Remediation Action Plan
Hunter Indoor Sports Centre
State Significant Development (SSD-66595459)

2 Monash Road and 24 Wallarah Road, New Lambton, NSW

26000852.001A

11 June 2025

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Kleinfelder Project: 26000852.001A

Kleinfelder Document: **NCA25R182734**

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Document Control:

Version	Description	Date
1.0	Draft	16 April 2024
1.1	Final	2 May 2024
2.0	Final (amended)	5 June 2025
2.1	Final (amended)	11 June 2025
Prepared	Reviewed	Endorsed
		
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ABBREVIATIONS

Abbreviation	Definition
%	Percent
µm	Micrometre
ACM	Asbestos Containing Material
APP	APP Corporation Pty Limited
AS	Australian Standard
ASS	Acid Sulfate Soil
BANL	Basketball Association of Newcastle Limited
BTEXN	Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene
COC	Chain of Custody
CoPC	Contaminants of Potential Concern
Council	Newcastle City Council
CRC CARE	Cooperative Research Centre for Contamination Assessment and Remediation of the Environment
CSM	Conceptual Site Model
DSI	Detailed Site Investigation
EIL	Ecological Investigation Levels
EPA	Environment Protection Authority
ESL	Ecological Screening Level
HIL	Health Investigation Levels
HSL	Health Screening Levels
Kleinfelder	Kleinfelder Australia Pty Ltd
km	Kilometre
LOR	Limit of Reporting

Abbreviation	Definition
m	Metre
m^2	Square Metres
mAHD	Metres Australian Height Datum
mbgl	Metres Below Ground Level
mm	Millimetre
N/A	Not Available
NATA	National Association of Testing Authorities
NEPM	National Environmental Protection Measure
NSW	New South Wales
PASS	Potential Acid Sulfate Soil
PAH	Polycyclic Aromatic Hydrocarbons
QA	Quality Assurance
QC	Quality Control
RAP	Remediation Action Plan
RC	Remediation Contractor
SAQP	Sample, Analysis and Quality Plan
SPR	Source-Pathway-Receptor
TRH	Total Recoverable Hydrocarbons
USEPA	United States Environmental Protection Agency

1 INTRODUCTION

Kleinfelder Australia Pty Ltd (Kleinfelder) was commissioned by Basketball Association of Newcastle Limited (BANL) to prepare this report in accordance with the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs), and in support of the State Significant Development (SSD-65595459) for the proposed Hunter Indoor Sport Centre (HISC) with courts, indoor stadium, amenities and associated civil and landscaping works, at 2 Monash Road and 24 Wallarah Road, New Lambton, NSW (the site).

This report presents a Remediation Action Plan (RAP) to manage identified contamination detected within fill soils at the site. Kleinfelder previously completed a Detailed Site Investigation (DSI) and supplementary DSI at the site. The findings of the DSI and supplementary DSI are documented in the following reports:

- Kleinfelder (2024a). Detailed Site Investigation 2 Monash Road and 24 Wallarah Road, New Lambton, NSW, Version 1.1, Final, Dated 2 May 2024.
- Kleinfelder (2024b). Supplementary Investigation: Detailed Site Investigation 2 Monash Road and 24 Wallarah Road, New Lambton, NSW, Version 1.1, Final, Dated 2 May 2024.

The DSI recommended that the management of impacted soils should be undertaken at the site through the implementation of a RAP and a Long-Term Environmental Management Plan (LTEMP), prepared in accordance with the NSW EPA (2020) *Contaminated land guidelines, consultants reporting on contaminated land.* This report identifies and assesses the feasibility of potential remediation strategies for the site and enables an informed decision-making process to take place for the remediation and redevelopment of the site. The LTEMP (to be prepared separately) will set out the requirements for management of the residual contamination post-remediation and development activities.

This RAP supports the Response to Submissions (RTS) and Amendment Report for SSD-65595459 for the proposed HISC at the site. SSD-65595459 sought development consent for an indoor stadium, amenities and associated civil and landscaping works.

The Amendment Report seeks changes to the original development proposal SSD-65595459.

The key project amendments include moving the building footprint and carpark west, adding turfed open space near Turton Road, and shifting the access driveway south. The realigned pedestrian promenade within the carpark includes a bridge over the open space.

The height at the south-eastern corner of the building will be increased to provide flexibility to use the upper level of the building for gymnastics and other activities, there are also minor internal reconfigurations to fit the revised footprint.

Within the public domain, works include widening the Turton Road footpath, adding pedestrian safety fencing, and retaining the existing cycle/pathway on the southeastern corner of the site. The landscaping and public domain changes mean that four trees on the Turton Road frontage (previously proposed to be removed) can now be retained.

On the southern edge of the site, landscaping elements have been removed. Space is provided for the future expansion of the pedestrian/cycleway route along this corridor (works to be delivered by others).

The active recreation area, including a half basketball court, has been deleted from the proposal.

Development consent is sought for the entire proposal, with the flexibility to deliver the project in two construction and operational stages.

Kleinfelder notes that this RAP applies to the proposed development of the site only and does not apply to the site if it were to remain in its current state. Contamination risks at the site in its current condition are considered to be low, due to the presence of a healthy vegetated surface layer, which is acting to inhibit the potential of prolonged, repeated exposure to contaminated materials by human or terrestrial ecological receptors. Should the site remain in its current state, the current site owner(s) would need to address the risk of any ongoing exposure to contaminated soils through the implementation of a Site Environmental Management Plan.

1.1 BACKGROUND

The site is located approximately 5.5 kilometres (km) to the west of the Newcastle Central Business District (CBD) and covers a combined area of approximately 3.7 hectares (ha). The proposal has been designed so that the project can be delivered over two construction stages, as described below, and as presented in **Appendix A**:

- Stage 1
  - 8 sports courts, amenities to support the functioning of the complex including bathrooms, change rooms, lobby and foyer, retain tenancy, and café.
  - Mezzanine level: multi-purpose rooms and administrative space.
  - Car park with 185 spaces, drop off spaces, and bus parking.
- Stage 2
  - Extension to the eastern side of the building to add 3 courts, including show court with retractable grandstand seating for 2,500 people over the two adjacent courts.
  - Extension to the southern side of the building to provide 1 court, plus high performance training area.
  - Extension to the mezzanine to provide function rooms, administration space, and training space / gymnasium.
  - Expansion of existing carpark to provide 240 spaces.

Following the completion of the Kleinfelder (2024b) investigation, Kleinfelder were engaged by APP on behalf of BANL to prepare a RAP for the site. The site location and layout are provided in **Figure 1**. It is understood that no other environmental investigations have been conducted at the site prior to the DSI completed in 2023 by Kleinfelder.

The DSI identified numerous detections of polycyclic aromatic hydrocarbons (PAH) and total recoverable hydrocarbons (TRH), in fill soils, above the adopted criteria for the assessment of recreational land use. The source of elevated contaminant concentrations was determined to be potentially due to local sources of filling material, which include former collieries that operated in the Newcastle area, fill containing ash from residential hearths/local commercial premises (historically) and impacted filling material associated with former railway lines to the north and east of the site. Observed TRH impacts within filling material are unlikely to have originated entirely from the filling material and may have been deposited on the site at a later date, either during placement of filling material or afterwards, by an unknown source.

BANL's overall goal is to redevelop the site for continued recreational use as a sports complex. Given this, impacted fill soils will require remediation and/or management to mitigate potential ecological and human health risks from direct contact with filling material containing elevated concentrations of PAH and TRH (including future site users and construction/intrusive maintenance workers). As such, a RAP (contained herein), has been prepared for the site prior to redevelopment.

1.2 REMEDIATION GOAL

The overall goal of the RAP is to achieve BANL's objective of redeveloping the site for use as a sports complex, whilst effectively managing safety and environmental risks. This is to be achieved by determining an appropriate remediation strategy, which is suitably protective of human health and ecological receptors, financially practicable to achieve, and does not generate additional risks to human health or the wider environment. The LTEMP document, when prepared, will manage risks from residual contamination after remediation and development works have been completed.

1.3 SCOPE OF WORK

The preparation of the RAP included the following scope of work:

- Establish the overall goal of the proposed remediation works.
- Provide background information on the presence of contaminants identified at the site, including the nature and extent of contamination. The extent of impacted material will inform the area requiring remediation.
- Outline the practical approach required by the remediation contractor (RC) to remediate impacted materials at the site, including the qualifications and licenses required by the RC to conduct the works.
- Provide detailed information on validating the success of the remediation works to be implemented by the RC.
- Provide detailed information on the requirements for environmental management controls to be deployed by the RC during and following completion of the works, including contingency planning.
- Where and if possible, adopt remediation approaches that complement the proposed earthworks strategy.

2 SITE CHARACTERISTICS

2.1 SITE IDENTIFICATION DETAILS

Table 2-1 below provides a summary of site details.

Table 2-1: Site details

Site Location	Corner of Monash Road and Turton Road, New Lambton, NSW
Site Name & Areas	Wallarah Oval and Blackley Oval
Site Owner	Newcastle City Council
Current Title Identification Details (Lot and Deposited Plan [DP])	Lot 2377 DP 755247 Lot 2378 DP 755247 Lot 2379 DP 755247 Lot 2380 DP 755247 Lot 1 DP 1304081
Current Land Use	The site is currently used as recreational ovals
Current Zoning	RE1 (Public Recreation)
Local Council	Newcastle City Council

2.2 SITE HISTORY

A summary of the site history is presented below. Further details and information are presented in the following reports:

- Kleinfelder (2023). Detailed Site Investigation Wallarah Oval and Blackley Oval, New Lambton, NSW, 2305, APP Corporation Pty Limited, Version 1.0, Final, 20 November 2023.

Historically, the site appears to have been used for recreational activities since at least 1954, with possible informal recreational use prior to this date. At the time of the DSI, no evidence was uncovered which identified that the site has been used for any other purpose.

2.2.1 Additional Site History Information Obtained During the Supplementary Investigation

Anecdotal information was obtained from local residents during additional site investigations undertaken during site sampling on 8 and 9 January 2024, which indicated the following:

- A coal mine previously existed approximately 100 m west of the site, and
- The site had been used during World War II as a heavy anti-aircraft gun dummy station.

An investigation was undertaken of these anecdotal claims on 8 February 2024. A search of available online historical records (provided on lachlanwetherall.com) indicated that the New Lambton A Pit was opened to the west of the site in 1867 and was later renamed New Duckenfield Colliery around 1883. A photograph of the area from about 1906 did not identify this colliery, indicating that it had either ceased operation by 1906, or mining operations were not present or entirely underground in the site area.

Aerial imagery available on the NSW Government Historical Imagery Search and Discovery Portal identified the location of remnant railway lines, which used to service the New Lambton Colliery, to the southwest of the site. These railway lines were directly adjacent to the northern and western boundaries of the site. Investigations of historical records (provided on lachlanwetherall.com) indicated that these railway lines were likely present between approximately 1863 and 1891. Maps of the area show the intricate web of railways that crossed the

landscape adjacent to the site. These maps, along with photographs taken at about 1906, indicate that the site was used as 'pasturage' during this time period.

Aerial imagery available on the NSW Government Historical Imagery Search and Discovery Portal also confirmed the presence of gun emplacements on the site visible in 1944 aerial imagery, however, aerial imagery does not indicate whether the anti-aircraft emplacements were real or dummies. A search of information provided by the Fortress Newcastle Project (available at The Fortress Newcastle Project - Hunter Living Histories) did not identify the site as an anti-aircraft battery, lending credence to the likelihood that the site housed dummy anti-aircraft artillery during the war.

Based on the additional historical information obtained, and in conjunction with previously obtained information, it is considered possible that contamination present at the site could also be resultant from fill generated on the colliery peripheries, fill associated with the rail line construction and burnt coal originating from locomotives which historically operated on railway lines near the site to transport mined coal to Newcastle.

Historical information obtained from online searches as part of the supplementary investigation were not provided to Kleinfelder during the previously completed historical investigations, as part of Kleinfelder (2023).

