



Site Audit Report - Qenos Port Botany Hydrocarbon Storage Terminal

Prepared for:
Qenos Pty Ltd

Prepared by:
ENVIRON Australia Pty Ltd

Date:
April 2015

Project Number:
AS121762

Audit Number:
MP 054

29 April 2015

Our Ref: AS121762

Qenos Pty Ltd
Attn: Duncan Romoser
Gate B40, 39 Friendship Rd
Port Botany NSW 2036

Dear Duncan

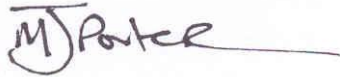
Re: Site Audit Report - Qenos Port Botany Hydrocarbon Storage Terminal

I have pleasure in submitting the Site Audit Report for the subject site. The Site Audit Statement, produced in accordance with the NSW Contaminated Land Management Act 1997, follows this letter. The Audit was commissioned by Qenos Pty Ltd to assess the suitability of the site for its intended commercial/industrial use.

The Audit was initiated to comply with a condition of the development approval (DA 6329) issued on 20 June 2014 by the Planning Assessment Commission of New South Wales and is therefore a statutory audit.

Thank you for giving me the opportunity to conduct this Audit. Please call me on 9954 8100 if you have any questions.

Yours faithfully,
ENVIRON Australia Pty Ltd



Melissa Porter
EPA Accredited Site Auditor 0803

cc: EPA
Randwick City Council

NSW Site Auditor Scheme SITE AUDIT STATEMENT



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

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

PART I: Site audit identification

Site audit statement no. MP 054

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: Melissa Porter

Company: ENVIRON Australia Pty Ltd

Address: Level 3, 100 Pacific Highway (PO Box 560)

North Sydney NSW

Postcode: 2060

Phone: 02 9954 8100

Fax: 02 9954 8150

Site details

Address: 39 Friendship Road, Port Botany NSW

Postcode: 2036

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

Part Lot 27 DP 1126332. Shown as proposed Lot 201 in Attachment at the end of Part I of this Statement

Local Government Area: Randwick City Council

Area of site (e.g. hectares): 4.3 ha

Current zoning: SP1 (special activities)

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

Declaration/Order/Agreement/Proposal/Notice* no(s): N/A

**Strike out as appropriate*

Site audit commissioned by

Name: Duncan Romoser

Company: Qenos Pty Ltd

Address: Gate B40, 39 Friendship Rd, Port Botany

Postcode: 2036

Phone: 02 8336 1434

Fax: N/A

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

N/A

Purpose of site audit

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

Commercial/industrial

OR

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

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

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

Information sources for site audit

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

- IT Environmental (Australia) Pty Ltd (IT)
- Pickford & Rhyder Consulting Pty Ltd (Pickford)
- Jacobs Group (Australia) Pty Ltd (Jacobs)

Title(s) of report(s) reviewed:

- 'Statement of Environmental Effects, Demolition of LPG Storage Tanks at Hydrocarbon Storage Terminal', December 2013, Qenos.
- 'Phase II Soil and Groundwater Environmental Site Audit, Sydney Ports Corporation – Orica Terminal, 39 Friendship Road, Port Botany NSW 2036', 17 February 2000, IT.
- 'Qenos – Port Botany Site, Asbestos Investigation Report', 18 July 2014, Pickford.
- 'Qenos Hydrocarbon Terminal – Port Botany, NSW, Contamination Assessment, Sampling, Analysis and Quality Plan', 10 March 2015, Jacobs.
- 'Qenos Hydrocarbon Terminal, Contamination Assessment', 17 April 2015, Jacobs.

Other information reviewed (including previous site audit reports and statements relating to the site)

N/A

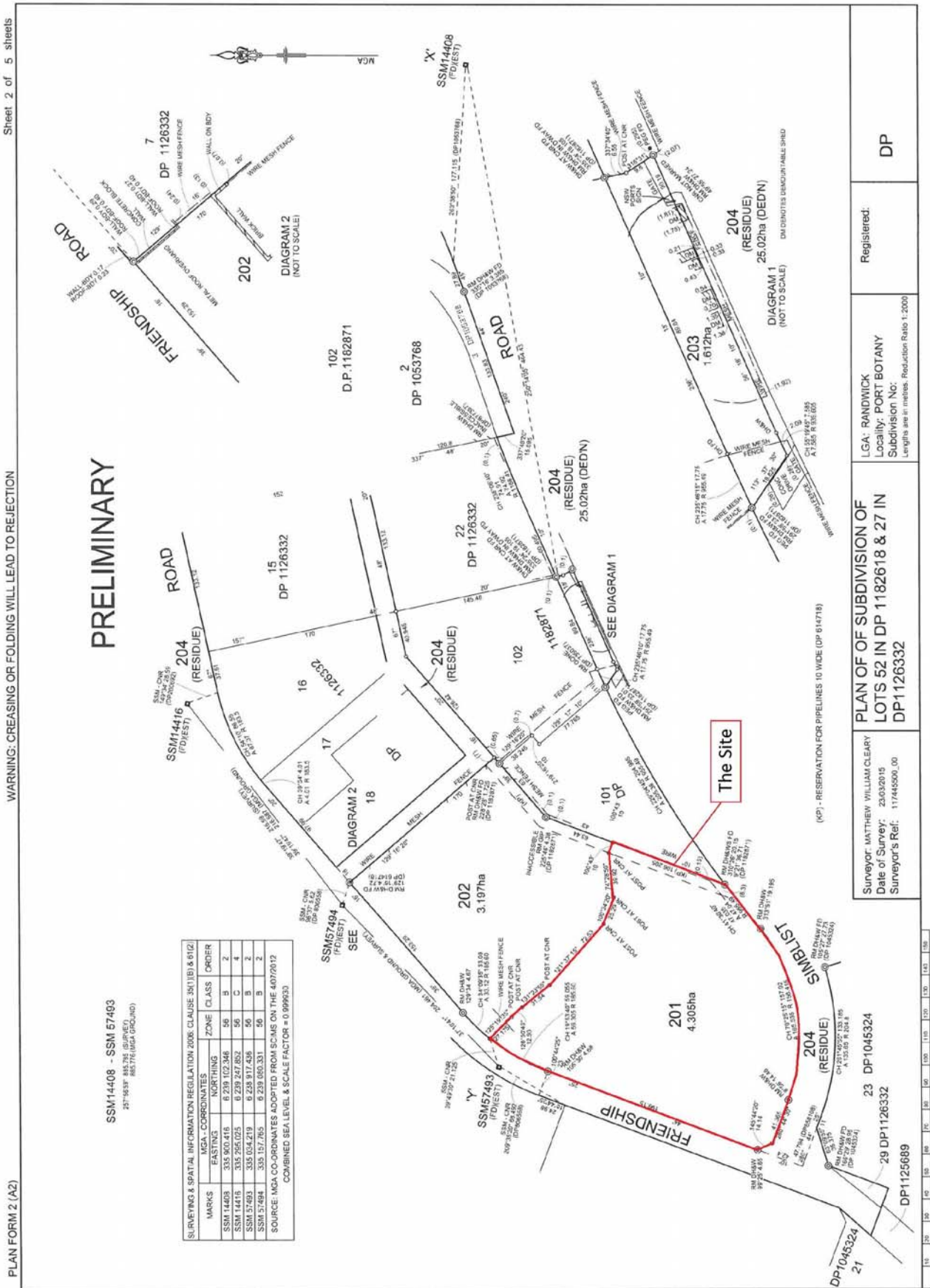
****Strike out as appropriate***

Site audit report

Title: ... Site Audit Report – Qenos Port Botany Hydrocarbon Storage Terminal

Report no. MP 054 (ENVIRON Ref: AS121762)

Date: April 2015



*Strike out as appropriate

PART II: Auditor's findings

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

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

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

Section A

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

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

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

OR

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

Overall comments...

