

16 April 2024
Our ref: JF/C14369

Adhami Pender Architecture
Via email: nabil@adhamipender.com

Attention: Nabil Adhami

Dear Sir

**PROPOSED RESIDENCE
217A BEACH ROAD, DENHAMS BEACH, NSW**

PRELIMINARY ENVIRONMENTAL ASSESSMENT REPORT

We are pleased to present our preliminary environmental assessment report for the proposed residence at 217a Beach Road, in Denhams Beach, NSW.

Adhami Pender Architecture engaged ACT Geotechnical Engineers to undertake a 'Phase 1' preliminary site investigation with soil sampling at 217a Beach Road in Denhams Beach, NSW, to assess the suitability of the site for the proposed residential development. The area that was the subject of this investigation is legally described as Lot 2 of DP 773132 and is approximately 1070m² in size.

The objective of this investigation was to assess the site for potentially contaminating activities that may have occurred on the site or on adjacent properties that may affect the suitability of the site for the proposed development.

The scope of the investigation included the following:

- A site walkover to assess the presence of any pre-existing wastes or material stored on site.
- Reviewing the site history using aerial photographs and undertaking limited soil samples from four (4) boreholes drilled to a maximum depth of 1.0m.
- Laboratory testing of the soil samples for Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylenes, Naphthalene (BTEXN), Organochlorine Pesticides (OCP), Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs), Heavy Metals and Asbestos.

A summary of the results of this investigation is provided below:

- Based on a review of the site history, surface and sub-surface samples were collected and analysed.
- Fill was encountered at borehole locations 1A, 2A and 3A.
- The natural material comprised of residual/colluvial soils and extremely weathered shale bedrock.
- Loose construction debris (bricks, concrete, etc.) and several small pieces of fibrous sheeting (potentially asbestos) were noted during sampling. No olfactory indicators of contamination were noted and no staining was observed in the soil from the boreholes.

- Concentrations of TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos in the samples analysed were below the laboratory limit of reporting and therefore below the adopted assessment criteria.
- The level of analytes evaluated in the soil samples were below detection limits or less than the NEPC (1999) thresholds for residential threshold land-uses.

Based on the results of this investigation, the site is considered suitable for all the permissible land uses under the R2: Low Density Residential zone use, including the proposed development from a contamination perspective.

While it is unlikely that contamination may be encountered during future construction works, it is recommended that an unexpected finds protocol (UFP), with management procedures for asbestos, is implemented prior to construction works commencing. The UFP will assist the construction contractor with identifying and managing any unexpected occurrences of contaminated material.

This investigation has not been completed with the intention of removing soil from the site. Should the removal of soil be necessary, then a soil classification report must be submitted to the Environmental Protection Authority (EPA) in accordance with the requirements of Information Sheet 4 'Requirements for the Reuse and Disposal of Contaminated Soil'.

Should you require any further information, please do not hesitate to contact our office.

Yours faithfully,

ACT Geotechnical Engineers Pty Ltd



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ADHAMI PENDER ARCHITECTURE

**PROPOSED RESIDENCE
217A BEACH ROAD, DENHAMS BEACH, NSW**

PRELIMINARY ENVIRONMENTAL ASSESSMENT REPORT

APRIL 2024

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PROPOSED RESIDENCE
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PRELIMINARY ENVIRONMENTAL ASSESSMENT REPORT

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ADHAMI PENDER ARCHITECTURE

PROPOSED RESIDENCE 217A BEACH ROAD, DENHAMS BEACH, NSW

PRELIMINARY ENVIRONMENTAL ASSESSMENT REPORT

1 INTRODUCTION

At the request of Adhami Pender Architecture, ACT Geotechnical Engineers Pty Ltd carried out a preliminary environmental assessment for a proposed residential development at 217a Beach Road in Denhams Beach, NSW. The project involves the construction of a new two-storey residence with a single-level basement cut ~3m into the sloping site. Therefore, for the purposes of this assessment, the site is considered as residential land-use.

The site was formerly occupied by a residential cottage, and has also been used for storage of construction materials and equipment. Adhami Pender Architecture requested a contamination assessment to determine the current soil contamination status of the site and to confirm suitability for proposed land-use for due diligence, prior to any proposed development.

2 SCOPE OF WORK

ACT Geotechnical Engineers Pty Ltd was commissioned by Adhami Pender Architecture to undertake a preliminary environmental assessment in accordance with the contaminated land management planning guidelines, from the *Contaminated Land Management Act 1997* (CLM Act 1997) and the *State Environmental Policy No. 55 (SEPP 55)* on the proposed development at 217a Beach Road, Denhams Beach, NSW. The objective was to identify potentially contaminating activities of the lot, identify potential contamination types, discuss the site condition, provide a preliminary assessment of possible site contamination and assess the need for further investigation.

The investigation was completed by ACT Geotechnical Engineers Pty Ltd. The scope of work completed as a part of the environmental investigation was as follows:

- Perform a site visit to characterise the property setting, including inspection of the site surface for obvious and visible signs of potential contamination and / or contaminant sources.
- A visual evaluation of surrounding land uses to identify any neighbouring activities which may present a potential risk to health of future occupants and the overall environmental quality of the site.
- An evaluation of aerial photographs to assist in assessing historical land uses and conditions both on and adjacent to the site.
- A review of the environmental setting with regards to geology, topography, hydrology, and hydrogeology.
- Undertake an intrusive site investigation across the site including advancing four (4) borehole for soil sampling within the site.
- Soil samples were collected from each of the four (4) boreholes.
- Undertake soil analysis at a National Associated of Testing Authorities (NATA) accredited laboratory for the analyses of the following contaminants of potential concern (COPC):
 - Total recoverable hydrocarbons (TRH);
 - Benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN);

- Organochlorine pesticides (OCP);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Polychlorinated Biphenyls (PCBs)
- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Asbestos.
- Assess laboratory results obtained from the investigation against the applicable land use criteria.
- Prepare a detailed investigation report presenting the results of the investigation.