2.3 SITE FEATURES

2.3.1 Present Land Use

The site was observed to comprise relatively flat terrain, which was predominantly covered in grassed surfaces. Built structures were present at the site, comprising a canteen building adjacent to the sites' southern boundary and lighting columns around the perimeter of the ovals. Three shipping containers were observed adjacent to the canteen, which are understood to be used for the storage of council property. No stockpiled or exposed soils were observed during the site inspection. No stressed vegetation or surface water was observed onsite during the site inspection.

Further detailed information on the current land use, including a photographic log of site conditions, can be found in the DSI (Kleinfelder, 2023).

2.3.2 Surrounding Land Use

The land use surrounding the site is summarised in **Table 2-2** below.

Table 2-2: Adjacent surrounding land uses

Direction	Land Use
North	The north of the site is bounded by New Lambton High School. The area beyond New Lambton High School comprises mixed use urban residential properties and commercial properties. A 7-Eleven service station is located approximately 100 m north of the site.
South	The south of the site is bounded by Lambton Ker-rai Creek, which is a concrete-lined channel draining east into Styx Creek. Directly beyond Lambton Ker-rai Creek is Monash Road, with urban residential properties on the south side of Monash Road.
East	The east of the site is bounded by Turton Road. The area beyond Turton Road comprises McDonald Jones Stadium, the Newcastle Harness Racing Club, Newcastle International Hockey Centre, and Styx Creek. Lambton Ker-rai Creek drains into Styx Creek approximately 450 metres east of the site.
West	The west of the site is bounded by Arthur Edden Oval. The area beyond Arthur Edden Oval comprises predominantly public ovals and recreation facilities, including Ford Oval, Harker Oval, the New Lambton Bowling Club, and Richard Ford Netball Courts. The recreation areas to the west of the site are bounded by urban residential properties.

2.3.3 Proposed Land Use

It is understood that the site will be redeveloped into a sports complex, comprising a staged development of the site as described in **Section 1.1**.

2.4 TOPOGRAPHY

The site is predominantly flat and is set at an elevation of approximately 8 metres Australian Height Datum (mAHD) (Geoscience Australia, 2023).

2.5 HYDROLOGY

No surface water bodies are present on the site. The site is predominantly unpaved, with surface water likely to infiltrate into the soil profile across the site and intercept the local groundwater aquifer. It is noted that some surface water may flow towards Lambton Ker-rai Creek.

Lambton Ker-rai creek is adjacent to the sites' southern boundary. This waterway is a concrete-lined channel which drains east into Styx Creek. The confluence of Lambton Ker-rai Creek with Styx Creek is located approximately 450 m east of the site. Surface water then flows in an approximate northwest direction into Newcastle Harbour. Lambton Ker-rai Creek and Styx Creek are both shallow and concrete-lined channels, indicating a low likelihood that groundwater is discharging into these surface water bodies.

2.6 GEOLOGY AND SOILS

A review of NSW seamless geology (MinView 2023) within the region indicates the site is predominantly underlain by alluvial floodplain deposits, characterised by silt, very fine- to medium-grained lithic to quartz-rich sand and clay from the Quaternary age (2.58 Ma – Present).

A review of the NSW Department of Planning, Industry & Environment (NSW DPIE) eSPADE v2.2 web application indicates soils are yellow podzols across the entirety of the site. Site geology was formed in the Quaternary age for deeper soils, with near surface soils likely comprising man-made fill.

2.7 HYDROGEOLOGY

A review of information available through the NSW DPIE eSPADE 2.2 web application indicated that local hydrogeology is described as fractured or fissured, with extensive aquifers of low and moderate productivity.

Based on the topography and geology encountered at the site, groundwater would be expected to be controlled by areas of high permeability alluvium. Regional groundwater is expected to flow in a generally easterly direction towards Styx Creek.

2.8 ACID SULFATE SOILS

The site is located within a Class 4 ASS zone. Works more than 2 mbgl and works where the water table is likely to be lowered more than 2 mbgl present an environmental risk. Kleinfelder conducted a Geotechnical Assessment in conjunction with the DSI which included an assessment of Acid Sulfate Soils. The Geotechnical Assessment (Kleinfelder, 2023b) concluded that Potential Acid Sulfate Soils are present at the site.

3 SUMMARY OF PREVIOUS INVESTIGATIONS

The following reports describe recent sampling and assessments undertaken in relation to the site, and are summarised in the following sub-sections:

- Kleinfelder (2024a), Detailed Site Investigation, Wallarah Oval and Blackley Oval, New Lambton, NSW, 2305. 20 November 2023.
- Kleinfelder (2024b), Supplementary Investigation – Detailed Site Investigation, Wallarah Oval and Blackley Oval, New Lambton, NSW, 2305. 16 March 2024.

3.1.1 Limitation – Expanded Site Areas

It is noted that previous investigations summarised below did not include an investigation of areas within the red hatched area, as depicted in **Figure 1**. These areas were included as part of the overall site design following the completion of previously completed investigations undertaken by Kleinfelder. As such, the findings of previous investigations may not be reflective of conditions within this area.

Given the proximity to previous investigation areas (as depicted in **Figure 1**), it is considered likely that the soil profile within the expanded site area would be comparable to that which has previously been defined. However, it is recommended that this is confirmed via additional intrusive investigations within the expanded site area prior to the commencement of site development, in accordance with the NSW EPA, 2022. *Sampling Design Part 1 – Application, Contaminated Land Guidelines,* to confirm that the nature and extent of contamination in the expanded site area is consistent with the findings of the Kleinfelder (2024a) and Kleinfelder (2024b) investigations.

3.2 DETAILED SITE INVESTIGATION (KLEINFELDER, 2024A)

The objective of the DSI was to collect sufficient environmental information on soil and groundwater conditions at the site to assist BANL with making informed decisions about the site. The specific objectives for the investigation included a review of all available historical site information, an evaluation of contaminants of potential concern for the site, and the undertaking of intrusive investigations and groundwater sampling to assess if contamination is present that would preclude the site from redevelopment for its intended use.

To achieve the objectives of the investigation, the scope of works comprised of the following:

- Desktop review of site information to review current and historical site information and images.
- Preparation of a Sampling and Analysis Quality Plan (SAQP) and Health, Safety, Environment and Quality Plan (HESQP) prior to intrusive site works.
- Intrusive site works including excavation of a total of 26 boreholes to depths ranging between 2.0 to 8.0 mbgl, conversion of three boreholes into groundwater monitoring wells, and manual excavation of 4 boreholes with a manual hand auger to depths ranging between 0.5 to 1.6 mbgl.
- The development of installed groundwater monitoring wells in preparation for a future groundwater monitoring event (GME).
- Completion of a GME on the three newly installed groundwater monitoring wells including gauging, sampling, and recording of field groundwater quality parameters.
- Survey of newly installed groundwater monitoring wells on-site for easting and northing and elevation to metres Australian Height Datum (mAHD).
- The development of a DSI report.

In-situ soils were observed to be generally consistent across the site, with fill material comprising silty topsoil in the top 0.2 m of site soils, followed by sandy clay fill with gravel to approximately 1.0 mbgl. Natural estuarine sandy clay to clay was present beneath fill soils, which included layers of natural sand. Groundwater was generally present from approximately 2.5 mbgl.

Detections of BTEXN, PAH, and TRH were reported in numerous samples across the site. Several samples reported benzo(a)pyrene concentrations above the adopted recreational/public open space health investigation levels and urban/public open space ecological screening levels for coarse-grained soils.

Identified TRH and PAH concentrations reported above the adopted ecological screening levels and health investigation levels were likely reflective of additions of these contaminants to the site by imported filling materials of unknown origin. Exceedances of the adopted criteria for TRH and PAH were reported in fill soils, with fewer exceedances reported in natural soils directly after the profile change from fill to natural, and no exceedances in deeper natural soils.

Based on field observations and the desktop study, impacted filling material present at the site may originate from local historical industrial processes in the Newcastle area, which generated waste fill during operation or had waste fill generated from site clearance. PAH contaminants detected are typically associated with burnt or partially burnt coal and/or wood and hence, potential local sources of filling material could include former collieries which operated in the Newcastle area, a former gasworks which was located approximately 1.5km north of the site, fill containing ash from residential/local business hearths (historically) and impacted filling material associated with former railway lines to the north and east of the site. Further analysis and an assessment of additional CoPCs may narrow down the number of potential fill origins. Observed TRH impacts within filling material are unlikely to have originated entirely within the filling material and may have been deposited on the site at a later date, either during placement of filling material or afterwards, by an unknown source.

Based on the results of the assessment, the report concluded that:

- Further assessment of site soils should be conducted for additional CoPC not assessed during this investigation and to confirm the leachability of PAH compounds identified within fill soils, through the use of toxicity characterisation leachate procedure (TCLP) analysis. This assessment would provide information regarding the leachability potential of identified contamination, and whether these contaminants have the potential to leach and migrate from the site. This could also aid in assigning a waste classification to impacted soils, should they be exported from the site.
- Management of impacted soils should be undertaken at the site through the implementation of a Remediation Action Plan (RAP), conducted in accordance with the NSW EPA (2020) Contaminated land guidelines consultants reporting on contaminated land. The RAP should identify and assess the feasibility of potential remediation strategies for the site, allowing an informed decision-making process to take place for the remediation and development of the site.
- Based on the proposed development, potential remediation strategies, to be investigated as part of the RAP, should give consideration for the potential containment of impacted fill material beneath a capping layer of clean fill material, based on the results of the leachability assessment described above. Should site soils pose an unacceptable degree of leachability potential, alternative remediation strategies should be investigated, in particular, offsite export of impacted fill.
- Should any material be identified at the site which is not consistent with the descriptions provided in this DSI (i.e., stained, or malodorous soils, sheen, or oils on the surface of groundwater, potentially asbestos containing material), it is recommended that works cease, and investigations are undertaken in accordance with a site Unexpected Finds Protocol (UFP).
- Should any material be exported from the site during development works, it is required that exported material is classified in accordance with the requirements of the NSW EPA (2014) Waste Classification Guidelines. Classification of material must be completed prior to off-site disposal of soils, where required, and
- Should any material be imported to the site during development works, it is required that imported material is classified as either Virgin Excavated Natural Material (VENM) or Excavated Natural Material (ENM), in accordance with state requirements under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014.

It is noted that the proposed swale is partially located outside of the site footprint which was investigated as part of the DSI. However, based on the results obtained during the DSI, it is considered likely that the soil profile within the proposed swale would be consistent with the findings of the DSI, therefore, at this juncture, the findings of the DSI are assumed valid for the proposed swale footprint. Confirmatory investigation prior to excavation in this area would be advisable.

3.3 SUPPLEMENTARY INVESTIGATION – DETAILED SITE INVESTIGATION (KLEINFELDER, 2024B)

Based on the findings of the DSI, a supplementary investigation was undertaken by Kleinfelder in January 2024 to identify additional CoPC not assessed during the initial DSI and to confirm the leachability potential of PAH compounds identified within fill soils. The objective of the investigation was to collect sufficient information on the leachability potential of fill soils and any further CoPC at the site, to guide the remediation options assessment for the RAP.

To achieve the objectives of the investigation, the scope of works comprised of the following:

- Intrusive site works including excavation of a total of 13 boreholes to a maximum depth of 1.0 mbgl, targeting areas of the site where the highest concentrations of PAH were identified during the DSI.
- Interpretation of laboratory results to determine if CoPC not assessed during the DSI are present at the site and to determine the leachability potential of PAH from site fill soils.
- The development of a Supplementary Investigation letter report.

Additional historical investigations identified extensive coal mining operations in the immediate vicinity of the site. The site was surrounded by multiple railway lines used to service collieries in the area. Based on the information obtained, it is likely that identified contamination was deposited as a result of historical coal mining activities and associated infrastructure (railway lines and coal fuelled locomotives) and may have been present at the site for over 100 years.

Analytical results obtained for total cyanide, ammonia, and total phenols were typically reported below the laboratory LOR in the majority of samples. Detections of ammonia and total phenols were reported, however, results detected were only slightly above the laboratory LOR.