Following reclamation of the land in the 1970s with dredged sand, a Hydrocarbon Storage Terminal was constructed by Qenos. The site, used for the storage of propane and butane, has since been vacated by Qenos. An investigation was undertaken to meet the conditions of the lease agreement between Qenos and NSW Ports to confirm that the site is suitable for commercial/industrial uses.

Section B

Purpose of the plan¹ which is the subject of the audit ...

I certify that, in my opinion:

- ☐ the nature and extent of the contamination HAS/HAS NOT* been appropriately determined

AND/OR

- ☐ the investigation/remedial action plan/management plan* IS/IS NOT* appropriate for the purpose stated above

AND/OR

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

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

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

...

subject to compliance with the following condition(s):

...

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

Overall comments

...

PART III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority under the *Contaminated Land Management Act 1997* (Accreditation No. 0803).

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...

29 April 2015

PART IV: Explanatory notes

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

How to complete this form

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

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

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

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

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

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

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

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

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

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

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

Where to send completed forms

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

EPA (NSW)

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

AND

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

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List of Abbreviations

ABC	Added Background Concentration
ACL	Added Contaminant Limit
ACM	Asbestos Containing Material
AHD	Australian Height Datum
ALS	Australian Laboratory Services
ANZECC	Australian and New Zealand Environment and Conservation Council
BTEX	Benzene, Toluene, Ethylbenzene & Xylenes (Monocyclic Aromatic Hydrocarbons)
CLM Act	NSW Contaminated Land Management Act 1997
COC	Chain of Custody
Council	Randwick City Council
CT	Certificate of Title
DA	Development Application
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EIL	Ecological Investigation Level
Envirolab	Envirolab Services Pty Ltd
EPA	Environment Protection Authority (NSW)
ESL	Ecological Screening Level
GIL	Groundwater Investigation Level
HIL	Health Investigation Level
HSL	Health Screening Level
ha	Hectare
IT	IT Environmental (Australia) Pty Ltd
Jacobs	Jacobs Group (Australia) Pty Ltd
km	Kilometres
m	Metres
MAH	Monocyclic Aromatic Hydrocarbons
Mercury	Inorganic mercury unless noted otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury
ML	Management Limit
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
mbgl	Metres below ground level
µg/L	Micrograms per Litre
NATA	National Association of Testing Authorities
NC	Not Calculated
ND	Not Detected
NEHF	National Environmental Health Forum
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
n	Number of Samples
OCPs	Organochlorine Pesticides
OEH	Office of Environment and Heritage
OH&S	Occupational Health & Safety
OPPs	Organophosphorus Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
pH	a measure of acidity, hydrogen ion activity
Pickford	Pickford & Rhyder Consulting Pty Ltd
PID	Photoionisation Detector
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
Qenos	Qenos Pty Ltd
RPD	Relative Percent Difference
SAQP	Sampling Analysis and Quality Plan

SAR	Site Audit Report
SAS	Site Audit Statement
SILs	Soil Investigation Levels
SVOCs	Semi Volatile Organic Compounds
SWL	Standing Water Level
TPHs	Total Petroleum Hydrocarbons
TV	Trigger Value
VOCs	Volatile Organic Compounds
-	On tables is "not calculated", "no criteria" or "not applicable"

1 Introduction

A site contamination audit has been conducted in relation to part of the Qenos Pty Ltd (Qenos) Hydrocarbon Storage Terminal located at 39 Friendship Road, Port Botany.

The audit was conducted to provide an independent review by an EPA Accredited Auditor of whether the land is suitable for any specified use or range of uses i.e. a "Site Audit" as defined in Section 4 (1) (b) (iii) of the *NSW Contaminated Land Management Act 1997* (the CLM Act).

The Qenos Hydrocarbon Terminal is leased from NSW Ports who own the land. The site, which comprises the southern part of the Qenos Hydrocarbon Terminal, is to be vacated by Qenos and returned to NSW Ports. The northern part of the terminal is to remain occupied by Qenos. The site location and layout are shown in Attachments 1 and 2, Appendix A.

The Audit was initiated to comply with a condition of the development approval (DA 6329) issued on 20 June 2014 by the Planning Assessment Commission of New South Wales and is therefore a statutory audit.

1.1 Scope of the Audit

Details of the audit are:

Requested by: Duncan Romoser on behalf of Qenos

Request/Commencement Date: 9 September 2014

Auditor: Melissa Porter

Accreditation No.: 0803

The scope of the audit included:

- Review of the following reports:
 - 'Statement of Environmental Effects, Demolition of LPG Storage Tanks at Hydrocarbon Storage Terminal', December 2013, Qenos.
 - 'Phase II Soil and Groundwater Environmental Site Audit, Sydney Ports Corporation – Orica Terminal, 39 Friendship Road, Port Botany NSW 2036', 17 February 2000, IT Environmental (Australia) Pty Ltd (IT).
 - 'Qenos – Port Botany Site, Asbestos Investigation Report', 18 July 2014, Pickford & Rhyder Consulting Pty Ltd (Pickford).
 - 'Qenos Hydrocarbon Terminal – Port Botany, NSW, Contamination Assessment, Sampling, Analysis and Quality Plan', 10 March 2015(a) (drafts 26 February 2015 and 14 November 2014), Jacobs Group (Australia) Pty Ltd (Jacobs).
 - 'Qenos Hydrocarbon Terminal, Contamination Assessment', 17 April 2015(b) (draft 13 March 2015), Jacobs.
- A site visit by the Auditor on 15 April 2015.
- Discussions with Qenos, and with Jacobs who undertook the investigation and validation.

The investigation by IT and Pickford were completed prior to the Auditor's engagement and no discussion with the consultants was undertaken.

ERM undertook environmental due diligence of Port Botany in 2012 as part of the lease process. Intrusive investigation was undertaken at the site as part of the due diligence exercise, however a report was not provided to the Auditor for review. Based on a summary of the investigation by Jacobs (2015a), it is understood that soil and groundwater sampling was undertaken. The results of the investigation have not been included in the data set reviewed, however the summary provided by Jacobs has been considered as an additional line of evidence.

2 Site Details

2.1 Location

The site locality is shown on Attachment 1, Appendix A.

The site details are as follows:

Street address: 39 Friendship Road, Port Botany NSW 2036

Identifier: part Lot 27 DP 1126332

Local Government: Randwick City Council

Owner: NSW Ports

Site Area: Approximately 4.3 ha

The southern, eastern and western boundaries of the site are well defined by adjoining streets. The northern boundary of the site comprises the remainder of the terminal and is not well defined.

A survey plan of the site has been provided in Attachment 3, Appendix A (shown as proposed Lot 201).

2.2 Zoning

Jacobs (2015b) report the zoning of the site as SP1 (special activities) under the SEPP (Port Botany and Port Kembla) 2013.