The findings of the report are based on the Scope of Work outlined above. ACT Geotechnical Engineers has performed services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties expressed or implied, are made.

The assessment was limited strictly to identifying typical environmental conditions associated with the subject property area and does not include evaluation of any other issues. The absence of any identified hazardous or toxic materials on the subject property should not be interpreted as a guarantee that such materials do not exist on the site.

3 SITE CHARACTERISTICS

The site location and a detailed site plan are presented as Figure 2, Appendix A.

3.1 Site Location and Description

Address	217a Beach Road, Denhams Beach, NSW
Client	Adhami Pender Architecture
Deposited Plans	Lot 7, DP 773132
Locality map	Figure 1
Aerial Photograph	Figure 2
Area	Approximately 1,070m ²
Land Zoning	R2: Low Density Residential
Current land Use	Residential vacant lot

The following description is based on observations made during the site visit conducted during borehole drilling on 22 November 2023:

- The development site is presently vacant and cleared of all materials and the surface stripped bare (based on our site inspection on 25 March 2024 – see attached site photos), however, it was previously being used for storage for construction equipment/materials and as machinery access for adjacent lots (such as skip bins, cleared vegetation, stockpiles of gabion rock and excavated soil material, mobile cranes, and excavators - based on our site inspection on 22 November 2023).
- The investigation area is bounded by Beach Road to the west, coastline to the east and other residential blocks to the north and south.

- Loose construction debris (bricks, concrete, etc.) and several small pieces of fibrous sheeting (potentially asbestos) were noted during sampling. Based on our site inspection on 25 March 2024, this material has been cleared from the site and the site is clear and the surface is bare. No olfactory indicators of contamination were noted.
- The steep slope at the rear (east) of the site had been cleared of vegetation (apart from ~7-8 trees) and had exposed weak shale bedrock with some overlying colluvial soil.

The site was re-inspected on 25 March 2024, and the following observations were made:

- The development site is vacant, and is no longer being used as storage for construction equipment/materials or as machinery access.
- The site had been stripped of all loose topsoil/fill material and any construction rubble, exposing the bare, natural soil below.
- No signs of gross contamination were present.

3.2 Surrounding Land Uses

A summary of the land uses that surround the site are as follows:

- **North:** Low density residential block (2/217 Beach Road, Denhams Beach, NSW)
- **South:** Low density residential block (219a Beach Road, Denhams Beach, NSW)
- **West:** Beach Road
- **East:** Coastline classified as Environmental Conservation land zoning

Historically the site was occupied by a residential cottage and has more recently been used for storage of construction materials and equipment, which may have contaminated the investigation area. Specifically, asbestos from the old demolition works on an unfenced site within the lot is a known concern. Historical and present surrounding land-uses of other sites are not expected to impact the site.

3.3 Sensitive Environment

The closest sensitive environment is the Batemans Marine Park Habitat Protection Zone, which is located directly adjacent to the eastern boundary of the site. This adjacent area is also classified as an environmental conservation area within the Eurobodalla Local Environment Plan 2012.

3.4 Proposed Land Uses

The proposed land use is the construction of a two-storey residence.

4 SITE HISTORY

4.1 Zoning

The investigation area is zoned R2: Low Density Residential under the Environmental Planning and Assessment Act 1979.

4.2 Land-use

As of 22 November 2023, the development site was vacant and was being used for storage of construction equipment and materials. Skip bins, cleared vegetation, stockpiles of gabion rock and excavated soil material, a mobile crane, and an excavator were being stored on site. Loose construction debris was also scattered across the ground surface.

Upon re-inspection on 25 March 2024, all topsoil/fill and construction rubble had been stripped from the site and no signs of any gross contaminants were noted. No construction equipment was being stored on site. See attached site photos.

4.3 Sources of information

- NSW EPA records of public notices under the Contaminated Land Management Act 1997
- Soil and geological maps
- Topographical map
- Aerial photographs (1961, 1969, 1979, 1989, 1997, 2005, 2012, 2015, 2020, 2023)
- Historical Maps (1971, 2015)
- Lotsearch record
- Site inspection 22 November 2023

4.4 Historical site review

A Lotsearch (Environmental Risk Report) was requested, which included historical aerial photographs of the site. These were reviewed to assist with assessing the history of the site. A summary of each photograph examined as a part of the investigation is provided in Section 4.4.1 below and the Lotsearch report in **Appendix D**.