Obtained results for total cyanide, ammonia, and total phenols indicate that the most likely source of elevated PAH concentrations observed in site soils during the Kleinfelder (2023) investigation relates to burnt coal and/or wood sourced from former collieries which operated in the Newcastle area, fill containing ash from residential hearths (historically), or impacts associated with former railway lines used to service collieries near to the site (including coal fuelled locomotives operating on these railway lines). Based on the results obtained, it is unlikely that impacted filling material originated from a gasworks site.

Analytical results of the leachability assessment typically returned below the laboratory LOR for metals and PAH in the majority of samples assessed. Detections of copper, lead, zinc, naphthalene, acenaphthene, fluorene, phenanthrene, fluoranthene, and pyrene were reported, however, results detected were slightly above the laboratory LOR in all samples and were below the adopted assessment criteria.

Obtained leachability results indicate that observed elevated heavy metals and PAH concentrations identified by Kleinfelder (2023) are bound within the soil profile and are not leaching into surface water or the shallow groundwater aquifer underlying the site.

Based on the results of the assessment, the report concluded that:

- The previous conclusions from Kleinfelder (2023) remain valid.
- Management of impacted soils should be undertaken at the site through the implementation of a Remediation Action Plan (RAP), conducted in accordance with the NSW EPA (2020) Contaminated land guidelines for consultants reporting on contaminated land. The RAP will identify and assess the feasibility of potential remediation strategies for the site, allowing an informed decision-making process to take place for the remediation and development of the site.
- Based on the proposed development, potential remediation strategies to be investigated as part of the RAP should give consideration to the potential containment of impacted fill material beneath a capping layer of clean fill material.

It is noted that the proposed swale is partially located outside of the site footprint which was investigated as part of the supplementary DSI. However, based on the results obtained during the supplementary DSI, it is considered likely that the soil profile within the proposed swale would be consistent with the findings of the supplementary

DSI, therefore, the findings of the supplementary DSI at this juncture are assumed valid for the proposed swale footprint. Confirmatory investigation prior to excavation in this area would be advisable.

4 KLEINFELDER (2023) ASSESSMENT CRITERIA

The criteria outlined in this section are relevant to this RAP, as they were used for screening purposes in the Kleinfelder (2023) DSI works, to provide guidance on areas proposed for remediation and validation following the identification of impacted filling material. A summary of their derivation is presented in the following sections.

In order to provide an initial assessment of the CoPC reported in samples collected from the site, sample results were compared to published Tier 1 ecological and/or human health-based assessment criteria. It is noted that guideline assessment criteria are inherently conservative in nature and form the basis for further consideration of the significance of contamination identified during environmental assessments. At this stage of the project the RAP adopted the Tier 1 assessment criteria presented in **Section 4.1**.

The primary source of guideline values adopted by Kleinfelder (2023) were the National Environment Protection Council (1999 as amended 2013), *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM, 2013), specifically those provided in Schedule B1: Guideline on Investigation Levels for Soil and Groundwater.

The relevant assessment criteria sourced from relevant guidelines are discussed in **Section 4.1**. It is understood that the site is to be remediated to allow for redevelopment and ongoing recreational/public open space use (refer to **Section 2**). Kleinfelder (2023) also sourced investigation levels from applicable international guidance, where no Australian guidelines were available.

4.1 SOIL ASSESSMENT CRITERIA

Based on the post-remediation land use and the environmental setting of the site outlined in **Section 2**, the following soil assessment criteria (SAC), presented in **Table 4-1**, were adopted as Teir 1 SACs.

Table 4-1: Soil Assessment Criteria

Guideline	Reference	Rationale
Human Health		
NEPM 2013	Table 1A (1) Health Investigation Levels (HILs)	The NEPM (2013) HILs provides a framework for the use of investigation and screening levels. The framework is applicable for assessing human health risk via all relevant pathways of exposure and covers a broad range of metals and organic substances. The analytical results obtained from the investigation will be compared to the NEPM (2013) HIL C (recreational/public open space) criteria, consistent with the ongoing land use.
	Table 1A (3) Health Screening Levels (HSLs)	The NEPM 2013 presents HSLs for petroleum compounds which have been derived through consideration of risks to human health, with the main focus being on the vapour exposure pathway. The results from the investigation will also be compared to the NEPM 2013 HSL C (recreational/public open space) criteria. Given the observed of soil lithology across the site, the criteria for sand and clay will be adopted on a case-by-case basis for the soil lithology observed at each sample location using the 0 - <1 m depth range for initial Tier 1 screening (exceedances will be further considered based on the retrieval depth of the sample and adjusted for soil type if required). The depth will also need to be adjusted based upon the required depth of excavation due to infrastructure development activities. HSLs were derived based on solubilities and vapour partitioning of standard petroleum sources in Australia (i.e., petrol and diesel).

Guideline	Reference	Rationale
	Table 7. Health Screening Levels for asbestos contamination	NEPM (2013) presents health screening levels for asbestos contamination in soils for bonded ACM, asbestos fines (**AF**) and fibrous asbestos (**FA**) (collectively referred to as friable asbestos). Quantitative analysis was undertaken as part of the investigation. Therefore, analytical results will be compared to the NEPM (2013) HSL C (recreational/public open space).
	Table 1B (7) Management Limits	The NEPM (2013) Management Limits for TRH are applied after the consideration of the relevant HSLs and Ecological Screening Levels (**ESLs**), as there are a number of policy considerations which reflect the nature and properties of petroleum hydrocarbons. There are Management Limits for specific soil types (coarse and fine) and land uses in the Amended ASC NEPM (NEPC, 2013). The Management Limits require consideration of site-specific factors to determine the maximum depth to which the limits should apply and seek to avoid or minimise the potential effects of the following: • Formation of observable LNAPL. • Fire and explosive hazards. • Effects on buried infrastructure e.g., penetration of, or damage to, inground services by hydrocarbons. Given the heterogeneity of near surface soils across the site, varying from fine to coarse, the analytical results obtained from the investigation will be compared to the recreational/public open space assessment criteria for fine- and coarse-grained soils, with the application of each criteria determined based on the soil lithology encountered at each sampling location.
	Schedule B1, Section 3.6, Aesthetics	The NEPM (2013) also requires consideration of aesthetics. That is, the presence of low-concern or non-hazardous inert foreign material (refuse) 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. The following characteristics are examples of where site assessment may not have detected contamination above investigation or screening levels but where further assessment may be required, following the findings of this investigation: • Highly malodorous soils or extracted groundwater (e.g., strong residual petroleum hydrocarbon odours, hydrogen sulphide in soil or extracted groundwater, organosulfur compounds). • Hydrocarbon sheen on surface water. • Discoloured chemical deposits or soil staining with chemical waste, other than of a very minor nature.
CRC CARE (2011)	Table A3 HSLs for Vapour Intrusion	CRC CARE presents HSLs for petroleum compounds which have been derived through consideration of risks to human health, with the main focus being on the vapour exposure pathway. The application of HSLs selects petroleum compounds and fractions dependent on specific soil physio-chemical properties, land-use scenarios, and depths. The results from the investigation will be compared to the CRC CARE 2011 HSL for intrusive maintenance workers (0 to 4m), adopting the same lithology as above due to the proposed infrastructure development on-site.
	Table A4 HSLs for Direct Contact	HSLs for direct contact have been derived for soil compounds and presented in CRC CARE 2011. Values for recreational/open space, low density residential, and intrusive maintenance workers will be adopted for Tier 1 screening.

Guideline	Reference	Rationale
Heads of Environment Protection Authority (HEPA), 2020. PFAS National Environmental Management Plan (PFAS NEMP) as revised February 2020	Table 2 Human Health Investigation Levels for Soil	The PFAS NEMP (HEPA, 2020) presents investigation levels for PFAS which have been derived through consideration of risks to human health through ingestion and dermal contact. The analytical results obtained from the investigation will be compared to recreational/public open space (HSL C) values, consistent with the recreational land use proposed for the site.
Ecological		
ASC NEPM 2013, (NEPC 2013)	Tables 1B (1) to 1B (5) Ecological Investigation Levels (**EILs**)	The ASC NEPM (NEPC, 2013) EILs have been developed for selected metals and organic substances and are applicable for assessing risk to terrestrial ecosystems. It is noted that ESLs consider depth of contamination, soil texture and age of the impacts. EILs depend on specific soil physicochemical properties and land use scenarios and generally apply to the top two metres of soil. EILs will be applied to all soil samples for comparative purposes, adopting recreational/open space land use criteria.
	Ecological Screening Levels (ESLs)	The ASC NEPM (NEPC, 2013) ESLs were developed to be protective of environmental concerns by determining the reasonable maximum exposure from site sources for a range of petroleum hydrocarbon compounds and TRH fractions commonly encountered on contaminated sites and are applicable for assessing risk to terrestrial ecosystems. ESLs broadly apply to coarse- and fine-grained soils and various land uses. They are generally applicable to the top two metres of soil and three metres in arid regions. The analytical results from the investigation will be compared to the guidelines for recreational/public open space land use in Fine soils to accommodate for the silty clay soils expected on-site. ESLs will be applied to all soil sample depths for comparative purposes. If variations in soil types are identified the criteria will be updated accordingly to accommodate the soil types encountered
PFAS NEMP, (HEPA, 2025)	Table 3. Ecological Guideline Values for Soils	The PFAS NEMP (HEPA, 2025) presents interim ecological investigation levels for PFAS which cover direct and indirect (secondary consumer) exposure for ecological receptors. The results from this investigation will be compared to both ecological direct and indirect exposure. The conservative indirect exposure criterion developed to be protective of potential impacts to freshwater ecology from leaching into groundwater will not be adopted for the site based on the following: • The site and surrounding area have been, and will be, intensively developed being located in an urban setting with the majority of the surface covered with hardstand, sealed concrete or compacted fill. • Secondary consumers are considered absent from the site, now and in the future, and there is minimal potential for indirect ecological exposure (higher order predators are unlikely to source all their food from an urban site); and • Lambton Ker-rai creek and Styx Creek are heavily modified with no critical or endangered species identified within the area.

5 NATURE AND DISTRIBUTION OF IDENTIFIED CONTAMINATION

The following sections present a summary of the nature and distribution of contamination identified from previous environmental investigations completed at the site, notably relying on the comprehensive works recently undertaken by Kleinfelder (2023) and Kleinfelder (2024).

5.1 SOIL

5.1.1 Heavy Metals (Copper and Zinc)

Concentrations of copper and zinc were identified exceeding the adopted ecological assessment criteria at select locations in fill materials across the site. The lateral spread of copper and zinc impacts was across the site, indicating that no single point source of contamination is present for copper and zinc. The vertical distribution of copper and zinc at the site was consistent with these metals being present within the filling material, noting that top-down contamination was possible prior to re-working of site surficial soils or due to importation of impacted filling material. Underlying natural soils, which comprised natural estuarine clay, were observed to have significantly lower concentrations of copper and zinc, which were at times reported below the laboratory LOR. Furthermore, leachability testing indicated that metals are bound within the soil profile and are unlikely to leach into underlying natural soils, groundwater, or surface water.

It is noted that site-specific ecological investigation levels were not adopted for copper and zinc concentrations, with reported results assessed against the default guideline values for these metals. The default guideline values may be considered conservative with respect to assessing the level of risk posed to ecological receptors by identified copper and zinc concentrations at the site.

5.1.2 Petroleum Hydrocarbons (TRH)

Concentrations of TRH were identified exceeding the adopted ecological assessment criteria at select locations in shallow soils and fill materials across the site. The lateral distribution of TRH impacts was spread across the site, indicating that no single point source of contamination is present for reported TRH. The vertical distribution of TRH impacts at the site was consistent with a pattern of top-down contamination arising from potential historical leaks and spills, possibly from site operations, such as maintenance activities conducted on the ovals.

The distribution of detected TRH identified a higher occurrence of long-chain (non-volatile fractions) of TRH C_{16} – C_{34}, indicating the source of TRH at these locations to be a mixture of diesel and heavy oils. In comparison, BTEXN and volatile/semi-volatile TRH F1 and F2 fractions were either absent or recorded at discrete locations.