2.3 Adjacent Uses

The site is located on a man-made peninsula surrounded by the waters of Botany Bay and is located within an area of industrial use. The surrounding site use includes:

North: The remainder of the Qenos Hydrocarbon Storage Terminal, then a pipeline easement and bulk liquid storage facility (Terminals).

East: Shipping container storage facility, Simblist Drive, Prince of Wales Drive, a sea wall and Botany Bay.

South: Simblist Drive, then Australian Container Freight Services.

West: Friendship Road, then a bulk liquid storage facility (Vopak and PB Towage) and gas storage facility (Elgas).

The remainder of the Qenos Hydrocarbon Storage Terminal is located immediately to the north of the site. This area of the site includes an aboveground ethylene storage tank in a concrete bund, fire water storage tank, a control building, workshop, liquid nitrogen storage, aboveground pipework and the relocated elevated flare.

The Auditor undertook a search of sites 'List of NSW contaminated sites notified to EPA' on 8 April 2015, which identified Vopak Terminals at 20 Friendship Road and 49 Friendship Road and a Terminals site at 45 Friendship Road as facilities 'under assessment'. Further information was not provided.

2.4 Site Condition

Jacobs (2015a) noted the following infrastructure on the site:

- Two former 7,000 tonne above ground storage tanks for propane and butane. The tanks were in concrete bunds.
- Pumps and pipework to the port terminals and Olefines. Pipes are above ground and underground.
- Compressors and equipment for liquefaction of propane and butane storage.
- An elevated flare and associated pipework and drums.
- Nitrogen supply and pipework.
- Firewater ring main.
- Chemical storage shed, which included small quantities of waste oil and chlorine.
- Prefabricated sheds used as offices.

The site conditions included the following:

- Ground cover was largely grass, exposed soils and bitumen access roads.
- The site is generally flat.
- An internal asphalt and gravel road ran around the western, southern and eastern boundaries.
- The site was fenced.
- Stormwater detention basins were located to the east of each tank.

The following was noted at the time of the Auditors site visit on 15 April 2015:

- Above ground infrastructure (documented by Jacobs, 2015a) had been removed from the site.
- The ground cover was exposed soils where infrastructure had been removed. The soil in these areas was observed to consist of sand, with some shells, fragments of concrete, steel reinforcement, plastic noted. No fragments of asbestos cement material (ACM) were observed. Areas away from former infrastructure were grassed.
- The gravel and asphalt road remained.
- Granite rubble, concrete and glass was observed in the south of the site in the vicinity of the former chemical storage shed. No fragments of ACM were observed.
- The stormwater detention basins had been filled with site sourced sand

2.5 Proposed Development

It is understood that Qenos leased the site from NSW Ports. The site is to be vacated by Qenos and returned to NSW Ports. The lease required "*An unconditional site audit statement prepared in accordance with the Contaminated Land Management Act 1997 (NSW) certifying that the Premises are suitable for commercial/industrial use*".

For the purposes of this audit, the 'commercial/industrial' land use scenario will be assumed.

3 Site History

Jacobs (2015a) provided a site history which is summarised in Table 3.1.

Table 3.1: Site History	
Date	Activity
1970s	Area reclaimed from Botany Bay with dredged sand containing minor amounts of clay, organic matter and shell fragments.
1979	Qenos commence leasing the site from Sydney Ports
1982	Construction of Hydrocarbon Storage Terminal
2013	NSW Treasurer announced a 99 year lease of Port Botany to the NSW Ports Consortium.
2015	Demolition of structures on the site undertaken. Sampling of the site by Jacobs

Jacobs (2015a) interviewed the Qenos Environmental Manager (Richard Benson) and reported that records showed no recorded loss of containment and *“no significant environmental events having occurred at the site”*.

The site operated under a Safety, Health and Environment Operating System (SHEOS) that included internal and external review.

3.1 Auditor's Opinion

The Auditor considers that the site history and operations at the site are sufficiently known. There were no indicators of significant industrial uses on-site that would have the potential to result in significant contamination of the site.

4 Contaminants Of Concern

Jacobs (2015a) provided a list of the contaminants of concern and potentially contaminating activities. These have been tabulated in Table 4.1.

Table 4.1: Contaminants of Concern		
Area	Activity	Potential Contaminants
Whole of site	Use of fill to reclaim the site	Metals, tributyltin, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCP), organophosphorus pesticides (OPP) and asbestos.
Vegetated areas	Spraying weeds	Metals and herbicides
Southern ring road in the south of the site	Surface contamination	ACM fragments
Various workshops and plant areas	Gaskets, awning, backing board, air conditioner, hose protector, paints	Asbestos and lead
Whole of site	Migration of contaminants from neighbouring sites in groundwater	Metals, TRH, BTEX, OCP, OPP and VOCs

The ACM fragments in the south of the site were identified by ERM during a due diligence investigation of the site around 2012. The full ERM report was not provided for review. Further investigation of the area was undertaken by Pickford (2014).

Jacobs report storage of propane and butane are not considered potential contamination sources as they would *"immediately flash off into the atmosphere"*.

Materials stored in the chemical storage shed in the south of the site were not identified as potential sources of contamination. It is understood that waste oil and chlorine were stored in the shed. The Auditor notes that the contaminants of concern are consistent with those identified by Jacobs for the site as a whole. Further consideration is provided in Section 6.

4.1 Auditor's Opinion

The Auditor considers that the analyte list used by Jacobs adequately reflects the site history and condition.

5 Stratigraphy and Hydrogeology

Following a review of the reports provided, a summary of the site stratigraphy and hydrogeology was compiled as follows.

5.1 Stratigraphy

Jacobs (2015a) reviewed the Sydney geological map and indicated that the site is underlain by “man made” fill including dredged estuarine sand and mud to a depth of approximately 20 m. Below the fill there are Botany Sand beds overlying Triassic Hawkesbury Sandstone.

Investigation of the site included approximately twelve boreholes by hollow flight auger (IT) and pushtube (Jacobs). All boreholes were terminated in fill material, with the maximum depth achieved 6.1 mbgl.

The sub-surface profile of the site comprised fill sand containing minor amounts of clay, organic matter and shell fragments. Surface material (<1 mbgl) in the vicinity of former infrastructure contained minor gravel and concrete fragments. Approximately 0.5 m of roadbase was present in the internal road in the northwest of the site.

Given the consistency of fill vertically and laterally across the site, the Auditor considers that the depth and composition of the site stratigraphy have been adequately characterised.

5.2 Hydrogeology

Jacobs (2015a) undertook a search of the NSW Natural Resource Atlas and identified seven registered bores within 2 km of the site. The bores were registered as monitoring bores, and none were located on the site. Jacobs (2015b) considered the risk to groundwater users to be low given the wells are not registered for a beneficial use.

Review of the Department of Primary Industries Botany Groundwater Management Zones map indicates that the site is located in ‘Zone 4’. Extraction of groundwater for domestic use is prohibited and bores for industrial use must be tested annually. The Botany Sands aquifer located approximately 1.5 km north of the site is located within a Groundwater Extraction Exclusion Area (Zone 1) due to chlorinated hydrocarbon contamination.