4.4.1 Historical aerial photographs and Historical Map

Year	Site land-use observations	Surrounding land-use
1961	The investigation area appears to be occupied by a residential home.	Beach Road is present to the west of the site within the 150m buffer distance. To the north, south and west, a couple of other lots are also occupied by residential dwellings within the 150m buffer distance. Thick vegetation surrounds the site.
1969	The site does not exhibit any discernible differences.	Further residential development has commenced in all directions of the site, both inside and outside of the buffer distance.
1979	The site does not exhibit any discernible differences.	Beach Road, and other surrounding roads, have been paved. Residential development is on-going in all directions of the site.
1989	The residence on the site has been demolished.	Residential development is on-going in all directions of the site, particularly to the west of the site, outside the buffer distance. New roads have also been added to the west. Significant vegetation removal has occurred to accommodate this.
1997	The site does not exhibit any discernible differences.	More residential dwellings have been constructed in all directions of the site. More removal of vegetation.
2005	The site has been stripped of grass.	The residential lot to the north of the site appears to have constructed an extension.
2012	Equipment/vehicles are being stored on the site.	No changes are evident to the land surrounding the site.
2015	Grass has regrown over the site. Equipment/vehicles are still being stored on the site	No changes are evident to the land surrounding the site.
2020	The site does not exhibit any discernible differences.	No changes are evident to the land surrounding the site.
2023	More construction equipment is being stored on site, as well as other construction debris and stockpiles.	No changes are evident to the land surrounding the site.

4.4.2 EPA Contaminated Search

No recorded contamination activities of the licensed activities under the Protection of the Environmental Operations Act 1997 were identified at 217a Beach Road, Denhams Beach, NSW.

4.4.3 Manufacturing Processes

There are no known manufacturing processes that currently occur or have previously occurred on the site.

4.4.4 Discharges to Land, Water and Air

No information regarding discharges to land, water and air was available for review at the time of writing this report. As no manufacturing operations are known to have occurred at the site, it is unlikely that there may have been previous discharges to land, water, or air in the past.

4.5 Contaminant sources

Potential contamination sources include the demolition works of the original residential cottage, and the storage of construction equipment/materials on the lot. Asbestos is a known concern from the demolition works. Other more recent activities on the lot may have led to TRH, BTEXN, OCP, PAH, PCB, and heavy metal contamination.

4.6 Relevant complaint history

No complaint history known.

4.7 Contaminated site register

The investigation area is not listed on the NSW EPA register of contaminated sites.

4.8 Previous investigations

No previous contamination investigations are known to have been undertaken on the site.

4.9 Integrity assessment

The site history was obtained from a site inspection and history review. The information is consistent with the current site condition and is accurate to the best of the assessor's knowledge.

5 SITE CONDITIONS AND ENVIRONMENTAL SETTING

5.1 Topography

The western side of the site has an elevation of approximately ~RL30m above the Australian Height Datum (m AHD) and dips gently east. The steep bank on the eastern side of the block is ~22m high and dips at an angle of ~40 degrees, with steep sections reaching 60 degrees.

5.2 Indication of Contamination

Loose construction debris (bricks, concrete, etc.) and several small pieces of fibrous sheeting (potentially asbestos) were noted during sampling. No olfactory indicators of contamination or staining were noted.

5.3 Indication of Acid Sulphate Soils

A review of the Australian Soil Resource Information System (ASRIS) map and Lotsearch Report shows the subject site to be situated in an area of 'low probability for acid sulfate soil occurrence'.

5.4 Geology

The 1:100,000 Ulladulla Geology map documents the area to be underlain by Cambrian age Wagonga Beds, comprising chert, conglomerate, agglomerate, slate, sandstone and phyllite.

5.5 Hydrogeology

5.5.1 Surface water

Surface water flows mostly in an easterly direction towards the coast. No dams, permanent streams or lakes were identified on the development site.

5.5.2 Groundwater

A groundwater bore search was provided within the Lotsearch report (**Appendix D**). The purpose of the bore search was to document the location and depth of any nearby registered groundwater bores, and the associated quality of the groundwater so that potential impacts of contaminants from the site or surrounding land uses (if any) on local users of groundwater may be assessed.

Three (3) groundwater bores are located within 400m to 600m north-west of the investigation area. The bores are licensed for water supply.

NSW Bore ID	Date drilled	Direction from site	Distance from site	Status	SWL	Salinity	Depth
GW105996	27/05/2005	North	458m	Functioning	13.50 mbgl	1000 mg/L	38m
GW105984	24/10/2003	North West	482m	Functioning	4.5 mbgl	900 mg/L	30.5m
GW103858	30/09/1998	North West	558m	Unknown	7.0 mbgl	1500 mg/L	21m

Based on the topography of the site and the nearest water body, the groundwater flow direction is inferred to be in an overall easterly direction towards the coast.

5.6 Sensitive Environments

Species on the NSW BioNet Atlas that have a NSW or federal conservation status, a NSW sensitivity status, or are listed under a migratory species agreement, and are within 10km include:

- Regent Honeyeater – Critically Endangered, Category 2 Sensitive Species
- Gang-Gang Cockatoo – Vulnerable, Category 3 Sensitive Species
- South-eastern Glossy Black-Cockatoo – Vulnerable, Category 2 Sensitive Species
- Leafless Tongue Orchid – Vulnerable, Category 2 Sensitive Species
- East Lynne Midge Orchid – Vulnerable, Category 2 Sensitive Species

6 CONCEPTUAL SITE MODEL

Conceptual site models (CSM) are a method of presenting site contamination information and the relationships between sources of contamination, how it may have been introduced to the site, possible pathways for contaminant migration and exposure, and the receptors that may be affected by contaminants.

The following conceptual site model has been prepared based on the information presented in the Lotsearch Report, document searches and site's fieldwork.

The preliminary CSM is presented in the sections below.

6.1 Sources of contamination

Potential contamination sources include the demolition works of the original residential cottage, and the storage of construction equipment/materials on the lot. Asbestos is a known concern from the demolition works. Other more recent activities on the lot may have led to TRH, BTEXN, OCP, PAH, PCB, and heavy metal contamination.

