

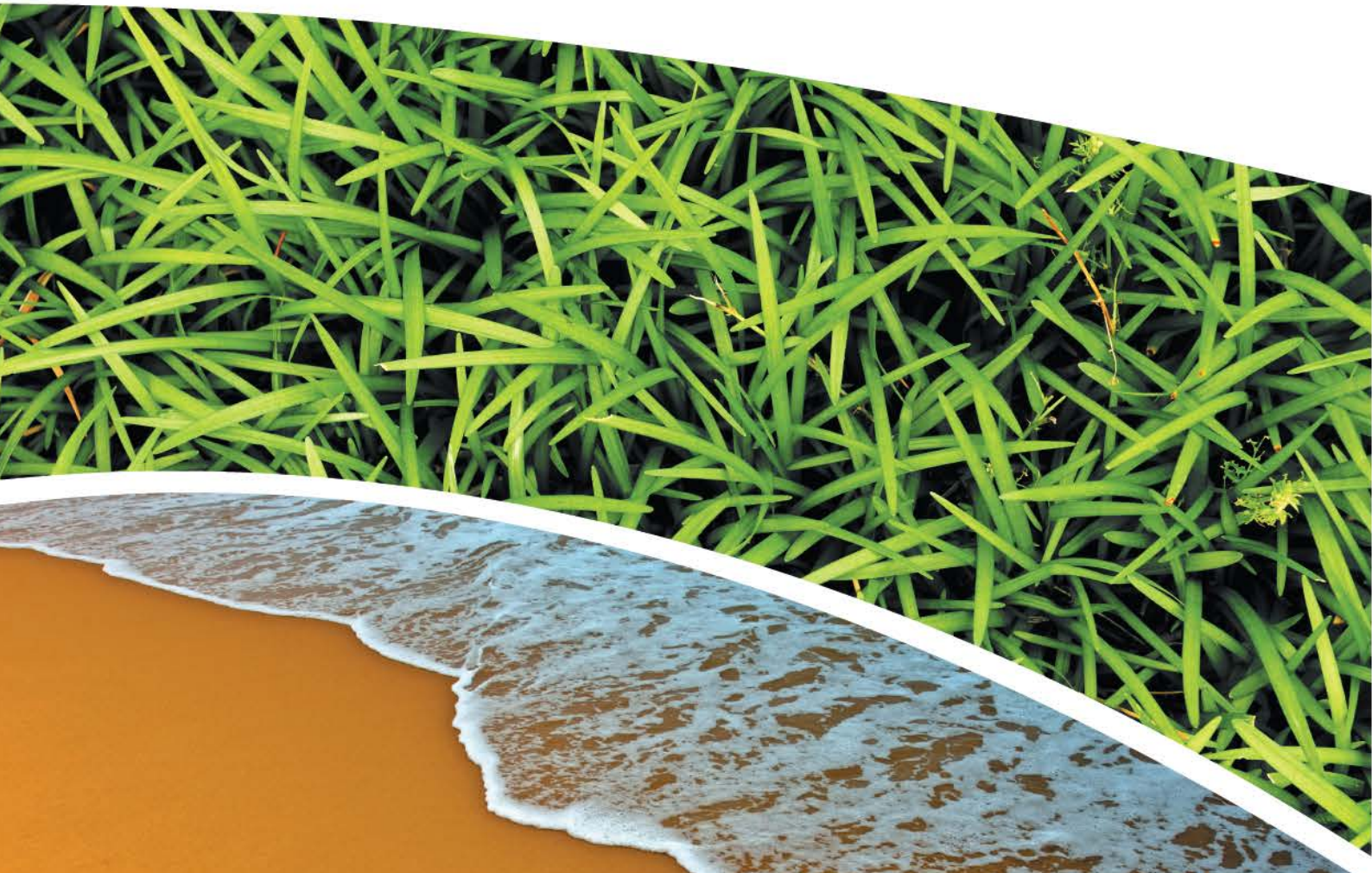
**PRELIMINARY SITE (CONTAMINATION) ASSESSMENT
LOTS 512 AND 513, KARIONG**

Prepared for Darkinjung Local Aboriginal Council

Prepared by RCA Australia

RCA ref 14872-401/1

June 2020



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RCA ref 14872-401/1

9 June 2020

Darkinjung Local Aboriginal Land Council
C/- Barr Property and Planning
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Attention: Mr Andrew Donald

Geotechnical Engineering

Engineering Geology

Environmental Engineering

Hydrogeology

Construction Materials Testing

Environmental Monitoring

Sound & Vibration

Occupational Hygiene

PRELIMINARY SITE (CONTAMINATION) ASSESSMENT LOTS 512 AND 513 DP 727686 KARIONG

1 INTRODUCTION

This report presents the findings of a preliminary site (contamination) assessment undertaken at Lots 512 and 513, DP 727686, Kariong. These Lots are adjacent to each other and is herein referred to as the 'site'.

The site which is currently vacant undeveloped bushland is proposed to be developed for residential use, with a portion remaining as an Environmental Conservation zone. The objective of this assessment is to identify potential contamination at the site and determine the suitability for residential development.

The assessment has been undertaken at the request of Barr and Property Planning on behalf of Darkinjung Local Aboriginal Land Council.

2 SITE IDENTIFICATION AND DESCRIPTION

The site is comprised of two (2) Lots:

- Lot 512, DP 727686 148 Woy Woy Road Kariong.
- Lot 513, DP 727686 2/16 Brittany Close, Kariong.

Both Lot 512 and Lot 513 span across the proposed residential area and the proposed Environmental Conservation zone.

Additional site details are shown in **Table 1**.

Table 1 *Site Details*

Current zoning (Ref [1]) Proposed zoning (Ref [2])	E2 – Environmental Conservation E2 – Environmental Conservation
Current use Proposed use	The site is currently unoccupied bushland. Proposed use: 6.2ha of the northern portion for proposed residential use, southern portion to remain as unoccupied Environmental Conservation zone.
Size of site	13.2ha
Land use to the: North	The site is bound to the north by residential properties.
South	The site is bound to the south by Brisbane Water National Park.
East	The site is bound to the east by Brisbane Water National Park.
West	The site is bounded to the west by Woy Woy Road and then by residential properties.
Nearest sensitive receptor (human health)	Residential properties located along Jeniwa Close and Woy Woy Road to the north and west. The rear of the Jeniwa Close properties are adjacent to the site.
Nearest sensitive receptor (environmental)	Brisbane Water National Park located adjacent to the site.

Drawing 1, Appendix A shows the locality and the layout of the site.

3 SITE HISTORY AND BACKGROUND INFORMATION

3.1 SITE NOTIFICATIONS

The Section 10.7 Planning Certificate as specified under the Environmental Planning and Assessment Regulation 2000 (Schedule 4) includes information associated with any restrictions for the use of the land.

Information relevant to this obtained from the 10.7 certificates and relevant to the site is contained in **Table 2**.

Table 2 Planning Advice Contained in the 10.7 Certificate – Lot 512 and Lot 513

Part 2 relevant Information	<ul style="list-style-type: none"> • Multiple SEPPs apply to the site. • The following land uses are permitted with consent: bed and breakfast accommodation; environmental facilities, environmental protection works, oyster aquaculture, dwelling houses, home occupations, recreation areas, roads and water storage facilities. • The land does not specify minimum land dimensions for the erection of a dwelling-house. • The land is not known to include or comprise critical habitat. • The land is not located within a heritage conservation area. • The land is not known to have located on it an item of environmental heritage. • The land is not within a proclaimed Mine Subsidence District under the <i>Coal Mine Mine Subsidence Compensation Act 2017</i>. • The land is not affected by any road widening or realignment proposals. • The land may be affected by restrictions of development because of the likelihood of land slip. • The land is not subject to flood related development controls. • The land is not reserved for acquisition. • The land is not biodiversity land under Part 8 of the <i>Biodiversity Conservation Act 2016</i>. • The land is not biodiversity stewardship site under Part 5 of the <i>Biodiversity Conservation Act 2016</i>. • The land is not a set aside area under section 60ZC of the <i>Local Land Services Act 2013</i>, unless otherwise stated in the certificate. • The site is located within bushfire prone land. • The land is not subject to a property vegetation plan approved under Part 4 of the Native Vegetation Act 2003. • The land is not subject to an order made under the Trees (Disputes Between Neighbours) Act 2006 to carry out work in relation to a tree on the land. • There are no directions under Part 3A which apply to the land. • The land is not within land declared to be significantly contaminated land, subject to a management order, subject of an approved voluntary management proposal, subject of an ongoing maintenance order or subject to a site audit statement within the meaning of the Contaminated Land Management Act 1997, unless otherwise stated in the certificate.
Part 5 relevant Information	<ul style="list-style-type: none"> • The property is subject to approval by Council for on-site sewage management and limitations and restrictions may apply for all future developments.

RCA undertook a search of the Office of Environment and Heritage (OEH) heritage register (<http://www.environment.nsw.gov.au/heritageapp/heritagesearch.aspx>) for Kariong and identified that there are two (2) Aboriginal Places listed under the National Parks and Wildlife Act. The Kariong Sacred Land rock engraving is located approximately 500m south of the site and the Bulgandry art site is located 900 south-west. There were no items listed under the NSW Heritage Act; however, there are eighteen (18) records listed by Local Government and State Agencies. These records were generally for local schools, parks, sporting fields, gardens, residential buildings, remanent farm buildings, a water reservoir and amenity buildings. These records are not considered to have the potential to impact on or be impacted by activities at the site.

RCA undertook a search of the Department of Environment and Energy heritage register (<http://www.environment.gov.au/heritage/publications/australian-heritage-database>) for Kariong and identified one (1) Aboriginal Place on the State Heritage Register. The location was not provided on the register; however, Aboriginal Places are not considered to pose a risk of contamination impact to the site.

3.2 HISTORICAL PHOTOGRAPHS

RCA reviewed historical aerial photographs and **Table 3** summarises the observations at the site and the surrounding environment.

Table 3 *Aerial Photograph Review*

1965	The site appears vacant with sparse vegetation running from the west to east of the centre of the site. Woy Woy Road is established as is a dirt road, which matches the current alignment of Milyerra Road. There appears to be two (2) residential properties to the north of the site; however, the majority of the northern area is bushland. To the west on the western side of Woy Woy Road, there are large cleared blocks of land with a few residential properties. The east and west of the site remains vacant bushland.
1976	The site remains vacant, although there the density of vegetation has decreased particularly within the north western and south eastern areas of the site. A track is visible running across the centre of the site from west to east. There does not appear to be any other significant changes since the 1965 photograph.
1984	The site continues to remain vacant with no significant changes to vegetation. Bushland to north west of the site has been cleared and shows the construction of roads for residential development. There is one water tank located adjacent the north-eastern boundary of the site. There are no other significant changes since the 1976 photograph.
1994	The site continues to remain vacant; however, there are an additional tracks running through the site concentrated in the north western area of the site. The vegetation density has increased on the site, when compared to the 1984 photograph. Residential development to the north and north-west has increased significantly. There is a residential property adjacent to the northern boundary. The large vacant blocks to the west have also been converted to medium-density residential developments. There is an additional large water tank and building located adjacent to the water tank along the north-eastern boundary of the site in the 1984 photograph.
1998	The site remains vacant bushland. There is evidence of clearing and increased establishment of a residential properties adjacent to the northern boundary. The Fire Station to the south-west of the site has been established.

2007	The site remains vacant, vegetation density appears to have increased; however, a small cleared area is visible along the eastern boundary. There is an additional residential house along the northern boundary of the site, with evidence of vegetation clearing on the site directly south of the residential property. There are no other significant changes since the 1998 photograph.
2015	Evidence of increased vegetation clearing within the north-eastern area of the site south of the residential property. The site remains vacant, the vegetation density continues to increase. There are no other significant changes since the 2007 photograph.
2020	The site remains vacant, there is evidence of clearing of vegetation in the northern area of the site, adjacent to the residential properties. There are no other significant changes since the 2015 photograph.

Reviewed documentation is included in **Appendix B**.

3.3 CONTAMINATED LAND PUBLIC RECORD

RCA undertook a search of the NSW EPA public lands register (<http://www.epa.nsw.gov.au/publicregister/>) and did not find any record of Environment Protection licences, applications, notices, audits or pollution studies and reduction programmes applicable to the site. There are six (6) records for Environment Protection licences in the Gosford area; however, these are all greater than 3km from the site and are not considered likely to impact the site.

RCA undertook a search of sites notified to the NSW EPA as potentially requiring regulation (<http://www.epa.nsw.gov.au/clm/publiclist.htm> as updated 27 May 2020) and confirmed that the site is not notified. There are two (2) sites listed on the register within the suburb of Kariong, both service stations: located at 6 Central Coast Highway and Lot 2 Langford Drive. The register states that regulation under the Contaminated Land Management (CLM) Act is not required for either site. The closest site is 500m north-west of the site and is not considered to have the potential to impact the site. Both sites are shown on **Drawing 1, Appendix A**.

RCA undertook a search of the NSW EPA gasworks database (<http://www.epa.nsw.gov.au/clm/gasworkslocation.htm>) and determined that there are no known gasworks within vicinity of the site.

RCA undertook a search of the NSW Department of Primary Industries (NSW DPI) register for cattle dip sites (<http://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator>) and determined that there are no known cattle dip sites on site or within vicinity of the site.

RCA undertook a search of the Department of Defence register for unexploded ordnance (<http://www.defence.gov.au/UXO/WhereIs.asp>) and determined that there are no known unexploded ordnance on site or within vicinity of the site.

RCA undertook a search of the Department of Industry mapping of naturally occurring asbestos

(<https://trade.maps.arcgis.com/apps/PublicInformation/index.html?appid=87434b6ec7dd4aba8cb664d8e646fb06>) and determined that there are no known point occurrences or geological units with medium to high asbestos potential.

3.4 GEOLOGY AND HYDROGEOLOGY

RCA reviewed published geological and hydrogeological maps and summarised the findings in **Table 4**.

Table 4 *Geology and Hydrogeology*

Soil type	The Gosford 1:100,000 Geology Map states that the site contains: Hawkesbury Sandstone: medium to coarse grained quartz sandstone, minor laminated mudstone and siltstone lenses.
Acid sulfate soil	The Gosford Acid Sulfate Soil Risk Map indicates that the site is situated in an area with no known occurrence of acid sulfate soils.
Groundwater use	No groundwater use is currently known to be undertaken at the site.
Number of monitoring wells on site	There are six (6) registered groundwater wells on the site (Ref [3]) within the Kariong area, the closest bore is located approximately 100m west from the site.
Depth to groundwater	Groundwater information for groundwater bores located within the Kariong area indicates that the standing water level ranged from 1.8 – 45 metres below the surface.
Estimated Groundwater flow direction	Unknown, presumed to be east towards Brisbane Water.
Background water quality	Unknown.

The groundwater information is attached in **Appendix C**.

3.5 INTEGRITY ASSESSMENT

Information obtained from the 10.7 Certificates is presumed to be accurate; however, is limited to information Council has obtained and documented.