Five groundwater monitoring wells (QMW02, QMW05, MW3, GW01 and GW02) are located on the site (Attachment 2, Appendix A). The wells were screened over an unconfined aquifer in dredged sand.

During the most recent groundwater monitoring round, groundwater was identified at depths of 2.9 m below top of well casing (mbTOC) (MW3) and 3.7 mbTOC (GW02). Measured parameters indicated that groundwater was neutral (pH 6.3-7.3), anaerobic (0.25-2 ppm), and with low conductivity (388-584 $\mu\text{S}/\text{cm}$). The elevation of the wells was not recorded by Jacobs, therefore the groundwater flow direction at the site is unknown. IT and Jacobs indicate that groundwater flows in a southerly direction towards Botany Bay.

The Auditor agrees that groundwater flow is likely to be towards Botany Bay and considers that the site hydrogeology has been adequately characterised for the purposes of the audit.

6 Evaluation of Quality Assurance and Quality Control

The Auditor has assessed the overall quality of the data by review of the information presented in the referenced reports, supplemented by field observations. The Auditor's assessment follows in Tables 6.1 and 6.2.

Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Data Quality Objectives (DQO) Jacobs defined specific DQOs in accordance with the seven step process outlined in DEC (2006) in the SAQP (2015a). IT (2000) did not define DQOs.	These were considered appropriate for the investigations conducted. IT clearly stated the project objectives and designed effective sampling strategies to achieve them. Overall the Auditor considers that the omission of specific DQOs does not affect the outcome of the audit.
Sampling pattern and locations <i>Soil:</i> Investigation locations were spaced to gain coverage of the site and target former site structures including the former workshops and plant areas. The former chemical storage shed was not targeted for sampling by Jacobs. <i>Groundwater:</i> Monitoring wells were located on the boundaries of the site. Based on an assumed southerly groundwater flow direction, there were two wells were located on the up gradient boundary (GW01 and GW02), two wells located on the down gradient boundary (MW3 and QMW05), and one well located on the western boundary (QMW03). No wells were located within the centre of the site.	In the Auditor's opinion the soil investigation locations target the main areas of concern and provide site coverage. Specific sampling was not provided adjacent to the chemical storage shed and this is considered further in Section 12. The groundwater monitoring well coverage is adequate to demonstrate there are no significant issues on the site and that no significant impact is migrating onto the site from the nearby facilities.
Sampling density <i>Soil:</i> The sampling density of 33 locations over approximately 4.3 ha is less than the minimum recommended by EPA (1995) <i>Sampling Design Guidelines</i> (52 locations). An additional 10 locations were undertaken by ERM in 2012. The coverage provides a 95% confidence of detecting a residual hot spot of approximately 43 m diameter. <i>Groundwater:</i> A total of five groundwater wells were installed at the site at the time of the Jacobs investigation.	In the auditor's opinion the sampling density was adequate given there is no indication of significant potential sources of contamination on the site based on the site use and site history. Further consideration of ERM (2012) indicative results is also provided in Section 8.
Sample depths Jacobs collected samples from a range of depths, with the primary intervals being within the shallow soil (0-0.2 mbgl) and at 0.5 m intervals. Samples were also collected where variations in geology or indications of contamination were noted. IT collected samples from 0-0.5 m and then at 1 m intervals to a maximum depth of 6 mbgl.	In the Auditor's opinion, this sampling strategy was appropriate and adequate to characterise the material types present on site.
Well construction Wells GW01, GW02 and MW3 were completed at between 5 and 6.1 m depth, and were constructed of 50 mm casing. Well screens were 3 m long, with the groundwater level	In the Auditor's opinion the well construction was acceptable. Construction details of the ERM installed wells (QMW02 and QMW05) were not provided.

Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
intersecting the screen.	
Sample collection method <i>Soil:</i> Sample collection is assumed to have been by hand trowel from the ground surface (Jacobs), via a push tube (Jacobs) and directly from the auger (IT and Jacobs GW01 and GW02). <i>Groundwater:</i> New and existing wells were developed by Jacobs with a submersible pump. Wells were purged and samples collected by low flow peristaltic pump with dedicated sample tubing. IT developed wells using a steel bailer. Wells were purged using an air-operated diaphragm pumped and sampled using disposable bailers.	Sample collection from the auger flights is not ideal as it can result in loss of volatiles and sample cross contamination. There was no evidence of cross contamination in the results. A review of the results obtained using the hand augers and those obtained using push tubes indicates that the results are relatively consistent (non-detect).
Decontamination procedures <i>Soil:</i> A hand trowel was decontaminated between locations. A generic work instruction for equipment decontamination was provided which indicated that the process includes washing in a non-phosphate detergent solution and two to three rinses with deionised water. New gloves were reportedly used for each new sample. Decontamination procedures undertaken by IT were not specified. <i>Groundwater:</i> Dedicated sample tubing was used for each well. New gloves were reportedly used for each new sample. The interface probe was decontaminated. A generic decontamination instruction was provided as described above. Decontamination of the submersible pump was not reported. Decontamination procedures undertaken by IT were not specified.	Although decontamination procedures were not provided by IT, there was no evidence of cross contamination. IT collected rinsate blanks from reusable equipment and the results suggest that decontamination had been undertaken.
Sample handling and containers Samples were placed into prepared and preserved sampling bottles provided by the laboratory and chilled during storage and subsequent transport to the laboratories. Groundwater samples to be analysed for heavy metals were field filtered.	Acceptable
Chain of Custody (COC) Completed chain of custody forms were provided in the reports.	Acceptable
Detailed description of field screening protocols Field screening for volatiles was undertaken using a PID. Samples were placed in ziplock plastic bags, agitated, left for 5 minutes (IT) or 15 minutes (Jacobs) in ambient conditions and the headspace measured. Groundwater field parameters were measured during well sampling using a flow cell and multi parameter meter.	Acceptable

Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Calibration of field equipment The PID was calibrated by the equipment supplier. Calibration certificates were provided. Field calibration checks were not undertaken. The groundwater meter was calibrated by the equipment supplier. A calibration certificate was provided. Field calibration check were not undertaken. IT did not provide calibration records for field equipment.	In consideration of the short sampling program and consistent results across the site, the omission of calibration checks of field equipment is not considered significant and the dataset is considered suitable for use.
Sampling logs Soil logs are provided within the report, indicating sample depth, PID readings and lithology. Groundwater field sampling records were not provided, although one set of field parameters is included in the report.	Acceptable

Table 6.2: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Auditor's Opinion
Field quality control samples Field quality control samples collected by Jacobs included trip blanks, trip spikes, rinsate blanks, field intra-laboratory and inter-laboratory duplicates at appropriate frequencies. Rinsate blanks were collected from the hand trowel and interface probe. IT collected one soil intra-laboratory duplicate, one water intra-laboratory duplicate and a rinsate blank. No inter-laboratory duplicate, trip blank or trip spike were collected.	Acceptable. IT data considered acceptable given samples were analysed at a NATA accredited laboratory and intra-laboratory duplicate RPDs were acceptable.
Field quality control results The results of field quality control samples were generally within appropriate limits. Relative percent differences (RPDs) for copper and nickel in a soil intra-laboratory duplicate were 86% and 58% respectively. The RPD for zinc in a soil inter-laboratory soil duplicate was 80%. The highest results were not used in report, however all results were significantly less than the screening criteria. The results suggest that there may be some heterogeneity in surface soils. IT field QC results were generally within appropriate limits. A low zinc concentration (0.003 mg/L) was detected in the rinsate blank.	Overall, in the context of the dataset reported, the elevated RPD results and rinsate blank detection are not considered significant and the field quality control results are acceptable.
NATA registered laboratory and NATA endorsed methods Laboratories used by Jacobs included Envirolab (primary) and ALS (secondary). Laboratory certificates were NATA stamped. IT sent samples to ALS (primary), however no secondary laboratory was used. Laboratory certificates were NATA stamped.	Acceptable