5.1.3 Polycyclic Aromatic Hydrocarbons (PAH)

Concentrations of PAH were identified exceeding the adopted human health and ecological assessment criteria at numerous locations in fill materials across the site. A number of compounds classed as PAH were reported at the site to varying degrees, with the highest concentration of 644 mg/kg of total PAH reported at sampling location BH20. Given the degree of PAH contamination present, presenting both a human health and ecological risk, and this will be the primary driver for remediation and validation works at the site.

The lateral distribution of PAH impacts was spread across the site, indicating that no single point source of PAH contamination was present on the site. The vertical distribution of PAH impacts at the site was consistent with PAH being present within filling material, noting that top-down contamination was possible prior to re-working of site surficial soils or due to importation of impacted filling material. Underlying natural soils, which comprised natural estuarine clay, were observed to be free of PAH contamination, with PAH concentrations consistently reported below the laboratory LOR. Furthermore, leachability testing indicated that PAH is bound within the soil profile and is unlikely to leach into underlying natural soils, groundwater, or surface water.

The most common compounds of PAH identified at the site included Phenanthrene, Fluoranthene, and Pyrene. In comparison, Naphthalene, Acenaphthylene, Acenaphthene, and Fluorene were recorded at discrete locations. Identified PAH contamination is consistent with burnt coal or burnt wood and is most likely resultant of historical

coal and/or wood burning activities (including coal mining, ancillary operations including railway operations, and residential/local industry burning) in the vicinity of the site prior to World War II.

5.2 Conceptual Site Model

A Conceptual Site Model (CSM) is a qualitative description of site related information regarding identified contamination sources, pathways, and receptors to identify plausible exposure routes to human and ecological receptors that could cause harm.

A CSM for the site was completed by Kleinfelder (2023) and has been updated based on final design specifications for this RAP and considers an ongoing land use setting (recreational / public open space) as detailed in **Section 2**. Site-specific sources of contamination affected environmental media, and the environmental setting of the site were incorporated into the Tier 1 qualitative assessment based on the environmental investigations completed at the site as detailed in **Section 3**.

5.2.1 Contaminants of Potential Concern

CoPC were identified based on previous environmental investigations (refer to **Section 3**), updated design specifications (**Appendix A**), and information provided on the chemicals stored and used at the Site. **Table 5-1** summaries the key relevant CoPC and the relevant affected environmental media.

Table 5-1: Key Relevant CoPC

Source	Key Relevant CoPC	Affected Relevant Environmental Media
Imported filling material onsite, potential atmospheric fallout from historical operations in the surrounding area (including coal mining and residential burning)	Metals PAHs	Soil
Maintenance equipment used on the site	TRH	Soil
Transport of impacted surface water and sediment to the site during overflow of Lambton Ker-Rai Creek (1% Annual Exceedance Probability (AEP) flood event) and surrounding stormwater runoff into the swale (10% AEP)	Metals, TRH, inorganics	Surface Water, Sediment/Soil in swale

5.2.2 Human Health

Table 5-2 summarises the identified potentially complete human health Source Pathway Receptor (S-P-R) linkages for the site based on the comprehensive CSM completed by Kleinfelder 2023.

Table 5-2: Summary of Potentially Complete Human Health S-P-R Linkages

Source	Relevant Potentially Complete Pathways	Relevant Receptors
Primary Sources		
Imported filling material onsite, containing historical impacts	Dermal contact and incidental ingestion of soil	Future construction / maintenance workers and potential future residents and commercial workers On-site future site users / visitors

5.2.3 Ecological

The following potentially complete ecological S-P-R linkages were identified by Kleinfelder (2023):

- Uptake from soil and plants (flora),
- Dermal uptake from soil (fauna e.g., invertebrates),
- Ingestion of soil (fauna e.g., invertebrates),
- Uptake of groundwater (flora),
- Ingestion of surface water (fauna); and
- Ingestion of plants / animals.
- Runoff of surface water from the proposed swale to Lambton Ker-Rai Creek

No threatened or endangered species were identified within the site, and vegetation of the surrounding area was identified by Kleinfelder (2023) to be highly disturbed. However, terrestrial ecological receptors are present, and will continue to be present at the site.

Table 5-3 summarises the identified potentially complete ecological Source Pathway Receptor (S-P-R) linkages for the site based on the comprehensive CSM completed by Kleinfelder 2023.

Table 5-3: Summary of Potentially Complete Ecological S-P-R Linkages

Source	Relevant Potentially Complete Pathways	Relevant Receptors
Primary Sources		
Imported filling material onsite, containing historical impacts.	Dermal contact and incidental ingestion of soil	On-site terrestrial ecological receptors
Maintenance equipment used on the site		

5.3 AREAS REQUIRING REMEDIATION

Based on the findings of Kleinfelder (2023), which identified complete S-P-R linkages associated with fill, impacted by historical activities onsite and in the immediate vicinity of the site, the site was identified as requiring remediation during the proposed development. Impacts were not horizontally delineated to any one area or areas of the site, indicating that all fill soils across the site should be considered potentially contaminated and requiring remediated or management. However, vertical delineation of contamination was achieved, with impacts restricted to fill soils to an approximate maximum depth of 1.0 metres below ground level.

With the exception of maintenance equipment used on the site, the source of contamination is no longer present for the majority of contamination identified at the site. As such, remediation of the site will mitigate potential risks to human health and the environment, suitable for ongoing recreational / public open space land use of the site.

6 CONCEPTUAL REMEDIATION STRATEGY

6.1 REMEDIATION DRIVERS AND OBJECTIVES

Based on investigation works conducted to the date of reporting, potentially complete S-P-R linkages have been identified which may present a risk to human health and / or the environment. The key remediation driver is to complete effective remediation focusing on removal or management of the primary sources of contamination in soils to the extent practicable in order to achieve the following key remediation objectives:

- Render the site suitable for ongoing recreational / public open space land use, and
- Completion of remediation in a manner consistent with the NSW EPA Contaminated Sites Policy, confirming the suitability of the site for an ongoing recreational / public open space land use.

6.2 REMEDIATION OPTIONS ASSESSMENT

A remediation options assessment (ROA) has been undertaken to identify the preferred management/remediation strategy for the identified impacted fill soils. This section provides a summary of the approach and the options identified as well as the preferred option and method for use at the site, based on considerations for adequate protection of human health, ecological receptors, the wider environment, and financial constraints.

6.2.1 Determining the Remediation Approach

Based on assessment works completed to date, the primary exposure concern relates to ground disturbance activities with the potential for direct contact with impacted fill soils. As detailed above in **Section 2.3.3**, it is understood that the intended use of the site will be recreational, in accordance with the current zoning as RE1 – Public Recreation.

When considering remediation approaches, priority is given to minimizing public health risks and soil disturbance, therefore, off-site disposal is generally only considered when all other options are unsuitable.

6.2.1.1 Guidelines

NEPC 2013 provides details on the preferred hierarchy of options for site clean-up and/or management including:

- On-site treatment of the contamination so that it is destroyed, or the associated risk is reduced to an acceptable level; or
- Off-site treatment of excavated soil so that the contamination is destroyed, or the associated risk is reduced to an acceptable level, after which soil is returned to the original site.

If the above is not practicable, the following options may be considered:

- Consolidation and isolation of the soil on-site by containment with a properly designed barrier; or
- Removal of contaminated material to an approved facility followed, where necessary, by replacement with appropriate material.

The objective of the remediation approach is to make the site suitable for the proposed development under its current zoning as RE1 – Public Recreation.

6.2.1.2 Objective

The objective of remediation is to reduce and/or remove the potential risks of identified TRH and PAH exposure to future site users and onsite terrestrial ecology. The primary exposure concern relates to direct contact during ground disturbance activities undertaken through general use/maintenance, or direct contact with soils during redevelopment of the site.

The level of remediation and control measures applied to protect human and terrestrial ecological health from impacted soils are dependent on:

- The nature, condition, and source of impacted fill soils,
- The spatial extent of contamination, including the total quantity and concentration/distribution of TRH and PAH within soils, depth, location and affected area(s), and

- Potential for disturbance from current and future land use.

6.2.2 Options Assessment

As part of the ROA, Kleinfelder undertook an options appraisal of potential remediation and management strategies comprising:

1. Do nothing,
2. Treatment on site (e.g. soil washing, with off-site disposal of process water),
3. Excavation and disposal to off-site landfill,
4. Earthworks and on-site capping/containment during redevelopment, augmented with a long-term environmental management plan (LTEMP).

Table 6-1 below, presents each option considered with comments on the description, positives, limitations, and social and environmental implications of each option.

Table 6-1: Remediation Options Assessment

Option	Positives	Limitations	Economic evaluation	Environmental and social implications
1 – Do nothing	Negligible costs and easy to implement.	Maintains elevated level of latent risk; Always a potential that future site users could unknowingly encounter impacted soils. An ongoing LTEMP would be required.	Negligible costs involved in the remediation. A small fee would be required to further develop the LTEMP.	Generally, this is very low impact. However, given the planned development of the site which will require extensive ground penetration and bulk excavation works, significant social implications exist if risks are not managed due to the exposure of contaminated soils. Future exposure of disturbed contaminated soils following development could have a negative impact on the development if not managed appropriately.
2 – Treatment On-site	Removes contaminants from the site without removing soils from the site, reducing the amount of waste in landfill. Lower costs than removing soils to landfill. Provides better reassurance than Option 1 that contaminants are unlikely to be encountered in the future.	Soil washing or onsite chemical treatment options are generally time consuming and require the implementation of pilot trials and performance monitoring during the remediation. Onsite treatment can be expensive. An ongoing LTEMP may be required, depending on the treatment method used.	High-cost option which carries latent risk due to potential difficulty in effective treatment due to recalcitrant contaminants of low leachability,	Generally, given the site setting, this strategy is likely to generate significant social implications. Environmental impacts may also arise from the operation of onsite treatment methodologies. Potentially extended noise impacts for local residents due to excavation works and operation of treatment technologies.
3 – Treatment Off-site	Removes contaminants from the site bound within impacted soils. Following offsite treatment, soils are returned to the site, reducing the amount of waste in landfill. Provides better reassurance than Option 1 that contaminants are unlikely to be encountered in the future.	Soil washing or onsite chemical treatment options are generally time consuming and require the implementation of pilot trials and performance monitoring during the remediation. Offsite treatment can be expensive, generally costing more than onsite treatment due to transport and handling costs.	High-cost option which carries latent risk due to potentially ineffective treatment due to recalcitrant contaminants of low leachability,	Generally, this method will generate lower social impacts than onsite treatment, but greater impact than Option 1. Environmental impacts will be limited onsite to during soil removal, and may be more effectively managed offsite at permanent, purpose-built treatment facilities. Potentially long-term noise impacts to local residents due to excavation works and mobilisation of haulage trucks.

