waste (asbestos waste).
- Soil surrounding the residential house was classified as restricted solid waste.

The consultant's figures are included in **Appendix D**. The consultant provided summary tables (**Appendix E**) in addition to detailed laboratory reports and chain of custody documentation

The consultant provided documentation relating to disposal permit applications/ approvals as summarised in **Table 8.1** below.

Table 8.1: Soil Disposal Permit Details

	Permit CLEB06649419	Permit CLEB06658919
Description of Source Area	Soil excavated from the farm pit, farm shed and residential house remediation areas	Additional soil excavated from the farm shed remediation area
Valid Dates of Transportation	01/08/2019 to 01/12/2019	04/10/2019 to 03/10/2020

	Permit CLEB06649419	Permit CLEB06658919
Waste Type	Asbestos Waste code S N220	
Waste Generator	Delta Group, 771 Cudgen Road, Cudgen NSW 2487	
Waste Transporter	Lantrak, 270 Lahr's Road, Ormeau QLD 4208	
Waste Receiver	Veolia Environmental Services (Australia) Pty Ltd, Ti-Tree Bioenergy, 55 Champions Way, Willowbank QLD 4306	

8.4.2 Excavation and Removal of Impacted Soil

Farm Pit

The consultant (Cavvanba 2019k) reported remediation works within the farm pit comprised excavation of approximately 5 m^3 of PAH impacted soils from the demarcated area. Excavated soils were directly loaded into trucks for off-site disposal on 10 September 2019. Approximately 10 tonnes of soils generated from the farm pit remediation area were disposed of at the Veolia TiTree Bioenergy waste facility on 10 September 2019.

In addition, the consultant (Cavvanba 2019k) reported that following wastes were removed from the farm pit area:

- Five litres of water contained within the farm pit concrete sump feature with elevated heavy metals, TRH and PAHs was pumped and disposed as oily water at Cleanaway Facility located at 29 Binary Street, Yatala, QLD.
- Concrete associated with the farm pit sump feature was excavated and disposed of off-site on 9 October 2019. A total of 9.79 tonnes of concrete was disposed of at Stotts Creek Resource Recovery Centre, Leddays Creek Road, Stotts Creek NSW.

Copies of relevant waste transport and disposal documentation were provided in the validation report (Cavvanba 2019k).

Farm Shed

Remediation of asbestos impacted soils associated with the farm shed was undertaken between 10 September and 17 October 2019. The consultant (Cavvanba 2019k) stated that multiple rounds of remediation was undertaken with the excavation extended until successful validation was achieved, as summarised below:

- Stage 1: Excavation to a depth of 0.3 m bgs as outlined in the RAP in a halo shape surrounding the former building and off-site disposal of 197.18 tonnes of soil on 10 September 2019.
- Stage 2: Additional excavation to a depth of 0.5 m bgs where asbestos was detected during Stage 1 validation predominantly around the central portion of the building and off-site disposal of 28.28 tonnes of soil on 23 September 2019.
- Stage 3: Excavation of the entire excavation area to approximately 0.4-0.5 m bgs including removal of the soil from beneath the farm shed and extending to the west of the investigation area in the central portion and off-site disposal of 351.28 tonnes of soil between 9 and 10 October 2019.
- Stage 4: Excavation of two areas where asbestos was identified during Sage 3 validation to approximately 1.0 m bgs in the eastern base of the excavation and unexpected find of glass burial pit and off-site disposal of 29.64 tonnes of soil on 17 October 2019.

The consultant (Cavvanba 2019k) stated that four air monitoring pumps were set up around the perimeter of the farm shed prior to commencement of each stage of remediation. Review of

asbestos air monitoring reports included in the validation report identified that air monitoring was conducted on 10 and 23 September and 1, 10 and 17 October 2019. Excavated soils were directly loaded into trucks for off-site disposal. A total of 606.38 tonnes of soils generated from the farm shed remediation area (Stages 1-4) were disposed of at the Veolia TiTree Bioenergy waste facility.

Copies of relevant waste transport and disposal documentation were provided in the validation report (Cavvanba 2019k).

Residential House

The consultant (Cavvanba 2019k) reported that remediation works within the residential house comprised excavation of lead impacted soils from the demarcated area. Excavated soils were directly loaded into trucks for off-site disposal on 10 September 2019. Approximately 45 tonnes of soils generated from the residential house remediation area were disposed of at the Veolia TiTree Bioenergy waste facility on 10 September 2019.

Copies of relevant waste transport and disposal documentation were provided in the validation report (Cavvanba 2019k).

Farm Dump

The consultant (Cavvanba 2019k) reported that approximately 18.02 tonnes of building and demolition waste from the farm dump was excavated and disposed on September 2019 at Stotts Creek Resource Recovery Centre, Leddays Creek Road, Stotts Creek NSW.

The consultant (Cavvanba 2019k) completed a visual inspection of the farm dump, following removal of waste material on 11 October 2019.

8.4.3 Unexpected Finds

Farm Shed – Staged Remediation

The consultant (Cavvanba 2019k) remediation of the farm shed area was undertaken in multiple stages noting that more widespread asbestos fibres was encountered during remediation in comparison to the approximate remedial extent identified in the RAP.

The consultant (Cavvanba 2019k) stated that following Stage 2 of remediation, further investigations were undertaken to inform validation including sampling of imported material placed above a geofabric layer as part of interim site management following demolition works, sampling beneath the former farm shed building and delineation samples to the west of the remedial excavation. The consultant (Cavvanba 2019k) noted that asbestos was detected in a sample (SL102) collected beneath the farm shed and in delineation samples (SL106 and SL107) collected to the west. Based on the findings of the investigation and time constraints associated with development, Stage 3 was extended to include the entire of the initial investigation area, below the former farm shed building, as well as extending the excavation to the west to the incorporate the delineation samples which detected fibres. The consultant (Cavvanba 2019k) further reported that the additional soil excavations and resulting spoil necessitated a second disposal permit to be obtained as outlined in **Table 8.1** above.

Farm Shed – Glass Bottle Burial Pit

The consultant (Cavvanba 2019k) reported that a burial pit containing glass bottles was encountered during Stage 4 remediation works undertaken within the farm pit area. The burial pit was identified to be 1.5 m long by 0.5 m wide extend from 0.7-1.1 m bgs. Due to potential aesthetic impacts and safety concerns, the burial pit was excavated and removed during Stage 4 works.

Farm Pit – Cattle Ramp

The consultant (Cavvanba 2019k) reported that a cattle ramp structure including a concrete ramp with metal supports was identified adjacent to the farm pit area during remediation. The feature

was found to consist of a concrete ramp, which was filled with boulders, as well as one piece of steel being identified within the structure. The consultant (Cavvanba 2019k) reported that no asbestos was identified within the ramp and no further investigations were considered required. The consultant reported the cattle ramp structure to be appropriate for removal as building demolition waste.

8.4.4 Soil Validation Sampling and Analysis

The soil validation works was completed by the consultant (Cavvanba 2019k) in accordance with the requirements of the relevant RAPs (OCTIEF 2019, Cavvanba 2019b, 2019d and 2019i), VSAQP (Cavvanba 2019j) and with consideration to observations made during site remediation as summarised below.

Farm Pit

Validation samples SL29_0.1, VS101_0.1, SL31_0.1 and SL33_0.1 were collected from the north, west, south and east wall respectively with validation sample VS100_0.3 collected from the base of the excavation following removal of B(a)P impacted soil. Validation samples were analysed for PAHs inclusive of B(a)P. The concertation of all analytes tested in the validation soil samples were reported below the laboratory reporting limit and/or adopted remediation criteria for all soil samples analysed.

Validation samples SL03_0.5, SL01_1.1, VS102_0.8 and SL02_1.1 were collected from the north, west, south and east wall respectively with validation sample VS103_1.1 collected from the base of the excavation following removal of the concrete sump feature. Validation samples were analysed for heavy metals, TRH, BTEXN, PAHs, OCPs, OPPs and PCBs. The concertation of all analytes tested in the validation soil samples were reported below the laboratory reporting limit and/or adopted remediation criteria for all soil samples analysed.

Farm Shed

In accordance with the requirements of the RAP and VSAQP, validation sampling at the farm shed was undertaken in accordance with WA DoH 2009. In locations of failed validation, remedial excavations were extended until successful validation was achieved. The auditor notes that four remediation stages were completed as outlined in **Section 8.4.2**. The consultant (Cavvanba 2019k) reported that the final resultant excavation face was approximately 765 m^2.

Successful validation samples collected from the farm shed remedial excavation are summarised below. It is noted that samples denoted with /2, /3 or /4 refer to successful validation samples collected following additional remedial excavations completed in Stages 2-4.

- Validation samples VS01, VS02, VS06, VS09, VS11, VS14, VS17, VS18, VS21, VS25, VS27, VS29, VS36, VS43, VS44, VS70, VS72, VS73, VS74, VS76, VS77, SL105, SL108 and SL109 were collected from the walls of the resultant excavation, approximately at 0.1 m bgs.
- Validation samples VS03/2, VS04/4, VS05, VS07/2, VS08/2, VS10, VS12, VS13, VS15, VS16, VS19, VS20, VS22, VS23, VS24, VS26, VS28, VS30, VS31, VS32, VS33, VS34/2, VS35/3, VS37/3, VS38, VS39/2, VS40/2, VS41, VS42, VS45, VS46/2, VS47/2, VS71, VS75 and VS77 collected from the base of the resultant excavation surrounding the former building, approximately at 0.5-1.0 m bgs.
- Validation samples VS48 – 59, VS60/2 and VS61 - VS69 were collected from the base of the resultant excavation within the former building footprint approximately at 0.5-1.0 m bgs.
- Validation samples UF02, UF03 and UF04 were collected from the excavation wall resulting from the unexpected find (glass burial pit) removal at approximately 0.7 m bgs, with sample UF01 was collected from the base of the excavation at 1.3 m bgs.

Validation samples were analysed for asbestos with concentrations within site specific remediation criteria (i.e. no presence of asbestos fibres in soil). Validation samples associated with the unexpected find removal were additionally analysed for arsenic with concentrations reported below the laboratory reporting limit for all soil samples analysed.

Residential House

Validation samples TP09_0.1 and TP10_0.1 collected from the north-western wall, samples VS205_0.1 and VS206_0.1 collected from the north-eastern wall, TP05_0.1 and TP12_0.1 collected form the south-eastern wall, TP07_0.1 and TP08_0.1 from the south-western wall and samples TP06_0.3, TP04_0.3, VS200, VS201, VS202, VS203 and VS204 collected from the base of the excavation. Validation samples were analysed for lead with concentrations reported below the laboratory reporting limit and/or adopted remediation criteria for all soil samples analysed.

8.4.5 Reinstatement of Remedial Excavations

The consultant (Cavvanba 2019k) reported that the on completion of site remediation works, the excavations were backfilled with material sourced from the site. The consultant stated that backfill material was sourced from the northern portion of the site proposed construction of the sediment basins and stockpiled prior to use. The consultant (Cavvanba 2019k) completed an inspection of the material prior to placement and reported the soil to be consistent with the natural soil on-site, i.e. red to brown silty clay with no anthropogenic materials, asbestos, or odours identified.

8.4.6 Validation Inspections and Monitoring

The consultant (Cavvanba 2019k) reported that asbestos air monitoring was conducted on 10 and 23 September and 9, 10 and 17 October 2019 during the removal of asbestos impacted soils in the vicinity of the farm shed. Review of relevant airborne fibre analysis test reports included in the validation report identified that all results were reported below 0.01 fibres/mL.

Following removal of asbestos impacted soils, the consultant (Cavvanba 2019k) stated that a visual clearance of the resultant surface was conducted by LAA, Benjamin Wackett (LAA000132) on 17 October 2019 of the resultant excavation surface. An asbestos clearance certificate ref: 19038-CC01-171019 was subsequently issued for the inspected area confirming no visible asbestos was present in the area.

The consultant (Cavvanba 2019k) reported that a visual inspection of the farm dump area was undertaken on 11 October 2019 and confirmed the removal of wastes previously present in the area.

8.5 Groundwater Investigation

As part of the groundwater and soil investigation documented in Cavvanba (2019h) recommended additional round of groundwater sampling to be undertaken during site validation to investigate the presence of low-level detections of TRH and exceedances of heavy metal criteria.

As part of site validation works (Cavvanba 2019k), groundwater monitoring was undertaken in September 2019, with existing groundwater monitoring wells (MW01-MW05) sampled and analysed for heavy metals, TRH (including silica gel clean-up), BTEXN, PAHs, OCPs, PCBs and major anions and cations. MW06 was noted to be dry at the time of sampling.

A summary of the groundwater analytical results, in comparison to the adopted investigation levels (as provided in **Section 6.2**) is provided in **Table 8.2**, as follows.

Table 8.2: Summary of Groundwater Results (µg/L) (Cavvanba 2019k)

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Metals			
Arsenic	<1	18	Exceedance in MW03 (18 µg/L) to 95% freshwater and drinking water criteria
Cadmium	<0.1	<0.1	No exceedance

Substance	Minimum concentration	Maximum concentration	Exceedance of Assessment Criteria
Chromium	<1	<1	No exceedance
Copper	<1	<1	No exceedance
Lead	<1	<1	No exceedance
Mercury	<0.1	<0.1	No exceedance
Nickel	<1	<1	No exceedance
Zinc	<5	7	No exceedance
Mercury	<0.1	<0.1	No exceedance
OCPs			
Aldrin + Dieldrin	< 0.01	< 0.01	No exceedance
Heptachlor	< 0.005	< 0.005	No exceedance
Endrin	< 0.01	< 0.01	No exceedance
Methoxychlor	< 0.01	< 0.01	No exceedance
PCBs			
PCBs	<0.1	<0.1	No exceedance
TRH			
F1 C6-C10	<20	<20	No exceedance
F2 >C10-C16	<100	<100	No exceedance
F3 >C16-C34	<100	<100	No exceedance
F4 >C34-C40	<100	<100	No exceedance
Naphthalene	<2	<2	No exceedance
BTEX			
Benzene	<1	<1	No exceedance
Toluene	<2	<2	No exceedance
Ethylbenzene	<2	<2	No exceedance
Xylenes	<2	<2	No exceedance
PAHs			
Benzo(a)pyrene	<0.5	<0.5	No exceedance
Carcinogenic PAHs	<0.5	<0.5	No exceedance
Total PAHs	<0.5	<0.5	No exceedance

The consultant (Cavvanba 2019k) provided the following discussion of results, conclusions and recommendations relating to groundwater investigation:

The reported concentration of arsenic in exceedance of site assessment criteria was considered not to require further investigation. The consultant reported that concentration of arsenic within site soils was an order of magnitude lower than the adopted site assessment criteria indicating the low-level detections of arsenic in groundwater to be representative of background conditions.

Higher concentrations of zinc and mercury were reported in the monitoring undertaken in July 2019 (Cavvanba 2019h), however, no exceedances were reported during the September 2019 monitoring event. The consultant (Cavvanba 2019k) reported that similar concentrations were present in majority of the wells during the July 2019 monitoring, including upgradient well MW01 and as such the reported concentrations were considered to be representative of background conditions.

8.6 Deviations from the RAP

A summary of the remediation and validation works undertaken at the site have been included above in **Section 8.4**. The RAP (OCTIEF 2018) and subsequent RAP addenda (Cavvanba 2019b, 2019d and 2019i) prepared for the site were reviewed by the auditor. Additionally, a VSAQP (Cavvanba 2019j) was prepared for review by the auditor prior to commencement of remediation works at the site.

The consultant (Cavvanba 2019k) stated that remediation of the farm shed area was undertaken in multiple stages noting that more widespread asbestos fibre impacted soils were encountered during remediation in comparison to the approximate remedial extent identified in the RAP. The consultant (Cavvanba 2019k) further reported that the additional soil excavations and resulting spoil necessitated a second disposal permit to be obtained as outlined in **Table 8.1** above.

8.7 Audit Findings

RAP

The consultant's nominated remediation objectives as reported in the RAP (OCTIEF 2018) and subsequent RAP addenda (Cavvanba 2019b, 2019d and 2019i) were appropriate and consistent with the proposed site landuse.

The consultant considered a range of remediation/management options and adopted excavation and off-site disposal as the preferred remediation approach for the site.

With consideration to the nature and extent of the identified soil contamination, the auditor accepts the preferred/adopted approach to be appropriate and consistent with relevant NSW EPA guidance.

The adopted remediation approach was checked by the auditor and found to be:

- Technically feasible.
- Environmentally justifiable given the nature and extent of the identified contamination.
- Consistent with relevant laws, policies and guidelines, since the works were undertaken in a manner which did not appear to result in any relevant regulatory measures being breached.

Extent of Remediation Works

Remediation works, primarily including the removal of impacted fill materials in the vicinity of the farm pit, farm shed, and residential house were undertaken between 5 September and 17 October 2019, with oversight from the consultant (Cavvanba). The remedial works also included removal of surface water and concrete associated with the farm pit concrete sump feature, removal of building and demolition waste in the vicinity of the farm dump and removal of an unexpected find comprising a glass bottle burial pit as part of the farm shed remediation works.

Remediation of asbestos impacted soil within the farm shed area was completed in multiple stages until remediation acceptance criteria outlined in the RAP were met. Following completion of remediation and validation works in this area, a final inspection of the resultant excavation was undertaken by an LAA. The consultant also undertook an inspection of the farm dump area following removal of building and demolition waste present in the area .

The RAP (OCTIEF 2019) detailed relevant regulatory requirements relating the remediation works. This included category 2 notification required to be submitted to Council prior to commencement of remediation works. However, based on development consent conditions subsequently issued for the site, the auditor was satisfied that consent had been obtained for remediation works and considered there to be no requirement for remediation works to be treated as Category 2 works as per Reg 15(1)(a) of SEPP55 (**Appendix B**). The RAP (OCTIEF 2019) also recommended that the remediation of the asbestos impacted materials on site be undertaken by an asbestos removalist contractor with a current friable asbestos removal licence (Class A) with SafeWork NSW to be notified five days prior to commencement of licensed asbestos removal work. It is noted that the consultant (Cavvanba 2019k) did not provide details relating to licenses held by the asbestos removalist and notifications made by the remediation contractor.

A Work Health and Safety Plan (Delta 2019), Works Plan (LLB 2019a) and Hazardous Materials Management Plan Asbestos Management Plan (LLB 2019b) were prepared for review by the auditor prior to commencement of remediation works at the site in accordance with requirements of the previous audit (Audit Reference: 0503-1901) and development consent conditions.

The consultant (Cavvanba 2019k) reported works were generally conducted in accordance with the RAP (OCTIEF 2018) and subsequent RAP addenda (Cavvanba 2019b, 2019d and 2019i), with deviations to the RAP reported as discussed above in **Section 8.6**. However, the auditor notes that

the remediation and validation sampling approach remained consistent with the overall remediation approach outlined in the RAP.

The remediation works described by the consultant were also consistent with observations made during audit inspections undertaken upon completion of remediation works as outlined in **Section 1.5**.

Validation Works

The consultant (Cavvanba 2019k) provided tables which adequately summarised laboratory results.

The site plans provided by the consultant were also prepared to scale and adequately identified the sampling locations relevant to the main site features, boundaries and street frontage.

The reported concentrations of contaminants by the consultant (Cavvanba 2019k) were checked against and were found to be consistent with those reported by the laboratory. The laboratory procedures were also appropriate for the identified contaminants of concern and the adopted site validation criteria against which the results were compared.

The validation sampling approach undertaken by the consultant (Cavvanba 2019k) comprised both a visual inspection and confirmatory sampling and provided photographic documentation in the validation report. Validation samples were collected in accordance with the RAP (OCTIEF 2019), RAP addenda (Cavvanba 2019b, 2019d and 2019i) and VSAQP (Cavvanba 2019j). Following remediation of asbestos impacted soils within the farm shed area, a visual inspection was undertaken by LAA, Benjamin Wackett (LAA000132) on 17 October 2019 of the resultant excavation surface. An asbestos clearance certificate ref: 19038-CC01-171019 was subsequently issued for the inspected area confirming no visible asbestos was present in the area (Cavvanba 2019k). In order to verify the consultant's observations, the auditor's assistant undertook a further visual assessment on 12 November 2019 (**Table 1.1**). The consultant's conclusions relating to visible asbestos were consistent with observations made during audit inspection.

Waste Classification and Off-site Disposal

The consultant undertook waste classification (Cavvanba 2019k) of soil intended for off-site disposal during remediation works, in accordance with waste classification guidelines (EPA 2014):

- Soil/concrete at the farm pit was classified as general solid waste (non-putrescible).
- Soil surrounding the farm shed was classified as general solid waste (asbestos waste).
- Soil surrounding the residential house was classified as restricted solid waste.

Based on review of waste disposal documentation, wastes were disposed from the site as summarised below:

- A total of 661.38 tonnes of soils generated from the farm pit, farm shed and residential house remediation works area were disposed of at the Veolia TiTree Bioenergy waste facility located at 55 Champions Way, Willowbank QLD 4306.
- Five litres of water contained within the farm pit (concrete sump feature) was pumped and disposed as oily water at Cleanaway Facility located at 29 Binary Street, Yatala, QLD.
- A total of 9.79 tonnes of concrete associated with the farm pit was disposed of at Scotts Creek Resource Recovery Centre, Leddays Creek Road, Stotts Creek NSW.
- A total of 18.02 tonnes of building and demolition waste from the farm dump was excavated and disposed on September 2019 at Stotts Creek Resource Recovery Centre, Leddays Creek Road, Stotts Creek NSW.

Waste disposal documentation was provided by the consultant (Cavvanba 2019k) indicates that the waste materials were appropriately classified and taken to facilities lawfully able to accept the waste materials, as classified.

Reinstatement of Remedial Excavations

Remedial excavations were reinstated using site won material sourced from the northern portion of the site proposed construction of the sediment basins. The material was stockpiled prior to use and inspected by the consultant (Cavvanba 2019k) and identified to be consistent with the natural soil on-site, i.e. red to brown silty clay with no anthropogenic materials, asbestos, or odours identified.

