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Remediation Action Plan

Client: Health Infrastructure

Site Address: World Class End of Life Care, Tamworth Hospital, 31 to 35 Dean Street, Tamworth NSW 2340

24 April 2025

Our Reference: 44178-ER01_A

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Client:	Health Infrastructure
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Prepared by:	Reviewed by:
	
Tiffany Skinner BNatRes (Hons) Environmental Scientist	Leah Desborough BNatRes (Hons) CEnvP Senior Environmental Scientist

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1.0 INTRODUCTION

1.1 Background

Barnson was engaged by Health Infrastructure to prepare a Remediation Action Plan for remediation of identified contamination at World Class End of Life Care, Tamworth Hospital, 31 to 35 Dean Street, Tamworth NSW.

Contamination investigations undertaken by Barnson in 2024 (Report number R44178c1) identified areas of environmental concern requiring remediation. The areas requiring remediation include carcinogenic PAH and benzo(a)pyrene impacted soil around sample location 06 and total recoverable hydrocarbons >C10-C16 (F2) around sample location 03.

A Remedial Action Plan (RAP) was recommended to manage works to make the site suitable for proposed palliative care facility. The RAP is required to develop an effective plan to remediate the impacted areas to enable proposed land-use.

1.2 Objectives

The objectives of the Remedial Action Plan are:

- Set remediation goals based on land-use threshold,
- Propose a cost effective and workable remediation method,
- Establish a validation procedure for the site,
- Classify the excavated material for determination of disposal options,
- Ensure remediation works comply with:
    - Guidelines for Consultants Reporting on Contaminated Sites (NSW EPA, 2020)
    - Guidelines for NSW Site Auditor Scheme (NSW EPA, 2017)
    - The Contaminated Land Management Act (1997)
    - State Environmental Planning Policy (Resilience and Hazards) 2021
    - National Environment Protection (Assessment of Site Contamination) Measure 1999 NEPC (2013)

1.3 Scope of Work

To meet the objectives, Barnson completed the following scope of work:

- Review of previous investigations
- Review of remediation options
- Preparation of a report outlining the steps regarding remediation methods, engineering methods and management procedures to be adopted during remediation works.

2.0 SITE SETTING

2.1 Site Identification

A summary of the available information pertaining to the site is present in Table 2.1.

Table 2.1: Site Setting Summary

Information	Details
Site address	Tamworth Hospital, 31 to 35 Dean Street, Tamworth NSW
Site (approx.)	1,500m^2
Lot and Deposited Plan No.	Lot 1 DP1181268
Zoning	R1 – General Residential
County	INGLIS
Parish	TAMWORTH
Local Government Area	Tamworth Regional Council

2.2 Environmental Setting

Information describing the environmental setting of the site was presented in the PSI report prepared by Barnson (Barnson Pty Ltd, 2024). Table 2.2 presents a summary of the information for ease of reference.

Table 2.2: Summary of Site Environmental Setting

Information	Details
Existing land-use	The site is a vacant landscaped area within the *Tamworth Hospital* grounds Tamworth NSW. A gravel path traverses east to west through the central section providing pedestrian access to the site. Gardens are present north and south of the path with seating available.
Surrounding land-uses	The site is within the *Tamworth Hospital* grounds. The site is adjoined by hospital infrastructure, access roads and landscaped areas.
Surface cover	The site is landscaped with areas of lawn on steeper slopes. A hardstand gravel pathway traverses the site. Landscaped areas contained native species with the surface covered by mulch. Lawn and broadleaf weeds were present throughout the mulch. Mulched areas were underpinned by black plastic weed matting.

Topography	Natural morphology of the site has been disrupted. The site morphology is a mid-slope with an inclination of 3-5% southeast. The site elevation ranges from 418m in the north to 416m in the south of the site.
Soils	The site is within the Orchard Creek Soil Landscape (NSW Government, nd). Topsoil in the Orchard Creek Soil Landscape consists of a dark reddish brown to dark brown silty clay loam with a clear boundary change to a dark reddish brown to dark brown silty clay loam to 50cm over a medium clay to 300cm. Natural sub soils observed on-site comprised reddish brown to yellowish brown and yellow sandy silty clay, sandy clay, and light medium clay. Sand and gravel occurred throughout the profiles. Various layers of gravelly to clayey sand and gravelly to sandy clay fill of varied depths was identified across the site.
Geology	The geological unit of the Orchard Creek Soil Landscape is the Baldwin Formation and the Yarrimie Formation. Parent rocks include quartz sandstone, lithic sandstone, conglomerate, ferruginous sandstone and red siltstone. Tertiary basalt also occurs on the site. (NSW Government, nd).
Groundwater	No groundwater bores were identified in the investigation area on the NSW Government Water NSW website (2024). Four registered groundwater bores were identified within 500m of the investigation area on the NSW Government Water NSW website (2024). The bores are licenced for domestic, irrigation, industrial and general purposes. Water-bearing zones (WBZ) for bores in which information was provided were from 24.50m to 34m in basalt and shale. Standing water levels were from 13.7m at the time of drilling.
Local hydrology	Surface water is expected to infiltrate. Any excess water flows will follow topography on-site and flow to the south. A stormwater grate is located to the south. Stormwater is expected to discharge to Spring Creek located approximately 300m east of the investigation area.
Summary of council records	The site is mapped on the heritage map as an area of local significance (NSW Planning Portal 2025). The main group of hospital buildings to which the local significance applies are located greater than 100m south of the investigation area.
Naturally occurring contaminants	No natural sources of PAH were identified. The investigation area is not mapped as an acid sulphate soil risk (State Government of NSW and Department of Planning, Industry and Environment 1998).

	The site is not mapped as a geological unit with asbestos potential (State Government of NSW and Department of Regional New South Wales 2015).

2.3 General Site History

The site was dedicated to the Tamworth Hospital on 18 November 1881. The original Tamworth Hospital was first opened in 1884. Historical parish maps indicate additional land acquisitions to the hospital site in 1916 and 1931.

Aerial photography indicates a structure was erected on the site prior to 1975. The structure is expected to have been part of the Tamworth hospital infrastructure. No obvious changes to the site occurred until redevelopment of the hospital in 2015.

2.4 Previous Investigations

Barnson Pty Ltd (2024) Preliminary contamination investigation, World Class End of Life Care, Tamworth Hospital, 31 to 35 Dean Street, Tamworth NSW (Report number R44178c1)

A preliminary contamination investigation was undertaken by Barnson Pty Ltd in 2024 (Barnson report number R44178c1).

An inspection of the site was made on 12 May 2024. On the day of inspection the site was landscaped. A hospital building was historically present on part of the site.

Surface cover on the investigation area is landscaped gardens with areas of lawn on steeper slopes. A hardstand gravel pathway traverses the site. The lawn area was generally 100% surface cover.