Information obtained from aerial photography is limited in that it only provides a snapshot of the site in time. RCA considers that adequate coverage was achieved for this investigation with aerials available from every decade from 1960 – 2020.

Overall RCA considers that the site history review is adequate to provide a general understanding of the past nature of land use.

4 PRELIMINARY CONCEPTUAL SITE MODEL

Based on RCA's understanding of the site, the potential contamination, exposure pathways, and receptors are considered as follows:

- Illegal dumping at the site
 - This may have resulted in surface contamination of soil. The contaminants of concern are considered to be hydrocarbons, metals, and asbestos.
 - On site-risks associated with this material are considered limited to direct exposure by ingestion, inhalation or dermal contact.
 - Offsite risks are considered insignificant, although there is potential for minimal migration of soil fines offsite via wind or stormwater.

The risk of potential contamination is considered to be minor. Soil sampling would enable identification of any potential contamination issues.

5 SAMPLING AND ANALYTICAL QUALITY PLAN

No formal sampling and analytical quality plan was prepared for the works however the following sections provides detail and rationale regarding the scope of works undertaken.

5.1 STEP 1 – STATE THE PROBLEM

Based on the preliminary conceptual site model, there is considered to be potential for hydrocarbons, metals and asbestos contamination arising from illegal dumping. Identification and characterisation of the potential contamination at the site is required to determine whether the site is suitable for the proposed development for residential use.

5.2 STEP 2 – IDENTIFY THE GOALS AND DECISIONS

The key uncertainty that the investigation attempts to address was:

- Has illegal dumping been undertaken at the site to an extent that there is a risk of contamination which may limit the proposed development of the site?

In order to resolve the uncertainty, decisions were to be made as to identify the presence and significance of potential contamination on the site. The specific decisions to be made are as follows:

- Investigate the potential for past and present contamination sources.
- Determine the nature of contamination.
- Determine the potential and actual contaminant migration routes.
- Assess whether further investigation or management is required.

5.3 STEP 3 – IDENTIFY INPUTS TO THE DECISIONS

The specific types of information needed to resolve the decision statement(s) in Step 2 are noted as follows:

- Adequate site history review.
- Adequate conceptual site model.
- Analytical data for the collected samples.
- Appropriate assessment criteria for the media being investigated and the proposed land use.
- Appropriate laboratory methods.

The ASC NEPM (Ref [4]) document has been approved by the NSW EPA for use on potentially contaminated sites and supersedes most of the preceding reference documents.

Best practise in alignment with council's requirements under SEPP55 (Ref [5]) prescribes assessment on the basis of the most sensitive allowable site use. Currently the site is undeveloped bushland and, based on information provided to RCA Australia, the proposed use consists of residential with accessible soil. RCA therefore considers the criteria as defined for the residential with soil access for the portion of the site proposed for residential use (HIL A) and open space (HIL C) for the portion of the site to remain as Environmental Conservation zone for assessment of human health risk from the soil at the site. The ecological risk has been assessed under the criteria defined for areas of urban residential and public open space (URPOS) for the residential area and area of ecological significance (AES) for the Environmental Conservation zone.

Full details of the relevant guidelines are included in **Appendix E**.

5.4 STEP 4 – DEFINE THE BOUNDARIES OF THE INVESTIGATION

The horizontal extent of the assessment has been defined by the cadastral lot boundaries as shown on the site plan (**Drawing 1, Appendix A**) and was interpreted in the field based on buildings and with the aid of hand-held GPS.

The vertical extent of the assessment was defined to the surface soils based on the consideration that potential contamination was limited to illegal waste dumping.

Practical constraints that could have interfered with sampling included:

- Density of vegetation preventing access to certain areas of the site.
- Fences.

5.5 STEP 5 – DEVELOP THE DECISION RULES

The Data Quality Indicators (DQI) that were implemented for the project are detailed in **Table 5**.

Table 5 *Data Quality Indicators Implemented for the Assessment*

DQI	Determined by	Criteria
Accuracy	Internal – surrogates, laboratory control samples, matrix spikes, method blanks.	Surrogate, LCS, spike - recovery data to be 70-130%. Blanks – results to be < PQL.
Precision	Internal – laboratory duplicates	RPD of duplicates: <ul style="list-style-type: none"> • 50% RPD at concentration levels greater than ten times the PQL. • 75% RPD at concentrations between five to ten times the PQL. • 100% RPD at concentration levels between two and five times the PQL. Where concentration levels are less than two times the PQL, the Absolute Difference (AD) shall be calculated. Data will be considered acceptable if the AD <2.5 times the PQL.
Completeness	The percentage of completed data points, taking in account consideration of other DQI.	95%
Representativeness	Whether there has been sufficient sampling by appropriate methodology with relevant analysis to determine that the assessment is representative of the site conditions.	
Comparability	<ul style="list-style-type: none"> • All samples collected during this sampling programme will be obtained by adequately trained RCA personnel using consistent sampling methodologies throughout the project. • All samples must be received by the laboratory cool and appropriately preserved for the requested analysis with sufficient time within the specified holding time. • All laboratory analyses will be conducted by NATA accredited methodologies that comply with the international standard methods. • Comparable analytes such as total recoverably hydrocarbons (TRH) TRH, Benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH) and metals should show some concurrence between analytical results and to identified field observations. 	

5.6 STEP 6 – ACCEPTABLE LIMITS ON DECISION ERRORS

The following lists the basis of assessment of the useability of the data if not accordance with the DQI:

- Closeness of the result to the guideline concentrations.
- Specific contaminant of concern (eg, response to carcinogens may be more conservative).
- The area of site in question and the potential lateral and vertical extent of questionable information.
- Whether the uncertainty can be effectively managed by site management controls.

If any data validation procedures or criteria identified were not followed or met, this will have constituted a non-conformance. The significance of the non-conformance will have determined if rectification was required.

5.7 STEP 7 – OPTIMISATION OF THE DESIGN OF THE COLLECTION OF DATA

The proposed scope of work was to inspect the site to identify visual and/or olfactory evidence of contamination and collect targeted surface soil samples in the vicinity of suspected contamination. Samples were to be collected directly from hand tools at all locations.

Samples were to be analysed for hydrocarbons, metals and/or asbestos, dependent on the waste types identified at the sampling location.

Samples were to be stored in the field in an insulated container on ice and sent to the laboratory within 48 hours of sampling under Chain of Custody (COC) documentation.

ALS was chosen as the primary analysing laboratory for all analyses due to its NATA accreditation and experience with potentially contaminated soil.

The scope is summarised in **Table 6**.

Table 6 *Sampling Strategy*

Contaminating activity	Potential Contaminants of Concern	Sampling Strategy	Rationale for Sampling Strategy and Sampling Locations
Illegal dumping of waste material.	Total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), metals and asbestos.	Targeted collection of surface soil samples when there was visual evidence of contamination. Collection of soil samples at 0.1-0.2m for soil stockpiles. Collection of any potential asbestos containing materials located on the site.	Due to the large area of the site and limited potential for contaminating activities sampling locations were chosen based on visual identification of potentially contaminating material and waste was considered to be most suitable for the purpose of the preliminary assessment.

6 FIELDWORK

An environmental engineer experienced in the handling of potentially contaminated soil undertook the fieldwork 14 May 2020. The scope of work included:

- A site inspection. This comprised approximately six (6) hours of traversing by vehicle, down the main track which partially intersects the site from the access gate towards Woy Woy Road, and by foot in areas which could be accessed. **Drawing 1, Appendix A** identifies the area which could not be inspected due to dense vegetation in the proposed residential area. Vegetation within the proposed Environmental Conservation zone was also very dense, as such inspections could only be undertaken from designated walking trails, which are shown in **Drawing 1, Appendix A**. Observations made during the inspection are detailed in **Table 7**.
- The collection of sixteen (16) soil samples from twelve (12) locations on the site:

- Twelve (10) surface soil samples were collected from the proposed residential area between depths of 0.05 – 0.1m below the existing surface using a hand auger.
- Six (6) soil samples were collected between depths of 0.1 – 0.2m into the surface of soil stockpiles, from a total of four (4) stockpile locations. Stockpiles were located within the proposed residential area.
- Analysis of nine (9) soil samples from nine (9) locations.
 - Eight (8) samples were analysed for TRH, BTEX, PAH, metals and asbestos.
 - One (1) sample was analysed for TRH, BTEX, PAH and metals.

The analysis of these samples was considered adequate to provide an indication of the encountered materials, the remaining seven (7) samples were collected from stockpiles of similar materials.

- The collection of three (3) material samples from three (3) locations.
 - One (1) sample of potential asbestos containing material was submitted for analysis.
 - Two (2) samples of building insulation were collected from two (2) locations. Samples were inspected by personnel qualified in undertaking hazardous material audits.

Table 7 *General Site Conditions and Observations*

Topography	The site topography
Site condition	The site comprised predominantly of dense bushland.
Condition of Building and roads	<p>There were no buildings or formal roads on the site. There are two (2) dirt tracks in the northern portion of the site. The southern portion of the site contained dirt walking tracks which are accessible by foot via Brisbane Water National Park.</p> <p>A gravel/asphalt road ring road was noted behind one of the properties outside the property boundary as shown in Drawing 1, Appendix A.</p>

<p>Presence of drums or waste</p>	<p>Insulation material was noted at two (2) locations, shown in Photograph 1 and Photograph 14. Geofabric material was also identified installed in a small creek (refer Photograph 2).</p> <p>In the northern area of the site, there were a number of tree/branch stockpiles, which may be due to clearing of vegetation undertaken in the area based on changes in vegetation noted in aerial photography (refer Photograph 3). Two (2) small (<5m³) stockpiles were also observed (refer Photograph 4 and Photograph 5). A soil stockpile was also identified underneath a tree and branch stockpile (refer Photograph 6). In close proximity to the stockpiles was a truck trailer, raised off the ground with drums (Photograph 7).</p> <p>It was noted during the inspection that one of the residential properties was unfenced, and items such as a boat, cardboard boxes, whitegoods are situated within the site. These items are located in close proximity to the asphalt road constructed on the site. The asphalt road starts from the rear of an unfenced residential property as shown in Drawing 1.</p> <p>Other small building waste materials were noted along the northern site boundary such as tin, bricks, terracotta roof tiles, concrete and timber as well as tyres (refer Photographs 8 – 13).</p>
<p>Visual Signs of contamination</p>	<p>There were no visual signs of contamination noted with the exception of the waste materials.</p>
<p>Signs of erosion</p>	<p>There were no obvious signs of erosion; however, is noted that large areas of the site were inaccessible due to the dense vegetation.</p>
<p>Identification of potential asbestos bearing materials</p>	<p>One (1) small piece of suspected asbestos containing material was identified in a soil stockpile and was submitted to the laboratory for asbestos identification testing.</p>
<p>Visible signs of plant stress</p>	<p>There were minimal signs of plant distress noted during the inspection. Plant distress is considered to be attributed to recent prolonged drought conditions.</p>
<p>Odours noticeable on site</p>	<p>There were no noticeable odours on site.</p>
<p>Evidence of current or former petroleum facilities</p>	<p>There was no evidence of former petroleum facilities on, or within the immediate vicinity of, the site.</p>
<p>Chemicals stored on site</p>	<p>No chemicals were observed at the site however it is considered that there is potential for chemicals to have been stored on site from the property owner that has stored items extending from their property boundary.</p>
<p>Evidence of waste burial: (anecdotal or otherwise)</p>	<p>No evidence of waste burial was observed however cannot be discounted at least within proximity to the residential properties based on the placement of other waste at the site.</p>

The location of photographs taken during the site inspection are shown on **Drawing 1, Appendix A** and attached in **Appendix D**.

Field sheets are attached in **Appendix F**. Due to the dense vegetation, some areas of the site were inaccessible for inspection; however, due it is considered unlikely for illegal dumping to have occurred within these areas due difficulties entering these locations, particularly by vehicles.

7 QUALITY ASSURANCE/QUALITY CONTROL

RCA has assessed the quality assurance and control in **Appendix G** and found it to be acceptable for the purpose of site assessment.

8 RESULTS

All soil results are compared to the relevant criteria in **Appendix H**. All soil samples were collected from the proposed residential area, such the following presents a comparison to the HILA A and URPOS criteria. The following section present a summary.

- BTEX concentrations were not detected and as such are considered below the relevant criteria (Ref [4]).
- TRH concentrations were not detected or were detected at low concentrations below the human health criteria (Ref [4]).
 - Two (2) samples (S10 and S15) reported TRH C₁₆₋₃₄ concentrations in excess of the ecological criterion (Ref [4]).
- There were no metals concentrations in excess of the health and ecological criteria (Ref [4]).
- There was no asbestos detected in any soil samples.
- The material sample submitted for identification of asbestos was identified to contain chrysotile asbestos.

9 SITE CONTAMINATION CHARACTERISATION

The NSW EPA guidelines (Ref [6]) recommend dividing sites greater than 5ha for purpose of assessment; a minimum of 55 sampling points is required for sites 5ha in size. The assessment of soil at nine (9) locations on the site is considered to be less than the recommended minimum by NSW EPA guidelines (Ref [6]) for a site of 13.2ha. The site is vacant and unused, as such the targeted sampling was undertaken based on evidence of contamination and/or waste materials and is considered appropriate for the preliminary nature of the assessment.

No indications of contamination beyond the waste was observed and samples were collected of soil within all identified stockpiles with a sample of each type of stockpile analysed for potential contaminants of concern. Suspected asbestos containing material (ACM) was observed in one (1) stockpile only; however, asbestos was included in the analytical suite for all soil samples. Soil samples were only collected from the area of the site proposed for residential use. There was no illegal dumping identified in the proposed Environment Conservation zone; while RCA's access was limited as the vegetation was very dense in this area it is considered that the vegetation would make the area inaccessible to vehicles also which would reduce the potential for illegal dumping.

Asbestos containing material was identified within one (1) small stockpile located in the northern portion of the site (refer **Photograph 5** and location S6, **Drawing 1, Appendix A**). The soil sample submitted for analysis from this stockpile reported nil detections of asbestos fibres and as such RCA consider that the identified ACM fragment is not friable. There is potential for further ACM to be present within this small stockpile and potentially within other stockpiles in the area.

Two (2) locations in the northern portion (proposed residential area) of the site reported TRH concentrations in excess of the ecological criteria (Ref [4]). One (1) sample was collected from a very small brick/rubbish stockpile and the second from a timber stockpile. As the location of these stockpiles are adjacent to a residential property boundary, the impact to ecology in this area is minimal. These elevated TRH concentrations are not considered likely to pose a constraint to the proposed residential development.

No contamination which may pose a risk to human health was identified in any of the soil samples. In combination with the site history review, RCA considers that there has been adequate assessment to consider there are no significant constraints to the proposed residential development. The identified waste material will have to be fully classified before removal to a licensed waste facility or be assessed for suitability for use at the site.

10 CONCLUSIONS

This report has presented the findings of a preliminary site (contamination) assessment undertaken at Lots 512 and 513, DP727686, Kariong.