9. Evaluation of Landuse Suitability

In assessing the suitability of a site for an existing or proposed landuse in an urban context, the decision process for assessing urban redevelopment sites should be followed (Page 46 and 47, EPA 2017), as discussed in the following sections.

This audit was undertaken with the objective of independently reviewing site investigation reports (OCTIEF 2018b, Cavvanba 2019a, 2019c, 2019f and 2019h), RAP (OCTIEF 2019), RAP addenda (Cavvanba 2019b, 2019d and 2019i), VSAQP (Cavvanba 2019j) and validation report (Cavvanba 2019k) to determine if the land is suitable for the proposed hospital use.

9.1 Reporting in accordance with EPA requirements

The documents provided by the consultants have been checked against, and meet the requirements of OEH (2011). As such, the reporting of the site investigation process and the remediation and validation process is considered to be appropriate and meets the requirements of this audit.

9.2 Aesthetic have been addressed

The consultants (OCTIEF 2018b, Cavvanba 2019c, 2019f and 2019h) completed an assessment of contaminant odours, soil discolouration, anthropogenic material and/or presence of asbestos during site investigation works. Additionally, potential aesthetic issues were addressed during site remediation works (Cavvanba 2019k). As part of site remediation, the consultant reported that all aesthetically impacted materials were removed from remediation areas including the residential house, farm shed, farm pit and farm dump. The removal of aesthetic impacts was confirmed during the visual assessment undertaken by the auditor's assistant on 12 November 2019

As such, aesthetic issues are considered to have been adequately addressed.

9.3 Soils have been assessed against the appropriate investigation levels

The site assessment criteria adopted by the consultants (OCTIEF 2018b, Cavvanba 2019c, 2019f, 2019h and 2019k) have been checked against and are generally consistent with, appropriate criteria endorsed by the EPA. The consultant adopted appropriate criteria considering the proposed use of the site as a hospital.

The consultant's (Cavvanba 2019c) asbestos analysis was limited to presence/absence and did not meet the requirements of NEPC 2013/ WA DoH 2009. However, the auditor notes that the analysis was adequate for the purpose of characterising the contamination status and additionally notes that subsequent site investigations (Cavvanba 2019h) and validation (Cavvanba 2019k) was undertaken in accordance with the requirements of NEPC 2013/ WA DoH 2009.

the auditor notes that appropriate site validation criteria were presented by the consultant in the RAP (OCTIEF 2019), RAP (Cavvanba 2019b, 2019d and 2019i) addenda and VSAQP (Cavvanba 2019j).

The remediation and validation works were generally conducted in general accordance with the RAP, RAP addenda, and VSAQP and criteria endorsed by the EPA.

9.4 Groundwater has been assessed against appropriate investigation levels

The groundwater investigation criteria adopted by the consultants (OCTIEF 2018b, Cavvanba 2019h and 2019k) have been checked against and are generally consistent with, appropriate criteria endorsed by the EPA. It is noted that due to the identified deficiencies in groundwater sampling methodologies, the groundwater data obtained as part of OCTIEF (2018b) was considered to be indicative only. Subsequent groundwater investigations were undertaken at the site as part of Cavvanba (2019h and 2019k). As discussed in **Section 6.2**, the consultant adopted NEPC 2013 GILs for freshwater adopted from the superseded ANZECC/ARMCANZ 2000 guidelines. However, given the reported groundwater conditions representative of background conditions, the auditor considers this this not to affect the interpretation of results and the outcome of the audit.

9.5 Background soil concentrations have been adequately addressed

During the site investigation works, the consultant sampled in natural formations, providing a clear indication and representation of local natural soil profiles. The remediation works at the site included the removal and disposal of impacted fill/natural materials and subsequently, validation of the underlying natural material was undertaken as part of the validation program. As such, background soil concentrations are considered to have been adequately addressed.

9.6 All impacts of chemical mixtures have been assessed

No issues relating to chemical mixtures in relation to identified contaminants of concern were identified. Hence, there was no requirement to give any further consideration to the impact of chemical mixtures.

9.7 Any potential ecological risks have been assessed

The consultants (OCTIEF 2019b, Cavvanba 2019a, 2019c and 2019h) identified potential sensitive ecological receptors and completed an assessment of potential ecological risks. OCTIEF (2018b) identified minor ecological exceedance to zinc in the vicinity of the farm shed and further ecological exceedances of heavy metals (copper, nickel and zinc), TRH F2, TRH F3 and B(a)P were reported in shallow soil at select locations across the site during Cavvanba (2019h).

In the absence of indicators relating to vegetation stress and future landscaped areas likely having imported topsoil/growing media, further investigation or remediation of isolated ecological exceedances was not considered to be warranted. As such, the requirements of the site audit in relation to potential ecological risks have been met.

9.8 Site management strategy is appropriate

Based on the remediation works undertaken at the site, long term site management is not required at the site.

9.9 Contaminant migration (actual or potential) has been addressed

The consultants (OCTIEF 2018b, Cavvanba 2019h and 2019k) addressed both the potential and actual migration of the identified contaminants of concern through an assessment of groundwater.

It is noted that due to the identified deficiencies in groundwater sampling methodologies, the groundwater data obtained as part of OCTIEF (2018b) was considered to be indicative only. As part of the previous site audit (Audit Reference: 0503-1901), based on risk-based factors outlined in NEPC (2013) in relation to consideration of groundwater impacts, and the absence of significant soil impacts at the site, the auditor considered that broader groundwater investigations were not required at the time.

Additional groundwater monitoring was undertaken by the consultant (Cavvanba 2019h and 2019k) as part of subsequent site investigations undertaken in accordance with development consent requirements which identified concentrations of metals (arsenic, zinc and/or mercury) in site groundwater in exceedance of the adopted criteria generally consistent with the findings of the previous OCTIEF (2018b) investigation. The Auditor concurs with the consultant that these metals are representative of background groundwater conditions and therefore do not require any further assessment or management.

As such, the requirements of the site audit in relation to consideration of contaminant migration have been met.

10. Audit Summary Opinion

On the basis of the findings of the site audit, and subject to the limitations in **Section 11**, the following summary opinions are provided:

- The site assessment activities and remediation and validation works are considered to have met the requirements of the Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd Edition) (EPA 2017).
- The site investigation activities identified lead, B(a)P and asbestos impacted soils in the vicinity of the residential house, farm pit and farm shed which required remediation or management under the proposed use as a hospital. Additionally, metals, TRH and naphthalene impacted water and concrete associated with the farm pit concrete sump feature and building and demolition waste in the vicinity of the farm dump required management.
- There were no levels of the identified contaminants of potential concern in groundwater which are considered to require remediation or management under the proposed use. There was no evidence of potential or actual migration of contaminants from the site which may result in unacceptable risks to surrounding human or ecological receptors.
- The RAP (OCTIEF 2019) and subsequent RAP addenda (Cavvanba 2019b, 2019d and 2019i) prepared for the site addressed the identified contamination issues as they relate to the proposed uses of the site. The remediation approach documented in the RAP and RAP addenda was checked by the auditor and was found to be technically feasible, environmentally justifiable given the nature and extent of the identified contamination and consistent with relevant laws, policies and guidelines.
- The remediation works completed at the site included excavation and off-site disposal of impacted soils surrounding residential house, farm pit and farm shed as well as removal of water and concrete associated with the farm pit concrete sump feature, removal of building and demolition waste in the vicinity of the farm dump and removal of unexpected find relating to a glass bottle burial pit in the vicinity of the farm shed.
- Given the nature of the identified contamination and the remediation works undertaken, there was no evidence of potential or actual migration of contaminants from the site which may result in unacceptable risks to surrounding human or ecological receptors.
- The auditor considers that the remediation and validation works were generally completed in accordance with the requirements of the RAP (OCTIEF 2019), RAP addenda (Cavvanba 2019b, 2019d and 2019i), VSAQP (Cavvanba 2019j) and previous auditor advice.
- The site is considered suitable for residential with garden / accessible soil land use as defined in Section 3 of Schedule B7 NEPC 2013, consistent with the proposed sensitive land use as a hospital.
- The suitability of the site for the identified uses is not dependent on any ongoing management of contamination. However, as part of the normal process of construction management, should any unexpected finds be encountered during the development works, these should be addressed in accordance with the unexpected finds protocols documented in the RAP (OCTIEF 2019) and subsequent RAP addenda (Cavvanba 2019b, 2019d and 2019i).

11. Limitations

This audit was conducted with a reasonable level of scrutiny, care and diligence on behalf of the client for the purposes outlined in the Contaminated Land Management Act 1997. The data used to support the conclusions reached in this audit were obtained by other consultants and the limitations which apply to the consultant's report(s) apply equally to this audit report.

Every reasonable effort has been made to identify and obtain all relevant data, reports and other information that provide evidence about the condition of the site, and those that were held by the client and the client's consultants, or that were readily available. No liability can be accepted for unreported omissions, alterations or errors in the data collected and presented by other consultants. Accordingly, the data and information presented by others are taken and interpreted in good faith.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations reviewed, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this audit are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G and the Site Auditor reserve the right to review the report in the context of the additional information, subject to meeting relevant guideline requirements imposed by the EPA.

Appendix A Guidelines made or approved by the EPA

Guidelines made or approved by the EPA (s.105 CLM Act 1997)

Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia (ANZG 2018)

Australian Drinking Water Guidelines, National Health and Medical Research Council and Agriculture and Resource Management Council of Australia and New Zealand, 2011 (NHMRC/NRMMC 2011)

Composite Sampling, Lock, W. H., National Environmental Health Forum Monographs, Soil Series No.3, 1996, SA Health Commission, (NEHF 1996)

Contaminated Sites: Sampling Design Guidelines, NSW EPA, 1995 (EPA 1995)

Contaminated Sites: Guidelines for the Vertical Mixing of Soil on Former Broad-Acre Agricultural Land, NSW EPA, 1995 (EPA 1995b)

Contaminated Sites: Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes, NSW Agriculture and CMPS&F Environmental, February 1996 (NSW Agr. 1996)

Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, NSW EPA, 1997 (EPA 1997, reprinted and updated 2011)

Contaminated Sites: Guidelines for Assessing Banana Plantation Sites, NSW EPA, 1997 (EPA 1997b)

Contaminated Sites: Guidelines for Assessing Former Orchards and Market Gardens, NSW EPA, 2005 (EPA 2005)

Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd Edition), NSW EPA, 2017 (EPA 2017)

Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination, NSW EPA, March 2007 (EPA 2007)

Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997, NSW EPA, June 2009 (EPA 2009)

Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards, Department of Health and Ageing and EnHealth Council, Commonwealth of Australia, June 2002 (EnHealth 2002)

National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013, National Environment Protection Council (NEPC 2013)

Appendix B Audit Correspondence

Penelope King

From: Andrew Lau
Sent: Friday, 10 August 2018 12:22 PM
To: Jacqueline Hawkins (Health Infrastructure); Penelope King; Andrew Lau
Cc: Sue Folliott
Subject: RE: Soil Sampling SAQP

Hi Jackie,

I've reviewed the revised SAQP and additional comments/responses provided in the email trail below and am satisfied that the audit comments have been addressed.

I have no further comments on the SAQP and am satisfied that it is appropriate for the purpose of the investigations.

Kind regards,
Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | E: alau@jbsg.com.au | www.jbsg.com.au
Contaminated Land | Groundwater Remediation | Environmental Approvals | Auditing and Compliance | Hygiene and Hazardous Materials | Due Diligence and Liability | Stakeholder and Risk Management

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From: Jacqueline Hawkins (Health Infrastructure) <Jacqueline.Hawkins@health.nsw.gov.au>
Sent: Friday, 10 August 2018 12:52 PM
To: Andrew Lau <ALau@jbsg.com.au>
Cc: Sue Folliott <sfolliott@tsamanagement.com.au>
Subject: FW: Soil Sampling SAQP

Good afternoon Andrew

Please find attached updated SAQP following your feedback and CV of Matthew Conroy. Please confirm suitability.

Cheers
Jackie

Jackie Hawkins
Project Director | **Health Infrastructure**
0407 624 953| jacqueline.hawkins@health.nsw.gov.au
Level 14, 77 Pacific Highway, North Sydney NSW 2060 | PO Box 1060, North Sydney NSW 2059

From: Sue Folliott [mailto:sfolliott@tsamanagement.com.au]
Sent: Friday, 10 August 2018 12:46 PM
To: Jacqueline Hawkins (Health Infrastructure) <Jacqueline.Hawkins@health.nsw.gov.au>
Subject: FW: Soil Sampling SAQP

As requested – I haven't reviewed as yet

SUE FOLLIOTT
Senior Project Manager
TSA
Level 15, Brisbane Club Tower
241 Adelaide Street | Brisbane QLD 4000
T: 02 9276 1400 | **M:** 0456 963 944
W: tsamanagement.com.au | **E:** sfolliott@tsamanagement.com.au
Visit our website for up to date news and project information
smart people **smarter** solutions

From: Matthew Conroy <Matthew.Conroy@octief.com.au>
Sent: Friday, 10 August 2018 11:57 AM
To: Sue Folliott <sfolliott@tsamanagement.com.au>
Subject: RE: Soil Sampling SAQP

Hi Sue,

Please find attached the revised SAQP, addressing comments below , some of these comments did not directly relate to the SAQP itself , and responses to these are shown below .

Regards

Matthew Conroy
Principal Environmental Scientist
OCTIEF

M: +61 491 211 508
P: 1800 628 433
E: matthew.conroy@octief.com.au
W: www.octief.com.au
Follow us on LinkedIn

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QLD
Unit 34, 53-57 Link Dr
Yatala
Queensland 4207

NT
Unit 12, 16 Charlton Ct
Woolner
Northern Territory 0820

ACT / NSW
17B Capital Tce
Queanbeyan East
New South Wales 2620

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From: Sue Folliott
Sent: Wednesday, 1 August 2018 8:53 AM
To: 'Matthew Conroy' <Matthew.Conroy@octief.com.au>
Subject: RE: Soil Sampling SAQP

Hi Matt,

Apologies for the delay in getting this back to you as I was in meetings all afternoon yesterday.

Please see comments below:

- Please ensure large diameter hand auger (>150mm) is used where samples are being analysed for asbestos, as per relevant guidelines.
- Confirm that >150mm diameter was used
- It may already be the case, but please ensure all samples analysed for volatile compounds are discrete samples and not composite samples, otherwise the data will be invalid.
- Addressed in revised SAQP
- Please ensure GPS co-ordinates are obtained for all sampling locations so that any areas of proposed remediation are able to be accurately recorded and documented in the Remedial Action Plan.
- Addressed in revised SAQP
-
- Please provide evidence that the report reviewer is appropriately qualified and experienced and that the person undertaking the fieldworks is a competent person in relation to asbestos investigations, as per relevant guidance.
- Propose to have report reviewed by certified CEnvP Site contamination specialist . I was onsite for the field works and have attached my short CV as evidence of competence.
- It's unclear whether composite data are to be compared directly against the or against the criteria divided by the number of composite samples as per relevant guidance. Please clarify.
- Addressed in revised SAQP

- Depending on what is identified in the soil investigations, an assessment of contamination migration via groundwater may be required, consistent with relevant guidance and also based on the `high' vulnerability of groundwater identified in the previous report.

-
- As per comment – dependant on what is identified in soil samples . Groundwater sample was collected from one well completed by Geotech at the time of the site works completed.
- The previous report makes mention of additional site historical review being required. Please ensure that the historical information presented in the assessment report meets relevant EPA reporting guidance.
- Octief have completed additional site historical review – will be included in report
- In the absence of a detailed inventory of chemicals stored in the shed(s), please consider the inclusion of a broader VOC suite instead of BTEX (only) for those targeted samples submitted for analyses.
- Addressed in revised SAQP
-
- The assessment report prepared at the end of the investigations should follow relevant reporting guidelines.
- Report will be in accordance with reporting guidelines

If you have any queries, happy to pass them on.

Given we may have restricted access after Friday, are you able to continue to liaise with Leigh to see how you can both meet your priorities?

If you can confirm what day and time you will be onsite so I can let the auditor know?

Thanks
Sue

SUE FOLLIOTT
Senior Project Manager
TSA
Level 15, Brisbane Club Tower
241 Adelaide Street | Brisbane QLD 4000
T: 02 9276 1400 | **M:** 0456 963 944
W: tsamanagement.com.au | **E:** sfolliott@tsamanagement.com.au
Visit our website for up to date news and project information
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From: Matthew Conroy <Matthew.Conroy@octief.com.au>
Sent: Monday, 30 July 2018 3:02 PM
To: Sue Folliott <sfolliott@tsamanagement.com.au>
Subject: Soil Sampling SAQP

Hi Sue,
As discussed, please find attached the Sample Analysis Quality Plan (SAQP).

Regards

Matthew Conroy
Principal Environmental Scientist
OCTIEF

M: +61 491 211 508
P: 1800 628 433
E: matthew.conroy@octief.com.au
W: www.octief.com.au
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QLD
Unit 34, 53-57 Link Dr
Yatala
Queensland 4207

NT
Unit 12, 16 Charlton Ct
Woolner
Northern Territory 0820

ACT / NSW
17B Capital Tce
Queanbeyan East
New South Wales 2620

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From: Sue Folliott <sfolliott@tsamanagement.com.au>
Sent: Friday, 27 July 2018 5:08 PM
To: Matthew Conroy <Matthew.Conroy@octief.com.au>
Cc: leigh bexley <lbexley@morrisongeo.com.au>
Subject: RE: Groundwater well Installation and sampling

Hi Matt,
No problem. Talk then
Kind regards
Sue

SUE FOLLIOTT
Senior Project Manager
TSA
Level 15, Brisbane Club Tower
241 Adelaide Street | Brisbane QLD 4000
T: 02 9276 1400 | **M:** 0456 963 944
W: tsamanagement.com.au | **E:** sfolliott@tsamanagement.com.au

From: Matthew Conroy <Matthew.Conroy@octief.com.au>
Sent: Friday, 27 July 2018 5:02 PM
To: Sue Folliott <sfolliott@tsamanagement.com.au>
Subject: Groundwater well Installation and sampling

Hi Sue,

As discussed, I have been liaising with Leigh regarding the groundwater wells/piezometers to be installed as part of the geotechnical drilling works. Based on those discussions , Morrisons are proposing to install 2 deep piezometers in the area beneath the future hospital buildings, and two shallow (`3m perched seepage water piezometers only) in the areas of the future hospital carparks. These piezometers will be installed to a standard suitable for environmental sampling if groundwater is present in the wells . It should be noted that it is not known if seepage / perched water is present beneath the site in those areas and consequently the perched water wells may remain dry.

In addition to the above, while the drill rig is onsite, I would like to install a groundwater well on the northern boundary of the cultivated area onsite (near the proposed permeability test holes shown on the geotech drilling location plan. However this would represent an additional borehole on top of what is currently being proposed for the geotech works, and as such could extend the drilling program. I will give you a call to discuss this on Monday.

Regards

Matthew Conroy
Principal Environmental Scientist
OCTIEF

M: +61 491 211 508
P: 1800 628 433
E: matthew.conroy@octief.com.au
W: www.octief.com.au
Follow us on LinkedIn

QLD
Unit 34, 53-57 Link Dr
Yatala
Queensland 4207

NT
Unit 12, 16 Charlton Ct
Woolner
Northern Territory 0820

ACT / NSW
17B Capital Tce
Queanbeyan East
New South Wales 2620

Tweed Valley Hospital
Tweed Shire
Greenfield Site
Northern Rivers
NSW 2485 Australia

JBS&G Australia Pty Ltd
Level 1, 50 Margaret St
Sydney
NSW 2000 Australia
Ph. +61 2 82450300

MAIL TYPE	MAIL NUMBER	REFERENCE NUMBER
General Correspondence	JBS&G-GCOR-000002	TSA-GCOR-000575

Re: Welcome to the Tweed Valley Project

From	Ms Penelope King - JBS&G Australia Pty Ltd
To	Susan Folliott - TSA Management
Cc	Mr Andrew Lau - JBS&G Australia Pty Ltd
Sent	Friday, 2 November 2018

MESSAGE

Hi Sue,

Thanks for providing the revised DSI for review. The revised report broadly satisfies the original auditor comments, and Andrew considers that the additional minor comments which have not been addressed by the consultant will not impact preparation of the SAR.

Andrew requests that the consultant please now proceed to develop a Remedial Action Plan (RAP) to address the contamination identified. It would be appreciated if you are able to let us know when we might receive this document for review to assist us in scheduling appropriate resources.

Don't hesitate to contact Andrew or me should you have any queries.

Kind Regards,
Penelope King
0402 601 151

From: S Folliott
Sent: 30/10/2018 12:22:33 PM AEDT (GMT +11:00)
To: Penelope King
Cc: Andrew Lau
Mail Number: TSA-GCOR-000881
Subject: Re: Welcome to the Tweed Valley Project

Please find attached final contamination report - apologies for not sending through earlier as my understanding was that all comments raised below had been addressed
Report split into three as per DPE requirements for the EIS submission
Kind regards
Sue

From: P King
Sent: 14/09/2018 10:57:18 AM AEST (GMT +10:00)
To: Susan Folliott

Cc: Andrew Lau
Mail Number: JBS&G-GCOR-000001
Subject: Re: Welcome to the Tweed Valley Project

Hi Sue,

Thanks for providing the Tweed Valley DSI for review. On behalf of Andrew Lau, please find below comments regarding the report.

Site Description

- Please provide geographic coordinates for the site.
- Limited information has been provided pertaining to site condition. Additional information should be provided in the revised report (in accordance with the NSW OEH reporting guidelines), including:
  - conditions at site boundary (such as type and condition of fencing, soil stability and erosion);
  - conditions of on-site buildings, roads and other infrastructure; and
  - condition of site surface (e.g. areas of hard stand, condition etc).
- Please provide information relating to both regional and site-specific soil conditions.
- Based on available desktop sources, please provide additional information pertaining to the site-specific and regional hydrogeological setting of the site (e.g. background water quality).
- Please provide a summary of climate information based on Bureau of Meteorology statistics.
- Please identify the nearest surface water body, and potential discharge location for groundwater.
- Hydrogeology – the standing water levels reported in the summary table (in some instances e.g. GW044188) are the approximate water bearing zones, rather than the SWLs as they are provided in the bore search information.