Table 6.2: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Auditor's Opinion
Analytical methods Analytical methods were included in the laboratory test certificates provided by Jacobs. Both Envirolab and ALS provided brief method summaries of in-house NATA accredited methods used based on USEPA and/or APHA methods (excluding asbestos) for extraction and analysis in accordance with the NEPM (2013). Asbestos identification was conducted by Envirolab and ALS using polarised light microscopy with dispersion staining by method AS4964-2004 "Method for the Qualitative Identification of Asbestos Bulk Samples". IT laboratory certificates included references to USEPA methods.	The analytical methods are considered acceptable for the purposes of the site audit, noting that the AS4964-2004 is currently the only available method in Australia for analysing asbestos. DOH (2009) and enHealth (2005) state that "<i>until an alternative analytical technique is developed and validated the AS4964-2004 is recommended for use</i>".
Holding times Review of the COCs and laboratory certificates indicate that the holding times had been met. Jacobs (2015b) report that all soil and groundwater samples were received within holding times. IT reported that although water samples for Cr VI analysis exceeded the holding time by 24 hours, the Cr III results were less than the PQL.	Acceptable Analysis of samples for Cr VI outside of the holding time is not considered to be a significant issue given a source was not identified and Cr III concentrations were not elevated.
Practical Quantitation Limits (PQLs) <i>Soil</i>: PQLs were less than the threshold criteria for the contaminants of concern. <i>Asbestos</i>: The limit of detection for asbestos in soil was 0.01% w/w. <i>Groundwater</i>: Not all PQLs for the groundwater assessment were sufficiently low, with the following PQLs exceeding the relevant trigger values: • Anthracene 1 µg/L, trigger value 0.01 µg/L • Phenanthrene 1 µg/L, trigger value 0.6 µg/L • Benzo(a)pyrene 1 µg/L, trigger value 0.1 µg/L	<i>Soil (except asbestos)</i>: Overall the soil PQLs are acceptable. <i>Asbestos</i>: In the absence of any other validated analytical method, the detection limit for asbestos is considered acceptable. A positive result would be considered to exceed the "no asbestos detected in soil" criteria, providing this is applied within a weight of evidence approach to assess the significance of the exceedance, accounting for the history of the site and frequency of the occurrence. <i>Groundwater</i>: The PQLs were only marginally elevated above the trigger values and in the context of the results reported and the site history, overall these discrepancies do not materially affect the outcome of the audit.
Laboratory quality control samples Laboratory quality control samples including laboratory control samples, matrix spikes, surrogate spikes, blanks and duplicates were undertaken by the laboratory.	Acceptable
Laboratory quality control results The results of laboratory quality control samples were within	Acceptable

Table 6.2: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Auditor's Opinion
appropriate limits. ALS report that the laboratory control sample for calcium and vinyl chloride were outside of the control limits, however the results were within typically accepted range of 70-130%.	
Data Quality Indicators (DQI) and Data Evaluation (completeness, comparability, representativeness, precision, accuracy) Jacobs discussed field and laboratory QA/QC, however did not undertake a formal QA/QC evaluation against the five category areas. Jacobs concluded that the DQO defined in the SAQP had been met. IT did not undertake a formal QA/QC evaluation against the five category areas, however discussed the results of field and laboratory QA/QC.	Acceptable

In considering the data as a whole the Auditor concludes that:

- While most data is likely to be representative, sampling from augers may have led to a loss of volatile contaminants in a limited number of samples. This has been considered during interpretation of the results.
- The data is complete.
- There is a reasonable degree of confidence that data is comparable for each sampling and analytical event. Reporting of TPH/TRH bands differ between IT and Jacobs investigations, however given the results were less than the PQL this is not considered significant.
- The primary laboratory provided sufficient information to conclude that data is of sufficient precision.
- Data is likely to be accurate.

7 Environmental Quality Criteria

The Auditor has assessed **soil** data provided by Consultant in reference to criteria from National Environmental Protection Council (NEPC) *National Environmental Protection (Assessment of Site Contamination) Measure 1999*, as Amended 2013 (NEPM, 2013).

Based on the continued use of the site for port services, the Tier 1 (screening) criteria for 'commercial/industrial' setting were referred to.

- Human Health Assessment
 - Health Based Investigation Levels (HIL D)
 - Soil Health Screening Levels (HSL D) for Vapour Intrusion. The most conservative criteria were adopted i.e. assumed depth to source < 1 m in sand.
 - Asbestos Health Screening Levels (HSL D).
 - US EPA Regional Screening Level for industrial soil (tributyltin).
- Terrestrial Ecological Assessment
 - Ecological Screening Levels (ESL commercial/industrial) assuming coarse soil.
 - Ecological Investigation Levels (EIL commercial/industrial). Site specific soil data on pH, clay content, cation exchange capacity and background concentrations was provided by Jacobs (2015) for calculation of the added contaminant limits (ACL) and added background concentration (ABC).
- Management Limits (ML commercial/industrial) (coarse soil)
- Aesthetics
 - The Auditor has considered the need for remediation based on the 'aesthetic' contamination as outlined in the NEPM (2013)

The Auditor has assessed the **groundwater** data provided by Consultant in reference to Tier 1 (screening) criteria for 'commercial/industrial' unless specified from the following:

- Human Health Assessment
 - Groundwater Health Screening Levels (HSL D) for vapour intrusion (sand, 2 to <4 m)
 - Guideline values for recreational waters from *Guidelines for Managing Risks in Recreational Waters* (NHMRC, 2008) based on 10x Australian Drinking Water Guidelines.
- Ecological Assessment
 - Groundwater Investigation Levels (GILs) listed in NEPM (2013) for protection of aquatic ecosystems referenced in ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Trigger values (TVs) provided are concentrations that, if exceeded, indicate a potential environmental problem at the point of use and 'trigger' further investigation. The marine water 95% level of protection was adopted.

The site is located within 'Zone 4' of the Botany groundwater management zones. Zone 4 prohibits the use of groundwater for domestic use (drinking, watering gardens, washing cars,

bathing or filling swimming pools). Bores used for industrial use must be tested annually. Therefore assessment of direct contact and consumption of groundwater is not required.

The environmental quality criteria referenced by the Auditor are consistent with those adopted by Jacobs, with the exception of the criteria for asbestos. Jacobs adopted 'not detected' for ACM and 'no respirable fibres' for trace analysis. Given that asbestos was not detected by Jacobs, this is not considered to affect the conclusions of the Audit.

8 Evaluation of Soil Analytical Results

Investigation of the site has been undertaken by IT, ERM, Pickford and Jacobs.

Initial investigations by IT in 1999/2000 included six boreholes (AH2, AH3, AH5, MW2, MW3 and MW4). Collected samples were analysed for TPH, BTEX, metals, OCP and PCB. Soil sampling locations are shown on Attachment 2, Appendix A. The results have been assessed against the adopted criteria and are summarised in Table 8.1.