6.2 Contaminants of concern

Based on the historical activities and site inspection the contaminants of concern are:

- Heavy metals (arsenic, cadmium, chromium, copper, nickel, lead, mercury and zinc)
- Total Recoverable Hydrocarbons (TRH)
- Benzene, Toluene, Ethylbenzene and Xylene (BTEXN)
- Organochlorine Pesticides (OCP)
- Polycyclic Aromatic Hydrocarbons (PAH)
- Polychlorinated Biphenyls (PCB) and
- Asbestos.

6.3 Potential receptors

The proposed land-use of the investigation area is residential. Surface water is expected to flow in an easterly direction towards the coastline.

Human receptors include

- On-site works during site development
- Site workers and site visitors
- Intrusive maintenance workers

Ecological receptors include

- Vegetation on the site and adjacent to the site
- Aquatic/marine receptors adjacent to the site and via surface water run-off

6.4 Exposure pathways

Pathways for exposure to contaminants are:

- Dermal contact following soil disturbance
- Ingestion after soil disturbance
- Inhalation of dust after soil disturbance
- Surface water and sediment runoff into nearby waterways
- Leaching of contaminants into the groundwater
- Direct contact of flora and fauna with the soil

6.5 Source receptor linkages

Potential source pathway receptor linkages are identified to enable evaluation of any adverse impact on human health or ecology.

The investigation area is currently vacant, however, construction work for the residential development has been proposed and therefore human receptors to the investigation area are possible. Proposed users of the site may have a risk of exposure if the contaminants are present and the soil is disturbed. Intrusive maintenance workers may also have an increased risk of exposure to contaminants during soil disturbance.

Source/contaminants	Transport	Potential exposure pathways	Receptors
■ Heavy metals from the historical land-use ■ Hydrocarbons impacted from the historical land-use	□ Volatilisation ■ Surface water ■ Groundwater ■ Wind ■ Sedimentation	■ Direct contact (ingestion and absorption) □ Inhalation □ Ingestion	■ On-site workers/visitors ■ Residents/staff ■ Intrusive maintenance and construction workers ■ Ecosystem

■ Potential, □ unknown/unlikely

7 DATA QUALITY OBJECTIVES (DQO)

7.1 State the problem

Historical and surrounding current land-uses may have resulted in contamination. A contamination assessment is required to determine the current soil contamination status and confirm suitability for proposed land-use.

7.2 Identify the decision

The proposed land use is residential land-use. The decision problem is, do the levels of potential contaminants exceed the assessment criteria listed in Section 10.

7.3 Identify the inputs decision

Investigations of the site are required to identify any potential contaminants from historical and current land-use.

7.4 Develop a decision rule

The initial guidelines for soil were the health and ecological investigation levels for residential land-use (NEPC 1999).

If soil contamination was identified, then the contaminant source and extent of contamination was determined.

7.5 Specify acceptable limits on the decision errors.

The 95% upper confidence limit of average levels of samples collected is less than the threshold levels and the results are less than 250% of relevant thresholds.

7.6 Optimize the design for obtaining data

Evaluate information from the previous steps and generate alternative data collection designs. Choose the most resource-effective design that meets all DQOs. Soil samples were collected from the proposed development site covering the north, east, south and west.

Analytes evaluated included TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos.

8 SAMPLING ANALYSIS PLAN AND SAMPLING METHODOLOGY

8.1 Sampling design

A soil investigation was undertaken by four (4) augered boreholes to a target depth of 1.0m (or into natural soil). The geological profile of the soil was described for each borehole, including any detection of hydrocarbon odour and staining.

Discrete soil samples were collected at each borehole location. The representative soil samples were submitted for laboratory analysis.

Schedule of samples collected for laboratory analysis is outlined in Table 1. Sampling locations are presented in Figure 2.

8.1.1 Sampling locations

Discrete soil samples were collected from the borehole locations. A total of ten (10) discrete soil samples were collected for analysis (Figure 2).

8.1.2 Sampling depth

Soil boring and descriptions were undertaken at the borehole locations. Target sampling was from surface level to 200mm/500mm (natural soil) across most of the site.

8.2 Analytes

Soil samples were evaluated for TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos.

8.3 Sampling methods

Four (4) boreholes (1A to 4A) were drilled across the investigation area on 22 November 2023 using a 100mm hand auger to a target depth of 1.0m (or into natural soil). Soil was taken at each individual sampling location and depth.

Discrete soil samples were transferred directly to a solvent rinsed glass jar with a Teflon lid.

Tools were decontaminated between sampling locations to prevent cross contamination by brushing to remove caked or encrusted material, washing in detergent and tap water.

After collection, samples were placed in an insulated container with ice bricks and refrigerated shortly after. Transportation to the laboratory for analysis was in insulated containers with ice bricks.

TABLE 1: Schedule of Samples and Analyses

Sample ID	Depth	Location	Analysis undertaken
1A/1D	0.0m – 0.1m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
1A/2D	0.5m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
1A/3D	0.0m – 0.1m	See Figure 2	Asbestos
2A/1D	0.0m – 0.1m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
2A/2D	0.1m – 0.2m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
2A/3D	0.0m – 0.1m	See Figure 2	Asbestos
3A/1D	0.0m – 0.1m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
3A/2D	0.5m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals
3A/3D	0.0m – 0.1m	See Figure 2	Asbestos
4A/1D	0.0m – 0.1m	See Figure 2	TRH, BTEXN, OCP, PAHs, PCBs, Heavy Metals

9 QUALITY ASSURANCE AND QUALITY CONTROL

9.1 Sampling design

The sampling program is intended to provide data regarding the presence and levels of contaminants in the soil.