Option	Positives	Limitations	Economic evaluation	Environmental and social implications
4a – Removal of all fill soils off-site to landfill (31,960m^3) (~57,500 tonne [t])	The contamination impacts would be effectively removed from the site. This option would significantly reduce potential exposure risks. No ongoing LTEMP required.	This is a comparatively expensive solution. This is not considered as an environmentally sustainable approach. Consideration would need to be given to managing off-site disposal.	This is a comparatively expensive option. Given the volume of soil requiring remediation, this option is considered the least economically feasible.	Potential increased exposure to contaminants during excavation of the material and transport. Disposal to landfill is not considered to be environmentally sustainable. Short term noise impacts to local residents due to excavation works and mobilisation of haulage trucks.
4b – Removal of bulk cut soils (from the proposed swale only) off-site to landfill (~4,215m^3) (~7,500 t)	The contamination impacts would be effectively removed from the bulk cut areas of the swale. This option would significantly reduce potential exposure risks in the swale area. Amendment to LTEMP required. Based on previous environmental investigations, soils beyond 0.5 metres below ground level may be retained for fill reuse onsite. This should be confirmed during bulk excavation.	This is a comparatively expensive solution. This is not considered as an environmentally sustainable approach. Consideration would need to be given to managing off-site disposal.	More favourable than off-site disposal of all fill soils on site by limiting off-site disposal to bulk cut soils in the swale only. Moderate cost option that is more economically viable than Options 2, 3, and 4a. Potential cost savings by reusing natural soils at depths greater than 0.5 metres below site surface as onsite filling material, if determined to be suitable (by a qualified environmental consultant) during bulk excavation.	Potential increased exposure to contaminants during excavation of the material and transport. Disposal to landfill is not considered to be environmentally sustainable. Short term noise impacts to local residents due to excavation works and mobilisation of haulage trucks.
5 – On-site Capping/Containment (31,960m^3) (~57,500 t)	The impacted soils would be capped to prevent direct contact and potential exposure would be controlled by an LTEMP. More viable to conduct at the same time as development earthworks and construction activities.	Reliant upon agreeing an approach with the EPA and local Council. Reliant upon engineering design and feasibility to construct recreational facilities above the contained material or relocate materials to below on-site areas (structures and open areas).	More favourable than other remediation methodologies.	More sustainable, not using up space in landfills and relocating the contamination elsewhere for future generations to manage. Potential increased exposure during the translocation of impacted materials. Would not have to haul material long distances on public roads.

Option	Positives	Limitations	Economic evaluation	Environmental and social implications
	Risks would be significantly reduced with negligible long-term liability, given prevention of direct contact and low leachability. Lower cost compared to off-site disposal or onsite or offsite treatments. Material would be placed beneath engineering capping and/or non-sensitive site areas with suitable hardstand (e.g. car parks, buildings) reducing potential long-term risks.	The location of the buried material would need to be recorded on the LTEMP. May require importation and placement of Virgin Excavated Natural Material (VENM) to establish a suitable capping layer where hardstand capping is not used.		Short to medium term noise impacts to local residents.

6.3 PREFERRED OPTION

A combination of Option 4a and Option 5 was considered the most practical, efficient, and cost-effective option for the site considering the proposed future use of the land as recreational / public open space, and considering the investigation results, which indicated that the identified contamination is a direct exposure risk but stable and of low leachability risk to the surrounding environment.

This option is considered sustainable and financially viable; however, the remediation option does rely on additional planning and design to assist with the proposed future development of the site and requires a program of long-term management. Given the volume of soil requiring remediation, Option 2, Option 3, and Option 4a are not considered as sustainable or economically viable for the project. Options 2 and 3 may prove difficult, due to the recalcitrant nature and low leachability of some contaminants. Option 1 is not considered appropriate for the project given the ongoing risks and significant social implications of associated with a 'do nothing' approach.

It is noted that, following bulk cut and off-site disposal of soils (Option 4b), exposed fill soils within the swale will need to be lined with geotextile fabric and capped with at least 0.5m of clean fill material, in accordance with Option 5, to restrict direct contact between stormwater and impacted fill soils, which are assumed to be present within the swale, based on previously completed investigations within nearby areas at the site (Kleinfelder, 2024a), (Kleinfelder, 2024b).

7 REMEDIATION WORKS IMPLEMENTATION

7.1 COMMUNICATION, ROLES, AND RESPONSIBILITIES

It is understood that BANL (or a nominated representative) will communicate with project stakeholders, relevant government and council stakeholders and future land custodians during the remediation planning, execution, and close-out phases. Relevant stakeholders and their corresponding roles and responsibilities are summarised in **Table 7-1**.

Table 7-1: Relevant Stakeholders

Stakeholder	Description
Newcastle City Council	Current site owner
Basketball Association of Newcastle Limited	Prospective site owner
Remediation Contractor	The contractor appointed by the site owner, who will be responsible for undertaking the remediation works, waste management, licenses, approvals (as requested by the site owner) establishment and maintenance of health, safety and the environmental protocols.
Validation Consultant	An environmental professional appointed by the site owner who will be responsible for the supervision and monitoring of remediation field works, validation activities outlined by this RAP and the final validation report for the site.
Regulator	Responsible for environmental approvals and licenses pertaining to potential waste disposal and environmental discharges (where required).

7.2 GENERAL REMEDIATION PROGRAM OVERVIEW

An indicative overview of the anticipated remediation program is provided in **Table 7-2**. Should different remediation methodologies be employed during the remediation program, the site works may differ to those presented below. Tasks have been set in chronological order where it has been identified beneficial to complete one task prior to another to maximise the efficiency of the remediation methodology and to mitigate potential further environmental contamination.

Table 7-2: Remediation Program Overview

Task	Component
1	Remediation pre work – including above ground site decommissioning, development of required documentation (e.g. remediation environmental management plans, work plans) and the application for required approvals (where required).
2	Stakeholder consultation including community consultation.
3	Regulatory approvals for proposed remediation work.
4	Mobilisation to site, establishment of environmental controls (where required).

Task	Component
5	**Stage 1 Remediation:** • Contaminated soils that are geotechnically unsuitable for reuse onsite may be stockpiled onsite with environmental controls (as described below), for waste classification assessment by a suitably qualified environmental consultant, prior to offsite disposal. • Environmental/erosion controls required for stockpiled soils will include, but may not be limited to, exclusion fencing, bunding around stockpiles such as sediment socks or haybales, covering material such as black plastic sheeting, appropriately weighed down), allowing protection of the adjacent creek from sediment run-off. • Excavation of soils for the installation of underground services, if these underground services cannot be installed within the capping layer of clean fill soils. • Excavation trenches for underground services (if emplaced in impacted soils) must be lined with a visual marker layer of geotextile fabric (walls and base) and backfilled with clean imported fill material (i.e., Virgin Excavated Natural Material (VENM) or Excavated Natural Material (ENM)). • Excavation of the bulk cut associated with the construction of the swale at the site's eastern boundary, as depicted in the design plans (**Appendix A**) (measuring approximately 105 m by 23 m, to a maximum depth of 1.043 m). • Additional investigations should be undertaken by a suitably qualified environmental consultant during bulk excavation of the swale. The investigation will serve to confirm the volume and distribution of fill material, and the volume and distribution of any underlying natural material. The investigation will determine the volume of fill material requiring off-site disposal, the extent of capping required within the swale, and whether natural soils (potentially present at the bottom of the swale) can be retained for use as site filling material). • Any impacted fill soils exposed within the walls and base of the swale must be lined with a visual marker layer of geotextile fabric, and capped with a minimum 500mm of imported fill material (VENM or ENM). • Capping should incorporate elements of stabilisation into the design for the swale, including geotextile fabric and vegetation cover, as required.
6	**Stage 2 Remediation**: • Excavation (where required for footings, underground services, and to meet design specifications) and capping of the remainder of the site. • Excavation of the remainder of the site should be undertaken in a staged approach in conjunction with planned development works to limit the area of exposed soils at any one time. • Excavation of grass and surface materials which are geotechnically unsuitable for containment onsite may be stockpiled onsite with environmental controls (as described above), for waste classification assessment by a suitably qualified environmental consultant prior to offsite disposal. • Any excess soils, excavated to meet design specifications, which are suitable for re-use onsite may be stockpiled onsite with environmental controls (including exclusion fencing and covering material such as black plastic sheeting). • Exposed soil surfaces must be capped with either hardstand (i.e. concrete), VENM, or ENM, depending on the design specifications of the site. • A visual marker layer of brightly coloured (e.g., white or orange) geotextile fabric must be installed to visually delineate overlying clean fill soils from the underlying contaminated material. A visual marker layer will be installed in areas capped with fill soils and within service trenches only, no visual marker layer is required beneath hardstand surfaces as the hardstand itself will act as the clean capping material and the marker layer. • If capped with fill material, the filling material layer must be at least 500 mm thick for unsealed areas, and 250 mm for areas capped by hardstand surfaces. The thickness of capping material should be determined in conjunction with the planned earthworks strategy, with respect to the final site level required and the removal of any geotechnically unsuitable areas. The capping layer used should also account for the future maintenance of the site, such as subsurface drainage in unsurfaced areas, or the need for future resurfacing i.e. use of increased capping in areas where future excavation would potentially occur would avoid requirements for a contamination management plan and decrease future disposal costs for impacted soils. Excavation areas are to be restricted with fencing and warning signage. Construction workers within the excavated areas (e.g., concreters) must be made aware of the potential health risks of direct contact with, or ingestion of, remaining fill soils during capping works.

Task	Component
7	Final Validation • Validation will include the confirmation of the thickness of capping material across the site via surveys prior to and after the completion of site remediation works, and records/images of trench protections. ENM/VENM certificates will also be required confirming the material was suitable for onsite use, as well as waste disposal documentation confirming the suitable offsite disposal of any unsuitable material. • Final validation of the site following removal of all stockpiled materials and the complete capping of the site with either hardstand, VENM, or ENM. • Soil samples to be collected from imported VENM or ENM, following the completion of remediation works, to confirm no cross-contamination of imported fill material and no risk to human health or ecological receptors from direct contact with surficial soils.
8	A Long-Term Environmental Management Plan and site Validation Report produced for the site, detailing the completed remediation works and the remaining presence of impacted soils at the site, which will be included on the Section 10.7(2) Planning certificate for the site.

7.3 REMEDIATION PRE-WORK

7.3.1 Work Plans

This RAP has been developed with sufficient detail for implementation of the preferred remediation methodology, such that it protects human health and the environment during remediation works. In addition to this RAP, a Remediation Work Plan (RWP), incorporating a technical specification and bill of quantities, will also be required to be developed, once the final design of the remediation strategy is complete. The work plan is to include:

- Technical excavation design and extents including requirements for battering or shoring, if required,
- Detailed backfill design so at to achieve a suitable ground surface for the redevelopment,
- Detailed volume estimates for contaminated materials, and
- Detailed materials tracking and handling procedures.

7.3.2 Regulatory and Legislative Requirements

This section details approvals and licensed required by regulatory authorities, including any items contained in development consent conditions, in accordance with the requirements of the NSW EPA (2020) Contaminated Land Guidelines – Consultants Reporting on Contaminated Land. Due care has been taken in accounting for the regulatory and legislative requirements of the project, however, the information provided in this section is preliminary advice only and should be confirmed by the project planning consultant prior to the commencement of the project.

Regulatory approvals, permits, licenses and notices may need to be sought to allow commencement of the remediation works. The following sections outline the key requirements that have been identified for the preferred remediation option detailed in **Section 6.3**.

7.3.2.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

The Environmental Planning and Assessment Act (NSW) 1979 sets out a regime for determining the planning assessment and approval requirements for development. As part of this process, Schedule 3 of the Environmental Planning and Assessment Regulation 2021 lists a number of land-uses and associated criteria as designated development. One land use refers to “contaminated soil treatment work” which details specific criteria in instances where remediation works would be designated as development are presented.

The proposed remediation works may be considered a designated development based on the following trigger(s):

- *It involves treating contaminated soil originating exclusively from the site on which the development is located and:*
    - *Incinerates more than 1,000 cubic metres per year of contaminated soil, or*

- *Disturbs more than an aggregate area of 3 hectares of contaminated soil* (concept development design plans indicate that the majority of the 3.7-hectare site will be disturbed).

Based on the preferred remediation strategy discussed in **Section 6.3**, the site would not be considered a designated development under the EP&A Act. It is noted that treatment of contaminated soils is not defined in the EP&A Act, however, treatment is generally interpreted as the physical or chemical alteration of contaminated soils to reduce the risk of impacts to human or ecological receptors. The process of capping contaminated soils, therefore, does not constitute treatment, as the physical or chemical properties of contaminated soils are not being altered.

7.3.2.2 State Environmental Planning Policy (Resilience and Hazards) 2021

The State Environmental Planning Policy (Resilience and Hazards) 2021 (SEPP (Resilience and Hazards)) under the EP&A Act provides a statewide planning approach for the remediation of contaminated land. Chapter 4 of the SEPP (Resilience and Hazards) provides guidance criteria to classify remedial works as Category 1 or Category 2. Project classified as Category 1 works require development consent, while projects classified as Category 2 do not generally require development consent and can be managed by the local council authority.