No buildings were located on-site. The use and construction materials of a hospital building previously located on the site is unknown.

Deep fill was identified at all borehole locations up to a depth of 2.0m. Depth of fill varied across the site. Fill comprised various layers of gravely to clayey sand to gravelly to sandy clay with fine to coarse gravel.

Discrete soil samples were collected from the investigation area on an approximate 10m grid pattern. Eight soil samples were collected from the near surface of the investigation area and analysed for contaminants of concern. Contaminants of concern are heavy metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAH) and asbestos.

Boreholes drilled on the site as part of geotechnical investigations were used to assess the presence of fill on the investigation area. If fill was identified a representative soil sample was collected for analysis of contaminants of concern.

The source of fill on the site is unknown and is likely from numerous off-site sources. Abundant brick fragments and concrete gravels were identified to the fill depth at borehole locations.

Levels of carcinogenic PAH and benzo(a)pyrene in one sample exceeded the adopted health investigation level (HIL) and the ecological screening level (ESL). Statistical analysis did not meet satisfactory acceptance limits for residential land-use. Contaminants were identified in grey gravelly sand topsoil fill material.

Total recoverable hydrocarbons >C10-C16 (F2) in one sample exceeded the ESL. F2 levels were equal to the HIL. Statistical analysis did not meet satisfactory acceptance limits for residential land-use.

Contaminants were identified in dark brown to brown gravelly to silty sand topsoil fill material. Existing vegetation receptors are expected to be removed.

Levels of remaining hydrocarbon contaminants and heavy metals analysed were less than the adopted residential thresholds for human health and environment in all near surface soil samples collected from the investigation area.

The levels of all assessed hydrocarbons and heavy metals contaminants in sub surface samples collected from boreholes drilled on the investigation area were below adopted human health and ecological thresholds.

No asbestos containing materials were observed on the surface of the site or in soil samples collected from the investigation area.

The report made the following recommendations:

Remediation of the carcinogenic PAH and benzo(a)pyrene impacts soil around sampling location 06 and total recoverable hydrocarbons >C10-C16 (F2) around sampling location 03 should be undertaken. The initial extent is described in Figure 4. Results from adjacent sampling locations indicate the extent of contamination is approximately 340m^2 and up to 0.5m depth. Approximately 170m^3 of soil is estimated to be impacted. Final extent will need to be determined by validation sampling.

The remediation works are classified as Category 2 works and should be undertaken in accordance with a remediation action plan (RAP), validated and supervised by a suitably qualified environmental scientist.

An unexpected finds procedure should be adopted for site development works due to potential for foreign materials and asbestos containing material.

3.0 CONCEPTUAL SITE MODEL

3.1 General

A preliminary conceptual site model (CSM) was developed to provide an understanding of the likelihood for contaminants to be present and potential for impacts to patients, visitors to patients, hospital staff and ecological receptors on and off the site.

The CSM draws together the land-use information for the site, with site specific geological, and contamination information to identify potential contamination sources, migration and exposure pathways and sensitive receptors.

3.2 Sources

The contaminant sources are expected to be from fill on the site likely from numerous off-site sources.

3.3 Contaminants of Potential Concern

Previous investigations have identified the contaminants of concern as:

- Polycyclic aromatic hydrocarbons (PAH)
- Total recoverable hydrocarbons >C10-C16 (F2)

3.4 Pathways

Pathways for exposure to contaminants are:

- Direct contact with grey gravelly sand topsoil fill materials during construction
- Inhalation following disturbance of topsoil fill materials.

3.5 Receptors

The proposed land-use of the site is a palliative care facility. Residential land-use is considered the most appropriate land-use and the site was assessed under the residential based criteria. The site has historically been used as part of the *Tamworth Hospital* precinct.

Potential site receptors may include:

Human receptor populations

- Patients (adults and children)
- Visitors to patients (adults and children)
- Hospital staff
- Workers involved in the development of the site and construction of the palliative care facility.
- Visitors to site (e.g. workers conducting maintenance).

Ecological receptor populations

- Flora adjacent the site; and.
- Aquatic flora and fauna receptors off-site.

Existing vegetation receptors on the site are expected to be removed. The groundwater beneath the site is not considered a receptor due to depth of groundwater.

3.6 Source Receptor Linkages

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

The proposed land-use of the site is a palliative care facility. The facility is considered residential as sensitive receptors may be present. Human receptors to the investigation area are likely. Proposed users of the site may have a risk of exposure if contaminants are present, and the soil is disturbed.

Workers and visitors may potentially be receptors to soil contaminants through direct contact to soil which includes ingestion and dermal contact. Following development it is expected that the majority of the site will be covered by hard surfaces. Routine activities will not result in soil disturbance.

Inhalation may occur as a result of soil disturbance and dust production. Major soil disturbance before and after redevelopment of the site is considered unlikely. Soil disturbance during redevelopment of the site is expected to be accompanied by erosion control measures which will reduce the incidence of dust production.

Vegetation on the site may be potential receptors to soil contamination through direct uptake of contaminants. Existing vegetation is expected to be removed.

The source receptor linkage to aquatic organisms and ecosystems is considered incomplete as the investigation area and surrounding the site is landscaped. Movement of sediments from the site is unlikely. During construction works it is expected that erosion control measures will be implemented and movement of sediment off site will be unlikely. Following development of the site it is expected that hard surfaces will be established which will control sediment movement from the site. The nearest waterway to the site is Spring Creek located approximately 300m east of the site. It is not expected that contaminants from the site will be transported to aquatic receptors within the creek. Spring Creek is considered a highly disturbed ecosystem.

Groundwater is not identified as a potential receptor to contaminants. The depth to groundwater is not known but expected to be greater than 12m bgl.

Refer to Table 3.1 for Summary of source receptor linkages.

Table 3.1: Summary of Source Receptor Linkages

Source/ contaminants	Transport	Potential exposure pathways	Receptors
☒ Fill Heavy metals TRH BTEXN PAH	☐Wind ☐Sedimentation ☐Groundwater ☐Surface water ☐Volatilisation	☒Direct contact (ingestion and absorption) (human and environment) ☒Inhalation ☐Runoff ☐Leaching	☒ Patients (adults and children) ☒ Visitors to patients adults and children) ☒Hospital staff ☒Construction workers ☒Intrusive maintenance workers ☐Vegetation ☐Aquatic receptors

☒Potential, ☐unknown/unlikely

4.0 REMEDIATION

4.1 Area Requiring Remediation

Contamination was identified in the following areas:

- AEC 1 -polycyclic aromatic hydrocarbons (PAH) in an embankment in the south east section of the site. The area impacted is approximately 180m2 to a depth of 0.5m.
- AEC 2 - the flat central northern section of the site contained elevated levels of TRH >C10-C16 (F2). The area impacted is approximately 140m2 to a depth of 0.5m.