The assessment consisted of a site inspection and targeted soil sampling. Analysis of nine (9) soil samples from nine (9) locations was undertaken for potential contaminants of concern (TRH, BTEX, PAH, metals and asbestos). Four (4) small stockpiles were sampled and ACM material was identified within one (1) stockpile. All samples were collected from the proposed residential zone, as no suspected contamination or illegal dumping of waste was identified within the proposed Environmental Conservation zone.

Concentrations within soil samples are not considered to pose a risk to human health. There were two (2) locations within the proposed residential zone that reported TRH concentrations in excess of the ecological criteria. As these locations were outside the proposed Environmental Conservation zone, they are not considered to pose a constraint to the development.

RCA considers based on the current assessment that the site conditions at the site are suitable for the proposed residential zone and Environmental Conservation zone. Further assessment of waste will be required prior to its disposal and additional assessment may be required in the event that waste or indications of contamination are identified during or following vegetation clearance.

11 LIMITATIONS

This report has been prepared for Darkinjung Local Aboriginal Land Council in accordance with an agreement with RCA Australia (RCA) dated 8 May 2020. The services performed by RCA have been conducted in a manner consistent with that generally exercised by members of its profession and consulting practice.

This report has been prepared for the sole use of Darkinjung Local Aboriginal Land Council. The report may not contain sufficient information for purposes of other uses or for parties other than Darkinjung Local Aboriginal Land. This report shall only be presented in full and may not be used to support objectives other than those stated in the report without written permission from RCA Australia.

The information in this report is considered accurate at the date of issue with regard to the current conditions of the site. Conditions can vary across any site that cannot be explicitly defined by investigation.

Environmental conditions including contaminant concentrations can change in a limited period of time. This should be considered if the report is used following a significant period of time after the date of issue.

Yours faithfully

RCA AUSTRALIA



Carmen Rocher
Environmental Engineer



Fiona Brooker
Environmental Services Manager

REFERENCES

- [1] Gosford Local Environment Plan 2014 under the Environmental Planning and Assessment Act 1979, published 17 April 2020.
- [2] Draft Central Coast Local Environment Plan, currently deferred.
- [3] Water NSW, All Groundwater Map, <https://realtimedata.waternsw.com.au/water.stm>, accessed 28 May 2020.
- [4] NEPC, *National Environment Protection (Assessment of Site Contamination) Measure*, 1999 as amended 2013.
- [5] Department of Urban Affairs and Planning, *State Environmental Planning Policy (SEPP): Remediation of Land*, August 1998.
- [6] NSW EPA, *Sampling Design Guidelines*, September 1995.

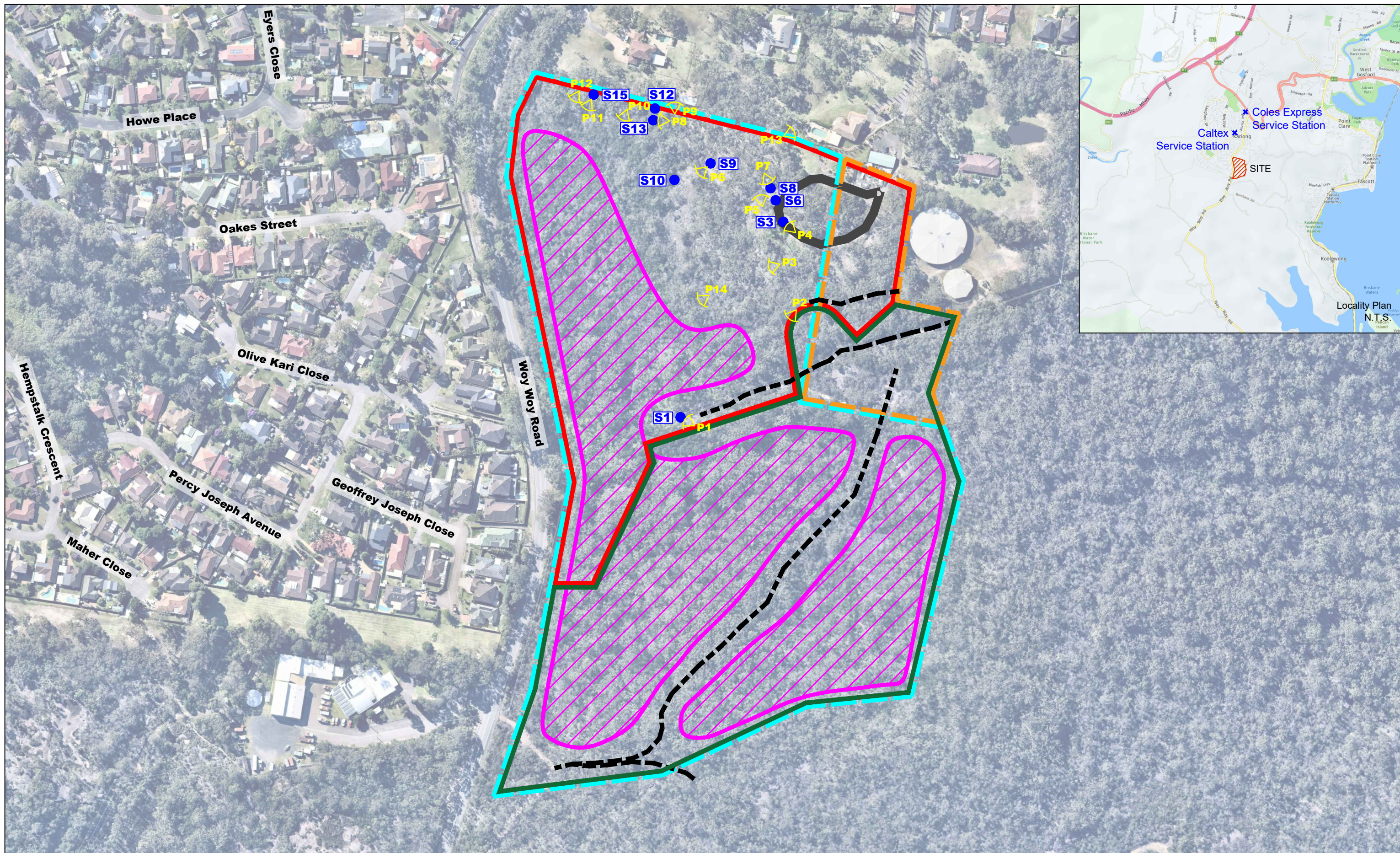
GLOSSARY

ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure.
EIL	Ecological investigation level. Relates to soil concentrations which may pose a risk to ecological health.
ESL	Ecological screening level. Relates to vapour risk from petroleum hydrocarbons which may pose a risk to ecological health.

HIL	Health investigation level. Relates to soil concentrations which may pose a risk to human health in soil.
HSL	Health screening level. Relates to the vapour risk from petroleum hydrocarbons which may pose a risk to human health in soil.
In-Situ	In place, without excavation.
Interlaboratory	A sample sent to two different laboratories for comparative analysis.
Intralaboratory	A sample split into two and sent blind to the sample laboratory for comparative analysis.
ISL	Investigation screening levels for soil. Comprised of HIL/EIL and HSL/ESL
kg	kilogram, 1000 gram.
LEP	Local environment plan. A planning tool for the Local Government.
µg	microgram, 1/1000 milligram.
mg	milligram, 1/1000 gram.
NSW EPA	NSW Environment Protection Authority – formerly a component of DECC, DECCW, OEH but made a separate entity in 2011 to regulates the contaminated land industry.
OEH	NSW Office of Environment and Heritage.
Pathogen	An organism capable of causing disease.
Phytotoxicity	Poisonous to, or inhibiting, plant growth.
PQL	Practical Quantitation Limit.
QA	Quality Assurance.
QC	Quality Control.
RPD	Relative Percentage Difference.
Vadose Zone	Unsaturated zone of soil above the groundwater, extending from
<u>Chemical Compounds</u>	
BTEX	Benzene, toluene, ethylbenzene, xylene.
PAH	Polycyclic aromatic hydrocarbons. Multi-ring compounds found in fuels, oils and creosote. These are also common combustion products.
PCB	Poly chlorinated biphenyls.
TRH	Total recoverable hydrocarbons
TSS	Total suspended solids.

Appendix A

Drawing



LEGEND	
	Proposed Residential Area
	Proposed Environmental Conservation Zone
	Approximate boundary of Lot 512
	Approximate boundary of Lot 513
	Approximate location of unsealed track
	Approximate location of sealed road
	Approximate soil sample location
	Approximate location and direction of photograph
	Inaccessible area

NOTES: Aerial image taken from Nearmap, April 18 2020 (used in accordance with commercial licence)

Drawing adapted from Indicative Concept Plan supplied by Barr Property and Planning, and drawn by Urbis (Job No. P12199, Dated 17/01/2020).

0 2 4 6 8 10 metres

N

RCA AUSTRALIA
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SITE LOCALITY & LOCATION, & SAMPLE PLAN PRELIMINARY (SITE) CONTAMINATION ASSESSMENT			
LOTS 512 AND 513, DP727686 KARIONG			
CLIENT	Darkinjung Local Aboriginal Land Council	RCA Ref	14872-401/1
DRAWN BY	CR	SCALE	1:250 (A3)
APPROVED BY	FJB	DATE	4/06/2020
		DRAWING No	1
		REV	0
		OFFICE	NEWCASTLE