Site History

- Section 4.7 indicates that the property has been owned by the current owners for approximately 30 years, whereas Sections 4.1 and 4.2 state that the current owners purchased the site in 2010. Please confirm which is correct.
- Please include the results of regulatory searches (such as NSW EPA records CLM register and POEO register) and WorkCover dangerous goods records) in the revised report.
- In the revised report, please include a review of heritage information sourced from the Australian Heritage Database and the NSW Heritage Database.

Figures

- Please label relevant features (such as road names, surface water bodies and sensitive receptors) on the site location figure.
- Soil analytical results identified as exceeding adopted assessment criteria should be shown on a figure.

Sampling and Analysis Quality Plan

- Section 6 should specifically reference the SAQP, and include a summary of proposed (as per the auditor reviewed SAQP) versus completed works, with justification for deviations from the SAQP

(e.g. collection of groundwater and surface samples; collection of soils from 50 rather than the proposed 58 locations etc). This should include information pertaining to how many samples (and what type) were collected from each area of environmental concern, and what COPCs the samples were analysed for.

Quality Assurance/Quality Control

- Table 9-1 incorrectly states that all lab duplicate RPDs were within acceptable limits as set by the lab. Work order 611312-S – RPD for nickel was outside the acceptable range.
- Please provide the Sample Receipt Notifications (SRNs) for all laboratory work orders.
- Please provide the quality control reports for work order EB1819257.
- Please provide all relevant bore logs. Only the geotechnical logs and a limited number of environmental logs (HA1, HA2, HA4, HA5 and HA7) have been provided. The coordinates of the investigation locations should be provided on the logs.
- Please provide a calibration certificate for the PID.
- Can any construction details be provided for geotechnical well BH1, from which groundwater sample GW1 was obtained?
- Please provide field records for groundwater well development and sampling activities.
- The rationale provided in Table 9-1 for the identification of zinc in the rinsate collected from the hand auger of being of no significance requires further consideration, as concentrations of zinc were identified in soil samples (not all <LOR as stated).
- Please provide justification for soil triplicate samples (inter-laboratory duplicates) being collected at less than the required frequency (only QC6A and QC8A are included in the tables).
- Please include discussion of RPDs (for soil and groundwater) which did not fall within the nominated acceptable range.
- Section 7.2 – inputs to the decision should include the site inspection and results of historical investigations.

Adopted Assessment Criteria

- Please provide justification for the adoption of the groundwater assessment criteria selected with reference to potential sensitive receptors.
- ANZAST 2018 is incorrectly referenced as ANZECC and ARMCANZ 2018.
- Please provide justification for the adoption of the sediment quality guidelines selected for comparison of samples collected from the farm dam.
- Please document the calculation of site-specific EILs, including tabulation of the laboratory data used (pH, CEC etc).
- Table 1 – analytical results have been compared to HIL-B rather than HIL-A criteria.
- Table 1 – only the ESL values for fine grain soils in urban residential/POS have been applied (ESLs for areas of ecological significance have not).
- Table 1 – it is unclear how the site specific EILs have been calculated, and only the values for urban/residential POS have been applied (ESLs for areas of ecological significance have not).
- Table 2 – ESLs for areas of ecological significance, fine grained soils – the incorrect guideline value for total xylenes has been applied (45 mg/kg rather than 1.6 mg/kg).

- Table 2 – it is unclear how the EILs have been calculated; and it appears that only the urban residential/POS values have been used, rather than both the urban residential/POS and areas of ecological significance values.

Results

- Please update analytical data tables with consideration of the comments regarding adopted assessment criteria, above.
- HA2-0.15 (from main shed) zinc concentration 270 mg/kg exceeds EIL for ecologically significant areas, but has not been highlighted. Is there are reason for this omission? Please check data tables to ensure this has not occurred for other samples and analytes.

Conclusions and Recommendations

As remediation is required/recommended (which the auditor agrees with), the site cannot currently be considered suitable for the proposed development, and the commentary in the conclusions around site suitability must reflect this, as per relevant EPA guidance.

- As the farm dump area has not been fully assessed due to the presence of vegetation, provision for further investigation and/or management of this area should be included in the RAP. Aesthetic factors associated with the farm dump should also be considered.

Don't hesitate to contact Andrew or me should you have any queries.

Kind Regards,
Penelope King
0402 601 151

From: S Folliott
Sent: 10/09/2018 1:56:40 PM AEST (GMT +10:00)
To: Penelope King
Cc: Sagar Mukherjee
Mail Number: TSA-GCOR-000575
Subject: Welcome to the Tweed Valley Project

Kind regards
Sue

Sahani Gunatunge

From: Christine Louie
Sent: Wednesday, 23 January 2019 3:34 PM
To: Sue Folliott
Cc: Andrew Lau; Sahani Gunatunge
Subject: RE: Tweed Valley Hospital Reports

Hi Sue,

Please see below the Auditor's review of the Octief and Cavvanba reports for the Tweed Valley Hospital site.

The following report has been reviewed by the Auditor:

- *Remediation Action Plan, Tweed Valley Hospital Site 771 Cudgen Road, Cudgen, NSW*. Ref: Version 3 J8961, 28 November 2018. (Octief Pty Ltd 2018).

Review of the Remediation Action Plan (RAP) has been undertaken against the requirements of NSW OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* and the NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999*, and the following comments are made:

a) Section 2.1 Site Description – please confirm the lot ID and site boundary for the site. SIX Maps shows 771 Cudgen Road Cudgen as being Lot 11 DP 1246853 and the lot boundary aligning with the concept design plan provided in Appendix C of the RAP.
b) Section 2.3 Zoning – please amend this section and subsequent sections as relevant based on any changes to the site boundary (see Section 2.1 comments).
c) Section 2.5 Site Layout and Significant Features – this section should be updated to include the shed demolition documented in Cavvanba (2019a).
d) Section 4 Relevant Guidelines and Legislation – the consultant should discuss and demonstrate that the relevant requirements of SEPP 55 and Department of Planning and Urban Affairs (1998) Planning *Guidelines SEPP 55 – Remediation of Land* are met.
e) Section 4.3 State Legislation and Guidelines – the Guidelines for Consultants Reporting on Contaminated Sites (OEH 2011) and Guidelines for NSW Site Auditor Scheme (2nd edition) (NSW DEC 2007) have been updated. Please amend the references.
f) Section 6 Remedial Options Assessment – this section evaluates various remedial options without having clearly identified the remediation goals in the RAP. While the extent of site contamination has been discussed in Section 3.3 Site Suitability, the extent of the area requiring remediation has not been clearly defined. Please define the remediation area and goals prior to assessment of appropriate remediation options, noting that vertical mixing and soil washing are not relevant remediation options. Reference should be made to WA DoH (2009) for additional guidance on remediation and management of asbestos.
g) Section 6.2.1 Preferred Remedial Option – please define the remedial goal (see above comment).
h) Section 7.1 Preliminaries – the AMP should be prepared in conjunction with the environmental consultant and reviewed by the Site Auditor.
i) Section 7.4 Removal of ACM and Validation of Excavation – please define the extent of the remediation area (see earlier comment). WA DoH (2009) recommends the removal of an extra 1m in all directions beyond the contaminated area and an additional 30 cm depth – a minimum excavation depth of 0.2m does not meet WA DoH guidance. It is noted that Figure 3 shows an 'indicative remediation area' on an aerial photograph that has not been discussed in the text of the RAP. Remediation and validation of asbestos impacted areas should be undertaken by a suitably qualified person as defined in WA DoH (2009) i.e '*environmental consultants supervised by a lead consultant with appropriate asbestos credentials and a minimum of 3 years continuous experience with asbestos contamination and relevant tertiary qualifications*'.

j) Section 9 Data Quality Objectives – without clear identification of the remediation extent and goal, the DQOs have therefore not been properly defined for the proposed site remediation works. Please review and amend. Refer to NEPM Schedule B2 for guidance on the DQO process.
k) Section 10.2 Soil Validation Plan – as the remediation extent has not been clearly defined, it is unclear whether the nominated number of validation samples are sufficient. Further detail on the soil sampling process for asbestos is required.
l) Section 10.4 Validation of Imported Fill – for any non pre-classified or non-certified VENM/ENM imported to site, the minimum sampling frequency requirement should be the greater of, five samples per source or 1 sample per 100 m^3.
m) Section 10.6 Unexpected Finds Protocol – an outline of a contingency plan or unexpected finds protocol should be provided including but not limited to encountering increased asbestos contamination.
n) Other details required in a RAP as per NSW OEH (2011) including site management plans and remediation schedule have not been included. Please amend the RAP.

The following report has been reviewed by the Auditor:

- *Soil Investigation Report – Farm Shed 771 Cudgen Road, Cudgen, NSW*. Ref: 18084 R03, January 2019. (Cavvanba Consulting Pty Ltd 2019a).

Review of the Soil Investigation Report has been undertaken against the requirements of NSW OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* and the NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999*, and the following comments are made:

a) Section 1.4 Scope of Work - the consultant should discuss and demonstrate that the relevant requirements of SEPP 55 and Department of Planning and Urban Affairs (1998) Planning *Guidelines SEPP 55 – Remediation of Land* are met.
b) Section 9.1 Asbestos is Soil Discussion - the assessment of asbestos impact was undertaken via targeted testpit locations rather than grid-based with the maximum depth of investigation of 0.3 m at one location only. Analysis was also limited to presence/absence only with no quantification of asbestos fibres from 500 mL soil sampling in accordance with the requirements of WA DoH (2009). The extent of asbestos impact as discussed in this section can therefore not be considered to be delineated with the limited assessment.

The following report has been reviewed by the Auditor:

- *Remediation Action Plan Addendum – Farm Shed 771 Cudgen Road, Cudgen, NSW*. Ref: 18084 R04, January 2019. (Cavvanba Consulting Pty Ltd 2019b).

Review of the Remediation Action Plan (RAP) has been undertaken against the requirements of NSW OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* and the NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999*, and the following comments are made:

a) Section 1.2 Background – refer comments on Cavvanba (2019a) and delineation of asbestos impact.
b) Section 2.6 Previous Investigation – refer comments on Cavvanba (2019a) and amend as appropriate.
c) Section 3 Remediation Criteria – the rationale for the adopted remediation criteria for the remediation area should address the appropriateness of the criteria for the proposed land use for the site as a hospital.
d) Section 3.2 Waste – soil data from Cavvanba (2019a) may be used for waste classification in conjunction with additional sampling of soil to be disposed of off-site.
e) Section 4.3 Lateral and Vertical Extent – the extent of asbestos impact was not clearly delineated in Cavaanba (2019a). Refer comments on Cavvanba (2019a) and amend remediation extent accordingly.
f) Section 5 Regulatory Requirements - the consultant should discuss and demonstrate that the relevant requirements of SEPP 55 and Department of Planning and Urban Affairs (1998) Planning *Guidelines SEPP 55 – Remediation of Land* are met.
g) Section 6.2.3 Removal – refer to previous comments on delineation of asbestos impact and amend accordingly.

h) Section 7.1 Validation Works – validation sampling of the excavated area should be in accordance with WA DoH (2009) i.e. at least 1 sample from each wall per 5 m length with the floor sampled at twice the minimum density as required. Sampling and analytical requirements should be provided.

The following report has been reviewed by the Auditor:

- *Soil Investigation Report – Residential House 771 Cudgen Road, Cudgen, NSW*. Ref: 18084 R01, December 2018. (Cavvanba Consulting Pty Ltd 2018a).

Review of the Soil Investigation Report has been undertaken against the requirements of NSW OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* and the NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999*, and the following comments are made:

a) Section 1.4 Scope of Work - the consultant should discuss and demonstrate that the relevant requirements of SEPP 55 and Department of Planning and Urban Affairs (1998) Planning *Guidelines SEPP 55 – Remediation of Land* are met.
a) Section 5.1 Contaminants of Concern – was asbestos considered as a contaminant for the residence? The presence of anthropogenic materials underneath the residence and demolition waste from a previous residence are potential sources of asbestos.
b) Section 5.3 Relevant Soil Environmental Criteria – please provide the rationale for the adopted assessment criteria.
c) Section 9.1 Lead – the extent of the area (horizontally and vertically) impacted by lead and requiring remediation is not clear.

The following report has been reviewed by the Auditor:

- *Remediation Action Plan Addendum – Residential House 771 Cudgen Road, Cudgen, NSW*. Ref: 18084 R02, December 2018b. (Cavvanba Consulting Pty Ltd 2018b).

Review of the Remediation Action Plan (RAP) has been undertaken against the requirements of NSW OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* and the NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999*, and the following comments are made:

a) Section 2.5.4 Discussion and Recommendations – Refer to comments on extent of lead impact (Cavvanba 2018a) and amend accordingly.
b) Section 5 Regulatory Requirements - the consultant should discuss and demonstrate that the relevant requirements of SEPP 55 and Department of Planning and Urban Affairs (1998) Planning *Guidelines SEPP 55 – Remediation of Land* are met.
c) Section 8.6 Unexpected Finds – based on the anthropogenic materials present underneath the residence, the management of unexpected finds should include provision for involvement of the environmental consultant to determine the appropriate course of action.

Regards,
Christine

Christine Louie | Principal | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0423 539 373| E: clouie@jbsg.com.au | W: www.jbsg.com.au
Contaminated Land | Groundwater Remediation | Environmental Approvals | Auditing and Compliance | Hygiene and Hazardous Materials | Due Diligence and Liability | Stakeholder and Risk Management

Tweed Valley Hospital
Tweed Shire
Greenfield Site
Northern Rivers
NSW 2485 Australia

JBS&G Australia Pty Ltd
Level 1, 50 Margaret St
Sydney
NSW 2000 Australia
Ph. +61 2 82450300

MAIL TYPE	MAIL NUMBER	REFERENCE NUMBER
General Correspondence	JBS&G-GCOR-000005	TSA-GCOR-001679

Re: PRIVILEGED AND CONFIDENTIAL:Cavvanba reports

From	Mr Andrew Lau - JBS&G Australia Pty Ltd
To	Susan Folliott - TSA Management
Cc (6)	Mr Simon Waterworth - GeoLINK
	Mr Jacob Sickinger - GeoLINK
	Ms Jacqueline Hawkins - Health Infrastructure
	Ms Penelope King - JBS&G Australia Pty Ltd
	Alyssa Muche - TSA Management
	Alison Tham - TSA Management
Sent	Friday, 25 January 2019

MESSAGE

Sue,
I have reviewed the revisions/responses and am satisfied that my previous audit comments have been addressed. I have no further comments on these reports.
Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | www.jbsg.com.au

Contaminated Land | Groundwater Remediation | Auditing and Compliance | Assessments and Approvals | Occupational Hygiene and Monitoring

From: S Folliott
Sent: 24/01/2019 10:50:03 PM AEDT (GMT +11:00)
To: Andrew Lau
Cc: Jacob Sickinger, Simon Waterworth, Jacqueline Hawkins, Penelope King, Alyssa Muche, Alison Tham
Mail Number: TSA-GCOR-001679
Subject: PRIVILEGED AND CONFIDENTIAL:Cavvanba reports

Hi Andrew,
Please find attached updated Cavvanba reports for your review and comment.
Octief to follow.
Can you please advise if there are any further updates required or if these are accepted for inclusion with the Submission Report.
Kind regards
Sue

From: Ben Wackett <ben@cavvanba.com>
Sent: Friday, 1 February 2019 9:17 AM
To: Tony Jackman <Tony.Jackman@woollamconstructions.com.au>
Cc: Rob McLelland <rob@cavvanba.com>; Glen Chisnall <glen@cavvanba.com>
Subject: FW: 771 Cudgen Creek Road, Unexpected find

Hi Tony,

As discussed, appropriate interim measures for this area would include:

- Fencing to restrict access
- Make the pit safe. i.e. cover the void.
- Tidy the area. The red sands (appears like sand blasting garnet sands), and blue powder (like copper), and any other wastes such as the brake pads, spark plugs, mechanical parts should be collected and placed into containers to avoid exposure/spills.
- Unlike the former residential house, I do not recommend covering the area with geofabric or gravel. The area appears to be relatively stable, with topsoil, leaf litter, tree cover, and minimal slope. Significant erosion and dust generation is unlikely to occur. As a precaution, some sediment controls may be appropriate, such as sediment fencing.
- The area should otherwise remain undisturbed until the investigation can take place. Field observations are critical to successful investigation, and location of structures and surface staining are primary considerations.

Regards

Ben Wackett
Principal Environmental Scientist – Contaminated Land

NSW Site Auditor
QLD Contaminated Land Auditor
Licensed Asbestos Assessor

Cavvanba Consulting Pty Ltd

T (02) 6685 7811 I F (02) 6685 5083 I M 0488 225 692 I www.cavvanba.com
1/66 Centennial Circuit I PO Box 2191 I Byron Bay NSW 2481

When sending large electronic reports and/or files, you can also use Cavvanba Consulting's secure internet-based file delivery system located at Cavvanba Consulting DropBox. In "subject", please include client and site name.

From: Ben Wackett <ben@cavvanba.com>
Sent: Tuesday, 29 January 2019 4:51 PM
To: 'Tony Jackman' <Tony.Jackman@woollamconstructions.com.au>
Cc: Rob McLelland <rob@cavvanba.com>; Glen Chisnall <glen@cavvanba.com>
Subject: 771 Cudgen Creek Road, Unexpected find

Hi Tony,

As discussed, the purpose of this email is to provide some recommendations regarding the unexpected find I inspected today (29/01/19).

- Located between the former farm shed and the former residential house
- Concrete structures, including a pit, a ramp, a concrete drip pad, and an infilled pit.
- Small quantities of liquids and wastes are present. Including brake pads, spark plugs, a blue powder, red/purple sand, oil staining, and mechanical parts.

It is possible that the structure is a former dip, based on the drip pad which leads to a potential infilled race. However, its construction and layout does not appear to be consistent with a typical cattle tick dip constructed/decommissioned by Dept Agriculture. It is therefore possible it is a private dip, and therefore unlikely to have been recorded.

The wastes are currently accessible, and exposed to rainfall, runoff and wind erosion.

It is recommended that the area is fenced and controlled to prevent disturbance and erosion until a determination can be made regarding its nature. It is recommended that sampling of soil is undertaken for a range of potential contaminants.

Happy to discuss.

Ben Wackett
Principal Environmental Scientist – Contaminated Land

NSW Site Auditor
QLD Contaminated Land Auditor
Licensed Asbestos Assessor

Cavvanba Consulting Pty Ltd

T (02) 6685 7811 I F (02) 6685 5083 I M 0488 225 692 I www.cavvanba.com
1/66 Centennial Circuit I PO Box 2191 I Byron Bay NSW 2481

Sahani Gunatunge

From: Andrew Lau
Sent: Friday, 28 June 2019 10:36 AM
To: Jacob Sickinger; Ben Wackett; Stuart Clark; Andrew Lau
Cc: Simon Waterworth; Ross Nicolson; Windley, Monique; Barrow, Geoff; Sahani Gunatunge; Christine Louie
Subject: Site Auditor Opinion - RE: Council notice 30 Days for Asbestos

Stuart & others,

I have reviewed the Development Consent (SSD 9575) and am satisfied that consent has already been obtained for remediation works at the site.

On this basis, it's my opinion that there is no requirement for the remediation works to be treated as Category 2 works as per Reg 15(1)(a) of SEPP55.

Regards,
Andrew

Andrew Lau | CEO, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | E: alau@jbsg.com.au |W: www.jbsg.com.au
Contaminated Land | Groundwater Remediation | Environmental Approvals | Auditing and Compliance | Hygiene and Hazardous Materials | Due Diligence and Liability | Stakeholder and Risk Management

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From: Jacob Sickinger <jsickinger@geolink.net.au>
Sent: Friday, 28 June 2019 9:57 AM
To: Ben Wackett <ben@cavvanba.com>; Stuart Clark <sclark@tsamanagement.com.au>; Andrew Lau <ALau@jbsg.com.au>
Cc: Simon Waterworth <SimonW@geolink.net.au>; Ross Nicolson <ross@cavvanba.com>; Windley, Monique <Monique.Windley@lendlease.com>; Barrow, Geoff <Geoff.Barrow@lendlease.com>
Subject: RE: [EXT]:RE: Council notice 30 Days for Asbestos

Morning all,

Just to clarify - with regard to Ben's email, that advice about the wording of the letter was given to be consistent with SEPP 55 at the time when the remediation works were being considered as part of the preliminary works scope as Category 2 remediation work.

With lodgement of the Response to Submissions Report to the Department of Planning and Environment, the remediation work was subsequently added to the SSD application Stage 1 works scope. Hence our understanding is that it is no longer being treated as Category 2 work as it has been included in the SSD application 9575 and the consent granted. Any notice would need to be in accordance with applicable SEPP 55 requirements and/or conditions of the consent.

As per his email, we'll allow Andrew to provide advise re notice, given his expertise in this area.

Tweed Valley Hospital
Tweed Shire
Greenfield Site
Northern Rivers
NSW 2485 Australia

JBS&G Australia Pty Ltd
Level 1, 50 Margaret St
Sydney
NSW 2000 Australia
Ph. +61 2 82450300

MAIL TYPE	MAIL NUMBER	REFERENCE NUMBER
Advice	JBS&G-ADVICE-000004	LL-GCOR-001124

Re: Cavvanba's VSAQP

From	Ms Sahani Gunatunge - JBS&G Australia Pty Ltd
To	Mr Stuart Clark - TSA Management
Cc (6)	Mr Andrew Lau - JBS&G Australia Pty Ltd (+5 more...)
Sent	Wednesday, 19 June 2019 5:33:23 PM AEST (GMT +10:00)
Status	N/A

ATTRIBUTES

Attribute 1	Early Works
Attribute 4	120 Environment Health & Safety EHS

MESSAGE

Hi Stuart,

The auditor has reviewed the Cavaanba Valida on Sampling Analy cal Quality Plan and has the following comments:

- While ra onale is provided in rela on to where the soil sampling is to occur, no ra onale is provided in rela on to the actual frequencies proposed (i.e., the actual number of sampling loca ons) for the iden fied areas of concern. This should be provided having regard to the likely hotspot able to be detected (in the case of the area-based targets such as the footprint of the shed) and volumetric frequency (i.e., samples per likely m3) in the case of targeted materials such as the content of the dump.