Based on the guidance presented in **Table 7-3** and **Section 7.3.2.3**, remediation works at the site are likely classified as Category 1 works, which require development consent. However, final classification should be considered by the project planning consultant following the completion of the detailed remediation design to be provided in the remediation work plan.

Table 7-3: Remediation Classification Assessment in Accordance with the State Environmental Planning Policy (Resilience and Hazards) 2021

Clauses under SEPP (Resilience and Hazards)	Outcome
(a) Constitute a designated development (under EP&A Act)	Based on the discussion provided in **Section 7.3.2.1**, remediation works at the site are not considered a designated development under the EP&A Act. However, the final excavation extent and soil volumes in context of the above triggers should be considered following the completion of the detailed remediation design provided in the remediation work plan.
(b) Is carried out on land considered to be critical habitat	The site was not identified (Kleinfelder 2023) to be designated critical habitat.
(c) Is likely to have a significant effect on a critical habitat or threatened species, population, or ecological community.	The site is not identified to be critical habitat. No threatened species, population or ecological community was identified to be present on the site by Kleinfelder (2023). Additionally, due to the nature of the site and its surrounds, species, populations and / or ecological communities of significant value are not expected to permanently reside within the site or its immediate vicinity. Lambton Ker-Rai Creek is identified to be adjacent to the southern site boundary, therefore additional controls (consistent with industry standard) will be employed to mitigate the risk of discharge of contaminated materials to the off-site environment.
(d) Constitutes a development for which another State environmental planning policy or a regional environmental plan requires development consent.	Due diligence investigations of state environmental planning policies have been undertaken which did not identify that the site would trigger this requirement. However, this conclusion is considered preliminary only, and should be confirmed by the project planning consultant.

Clauses under SEPP (Resilience and Hazards)	Outcome
(e) Is carried out or is to be carried out in an area or zone to which any classifications to the following effect apply under the environmental planning instrument – coastal protection, conservation or heritage conservation, habitat area, habitat protection area, habitat wildlife corridor, environment protection, escarpment, escarpment protection or escarpment preservation, floodway, littoral rainforest, nature reserve scenic area or scenic protection or wetland.	A preliminary review of the relevant available planning information indicated that the site may be located within a floodway area or zone. It is understood that a flood plan has been prepared for the site. Relevant environmental planning instruments should be reviewed and confirmed by the project planning consultant prior to development.
(f) 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 suited.	Remediation works to be undertaken on the site under the preferred remediation options complies with the Newcastle Development Control Plan (2023). However, the preferred remediation options assessment includes the encapsulation or capping of contaminated materials, as such, development application for Category 1 remediation works will apply.

7.3.2.3 Newcastle Development Control Plan (DCP) (2023) and Associated Planning Policies

The Newcastle Development Control Plan (DCP) 2023 was developed by Newcastle City Council to provide detailed provisions to control development throughout the Newcastle Council area. Development on contaminated lands is detailed in Part B; Section B7 of the DCP, which serves as a framework for Council's planning functions relating to the use and development of land that is, or may be, contaminated, and need to be considered during the remedial works plan, technical specifications, and remediation environmental management plans for remediation activities.

The Newcastle Technical Manual Contaminated Land Management (2012) states that no contaminated soil shall be encapsulated or capped on the site that contains concentrations of contaminants that are above the soil investigation levels for urban development sites in NSW for the range of landuses permissible on the subject site. Approval to cap contaminated soil which exceeds the soil investigation levels for the range of landuses permissible on the site can be sought through a development application to Council (category 1 remediation). As such, in accordance with the Newcastle Technical Manual Contaminated Land Management (2012), remediation at the site would be considered a Category 1 remediation.

7.4 PRIMARY REMEDIATION TECHNIQUES

7.4.1 Off-site Disposal of Impacted Soils (Swale Construction)

Off-site disposal of impacted soils excavated during the bulk earthworks associated with the swale construction should be completed in the chronological task order provided in **Section 7.2** and in a manner integrated with the proposed earthworks and development strategy. Off-site disposal of excess fill soils from the swale construction should be completed in a staged approach in conjunction with planned development works, to minimise the area of exposed impacted soils at the site at any one time.

Prior to or during bulk excavation of the swale, a suitably qualified environmental consultant should be engaged to conduct a contamination assessment of materials excavated from the swale. The investigation should target CoPCs identified in previous investigations (heavy metals, PAH, TRH), as a minimum. The purpose of the investigation will be to achieve the following objectives:

- Confirm the volume of fill material excavated from the swale for off-site disposal
- Confirm the volume of any underlying natural material excavated from the swale, which may be suitable for onsite reuse, and
- Confirm the distribution of impacted fill material remaining in-situ within the swale, which will require capping (in accordance with **Section 7.4.2**).

Impacted material excavated from the swale should be stockpiled prior to off-site disposal. Stockpiled impacted material should be excavated and stockpiled separately from other materials, and access must be restricted with fencing, boundary tape, or flagging, noting that it is assumed that unauthorised, public access to the site will be restricted in accordance with standard site control practices, and covered with black plastic sheeting or similar.

Material excavated during the swale construction, which is to be disposed off-site must be assessed by a suitably qualified environmental consultant to determine an appropriate waste classification for the material in accordance with the NSW EPA (2014) *Waste Classification Guidelines Part 1: Classifying Waste*.

Following the completion of bulk excavation of the swale to the desired grade, as detailed in the design plans (**Appendix A**), any exposed impacted in-situ fill material on the surface of the swale must be capped with a geotextile marker layer to demarcate the boundary between contaminated soils and overlying capping material. Capping material must be installed in accordance with the guidance provided in **Section 7.4.2** below. Furthermore, given the grade of the swale, erosion mitigation (such as vegetation and landscaping elements) should be included to stabilise the capping material.

7.4.2 Capping of Impacted Soils

Capping of impacted soils should be completed in accordance with the chronological task order provided in **Section 7.2** and in a manner integrated with the proposed earthworks and development strategy. Capping of impacted soils should be completed using a staged approach in conjunction with planned development works, to minimise the area of exposed impacted soils at the site at any one time.

Grass and impacted materials geotechnically unsuitable to be capped at the site should be excavated and stockpiled separately from other materials for offsite disposal. Prior to disposal, access to stockpiled impacted materials must be restricted with fencing, boundary tape, or flagging, noting that it is assumed that unauthorised, public access to the site will be restricted in accordance with standard site control practices, and covered with black plastic sheeting or similar. Stockpiled grass and unsuitable materials must be assessed by a suitably qualified environmental consultant to determine an appropriate waste classification for the material in accordance with the NSW EPA (2014) *Waste Classification Guidelines Part 1: Classifying Waste*.

Any excess impacted soils excavated to meet design specifications, which are geotechnically suitable to be retained onsite, should be stockpiled separately from other materials at the site. Access to stockpiled impacted materials must be restricted with fencing, boundary tape, or flagging, noting that it is assumed that unauthorised, public access to the site will be restricted in accordance with standard site control practices, and covered with black plastic sheeting or similar prior to emplacement at the site.

All trenches excavated to install underground services in impacted fill must be backfilled with VENM or ENM. The underground service trenches must be excavated to meet the design specifications. A geotextile marker layer must be installed on the walls and base of the underground service trenches to demarcate the boundary between VENM / ENM within the trench and contaminated soils outside of the trench.

The surface of the site must be capped with either hardstand (e.g., concrete, asphalt), VENM, or ENM. It is understood that, as part of the design specifications, the site elevation will be increased to mitigate flooding potential. As such, opportunity exists to implement a clean fill capping layer at the site without significantly altering design specifications. Where accessible soils are to remain at the site (e.g., grassed areas and landscaped areas), a minimum 500 mm clean fill capping layer must be installed to restrict access to underlying contaminated soils (where contaminated soils remain present) during any future maintenance activities such as tree planting or landscaping works, in accordance with the Newcastle Development Control Plan (2023).

8 REMEDIATION SITE MANAGEMENT

8.1 HEALTH AND SAFETY MANAGEMENT

It is the Remediation Contractor's legal responsibility to ensure a safe workplace for all workers and others who may attend the site during remediation works. The site-specific **Health and Safety Plan** and associated **Safe Work Method Statement** for each task should be developed by the Remediation Contractor and referred to for all WH&S matters. The following general WH&S requirements of the WH&S Act 2011 and applicable standards and codes of practice should be followed:

- Evaluation of onsite hazards and risks associated with these hazards.
- Particular risk control measures (including noise, atmosphere, electricity, confined spaces, odours, and manual handling).
- Definition of personal protection standards.
- Classification of onsite personnel and work zones.
- Details on work practices and restrictions, assessment of anticipated protection levels, controls on access to work zones and decontamination.
- The use of plant at places of work.
- Supervision of work practices and medical surveillance.
- The notification of accidents and other matters.
- Environmental monitoring protocols.
- Emergency information.
- Risk assessment methods.

8.2 ENVIRONMENTAL MANAGEMENT

A Construction Environmental Management Plan (CEMP) should be developed prior to the commencement of remediation activities in accordance with the Development Control Plan (Newcastle City Council, 2012). Significant aspects of the CEMP, relevant to the proposed remediation program include:

- Security
- Traffic and Access
- Quarantined Material
- Stockpile Management
- Materials Management and Tracking
- Excavation
- Unexpected Finds
- Soil Erosion and Surface Water Runoff
- Noise and Vibration
- Protection of Vegetation
- Waste Management
- Chemical Storage and Handling
- Odour Control
- Dust Control
- Noise and Vibration
- Monitoring Requirements
- Vehicle / Equipment Cleaning and Operation

8.3 MATERIALS HANDLING AND TRACKING

8.3.1 Materials Tracking

A materials handling and tracking procedure is to be provided in the site RWP prior to the commencement of remediation work. All materials handled during the remediation will be tracked and recorded from ‘cradle-to-grave’ to mitigate cross-contamination and provide complete records for site validation. The materials tracking will provide detailed information on the location and quantity of all material movements both on- and off-site, so that all the material being handled can be identified and accounted for.

Designated material placement locations, such as inert waste, clean soil, restricted waste, and hazardous waste, shall be allocated and detailed on plans prepared by the Remediation Contractor. Each designated material placement location is to follow the guidelines for stockpile management, compiled in the RWP, so as to limit cross contamination and mitigate the risk to the environment from potentially hazardous materials.

A register of all stockpiles will be kept onsite detailing their location, quantity, source, analytical concentrations and intended future use.

Standard forms shall be prepared as part of the Materials Tracking Procedure along with the EPA on-line waste tracking system. The forms and their function shall include, but not be limited to:

- *Material Excavation Form* – Providing a record of excavated materials for each excavation on the site including the date, material type, excavated quantity, origin and intended destination,
- *Material Stockpiling Form* – Provides a record of all materials placed in each of the site stockpiles. The form will include the date, material type, stockpiled quantity, origin and intended end use,
- *Off-site Transport Form* – Providing a record of materials removed from the site and including the material type, quantity, origin, and shipping destination; and
- *Imported Fill Form* – Providing a record of materials imported to the site including the date, material type, quantity, point of origin, intended use and the suitability of the material for use as backfill at the site.

During the works, each form shall be completed as required and collated into a cumulative log for each process. All material tracking information is to be retained and provided in the site validation report.

8.3.2 Imported Fill, Backfilling, Capping, and Compaction

Backfilling and site capping will be undertaken to ensure the site is safe in accordance with the WHS Regulations (2017). The volume of imported VENM required will depend on the volume of excavated material requiring offsite disposal to make the excavated areas safe, and the volume of soil required for capping (including any site raising) where hardstand capping is not being implemented. Additionally, clean fill materials generated from remedial activities at the site may be beneficially reused for the backfilling of excavations where geotechnically suitable and are proven to pass the remediation screening criteria (refer to **Section 8.4.3**).

Backfill material placed at the site as part of the remediation works will not be sampled prior to placement. It is anticipated that backfill material will be capped by hardstand, or VENM or ENM with appropriate certification.