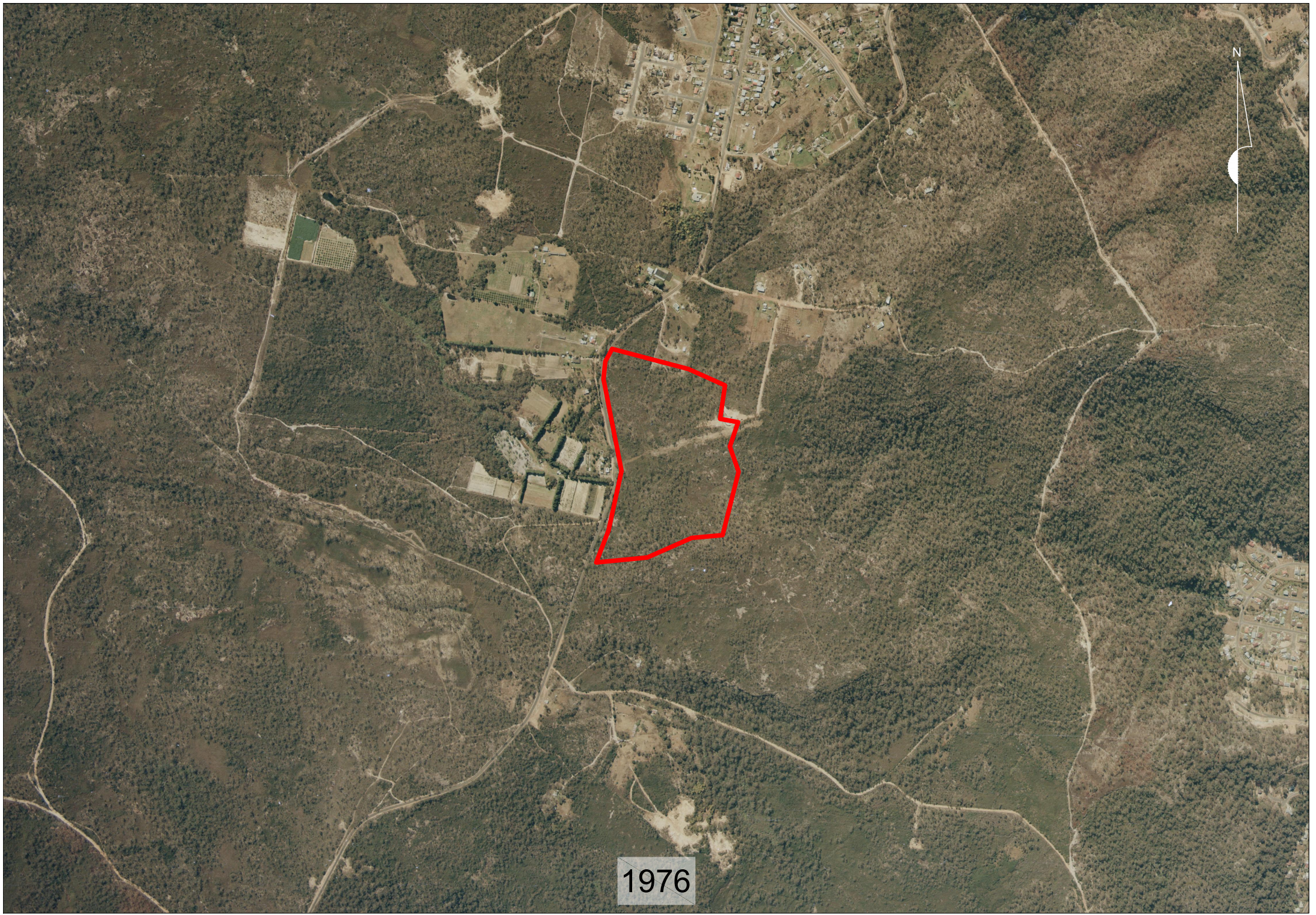
CDT-DWG-A3H-001/1

Appendix B

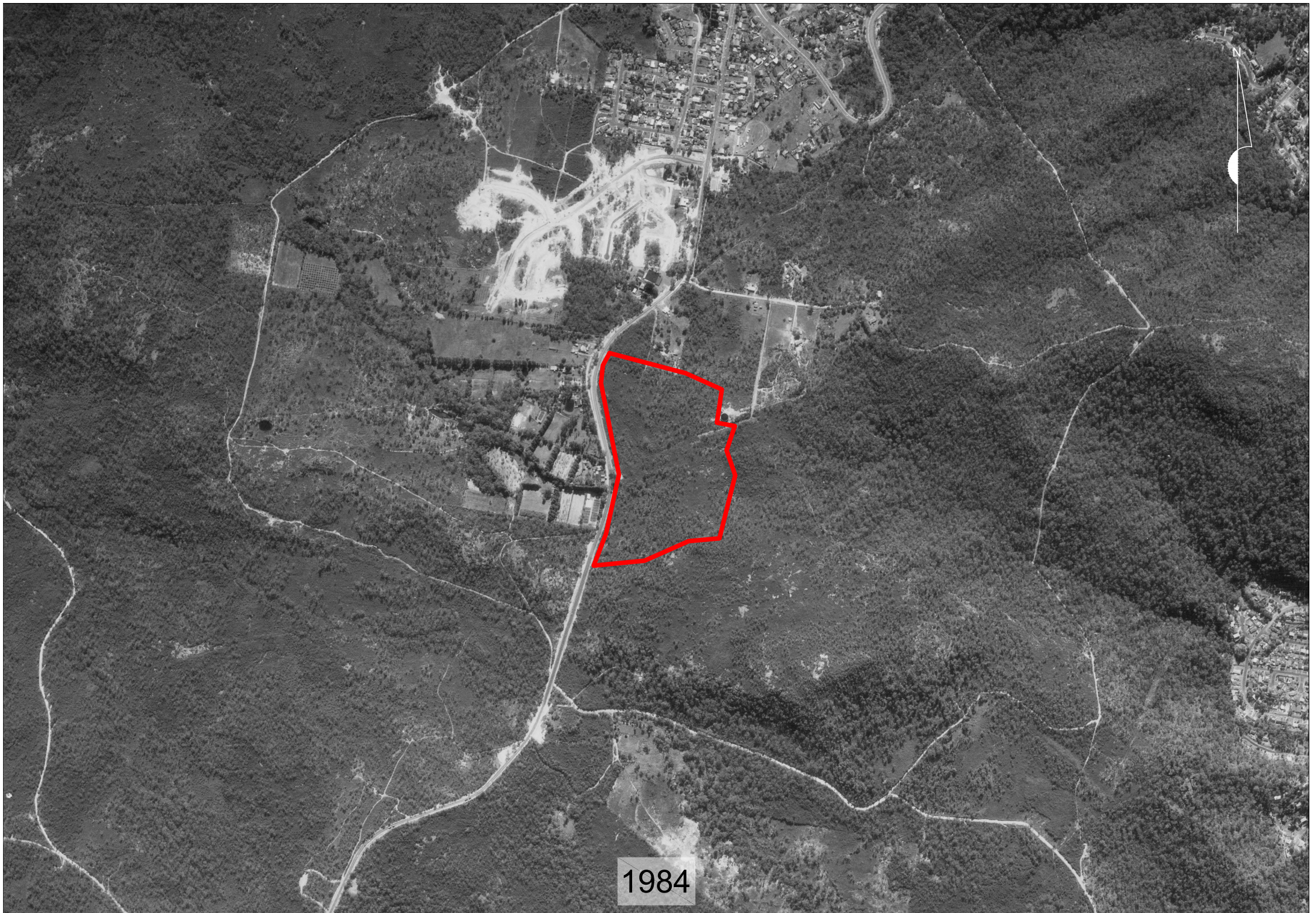
Historical Photographs



1965



1976



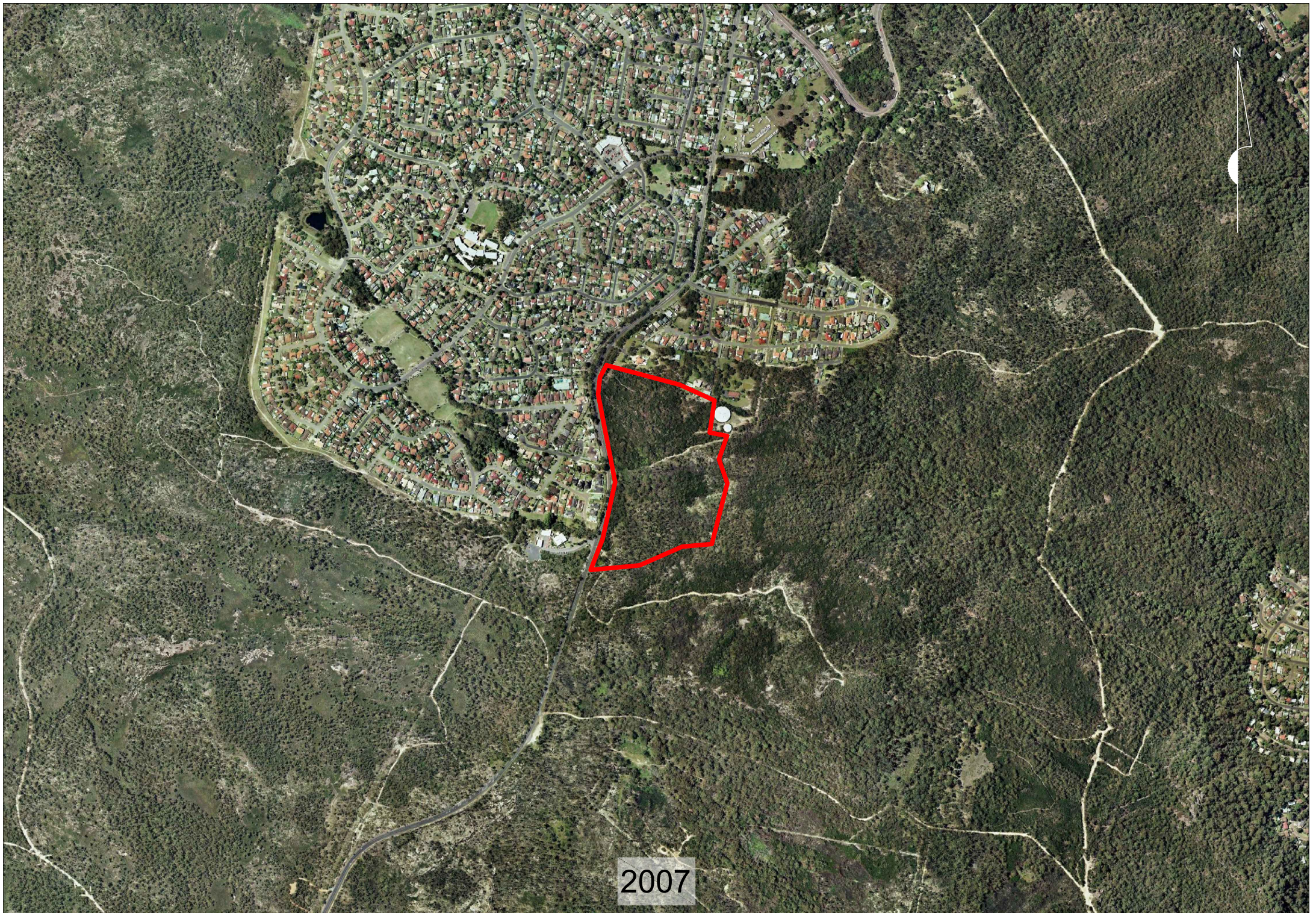
1984



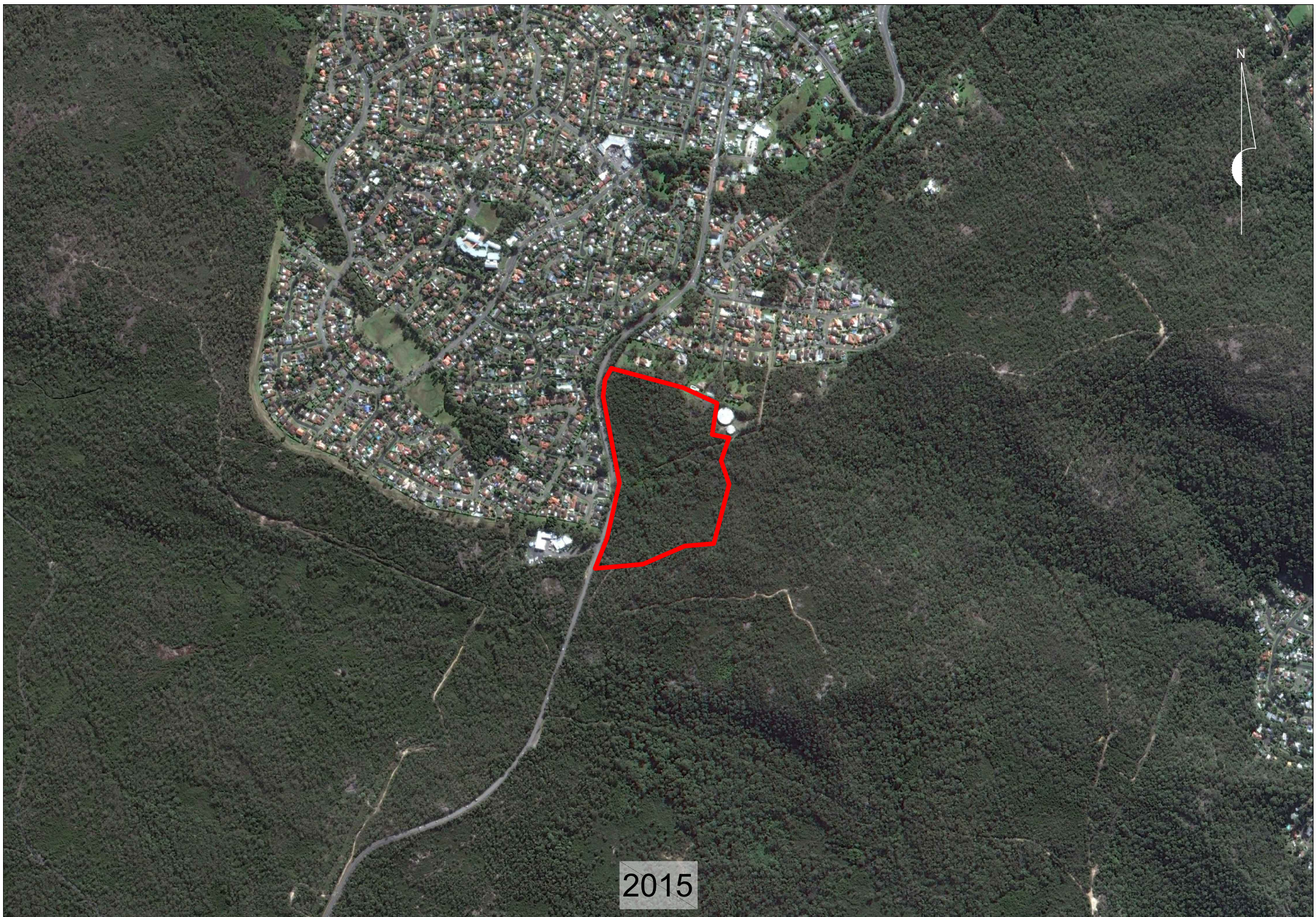
1994



1998



2007



2015



2020



Appendix C

Registered Groundwater Well Information



Groundwater Bore Search



500m

Contact: geoscience.products@planning.nsw.gov.au
 Date Saved: 02/06/2020 02:08

Disclaimer

Because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date. The information contained in this publication may not be or may no longer be aligned with government policy nor does the publication indicate or imply government policy. No warranty about the accuracy, currency or completeness of any information contained in this document is inferred (including, without limitation, any information in the document provided by third parties). While all reasonable care has been taken in the compilation, to the extent permitted by law, the State of New South Wales (including the NSW Department of Planning and Environment) exclude all liability for the accuracy or completeness of the information, or for any injury, loss, or damage whatsoever (including without limitation liability for negligence and consequential losses) suffered by any person acting, or purporting to act, in reliance upon anything contained herein. Users should rely upon their own advice, skills, interpretation and experience in applying information contained in this publication.

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WaterNSW

Work Summary

GW013660

Licence: 20WA204086

Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Well

Work Status:

Construct.Method:

Owner Type: Private

Commenced Date:
Completion Date: 01/02/1958

Final Depth: 3.80 m
Drilled Depth: 3.80 m

Contractor Name: (None)

Driller:

Assistant Driller:

Property: N/A 29 Woy Woy Rd KARIONG 2250
NSW
GWMA: 606 - MANGROVE MOUNTAIN
GW Zone: 008 - MOONEY MOONEY AND
MULLET CREEKS GROUNDWATER
SOURCE

Standing Water Level
(m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

County **Parish** **Cadastre**
Form A: NORTHUMBERLAND PATON 158
Licensed: NORTHUMBERLAND PATONGA Whole Lot 2//241106

Region: 10 - Sydney South Coast

CMA Map: 9131-2S

River Basin: 212 - HAWKESBURY RIVER
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation (Unknown)
Source:

Northing: 6298964.000
Easting: 341613.000

Latitude: 33°26'13.3"S
Longitude: 151°17'46.1"E

GS Map: -

MGA Zone: 56

Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Concrete Cylinder	-0.40	3.40	1371			Seated

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
3.50	3.50	0.00	Fractured	1.80		0.06			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.21	1.21	Sand	Sand	
1.21	3.20	1.99	Clay Shale	Clay	
3.20	3.81	0.61	Rock Water Supply	Rock	

Remarks

30/06/1982: LOT 2 WOY WOY RD KARIONG

***** End of GW013660 *****

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WaterNSW

Work Summary

GW029948

Licence: 20WA204093

Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore open thru rock

Work Status:

Construct.Method: Cable Tool

Owner Type: Private

Commenced Date:
Completion Date: 01/11/1968

Final Depth: 76.20 m
Drilled Depth: 76.20 m

Contractor Name: (None)

Driller:

Assistant Driller:

Property: N/A 2 Mowbray Palce KARIONG
2250 NSW
GWMA: 606 - MANGROVE MOUNTAIN
GW Zone: 003 - BRISBANE WATER
GROUNDWATER SOURCE

Standing Water Level
(m):
Salinity Description: Good
Yield (L/s):

Site Details

Site Chosen By:

County
Form A: NORTHUMBERLAND
Licensed: NORTHUMBERLAND

Parish
PATON
PATONGA

Cadastre
368
Whole Lot 4//1034646

Region: 10 - Sydney South Coast

CMA Map: 9131-2S

River Basin: 212 - HAWKESBURY RIVER
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation (Unknown)
Source:

Northing: 6298354.000
Easting: 342011.000

Latitude: 33°26'33.3"S
Longitude: 151°18'01.1"E

GS Map: -

MGA Zone: 56

Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	P.V.C.	-0.10	2.90	127			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
60.90	60.90	0.00	Consolidated	45.70		0.03			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	3.04	3.04	Clay Sandy	Clay	
3.04	44.19	41.15	Sandstone	Sandstone	
44.19	44.80	0.61	Clay	Clay	
44.80	76.20	31.40	Sandstone Water Supply	Sandstone	

Remarks

07/08/1974: SITED MILYERA ST KARIONG

***** End of GW029948 *****

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WaterNSW

Work Summary

GW050096

Licence:

Licence Status:

Authorised Purpose(s):
Intended Purpose(s): IRRIGATION

Work Type: Bore open thru rock

Work Status:

Construct.Method: Rotary Air

Owner Type: Private

Commenced Date:
Completion Date: 01/02/1980

Final Depth: 106.80 m
Drilled Depth: 106.80 m

Contractor Name: (None)

Driller:

Assistant Driller:

Property:

Standing Water Level
(m):

GWMA:
GW Zone:

Salinity Description: Good
Yield (L/s):

Site Details

Site Chosen By:

County: NORTHUMBERLAND
Parish: PATONGA
Cadastre: L1 (157)

Region: 10 - Sydney South Coast

CMA Map: 9131-2S

River Basin: 212 - HAWKESBURY RIVER
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation (Unknown):
Source:

Northing: 6298063.000
Easting: 341163.000

Latitude: 33°26'42.3"S
Longitude: 151°17'28.1"E

GS Map: -

MGA Zone: 56

Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	P.V.C.	0.00	6.00	150			Suspended in Clamps

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
58.00	59.00	1.00	Consolidated			0.38			
76.00	100.00	24.00	Consolidated			1.52			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	Soil	Soil	
1.00	4.00	3.00	Clay	Clay	
4.00	106.80	102.80	Sandstone Water Supply	Sandstone	

***** End of GW050096 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW

Work Summary

GW060322

Licence:

Licence Status:

Authorised Purpose(s):
Intended Purpose(s): IRRIGATION

Work Type: Bore open thru rock

Work Status:

Construct.Method: Rotary Air

Owner Type: Private

Commenced Date:
Completion Date: 01/01/1985

Final Depth: 114.00 m
Drilled Depth: 114.00 m

Contractor Name: (None)

Driller:

Assistant Driller:

Property:

Standing Water Level
(m):

GWMA:
GW Zone:

Salinity Description: Good
Yield (L/s):

Site Details

Site Chosen By:

County **Parish** **Cadastre**
Form A: NORTHUMBERLAND PATON L2 DP561417 (157)
Licensed:

Region: 10 - Sydney South Coast

CMA Map: 9131-2S

River Basin: 212 - HAWKESBURY RIVER
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation (Unknown)
Source:

Northing: 6297911.000
Easting: 341269.000

Latitude: 33°26'47.3"S
Longitude: 151°17'32.1"E

GS Map: -

MGA Zone: 56

Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	P.V.C.	0.00	6.00	150			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
75.00	77.00	2.00	(Unknown)			0.13			
100.00	102.00	2.00	(Unknown)			0.47			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	Soil	Soil	
1.00	3.00	2.00	Clay	Clay	
3.00	114.00	111.00	Sandstone Water Supply	Sandstone	
3.00	114.00	111.00	Shale Some Thin Layers	Shale	

***** End of GW060322 *****

Warning To Clients: This raw data has been supplied to the WaterNSW by drillers, licensees and other sources. WaterNSW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW

Work Summary

GW100623

Licence: 20WA218737

Licence Status: CURRENT

Authorised Purpose(s): RECREATION (GROUNDWATER)
Intended Purpose(s): RECREATION (GROU

Work Type: Bore

Work Status: Supply Obtained

Construct.Method: Rotary

Owner Type: School

Commenced Date:
Completion Date: 09/07/1997

Final Depth: 114.00 m
Drilled Depth: 114.00 m

Contractor Name: JH ISELT PTY LTD

Driller: Paul John Iselt

Assistant Driller:

Property: N/A 48 Langford Drv KARIONG 2250 NSW

GWMA: 606 - MANGROVE MOUNTAIN
GW Zone: 008 - MOONEY MOONEY AND MULLET CREEKS GROUNDWATER SOURCE

Standing Water Level 26.000 (m):

Salinity Description: Fresh
Yield (L/s): 1.130

Site Details

Site Chosen By:

County	Parish	Cadastre
Form A: NORTHUMBERLAND	PATON	510//705485
Licensed: NORTHUMBERLAND	PATONGA	Whole Lot 510//705485

Region: 20 - Hunter

CMA Map:

River Basin: - Unknown
Area/District:

Grid Zone:

Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6298453.000
Easting: 340994.000

Latitude: 33°26'29.6"S
Longitude: 151°17'21.8"E

GS Map: -

MGA Zone: 56

Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	5.00	200			Rotary
1		Hole	Hole	5.00	14.00	150			Rotary
1	1	Casing	Pvc Class 9	-0.50	5.50				Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
26.60	27.00	0.40	Unknown	22.00	30.00	0.05	30.00		
68.80	69.50	0.70	Unknown	30.00	75.00	0.13	75.00		
77.00	77.50	0.50	Unknown	30.00	85.00	0.30	85.00	01:00:00	
97.00	97.50	0.50	Unknown	26.00	114.00	0.65	114.00	01:00:00	

Drillers Log

From	To	Thickness	Drillers Description	Geological Material	Comments
------	----	-----------	----------------------	---------------------	----------

(m)	(m)	(m)		
0.00	0.30	0.30	TOP SOIL	Topsoil
0.30	0.70	0.40	LANDFILL	Fill
0.70	1.00	0.30	CLAY, WHITE	Clay
1.00	7.00	6.00	SANDSTONE, WHITE	Sandstone
7.00	8.70	1.70	SANDSTONE, YELLOW	Sandstone
8.70	15.20	6.50	SANDSTONE, WHITE	Sandstone
15.20	26.60	11.40	SANDSTONE/IRON STONE	Sandstone
26.60	27.00	0.40	SANDSTONE, WHITE, WITH BANDS	Sandstone
27.00	29.00	2.00	SANDSTONE, WHITE	Sandstone
29.00	36.50	7.50	SANSTONE, IRONSTONE	Sandstone
36.50	68.80	32.30	SANDSTONE, WHITE	Sandstone
68.80	69.50	0.70	SANDSTONE, YELLOW, WITH BANDS	Sandstone
69.50	75.20	5.70	SANDSTONE, YELLOW	Sandstone
75.20	77.00	1.80	IRONSTONE	Ironstone
77.00	77.50	0.50	SANDSTONE, YELLOW, WITH BANDS	Sandstone
77.50	82.50	5.00	SANDSTONE, YELLOW	Sandstone
82.50	97.00	14.50	SANDSTONE, GREY	Sandstone
97.00	97.50	0.50	SANDSTONE, GREY, WITH BANDS	Sandstone
97.50	114.00	16.50	SANDSTONE, GREY	Sandstone

Remarks

09/07/1997: Form A Remarks:

REMARKS:

KARIONG PUBLIC SCHOOL, DETAILS TO BE SUPPLIED BY D.L.W.C.

22/01/2013: Nat Carling, 22-Jan-2013; Added rock type codes to driller's log & added missing information (based on existing data).

*** End of GW100623 ***

Warning To Clients: This raw data has been supplied to the WaterNSW by drillers, licensees and other sources. WaterNSW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW

Work Summary

GW200310
Licence: 20WA204215

Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore

Work Status:
Construct.Method: Rotary Mud

Owner Type:
Commenced Date:
Completion Date: 15/11/2006

Final Depth: 56.00 m
Drilled Depth: 56.00 m

Contractor Name: (None)

Driller: Lloyd Norman Whitsed

Assistant Driller:
Property: N/A 109 Woy Woy Rd KARIONG
 2250 NSW
GWMA: 606 - MANGROVE MOUNTAIN
GW Zone: 008 - MOONEY MOONEY AND
 MULLET CREEKS GROUNDWATER
 SOURCE

Standing Water Level
 (m):
Salinity Description:
 Yield (L/s): 0.200

Site Details

Site Chosen By:

County	Parish	Cadastre
Form A: NORTHUMBERLAND	PATON	1/849778
Licensed: NORTHUMBERLAND	PATONGA	Whole Lot 1//849778

Region: 20 - Hunter

CMA Map:
River Basin: - Unknown
Area/District:
Grid Zone:
Scale:
Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6297963.000
Easting: 341085.000

Latitude: 33°26'45.5"S
Longitude: 151°17'25.0"E

GS Map: -

MGA Zone: 56

Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	56.00	175			Rotary Mud
1	1	Casing	Pvc Class 9	-0.50	56.00	125	115		Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	17.00	25.00	125		0	Casing - Machine Slotted, PVC Class 9, SL: 100.0mm, A: 1.00mm
1	1	Opening	Slots - Vertical	47.50	53.50	125		0	Casing - Machine Slotted, PVC Class 9, SL: 100.0mm, A: 1.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
47.00	53.00	6.00	Unknown		53.00	0.20		02:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
1.00	5.00	4.00	clay (brown and gritty)	Clay	

5.00	41.00	36.00	sandstone (pink & brown various clay contents to very hard)	Sandstone	
41.00	49.00	8.00	sandstone (brown, softer)	Sandstone	
49.00	56.00	7.00	sandstone (creamy color, broken layers)	Sandstone	

Remarks

15/11/2006: Form A Remarks:

Sump installed from 53.5m to 56m

05/11/2009: Updated coordinates as per existing Eastings and Northings.

***** End of GW200310 *****

Warning To Clients: This raw data has been supplied to the WaterNSW by drillers, licensees and other sources. WaterNSW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

Appendix D

Site Photographs



PHOTOGRAPH 1 *Insulation Material taken at sample location S1*



Client: Darkinjung Local Aboriginal Land Council

RCA Australia

Project: Preliminary Site (Contamination) Assessment

Location: Lots 512 and 513, DP727686, Kariong

RCA ref: 14872-401/1

PHOTOGRAPH 2 *Geofabric material near small creek*



PHOTOGRAPH 3 *Branch and tree stockpile*

Client: Darkinjung Local Aboriginal Land Council

RCA Australia

Project: Preliminary Site (Contamination) Assessment

Location: Lots 512 and 513, DP727686, Kariong

RCA ref: 14872-401/1



PHOTOGRAPH 4 *Small soil stockpile, sample S3 location*



Client: Darkinjung Local Aboriginal Land Council

RCA Australia

Project: Preliminary Site (Contamination) Assessment

Location: Lots 512 and 513, DP727686, Kariong

RCA ref: 14872-401/1

PHOTOGRAPH 5 *Small soil stockpile containing asbestos containing material fragment, sample location S6*



PHOTOGRAPH 6 *Branch stockpile with soil stockpile underneath, sample S9*

Client: Darkinjung Local Aboriginal Land Council

RCA Australia

Project: Preliminary Site (Contamination) Assessment

Location: Lots 512 and 513, DP727686, Kariong

RCA ref: 14872-401/1



PHOTOGRAPH 7 *Truck trailer elevated using drums*



PHOTOGRAPH 8 *Waste scrap tin pile*

Client: Darkinjung Local Aboriginal Land Council

RCA Australia

Project: Preliminary Site (Contamination) Assessment

Location: Lots 512 and 513, DP727686, Kariong

RCA ref: 14872-401/1



PHOTOGRAPH 9 *Building waste (metal screen and concrete) outside northern residential boundary*



Client: Darkinjung Local Aboriginal Land Council

RCA Australia

Project: Preliminary Site (Contamination) Assessment

Location: Lots 512 and 513, DP727686, Kariong

RCA ref: 14872-401/1

PHOTOGRAPH 10 *Tyre, terracotta tiles and other materials located adjacent to residential property*



PHOTOGRAPH 11 *Tyre pile and waste building timber*

Client: Darkinjung Local Aboriginal Land Council

RCA Australia

Project: Preliminary Site (Contamination) Assessment

Location: Lots 512 and 513, DP727686, Kariong

RCA ref: 14872-401/1



PHOTOGRAPH 12

Waste concrete



Client: Darkinjung Local Aboriginal Land Council

RCA Australia

Project: Preliminary Site (Contamination) Assessment

Location: Lots 512 and 513, DP727686, Kariong

RCA ref: 14872-401/1

PHOTOGRAPH 13 *Brick and metal stockpile located within the site adjacent to residential property*



PHOTOGRAPH 14 *Insulation Material*

Client: Darkinjung Local Aboriginal Land Council

RCA Australia

Project: Preliminary Site (Contamination) Assessment

Location: Lots 512 and 513, DP727686, Kariong

RCA ref: 14872-401/1

Appendix E

Screening Levels and Guidelines

NATIONAL ENVIRONMENT PROTECTION (ASSESSMENT OF SITE CONTAMINATION) MEASURE 1999 AS AMENDED 2013

Soil

The investigation and screening levels (ISL) utilised for the assessment of the soil on site were sourced from the National Environment Protection Measure for the Assessment of Site Contamination (ASC NEPM, Ref [4]). These ISL are not derived as acceptance criteria for contamination at a site, but as levels above which specific consideration of risk, based on the site use and potential exposure, is required. If a risk is determined as present, then remediation and/or management must be undertaken.

Assessment ISL are based on:

- Human Health.

Intentionally conservative health investigation levels (HIL) have been derived for four (4) generic land use settings.

- HIL 'A' - Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry). This category includes children's day care centres, preschools and primary schools.
- HIL 'B' - Residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high rise buildings and flats.
- HIL 'C' - Public open space such as parks, playgrounds, playing fields (e.g. ovals) secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves).
- HIL 'D' - Commercial/industrial such as shops, offices, factories and industrial sites.

The exposure scenario for the derivation of the relevant land use setting is set out in the table below.

Health screening levels (HSL) have been determined for risks associated from vapour intrusion from petroleum¹ compound contamination for the same land use settings. These HSL are additionally based on the fraction of compound, the soil texture and the depth of the encountered soil.

Direct hydrocarbon contact criteria are not provided in the ASC NEPM (Ref [4]), however these are provided in CRC Care Technical Report 10 (Ref [4]) which is the source document for the HSL.

- Ecological Health

These levels are considered to apply to soil within two (2) metres of the surface, the root zone and habitation zone of many species.

Ecological investigation levels (EIL) have been determined for arsenic, copper, chromium III, DDT, naphthalene, nickel, lead and zinc in soil based on species sensitivity model and for three (3) generic land use settings:

¹ Laboratory analysis of hydrocarbons is being reported as total recoverable hydrocarbons (TRH). This testing method includes all forms of hydrocarbons, not just petroleum hydrocarbons and therefore can be considered a conservative measure against the chosen TPH criteria. Further laboratory analysis using a silica gel clean up (TRH_{sg}) is considered to enable a better identification of the extent of petroleum based contamination.

- Areas of ecological significance – for areas where the primary intention is for the conservation and protection of the natural environment. Protection level of 99%.
- Urban residential areas and public open space – broadly equivalent to the HIL A, HIL B and HIL C land use settings. Protection level of 80%.
- Commercial and industrial land uses – considered to be broadly equivalent to HIL D land use setting. Protection level of 60%.

Methodology for the derivation of EIL for other contaminants is available in the ASC NEPM (Ref [4]) and requires additional soil character data.

Ecological screening levels (ESL) have been determined for petroleum compound contamination. Due to limitations in the data only moderate reliability ESL have been determined for fractions $<C_{16}$, applied generically in fine and coarse grained soils. ESL for petroleum fractions $> C_{16}$, BTEX and naphthalene are consider low reliability.

- Aesthetics

Aesthetic considerations operate separately to the HIL/HSL and EIL/ESL assessment. Issues to be considered include:

- Highly malodorous soils or extracted groundwater (e.g. strong residual petroleum hydrocarbon odours, hydrogen sulphide in soil or extracted groundwater, organosulfur compounds).
- Hydrocarbon sheen on surface water.
- Discoloured chemical deposits or soil staining with chemical waste other than of a very minor nature.
- Large monolithic deposits of otherwise low-risk material, e.g. gypsum as powder or plasterboard, cement kiln dust.
- Presence of putrescible refuse including material that may generate hazardous levels of methane such as a deep-fill profile of green waste or large quantities of timber waste.
- Soils containing residue from animal burial (e.g. former abattoir sites).

Site assessment requires consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity. For example, higher expectations for soil quality would apply to residential properties with gardens compared with industrial settings.

Tier 1 assessment comprises the comparison of the soil data with the HIL/HSL and EIL/ESL. In the event that some concentrations are in excess of the relevant criteria, the summary statistics of the data set may be utilised for assessment purpose. Consideration of a range of statistics is recommended; at a minimum the 95%UCL_{ave} should be compared to the relevant criteria as long as:

- No single value exceeds 250% of the relevant criterion.
- The standard deviation of the results for each analyte is less than 50% of the relevant criterion.