- The analy cal suite should include asbestos (500 ml as per NEPC 2013 / DoH 2009) given that it is a contaminant of concern at the site and the wording of condi on B9(c) which refers to `tests for all relevant contaminants of concern'.

- The soil sampling methodology should include sampling for asbestos in soil.

- The groundwater inves ga on should also include surveying of the wells to enable groundwater flow direc on es ma ons to be made in the report.

- The repor ng requirements following the comple on of the field inves ga ons have not been included included in the document.

Happy to discuss if anything's unclear.

Kind Regards,

Sahani Gunatunge | Environmental Consultant | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0410 240 607| E: sgunatunge@jbsg.com.au | W: www.jbsg.com.au
Contaminated Land | Groundwater Remedia on | Environmental Approvals | Audi ng and Compliance | Hygiene and Hazardous Materials | Due Diligence and Liability | Stakeholder and Risk Management

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From: A Lau
Sent: 12/06/2019 2:39:42 PM AEST (GMT +10:00)
To: Stuart Clark
Cc: Sahani Gunatunge, Darren Chow, Monique Windley, Sagar Mukherjee
Mail Number: JBS&G-GCOR-000008
Subject: Re: Cavvanba's VSAQP

Hi Stuart,
Thanks for sending through. I will review and have comments across by the end of next week.
Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | www.jbsg.com.au
Contaminated Land | Groundwater Remedia on | Audi ng and Compliance | Assessments and Approvals | Occupa onal Hygiene and Monitoring

---

From: S Clark
Sent: 11/06/2019 10:12:19 AM AEST (GMT +10:00)
To: Andrew Lau
Cc: Darren Chow, Monique Windley, Sagar Mukherjee
Mail Number: TSA-GCOR-003097

Subject: Fwd: Cavvanba's VSAQP

Andrew
Please find the Cavvanba VSAQP for review pre receiving the SSD1 conditions
Attached are the final DRAFT conditions for reference

STUART CLARK
Senior Project Manager
Tweed Valley Hospital - Integrated Project Office
Tweed Shire Council Offices
17 Bre St T weed Heads
NSW 2485
Level 2 Suite B

TSA MANAGEMENT

Level 15, 207 Kent Street | Sydney NSW 2000
T: 02 9276 1400 | **M:** 0401 523 395
W: tsamanagement.com.au | **E:** sclark@tsamanagement.com.au

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From: M Windley
Sent: 07/06/2019 9:22:51 AM AEST (GMT +10:00)
To: Stuart Clark
Cc: Darren Chow, Stephen Chaseling
Mail Number: LL-GCOR-001124
Subject: Cavvanba's VSAQP

Hi Stu,

Please find attached Cavvanba's VSAQP, for yours and JBS&G's review.

Kind Regards

Monique Windley
Site Engineer, Tweed Valley Hospital
Level 3, Kings Gate, 2 King Street, Bowen Hills, 4006 QLD Australia
M +61 437 137 210
monique.windley@lendlease.com | www.lendlease.com

Tweed Valley Hospital
Tweed Shire
Greenfield Site
Northern Rivers
NSW 2485 Australia

JBS&G Australia Pty Ltd
Level 1, 50 Margaret St
Sydney
NSW 2000 Australia
Ph. +61 2 82450300

MAIL TYPE	MAIL NUMBER	REFERENCE NUMBER
General Correspondence	JBS&G-GCOR-000011	LL-GCOR-001269

Re: SAQP for Site Auditor Review

From	Mr Andrew Lau - JBS&G Australia Pty Ltd
To (2)	Ms Sahani Gunatunge - JBS&G Australia Pty Ltd (+1 more...)
Cc (2)	Mr Todd Lee - Health Infrastructure (+1 more...)
Sent	Friday, 28 June 2019 5:20:35 PM AEST (GMT +10:00)
Status	N/A

ATTRIBUTES

Attribute 1	Early Works
Attribute 4	120 Environment Health & Safety EHS, 165 Project Administration

MESSAGE

Hi Stuart,
Thanks for sending through the revised report.
The changes have addressed my previous comments and i have no further comments.
regards,
Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | www.jbsg.com.au

Contaminated Land | Groundwater Remedia on | Audi ng and Compliance | Assessments and Approvals | Occupa onal Hygiene and Monitoring

---

From: S Clark
Sent: 28/06/2019 8:55:14 AM AEST (GMT +10:00)
To: Sahani Gunatunge, Andrew Lau
Cc: Todd Lee, Monique Windley
Mail Number: TSA-GCOR-003373

Subject: Fwd: SAQP for Site Auditor Review

ANdrew Sahani
Please find revised SAQP from Cavvanba for records following your previous recommendations

STUART CLARK
Senior Project Manager
Tweed Valley Hospital - Integrated Project Office
Tweed Shire Council Offices
17 Bre St T weed Heads
NSW 2485
Level 2 Suite B

Level 15, 207 Kent Street | Sydney NSW 2000
T: 02 9276 1400 | **M:** 0401 523 395
W: tsamanagement.com.au | **E:** sclark@tsamanagement.com.au
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From: M Windley
Sent: 28/06/2019 7:23:54 AM AEST (GMT +10:00)
To: Stuart Clark
Cc: Todd Lee, Darren Chow
Mail Number: LL-GCOR-001335
Subject: SAQP for Site Auditor Review

Morning Stu,

Find attached the revised SAQP.
Whilst this does not need to approved prior to the commencement of works it would be good to have JBS&G's final input on it prior.

Kind Regards

Monique Windley
Site Engineer, Tweed Valley Hospital
Level 3, Kings Gate, 2 King Street, Bowen Hills, 4006 QLD Australia
M +61 437 137 210
monique.windley@lendlease.com | www.lendlease.com

From: S Clark
Sent: 25/06/2019 2:37:17 PM AEST (GMT +10:00)
To: Sahani Gunatunge, Penelope King, Andrew Lau
Cc: Todd Lee, Darren Chow, Monique Windley
Mail Number: TSA-GCOR-003323

Subject: Re: B16 - Works Plan, Site Plan, VSQAP and WHS Plan for Site Auditor Review

Thanks Andrew

Monique Darren, Can you review this with Cavvanba urgently and update their and your plans as noted .

STUART CLARK
Senior Project Manager
Tweed Valley Hospital - Integrated Project Office
Tweed Shire Council Offices
17 Bre St T weed Heads
NSW 2485
Level 2 Suite B

TSA MANAGEMENT

Level 15, 207 Kent Street | Sydney NSW 2000
T: 02 9276 1400 | **M:** 0401 523 395
W: tsamanagement.com.au | **E:** sclark@tsamanagement.com.au
smart people **smarter** solutions

From: A Lau
Sent: 25/06/2019 1:28:28 PM AEST (GMT +10:00)
To: Sahani Gunatunge, Penelope King, Stuart Clark
Cc: Todd Lee, Andrew Lau, Darren Chow, Monique Windley
Mail Number: JBS&G-GCOR-000010
Subject: Re: B16 - Works Plan, Site Plan, VSQAP and WHS Plan for Site Auditor Review

Hi Stuart,

My comments on the various reports provided in your aconex note below (plus other aconex notes relevant to the consent conditions) are provided as follows:

DQO/SAQP - Groundwater and Soil Investigation
I have reviewed the Cavaanba SAQP and am satisfied that 3 of the 5 previously provided comments have been addressed. The SAQP does not provide any additional detail on how soil samples to be assessed/analysed for asbestos will be collected (i.e., by a competent person / LAA?) or detail what laboratory method is proposed (i.e.,, 40 g sample to 0.1g/kg LOR or 500 Ml sample to meet NEPC 2013 / DoH 2009 requirements, so my two previous comments relating to asbestos remain open.

Hazardous Materials Management Plan (Lend Lease, 18/6/2019, Rev 5)
The Federal/National list of legislation is incomplete and contains errors in Section 2.
The state list of legislation and regulations does not contain any legislation or regulations in Section 2.
Section 2 contains a statement, `No asbestos waste is to be re-used or recycled on site', which is consistent with relevant prohibition for asbestos waste, however, this must not be misconstrued as applying to soils containing asbestos which meet relevant NSW EPA endorsed criteria and are not surplus to site requirements (so are not defined as waste under relevant legislation). This must be explicitly clarified in this plan to avoid incorrect application of legislation/regulations to the activities on the site.
There is no information in relation to the licensing requirements for asbestos removalists and guidance on when bonded or friable licensed removalists will be used. Similarly, no guidance is provided in relation to the various types of clearances required and the requirement for Licensed Asbestos Assessors in certain circumstances, consistent with relevant regulations and guidance.

Environment and Safety Workplan (Cavvanba Ref 19038, date unknown)
The EHS plan is considered appropriate for the works the plan covers - that is, the further site investigations and validation sampling (only) associated with the remediation works.

Compliance with Consent Conditions
Various documents have been provided for my review and endorsement against Condition B16 or the consent conditions. Condition B16 makes reference to Conditions B11- B15, which in turn require conditions B9 - B10 to be completed. Given that the additional investigations have not yet been completed to satisfy B9 - B10, it is not yet known what B11 - B15 involves in terms of revising the scope of remediation works. For these reasons, i am not in a position to review or endorse anything in relation to satisfying B16, however, i have provided some preliminary commentary below on what has been provided to assist the consultant & contractor when they are at an appropriate stage to prepare them and submit for my review:
(a) I have reviewed the site plan provided, which is an aerial photograph with coloured shapes in parts of the site where remediation (known) and where further investigations are proposed. The plan is not to scale and its hard for me to tell what if any use the plan has in a practical sense in terms of guiding the remedial works, notwithstanding that further investigations are yet to be undertaken to provide further data on this. Relevant guidelines are available to be followed and require various elements to be included in plans for remediation works, including (but not limited to): scale, dimensions both lateral and target vertical depths & geographical co-ordinates.
(b) A works plan has not been provided. It is noted that the EHS Plan reviewed above has `workplan' in its title, but this document relates only to the proposed additional investigation works and (arguably) the sampling associated with the remediation works.
(c) Validation Sampling Analytical Quality Plan (VSAQP) is yet to be provided for my review. It is noted that the SAQP referred to above relates to the additional data gap investigation rather than the validation phase of the works. The VSAQP will be able to be completed once the additional investigations and revisions to the extent of remediation works (if any) in a revised RAP are done.
(d) While i have provided comments on the Cavvanba EHS plan above, this plan relates only to the additional investigation works and not the remediation works in their entirety. As such, i am yet to be provided with a Work Health and Safety Plan (WHSP) which deals with the remediation and validation stages of the project (as opposed to just the additional site investigations).

Happy to discuss if you have any questions.

Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | www.jbsg.com.au

From: S Clark
Sent: 21/06/2019 3:13:47 PM AEST (GMT +10:00)
To: Sahani Gunatunge, Penelope King, Andrew Lau
Cc: Todd Lee, Darren Chow, Monique Windley
Mail Number: TSA-GCOR-003265
Subject: Fwd: B16 - Works Plan, Site Plan, VSQAP and WHS Plan for Site Auditor Review

Hi Andrew, Sahani
Please find attached from the Main Contractor Lendlease

Find attached the ZIP file for all documents to be approved by the site auditor, as well as the revised VSAQP (markup showing changes is also attached).

Once you return it , will then need to go the certifier and then department of Planning so advise on turnaround please .

STUART CLARK
Senior Project Manager
Tweed Valley Hospital - Integrated Project Office
Tweed Shire Council Offices
17 Bre St T weed Heads
NSW 2485
Level 2 Suite B

Level 15, 207 Kent Street | Sydney NSW 2000
T: 02 9276 1400 | **M:** 0401 523 395
W: tsamanagement.com.au | **E:** sclark@tsamanagement.com.au
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From: M Windley
Sent: 21/06/2019 2:55:30 PM AEST (GMT +10:00)
To: Todd Lee, Stuart Clark
Cc: Geoff Barrow, Darren Chow
Mail Number: LL-GCOR-001269
Subject: B16 - Works Plan, Site Plan, VSQAP and WHS Plan for Site Auditor Review

Hi Stu,

Find attached the ZIP file for all documents to be approved by the site auditor, as well as the revised VSAQP (markup showing changes is also attached).

Can you please issue to JPS&G for approval, it will then need to go the certifer and the department.

In the meantime, myself and Geoff Barrow will work on getting the mobilization documents in order.

Kind Regards

Monique Windley
Site Engineer, Tweed Valley Hospital
Level 3, Kings Gate, 2 King Street, Bowen Hills, 4006 QLD Australia
M +61 437 137 210
monique.windley@lendlease.com | www.lendlease.com

Tweed Valley Hospital
Tweed Shire
Greenfield Site
Northern Rivers
NSW 2485 Australia

MAIL TYPE	MAIL NUMBER	REFERENCE NUMBER
General Correspondence	TSA-GCOR-003534	LL-GCOR-001269

Re: SAQP for Site Auditor Review

From	Mr Stuart Clark - TSA Management
To (2)	Mr Andrew Lau - JBS&G Australia Pty Ltd (+1 more...)
Cc (4)	Mr Todd Lee - Health Infrastructure (+3 more...)
Sent	Saturday, 13 July 2019 6:51:51 AM AEST (GMT +10:00)
Status	N/A

ATTRIBUTES

Attribute 1	Early Works
Attribute 4	120 Environment Health & Safety EHS, 165 Project Administration

MESSAGE

Thank you for the Advice Andrew, we will let you know the outcome .

STUART CLARK
Senior Project Manager
Tweed Valley Hospital - Integrated Project Office
Tweed Shire Council Offices
17 Bre St T weed Heads
NSW 2485
Level 2 Suite B

Level 15, 207 Kent Street | Sydney NSW 2000
T: 02 9276 1400 | **M:** 0401 523 395
W: tsamanagement.com.au | **E:** sclark@tsamanagement.com.au

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From: A Lau
Sent: 11/07/2019 5:03:52 PM AEST (GMT +10:00)
To: Monique Windley, Stuart Clark
Cc: Todd Lee, Sahani Gunatunge, Penelope King, Darren Chow
Mail Number: JBS&G-GCOR-000014

Subject: Re: SAQP for Site Auditor Review

Monique/Stuart,
Suggest consideration be given to installing a monitoring well at the maximum achievable depth and attempting to sample it. An appropriate lines of evidence approach could then be given to the risks posed to GW, based on guidance in NEPC 2013.
Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | www.jbsg.com.au

From: M Windley
Sent: 11/07/2019 12:36:03 PM AEST (GMT +10:00)
To: Andrew Lau, Stuart Clark
Cc: Todd Lee, Sahani Gunatunge, Penelope King, Darren Chow
Mail Number: LL-GCOR-001462
Subject: Re: SAQP for Site Auditor Review

Hi Andrew,
We have just received the following from statement from Cavvanba, could you please review and advise on the below.
Thanks

Due to the steep terrain surrounding the farm dump, access isn't possible using a drill rig. We have successfully installed a shallow groundwater monitoring well adjacent to the dam using handtools to approximately 2 m which has encountered water, however the monitoring well we are installing at the dump is likely to be dry. The dump is located at a higher elevation than the dam, and it is likely that groundwater is at depths which are not attainable with hand tools, and unfortunately access using a drill rig is not possible.

We have received preliminary results from the soil samples collected surrounding the dump materials and there have been no exceedances of site criteria identified (TRHs, BTEXN, OCPs, PCBs, heavy metals, still awaiting PAHs) in samples collected at either 0.1 m or 0.5 m in close proximity to the dump material. Could we use a pragmatic approach to determine that a groundwater investigation is not required for the dump, as detailed in the following points:

- *The low risk contamination nature of the materials associated with the dump;*
- *Lack of soil impact detected;*
- *Lack of shallow groundwater;*
- *No impact identified in the surfacewater or groundwater monitoring well downgradient.*

Or is it your opinion that the language of the conditions (Condition B9) means that groundwater monitoring is required specifically at each of the features and not having this well would mean the conditions were not being met?

Kind Regards

Monique Windley
Site Engineer, Tweed Valley Hospital
Level 3, Kings Gate, 2 King Street, Bowen Hills, 4006 QLD Australia
M +61 437 137 210
monique.windley@lendlease.com | www.lendlease.com

From: A Lau
Sent: 11/07/2019 10:25:02 AM AEST (GMT +10:00)
To: Monique Windley, Stuart Clark
Cc: Todd Lee, Sahani Gunatunge, Penelope King, Darren Chow
Mail Number: JBS&G-GCOR-000013
Subject: Re: SAQP for Site Auditor Review

Monique/Stuart
I have reviewed the information provided on in the marked up plan. On the basis that what is on the plan is consistent with what is reported in the lab reports and the data are reliable, then I'm supportive of the approach to further delineate the health based criteria exceedances. I do not consider that further delineation of the ecological exceedances are necessary as the remediation approach adopted (and endorsed/approved) for the site does not require remediation of isolated ecological criteria exceddances as there was no widespread ecological issues identified as part of the broader site investigations and any elevated zinc and copper concentrations are likely to be localised and not warranting remediation.
regards
Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | www.jbsg.com.au

From: M Windley
Sent: 11/07/2019 10:06:36 AM AEST (GMT +10:00)
To: Andrew Lau, Stuart Clark

Cc: Todd Lee, Sahani Gunatunge, Penelope King, Darren Chow
Mail Number: LL-GCOR-001458
Subject: Re: SAQP for Site Auditor Review

Morning Andrew,

We received the first round of summary test results for the area surrounding the potential cattle dip. There were several exceedances of zinc, copper, B(a)P TEQ, TRH as seen on the attached plan.

Cavvanba intend to perform additional soil investigation at nominated step out locations to be able to clarify the extent of contamination.

Can you please confirm you are happy for us to proceed with this approach.

Kind Regards

Monique Windley
Site Engineer, Tweed Valley Hospital
Level 3, Kings Gate, 2 King Street, Bowen Hills, 4006 QLD Australia
M +61 437 137 210
monique.windley@lendlease.com | www.lendlease.com

From: A Lau
Sent: 08/07/2019 5:19:18 PM AEST (GMT +10:00)
To: Monique Windley, Stuart Clark
Cc: Sahani Gunatunge, Penelope King, Darren Chow
Mail Number: JBS&G-GCOR-000012
Subject: Re: SAQP for Site Auditor Review

Monique/Stuart,
Thanks for providing the rationale/justification for the proposed monitoring well locations. I have reviewed and am satisfied that they are appropriate. Please note that, should groundwater impacts be identified, then additional monitoring wells may be required to delineate the extent of any impact.
regards,
Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | www.jbsg.com.au

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From: M Windley
Sent: 08/07/2019 2:55:08 PM AEST (GMT +10:00)
To: Andrew Lau, Stuart Clark
Cc: Sahani Gunatunge, Penelope King, Darren Chow, Monique Windley
Mail Number: LL-GCOR-001428
Subject: Re: SAQP for Site Auditor Review

Hi Andrew,

Cavvanba have provided some further documentation on this for your review - see attached.

Kind Regards

Monique Windley
Site Engineer, Tweed Valley Hospital
Level 3, Kings Gate, 2 King Street, Bowen Hills, 4006 QLD Australia
M +61 437 137 210
monique.windley@lendlease.com | www.lendlease.com

From: A Lau
Sent: 05/07/2019 5:00:42 PM AEST (GMT +10:00)
To: Stuart Clark
Cc: Sahani Gunatunge, Penelope King, Darren Chow, Monique Windley
Mail Number: JBS&G-ADVICE-000005
Subject: Re: SAQP for Site Auditor Review

Hi Stuart,
The consultant needs to provide the rationale for the proposed well locations, having regard to the topography, geology, hydrogeology and anticipated flow directions. I can then provide comments on what they propose.
regards,
Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | www.jbsg.com.au

From: S Clark
Sent: 05/07/2019 3:28:39 PM AEST (GMT +10:00)

To: Andrew Lau
Cc: Sahani Gunatunge, Penelope King, Darren Chow, Monique Windley
Mail Number: TSA-GCOR-003464
Subject: Fwd: SAQP for Site Auditor Review

Andrew, I left a message for you on phone,
Cavvanba have asked for me to forward through the following attachments for you to review.

They are the intended location of the groundwater well installs.

We will be performing this action on Tuesday, so if you could please set aside some time either this afternoon or Monday to have a look and confirm your acceptance of these location this would be appreciated.

STUART CLARK
Senior Project Manager
Tweed Valley Hospital - Integrated Project Office
Tweed Shire Council Offices
17 Bre St T weed Heads
NSW 2485
Level 2 Suite B

Level 15, 207 Kent Street | Sydney NSW 2000
T: 02 9276 1400 | **M:** 0401 523 395
W: tsamanagement.com.au | **E:** sclark@tsamanagement.com.au
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From: M Windley
Sent: 05/07/2019 2:56:09 PM AEST (GMT +10:00)
To: Stuart Clark
Cc: Todd Lee, Monique Windley
Mail Number: LL-GCOR-001411
Subject: Re: SAQP for Site Auditor Review

Hi Stu,

Could you please pass the following comments and attachment onto JBS&G for their review:

Hi Andrew,

Cavvanba have asked for me to forward through the following attachments for you to review.

They are the intended location of the groundwater well installs.

We will be performing this action on Tuesday, so if you could please set aside some time either this afternoon or Monday to have a look and confirm your acceptance of these location this would be appreciated.