Areas requiring remediation are depicted in Figure 3.

4.2 Data gaps

The preliminary investigation determined the lateral and vertical extent of the contamination based on results of adjacent samples. The data gaps can be confirmed at the time of remediation.

5.0 ASSESSMENT

5.1 Remedial objectives

Table 5.1: Remediation objectives

Concern	Remediation objective	Remediation end point
AEC 1 PAH impacted topsoil fill in embankment	Reduce the exposure to human health and the environment	Removal or no complete pathways to expose human health and environmental receptors
AEC 2 TRH (F2) impacted topsoil fill material in flat central northern section	Reduce exposure to the environment	Removal or no complete pathways to expose environmental receptors

5.2 Remediation Hierarchy

The CRC National Remediation Framework hierarchal order for remediation and management is:

- On-site treatment of the soil so the contaminant is either destroyed or the associated hazard is reduced to an acceptable risk.
- Off-site treatment of excavated soil so the contaminant is either destroyed or the associated hazard is reduced to an acceptable risk, after which the soil is returned to the site.
- Removal of the contaminant to an approved site or facility followed where necessary with replacement with clean fill.
- Consolidation and isolation of the soil on-site by containment with a barrier.
- Adoption of a less sensitive land-use or control of activities on-site that will reduce the need for remediation.

5.3 Review of Remediation Options

The appropriateness of the remediation option depends on technical feasibility, local factors, environmental factors and cost. Remediation methods are aimed at removing the contamination and disposing off site (Table 5.2).

Table 5.2: Summary of remediation options

Technology	Advantages	Disadvantages	Comments	Suitability
On-site treatment	Impacted material remains on-site reducing the need for transport and landfill space	High capital costs. Variable rate of effectiveness	Suitable for hydrocarbon contamination. Site leveling required prior to construction.	No
Excavation Off site treatment and return to site	Reduces risk of migration. Reduced need for landfill space	Costs unknown Risks during transport.	Site leveling required prior to construction.	No
Excavation Off site disposal	Simple option No ongoing management	High use of scarce landfill space. Risks during transport. High carbon footprint.	May be cost prohibitive due to waste classification of material.	Yes
Physical containment	Cost effective depending on size	Does not provide clean-up. Intergenerational equity due to ongoing liability	Will restrict potential future land-use. Ongoing management of the site in accordance with an environmental management plan. Site leveling required prior to construction.	No
Less sensitive land-use	Nil	Does not provide clean-up. Intergenerational equity due to ongoing liability.	Will restrict potential future land-use.	No

5.4 Preferred Remediation Option

AEC 1 and AEC 2 will be excavated and temporarily stockpiled for waste classification prior to disposal off-site. Impacted materials from AEC 1 and AEC 2 shall be separated. The material will be disposed to a landfill licenced to receive the waste. AEC 1 excavations will extend to the embankment (180m^2) to a depth of 0.5m. AEC 2 excavations will extend to the flat central northern section (140m^2) to a depth of 0.5m.

Validation of areas excavated will be by visual inspection, soil sampling and analysis of the walls and base of the excavation pit.

5.5 Rationale for Selection of Options

Excavation and disposal to landfill is considered the only practical method for remediation as site leveling is required prior to construction.

6.0 REMEDIATION PLAN

6.1 Remediation Goal

Establish site conditions that will be an acceptable risk to human health and the environment from contaminated soil at the site. The proposed land-use of the site is as a palliative care facility considered residential.

The remediation goals are:

- To make the site acceptable and safe for long-term residential land-use. The site is considered acceptable and safe when contaminants of concern in the soil are present below the adopted thresholds or do not form linkages with sensitive receptors.

6.2 Remediation Criteria

6.2.1. Soil

The ASC NEPM (NEPC 1999 rev 2013) is the main reference for environmental site assessment in Australia and will be adopted for topsoil fill material impacted areas which will be excavated. This document includes criteria for use in evaluating potential risk to human health and ecosystems from chemical impacts, which are presented as generic investigation levels and screening levels appropriate to a Tier 1 risk-based assessment applicable for site assessment. The application of these investigation levels and screening levels is subject to a range of limitations, and their selection and use must be in the context of a conceptual site model (CSM) relating to the nature and distribution of impacts and potential exposure pathways.

The proposed land-use of the site is considered residential as the area is likely to be inhabited by sensitive receptors for an extended period. Residential (HIL A) land-use thresholds are considered appropriate criteria are described in *Guideline on Investigation Levels for Soil and Groundwater* (NEPC 1999). Assessment criteria are provided in Table 6.2.

The NEPC (1999) also 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 7.2. TRH>C16 have physical properties which make the TRH fractions non-volatiles and therefore these TRH fractions are not applicable 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.

Typical CEC value for the site is >10 to 15cmol(+)/kg, clay content of >20 to 25%, pH values of between 5.5 and 6 and organic carbon of 1.5 to 2% (eSPADE, 2024). The proposed land-use is considered residential. The contaminants have been identified in the soil for at least two years and are considered aged (Table 6.1).

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 6.2.

Management limits have been developed to assess petroleum hydrocarbons following evaluation of human health and ecological risks (NEPC 1999). Management limits are applicable as screening

levels after consideration of relevant ESLs and HSLs. The appropriate management limit for the site is listed in Table 6.2.

The proposed health screening levels for direct contact with petroleum hydrocarbons is listed in CRC Care Technical Report No 10. The CRC Care Technical Report 10 is not endorsed by the NSW EPA but included for comparative purposes.

The aesthetic state of sites is required to be assessed in PSI. Aesthetic issues generally relate to the presence of materials with a negligible risk or non-hazardous inert foreign material in soil or fill resulting from human activity. Sites that have been assessed as being acceptable from a human health and environmental perspective may still contain such foreign material. An assessment of the site aesthetics requires consideration of the natural state of soil on any given site, and a comparison between it and the soil encountered during investigation works. Soils on site should not exhibit discolouration (staining), amalodorous nature (odours) or abnormal consistency (rubble and asbestos).

Chromium is analysed as total chromium which is the sum of chromium (III) and chromium (VI). Chromium (VI) is a potential contaminant from industrial processes including ferrochrome production, electroplating, pigment production and tanning (WHO 1998). Chromium (VI) is reduced to chromium (III) when it comes into contact with organic matter in biota, soil and water. Chromium in the environment is present in the trivalent state (WHO 1998).