8.3.3 Beneficial Reuse

Where materials have been identified to be geotechnically suitable, soil may be beneficially reused onsite within excavation backfill. **The following criteria must be met**:

- Documentation must be maintained with regards to the quantity and backfill locations of beneficially reused material to be presented in the final validation report.
- Backfill material must be capped either by hardstand or a minimum 500 mm layer of VENM / ENM.
- Backfill material excavated from the fill layer of the site (i.e., excavated from the top 1.0 m of site soils) must not be used as backfill at depths beyond 1.0 m below the current site level (i.e., must not be used as backfill within the natural estuarine clay soil profile).
- Should material be identified suitable for beneficial reuse onsite subject to conditions (e.g. placed at depths greater than 1.0m in the base of excavations), all conditions must be complied with.

8.3.4 Waste Management

It is anticipated that the current site grass cover would be unsuitable for use as backfill at the site and would be unsuitable to remain below the site capping layer. Waste types expected to be generated during remedial works are presented in **Table 8-1** with summarised management requirements. Detailed management requirements for stockpiled wastes will be included in the development of the CEMP.

Table 8-1: Waste Classification and Management

Waste Classification	Description and Management
Asbestos Waste	Asbestos waste as defined by the NSW EPA (2014) Waste Classification Guidelines *Part 1: Classifying Waste* includes any wastes that contains asbestos. Asbestos waste is not expected to be generated during the remedial works; however, potential exists for the unexpected find of asbestos which was not identified during previous investigation works. Where asbestos wastes cannot be disposed of directly to an offsite licensed waste facility, asbestos wastes should be quarantined in a temporary, isolated storage area onsite and managed in accordance with the requirements outlined in the CEMP (i.e. stockpiles covered and wetted down and air monitoring conducted as appropriate).
Liquid Wastes	Liquid waste as defined by the NSW EPA (2014) Waste Classification Guidelines *Part 1: Classifying Waste* means any waste that has an angle of repose of less than 5 degrees, becomes free-flowing at or below 60 degrees Celsius when transported, generally not capable of being picked up by a spade or shovel or is classified as liquid waste under an EPA gazettal notice. Liquid wastes are not expected to be generated during the redevelopment.
Contaminated Soil	Excavated contaminated soils requiring offsite disposal will be sampled in accordance with the NSW EPA (2014) *Waste Classification Guidelines: Part 1: Classifying Wastes.* A waste classification report will be required to accompany any soil requiring offsite disposal. Disposal of soil shall only be to a waste facility licensed to receive the waste. Prior to offsite disposal, contaminated soils will be held in demarcated temporary storage areas, based on contaminant and intended future disposal. Soils are to be managed in accordance with the requirements developed in the site's Remediation Environmental Management Plan.

Waste tracking certificates, materials tracking information and waste disposal dockets from all receiving offsite waste facilities will be obtained and provided as part of the final site Validation Report as evidence of appropriate disposal. Where beneficial reuse of materials may have occurred onsite, materials tracking information and subsequent beneficial reuse assessments will be appended to the final Validation Report.

8.3.5 Preliminary Waste Classification

Based on the results obtained from investigations undertaken to date, a preliminary waste classification was provided as part of the addendum DSI (Kleinfelder, 2024b). The waste classification assessment included results selected samples collected during the addendum DSI, as well as soil results obtained during the DSI (Kleinfelder, 2024a).

Analytical results typically returned below the laboratory LOR for the majority of analytes including asbestos, monocyclic aromatic hydrocarbons (MAH), polychlorinated biphenyls (PCB), phenolic compounds, organochlorine pesticides (OCP), and organophosphorus pesticides (OPP). Detections of total recoverable hydrocarbons (TRH) were reported; however, detections were reported below the General Solid Waste Maximum Value (CT1) in all samples assessed.

The following were reported above the adopted criteria:

- One detection of lead was reported above the General Solid Waste Maximum Value (CT1), within sample BH04_0.2-0.7,
- Two detections of total PAH were reported above the General Solid Waste Maximum Value (CT1), within samples MW02_0.3-0.5 and BH20_0.6-0.7, and
- Several detections of benzo(a)pyrene were reported above the adopted guidelines, including:
    - 18 samples reported above the General Solid Waste Maximum Value (CT1),

- 11 samples reported above the Restricted Waste Maximum Value (CT2),
- Three detections of benzo(a)pyrene were reported above the General Solid Waste Maximum Value (SCC1) within samples MW01_0.2-0.5, MW02_0.3-0.5 and BH20_0.6-0.7, and
- Two detections of benzo(a)pyrene reported above the Restricted Waste Maximum Value (SCC2) within samples MW02_0.3-0.5 and BH20_0.6-0.7.

Based on the leachability results, site soils are non-leachable and therefore the majority of soils would meet the requirements for classification as General Solid Waste (non-putrescible), with the exclusion of the following:

- Soils at MW01, which would be classified as Restricted Waste, and
- Soils at BH20 and MW02, which would be classified as Hazardous Waste.

Given the limited number of samples collected from the site (with respect to the total area of impacted filling material), the nature of the filling material and the spread of contamination across the site, elevated PAH may be present in other areas of the site. Furthermore, previous investigations were not undertaken within the proposed swale footprint. It is therefore recommended, if fill soils are required to be exported from the site, that they are investigated and tested, prior to excavation, by a suitably qualified environmental consultant to determine fill volumes and an appropriate waste classification for stockpiled materials in accordance with the NSW EPA (2014) *Waste Classification Guidelines Part 1: Classifying Waste*.

8.4 SERVICES

It is understood that all onsite services will be isolated prior to the commencement of the remediation program. Should remedial works be identified to impact on existing services the Remediation Contractor should notify the service provider and implement management controls as provided by the relevant service authority.

9 VALIDATION METHDOLOGY

This section provides a description of the validation methodology to be adopted during remediation works. This methodology may be subject to amendment as the remedial works proceed, to accommodate updated site conditions. The following elements should form part of a Validation Sampling, Analysis and Quality Plan, to be developed by the environmental consultant overseeing implementation of the works.

9.1 PROJECT VALIDATION TEAM

The project validation team should consist of suitably qualified environmental consultants with experience working on comparable contaminated sites of the nature and extent as reported herein. All members of the project validation team should be aware of the components of the requirements of this RAP and components of the Validation Sampling, Analysis and Quality Plan.

9.2 VALIDATION ELEMENTS

9.2.1 Validation of Capping

At a minimum, validation sampling of accessible soils following capping works should be conducted in accordance with Australian Standards (AS 4482.1:2005 and AS 4482.2:1999); the NEPM 2013; and relevant NSW EPA Sample Design Guidelines.

Photographic evidence of completed remediation works will be maintained and compiled for the final validation report. Additionally, verification of capping depths must be made, including site records, photographs, and potentially via coring (where required). Verification of lining and backfilling for service trenches must also be provided. The location of stockpiles should have the residual ground surface inspected following stockpile removal, including any areas which may be impacted be eroded sediment/run-off movement.

Groundwater quality testing should be conducted prior to and following works to determine if the development has had an adverse effect on local groundwater conditions. Given the proximity of creek lines, the site will also require a surface water management strategy with respect to surface water runoff (if any) to nearby creek lines.

Validation samples will be obtained at the completion of the remediation works under the general remediation program (refer to **Section 7.2**) and will be submitted to a National Association of Testing Authorities (NATA) accredited laboratory for all analysis. A summary of the minimum sampling requirements is outlined in **Table 9-1**.

Table 9-1: Validation Sampling Minimum Requirements

Validation Locations	Sample Media	No. of Samples
Validation of completed capping work, accessible soils across the site.	Soil	• Validation samples should be collected at a frequency specific to systematic sampling methodologies provided by the NSW EPA (2022) Contaminated Land Guidelines Sampling Design Part 1 – Application. The extent of accessible soil surfaces is unknown at the time of compiling this RAP, therefore future consideration would need to be given to the required number of validation samples.

The validation analytical suite is to comprise of CoPC consistent with previous environmental investigations:

- Heavy metals,
- TRH, and
- PAHs.

The final Validation Report will include a comparison of the upper 95% confidence levels for CoPC in the collected validation samples, for each area and source and will be compared to the required remediation screening criteria as presented in **Section 4.1** to confirm that no cross-contamination of soils has occurred during remediation, and

to ascertain whether contamination has been capped to levels which render the site suitable for use under a recreational / public open space land use setting.

9.2.2 Validation of Imported Fill Materials

It is expected that imported materials brought to the site for the purpose of excavation reinstatement will be certified VENM or ENM.

VENM refers to natural material (e.g. clay, gravel, sand, soil, or rock fines) that:

- has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining, or agricultural activities; and
- does not contain sulfidic ores or soils, or any other waste.

ENM refers to natural material, including naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay, and soil that has:

- Been excavated from the ground,
- Contains at least 98% (by weight) natural material, and
- Does not meet the definition of Virgin Excavated Natural Material in the Act.

Visual inspection of imported fill materials should take place at the source location or at another offsite storage area (where possible) before importing fill materials directly to site prior to verification sampling. Material should be inspected as it comes onto site to make sure it is the same material and no evidence of visual or olfactory contamination is present. VENM will not be accepted where adequate certification is not provided. Should VENM not visually match the adequate certification, verification sampling should be undertaken including field screening using a PID for field VOC assessment and the collection of analytical samples at a rate of 1 per 100m^3, noting a minimum of 5 samples will need to be collected where imported materials are less than 500m^3. Samples should be analysed for CoPC consistent with those presented in **Section 9.2.1**.

9.2.3 Validation Contingency

If any of the validation elements outlined above fail to achieve the nominated remediation screening criteria, contingency measures will be required to be implemented as outlined in **Table 9-2**.

Table 9-2: Validation Contingency

Validation Element	Contingency
Validation sample failure in areas requiring remediation	Should validation samples collected return concentrations above the adopted remediation screening criteria and are indicative of potential contamination risks to receptors, further excavation and additional validation samples may be required. However, the need for further remediation would consider the magnitude and location of exceedances, including statistical analysis.
Identified impacts under stockpiled soil locations, or within/below eroded sediments	Impacted material should be removed, and further validation assessments should be conducted following the removal of this material. This will not be required if the stockpiles are located in an area which is proposed to be capped as part of site remediation works
VENM / ENM does not meet the adequate standard and / or fails reverification sampling	Should imported VENM / ENM fail to meet the required adequate standard and / or fails reverification sampling, materials are to be removed from site and the required quantity of backfill material sourced from another provider.
Insufficient capping used in areas requiring remediation	Increase the depth of imported VENM / ENM in these areas to provide a suitable capping thickness.
Trenches for utilities improperly lined or backfilled with improper capping material	Excavate trenches and line and backfill with suitable material.

Validation Element	Contingency
Identified impacts to groundwater or adjacent creeks	A review of site activities must be conducted to determine what may have contributed to impacts to local groundwater or surface water. The contaminating activity must cease, and greater controls must be put in place to protect the surrounding environment. Confirmation that these controls have been effective must be conducted via further monitoring.

9.3 Long Term Environmental Management Plan

In order to fulfill the objective of achieving remediation to the extent practicable, impacted soil will remain at the site beneath the capping layer. Because impacted soil is remaining at the site, a Long-Term Environmental Management Plan (LTEMP) will be required to be prepared and implemented by current and future owners of the site, to mitigate future exposure to impacted soils, manage potential human health or ecological concerns, and protect the safety of members of the public accessing the site.

The LTEMP will define the management procedures required to mitigate potential exposure risks following the completion of capping works at the site. The LTEMP should be prepared as part of the planning phase and prior to capping works in accordance with the NSW EPA (2020) Contaminated Land Guidelines Consultants Reporting on Contaminated Land and the NSW EPA Practice note: Preparing environmental management plans for contaminated land. The plan should be reviewed and approved by a contaminated land consultant, certified under a certification scheme recognised by the NSW EPA.