Thanks in advance,

Kind Regards

Monique Windley
Site Engineer, Tweed Valley Hospital
Level 3, Kings Gate, 2 King Street, Bowen Hills, 4006 QLD Australia
M +61 437 137 210
monique.windley@lendlease.com | www.lendlease.com

From: A Lau
Sent: 28/06/2019 5:20:35 PM AEST (GMT +10:00)
To: Sahani Gunatunge, Stuart Clark
Cc: Todd Lee, Monique Windley
Mail Number: JBS&G-GCOR-000011
Subject: Re: SAQP for Site Auditor Review

Hi Stuart,
Thanks for sending through the revised report.
The changes have addressed my previous comments and i have no further comments.
regards,
Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane
Level 1, 50 Margaret Street Sydney NSW 2000
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From: S Clark
Sent: 28/06/2019 8:55:14 AM AEST (GMT +10:00)
To: Sahani Gunatunge, Andrew Lau
Cc: Todd Lee, Monique Windley
Mail Number: TSA-GCOR-003373
Subject: Fwd: SAQP for Site Auditor Review

ANdrew Sahani
Please find revised SAQP from Cavvanba for records following your previous recommendations

STUART CLARK
Senior Project Manager
Tweed Valley Hospital - Integrated Project Office
Tweed Shire Council Offices
17 Bre St T weed Heads
NSW 2485

Level 2 Suite B

Level 15, 207 Kent Street | Sydney NSW 2000
T: 02 9276 1400 | **M:** 0401 523 395
W: tsamanagement.com.au | **E:** sclark@tsamanagement.com.au
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From: M Windley
Sent: 28/06/2019 7:23:54 AM AEST (GMT +10:00)
To: Stuart Clark
Cc: Todd Lee, Darren Chow
Mail Number: LL-GCOR-001335
Subject: SAQP for Site Auditor Review

Morning Stu,

Find attached the revised SAQP.
Whilst this does not need to approved prior to the commencement of works it would be good to have JBS&G's final input on it prior.

Kind Regards

Monique Windley
Site Engineer, Tweed Valley Hospital
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monique.windley@lendlease.com | www.lendlease.com

From: S Clark
Sent: 25/06/2019 2:37:17 PM AEST (GMT +10:00)
To: Sahani Gunatunge, Penelope King, Andrew Lau
Cc: Todd Lee, Darren Chow, Monique Windley
Mail Number: TSA-GCOR-003323
Subject: Re: B16 - Works Plan, Site Plan, VSQAP and WHS Plan for Site Auditor Review

Thanks Andrew

Monique Darren, Can you review this with Cavvanba urgently and update their and your plans as noted .

STUART CLARK
Senior Project Manager
Tweed Valley Hospital - Integrated Project Office
Tweed Shire Council Offices

17 Bre St T weed Heads
NSW 2485
Level 2 Suite B

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T: 02 9276 1400 | **M:** 0401 523 395
W: tsamanagement.com.au | **E:** sclark@tsamanagement.com.au
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From: A Lau
Sent: 25/06/2019 1:28:28 PM AEST (GMT +10:00)
To: Sahani Gunatunge, Penelope King, Stuart Clark
Cc: Todd Lee, Andrew Lau, Darren Chow, Monique Windley
Mail Number: JBS&G-GCOR-000010
Subject: Re: B16 - Works Plan, Site Plan, VSQAP and WHS Plan for Site Auditor Review

Hi Stuart,

My comments on the various reports provided in your aconex note below (plus other aconex notes relevant to the consent conditions) are provided as follows:

DQO/SAQP - Groundwater and Soil Investigation
I have reviewed the Cavaanba SAQP and am satisfied that 3 of the 5 previously provided comments have been addressed. The SAQP does not provide any additional detail on how soil samples to be assessed/analysed for asbestos will be collected (i.e., by a competent person / LAA?) or detail what laboratory method is proposed (i.e.,, 40 g sample to 0.1g/kg LOR or 500 Ml sample to meet NEPC 2013 / DoH 2009 requirements, so my two previous comments relating to asbestos remain open.

Hazardous Materials Management Plan (Lend Lease, 18/6/2019, Rev 5)
The Federal/National list of legislation is incomplete and contains errors in Section 2.
The state list of legislation and regulations does not contain any legislation or regulations in Section 2.
Section 2 contains a statement, `No asbestos waste is to be re-used or recycled on site', which is consistent with relevant prohibition for asbestos waste, however, this must not be misconstrued as applying to soils containing asbestos which meet relevant NSW EPA endorsed criteria and are not surplus to site requirements (so are not defined as waste under relevant legislation). This must be explicitly clarified in this plan to avoid incorrect application of legislation/regulations to the activities on the site.
There is no information in relation to the licensing requirements for asbestos removalists and guidance on when bonded or friable licensed removalists will be used. Similarly, no guidance is provided in relation to the various types of clearances required and the requirement for Licensed Asbestos Assessors in certain circumstances, consistent with relevant regulations and guidance.

Environment and Safety Workplan (Cavvanba Ref 19038, date unknown)
The EHS plan is considered appropriate for the works the plan covers - that is, the further site investigations and validation sampling (only) associated with the remediation works.

Compliance with Consent Conditions
Various documents have been provided for my review and endorsement against Condition B16 or the consent conditions. Condition B16 makes reference to Conditions B11- B15, which in turn require conditions B9 - B10 to be completed. Given that the additional investigations have not yet been completed to satisfy B9 - B10, it is not yet known what B11 - B15 involves in terms of revising the scope of remediation works. For these reasons, i am not in a position to review or endorse anything in relation to satisfying B16, however, i have provided some preliminary commentary

below on what has been provided to assist the consultant & contractor when they are at an appropriate stage to prepare them and submit for my review:
(a) I have reviewed the site plan provided, which is an aerial photograph with coloured shapes in parts of the site where remediation (known) and where further investigations are proposed. The plan is not to scale and its hard for me to tell what if any use the plan has in a practical sense in terms of guiding the remedial works, notwithstanding that further investigations are yet to be undertaken to provide further data on this. Relevant guidelines are available to be followed and require various elements to be included in plans for remediation works, including (but not limited to): scale, dimensions both lateral and target vertical depths & geographical co-ordinates.
(b) A works plan has not been provided. It is noted that the EHS Plan reviewed above has `workplan' in its title, but this document relates only to the proposed additional investigation works and (arguably) the sampling associated with the remediation works.
(c) Validation Sampling Analytical Quality Plan (VSAQP) is yet to be provided for my review. It is noted that the SAQP referred to above relates to the additional data gap investigation rather than the validation phase of the works. The VSAQP will be able to be completed once the additional investigations and revisions to the extent of remediation works (if any) in a revised RAP are done.
(d) While i have provided comments on the Cavvanba EHS plan above, this plan relates only to the additional investigation works and not the remediation works in their entirety. As such, i am yet to be provided with a Work Health and Safety Plan (WHSP) which deals with the remediation and validation stages of the project (as opposed to just the additional site investigations).

Happy to discuss if you have any questions.

Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | www.jbsg.com.au

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From: S Clark
Sent: 21/06/2019 3:13:47 PM AEST (GMT +10:00)
To: Sahani Gunatunge, Penelope King, Andrew Lau
Cc: Todd Lee, Darren Chow, Monique Windley
Mail Number: TSA-GCOR-003265
Subject: Fwd: B16 - Works Plan, Site Plan, VSQAP and WHS Plan for Site Auditor Review

Hi Andrew, Sahani
Please find attached from the Main Contractor Lendlease

Find attached the ZIP file for all documents to be approved by the site auditor, as well as the revised VSAQP (markup showing changes is also attached).

Once you return it , will then need to go the certifier and then department of Planning so advise on turnaround please .

STUART CLARK
Senior Project Manager
Tweed Valley Hospital - Integrated Project Office

Tweed Shire Council Offices
17 Bre St T weed Heads
NSW 2485
Level 2 Suite B

Level 15, 207 Kent Street | Sydney NSW 2000
T: 02 9276 1400 | **M:** 0401 523 395
W: tsamanagement.com.au | **E:** sclark@tsamanagement.com.au
smart people **smarter** solutions

From: M Windley
Sent: 21/06/2019 2:55:30 PM AEST (GMT +10:00)
To: Todd Lee, Stuart Clark
Cc: Geoff Barrow, Darren Chow
Mail Number: LL-GCOR-001269
Subject: B16 - Works Plan, Site Plan, VSQAP and WHS Plan for Site Auditor Review

Hi Stu,

Find attached the ZIP file for all documents to be approved by the site auditor, as well as the revised VSAQP (markup showing changes is also attached).

Can you please issue to JPS&G for approval, it will then need to go the certifer and the department.

In the meantime, myself and Geoff Barrow will work on getting the mobilization documents in order.

Kind Regards

Monique Windley
Site Engineer, Tweed Valley Hospital
Level 3, Kings Gate, 2 King Street, Bowen Hills, 4006 QLD Australia
M +61 437 137 210
monique.windley@lendlease.com | www.lendlease.com

Tweed Valley Hospital
Tweed Shire
Greenfield Site
Northern Rivers
NSW 2485 Australia

JBS&G Australia Pty Ltd
Level 1, 50 Margaret St
Sydney
NSW 2000 Australia
Ph. +61 2 82450300

MAIL TYPE	MAIL NUMBER	REFERENCE NUMBER
Advice	JBS&G-ADVICE-000007	LL-GCOR-001728

Re: TVH - Amended House RAP and Soil Investigation following exceedance of Aldrin and Dieldrin

From	Arthur Teo - JBS&G Australia Pty Ltd
To (4)	Mr Todd Lee - Health Infrastructure (+3 more...)
Cc (2)	Mr Darren Chow - Lendlease Building (+1 more...)
Sent	Friday, 9 August 2019 10:14:49 AM AEST (GMT +10:00)
Status	N/A

FILE ATTACHMENTS (2)

File Name
56336-123,764 AIR #1.0 090819.docx
56336-123,764 AIR #1.0 090819.pdf

ATTRIBUTES

Attribute 1	Early Works
Attribute 4	120 Environment Health & Safety EHS

MESSAGE

Hi Monique

On behalf of Andrew, please find attached our comments for the Soil and Groundwater Investigation Report for your consideration. A word version of the Audit Issues Register is also attached should the Assessor wish to provide response.

We are in the process of reviewing the Farm Pit RAP and plan to send through our comments early next week.

Should you have any queries, please do not hesitate to contact Andrew or me.

Kind Regards

Arthur Teo | Senior Associate | JBS&G

Sydney | **Melbourne** | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong | Bunbury

Level 2, 155 Queen Street, Melbourne VIC 3000
T: 03 9642 0599 | M: 0416 889 954 | E: ateo@jbsg.com.au |W: www.jbsg.com.au

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From: M Windley
Sent: 02/08/2019 4:38:38 PM AEST (GMT +10:00)
To: Todd Lee, Sahani Gunatunge, Penelope King, Andrew Lau, Arthur Teo, Stuart Clark
Cc: Darren Chow, Susan Folliott
Mail Number: LL-GCOR-001735
Subject: Re: TVH - Amended House RAP and Soil Investigation following exceedance of Aldrin and Dieldrin

All,

Please find attached the following documents:

1. Soil and Groundwater Investigation Report
2. RAP - Residential House
3. Residential House detailed investigation report

Item 1 is a new document, specifically drafted to satisfy the SSD Stage 1 conditions. Items 2 and 3 have been updated based on Authur's and Andrew's comments from earlier today.

Next week and the following we aim to get the following over to you (please let me know if there is anything missing):

- Farm Pit RAP
- Site Plan
- Works Plan
- VSAQP
- WHSP
- HMMP

We are still hoping to have a combined interim statement by the end of August, so if there is anything we need to do to get this across the line please advise.

If there are any concerns with any of these documents - please don't hesitate to give me a call.

Have a good weekend.

Kind Regards

Monique Windley
Site Engineer, Tweed Valley Hospital
Level 3, Kings Gate, 2 King Street, Bowen Hills, 4006 QLD Australia
M +61 437 137 210
monique.windley@lendlease.com | www.lendlease.com

From: T Lee
Sent: 02/08/2019 12:23:09 PM AEST (GMT +10:00)
To: Sahani Gunatunge, Penelope King, Andrew Lau, Arthur Teo, Monique Windley, Stuart Clark

Cc: Darren Chow, Susan Folliott
Mail Number: Health I-GCOR-000506
Subject: Re: TVH - Amended House RAP and Soil Investigation following exceedance of Aldrin and Dieldrin

Thanks Arthur,
Appreciate the quick response.
We will ensure Cavvanba makes they suggested amendments.
Regards,

Todd Lee

Project Director | **Health Infrastructure**

Tweed Valley Hospital Development

0413 591 242 | todd.lee@health.nsw.gov.au

Level 2 Suite B, 21 Bre Street, Tweed Heads NSW 2485

Safety first, a commitment to our integrated teams.

From: A Teo
Sent: 02/08/2019 11:07:44 AM AEST (GMT +10:00)
To: Todd Lee, Sahani Gunatunge, Penelope King, Andrew Lau, Monique Windley, Stuart Clark
Cc: Darren Chow, Susan Folliott
Mail Number: JBS&G-ADVICE-000006
Subject: Re: TVH - Amended House RAP and Soil Investigation following exceedance of Aldrin and Dieldrin

Hi Todd/Monique

On behalf of Andrew, please find below our comments with regards to the amended RAP and Soil Investigation Report:

- The Auditor has conducted an independent verification of the statistical assessment and is satisfied that the aldrin and dieldrin concentrations in the shallow soil beneath the garage slab are within the acceptable NEPM statistical parameters.
- The Auditor notes that the elevated aldrin and dieldrin impact at TP30/0.1 at 0.1 m has been vertically delineated by the underlying soil.
- Based on the soil results and statistical assessment results, the Auditor concurs with the Assessor that no further remediation is warranted associated with the aldrin and dieldrin impact beneath the garage slab.
- Minor comment: It is understood that soil samples from TP102 – TP110 were collected from a depth of 0.1 m. However, Table 1 attached at the rear of the RAP and Soil Investigation

Report indicates that these samples were collected from depths ranging from 1.1 – 9.1 m. Please update the sampling depths in Table 1.

Don't hesitate to contact Andrew or me if you have any queries.

Kind Regards

Arthur Teo | **Senior Associate** | JBS&G
Sydney | **Melbourne** | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong | Bunbury
Level 2, 155 Queen Street, Melbourne VIC 3000
T: 03 9642 0599 | M: 0416 889 954 | E: ateo@jbsg.com.au |W: www.jbsg.com.au

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From: T Lee
Sent: 02/08/2019 9:46:14 AM AEST (GMT +10:00)
To: Todd Lee, Sahani Gunatunge, Penelope King, Andrew Lau, Arthur Teo, Monique Windley, Stuart Clark
Cc: Darren Chow, Susan Folliott
Mail Number: Health I-GCOR-000505
Subject: Re: TVH - Amended House RAP and Soil Investigation following exceedance of Aldrin and Dieldrin

Hi Andrew, Arthur,
Please see attached data from Cavvanba.
Let us know if you need anything else.
Thank you,

Todd Lee
Project Director | **Health Infrastructure**
Tweed Valley Hospital Development
0413 591 242 | todd.lee@health.nsw.gov.au
Level 2 Suite B, 21 Bre Street, Tweed Heads NSW 2485

Safety first, a commitment to our integrated teams.

From: T Lee
Sent: 02/08/2019 8:42:10 AM AEST (GMT +10:00)
To: Sahani Gunatunge, Penelope King, Andrew Lau, Arthur Teo, Monique Windley, Stuart Clark
Cc: Darren Chow, Susan Folliott
Mail Number: Health I-GCOR-000504
Subject: Re: TVH - Amended House RAP and Soil Investigation following exceedance of Aldrin and Dieldrin

Thanks Andrew,
Appreciate the quick response.
Hi Monique,
Please get Cavvanba to provide the data asap this morning.
Thank you,

Todd Lee
Project Director | **Health Infrastructure**
Tweed Valley Hospital Development
0413 591 242 | todd.lee@health.nsw.gov.au
Level 2 Suite B, 21 Bre Street, Tweed Heads NSW 2485

Safety first, a commitment to our integrated teams.

From: A Lau
Sent: 02/08/2019 8:34:48 AM AEST (GMT +10:00)
To: Todd Lee, Sahani Gunatunge, Penelope King, Arthur Teo, Monique Windley, Stuart Clark
Cc: Darren Chow, Susan Folliott
Mail Number: JBS&G-GCOR-000015
Subject: Re: TVH - Amended House RAP and Soil Investigation following exceedance of Aldrin and Dieldrin

Todd/Monique,
Thanks for sending through. I've reviewed the commentary around the Aldrin and Dieldrin and at face value i accept the assessment and conclusions. However, to confirm this we will need to check the statistical calculations presented in the report and are not able to do this because the data isn't provided in the report.
If you can please send through the data to my auditor assistant, Arthur Teo (included on this aconex note), we will check the calculations and confirm my views above. If we can have this data this morning we will be able to confirm by the end of the day today.
Regards,
Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane

Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | www.jbsg.com.au
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From: T Lee
Sent: 02/08/2019 8:25:22 AM AEST (GMT +10:00)
To: Sahani Gunatunge, Penelope King, Andrew Lau, Monique Windley, Stuart Clark
Cc: Todd Lee, Darren Chow, Susan Folliott
Mail Number: Health I-GCOR-000503
Subject: Re: TVH - Amended House RAP and Soil Investigation following exceedance of Aldrin and Dieldrin

Morning Andrew,
Could you please expedite this review and advise how long it will take?
Many thanks,

Todd Lee
Project Director | **Health Infrastructure**
Tweed Valley Hospital Development
0413 591 242 | todd.lee@health.nsw.gov.au
Level 2 Suite B, 21 Bre Street, Tweed Heads NSW 2485

Safety first, a commitment to our integrated teams.

From: M Windley
Sent: 02/08/2019 7:48:03 AM AEST (GMT +10:00)
To: Sahani Gunatunge, Penelope King, Stuart Clark
Cc: Todd Lee, Andrew Lau, Darren Chow, Susan Folliott
Mail Number: LL-GCOR-001728
Subject: TVH - Amended House RAP and Soil Investigation following exceedance of Aldrin and Dieldrin

Morning Stu,

Cavvanba have sent through their amended RAP and DSI (Detailed Soil Investigation) that were submitted prior to the initial audit statement.

This was off the back of the exceedance of Aldrin and Dieldrin found underneath the demolished garage.

Prior to the submission of the final Soil and Groundwater investigation report (required as part of SSD Stage 1 conditions), they are hoping to get some feedback from JBS&G whether they are happy with the current report.

Cavvanba have supplied a tracked changes version as well as a clean one to expediate JBS&G reviews process.

Kind Regards

Monique Windley
Site Engineer, Tweed Valley Hospital
Level 3, Kings Gate, 2 King Street, Bowen Hills, 4006 QLD Australia
M +61 437 137 210
monique.windley@lendlease.com | www.lendlease.com

56336- 124,103
L03 (Interim Advice 0503-1914-002 Rev 0)

30 August 2019

Health Infrastructure
c/- Sue Folliott
TSA Management
Via email: sfolliott@tsamanagement.com.au

Interim Audit Advice (0503-1914-002): 771 Cudgen Road, Cudgen NSW

Dear Sue,

1. Introduction

Andrew Lau, of JBS&G Australia Pty Ltd (JBS&G), was engaged on 6 May 2019, by Health Infrastructure (HI) to conduct a site audit of the property located at 771 Cudgen Road, Cudgen, NSW ('the site').

The site is legally identified as Lot 11 in DP 1246853 and has an area of approximately 19.4 hectares. The site audit relates to the proposed development of the site as the Tweed Valley Hospital. It is understood that the development application pathway for the project consists of a staged Significant Development Application under Section 4.22 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

Andrew Lau (`the Auditor') is a Site Auditor accredited by the NSW Environment Protection Authority (EPA) under the *Contaminated Land Management Act 1997* (CLM Act 1997) (Accreditation Number 0503). A Site Audit Statement (SAS) and Site Audit Report[1] (SAR) were previously issued for the site by Andrew Lau on 4 February 2019, certifying that the site could be made suitable for the proposed land use subject to remediation and management in accordance with the Remedial Action Plans (RAPs) prepared by OCTIEF (2019)[2] and Cavvanba (2019a[3] and 2019c[4]) and a number of conditions including the preparation of a Validation Sampling Analysis and Quality Plan (VSAQP) and Work Health and Safety Plan (WHSP) for subsequent review and endorsement by the Auditor prior to commencing the site works.

A Development Consent (SSD 9575) has since been granted by Minister for Planning and Public Spaces on 11 June 2019 for the proposed hospital development at the site. Conditions B10, B11, B15 and B16 within Schedule 3, Part B of the Development Consent require the preparation of a Soil and Groundwater Investigation Report, a RAP (for any additional contamination identified) and various management plans requiring review and endorsement by the Site Auditor prior to certification of site works. The required documents have subsequently been prepared by the consultants, Cavvanba

[1] JBS&G Australia Pty Ltd (2019) *Site Audit Report 0503-1901, 771 Cudgen Road, Cudgen NSW*, 4 February 2019.
[2] OCTIEF Pty Ltd (2019) *Remediation Action Plan, Tweed Valley Hospital site, 771, Cudgen Road, Cudgen NSW*, 1 February 2019.
[3] Cavvanba Consulting Pty Ltd (2019a) *Remedial Action Plan Addendum – Farm Shed, 771 Cudgen Road, Cudgen NSW*, 24 January 2019.
[4] Cavvanba Consulting Pty Ltd (2019c) *Remedial Action Plan Addendum – Residential House, 771 Cudgen Road, Cudgen NSW*, 1 August 2019.

and others and provided to the Auditor for independent review to assist with the preparation of this interim audit advice (IAA).