Table 6.1: EIL Calculation sheet

Analyte	Rationale	EIL (mg/kg) Urban residential/ public open space
Arsenic	Generic	100
Chromium (III)	Clay content 25%, aged	550
Copper	CEC 15cmol/kg, pH 6, organic carbon 2%	210
Lead	Generic	1,100
Nickel	CEC 15cmol/kg	220
Zinc	CEC 15cmol/kg, pH 6	480
Naphthalene	Generic	170

Table 6.2: Human health and ecological risk investigation levels (mg/kg)

Analyte	HIL A Residential	HSL A Residential clay soil			EIL Residential	ESL Residential Fine soil	Management limits Residential Fine soil	CRC CARE HSL A Residential
		0m to <1m	1m to <2m	2m to <4m				
Arsenic	100	-	-	-	100	-	-	-
Cadmium	20	-	-	-	-	-	-	-
Chromium	1001	-	-	-	5502	-	-	-
Copper	6,000	-	-	-	210	-	-	-
Lead	300	-	-	-	1,100	-	-	-
Nickel	400	-	-	-	220	-	-	-
Zinc	7,400	-	-	-	480	-	-	-
Mercury	40	-	-	-	-	-	-	-
F1 (TRH C6-10)	-	50	90	150	-	180	800	4,400
F2 (TRH C10-16)	-	280	NL	NL	-	120	1,000	3,300
F3 (TRH C16-34)	-	-	-	-	-	1,300	3,500	4,500
F4 (TRH C34-40)	-	-	-	-	-	5,600	10,000	6,300
Benzene	-	0.7	1	2	-	65	-	100
Toluene	-	480	NL	NL	-	105	-	14,000
Ethylbenzene	-	NL	NL	NL	-	125	-	4,500
Xylenes	-	110	310	NL	-	45	-	12,000
Naphthalene	-	5	NL	NL	170	-	-	1,400
Benzo(a)pyrene	-	-	-	-	-	0.7	-	-
Carcinogenic PAH	3	-	-	-	-	-	-	-
PAH (Total)	300	-	-	-	-	-	-	-

HIL – health investigation levels, HSL – health screening level, EIL – ecological investigation levels, ESL – ecological screening level, NL – non limiting, [1] Threshold for Chromium (VI), [2] Threshold for Chromium (III)

6.2.2. Waste Classification

Any waste that is disposed off-site will be classified against the NSW EPA (2014) guidelines (Table 6.4). The waste will be classified as general or restricted waste.

Table 6.3: Waste classification guidelines (mg/kg)

	General Solid Waste			Restricted Solid Waste		
Analyte	CT1	SCC1	TCLP1	CT2	SCC2	TCLP2
Arsenic	100	500	5.0	400	2,000	20
Cadmium	20	100	1.0	80	400	4
Chromium (VI)	100	1,900	5	400	7,600	20
Copper	-	-	-	-	-	-
Lead	100	1,500	5	400	6,000	20
Nickel	40	1,050	2	160	6,000	8
Zinc	-	-	-	-	-	-
Mercury	4	50	0.2	16	200	0.8
TRH (C6-C9)	650	650	NA	2,600	2,600	NA
TRH (C10-C36)	10,000	10,000	NA	40,000	40,000	NA
Benzene	10	18	0.5	40	72	2
Toluene	288	518	14.4	1,152	2,073	57.6
Ethylbenzene	600	1,080	30	2,400	4,320	120
Xylenes	1,000	1,800	50	4,000	7,200	200
PAH	200	200	NA	800	800	NA
Benzo(a)pyrene	0.8	10	0.04	3.2	23	0.16

NA – not applicable

6.2.3. Imported fill

All fill imported to the site shall be documented by the Contractor, including landscaping materials. All soils and landscaping materials shall be validated by the contaminated land consultant PRIOR to being received at the site to confirm these are Virgin Excavated Natural Material (VENM) or Excavated Natural Material (ENM).

VENM must meet the definition of VENM and ENM must meet the requirements of the Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014, The Excavated Natural Material Order 2014 (Table 6.5).

Table 6.4: ENM assessment criteria (mg/kg)

	ENM thresholds	
Analyte	Maximum average concentration	Absolute maximum concentration
Arsenic	20	40
Cadmium	0.5	1
Chromium (VI)	75	150
Copper	100	200
Lead	50	100
Nickel	30	60
Zinc	150	300
Mercury	0.5	1
Electrical conductivity (dS/m)	1.5	3
pH (pH units)	5 to 9	4.5 to 10
TRH (C6-C9)	-	-
TRH (C10-C36)	250	500
Benzene	NA	0.5
Toluene	NA	65
Ethylbenzene	NA	25
Xylenes	NA	15
PAH	20	40
Benzo(a)pyrene	0.5	1
Foreign materials	0.05	0.10

6.3 Remediation method

Table 6.5: Remediation method

AEC	Contaminant	Location	Works	Waste classification
1	PAH impacted topsoil fill in embankment	Embankment	Excavate and dispose to landfill.	Waste classification to be determined
2	TRH (F2) impacted topsoil fill material in flat central northern section	Flat central northern section	Excavate and dispose to landfill.	Waste classification to be determined but expected to be general solid waste.

The AEC 1 and AEC 2 will be excavated and temporarily stockpiled for waste classification. Works will include:

- Excavation of PAH and TRH impacted material.
- Care shall be undertaken to separate impacted materials from each location and surrounding soils.
- Impacted materials shall be stockpiled separately on plastic and managed to minimise erosion and dust.
- The impacted soil will be transported and disposed to a landfill licenced to receive the waste.
- The waste should be transported in a covered, leak proof vehicle.
- The base and walls of the excavation pit will be validated by visual inspection, soil sampling and analysis to confirm all impacted material has been removed and remaining material is below the adopted criteria.

6.4 Services, excavation and earth moving

Excavation, transport and disposal methods must ensure that potentially affected soil is not spread onto non-excavation areas. Care will be taken to separate differently classified materials from each other and from the surrounding soil. The impacted soil will be removed or disturbed with an excavator. Excavated material for off-site disposal will be stockpiled to enable waste classification. Once waste classification is completed, the material will be loaded onto trucks for transportation to landfill. The following will be implemented concerning stockpiles:

- Any stockpiles shall be placed in a secure bund
- All stockpiles of soil or other material shall be placed within an erosion containment boundary away from drainage lines, and
- All stockpiles of soil or other materials likely to generate dust or odours shall be covered.

6.5 Validation of excavation areas

Requirements for validation of remediated areas and backfill are discussed in Section 9.0.

6.6 Supervision

Remediation works will be supervised by an Environmental Scientist and comply with EPA guidelines including Chapter 4 of *State Environmental Planning Policy (Resilience and Hazards) 2021*.