Discrete soil samples were collected across the site. The sampling density will enable the detection of an area with a 95% confidence level.

The number and location of samples taken is expected to provide an adequate assurance that the soil samples are representative of the site as a whole.

9.2 Field

The collection of samples was undertaken in accordance with accepted standard protocols (NEPC 1999).

Selected discrete soil samples collected from the site were analysed for TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos.

Sampling equipment was decontaminated between each sampling event. The appropriate storage conditions and duration were observed between sampling and analysis. A chain of custody form accompanied the samples to the laboratory (**Appendix C**).

A single sampler was used to collect the samples using standard methods. Soil collected was a fresh sample from a hand shovel. After collection the samples were immediately placed in new glass sampling jars and placed in a cooler.

No field blank, rinsate, trip blank or matrix spikes were submitted for analysis. A field sampling log is presented in **Appendix B**. Refrigerated storage and transportation in insulated containers with ice bricks by overnight couriers ensured the integrity of the samples. Samples from each batch did not contain detectable levels of some analytes which indicates adequate sampling integrity and no cross contamination in sampling and transport.

9.3 Laboratory

Chemical analysis was conducted by Envirolab Services Pty Ltd, Sydney, which is NATA accredited for the tests undertaken. The laboratories have quality assurance and quality control programs in place, which include internal replication and analysis of spike samples and recoveries.

Method blanks, matrix duplicates and laboratory control samples were within acceptance criteria. The quality assurance and quality control report are presented together with the laboratory report as **Appendix C**.

9.4 Data evaluation

The laboratory quality control report indicates the data variability is within acceptable commercial limits. The data is considered representative and usable for the purposes of the investigation.

Method blanks, matrix spikes, matrix duplicates and laboratory control samples were within acceptance criteria. The quality assurance and quality control report are presented together with the laboratory report in **Appendix C**.

10 ASSESSMENT CRITERIA

The proposed land-use of the site is residential, and the laboratory results were assessed against the relevant criteria.

The health-based investigation levels of contaminants in the soil for a residential site, for the substances for which criteria are available, are listed in Table 2, as recommended in the NEPM (1999).

The NEPM (1999) provides health screening levels (HSL) for hydrocarbons in soil. The HSLs have been developed to be protective of human health for soil types, depths below surface and apply to exposure to hydrocarbons through the predominant vapour exposure pathway. The appropriate HSL for the site is listed in Table 3. TRH>C16 have physical properties which make the TRH fractions non-volatiles and therefore these TRH fractions are not limiting for vapour intrusion.

Ecological investigation levels (EIL) have been developed for the protection of terrestrial ecosystems for selected metals and organic substances in the soil in the guideline (NEPC 1999). Ecological screening levels (ESL) assess the risk to terrestrial ecosystems from petroleum hydrocarbons in the soil. The EILs and ESLs consider the properties of the soil and contaminants and the capacity of the local ecosystem to accommodate increases in contaminant levels. EILs vary with land-use and apply to contaminants up to 2m depth below the surface. The EILs for residential land-use are listed in Table 4. ESLs are dependent on land-use, soil types and are applicable to contaminants up to 2m below the surface. The appropriate ESLs for the site are listed in Table 3.

Management limits have been developed to assess petroleum hydrocarbons following evaluation of human health and ecological risks (NEPC 1999). Management units are applicable as screening levels after consideration of relevant ESLs and HSLs. The appropriate management limit for the site is listed in Table 3.

Typical CEC values for soils in the locality include 10cmol(+)/kg, pH values of between 5 and 6, organic carbon of 2% and clay content of 20 to 30% (Espade, 2019). The proposed land-use is low density residential.

TABLE 2: Health Investigation Levels (HIL) – Residential A Land-Use Category (NEPC 1999)

Analyte	HIL Residential A (mg/kg)
Arsenic	100
Cadmium	20
Chromium (VI)	100
Copper	7,000
Lead	300
Nickel	400
Zinc	8,000
Mercury	7
DDT+DDE+DDD	260
PAHs (total)	300
PCBs (total)	1

HIL – health investigation level

TABLE 3: Investigation and Screening Levels (HSL) – Residential A Land-Use Category/Urban Residential and public open space land-use (NEPC 1999)

Analyte	HSL-A Residential / clay soil (mg/kg)			ESL Urban residential and public open space (mg/kg)	Management limits for TRH Residential, Parkland and public open space (mg/kg)
	0m to <1m	1m to <2m	2m to <4m		
TRH (C6-C10)	60	100	180	180	800
TRH (>C10-C16)	330	NL	NL	120	1,000
TRH (>C16-C34)	NA	NA	NA	1,300	3,500
TRH (>C34-C40)	NA	NA	NA	5,600	10,000
Benzene	0.8	1	2	65	NA
Toluene	560	NL	NL	105	NA
Ethylbenzene	NL	NL	NL	125	NA
Xylenes	130	310	NL	45	NA
Naphthalene	6	NL	NL	NA	NA

HIL – health investigation level, HSL – health screening level, EIL – ecological investigation level, ESL – ecological screening level, NL – non limiting, NA – not applicable

TABLE 4: EIL Calculation sheet – Urban residential and public open space land-use (NEPC 1999)

Analyte	Rationale	ACL (mg/kg)	ABC (mg/kg)	EIL (mg/kg)
Zinc	CEC 10cmol/kg, pH 5.5	270	0	270
Copper	pH 5.5	130	0	130
Nickel	CEC 10cmol/kg	170	0	170
Lead	Generic	1,100	0	1,100
Arsenic	Aged	100	0	100
DDT	Aged	180	0	180
Naphthalene	Aged	170	0	170

ACL – added contaminant limit, ABC – ambient background concentration, EIL – Ecological investigation limit (ACL+ABC)

11 RESULTS

11.1 Soil Results

The findings from site inspection and laboratory analytical results of the investigation area presented in the following sections.