2. Documents Reviewed

The documents reviewed as part of the preparation of this IAA include:

- B & P Survey Consulting Surveyors, *Remediation Area Plan*, ref: T16452, 9 August 2019;
- Cavvanba Consulting Pty Ltd (2019a) *Remedial Action Plan Addendum – Farm Shed*, 771 Cudgen Road, Cudgen, NSW, ref: 18084 R04 V2, 24 January 2019;
- Cavvanba Consulting Pty Ltd (2019b) *Soil Investigation Report – Residential House, 771 Cudgen Road, Cudgen NSW*, ref: 18084 R01 V3, 1 August 2019;
- Cavvanba Consulting Pty Ltd (2019c) *Remedial Action Plan Addendum – Residential House, 771 Cudgen Road, Cudgen NSW*, ref: 18084 R02 V4, 1 August 2019;
- Cavvanba Consulting Pty Ltd (2019d) *Groundwater and Soil Investigation, 771 Cudgen Road, Cudgen NSW,* Ref: 19038 R02 V2, dated 22 August 2019;
- Cavvanba Consulting Pty Ltd (2019e) *Remedial Action Plan Addendum – Farm Pit, 771 Cudgen Road, Cudgen NSW*, ref: 19038 R03 V2, 19 August 2019;
- Cavvanba Consulting Pty Ltd (2019f) *Validation Data Quality Objectives and Sampling, Analysis and Quality Plan, Proposed Tweed Valley Hospital, 771 Cudgen Road, Cudgen NSW,* ref: 19038 R04 V1, 23 August 2019;
- Delta Pty Ltd (2019) *Work Health and Safety Plan*, dated 28 August 2019;
- Lendlease Building Pty Ltd (2019a) *Tweed Valley Hospital, Management Plan – Hazardous Materials*, Rev7, 28 August 2019; and
- Lendlease Building Pty Ltd (2019b) *Tweed Valley Hospital, Works Plan*, Rev3, 26 August 2019.

It should be noted that the Soil Investigation Report (Cavvanba 2019b) and RAP (Cavvanba 2019c) prepared for the residential house and garage were reviewed and considered by the Auditor in the preparation of the previous Site Audit Report and Site Audit Statement. These reports have recently been amended to reflect an isolated aldrin and dieldrin impact identified within shallow soil beneath the garage slab. Based on the results of the soil investigation and statistical assessment, the Auditor concurs with the consultant (Cavvanba) that the reported soil impact beneath the garage slab is unlikely to realise any unacceptable health and ecological risks to the proposed development, hence soil remediation is not considered to be warranted in this area. These revised reports have been included in the list of the reviewed documents above for completeness.

3. Summary of Contamination Issues

Since the issuance of the previous Site Audit Statement and Audit Report, additional soil, groundwater and surface water investigative works have been conducted at the site. key findings of these investigation works are summarised in the sections below.

3.1 Soil

A summary of the soil investigation results is provided as follows:

- A total of 31 soil boreholes/test pits were advanced at the site, targeting the existing residential house (now demolished), farm pit (concrete sump feature), farm shed, farm dam and farm dump to a maximum depth of 1.2 metre below ground surface (mbgs);

- Two (2) locations (SL21 and SL22) beneath the residential house reported elevated lead concentrations (up to 385 mg/kg) above the adopted NEPM health investigation level A (HIL A) at a depth of approximately 0.1 mbgs. Previous soil investigation also identified elevated lead concentrations (up to 1,600 mg/kg) within the shallow soil at the residential house which appear to be limited to the building footprint;
- One (1) location (SL11) adjacent to the concrete slab associated with the farm pit reported an elevated benzo(a)pyrene (BaP) TEQ concentration (7.1 mg/kg) above the adopted NEPM HIL A at a depth of approximately 0.1 mbgs. The reported BaP TEQ impact at this location has been vertically and laterally delineated;
- The shallow soil samples collected from select locations (SL01 and SL02) in the vicinity of the farm pit reported elevated TRH F2 or F3 concentrations above the adopted NEPM ecological screening levels (ESLs) for urban residential land use setting. The consultant (Cavvanba 2019d) has concluded that the reported TRH impacts at these locations are potentially attributed to overflow of the farm pit water during rainfall events or general poor housekeeping during historical farm operation;
- One (1) sample (CS_02) retrieved from the concrete slab associated with the farm pit reported an elevated copper concentration (12,200 mg/kg) above the adopted NEPM HIL A. In addition, elevated concentrations of zinc (up to 1,590 mg/kg) and TRH F3 (up to 9,440 mg/kg) above the adopted NEPM ESLs for urban residential land use setting were also recorded in all the concrete samples. The consultant (Cavvanba 2019d) has concluded that the contaminant levels recorded in the concrete samples are reflective of the effect of chemical impregnation associated with the historical use of the farm pit;
- One (1) location (SL16) located to the western side of the farm shed reported detection of asbestos fibres at a depth of approximately 0.1 mbgs, however no asbestos was detected in the underlying sample at 0.5 mbgs, suggesting the asbestos impact was limited to shallow depth. Previous investigations conducted by OCTIEF (2018a)[5] and Cavvanba (2019a) also reported the presence of shallow asbestos contamination to the western and south-eastern sides of the farm shed. The nature of asbestos contamination is considered to be asbestos containing material (ACM) in disturbed soil rather than a friable asbestos source;
- One (1) location (SL23) was advanced in the vicinity of the farm dam. Soil samples collected from this location reported concentrations of all contaminants of potential concern (COPC) (where analysed) were either below the laboratory limit of reporting (LOR) or adopted ecological and human health criteria;
- Select shallow soil samples retrieved from the residential house, farm shed and farm pit reported concentrations of a combination of COPC including heavy metals (copper, nickel and zinc) and BaP above the adopted ecological criteria for urban residential land use setting;
- One (1) sediment sample (SS01) retrieved from the farm dam reported concentrations of all COPC (where analysed) were either below the laboratory LOR or ANZECC/ARMCANZ (2000) low sediment quality guidelines;
- Three (3) locations (SL26, SL28 and SL29) advanced within the farm dump reported zinc concentrations (up to 502 mg/kg) above the adopted ecological criterion for urban residential land use setting at depths between 0.1 and 0.5 mbgs. However, all soil samples

[5] OCTIEF Pty Ltd (2018) *Preliminary and Detailed Site Investigation – 771 Cudgen Road, Cudgen, NSW 2487*, 17 October 2018.

reported concentrations of all COPC (where analysed) were below the adopted human health criteria; and

- The consultant (Cavvanba 2019d) has recommended excavation and validation of the identified soil impacts at the residential house, farm shed and farm pit. The farm dump is proposed to be removed from the site due to the presence of aesthetically unsuitable materials including corrugated iron, cement sheeting (non-asbestos), plastic hosing, star pickets and bricks.

The soil and sediment investigation locations are depicted in the attached **Figures 1 – 5**.

3.2 Groundwater

A summary of the groundwater investigation results is provided as follows:

- Four (4) groundwater monitoring wells (MW01 – MW04) were installed in the vicinity of farm shed and farm pit using a combination of solid flight auger and air hammer to a maximum depth of 17 mbgs. These wells were screened within the underlying basalt aquifer;
- Two (2) additional groundwater monitoring wells (MW05 and MW06) were installed in the vicinity of the farm dump and farm dam using a hand auger to a maximum depth of 1.5 mbgs. These wells were screened within silty clay which is likely to be underlain by the basalt aquifer;
- Standing water levels in the wells ranged from 0.37 to 14.53 metre Australian Height Datum (mAHD). Based on the groundwater elevations, groundwater flow direction was inferred to be predominantly northerly towards an unnamed canal located approximately 250 m to the north of the site (at its nearest point). The canal is likely to drain into the Tweed River and potentially Cudgen Creek located approximately 2.9 km to the north-west and 0.8 km to the east of the site respectively;
- Elevated concentrations of zinc and mercury above the adopted freshwater criteria were reported in most of the groundwater wells. The consultant (Cavvanba 2019d) has concluded that these metals are representative of background groundwater conditions;
- Appreciable concentrations of TRH F3 (albeit below the adopted groundwater criteria) were reported in wells MW02 and MW03. It is not clear whether the reported TRH impact at these locations is of anthropogenic nature; and
- The consultant (Cavvanba 2019d) has recommended (the Auditor agrees) an additional round of groundwater monitoring be undertaken to confirm the initial groundwater results. Cavvanba has also recommended TRH silica gel clean up, major ions and trace level OCP analysis be included in the analytical schedule for the next groundwater monitoring.

The groundwater investigation locations are depicted in attached **Figures 6** and **7**.

3.3 Surface Water

A summary of the surface investigation results is provided as follows:

- One (1) surface water sample (SW_DAM) was collected from the existing dam on-site using an unpreserved bottle attached to an extendable pole. The sampler was gently submerged into the water body to minimise disturbance to the underlying sediment;
- The dam water sample reported an elevated zinc concentration above the freshwater criterion, which is consistent with the underlying groundwater. The consultant (Cavvanba

2019d) has concluded that the dam is potentially recharged by the underlying groundwater hence the elevated zinc is likely representative of background groundwater condition;

- One (1) water sample (SW-DIP) was collected from the water within the farm pit feature. The results indicated concentrations of select metals (cadmium, chromium, copper, lead and zinc), TRH and PAHs exceeded the adopted freshwater and/or drinking water criteria. The consultant (Cavvanba 2019d) has concluded the impacted pit water is likely associated with the historical use of fuels, oils, grease and solvents within this area; and
- The consultant (Cavvanba 2019d) has recommended removal of the farm pit water as part of the remediation works proposed for the farm pit.

The surface water investigation locations are depicted in attached **Figures 6** and **7**.

4. Remediation and Validation Strategy

A remediation feasibility assessment has been conducted and included in the relevant RAPs (2019a, 2019c and 2019e) to assist with the identification of the most feasible remediation methodology for the identified contamination issues at the residential house, farm shed and farm pit. A VSAQP has also been prepared by the consultant (Cavvanba 2019f) outlining the validation and sampling procedures and requirements for each area of concern. The relevant RAPs and VSAQP have been reviewed and endorsed by the Auditor.

A summary of the proposed remedial and validation strategy for each area of concern is provided in the table below.

Area of Concern	Identified Contamination Issue	Proposed Remediation Strategy	Proposed Validation Strategy
Residential house	• Shallow lead impact above NEPM HIL A has been reported at select locations beneath the residential house; and • Approximately 132 m^3 of lead impacted soil requires management.	• Excavation of the lead impacted area to a maximum depth of 0.7 mbgs; and • Disposal of the excavated material to an EPA licensed facility.	• Five (5) soil samples are proposed to be collected from the surface of the excavation and analysed for lead; and • Further excavation/validation sampling may be conducted should the initial validation results report any NEPM HIL exceedances. The extent of lead impacted area and the proposed sampling locations are depicted in **Figure 10**.
Farm pit	• Shallow BaP TEQ impact above NEPM HIL A has been reported at SL11 around the farm pit; and • Approximately 5 m^3 of BaP TEQ impacted soil requires management.	• Excavation of the BaP TEQ impacted area to a maximum depth of 0.3 mbgs; and • Disposal of the excavated material to an EPA licensed facility.	• One (1) soil sample is proposed to be collected from the base of the excavation where SL11 is located; • One (1) soil sample is proposed to be collected from the western wall of the excavation at a target depth of 0.1 m; • All soil samples are proposed to be analysed for PAHs (including BaP TEQ); and • Further excavation/validation sampling may be conducted should the initial validation results report any NEPM HIL exceedances. The extent of BaP TEQ impacted area and the proposed sampling locations are depicted in **Figure 8**.

Area of Concern	Identified Contamination Issue	Proposed Remediation Strategy	Proposed Validation Strategy
	• Farm pit sump feature remains at the site.	• Excavation and off-site disposal of the farm pit sump feature.	• One (1) soil sample is proposed to be collected from the base of the farm pit sump at approximately 1.1 mbgs; • One (1) soil sample is proposed to be collected from the southern wall at a target depth of 0.5 mbgs; and • All soil samples are proposed to be analysed for a broad suite of COPC including TRH, BTEXN, PAHs, OCPs, PCBs and heavy metals; and • Further excavation/validation sampling may be conducted should the initial validation results report any NEPM HIL exceedances. The farm pit sump and the proposed sampling locations are depicted in **Figure 8**.
	• Approximately 5 m^3 of concrete material is present at the farm pit area with elevated levels of TRHs and heavy metals.	• Excavation and off-site disposal of the concrete material to an EPA licensed facility.	• Not required.
	• Approximately 1,000 L of water with elevated levels of TRHs, heavy metals and naphthalene are present within the farm pit.	• Vacuum removal of the pit water by a licensed waste removal contractor and off-site disposal to an EPA licensed facility.	• Not required.
Farm shed	• ACM has been reported adjacent in shallow soil to the western side and south-eastern side of the shed; and • Approximately 200 m^3 of asbestos impacted soil requires management.	• Excavation of asbestos impacted area to a maximum depth of 0.3 mbgs; and • Disposal of the excavated material to an EPA licensed facility.	• A total of 45 soil samples are proposed to be collected from the surface and walls of the excavation and submitted for asbestos analysis; • The proposed soil sampling density at the base of the excavation meets that provided in WA DoH (2009) guidelines, i.e. twice the minimum density listed in the NSW EPA *Sampling Design Guidelines* (1995) for the asbestos likelihood "known"; • At least one (1) sample from each wall per 5 m length of strata of interest (or per 1 m depth) is proposed for validation of excavation walls. Additional discretionary samples will be collected if necessary; • Further excavation/validation sampling may be conducted should the initial validation results report any detection of asbestos fibres or ACM in soils; and • Asbestos airborne fibre monitoring will be set up at four (4) locations of the work area during excavation works.

Area of Concern	Identified Contamination Issue	Proposed Remediation Strategy	Proposed Validation Strategy
			The asbestos impacted area and the proposed sampling locations are depicted in **Figure 9**.
Farm dump	• Presence of aesthetically unsuitable material in the farm dump; and • Approximately 500 m^3 of farm dump requires management.	• Off-site disposal of the farm dump to a nominated tipping facility.	• Not required.

5. Auditor Opinions

The soil and groundwater investigation report (Cavvanba 2019d) was reviewed by the Auditor and was found to have sufficiently characterised soil, groundwater, sediment and surface water at the site. The assessment results were also considered sufficient to define the extent of remediation of the shallow soil impacts identified at the residential house, farm shed and farm pit. Subject to the limitations in **Attachment 1**, the following opinions are presented:

- The site assessment activities undertaken are considered to have met the requirements of the *Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd Edition)* (EPA 2017).
- Elevated levels of metals (zinc and/or mercury) in site groundwater and dam water exceeded the adopted freshwater criteria. The Auditor concurs with the consultant (Cavvanba 2019d) that these metals are likely representative of background groundwater conditions and so do not require any further assessment or management as per the requirements of ANZECC/ARMCANZ 2000.
- Shallow soil impacts have been identified at the residential house, farm shed and farm pit which require management. However, the Auditor is satisfied that the remediation and validation processes documented in the relevant RAPs and VSAQP are sufficient to address the extent of remediation required.
- Ecological exceedances of heavy metals (copper, nickel and zinc), TRH F2, TRH F3 and BaP were reported in shallow soil at select locations across the site. Due to the absence of any ecological impacts identified as part of the site investigations, the exceedances of the EILs are considered by the Auditor to not warrant any further assessment or management.
- The remediation strategy documented in the relevant RAPs was reviewed by the Auditor and found to be technically feasible; environmentally justifiable given the nature and extent of the identified contamination; and consistent with relevant laws, policies and guidelines.
- The Auditor notes that the remediation and validation procedures outlined in the relevant RAPs and VSAQP are appropriate to render the site suitable for the proposed land use, subject to the following considerations:
    - Implementation of the Hazardous Materials Management Plan (Lendlease 2019a), Works Plan (Lendlease 2019b) and Work Health and Safety Plan (Delta 2019) which have been prepared for the site.
    - Undertaking an additional round of groundwater monitoring at the site which includes analysis of TRH silica gel clean up, major ions and trace level OCP.
    - Preparation of a validation report detailing the remediation and validation of the residential house, farm shed and farm pit in accordance with relevant guidelines.

- Completion of a Site Audit Statement supported by a Site Audit Report, certifying suitability for the proposed use, following the successful completion of the remediation and validation activities at the site.

Please note that this interim advice does not constitute a Site Audit Statement or a Site Audit Report, but is provided to assist in the assessment and management of contamination issues at the site in regard to requirements of the site audit. The information provided herein should not be considered pre-emptive of the final audit conclusions, but rather represent the findings of the audit based on a preliminary review of available site information. Furthermore, the interim advice should not be regarded as approval of any proposed investigations or remedial activities, as any such approval is beyond the scope of an independent auditor.

Should you require clarification, please contact the undersigned on 02 8245 0300 or by email alau@jbsg.com.au.

Yours sincerely:

Andrew Lau
NSW EPA Accredited Site Auditor
JBS&G Australia Pty Ltd

Attachments (1) Limitations
(2) Figures

Attachment 1 – Limitations

This audit was conducted with a reasonable level of scrutiny, care and diligence on behalf of the client for the purposes outlined in the *Contaminated Land Management Act 1997*. The data used to support the conclusions reached in this audit were obtained by other consultants and the limitations which apply to the consultant's report(s) apply equally to this audit report.

Every reasonable effort has been made to identify and obtain all relevant data, reports and other information that provide evidence about the condition of the site, and those that were held by the client and the client's consultants, or that were readily available. No liability can be accepted for unreported omissions, alterations or errors in the data collected and presented by other consultants. Accordingly, the data and information presented by others are taken and interpreted in good faith.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements. Limited sampling and laboratory analyses were undertaken as part of the investigations reviewed, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this audit are based on the information obtained at the time of the investigations.

Attachment 2 – Figures

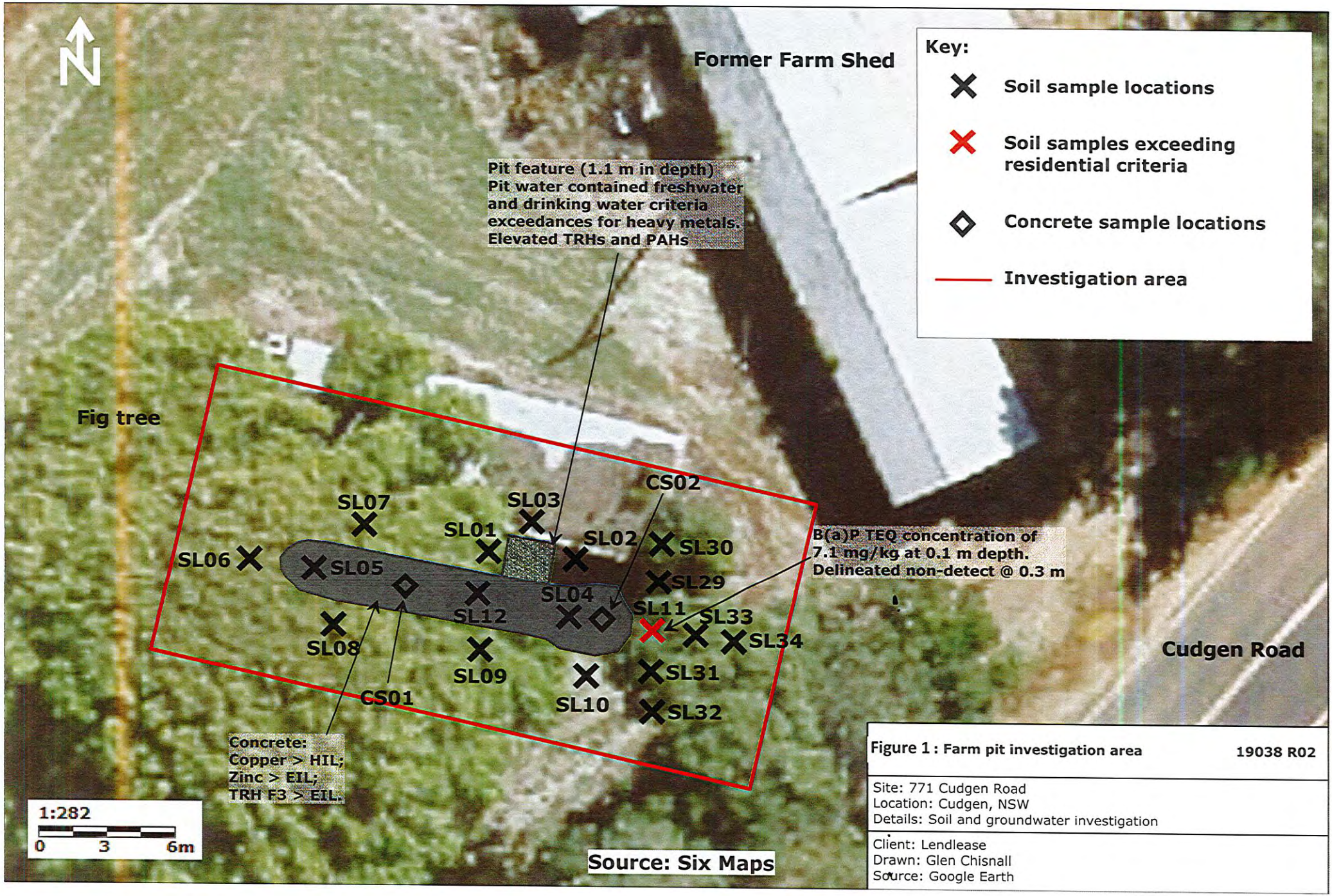

Figure 1 : Farm pit investigation area **19038 R02**

Site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Soil and groundwater investigation