7.0 REMEDIATION MANAGEMENT

7.1 Approvals

The remediation works are not:

- Designated development
- Carried out or to be carried out on land declared to be critical habitat
- Likely to have a significant effect on a critical habitat or a threatened species, population or ecological community
- Development for which another State Environmental Planning Policy or a Regional Environmental Plan requires development consent
- Carried out or to be carried out in an area or zone to which any classifications to the following effect apply under an environmental planning instrument:
    - Coastal protection
    - Conservation or heritage conservation
    - Habitat area, habitat protection area, habitat or wildlife corridor
    - Environment protection, escarpment, escarpment protection or escarpment preservation
    - Floodway
    - Littoral rainforest
    - Nature reserve
    - Scenic are or scenic protection
    - wetland
- Carried out or to be carried out on any land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council for any local government area in which the land is situated.

The remediation works are considered Category 2 and do not require consent. Notice of the proposed works must be provided to Tamworth Regional Council in accordance with *State Environmental Planning Policy (Resilience and Hazards) 2021*. The notice must:

- Be given at least 30 days before commencement of work
- Be in writing
- Provide the name, address and telephone number of the person who has the duty of ensuring that the notice is given
- Briefly describe the remediation work
- Show why the person considers that the work is Category 2 remediation work
- Specify, by reference to its property description and street address, the land on which the work is to be carried out
- Provide a map of the location of the land
- Provide estimates for the commencement and completion of the work.
- Applications for approval to dispose of waste will follow the guidelines set out in NSW DECC (2014) *Waste Classification Guidelines, Part 1: Classifying Waste.*

7.2 Access

Barricading may be established to prevent unauthorised access during soil disturbance works and excavation. Care will be taken to ensure soil, earth or similar materials are retained within the site. Soil, earth, mud, or similar materials must be removed from non-excavation surfaces by shovelling or a means other than washing, at the end of the day or as required to prevent movement off the work area.

7.3 Dust Control

Dust emission shall be confined within the site boundary. The following dust control procedures may be employed to comply with those requirements:

- Securely covering all loads entering or exiting the site
- Use of water sprays across the site to suppress dust, as appropriate
- Covering of stockpiles may be considered
- Excavation surfaces will be kept moist
- Work to stop during high winds to minimize problems with dust generation

7.4 Sediment and Water Management

The NSW Department of Housing Blue Book *Managing Urban Stormwater- Soil and Conservation* 2004 outlines the general requirement for the preparation of a soil and water management plan. All vegetation clearance and soil disturbance works shall be conducted in accordance with a soil and water management plan prepared by the contractor undertaking these activities. A copy of the plan shall be kept on-site and made available to Council officers on request. All erosion and sediment measure must be maintained in a functional condition throughout the remediation works.

7.5 Stockpile Management

Temporary stockpiling may be required for excavated material or importation of ENM. The following will be implemented for stockpiles if required:

- Care will be taken to separate differently classified materials from each other and from the surrounding soils,
- Contaminated material stockpiles shall be placed in a secure bund consisting of hay bales/sandbags and covered if required,
- All stockpiles of soil or other material shall be placed within an erosion containment boundary away from drainage lines, gutters or stormwater pits or inlets,
- All stockpiles of soil or other materials likely to generate dust or odours shall be covered.

7.6 Excavation Pump-out

Based on available knowledge of the current site conditions, a pump-out will not be required. In the unlikely event that it shall be required the following will be carried out:

- Any excavation pump-out water must be analysed for suspended solid concentrations, pH, and any contaminants of concern identified during the site investigation prior to discharge

to the stormwater system or other disposal method as appropriate. The analytical results must comply with relevant Council/EPA and ANZG standards for water quality, and

- Other options for the disposal of excavation pump-out water include disposal to sewer,
- Contaminated groundwater will need to be collected by a liquid waste contractor.

7.7 Landscaping/ Rehabilitation

Seeding, rehabilitation or stabilisation of the disturbed areas will be undertaken to prevent erosion.

7.8 Bunding

All stockpiles shall be covered and bunded as required

7.9 Timing

The remediation and is expected to be completed over a period of four (4) weeks. Delays may occur due to timing for approvals and weather conditions.

7.10 Noise Control

During construction works on the site there is likely to be a slight increase in noise due to the higher incidence of workers and equipment onsite. The site is located in a hospital precinct and no neighbouring properties are present in the locality.

All remediation works shall comply with the Environment Protection Authority's Environmental Noise Manual and the *Protection of the Environment Operations Act* (1997).

7.11 Odour Control

Based on the current knowledge of the site it is unlikely that odour control measures are required.

7.12 Vibration

Site development involves excavating soil. It is expected that any in situ rock encountered will be excavated without the need for blasting or other rock breaking methods to be employed. The contractor should ensure the excessive vibration does not occur in surrounding areas.

7.13 Site, Signage and Contact Numbers

The following are contact numbers that will be needed for the various parties involved:

- Barnson Pty Ltd- 1300 227 676
- Contractor- To be determined

Signage displaying the contact details of the remediation contractor shall be displayed on the site adjacent to the site access. These signs shall be displayed throughout the duration of the remediation works.

7.14 Roads, Traffic and Transport Networks

All haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site shall be selected to meet the following objectives:

- Comply with all road traffic rules
- Minimize noise, vibrations and odour to adjacent premises
- Securely cover all loads to prevent any dust or odour during transportation
- Exit the site in a forward direction and
- Will not track soil, mud or sediment onto the road.

7.15 Decontamination

Personal decontamination involves the removal of visible dust/residue from PPE worn during the remediation. It shall be undertaken each time a worker leaves the remediation area and at completion of the remediation work. Personal decontamination will be undertaken in a decontamination area.

All equipment removed from site must be inspected for possible residue and brushed down prior to exiting the site.

7.16 Hazardous Materials

In the event that hazardous and/or intractable wastes are encountered during the remediation work, they shall be treated and disposed of in accordance with the requirements of the NSW EPA and SafeWork NSW.

A suitable management plan for the disposal to a licensed landfill will be developed. The plan must include additional testing to quantify the material and classify it to ensure proper off-site disposal to a licensed landfill. Material will not be removed from the site until the approval is given.

7.17 Imported Fill

Fill material will be validated prior to importing in accordance with EPA requirements to ensure it is compatible with the proposed site use. Requirements for imported fill are discussed in detail in Section 6.

7.18 Site Security

The contractor will be responsible to ensure any temporary barricading/ fencing erected is secure and prevents unauthorised access to the site. All SafeWork NSW requirements will be followed regarding signs and safety measures when working near excavations.

8.0 PUBLIC AND WORK, HEALTH AND SAFETY (P&WH&S)

8.1 Prior Remediation

Fencing will be erected around the site to prevent unnecessary access. It may be required based on site conditions at the time of soil disturbance works.

8.2 During Remediation

Standard P&WH&S procedures for earthworks projects should be implemented on the site together with emergency and evacuation procedures.