11.2 Visual Observations / Field Measurements

The majority of the surface of the site was covered by topsoil and fill material. No surface staining was detected on the site.

Uncontrolled fill material and topsoil was encountered in boreholes 1A, 2A and 3A to a depth of 0.1m/0.5m.

The natural colluvial/residual soil and extremely weathered shale bedrock was encountered below the fill in all boreholes.

Loose construction debris (bricks, concrete, etc.) and several small pieces of fibrous sheeting (potentially asbestos) were noted during sampling. No olfactory indicators of contamination or staining were noted.

A copy of the sampling log is presented in **Appendix B**.

11.3 Analytical Results

The levels of all substances analysed in the soil samples (Table 5-9) collected from the site were not detected or at environmental background levels for proposed residential land-use thresholds (NEPM 1999).

TABLE 5: Analytical results and threshold concentrations (mg/kg)

Sample ID	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Mercury (mg/kg)
1A/1D (0.0m – 0.1m)	86	<0.4	9	23	15	2	9	<0.1
1A/2D (0.5m)	29	<0.4	7	20	16	2	42	<0.1
2A/1D (0.0m – 0.1m)	13	<0.4	6	19	15	1	31	<0.1
2A/2D (0.1m – 0.2m)	27	<0.4	8	22	27	2	48	<0.1
3A/1D (0.0m – 0.1m)	30	<0.4	12	22	20	4	90	<0.1
3A/2D (0.5m)	25	<0.4	4	18	8	<1	8	<0.1
4A/1D (0.0m – 0.1m)	33	<0.4	8	26	100	<1	58	<0.1
Health Investigation Levels – Residential A Land-Use								
Disturbed	100	20	100	7,000	300	400	8,000	7
Ecological Investigation Levels – Urban Residential and Public Open Space								
Disturbed	100	NA	NA	130	1,100	170	270	NA

TABLE 6: Analytical results and threshold concentrations for BEXTN

Sample ID	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylene (mg/kg)	Naphthalene (mg/kg)
1A/1D (0.0m – 0.1m)	<0.2	<0.5	<1	<1	<1
1A/2D (0.5m)	<0.2	<0.5	<1	<1	<1
2A/1D (0.0m – 0.1m)	<0.2	<0.5	<1	<1	<1
2A/2D (0.1m – 0.2m)	<0.2	<0.5	<1	<1	<1
3A/1D (0.0m – 0.1m)	<0.2	<0.5	<1	<1	<1
3A/2D (0.5m)	<0.2	<0.5	<1	<1	<1
4A/1D (0.0m – 0.1m)	<0.2	<0.5	<1	<1	<1
Health Screening Levels – Residential A Land-Use / clay soil up to 1.0m depth					
	0.8	560	NL	130	6
Ecological Investigation Levels – Urban Residential and Public Open Space					
	NA	NA	NA	NA	170
Ecological Screening Levels – Urban Residential and Public Open Space					
	65	105	125	45	NA

TABLE 7: Analytical results and threshold concentrations for TRH

Sample ID	C6 – C10 (mg/kg)	>C10 – C16 (mg/kg)	>C16 – C34 (mg/kg)	>C34 (mg/kg)
1A/1D (0.0m – 0.1m)	<50	<50	<100	<100
1A/2D (0.5m)	<50	<50	<100	<100
2A/1D (0.0m – 0.1m)	<50	<50	<100	<100
2A/2D (0.1m – 0.2m)	<50	<50	<100	<100
3A/1D (0.0m – 0.1m)	<50	<50	160	<100
3A/2D (0.5m)	<50	<50	<100	<100
4A/1D (0.0m – 0.1m)	<50	<50	110	<100
Health Screening Levels – Residential A Land-Use / clay soil up to 1.0m depth				
	60	330	NA	NA
Ecological Screening Levels – Urban Residential and Public Open Space				
	180	120	1,300	5,600
Management limits for TRH Residential, Parkland and Public Open Space				
	800	1,000	3,500	10,000

TABLE 8: Analytical results and threshold concentrations for Organochlorine Pesticides, Polycyclic Aromatic Hydrocarbons (PAHs) and PCBs.

Sample ID	DDT+DDE+DDD (mg/kg)	PAHs (sum) (mg/kg)	PCBs (sum) (mg/kg)
1A/1D (0.0m – 0.1m)	<0.1	<0.05	<0.1
1A/2D (0.5m)	<0.1	<0.05	<0.1
2A/1D (0.0m – 0.1m)	<0.1	<0.05	<0.1
2A/2D (0.1m – 0.2m)	<0.1	<0.05	<0.1
3A/1D (0.0m – 0.1m)	<0.1	<0.05	<0.1
3A/2D (0.5m)	<0.1	<0.05	<0.1
4A/1D (0.0m – 0.1m)	<0.1	<0.05	<0.1
Health Investigation Levels – Residential A Land-Use			
	260	300	1
Ecological Investigation Levels – Urban Residential and Public Open Space			
	180	NA	NA

TABLE 9: Analytical results for Asbestos in soil

Sample ID	Analysis	
	Asbestos ID in soil	Trace Analysis
1A/3D (0.0m – 0.1m)	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected
2A/3D (0.0m – 0.1m)	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected
3A/3D (0.0m – 0.1m)	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected

12 SITE CHARACTERISATION

12.1 Chemical degradation production

Not applicable as no contamination was identified.