Client: Lendlease
Drawn: Glen Chisnall
Source: Google Earth

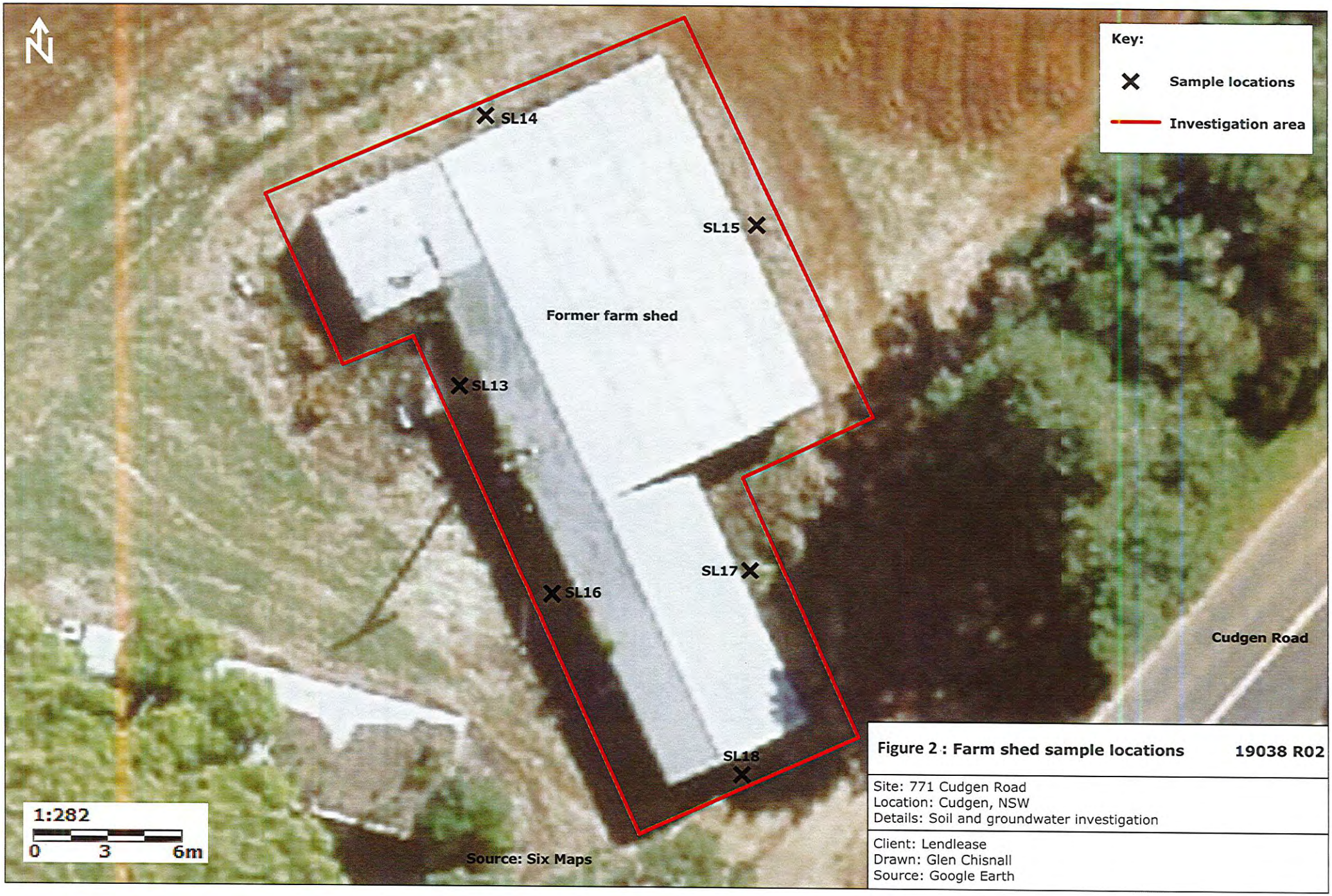

Figure 2 : Farm shed sample locations **19038 R02**

Site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Soil and groundwater investigation

Client: Lendlease
Drawn: Glen Chisnall
Source: Google Earth

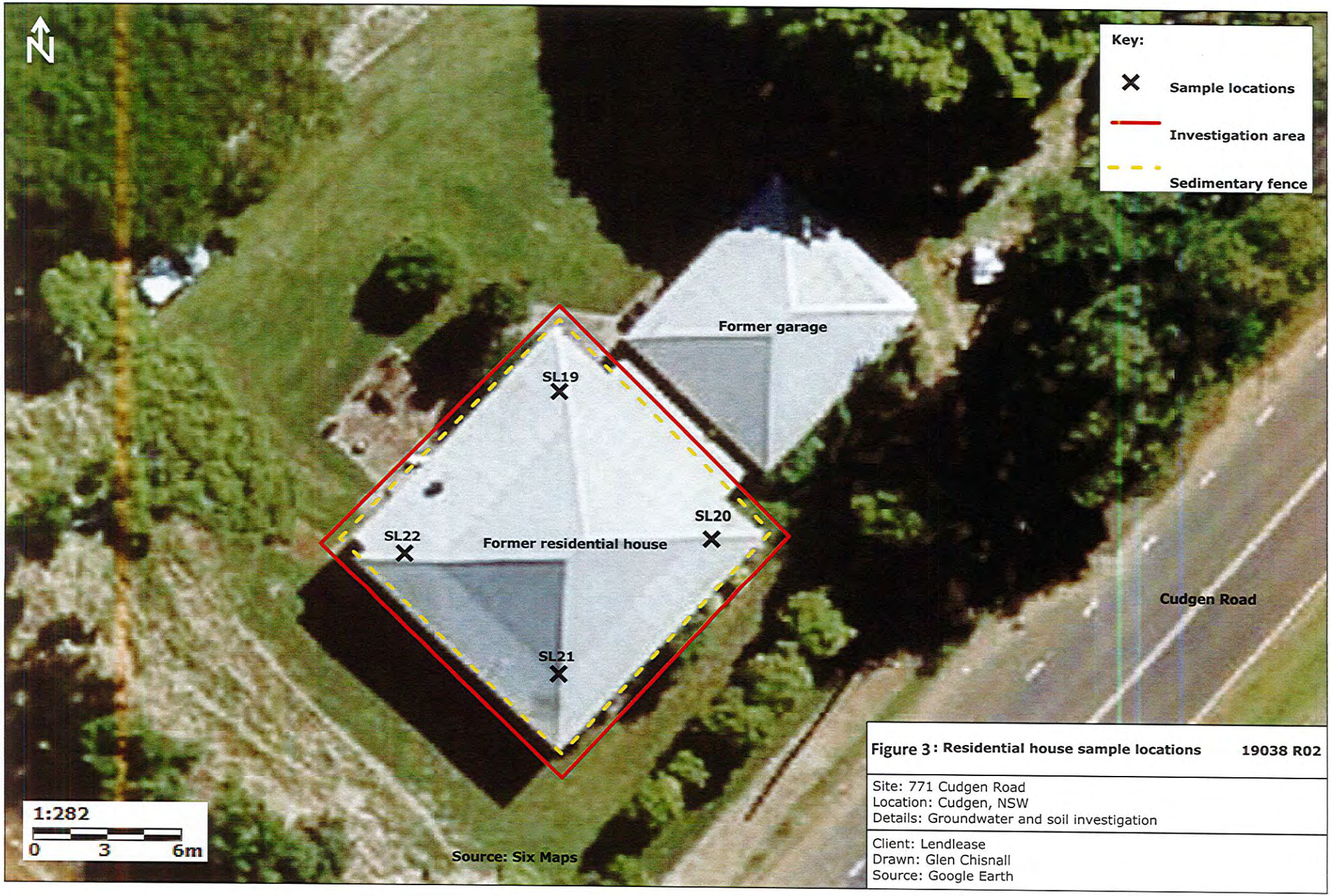

Figure 3: Residential house sample locations **19038 R02**

Site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Groundwater and soil investigation

Client: Lendlease
Drawn: Glen Chisnall
Source: Google Earth

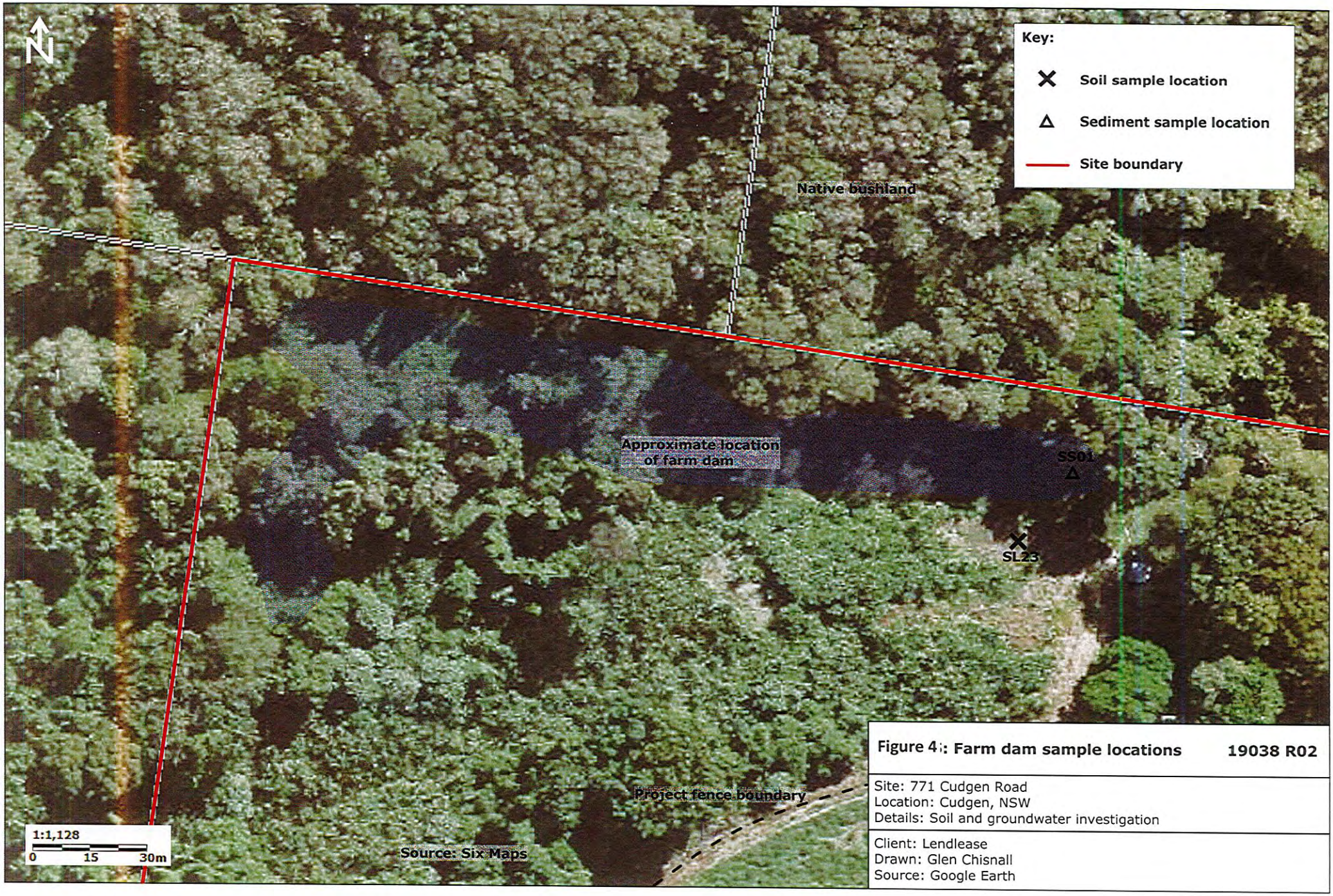

Figure 4: Farm dam sample locations **19038 R02**

Site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Soil and groundwater investigation

Client: Lendlease
Drawn: Glen Chisnall
Source: Google Earth

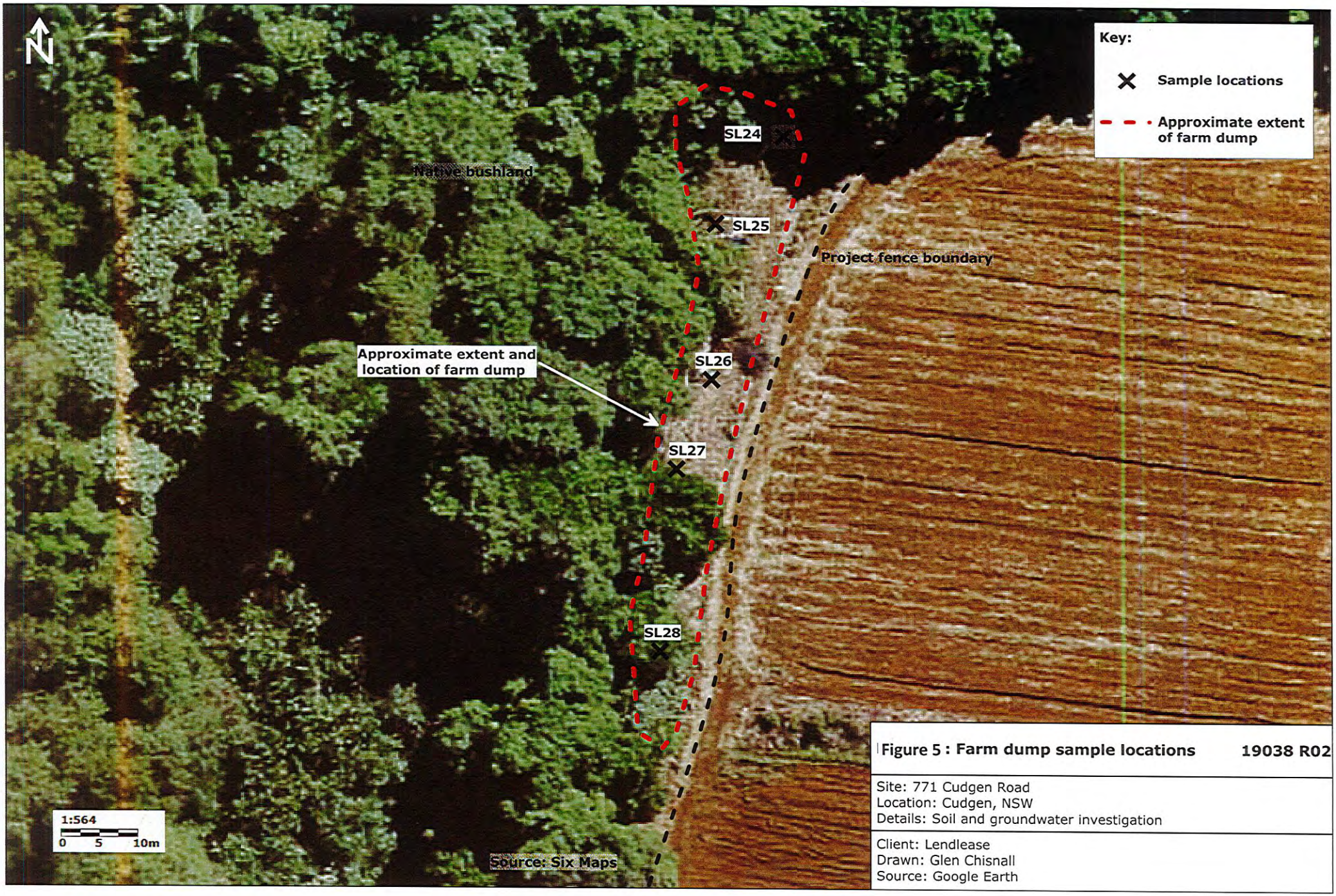

Figure 5 : Farm dump sample locations **19038 R02**

Site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Soil and groundwater investigation

Client: Lendlease
Drawn: Glen Chisnall
Source: Google Earth

Figure 6 : Farm pit and shed GW/SW sample locations **19038 R02**

Site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Groundwater and soil investigation

Client: Lendlease
Drawn: Glen Chisnall
Source: Google Earth

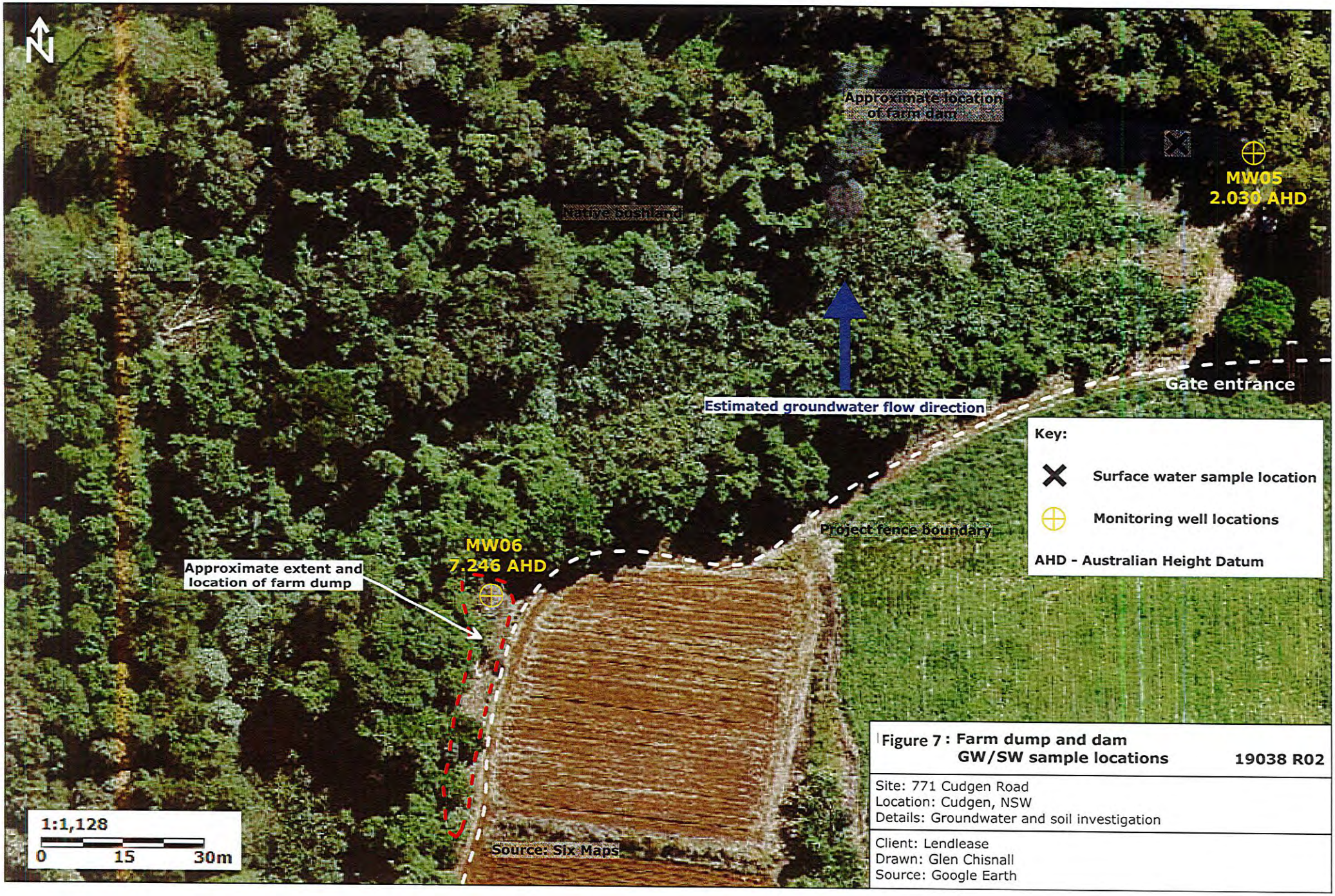

Figure 7 : Farm dump and dam GW/SW sample locations **19038 R02**

Site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Groundwater and soil investigation