A site-specific P&WH&S plan is to be developed by the contractor prior to starting the works this plan may include but not be limited to the following:

- Briefing of all Staff on P&WH&S concerns, contractors and individuals' responsibilities and personal protective procedures.
- Site access exclusively for briefed and authorized staff. A logbook shall be kept.
- Soil and Water, Dust and Waste management plans.
- Dust suppression particularly during the excavation and handling of materials.
- Staff personal protection handling affected soils.
- Crib and washing facilities.
- Provision of site security at all times, and
- Emergency and evacuation procedures. The nearest hospital is Tamworth Hospital, 31 to 35 Dean Street, Tamworth NSW. Relevant telephone numbers are:
    - Tamworth Health Service - (02) 6767 7700
    - Fire Brigade, Police, Ambulance- 000
    - Poisons Information Centre- 131126
    - SafeWork NSW- 131050

Smoking, eating and/or drinking on the site is prohibited whilst remediation works are active. Exposed areas including hands and face are to be washed thoroughly upon completion of work and prior to eating and drinking. Heat stress is an important consideration that must be taken into account in hot weather.

8.3 Personal Protective Equipment

The following personal protective equipment (PPE) is required during remedial works:

- Long sleeved shirts and long pants
- Steel capped boots
- Hard hat when working around operating plant such as excavators and back hoes
- Eye protection
- Gloves when handling soil or equipment

The following PPE shall be considered:

- P2 dust masks when excavating impacted surface soils where conditions are dusty

Personnel should practice good hygiene and ensure hands are washed prior to meals, other hand to mouth actions such as smoking and leaving the site.

9.0 REMEDIATION WORK VALIDATION

9.1 Validation of Remediation

An appropriately qualified environmental consultant shall complete validation sampling and analysis. Validation samples will be collected from the walls and base of the impacted areas.

The frequency of samples will be a based on a 4m grid spacing over the excavated area. The sampling frequency and analysis will be increased if site condition or analytical results suggest a potential risk of residual contamination.

The number of validation samples is in accordance with the recommended in NSW EPA (2022) *Sampling Design Guidelines*.

Validation samples shall be collected and analysed as follows:

- On a grid-based pattern across the base and walls of the remedial excavation
- Either directly from the surface by hand or with the use of hand tools
- Wearing dedicated disposable nitrile gloves, which are to be changed between sampling locations
- Where hand tools or other equipment is used, decontamination by washing the equipment and rinsing in potable water should be undertaken
- Collected into laboratory-supplied acid-rinsed glass jars with Teflon© lined lids
- Validation samples will be analysed for:
    - AEC 1 - PAH
    - AEC 2 - TRH
- One intra-laboratory duplicate sample is to be collected for analysis at the primary laboratory
- Validation samples shall be stored in an ice-filled cooler box for transportation to the laboratory
- Validation samples shall be transported to the laboratory under Chain of Custody conditions
- Laboratory analysis shall be completed for heavy metals by a laboratory NATA accredited for this analysis

9.2 Validation Imported Fill

Validation of all imported fill includes:

- An ENM certificate issued by a suitable qualified professional including a description of the source of the material, typical analysis results and a statement that the material is suitable for the proposed use.
- Systematic and documented inspection of loads of fill entering the site will be undertaken. Loads of material suspected to not be ENM or that are not consistent with the material at the source site will be rejected.
- Validation will be achieved by sampling and analysis for heavy metals, electrical conductivity, pH, TRH, PAH and BTEX. Additional laboratory analysis of samples will be undertaken if any additional potential contaminants of concern are identified at the source site. Results will be compared against the ENM Order (2014) assessment criteria.

- The frequency of samples will be in accordance with the ENM Exemption and include a minimum of three samples for volumes of soil of less than 500 tonnes. Sampling frequency and analysis will be increased if site condition or analytical results suggest a potential risk of contamination. The results of analysis will reflect the adopted thresholds. The sample density and results will be adequate to characterize the imported fill as ENM suitable for the proposed land-use.
- All fill to a depth greater than 0.6m and located in areas proposed for structures and footpaths will be compacted and density testing undertaken. The required compaction density for residential development is 98%

9.3 Validation Reporting

Following the completion of the remediation works, a validation report will be presented in accordance with NSW EPA *Guidelines for Consultants Reporting on Contaminated Sites* (2020) and *Guidelines for the NSW Site Auditor Scheme* (2017). The validation report will:

- Provide a summary of previous assessment work carried out
- Outline the remediation works undertaken on-site
- Summarise field observations
- Describe validation sampling and analysis
- Discuss analytical results
- Confirm waste has been disposed of appropriately through the presentation of waste disposal dockets
- Confirm that any imported fill has been validated as required and are accompanied with ENM certificates
- Confirm the Remedial Action Plan's objectives have been achieved, and
- Detail any on-going management requirements.

10.0 OTHER ISSUES

10.1 Community Consultation

During remediation works the contractor shall maintain a written record of any complaints received in relation to the remediation. The record must include complainants name, address, time, date of complaint and actioned taken to address the complaint. Any complaint received during the remediation works must be notified to Tamworth Regional Council no later than 2 business days following the complaint.

The site is located in a hospital precinct and no adjoining properties are present in the locality.

10.2 Contingency Plans

In order to avoid potential effect on the surrounding environment and community the contractor will implement the following contingency plan in Table 10.1.

Table 10.1: Contingency Plan

Issue	Contingency Response
Levels of potential contaminants in validation samples exceed adopted criterion	Additional excavations required.
Excessive Rain Events	Cease works. Ensure suitable sediment and erosion controls measures are in place. Regularly monitor sediment and erosion control measures. Pump out of water from areas of excavation to be undertaken in accordance with Section 7.6.
Excessive Odour	Cover with plastic sheeting until a solution is development by an environment consultant.
Excessive Dust	Increase the use of moisture sprays to suppress dust and/or cover with plastic sheeting
Excessive Noise	Reduce noise until noise is monitored by an acoustics consultant. Adopt recommendations made.
Excessive Vibrations	Cease activities causing vibrations and engage a vibrations consultant to monitor. Implement any vibration control measure recommended.
Discovery of Unknown Underground Storage Tanks (UST)	The Environmental Supervisor and Client Representative will be notified and all work within the worksite will cease. A Remedial Action Plan and Sampling and Analysis Quality Plan (SAQP) will be prepared for the USTs. Upon approval of the RAP and SAQP, the offending UST's shall be removed and disposed at a licensed landfill. Samples shall be taken from the area where the UST once located and soil analysis undertaken. Upon the results of the soil samples appropriate works shall proceed; either further excavation

Issue	Contingency Response
	and remediation or continuation of the development works proposed.
Discovery of Further Contamination	Remediation works shall take place accordingly. All unsuitable material shall be removed and disposed off-site to a licensed landfill. If contamination is more extensive than initially determined, other remediation methods may be considered, and the RAP revised. Discussions with Tamworth Regional Council may be required regarding the future course of action.
Spillage/ Leakage of Oil, Hydraulic Fluid or Fuels from Excavator and Trucks	An Environmental Management Plan shall be prepared by the contractor detailing procedures and emergency responses to be undertaken in the event of spillages. Procedures to be followed may include: Major Spill: Stop spill and contain. Place sandbags downslope, cover area in sand, excavate impacted soil and dispose of to an appropriately approved facility. Minor Spill: Stop spill and contain. Cover area in sand, excavate impacted sand and soils and dispose in EPA approved facility.