ERM investigated the site in 2012 as part of wider investigation of Port Botany for environmental due diligence. The full report has not been provided for review. The results of the investigation have not been included in the data set, however are discussed during assessment of other results.

Pickford undertook further investigation of the southern area of the site in 2014 where ERM identified ACM. Pickford undertook a visual inspection of the area and collected four surface soil samples for laboratory analysis. The results have been included in Table 8.1.

Soil samples collected by Jacobs following demolition of the site in 2015 were analysed for a variety of contaminants including metals, TRH, BTEX, PAHs, OCPs, OPPs, PCBs, herbicides, asbestos and tributyltin. Soil sampling locations are shown on Attachment 2, Appendix A. The results have been assessed against the adopted criteria and are summarised in Table 8.1.

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	n > Terrestrial Ecological Screening Criteria (NEPM, 2013)
Asbestos	46	0	-	0	-
Arsenic	42	7	11	0	0
Cadmium	42	3	2	0	-
Total Chromium	42	38	810	0	1
Copper	42	26	73	0	0
Lead	42	31	150	0	0
Mercury (inorganic)	42	1	0.1	0	-
Nickel	36	25	420	0	1
Zinc	42	39	900	0	3
TPH (C ₆ -C ₁₀ less BTEX)	42	0	<PQL	0	0
TPH (>C ₁₀ -C ₁₆ less naphthalene)	42	0	<PQL	NL	0
TPH (>C ₁₆ -C ₃₄)	42	0	<PQL	-	0
TPH (>C ₃₄ -C ₄₀)	42	0	<PQL	-	0
BTEX	42	0	<PQL	0	0
Total PAHs	36	2	0.47	0	

Table 8.1: Evaluation of Soil Analytical Results – Summary Table (mg/kg)

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	n > Terrestrial Ecological Screening Criteria (NEPM, 2013)
Carcinogenic PAHs	36	2	0.08	0	-
Benzo(a)pyrene	36	2	0.07	-	0
Naphthalene	36	0	<PQL	NL	0
OCP	42	0	<PQL	0	0
OPP	36	0	<PQL	0	-
PCB	42	0	<PQL	0	-
Herbicides	34	0	<PQL	0	-
Tributyltin	3	1	0.00083	0	-

n number of samples

- No criteria available/used

NL Not limiting

Metal concentrations were less than the human health criteria. Concentrations of chromium, nickel and zinc exceeded the tier 1 terrestrial ecological screening criteria in a maximum of three shallow soil samples collected in the north of the site. Jacobs noted that the metals concentrations were of limited distribution and there was no evidence of vegetative stress. Jacobs considered the heavily industrialised area and land reclamation works had resulted in an absence of sensitive ecological receptors. The Auditor agrees and considers the risk to terrestrial ecosystems to be low.

There were generally no indicators of contamination in the fill however minor black or dark grey staining at a depth of approximately 0.7-0.8 mbgl in two boreholes. Samples collected above (0.2 mbgl) and below (2 and 1.5 mbgl) did not detect TRH above the PQL. It is also noted that PID readings were low (<1 ppm). Given the description (minor), lack of detectable volatiles, odours and limited thickness of the stained soil, the Auditor considers that the risk of gross contamination being associated with the soil that could pose a risk human health under the proposed commercial/industrial land is low.

Only low concentrations of PAHs were detected marginally above the detection limits in a limited number of samples well below the adopted criteria and all other organics were less than the PQLs.

Tributyltin was detected in one sample at a depth of 0.15 mbgl. The concentration was significantly below the screening criteria of 25 mg/kg.

ERM (2012) and Pickford (2014) both identified two ACM fragments on the ground surface in the southern area of the site. Laboratory analysis of four samples from the southern area of the site by Pickford did not identify respirable fibres. Jacobs (2015) did not detect asbestos in surface or deeper samples, or observe fragments of ACM on the site. Pickford concluded that fragments of ACM may be present at or below the surface of the site, however there was no measurable risk to site occupants during normal activities.

No asbestos was identified during recent investigation by Jacobs or observed by the Auditor during the site visit. The Auditor considers that the risk of fragments of ACM remaining undetected below the ground surface in the southern portion of the site to be low.

In the Auditor's opinion, the soil analytical results are consistent with the site history and field observations. The results indicate that site activities including filling have not resulted in significant contamination at the site. The Auditor is satisfied that no further investigations are needed and that the site criteria for commercial/industrial land uses have been met.

9 Evaluation of Groundwater Analytical Results

Groundwater samples were collected from five wells in January 2015 (QMW02, QMW05, MW3, GW01 and GW02). Well locations are shown in Attachment 2, Appendix A. The analytical results are summarised below in Table 9.1.

Table 9.1: Evaluation of Groundwater Analytical Results – Summary Table (µg/L)						
Analyte	n	Detections	Maximum	n >ANZECC 95% Marine (2000)	n >NHMRC Recreation (2008)	n >HSL NEPM (2013)
Arsenic	5	4	4	2	0	-
Cadmium	5	0	<PQL	0	0	-
Total Chromium	5	4	7	0	0	-
Copper	5	0	<PQL	0	0	-
Lead	5	0	<PQL	0	0	-
Mercury (inorganic)	5	0	<PQL	0	0	-
Nickel	5	5	10	1	0	-
Zinc	5	5	6	0	0	-
TRH (C ₆ -C ₁₀)	5	0	<PQL	-	-	0
TRH (>C ₁₀ -C ₁₆)	5	0	<PQL	-	-	NL
TRH (>C ₁₆ -C ₃₄)	5	0	<PQL	-	-	NL
TRH (>C ₃₄ -C ₄₀)	5	0	<PQL	-	-	NL
BTEX	5	0	<PQL	0	0	0
PAHs	5	0	<PQL	0	0	NL
OCP/OPP	5	0	<PQL	0	0	-
PCB	5	0	<PQL	0	-	-
VOCs	5	0	<PQL	0	0	-

n number of samples

- No criteria available/used

NL Not limiting

The groundwater monitoring results are summarised as follows:

- Concentrations of arsenic and nickel were reported marginally above the ecological criteria for marine waters in a maximum of two wells.
- No organic contaminants were detected.

IT (2000) installed and sampled four monitoring wells (MW1-MW4) during a Phase II investigation of the entire terminal site in 2000. One of the monitoring wells (MW3) remains on the site, however the remaining wells have been lost or destroyed (Attachment 2, Appendix A). Groundwater samples were analysed for metals, TPH, BTEX and volatile halogenated compounds (VHCs). Consistent with the results reported by Jacobs, the results were less than the adopted criteria and generally less than the PQL.

The Auditor concludes that groundwater is not significantly contaminated. There was no evidence of groundwater contamination as a result of site operations, and no evidence of contamination migrating onto the site from up gradient and offsite sources.

Metals concentrations only marginally exceeded the ecological criteria for marine waters. Sources of arsenic or nickel were not identified on the site. Given this and results obtained at the up gradient boundary, the Auditor considers that these concentrations are representative of background concentrations and that no further groundwater monitoring is required.

10 Evaluation of Remediation

No remediation has been recommended or conducted by Jacobs. In the Auditor's opinion, this is considered appropriate.