Client: Lendlease
Drawn: Glen Chisnall
Source: Google Earth

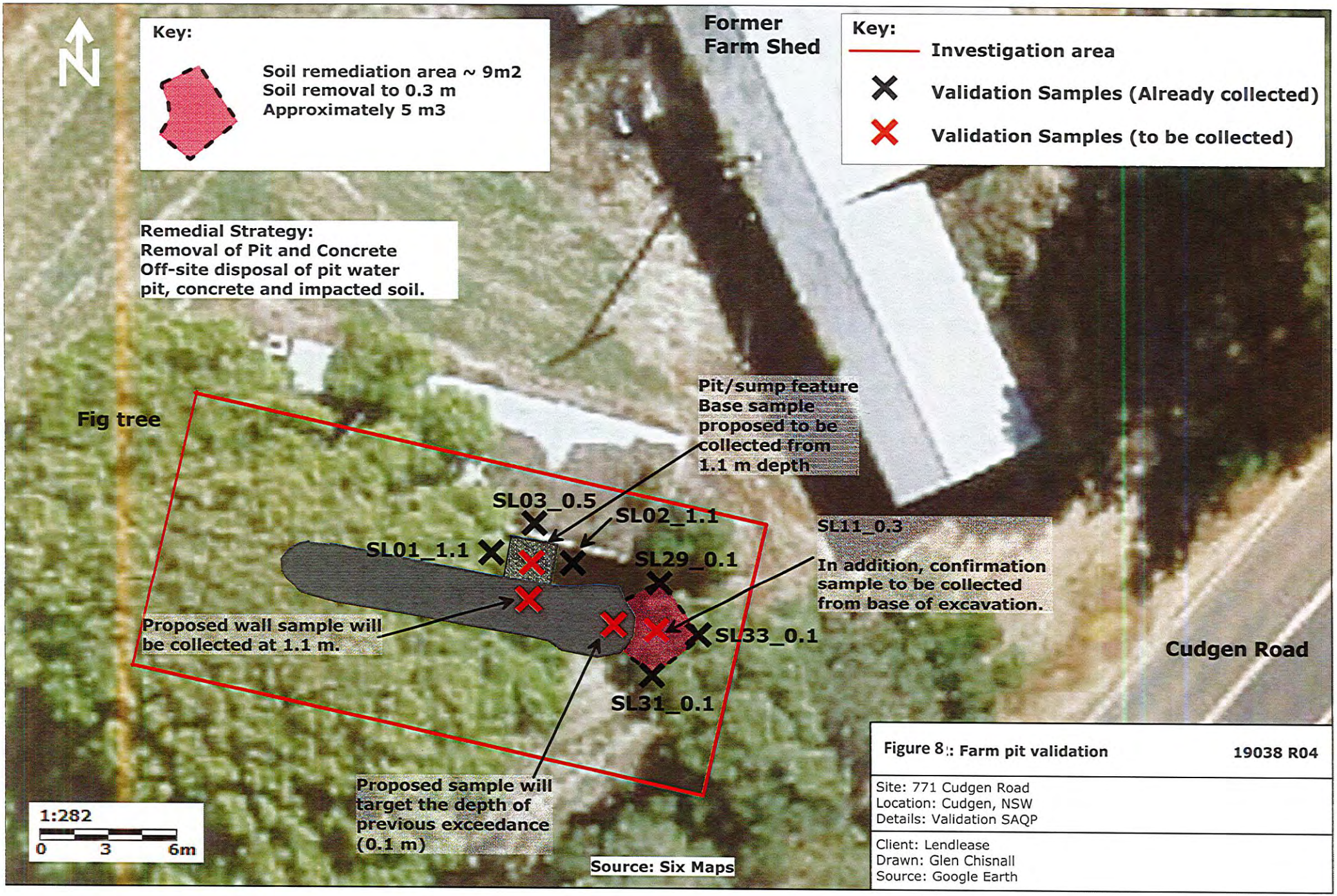

Figure 8: Farm pit validation 19038 R04

Site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Validation SAQP

Client: Lendlease
Drawn: Glen Chisnall
Source: Google Earth

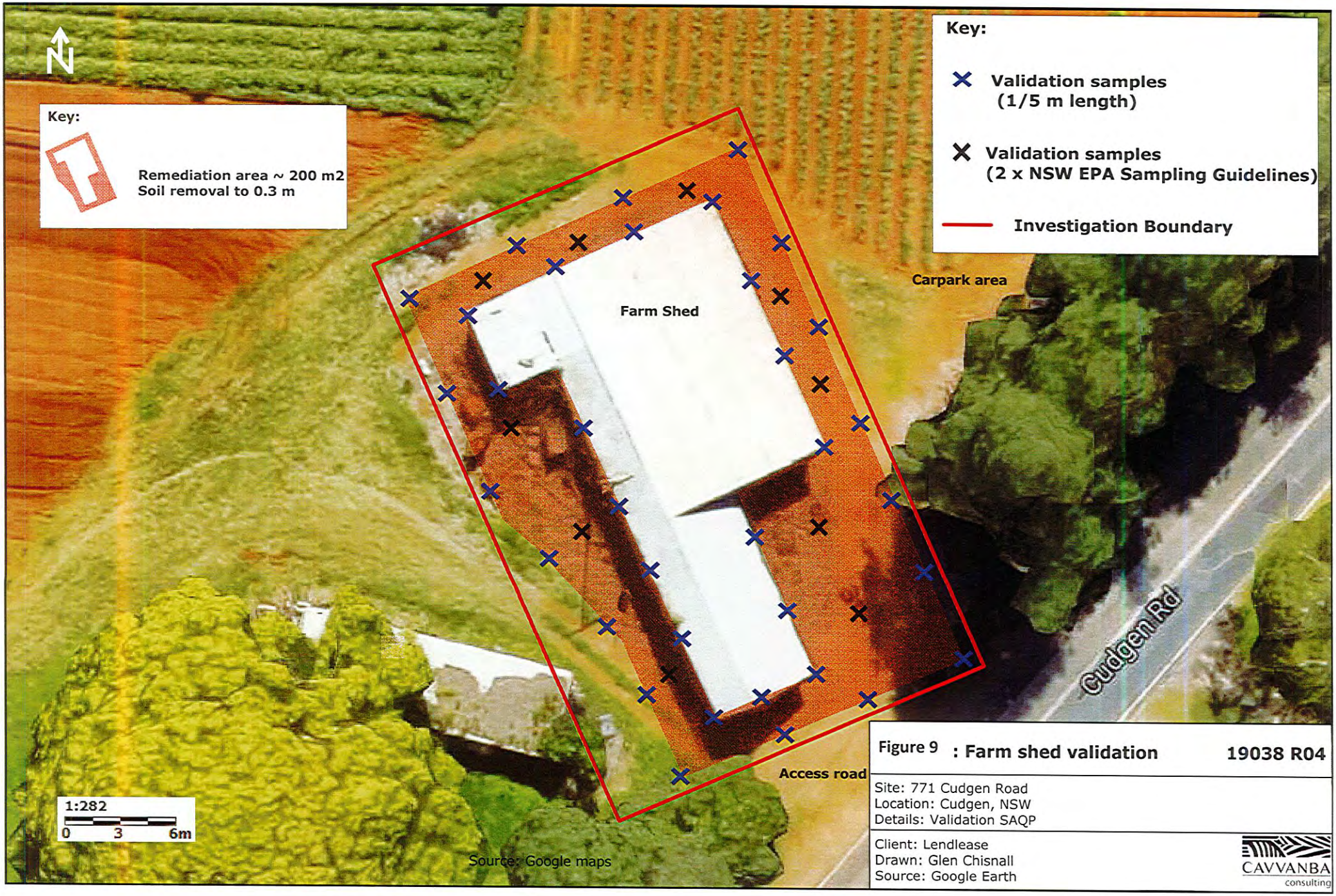

Figure 9 : Farm shed validation **19038 R04**

Site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Validation SAQP

Client: Lendlease
Drawn: Glen Chisnall
Source: Google Earth

CAVVANBA consulting

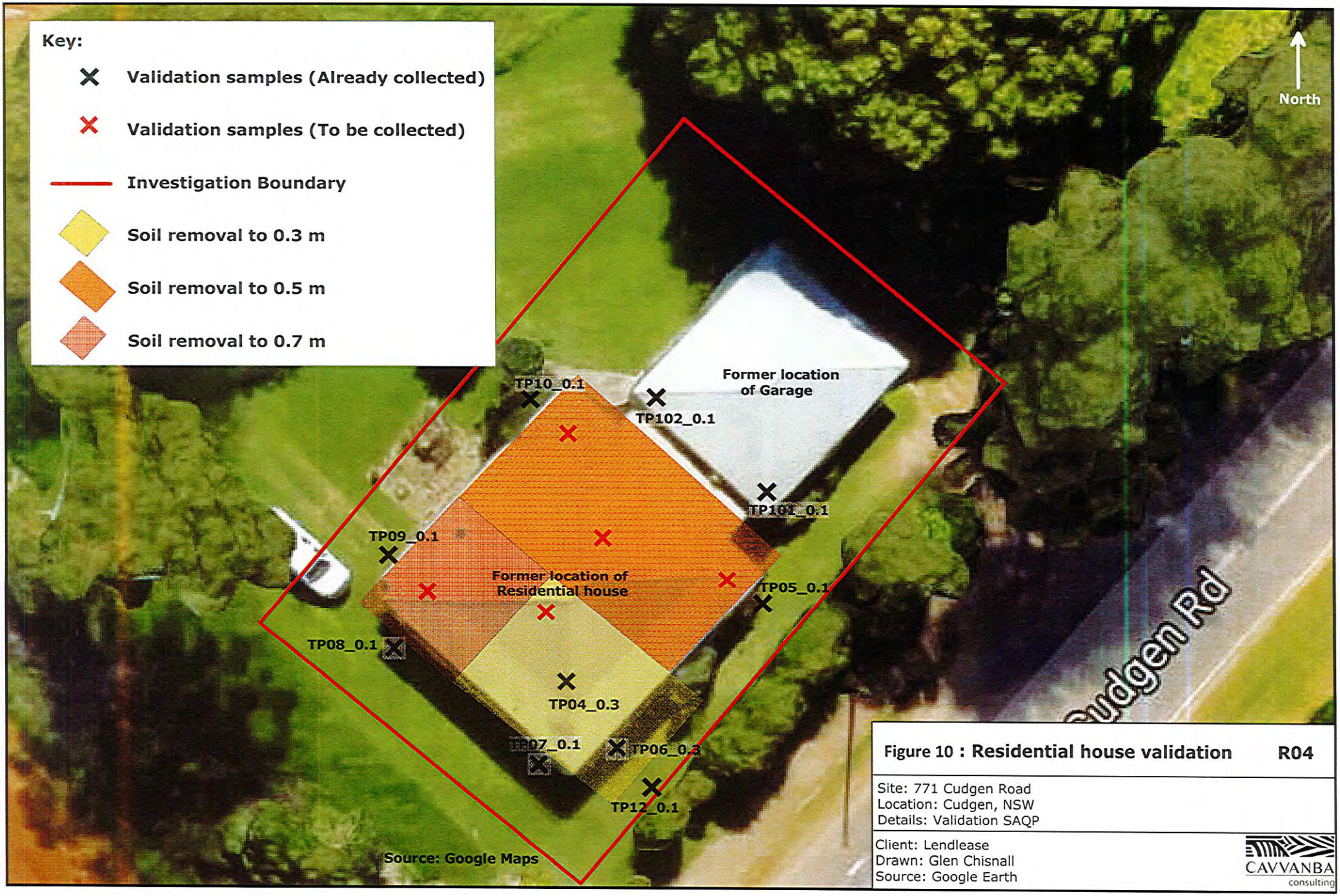

Figure 10 : Residential house validation **R04**

Site: 771 Cudgen Road
Location: Cudgen, NSW
Details: Validation SAQP

Client: Lendlease
Drawn: Glen Chisnall
Source: Google Earth

CAVVANBA consulting

Sahani Gunatunge

From: Andrew Lau
Sent: Tuesday, 17 September 2019 11:02 AM
To: Lobdell, Geoffrey; Christine Louie; Sahani Gunatunge; Stuart Clark; Andrew Lau
Cc: Barrow, Geoff; Windley, Monique; Chow, Darren
Subject: RE: [EXT]:Farm Shed Validation TVH

Geoff,

100 mm additional excavation seems like a reasonable approach. Whether it is sufficient will depend on the validation data.

Regards,
Andrew

Andrew Lau | CEO, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong | Bunbury
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | E: alau@jbsg.com.au |W: www.jbsg.com.au
Contaminated Land | Groundwater Remediation | Approvals and Assessments | Auditing and Compliance | Hygiene and Hazardous Materials | Due Diligence and Liability | Fire Management Planning | Stakeholder and Risk Management

---

From: Lobdell, Geoffrey <Geoffrey.Lobdell@lendlease.com>
Sent: Tuesday, 17 September 2019 10:57 AM
To: Andrew Lau <ALau@jbsg.com.au>; Christine Louie <clouie@jbsg.com.au>; Sahani Gunatunge <SGunatunge@jbsg.com.au>; Stuart Clark <sclark@tsamanagement.com.au>
Cc: Barrow, Geoff <Geoff.Barrow@lendlease.com>; Windley, Monique <Monique.Windley@lendlease.com>; Chow, Darren <Darren.Chow@lendlease.com>
Subject: RE: [EXT]:Farm Shed Validation TVH

Hi Andrew

Attached is the recommendation from Cavvanba regarding the additional excavation. They have recommended 100mm additional excavation over the 111m2 area. Can you please review and confirm your acceptance?

Regards,

Geoff Lobdell
Site Engineer, Tweed Valley Hospital Project
771 Cudgen Road, Cudgen, 2487 NSW Australia
M 0450 095 648
Geoffrey.Lobdell@lendlease.com | www.lendlease.com

Please consider the environment before printing this e-mail.

From: Lobdell, Geoffrey
Sent: Monday, 16 September 2019 5:28 PM
To: Andrew Lau <ALau@jbsg.com.au>; Christine Louie <clouie@jbsg.com.au>; Sahani Gunatunge <SGunatunge@jbsg.com.au>; Stuart Clark <sclark@tsamanagement.com.au>
Cc: Barrow, Geoff <Geoff.Barrow@lendlease.com>; Windley, Monique <Monique.Windley@lendlease.com>; Chow, Darren <Darren.Chow@lendlease.com>
Subject: RE: [EXT]:Farm Shed Validation TVH

Hi Andrew

Thank you for the prompt response. We will proceed with option 1 as recommended.

Regards,

Geoff Lobdell
Site Engineer, Tweed Valley Hospital Project
771 Cudgen Road, Cudgen, 2487 NSW Australia
M 0450 095 648
Geoffrey.Lobdell@lendlease.com | www.lendlease.com

Please consider the environment before printing this e-mail.

From: Andrew Lau <ALau@jbsg.com.au>
Sent: Monday, 16 September 2019 5:17 PM
To: Lobdell, Geoffrey <Geoffrey.Lobdell@lendlease.com>; Christine Louie <clouie@jbsg.com.au>; Sahani Gunatunge <SGunatunge@jbsg.com.au>; Stuart Clark <sclark@tsamanagement.com.au>
Cc: Barrow, Geoff <Geoff.Barrow@lendlease.com>; Windley, Monique <Monique.Windley@lendlease.com>; Chow, Darren <Darren.Chow@lendlease.com>
Subject: Re: [EXT]:Farm Shed Validation TVH

Geoff/Stuart,

I've reviewed the information provided below (and attached) and offer the following comments for your consideration:

- Both the RAP and the VSAQP refer to the NEPM criteria as being applicable, which is correct and which I've agreed to in my previous advice.

- There are concentrations reported in the lab report which exceed the NEPM criterion of 0.001%.

- The RAP indicates that material will be removed until the criteria are achieved.

- For these reasons, I accept option 1 (keep digging until you achieve validation). I don't accept option 2 because the detection limit of 0.1 g/kg isn't low enough to compare against the NEPM criteria.

Hope this helps. I'm travelling interstate tomorrow so have limited availability to discuss but happy to try and find a time if you like. I've got gaps between 10am-12pm or otherwise 4-5pm.

Regards

Andrew

Andrew Lau
0412 512 614
www.jbsg.com.au

On 16 Sep 2019, at 16:51, Lobdell, Geoffrey <Geoffrey.Lobdell@lendlease.com> wrote:

> Hi Andrew,
>
> We have received the below advice from Cavvanba regarding the soil validation results for the farm shed area. Can you please advise when you are available tomorrow to discuss the two options proposed by Cavvanba?
>
> If we are required to remove and replace additional soil we would prefer to progress these works ASAP while the remediation works are still progressing.
>
> Regards,
>
> **Geoff Lobdell**
> Site Engineer, Tweed Valley Hospital Project
> 771 Cudgen Road, Cudgen, 2487 NSW Australia
> M 0450 095 648
> Geoffrey.Lobdell@lendlease.com | www.lendlease.com
>
> <image001.png>
>
> Please consider the environment before printing this e-mail.
>
> ---
>
> **From:** glen@cavvanba.com <glen@cavvanba.com>
> **Sent:** Monday, 16 September 2019 4:22 PM
> **To:** Lobdell, Geoffrey <Geoffrey.Lobdell@lendlease.com>; Barrow, Geoff <Geoff.Barrow@lendlease.com>
> **Cc:** 'Ross Nicolson' <ross@cavvanba.com>; 'Ben Wackett' <ben@cavvanba.com>
> **Subject:** [EXT]:Farm Shed Validation
>
> Hi all,
>
> We have received the soil validation results from the farm shed area.
>
> Out of the 45 samples collected, 9 have reported the positive presence of asbestos fibres below the limit of reporting (0.1g/kg). I have attached analytical results and a figure which shows the samples with presence.
>
> The presence of asbestos may or may not be considered to have met the site specific criteria, as described in the VSAQP R04 below:
>
> *"With respect to asbestos, the criteria outlined in the NEPM is applicable, which includes a requirement for the top 10 cm to be free of visible asbestos. In addition, site specific criteria is a combination of no visual observations of ACM as well as non-detects of asbestos fibres in soil"*
>
> Therefore, Cavvanba strongly recommends this is discussed further with the auditor and or any other relevant stakeholders. It is our opinion, there are two options:

1. Remove additional soil in areas where asbestos is present and re-sample the resultant surface.

2. Accept the results as non-detects and report accordingly i.e. that there is asbestos present and it is below the laboratory LOR.

It is Cavvanba's opinion that both options are sufficient to protect human health. It is also highlighted that all samples were collected from the natural clay soil surface, therefore the source of asbestos presence is unclear.

Kind regards,

Glen Chisnall

Environmental Scientist – Contaminated Land

Cavvanba Consulting Pty Ltd

NSW and QLD Contaminated Land Auditing
Licensed Asbestos Assessments

T (02) 6685 7811 I F (02) 6685 5083 I M 0499 401 092 I www.cavvanba.com
1/66 Centennial Circuit I PO Box 2191 I Byron Bay NSW 2481

When sending electronic reports and/or files, please use Cavvanba Consulting's secure internet-based file delivery system located at Cavvanba Consulting DropBox. In "subject", please include client and site name.

<EN1906392_0_COA.pdf>

<Figure 3 - farm shed validation plan.pdf>

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Tweed Valley Hospital
Tweed Shire
Greenfield Site
Northern Rivers
NSW 2485 Australia

JBS&G Australia Pty Ltd
Level 1, 50 Margaret St
Sydney
NSW 2000 Australia
Ph. +61 2 82450300

MAIL TYPE	MAIL NUMBER	REFERENCE NUMBER
General Correspondence	JBS&G-GCOR-000020	LL-GCOR-002791

Re: Audit Comments - Draft Remediation Validation Report

From	Ms Sahani Gunatunge - JBS&G Australia Pty Ltd
To (2)	Geoffrey Lobdell - Lendlease Building (+1 more...)
Cc (5)	Mr Todd Lee - Health Infrastructure (+4 more...)
Sent	Friday, 8 November 2019 2:22:44 PM AEDT (GMT +11:00)
Status	N/A

ATTRIBUTES

Attribute 1	Early Works
Attribute 4	120 Environment Health & Safety EHS

MESSAGE

Geoff/Stuart,

Andrew has reviewed the revised validation report and is satisfied with the changes with no further comments provided. We will commence preparing the site audit statement and report.

Kind Regards,

Sahani Gunatunge | Environmental Consultant | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0410 240 607| E: sgunatunge@jbsg.com.au | W: www.jbsg.com.au
Contaminated Land | Groundwater Remediaon | En vironmental Approvals | Auding and Compliance | Hy giene and Hazardous Materials | Due Diligence and Liability | Stakeholder and Risk Management

---

From: G Lobdell
Sent: 08/11/2019 9:03:57 AM AEDT (GMT +11:00)
To: Andrew Lau, Geoffrey Lobdell
Cc: Todd Lee, Sahani Gunatunge, Darren Chow, Monique Windley, Stuart Clark
Mail Number: LL-GCOR-002933
Subject: Re: Audit Comments - Draft Remediation Validation Report

Hi Andrew

Please find attached the amended Validation Report. Note I have attached a document with track changes to review. Please advise if you require anything further.

Regards,

Geoff Lobdell
Site Engineer, Tweed Valley Hospital
Level 2, Kingsgate, 2 King Street, Bowen Hills, 4006 QLD Australia
M 0450 095 648
Geoffrey.Lobdell@lendlease.com | www.lendlease.com

From: G Lobdell
Sent: 04/11/2019 4:05:56 PM AEDT (GMT +11:00)
To: Andrew Lau
Cc: Todd Lee, Sahani Gunatunge, Darren Chow, Monique Windley, Stuart Clark
Mail Number: LL-GCOR-002880
Subject: Re: Audit Comments - Draft Remediation Validation Report

Hi Andrew

We will address your comments and will aim to resubmit by COB 8 November 2019.

Regards,

Geoff Lobdell
Site Engineer, Tweed Valley Hospital
Level 2, Kingsgate, 2 King Street, Bowen Hills, 4006 QLD Australia
M 0450 095 648
Geoffrey.Lobdell@lendlease.com | www.lendlease.com

From: A Lau
Sent: 04/11/2019 3:57:00 PM AEDT (GMT +11:00)
To: Geoffrey Lobdell
Cc: Todd Lee, Sahani Gunatunge, Darren Chow, Monique Windley, Stuart Clark
Mail Number: JBS&G-ADVICE-000018
Subject: Audit Comments - Draft Remediation Validation Report

Geoff/Stuart/Todd,

I've completed my review of the draft validation report and have the following comments to be addressed by the consultant:
- Laboratory reports indicate that various soil samples were collected from locations SL04 - SL10 and SL23-SL28 for laboratory analysis, however these sample locations have not been identified in site figures and results have not been discussed in the report. Please clarify if/how samples relate to the validation program.
- Farm pit validation sample depths provided on Table 6.3 do not correspond to sample depths noted on Figure 2: Farm Pit Validation. Detailed laboratory reports indicate further sampling depths (e.g. samples SL01_0.1, SL02_0.1 and SL02_1.2) however these results are not included in Table 6.3 and Figure 2. Please clarify the validation sample depths relating to the farm pit.
- Table 6: Soil analytical results - Farm shed asbestos validation sample depths are all noted as 0.1 m and are inconsistent with remedial excavation depths.
- Table 2: Soil analytical results - Lead concentrations for samples VS205 and VS206 appear to be interchanged.
Table 10: Groundwater analytical results summary metals – incorrect unit is noted in table.
- Notwithstanding the comments provided above and on the assumption that any of the responses do not contradict the data presented in the draft report, I am in agreement with the conclusions presented in the report. For clarity, consideration should be given to extending the landuse suitability conclusions to specifically include all of the proposed uses(s) relating to hospital use, since the current landuse conclusions relate to residential use which may confuse certain readers.

Happy to discuss if anything's unclear. Can you please provide an indication when the revised report will be provided.
Regards,
Andrew

Andrew Lau | Managing Director, Accredited Auditor | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane
Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0412 512 614 | www.jbsg.com.au

From: G Lobdell
Sent: 30/10/2019 6:49:32 PM AEDT (GMT +11:00)
To: Andrew Lau
Cc: Todd Lee, Sahani Gunatunge, Arthur Teo, Darren Chow, Monique Windley, Stuart Clark
Mail Number: LL-GCOR-002814
Subject: Fwd: Draft Remediation Validation Report for review and comment

Hi Andrew

Please see attached Validation report prepared by Cavvanba. Please advise if you have any comments or require further clarification regarding the report or supporting documentation by COB 13 October 2019.

Regards,

Geoff Lobdell
Site Engineer, Tweed Valley Hospital
Level 2, Kingsgate, 2 King Street, Bowen Hills, 4006 QLD Australia
M 0450 095 648
Geoffrey.Lobdell@lendlease.com | www.lendlease.com

From: G Lobdell
Sent: 29/10/2019 11:43:38 AM AEDT (GMT +11:00)
To: Todd Lee, Stuart Clark
Cc: Darren Chow
Mail Number: LL-GCOR-002791
Subject: Draft Remediation Validation Report for review and comment

Gents

As discussed, attached is the draft remediation validation report from Cavvanba. Please provide your comments by COB Wednesday 30/10/19 to allow time to update the report before issuing to the Site Auditor.

Regards,

Geoff Lobdell
Site Engineer, Tweed Valley Hospital
Level 2, Kingsgate, 2 King Street, Bowen Hills, 4006 QLD Australia
M 0450 095 648
Geoffrey.Lobdell@lendlease.com | www.lendlease.com

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