12.2 Exposed population

Not applicable as no contamination was identified.

13 INCIDENT NOTIFICATION/DUTY OF REPORT

13.1 Section 60 Contaminated Land Management Act 1997

Under Section 60 of the CLM Act, a person whose activities have contaminated land or a landowner whose land has been contaminated are required to notify EPA when they become aware of the contamination.

Triggers to notification include:

13.1.1 On-site soil contamination

- the 95% upper confidence limit on the arithmetic average concentration of contamination in or on soil, on the land is equal to, or above the EPA health investigation level or guidelines

OR

- the concentration of a contaminant in an individual soil sample is above two and a half times the EPA investigation level or guideline

AND

- a person has been, or foreseeable will be, exposed to the contaminant or any by-product of the contaminant

Response: No contamination was identified in the soil samples analysed.

13.1.2 Off-site soil contamination

- the 95% upper confidence limit on the arithmetic average concentration of contamination in or on soil, on the land is equal to, or above the EPA health investigation level or guidelines

OR

- the concentration of a contaminant in an individual soil sample is above two and a half times the EPA investigation level or guideline

AND

- the concentration of the contaminant in, or on, the soil on the neighbouring land will foreseeable continue to remain above the specified concentration

Response: No contamination was identified in the soil samples analysed.

13.1.3 Foreseeable contamination of neighbouring land

- the contaminant will foreseeably enter neighbouring land

AND

- the concentration of contamination of neighbouring land is above the above the EPA health investigation level or guidelines

AND

- the concentration of contaminant will foreseeable continue to remain above the specified concentration

Response: No contamination was identified in the soil samples analysed.

13.2 Overall assessment

It is concluded with the information available the appropriate regulatory authority or EPA is not required to be notified as no contamination was identified on the site soil.

14 CONCLUSIONS

The development site was vacant and was being used for storage of construction equipment and materials at the time of sampling on 22 November 2023. Samples were collected from the target area.

The site was re-inspected by ACT Geotech on 25 March 2024, which found that all previous construction activities had been completed. The site was stripped of all loose topsoil/fill material and construction rubble, exposing the bare, natural soil below. No construction equipment or materials were being stored on site. At the time of re-inspection, there were no signs of any gross contamination.

The soil samples were analysed for TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos.

No hydrocarbon odour was observed in the boreholes. The TRH, BTEXN, OCP, PAH, PCB, Heavy Metals and Asbestos levels in all soil samples collected were less than the assessment thresholds.

Whilst no asbestos levels were detected at the reporting limit of 0.1 g/kg, organic fibres were detected in all the collected soil samples.

No natural occurrence asbestos (NOA) was identified at the borehole locations, however, several small pieces of fibrous sheeting (potentially anthropogenic asbestos) were identified at the time of sampling (22 November 2023). Upon re-inspection on 25 March 2024, no signs of fibrous sheeting were detected.

14.1 Assumptions in reaching the conclusions

The assessment is comprised of a desktop study, site inspections, subsoil investigations and soil analysis. It is assumed the sampling sites are representative of the site. An accurate history has been obtained and typical management practices were adopted.

14.2 Extent of uncertainties

The analytical data relates only to the locations sampled. Soil conditions can vary both laterally and vertically and it cannot be excluded that unidentified contaminants may be present.

14.3 Suitability for proposed use of the site

The site is suitable for proposed childcare center/residential land-use.

14.4 Limitations and constraints on the use of the site

No constraints are recommended.

14.5 Recommendations

No constraints are recommended.

15 REPORT LIMITATIONS AND INTELLECTUAL PROPERTY

This report has been prepared for the use of the client to achieve the objectives given the client requirements. The level of confidence of the conclusion reached is governed by the scope of the investigation and the availability and quality of existing data. Where limitations or uncertainties are known, they are identified in the report. No liability can be accepted for failure to identify conditions or issues which arise in the future and which could not reasonably have been predicted using the scope of the investigation and the information obtained.

The investigation identifies the actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing is interpreted by geologists, engineers or scientists who then render an opinion about overall subsurface conditions, the nature and extent of the contamination. Actual conditions may differ from those inferred to exist, because no professional, no matter how well qualified, and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock or time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. It is thus important to understand the limitations of the investigation and recognise that we are not responsible for these limitations.

This report, including data contained and its findings and conclusions, remains the intellectual property of ACT Geotechnical Engineers Pty Ltd. This report should not be used by persons or for purposes other than those stated and should not be reproduced without the permission of ACT Geotechnical Engineers Pty Ltd.

REFERENCES

NSW EPA (2017) Guidelines for the NSW Site Auditor Scheme (3rd Ed.)