11 Contamination Migration Potential

No significant levels of contaminants were detected in soil or groundwater and therefore there is little or no potential for migration of contamination from the site or vertically to groundwater.

12 Assessment of Risk

Based on assessment of results against relevant guidelines and consideration of the overall investigation, it is the Auditor's opinion that the risks to human health and the environment are low.

There is a risk of shallow subsurface contamination to soil from storage of chemicals at the southern boundary as specific sampling was not undertaken. Given the reported low volumes of chemicals stored in this area and the proposed industrial uses, the risks to human health are considered to be low and acceptable.

Given the inspections undertaken, the risk of areas of significant amounts of asbestos or undetected gross contamination on-site is low.

13 Compliance with Regulatory Guidelines and Directions

The Auditor has used guidelines currently approved by the EPA under section 105 of the *NSW Contaminated Land Management Act 1997* (Appendix C).

The investigation was generally conducted in accordance with SEPP 55 Planning Guidelines and reported in accordance with the OEHL (2011) *Guidelines for Consultants Reporting on Contaminated Sites*. The checklist included in that document has been referred to. The EPA's *Checklist for Site Auditors using the EPA Guidelines for the NSW Site Auditor Scheme 1998 (December 1999)* has also been referred to.

Jacobs does not state whether well licences were obtained from NSW Office of Water.

The Audit was initiated to comply with a condition of the development approval (DA 6329) issued on 20 June 2014 by the Planning Assessment Commission of New South Wales.

No other regulatory approvals and licences were reportedly obtained for works at the Site.

14 Conclusions and Recommendations

Jacobs (2015b) considers “...*the site suitable for the ongoing commercial/industrial land use*”. Based on the information presented in IT, Pickford and Jacobs reports and observations made on site, and following the Decision Process for Assessing Urban Redevelopment Sites in DEC (2006) *Guidelines for the NSW Site Auditor Scheme*, the Auditor concludes that the site is suitable for the purposes of “commercial/industrial” use.

15 Other Relevant Information

This Audit was conducted on the behalf of Qenos Pty Ltd for the purpose of assessing whether the land is suitable for the proposed commercial/industrial uses i.e. a "Site Audit" as defined in Section 4 (1) (b) (iii) of the CLM Act.

This summary report may not be suitable for other uses. IT and Jacobs included limitations in their report. The audit must also be subject to those limitations. The Auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which the Auditor had some control or is reasonably able to check.

The Auditor has relied on the documents referenced in Section 1 of the Site Audit Report in preparing the Auditors' opinion. If the Auditor is unable to rely on any of those documents, the conclusions of the audit could change.

It is not possible in a Site Audit Report to present all data which could be of interest to all readers of this report. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

Appendix A: Attachments

Attachment 1: Site Location

**Attachment 2: Site Layout and Investigation
Sample Locations**

Attachment 3: Site Survey Plan



Figure 1
Regional site location

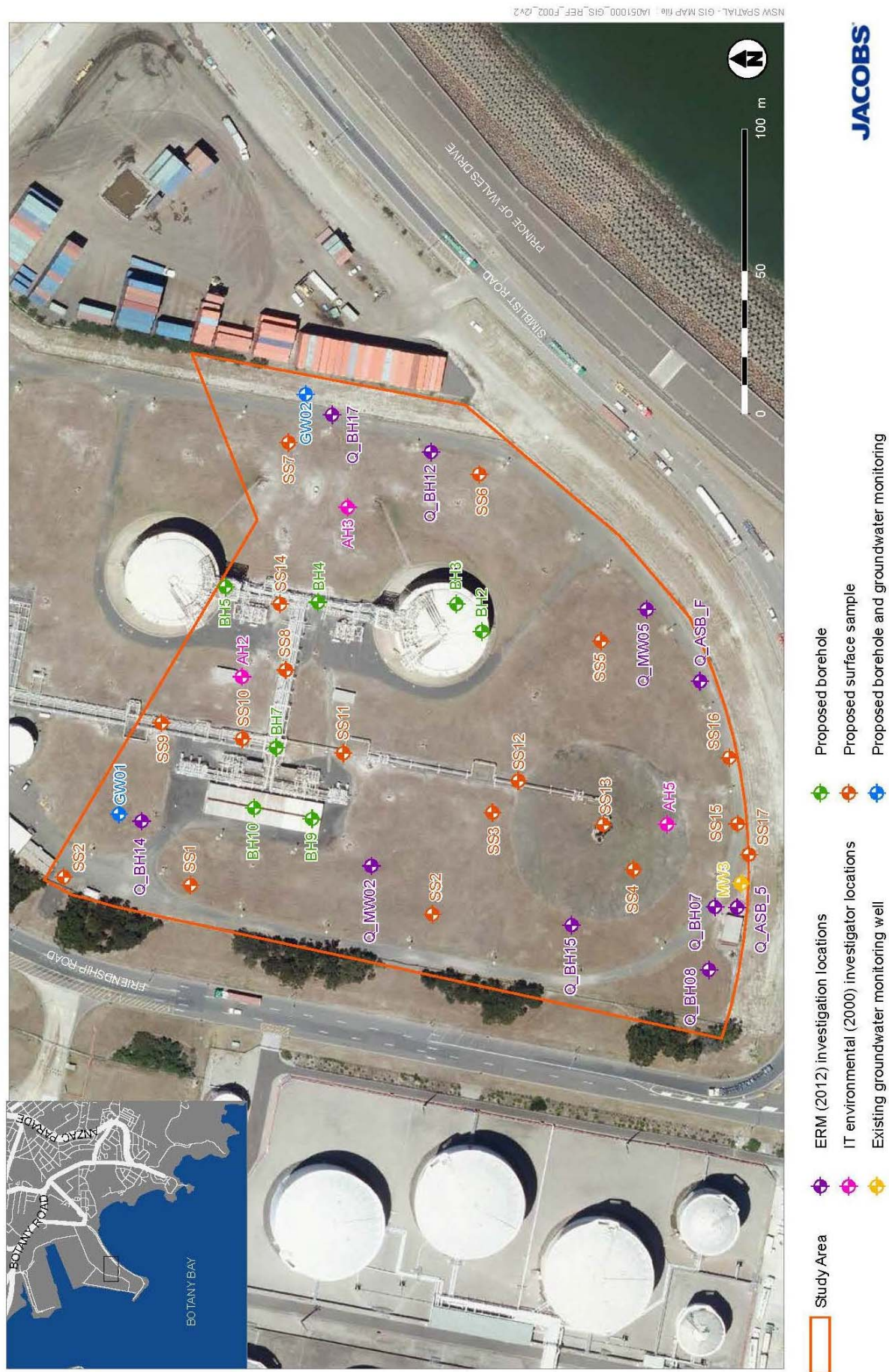
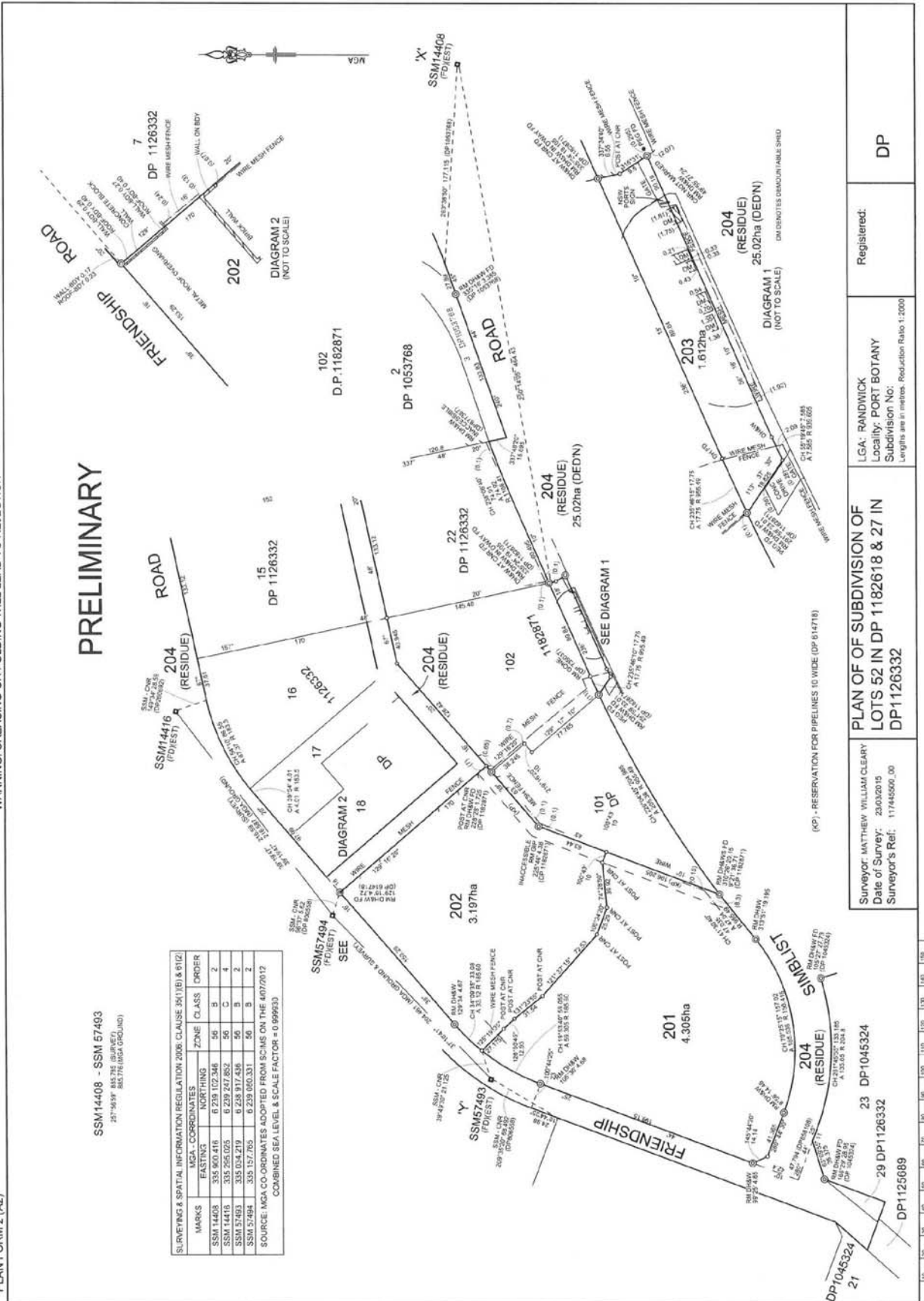