In addition to appropriate consideration and application of the HSL and ESL, there are a number of policy considerations which reflect the nature and properties of petroleum hydrocarbons:

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

The ASC NEPM (Ref [4]) has therefore provided management limits, the application of which will require consideration of site-specific factors such as the depth of building basements and services and depth to groundwater, to determine the maximum depth to which the limits should apply. The management limits may have less relevance at operating industrial sites (including mine sites) which have no or limited sensitive receptors in the area of potential impact. When the management limits are exceeded, further site-specific assessment and management may enable any identified risk to be addressed.

The presence of site hydrocarbon contamination at the levels of the management limits does not imply that there is no need for administrative notification or controls in accordance with jurisdiction requirements.

The following figure has been taken from the ASC NEPM (Ref [4]) to illustrate the assessment methodology in regards to petroleum contamination.

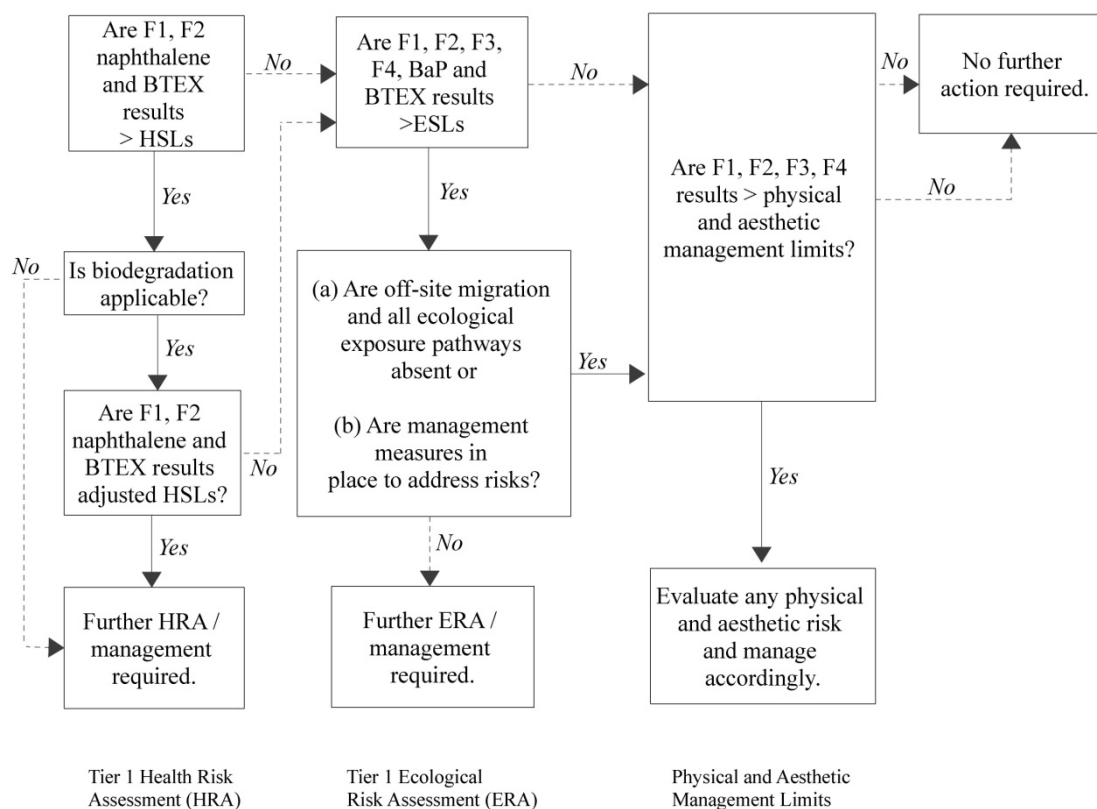


Figure 1 Flowchart for the Tier 1 human and ecological risk assessment of petroleum hydrocarbon contamination – application of HSL and ESL and consideration of management limits

Residential with Garden/Accessible soil

Summary of Exposure Pathways	Abbreviations	Units	Parameters	
			Adult	Child
Body weight	BW _A or BW _C	kg	70	15
Exposure duration	ED _A or ED _C	years	29	6
Exposure frequency	EF	days	365	365
Soil/dust ingestion rate ¹	IR _{SA} or IR _{SC}	mg/day	50 ²	100 ²
Soil/dust to skin adherence factor	AF	mg/cm ² /day	0.5	0.5
Skin surface area	SA _A or SA _C	cm ²	20 000	6100
Fraction of skin exposed	F _s	%	31.5	44.3
Dermal absorption factor	DAF	%	Chemical specific values applied	
Time spent indoors on site each day	ET _i	hours	20	20
Time spent outdoors on site each day	ET _o	hours	4	4
Home-grown fraction of vegetables consumed	F _{HG}	%	10	10
Vegetable & fruit consumption rate	C _y (veg and fruit)	g/day	400	280
Averaging time for carcinogens ('lifetime')	AT _{NT}	years	70	70
Dust lung retention factor	RF	%	37.5	37.5

Soil ingestion rates for children are based on a child aged 2-3 years where normal hand-to-mouth activity is assumed and does not account for pica behaviour

Soil ingestion rates for the HIL A scenario include the ingestion of both outdoor soil, including soil adhering to home-grown produce, and indoor dust (derived from outdoor soil tracked indoors)

Appendix F

Field Sheets

ENVIRONMENTAL SAMPLE COLLECTION RECORD

CLIENT: Barr & Property Group
 PROJECT: 14872
 LOCATION: Kariong
 PROJECT MANAGER: F.B.

DATE: 14.5.2020.
 PROJECT No: 14872.
 CLIENT REF: _____

Sample ID	Location	Depth (m)	PID (ppm)	Sample Type	Sample Description	Comments	Lab (y/n)
	564						
S1	0341517; 6297951	0.05		S	Silty sand, brown with gravels.		
M1	" "	0.05		M	Insulation		
S2	0341577; 6298013	0.05		S	Silty sand, brown. collected from under geofabric.		
S3	0341538; 6298061	0.2		S	Sandy silt brown, with gravels.	from stockpile.	
S4	0341538; 6298065	0.2		S	gravelly silt, brown	from stockpile.	
S5	0341524; 6298076	0.2		S	Silty clay orange/brown	stockpile (small)	
S6	" "	0.1		S	Silty clay orange/brown.	stockpile (small) - small asbestos fragments?	
S7	0341520; 6298085	0.05		S	Sandy silt, brown vegetation present. Adjacent to drum odour.		
S8	" "	0.05		S	Sandy silt brown, vegetation present adjacent to drum odour.		
S9	0341513; 6298091	0.2		S	Silty sand, brown	located inside timber stockpile	
S10	0341455; 6298121	0.2		S	Silty sand, brown with gravel	timber stockpile.	
S11	See photo coordinates	0.1		S	Silty sand, brown near building insulation	small stockpile.	

RCA Australia	Sampled by: <u>C. Roche</u>	Date: _____
Office: _____	Checked by: _____	Date: _____

ENVIRONMENTAL SAMPLE COLLECTION RECORD

CLIENT: Barr & Property Group
 PROJECT: Contamination (Preliminary) site
 LOCATION: Kariong
 PROJECT MANAGER: F.B.

DATE: 14/8/2020
 PROJECT No: 14872
 CLIENT REF: _____

Sample ID	Location	Depth (m)	PID (ppm)	Sample Type	Sample Description	Comments	Lab (y/n)
S12	0341453; 6298156	0.1		S	Sandy silt, light brown	Very small SP with brick/rubbish	
S13	0341439; 6298158	0.05		S	Silty sand light brown	tin pile	
S14		0.05		S	sandy silt dark brown	collected near concrete	
S15		0.05		S	silty sand, brown	collected from timber pile	next to (y/n)
S16		0.05		S	silty sand, brown	collected near tyre)	

RCA Australia	Sampled by: <u>C. Rocher</u>	Date: _____
Office: _____	Checked by: _____	Date: _____

Appendix G

Quality Assurance Review and
Laboratory Report Sheets

RCA omitted the duplicate due to the small number of samples, field blank due to the low potential for cross contamination from field conditions, trip blank and spike due to the presumed absence of volatile compounds and equipment wash due to the low potential for cross contamination from the sampling equipment.

ALS was chosen as the primary laboratory. This laboratory used for analysis is NATA accredited and is experienced in the analytical requirements for potentially contaminated soil and groundwater.

ALS undertook internal quality assurance testing. Results are contained within the laboratory report sheets, included in this **Appendix. Table 8** presents a summary of their review.

Table 8 *Internal Quality Assurance Review*

	Number Samples (including QA)	Laboratory Duplicates	Spikes	Laboratory Control Samples	Laboratory Blanks
Requirement		10%	5%	One every batch	One every batch
Soil					
Metals (As, Cd, Cr, Cu, Ni, Hg, Pb, Zn)	9	1 (2)	1 (1)	2	2
TRH C ₆ -C ₁₀	9	1 (1)	0 (1)	1	1
TRH >C ₁₀ -C ₄₀	9	1 (1)	0 (1)	1	1
BTEX	9	1 (1)	0 (1)	1	1
PAH	9	1 (1)	0 (1)	1	1

Numbers in brackets refer the tests undertaken on samples not from this project but within the same laboratory batch.

Internal duplicate, spikes, laboratory control samples and blanks are not undertaken for asbestos identification in soils or bulk material.

Examination of the above table reveals that ALS has undertaken laboratory quality assurance testing in accordance with the ASC NEPM (Ref [4]).

- Recoveries of Surrogates were within acceptance criteria of 70-130%.
- Holding Times were within laboratory specified time frames.
- Recoveries of laboratory control samples were within the acceptance criteria of 70-130%.
- Recoveries of Spikes were within acceptance criteria of 70-130%.
- Relative Percentage Differences for duplicates were within acceptance criteria as defined in **Table 6**.
- No Laboratory Blank result was detected above the practical quantification limit (PQL).

CERTIFICATE OF ANALYSIS

Work Order : **ES2016825**
Client : **ROBERT CARR & ASSOCIATES P/L**
Contact : MS FIONA BROOKER
Address : PO BOX 175
 CARRINGTON NSW, AUSTRALIA 2294
Telephone : +61 02 4902 9200
Project : 14872
Order number : ----
C-O-C number : ----
Sampler : CARMEN ROCHER
Site : ----
Quote number : SYBQ/400/18
No. of samples received : 10
No. of samples analysed : 10

Page : 1 of 10
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61-2-8784 8555
Date Samples Received : 15-May-2020 15:05
Date Analysis Commenced : 18-May-2020
Issue Date : 21-May-2020 17:13



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Alexander Ristoski	Laboratory Technican	Newcastle - Asbestos, Mayfield West, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- **EA200 Legend**
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200 'Trace' - Asbestos fibres ("Free Fibres") detected by trace analysis per AS4964. The result can be interpreted that the sample contains detectable 'respirable' asbestos fibres
- EA200: For samples larger than 30g, the <2mm fraction may be sub-sampled prior to trace analysis as outlined in ISO23909:2008(E) Sect 6.3.2-2
- EA200: 'Yes' - Asbestos detected by polarised light microscopy including dispersion staining.
- EA200: 'No*' - No asbestos found, at the reporting limit of 0.1g/kg, by polarised light microscopy including dispersion staining. Asbestos material was detected and positively identified at concentrations estimated to be below 0.1g/kg.
- EA200: 'No' - No asbestos found at the reporting limit 0.1g/kg, by polarised light microscopy including dispersion staining.
- EA200: N/A - Not Applicable



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				S1	S3	S6	S8	S9
Client sampling date / time				14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00
Compound	CAS Number	LOR	Unit	ES2016825-001	ES2016825-002	ES2016825-003	ES2016825-004	ES2016825-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	12.7	11.3	5.0	15.1	14.7
EA200: AS 4964 - 2004 Identification of Asbestos in Soils								
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	No	----	No
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	No	----	No
Asbestos Type	1332-21-4	-	--	-	-	-	----	-
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	No	----	No
Organic Fibre	----	0.1	g/kg	No	No	No	----	No
Sample weight (dry)	----	0.01	g	12.2	29.2	36.0	----	14.6
APPROVED IDENTIFIER:	----	-	--	C.OWLER	C.OWLER	C.OWLER	----	C.OWLER
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	<2	6	4	5	2
Copper	7440-50-8	5	mg/kg	<5	7	<5	<5	<5
Lead	7439-92-1	5	mg/kg	<5	9	5	9	7
Nickel	7440-02-0	2	mg/kg	<2	2	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	<5	26	<5	<5	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
Client sampling date / time				S1	S3	S6	S8	S9
Compound				14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00
CAS Number	LOR	Unit		ES2016825-001	ES2016825-002	ES2016825-003	ES2016825-004	ES2016825-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	230
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	230
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	<50	460
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	80
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	120	300
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	240
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	120	620
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	<50	<50	80
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	82.1	92.8	84.5	82.0	84.6
2-Chlorophenol-D4	93951-73-6	0.5	%	85.8	102	84.7	88.2	82.8



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	S1	S3	S6	S8	S9
Client sampling date / time				14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	
Compound	CAS Number	LOR	Unit	ES2016825-001	ES2016825-002	ES2016825-003	ES2016825-004	ES2016825-005	
				Result	Result	Result	Result	Result	
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
2,4,6-Tribromophenol	118-79-6	0.5	%	73.7	75.5	64.8	79.2	80.4	
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%	97.6	100	90.8	99.0	103	
Anthracene-d10	1719-06-8	0.5	%	93.8	94.7	86.7	93.3	94.6	
4-Terphenyl-d14	1718-51-0	0.5	%	99.4	104	94.4	102	102	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	114	117	113	119	117	
Toluene-D8	2037-26-5	0.2	%	109	107	103	111	114	
4-Bromofluorobenzene	460-00-4	0.2	%	104	104	101	106	96.1	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	S10	S12	S13	S15	----
Client sampling date / time				14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	----	
Compound	CAS Number	LOR	Unit	ES2016825-006	ES2016825-007	ES2016825-008	ES2016825-009	-----	
				Result	Result	Result	Result	----	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	21.1	12.1	11.2	13.8	----	
EA200: AS 4964 - 2004 Identification of Asbestos in Soils									
Asbestos Detected	1332-21-4	0.1	g/kg	No	No	No	No	----	
Asbestos (Trace)	1332-21-4	5	Fibres	No	No	No	No	----	
Asbestos Type	1332-21-4	-	--	-	-	-	-	----	
Synthetic Mineral Fibre	----	0.1	g/kg	No	No	No	No	----	
Organic Fibre	----	0.1	g/kg	No	No	No	No	----	
Sample weight (dry)	----	0.01	g	16.1	34.2	14.7	6.97	----	
APPROVED IDENTIFIER:	----	-	--	C.OWLER	C.OWLER	C.OWLER	C.OWLER	----	
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	----	
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	----	
Chromium	7440-47-3	2	mg/kg	3	5	<2	4	----	
Copper	7440-50-8	5	mg/kg	<5	<5	<5	<5	----	
Lead	7439-92-1	5	mg/kg	<5	<5	<5	5	----	
Nickel	7440-02-0	2	mg/kg	<2	<2	<2	<2	----	
Zinc	7440-66-6	5	mg/kg	<5	6	147	20	----	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	----	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	S10	S12	S13	S15	----
Client sampling date / time				14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	----	
Compound	CAS Number	LOR	Unit	ES2016825-006	ES2016825-007	ES2016825-008	ES2016825-009	-----	
				Result	Result	Result	Result	----	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	0.6	0.6	----	
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	1.2	1.2	----	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	----	
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	90	----	
C15 - C28 Fraction	----	100	mg/kg	250	<100	<100	300	----	
C29 - C36 Fraction	----	100	mg/kg	300	<100	120	380	----	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	550	<50	120	770	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	----	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	----	
>C10 - C16 Fraction	----	50	mg/kg	70	<50	<50	90	----	
>C16 - C34 Fraction	----	100	mg/kg	430	<100	160	530	----	
>C34 - C40 Fraction	----	100	mg/kg	260	<100	140	280	----	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	760	<50	300	900	----	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	70	<50	<50	90	----	
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----	
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----	
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----	
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	----	
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%	80.6	84.6	84.5	84.4	----	
2-Chlorophenol-D4	93951-73-6	0.5	%	83.4	92.6	98.6	88.7	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	S10	S12	S13	S15	----
Client sampling date / time				14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	14-May-2020 00:00	----	
Compound	CAS Number	LOR	Unit	ES2016825-006	ES2016825-007	ES2016825-008	ES2016825-009	-----	
				Result	Result	Result	Result	----	
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
2,4,6-Tribromophenol	118-79-6	0.5	%	81.5	71.6	81.4	75.1	----	
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%	87.3	96.7	99.0	96.2	----	
Anthracene-d10	1719-06-8	0.5	%	92.0	94.5	94.8	91.4	----	
4-Terphenyl-d14	1718-51-0	0.5	%	100	105	102	99.4	----	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	119	129	122	124	----	
Toluene-D8	2037-26-5	0.2	%	114	116	116	118	----	
4-Bromofluorobenzene	460-00-4	0.2	%	109	111	112	113	----	