NSW EPA (1995) Sampling Design Guidelines (1995)

NSW EPA (2020) Contaminated Land Guidelines - Consultants Reporting on Contaminated Land

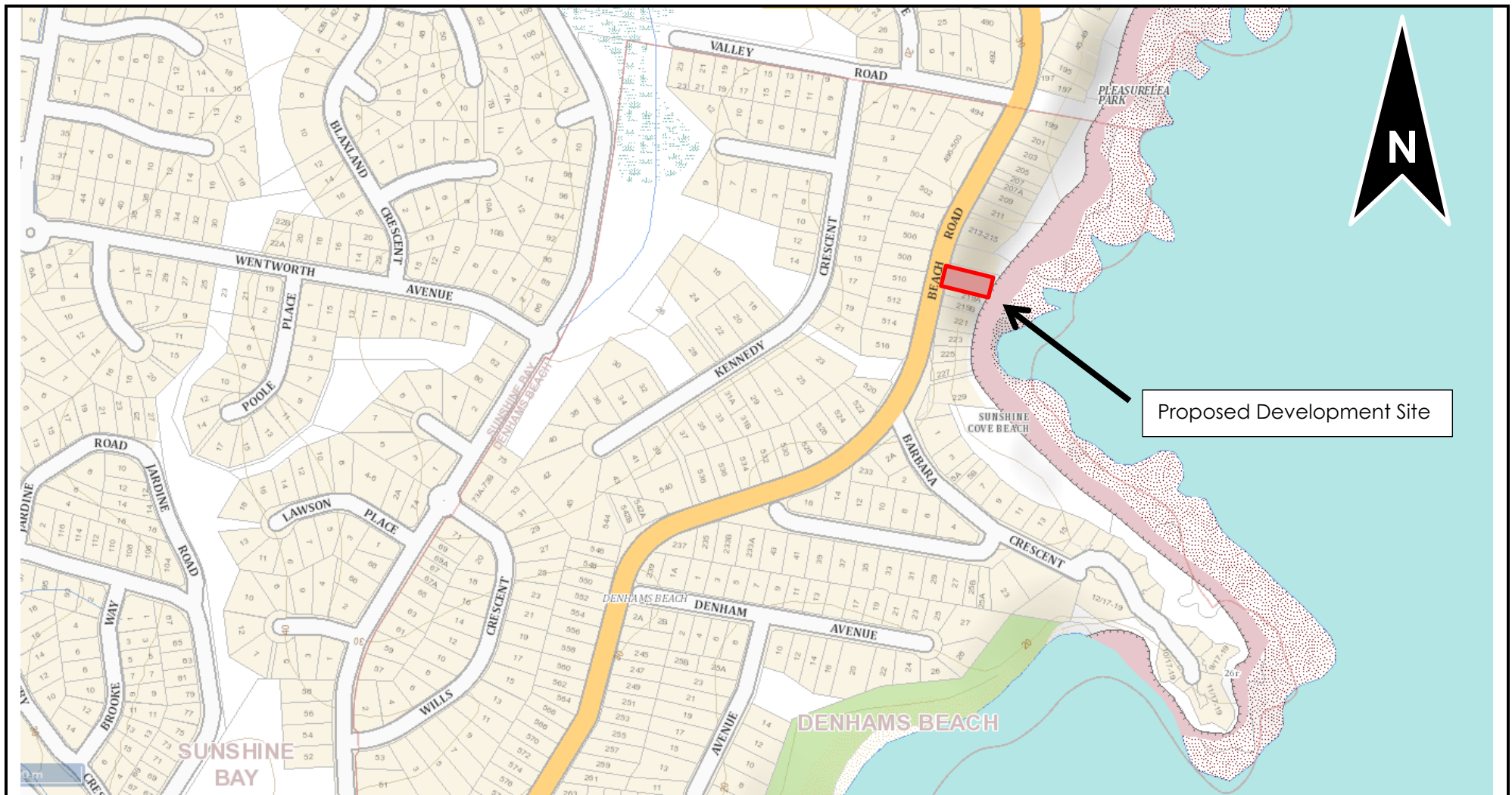
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Bureau of Mineral Resources, Geology and Geophysics (1984) '1:100,000 Hydrogeology of the Australian Capital Territory and Environs'.

NSW Department of Primary Industries (2018), *Batemans Marine Park Zoning Map*, NSW Government.

APPENDIX A

Figures



ADHAMI PENDER ARCHITECTURE
 PROPOSED RESIDENCE – 217A BEACH ROAD, DENHAM BEACH, NSW
 SITE LOCALITY





ADHAMI PENDER ARCHITECTURE
PROPOSED RESIDENCE – 217A BEACH ROAD, DENHAMS BEACH, NSW
SITE PHOTOGRAPHS FROM RE-INSPECTION ON 25 MARCH 2024

APPENDIX B

Sampling Log

Appendix B. Field sampling log

Client Adhami Pender Architects

Job number C14369

Location Lot 2 DP773132 Beach Road, Denhams Beach, NSW

Date 22 November 2023

Investigator(s) Jeremy Murray

Weather conditions Warm and sunny

Sample ID	Matrix	Analysis required	Observations/comment
1A/1D	Uncontrolled Fill	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.0m – 0.1m
1A/2D	Colluvial Soil?	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.5m
1A/3D	Uncontrolled Fill	Asbestos	Discrete Sample Depth; 0.0m – 0.1m
2A/1D	Uncontrolled Fill	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.0m – 0.1m
2A/2D	Extremely Weathered Shale Bedrock	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.1m – 0.2m
2A/3D	Uncontrolled Fill	Asbestos	Discrete Sample Depth; 0.0m – 0.1m
3A/1D	Topsoil	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.0m – 0.1m
3A/2D	Extremely Weathered Shale Bedrock	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.5m
3A/3D	Topsoil	Asbestos	Discrete Sample Depth; 0.0m – 0.1m
4A/1D	Residual Soil	TRH, BTEX, OCP, PAH, PCB, Heavy Metals.	Discrete Sample Depth; 0.0m – 0.1m

APPENDIX C

NATA Laboratory Certificate of Analysis, Quality Control and Chain of Custody Documentation

APPENDIX D
Lotsearch Environmental Risk Report

APPENDIX E

Definitions and Limitations