10.3 Progress Reporting

No progress report will be prepared.

10.4 Regulatory Compliance

All works are to comply with the relevant regulations ensuring that the remediation works do not adversely impact on the environment and public amenity.

11.0 REFERENCES

Barnson Pty Ltd. (2024). *Preiminary contamination investigation, World Class End of Life Care, Tamworth Hospital, 31 to 35 Dean Street, Tamworth NSW (Report number R44178c).* Orange: Barnson Pty Ltd.

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

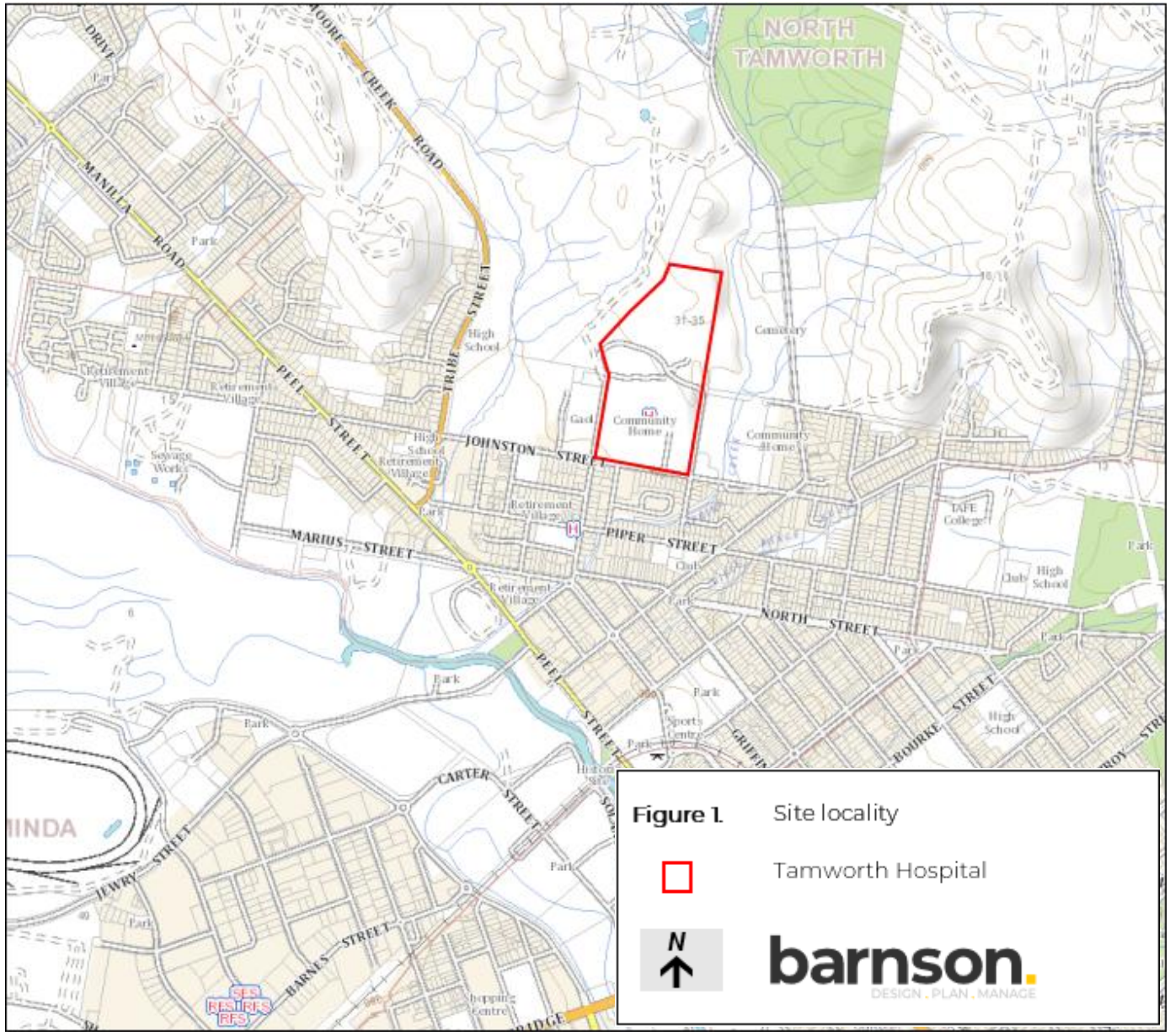
NSW EPA. (2014). *Waste Classification Guidelines - Part 1: Classifying Waste, EPA2014/0796.* Sydney: NSW Environmental Protection Authority.

NSW EPA. (2014a). *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014, The excavated natural material order 2014.* Sydney: NSW Environment Protection Authoroty.

NSW EPA. (2015). *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997.* Sydney, NSW: State of NSW, Environment Protection Authority.

NSW EPA. (2017). *Contaminated Land Management -Guidelines for the NSW Site Auditor Scheme (3rd edition).* Sydney, NSW: NSW Environmental Protection Authority.

NSW EPA. (2020). *Consultants Reporting on Contaminated Land, Contaminated Land Guidelines.* Sydney: NSW Environmental Protection Authority.