Analytical Results

Sub-Matrix: SOLID (Matrix: SOLID)				Client sample ID	M2	----	----	----	----
Client sampling date / time				14-May-2020 00:00	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES2016825-010	-----	-----	-----	-----	
				Result	----	----	----	----	
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples									
Asbestos Detected	1332-21-4	0.1	g/kg	Yes	----	----	----	----	
Asbestos Type	1332-21-4	-	--	Ch	----	----	----	----	
Asbestos (Trace)	1332-21-4	5	Fibres	N/A	----	----	----	----	
Sample weight (dry)	----	0.01	g	9.89	----	----	----	----	
Synthetic Mineral Fibre	----	0.1	g/kg	No	----	----	----	----	
Organic Fibre	----	0.1	g/kg	Yes	----	----	----	----	
APPROVED IDENTIFIER:	----	-	--	A. RISTOSKI	----	----	----	----	

Analytical Results

Descriptive Results

Sub-Matrix: SOIL		
Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in Soils		
EA200: Description	S1 - 14-May-2020 00:00	Mid brown soil.
EA200: Description	S3 - 14-May-2020 00:00	Mid brown soil.
EA200: Description	S6 - 14-May-2020 00:00	Mid brown soil.
EA200: Description	S9 - 14-May-2020 00:00	Mid brown soil.
EA200: Description	S10 - 14-May-2020 00:00	Mid brown soil.
EA200: Description	S12 - 14-May-2020 00:00	Mid brown soil.
EA200: Description	S13 - 14-May-2020 00:00	Mid brown soil.
EA200: Description	S15 - 14-May-2020 00:00	Mid brown soil.
Sub-Matrix: SOLID		
Method: Compound	Client sample ID - Client sampling date / time	Analytical Results
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	M2 - 14-May-2020 00:00	Two pieces of asbestos cement sheeting approximately 50x25x5mm.



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2,4,6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

QUALITY CONTROL REPORT

Work Order	: ES2016825	Page	: 1 of 9
Client	: ROBERT CARR & ASSOCIATES P/L	Laboratory	: Environmental Division Sydney
Contact	: MS FIONA BROOKER	Contact	: Customer Services ES
Address	: PO BOX 175 CARRINGTON NSW, AUSTRALIA 2294	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 4902 9200	Telephone	: +61-2-8784 8555
Project	: 14872	Date Samples Received	: 15-May-2020
Order number	: ----	Date Analysis Commenced	: 18-May-2020
C-O-C number	: ----	Issue Date	: 21-May-2020
Sampler	: CARMEN ROCHER		
Site	: ----		
Quote number	: SYBQ/400/18		
No. of samples received	: 10		
No. of samples analysed	: 10		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Alexander Ristoski	Laboratory Technican	Newcastle - Asbestos, Mayfield West, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Christopher Owler	Team Leader - Asbestos	Newcastle - Asbestos, Mayfield West, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3025734)									
ES2016504-009	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	22	30	29.3	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	9	9	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	9	<5	54.2	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	21	19	7.55	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	27	15	55.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	57	57	0.00	0% - 50%
ES2016720-004	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	11	10	11.1	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	19	21	10.8	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	7	8	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	19	20	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	12	9	30.8	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	63	52	18.3	0% - 50%
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3025738)									
ES2016825-005	S9	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	2	<2	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	7	6	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	7	34.6	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3025741)									
ES2016825-001	S1	EA055: Moisture Content	----	0.1	%	12.7	12.7	0.00	0% - 50%



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3025735)									
ES2016504-009	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES2016720-004	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3025739)									
ES2016825-005	S9	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3025258)									
ES2016719-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	6.6	7.0	5.51	0% - 50%
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	0.9	1.0	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	15.3	16.3	6.17	0% - 20%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	13.6	14.5	6.60	0% - 20%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	4.3	4.6	6.73	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	5.0	5.1	2.32	0% - 50%
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	6.1	6.1	0.00	0% - 50%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	2.2	2.4	6.01	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	5.2	5.5	6.02	0% - 50%
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	3.2	3.4	7.64	No Limit
		EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	0.7	0.8	0.00	No Limit
		EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	4.1	3.6	12.6	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	67.2	70.8	5.22	0% - 20%
EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	7.6	8.0	5.97	0% - 50%		
ES2016825-008	S13	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit



Sub-Matrix: SOIL

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3025258) - continued									
ES2016825-008	S13	EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3024378)									
ES2016719-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
ES2016825-001	S1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3025259)									
ES2016719-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	120	160	22.1	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	150	160	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES2016825-008	S13	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	120	160	28.3	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3024378)									
ES2016719-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
ES2016825-001	S1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3025259)									
ES2016719-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	230	260	12.6	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	110	130	11.4	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
ES2016825-008	S13	EP071: >C16 - C34 Fraction	----	100	mg/kg	160	190	17.7	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	140	170	17.1	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 3024378)									
ES2016719-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit
ES2016825-001	S1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

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 Work Order : ES2016825
 Client : ROBERT CARR & ASSOCIATES P/L
 Project : 14872



Sub-Matrix: **SOIL**

Laboratory Duplicate (DUP) Report

<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Method: Compound</i>	<i>CAS Number</i>	<i>LOR</i>	<i>Unit</i>	<i>Original Result</i>	<i>Duplicate Result</i>	<i>RPD (%)</i>	<i>Recovery Limits (%)</i>
EP080: BTEXN (QC Lot: 3024378) - continued									
ES2016825-001	S1	EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
				Result	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3025734)									
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	93.8	86.0	126	
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	88.1	83.0	113	
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	84.7	76.0	128	
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	90.6	86.0	120	
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	84.7	80.0	114	
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	92.4	87.0	123	
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	85.8	80.0	122	
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3025738)									
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	91.3	86.0	126	
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	85.0	83.0	113	
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	82.8	76.0	128	
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	91.1	86.0	120	
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	84.1	80.0	114	
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	89.9	87.0	123	
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	81.5	80.0	122	
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3025735)									
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	73.6	70.0	105	
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3025739)									
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	73.6	70.0	105	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3025258)									
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	97.0	77.0	125	
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	94.5	72.0	124	
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	96.6	73.0	127	
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	91.8	72.0	126	
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	94.9	75.0	127	
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	96.9	77.0	127	
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	101	73.0	127	
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	103	74.0	128	
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	92.8	69.0	123	
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	99.8	75.0	127	
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2	0.5	mg/kg	<0.5	6 mg/kg	93.6	68.0	116	
	205-82-3								
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	101	74.0	126	
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	100	70.0	126	



Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report				
					Spike Concentration	Spike Recovery (%)		Recovery Limits (%)	
						LCS	Low	High	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3025258) - continued									
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	91.1	61.0	121	
EP075(SIM): Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	90.3	62.0	118	
EP075(SIM): Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	91.7	63.0	121	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3024378)									
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	92.6	68.4	128	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3025259)									
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	101	75.0	129	
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	103	77.0	131	
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	100	71.0	129	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3024378)									
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	106	68.4	128	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3025259)									
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	99.7	77.0	125	
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	108	74.0	138	
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	81.3	63.0	131	
EP080: BTEXN (QCLot: 3024378)									
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	105	62.0	116	
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	103	67.0	121	
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	105	65.0	117	
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	100	66.0	118	
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	101	68.0	120	
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	83.2	63.0	119	

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report				
				Spike Concentration	Spike Recovery(%)		Recovery Limits (%)	
					MS	Low	High	
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3025734)								
ES2016504-009	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	86.5	70.0	130	
		EG005T: Cadmium	7440-43-9	50 mg/kg	91.0	70.0	130	
		EG005T: Chromium	7440-47-3	50 mg/kg	78.5	70.0	130	
		EG005T: Copper	7440-50-8	250 mg/kg	97.9	70.0	130	
		EG005T: Lead	7439-92-1	250 mg/kg	85.4	70.0	130	
		EG005T: Nickel	7440-02-0	50 mg/kg	92.2	70.0	130	



Sub-Matrix: SOIL

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3025734) - continued							
ES2016504-009	Anonymous	EG005T: Zinc	7440-66-6	250 mg/kg	102	70.0	130
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3025738)							
ES2016825-005	S9	EG005T: Arsenic	7440-38-2	50 mg/kg	94.1	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	91.5	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	91.3	70.0	130
		EG005T: Copper	7440-50-8	250 mg/kg	100.0	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	90.4	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	91.2	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	86.6	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3025735)							
ES2016504-009	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	81.2	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3025739)							
ES2016825-005	S9	EG035T: Mercury	7439-97-6	5 mg/kg	86.4	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3025258)							
ES2016719-001	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	98.0	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	95.8	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3024378)							
ES2016719-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	125	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3025259)							
ES2016719-001	Anonymous	EP071: C10 - C14 Fraction	----	523 mg/kg	88.5	73.0	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	108	53.0	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	128	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3024378)							
ES2016719-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	124	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3025259)							
ES2016719-001	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	110	73.0	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	121	53.0	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	126	52.0	132
EP080: BTEXN (QCLot: 3024378)							
ES2016719-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	102	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	98.3	70.0	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	108	70.0	130
		EP080: meta- & para-Xylene	108-38-3	2.5 mg/kg	126	70.0	130
		EP080: ortho-Xylene	106-42-3	2.5 mg/kg	123	70.0	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	75.1	70.0	130



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2016825	Page	: 1 of 6
Client	: ROBERT CARR & ASSOCIATES P/L	Laboratory	: Environmental Division Sydney
Contact	: MS FIONA BROOKER	Telephone	: +61-2-8784 8555
Project	: 14872	Date Samples Received	: 15-May-2020
Site	: ----	Issue Date	: 21-May-2020
Sampler	: CARMEN ROCHER	No. of samples received	: 10
Order number	: ----	No. of samples analysed	: 10

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**



Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Moisture Content	1	11	9.09	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
S1, S3,	14-May-2020	----	----	----	18-May-2020	28-May-2020	✓
S6, S8,							
S9, S10,							
S12, S13,							
S15							
EA200: AS 4964 - 2004 Identification of Asbestos in Soils							
Snap Lock Bag: Separate bag received (EA200)							
S1, S3,	14-May-2020	----	----	----	18-May-2020	10-Nov-2020	✓
S6, S9,							
S10, S12,							
S13, S15							
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
S1, S3,	14-May-2020	18-May-2020	10-Nov-2020	✓	19-May-2020	10-Nov-2020	✓
S6, S8,							
S9, S10,							
S12, S13,							
S15							



Matrix: SOIL

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T) S1, S6, S9, S12, S15	S3, S8, S10, S13	14-May-2020	18-May-2020	11-Jun-2020	✔	19-May-2020	11-Jun-2020	✔
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM)) S1, S6, S9, S12, S15	S3, S8, S10, S13	14-May-2020	19-May-2020	28-May-2020	✔	19-May-2020	28-Jun-2020	✔
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP080) S1, S6, S9, S12, S15	S3, S8, S10, S13	14-May-2020	18-May-2020	28-May-2020	✔	20-May-2020	28-May-2020	✔
Soil Glass Jar - Unpreserved (EP071) S1, S6, S9, S12, S15	S3, S8, S10, S13	14-May-2020	19-May-2020	28-May-2020	✔	20-May-2020	28-Jun-2020	✔
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080) S1, S6, S9, S12, S15	S3, S8, S10, S13	14-May-2020	18-May-2020	28-May-2020	✔	20-May-2020	28-May-2020	✔
Soil Glass Jar - Unpreserved (EP071) S1, S6, S9, S12, S15	S3, S8, S10, S13	14-May-2020	19-May-2020	28-May-2020	✔	20-May-2020	28-Jun-2020	✔



Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
S1, S3, S6, S8, S9, S10, S12, S13, S15	14-May-2020	18-May-2020	28-May-2020	✓	20-May-2020	28-May-2020	✓

Matrix: **SOLID**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples							
Snap Lock Bag - Friable Asbestos/PSD Bag (EA200)							
M2	14-May-2020	----	----	----	18-May-2020	10-Nov-2020	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
Analytical Methods							
Laboratory Duplicates (DUP)							
Moisture Content	EA055	1	11	9.09	10.00	✖	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	12	16.67	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	24	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	25	12.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	16	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	12	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	24	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	25	8.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	6.25	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	12	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	24	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	25	8.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	6.25	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	12	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	24	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	25	8.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	16	6.25	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 6.1 and Table 1 (14 day holding time).
Asbestos Identification in Soils	EA200	SOIL	AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270E. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260D. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na ₂ SO ₄ and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : ES2016825

Client	: ROBERT CARR & ASSOCIATES P/L	Laboratory	: Environmental Division Sydney
Contact	: MS FIONA BROOKER	Contact	: Customer Services ES
Address	: PO BOX 175 CARRINGTON NSW, AUSTRALIA 2294	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: fionab@rca.com.au	E-mail	: ALSEnviro.Sydney@ALSGlobal.com
Telephone	: +61 02 4902 9200	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 4902 9299	Facsimile	: +61-2-8784 8500
Project	: 14872	Page	: 1 of 3
Order number	: ----	Quote number	: ES2017ROBCAR0004 (SYBQ/400/18)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: CARMEN ROCHER		

Dates

Date Samples Received	: 15-May-2020 15:05	Issue Date	: 15-May-2020
Client Requested Due Date	: 22-May-2020	Scheduled Reporting Date	: 22-May-2020

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 1.1°C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 10 / 10

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- **Asbestos analysis will be conducted by ALS Newcastle.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA055-103 Moisture Content	SOIL - EA200 Asbestos Identification in Soils -	SOIL - EA200B Asbestos Identification in Bulk Solids (Excluding	SOIL - S-26 8 metals/TRH/TEXN/PAH
ES2016825-001	14-May-2020 00:00	S1	✓	✓		✓
ES2016825-002	14-May-2020 00:00	S3	✓	✓		✓
ES2016825-003	14-May-2020 00:00	S6	✓	✓		✓
ES2016825-004	14-May-2020 00:00	S8	✓			✓
ES2016825-005	14-May-2020 00:00	S9	✓	✓		✓
ES2016825-006	14-May-2020 00:00	S10	✓	✓		✓
ES2016825-007	14-May-2020 00:00	S12	✓	✓		✓
ES2016825-008	14-May-2020 00:00	S13	✓	✓		✓
ES2016825-009	14-May-2020 00:00	S15	✓	✓		✓
ES2016825-010	14-May-2020 00:00	M2			✓	

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.