Figure 2
Proposed investigation locations



DRAFT

Appendix B: EPA Approved Guidelines

Guidelines made or approved by the EPA under section 105 of the *Contaminated Land Management Act 1997*

(as of 09 July 2014)

Section 105 of the Contaminated Land Management Act 1997 (CLM Act) allows the Environment Protection Authority (EPA) to make or approve guidelines for purposes connected with the objects of the Act. These guidelines must be taken into consideration by the EPA whenever they are relevant and by accredited site auditors when conducting a site audit. They are also used by contaminated land consultants in undertaking investigation, remediation, validation and reporting on contaminated sites.

Guidelines made by the EPA

- Guidelines for the Vertical Mixing of Soil on Former Broad-acre Agricultural Land(2003028VerticalMixGuidelines.pdf, 148KB) (January 1995)
- Sampling Design Guidelines (9559samppgdline.pdf, 2MB) (September 1995)
- Guidelines for Assessing Banana Plantation Sites (bananaplantsite.pdf; 586KB) (October 1997)
- Guidelines for Consultants Reporting on Contaminated Sites (20110650consultantsglines.pdf; 428KB) (reprinted August 2011)
- Guidelines for Assessing Former Orchards and Market Gardens (orchardgdline.pdf; 172KB) (June 2005)
- Guidelines for the NSW Site Auditor Scheme, 2nd edition (auditorglines06121.pdf; 510KB) (April 2006)
- Guidelines for the Assessment and Management of Groundwater Contamination (groundwaterguidelines07144.pdf; 604KB) (March 2007)
- Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (09438gldutycontclma.pdf; 1MB) (June 2009)

Note: All references in the EPA's contaminated sites guidelines to:

the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, November 1992) are replaced as of 6 September 2001 by references to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality [\[PDF\]](#) (ANZECC and ARMCANZ, October 2000)

the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 1999) are replaced as of 16 May 2013 by references to the National Environment Protection (Assessment of Site Contamination) Measure 1999 [\[PDF\]](#) (April 2013)

Guidelines approved by the EPA

ANZECC publications

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality [\[PDF\]](#), published by ANZECC and the Agriculture and Resource Management Council of Australia and New Zealand, Paper No. 4 (October 2000)

EnHealth publications (formerly National Environmental Health Forum monographs)

- Composite Sampling [PDF](#), Lock, W. H., National Environmental Health Forum Monographs, Soil Series No.3, 1996, SA Health Commission, Adelaide
- Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards [PDF](#), Department of Health and Ageing and EnHealth Council, Commonwealth of Australia (2012)

National Environment Protection Council publications

- National Environment Protection (Assessment of Site Contamination) Measure 1999 [PDF](#) (April 2013)

The NEPM consists of a policy framework for the assessment of site contamination, Schedule A (Recommended General Process for the Assessment of Site Contamination) and Schedule B (Guidelines).

Schedule B guidelines include:

Guideline on Investigation Levels for Soil and Groundwater

Guideline on Site Characterisation

Guideline on Laboratory Analysis of Potentially Contaminated Soils

Guideline on Site-specific Health Risk Assessment Methodology

Guideline on Ecological Risk Assessment

Guideline on Methodology to Derive Ecological Investigation Levels in Contaminated Soils

Guideline on Ecological Investigation Levels for Arsenic, Chromium(III), Copper, DDT, Lead, Naphthalene, Nickel and Zinc

Guideline on the Framework for Risk-based Assessment of Groundwater Contamination

Guideline on Derivation of Health-based Investigation Levels

Guideline on Community Engagement and Risk Communication

Guideline on Competencies and Acceptance of Environmental Auditors and Related Professionals

[More details](#) on the amended NEPM and the transitional arrangements for its implementation

Other documents

- Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes, NSW Agriculture and CMPS&F Environmental (February 1996)
- Australian Drinking Water Guidelines [PDF](#), NHMRC and Natural Resource Management Ministerial Council of Australia and New Zealand (2011)
- Further guidance webpage