NORTH TAMWORTH
MOORE CREEK ROAD
MANILLA ROAD
PEEL STREET
TRIBE STREET
JOHNSTON STREET
MARIUS STREET
PIPER STREET
NORTH STREET
BOURKE STREET
CARTER STREET
JEWRY STREET
BARNES STREET
High School
Retirement Village
Community Home
Cemetery
TAFE College
Sewage Works
Sports Centre
Park
Figure 1. Site locality
Tamworth Hospital
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DESIGN . PLAN . MANAGE

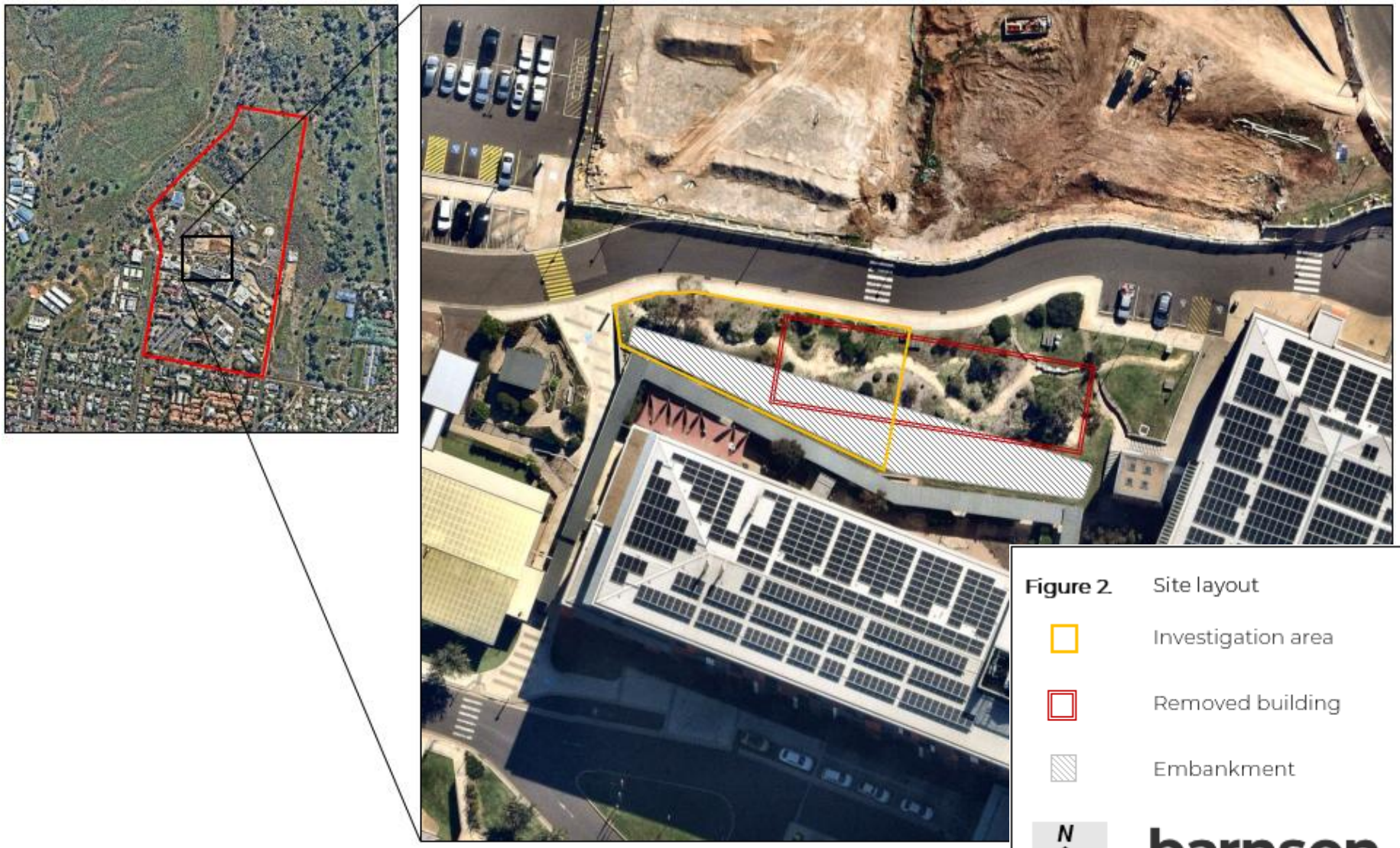
Figure 2.
Site layout
Investigation area
Removed building
Embankment
N
barnson.
DESIGN . PLAN . MANAGE

Figure 3. Remediation areas

Investigation area

Removed building

Embankment

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DESIGN . PLAN . MANAGE

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APPENDIX A

Data quality indicators

Quality control and assurance is undertaken to ensure the representativeness and integrity of field and laboratory procedures to ensure accuracy and reliability results.

1. Completeness

A measure of the amount of usable data for a data collection activity (total to be greater than 90%)

1.1 Field

Consideration	Requirement
Locations to be sampled	Described in the sampling plan
Depth to be sampled	Described in the sampling plan, each layer or explained
SOP appropriate and compiled	Described in the sampling plan
Experiences sampler	Sampler or supervisor
Documentation correct	Sampling log and chain of custody completed

1.2 Laboratory

Consideration	Requirement
Samples analysed	Number according to sampling and quality plan
Analytes	Number according to sampling and quality plan
Methods	EPA or other recognised methods with suitable PQL
Sample documentation	Complete including chain of custody and sample description
Sample holding times	Metals 6 months, OCP, PAH, TRH, PCB 14 days

2. Comparability

The confidence that data may be considered to be equivalent for each sampling and analytical event.

2.1 Field

Consideration	Requirement
SOP	Same sampling procedures to be used
Experienced sampler	Sampler or supervisor
Climatic conditions	Described as may influence results

Samples collected	Sample medium, size and preparation

2.2 Laboratory

Consideration	Requirement
Analytical methods	Same methods
PQL	Same
Same laboratory	Justify if different
Same units	Justify if different

3. Representativeness

The confidence (expressed qualitatively) that data are representative of each media present on the site.

3.1 Field

Consideration	Requirement
Appropriate media sampled	Sampled according to sampling and quality
All media identified	Sampling media identified in the sampling and quality plan

3.2 Laboratory

Consideration	Requirement
Samples analysed	Blanks

4. Precision

A quantitative measure of the variability (or reproduced of the data)

4.1 Field

Consideration	Requirement
Field duplicates	Frequency of 5%, results to be within +/-40% or discussion required indicate the appropriateness of SOP

4.2 Laboratory

Consideration	Requirement
Laboratory and inter lab duplicates	Frequency of 5%, results to be within +/-40% or discussion required
Field duplicates	Frequency of 5%, results to be within +/-40% or discussion required
Laboratory prepared volatile trip spikes	One per sampling batch, results to be within +/-40% or discussion required

5. Accuracy

A quantitative measure of the closeness of the reported data to the true value

5.1 Field

Consideration	Requirement
SOP	Complied

5.2 Laboratory

Consideration	Requirement
Field blanks	Frequency of 5%, <5 times the PQL, PQL may be adjusted
Rinsate blanks	Frequency of 5%, <5 times the PQL, PQL may be adjusted
Method blanks	Frequency of 5%, <5 times the PQL, PQL may be adjusted
Matrix spikes	Frequency of 5%, results to be within +/-40% or discussion required
Matrix duplicates	Frequency of 5%, results to be within +/-40% or discussion required
Surrogate spikes	Frequency of 5%, results to be within +/-40% or discussion required
Laboratory control samples	Frequency of 5%, results to be within +/-40% or discussion required
Laboratory prepared spikes	Frequency of 5%, results to be within +/-40% or discussion required