Requested Deliverables

ADMINISTRATOR

- *AU Certificate of Analysis - NATA (COA)	Email	administrator@rca.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	administrator@rca.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	administrator@rca.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	administrator@rca.com.au
- Chain of Custody (CoC) (COC)	Email	administrator@rca.com.au
- EDI Format - ENMRG (ENMRG)	Email	administrator@rca.com.au
- EDI Format - ESDAT (ESDAT)	Email	administrator@rca.com.au
- EDI Format - XTab (XTAB)	Email	administrator@rca.com.au

ALL INVOICES

- A4 - AU Tax Invoice (INV)	Email	administrator@rca.com.au
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CARMEN ROCHER

- *AU Certificate of Analysis - NATA (COA)	Email	carmenr@rca.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	carmenr@rca.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	carmenr@rca.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	carmenr@rca.com.au
- A4 - AU Tax Invoice (INV)	Email	carmenr@rca.com.au
- Chain of Custody (CoC) (COC)	Email	carmenr@rca.com.au
- EDI Format - ENMRG (ENMRG)	Email	carmenr@rca.com.au
- EDI Format - ESDAT (ESDAT)	Email	carmenr@rca.com.au
- EDI Format - XTab (XTAB)	Email	carmenr@rca.com.au

FIONA BROOKER

- *AU Certificate of Analysis - NATA (COA)	Email	fionab@rca.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	fionab@rca.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	fionab@rca.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	fionab@rca.com.au
- A4 - AU Tax Invoice (INV)	Email	fionab@rca.com.au
- Chain of Custody (CoC) (COC)	Email	fionab@rca.com.au
- EDI Format - ENMRG (ENMRG)	Email	fionab@rca.com.au
- EDI Format - ESDAT (ESDAT)	Email	fionab@rca.com.au
- EDI Format - XTab (XTAB)	Email	fionab@rca.com.au



CHAIN OF CUSTODY

ALS Laboratory:
please tick →

DADELAIDE 21 Burna Road Pooraka SA 5096
Ph: 08 8359 0830 E: adelaide@alsglobal.com

BRISBANE 32 Shand Street Sturford QLD 4053
Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callamondah Drive Clinton QLD 4680
Ph: 07 7471 5650 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740
Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 2-4 Waelaf Road Springvale VIC 3171
Ph: 03 8849 6800 E: samples.melbourne@alsglobal.com

MUDJEE 27 Sydney Road Mudjee NSW 2859
Ph: 02 6372 6733 E: mudjee.mali@alsglobal.com

NEWCASTLE 5/565 Millend Rd Mayfield West NSW 2305
Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

NEWCASTLE 4/13 Greay Place North News NSW 2541
Ph: 024423 2083 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090
Ph: 08 9209 7855 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164
Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Drama Court Boite QLD 4818
Ph: 07 4736 0600 E: townsville.environmental@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: RCA Australia	TURNAROUND REQUIREMENTS : <input checked="" type="checkbox"/> Standard TAT (List due date): (Standard TAT may be longer for some tests e.g. Ultra Trace Organics) <input type="checkbox"/> Non Standard or urgent TAT (List due date):	FOR LABORATORY USE ONLY (Circle) Custody Seal Intact? Yes No N/A Has any broken ice bricks present upon receipt? Yes No N/A Random Sample Temperature on Receipt: C Other comment: 1.1
OFFICE: 92 Hill Street, Carrington	ALS QUOTE NO.: SYBQ_400_18	
RCA Ref No: 14872	PROJECT MANAGER: F Brooker	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
SAMPLER: C Rocher	SAMPLER MOBILE: 0478 548 630	RECEIVED BY: MM 2:55pm ANDREW
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	RELINQUISHED BY: HJ
Email Reports to: administrator@rca.com.au + carmenr@rca.com.au + fionab@rca.com.au	RELINQUISHED BY: S. NING	RECEIVED BY: HJ
Email Invoice to: as above	DATE/TIME: 15/05/20 15:00	DATE/TIME: 15/05/20 5:09
Comments/SPECIAL HANDLING/STORAGE OR DISPOSAL:	DATE/TIME: 15/05/20 15:00	DATE/TIME: 15/05/20 7:30 pm

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).					Additional Information	
	LAB ID	Sample ID	Date / Time	Matrix	Type & Preservative (refer to codes below)	Total Containers	S26	EA200-Asbestos absence/presence	Asbestos absence / presence in bulk solids			Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	1	S1	14/5/2020	S		2	X	X				
	2	S3	14/5/2020	S		2	X	X				
	3	S6		S		2	X	X				
	4	S8		S		2	X					
	5	S9		S		2	X	X				
	6	S10		S		2	X	X				
	7	S12		S		2	X	X				
	8	S13		S		2	X	X				
	9	S15		S		2	X	X				
	10	M2	14/5/2020	B		1			X			
						TOTAL						

Environmental Division
Sydney
Work Order Reference
ES2016825

Telephone: +61-2-8704 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airflight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airflight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag

ASB (C) EN

Appendix H

Summary of Results

Sample Identification	PQL	Guideline ^A						S1	S3	S6	S8	S9	S10	S12	S13	S15	
Sample Depth (m) ^B		HSL 'A' HSL 'B'		ESL URPOS		Sensitive ML		DC A	0.05	0.05	0.1	0.05	0,2	0.2	0.1	0.1	0.05
Date		SAND 0-<1m	SILT 0-<1m	Coarse	Fine	Coarse	Fine		14/5/20	14/5/20	14/5/20	14/5/20	14/5/20	14/5/20	14/5/20	14/5/20	14/5/20
Sample Profile								Silty sand, brown with gravel	Sandy silt, brown with gravel	Silty clay, orange/brown	Sandy silt, brown, vegetation present	Silty Sand, brown	Silty sand, brown	Sandy silt, light brown	Silty sand, light brown	Silty sand, brown	
Dominant Stratum ^C								Sand	Sand	Silt	Sand	Sand	Sand	Sand	Sand	Sand	Sand
Sample Purpose								Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample collected by								RCA - CR	RCA - CR	RCA - CR	RCA - CR	RCA - CR	RCA - CR	RCA - CR	RCA - CR	RCA - CR	RCA - CR
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)																	
Benzene	0.2	0.5	0.6	50	65			100	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	0.5	160	390	85	85			14000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5	55	NL	70	125			4500	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
meta- and para-Xylene	0.5								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	0.5								<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Xylenes	1	40	95	105	45			12000	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Polycyclic Aromatic Hydrocarbons (PAH)																	
Naphthalene	1	3	4	170	170			1400	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Recoverable Hydrocarbons (TRH)																	
TRH C ₆ -C ₁₀	10					700	800	4400	<10	<10	<10	<10	<10	<10	<10	<10	<10
TRH >C ₁₀ -C ₁₆	50			120	120	1000	1000	3300	<50	<50	<50	<50	80	70	<50	<50	90
TRH >C ₁₆ -C ₃₄	100			300	1300	2500	3500	4500	<100	<100	<100	120	300	430	<100	160	530
TRH >C ₃₄ -C ₄₀	100			2800	5600	10000	10000	6300	<100	<100	<100	<100	240	260	<100	140	280
F1	10	45	40	180	180				<10	<10	<10	<10	<10	<10	<10	<10	<10
F2	50	110	230						<50	<50	<50	<50	79.5	69.5	<50	<50	89.5

All results are in units of mg/kg.

Blank Cell indicates no criterion available

PQL = Practical Quantitation Limit. Where PQL is for a summation, PQL of all components is summed and may be different from that presented by laboratory

F1 = TRH C₆-C₁₀ minus BTEX. F1 PQL deemed equal TRH C₆-C₁₀.

F2 = TRH/TRH >C₁₀-C₁₆ minus naphthalene. F2 PQL deemed = TRH >C₁₀-C₁₆.

^A ASC NEPM 1999 (amended April 2013) Vapour Based Health Screening Levels (HSL) 'A' (Residential)

^A ASC NEPM 1999 (amended April 2013) Ecological Screening Levels (ESL) URPOS (Urban Residential and Public Open Space)

^A ASC NEPM 1999 (amended April 2013) Management Limits (ML) Sensitive Sites (Residential, open space)

^A CRC Care Technical Report 10, September 2011 Direct Contact (DC) Health Screening Levels 'A' (Residential)

^B Start of sample, generally over a 0.1m interval

^C Note that this is a generalisation for the purpose of comparing to the HSL criteria. Where two strata equally represented, most conservative criterion used

NL designates 'Not Limiting' indicating that the pore water concentration required to constitute a vapour risk is higher than the solubility capacity for that compound based on a petroleum mixture. Vapour is therefore not a risk for this compound.

Results for TRH have been compared to TPH guidelines.

Presented ESL for naphthalene is an Ecological Investigation Level

ESL are applicable for material at less than 2m depths below finished surface/ground level

For the purpose of the Tier 1 ESL/EIL assessment, all background concentrations are assumed to be zero

ESL for TRH >C₁₆-C₃₄ and >C₃₄-C₄₀ are low reliability

Results shown in **BOLD** are in excess of the vapour based HSL

Results shown in shading are >250% of the vapour based HSL

Results shown in underline are in excess of the ESL

Results shown in *italics* are in excess of the management limit

Results shown in patterned cells are in excess of the direct contact HSL

Where summation required (Xylene, F1, F2) calculation includes components reported as non detected as 1/2 PQL.

Sample Identification	PQL	Guideline ^A		S1	S3	S6	M2	S8	S9	S10	S12	S13	S15
Sample Depth (m) ^B		HIL 'A'	EIL URPOS	0.05	0.05	0.1	0.05	0.05	0.2	0.2	0.1	0.05	0.05
Date				14/5/20	14/5/20	14/5/20	14/5/20	14/5/20	14/5/20	14/5/20	14/5/20	14/5/20	14/5/20
Sample Profile				Silty sand, brown with gravel	Sandy silt, brown with gravel	Silty clay, orange/brown	White/cream fibro board approximately fragment 50mm) at location S6	Sandy silt, brown, vegetation present	Silty Sand, brown	Silty sand, brown	Sandy silt, light brown	Silty sand, light brown	Silty sand, brown
Sample Purpose				Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation	Investigation
Sample collected by				RCA - CR	RCA - CR	RCA - CR	RCA CR	RCA - CR	RCA - CR	RCA - CR	RCA - CR	RCA - CR	RCA - CR
Polycyclic Aromatic Hydrocarbons (PAH)													
Naphthalene	0.5		170	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)&(j)fluoranthene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a) pyrene	0.5		0.7	<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a,h)anthracene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	0.5			<0.5	<0.5	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carcinogenic PAH (B(a)P equivalent)	1.21	3		0.605	0.605	0.605	--	0.605	0.605	0.605	0.605	0.605	0.605
Sum of reported PAH	8	300		4	4	4	--	4	4	4	4	4	4
Metals													
Arsenic	5	100	100	<5	<5	<5	--	<5	<5	<5	<5	<5	<5
Cadmium	1	20		<1	<1	<1	--	<1	<1	<1	<1	<1	<1
Chromium	2	100	190	<2	6	4	--	5	2	3	5	<2	4
Copper	5	6000	280	<5	7	<5	--	<5	<5	<5	<5	<5	<5
Mercury	0.1	40		<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lead	5	300	1100	<5	9	5	--	9	7	<5	<5	<5	5
Nickel	2	400	30	<2	2	<2	--	<2	<2	<2	<2	<2	<2
Zinc	5	7400	230	<5	26	<5	--	<5	<5	<5	6	147	20
Asbestos													
Detected Asbestos Weight	0.1			Nil detected -	Nil detected -	Nil detected -	Yes (chrysotile)	--	Nil detected -	Nil detected -	Nil detected -	Nil detected -	Nil detected -
Sample weight				12.2	29.2	36.0			14.6	16.1	34.2	14.7	6.97

All results are in units of mg/kg, except for asbestos.

Blank Cell indicates no criterion available

PQL = Practical Quantitation Limit. Where PQL is for a summation, PQL of all components is summed and may be different from that presented by laboratory

^A ASC NEPM 1999 (amended April 2013) Health Investigation Levels (HIL) 'A' (Residential)

^A ASC NEPM 1999 (amended April 2013) Ecological Investigation Levels (EIL) URPOS (Urban Residential and Public Open Space)

^B Start of sample, generally over a 0.1m interval

The Carcinogenic PAH value is calculated by multiplying the concentration of each of the 8 carcinogenic PAH compounds by its B(a)P toxic equivalence factor and summing these products.

HIL for Chromium are for Chromium VI

Presented ecological value for benzo(a)pyrene is a low reliability Ecological Screening Level

ESL are applicable for material at less than 2m depths below finished surface/ground level

For the purpose of the Tier 1 ESL/EIL assessment, all background concentrations are assumed to be zero

EIL for Naphthalene are for fresh (<2years) Naphthalene

EIL for Arsenic are for aged (>2years) Arsenic

EIL for Chromium are the added contaminant limit for aged (>2years) Chromium III in soils of 1% clay, the most conservative of the criteria.

EIL for Copper are the added contaminant limit for aged (>2years) Copper in soils of pH 6.5.

EIL for Lead are the added contaminant limit for aged (>2years) Lead.

EIL for Nickel are the added contaminant limit for aged (>2years) Nickel in soils of 5% CEC the most conservative of the criteria.

EIL for Zinc are the added contaminant limit for aged (>2years) Zinc in soils of 5% CEC and pH of 6.5, the most conservative of the criteria at pH 6.5.

Results shown in **BOLD** are in excess of the HIL

Results shown in shading are >250% of the HIL

Results shown in underline are in excess of EIL

Where summation required (PAH) calculation includes components reported as non detected as 1/2 PQL.