It is intended that the LTEMP will be implemented by BANL, its delegates and future site owners or occupants and is applicable to the following tasks:

- Routine inspections to monitor the condition of the site surface to ensure the capping layer remains structurally intact,
- General surface maintenance such as lawn mowing, weed eradication or repairs to any significant animal burrows, and
- Safety controls to prevent dermal exposure, and contaminated soil waste management, for any future excavation works proposed below the site capping layer.
- General maintenance, including sediment/erosion control mechanisms, until vegetation is established on the site surface and functioning to inhibit surface erosion.
- Scour and sediment accumulation checks in the swale after flooding and high rainfall events.

It is intended that the site will continue as non-sensitive and informal use as recreational / public open space. Should an alternative land-use be required in the future, the site conditions will need to be re-assessed which may require further remediation and management works to ensure that the land can be made suitable.

10 REMEDIATION CONTINGENCY

10.1 UNEXPECTED FINDS

Due to the limited historical information available for review pertaining to the unknown source of filling material present at the site, there is a potential for unexpected areas of contamination, anthropogenic materials and / or ground materials to be encountered during remediation works which have not been previously assessed and may result in the exposure of personnel to hazardous conditions, generation of additional wastes and extension of the remediation timeframe. A detailed unexpected finds procedure is to be provided in the site CEMP, prior to commencement of the site remediation works. An indicative workflow is as follows:

- Site activities within the immediate surrounds are to cease.
- Notification of the unexpected find to the site supervisor.
- Recording of the unexpected find including photographs and co-ordinates.
- The unexpected find should be investigated to ascertain the nature and extent of potential contamination; and
- Remediation and validation of the unexpected find.

All unexpected finds are to be recorded and assessed as necessary by a suitably qualified environmental consultant.

10.2 EQUIPMENT FAILURE

Failure of critical equipment may cause lengthy delays to remedial works. A proactive approach to equipment maintenance should be overseen by the Remediation Contractor. All equipment is to be maintained and regularly serviced, with maintenance and servicing records maintained, in addition to daily pre-starts. Records of the emergency equipment repair service providers should be held on-site and maintain a list of nearby rental options should be maintained to minimise delays to the remediation works. In the event equipment cannot be repaired on-site or replaced, works involving the particular equipment are to be rescheduled until repairs are made.

Additional controls regarding equipment maintenance are to be provided in the CEMP.

10.3 RELEASE OF CONTAMINATED MATERIALS TO THE ENVIRONMENT

Should a release of contaminated material occur to the environment, significant delays to the projected remediation schedule may occur. Appropriate spill control measures should be detailed in the CEMP. All contaminated materials should be managed in accordance with the requirements outlined in the CEMP. After removal of any impacted materials, the residual surface should be checked by validation sampling.

10.4 INCLEMENT WEATHER

Inclement weather such as excessive rainfall events may disrupt and delay remediation works and may lead to flooding at the site. Weather forecasts and environmental conditions should be monitored regularly and site activities to be re-assessed during or prior to significant weather events.

11 CONCLUSIONS

The conceptual remediation strategy and remediation works implementation outlined in this RAP is considered to meet the required NSW EPA standards outlined in NSW EPA, 2020. *Consultants Reporting on Contaminated Land, Contaminated Land Guidelines*, as revised May 2020 and NSW EPA, 2017. *Contaminated Land Management – Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, as published October 2017.

It is considered that should site remediation works be completed in accordance with the guidance provided in this RAP, the site can be made suitable for an ongoing recreational / public open space land use.

The level of detail provided herein is considered sufficient to enable the preparation of the following documents, required prior to the commencement of site remediation works:

- Remediation Works Plan / Remediation Technical Specification and / or a Bill of Quantities outlining detailed remediation design,
- CEMP outlining detailed environmental management procedures to be employed during the remediation works,
- Validation Sampling Analysis and Quality Plan outlining detailed sampling guidelines and validation records required for the final validation report.

All WH&S documentation is to be developed in accordance with **Section 8.2** by the relevant stakeholders prior to the commencement of site remediation works.

Because impacted soil is remaining at the site, a Long-Term Environmental Management Plan (LTEMP) will be required to be prepared and implemented to mitigate future exposure to impacted soils, manage potential human health or ecological concerns, and protect the safety of members of the public accessing the site.

The LTEMP should be prepared as part of the planning phase and prior to capping works in accordance with the NSW EPA (2020) Contaminated Land Guidelines Consultants Reporting on Contaminated Land and the NSW EPA Practice note: Preparing environmental management plans for contaminated land. The plan should be reviewed and approved by a contaminated land consultant, certified under a certification scheme recognised by the NSW EPA.

It is further noted that, as described in **Section 3.1.1**, the Kleinfelder (2024a) and Kleinfelder (2024b) investigations did not include an investigation of areas within the red hatched area, as depicted in **Figure 1**. It is recommended that this is confirmed via additional intrusive investigations within the expanded site area prior to the commencement of site development, in accordance with the NSW EPA, 2022. *Sampling Design Part 1 – Application, Contaminated Land Guidelines,* to confirm that the nature and extent of contamination in the expanded site area is consistent with the findings of the Kleinfelder (2024a) and Kleinfelder (2024b) investigations.

12 REFERENCES

- Cooperative Research Centre for Contamination Assessment and Remediation for the Environment (CRC CARE) 2011. *Technical Report No. 10 – Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater*. Friebel, E. and Nadebaum, P., September 2011 (CRC CARE Tech. Report 10).
- CRC CARE, 2013. *Technical Report 23 – Petroleum Hydrocarbon Vapour Intrusion Assessment*. Wright, J and Manning, T., July 2013 (CRC CARE Tech Report 23).
- CRC CARE, 2019. *National Remediation Framework,* as published July 2019 (NRF, 2019).
- *Contaminated Land Management Act* 1997 (CLM Act, 1997).
- *Environmental Planning and Assessment Act* 1979, as amended in 1997 (EP&A Act, 1997).
- Future City Group of The City of Newcastle (2012) Newcastle Technical Manual Contaminated Land Management.
- Kleinfelder (2023), *Detailed Site Investigation, Wallarah Oval and Blackley Oval, New Lambton, NSW, 2305.* November 2023.
- Kleinfelder (2024), *Supplementary Investigation – Detailed Site Investigation, Wallarah Oval and Blackley Oval, New Lambton, NSW, 2305.* February 2024.
- National Environment Protection Council (NEPC), 1999. *National Environment Protection (Assessment of Site Contamination) Measure,* 1999 as amended in May 2013 (NEPM, 2013).
- Newcastle City Council (2023) Newcastle Development Control Plan.
- NSW EPA, 2022. *Sampling Design Part 1 – Application, Contaminated Land Guidelines.*
- NSW EPA, 2020. *Consultants Reporting on Contaminated Land, Contaminated Land Guidelines*, as revised May 2020.
- NSW EPA, 2017. *Contaminated Land Management – Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, as published October 2017.
- NSW EPA, 2014. *Waste Classification Guidelines – Part 1: Classifying Waste*, as published November 2014.
- NSW EPA, 2016. *Addendum to the Water Classification Guidelines (2014) – Part 1: Classifying Waste,* as published in October 2016.
- NSW State Government, 2018. *State Environmental Planning Policy No.55 – Remediation of Land (SEPP55).*
- *Protection of the Environment Operations Act* 1997 (POEO Act, 1997).
- *Protection of the Environment Operations (Waste) Regulation*, 2005.
- Special Collections (2020) The Fortress Newcastle Project. Retrieved from The Fortress Newcastle Project - Hunter Living Histories
- Standards Australia AS 4482.1-1997. *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil. Part 1: Non-volatile and semi-volatile* compounds, as revised in 2005.
- Standards Australia AS 4482.2-1999. *Guide to the Sampling and Investigation of Potentially Contaminated Soil. Part 2: Volatile Substances*, as published in 1999.
- Wetherall, L. (2018) New Lambton Colliery. Retrieved from New Lambton Colliery | A bit of this, a bit of that (lachlanwetherall.com)
- Wetherall, L. (2015) Lambton Colliery. Retrieved from Lambton Colliery | A bit of this, a bit of that (lachlanwetherall.com)
- Wetherall, L. (2014) The Dividing Lines. Retrieved from The Dividing Lines | A bit of this, a bit of that (lachlanwetherall.com)

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It is further noted that, as described in **Section 3.1.1**, the Kleinfelder (2024a) and Kleinfelder (2024b) investigations did not include an investigation of areas within the red hatched area, as depicted in **Figure 1**. These areas were included as part of the overall site design following the completion of previously completed investigations undertaken by Kleinfelder. As such, the findings of previous investigations, and subsequent remediation strategy recommended in this RAP, may not be reflective of conditions within the expanded site area.

FIGURES

Legend

- Investigation Area
- Extended Site Area
- Lot Boundaries

0 7.5 15 30 45 60 75

Scale @ A4 1:1,500 Metres

GDA 1994 MGA Zone 56

N

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PROJECT REFERENCE:	24002155
DATE DRAWN: 11/06/2025	Version 1
DRAWN BY:	RHourigan
DATA SOURCE: Metromap - 2023	

Site Layout and Investigation Area

APP
Basketball Association of Newcastle Limited
New Lambton, NSW 2305

FIGURE:

1

J:\00 CLIENT FILES\89268_APP\24002155_BasketballAssociation\250605_BasketballAssociation_DSI.aprx (1)

APPENDIX A: DESIGN PLANS

GROUNDSWELL ENGINEERS

TRANSMITTAL

PROJECT No.	PROJECT
250106	HUNTER INDOOR SPORTS CENTRE - 2 MONASH ROAD

DESCRIPTION	DATE
ISSUED FOR APPROVAL	03.06.25

DRAWING No.	DRAWING TITLE	CURRENT REVISION	RECEIVING REVISION
250106-DA-000-01	COVER SHEET, DRAWING LIST AND LOCALITY PLAN	1	1
250106-DA-030-01	GENERAL ARRANGEMENT PLAN	1	1
250106-DA-110-01	CONCEPT EROSION AND SEDIMENT CONTROL PLAN	1	1
250106-DA-130-01	CONCEPT EROSION AND SEDIMENT CONTROL DETAILS	1	1
250106-DA-210-01	BULK EARTHWORKS PLAN	1	1
250106-DA-310-01	CONCEPT CIVIL WORKS PLAN STAGE 1	1	1
250106-DA-320-01	CONCEPT CIVIL WORKS PLAN STAGE 2	1	1
250106-DA-360-01	CONCEPT ACCESS PLAN	1	1
250106-DA-980-01	SWEPT PATH PLAN - 14.5m BUS	1	1

DISTRIBUTION	
BASKETBALL ASSOCIATION OF NEWCASTLE	*

SENT BY	J. HOEY
JOB MANAGER	J. HOEY
QA FORM No.	

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HUNTER INDOOR SPORTS CENTRE

2 MONASH ROAD, BROADMEDOW, NSW, 2292

CIVIL ENGINEERING PACKAGE

IMAGE SOURCE : NEARMAPS

LOCALITY PLAN

DRAWING LIST

DRAWING	TITLE
250106-DA-000-01	COVER SHEET, DRAWING LIST AND LOCALITY PLAN
250106-DA-030-01	GENERAL ARRANGEMENT PLAN
250106-DA-110-01	CONCEPT EROSION AND SEDIMENT CONTROL PLAN
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250106-DA-360-01	CONCEPT ACCESS PLAN
250106-DA-980-01	SWEPT PATH PLAN - 14.5m BUS

REV	DESCRIPTION	ISSD	APP	DATE
A	ISSUED FOR INFORMATION	JH	JH	30.05.25
1	ISSUED FOR APPROVAL	JH	JH	03.06.25

PROJECT MANAGER: J.HOEY
DESIGNED: T.SQUIRES
DRAFTED: R.HUTCHISON
VERIFIED: TBD

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ARCHITECT: EJE

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SCALE 1:2500

NORTH

SHEET SIZE A1
SETOUT TBD

GROUNDSWELL ENGINEERS
54 HUDSON STREET, HAMILTON NSW 2303

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2 MONASH ROAD, BROADMEDOW, NSW, 2292

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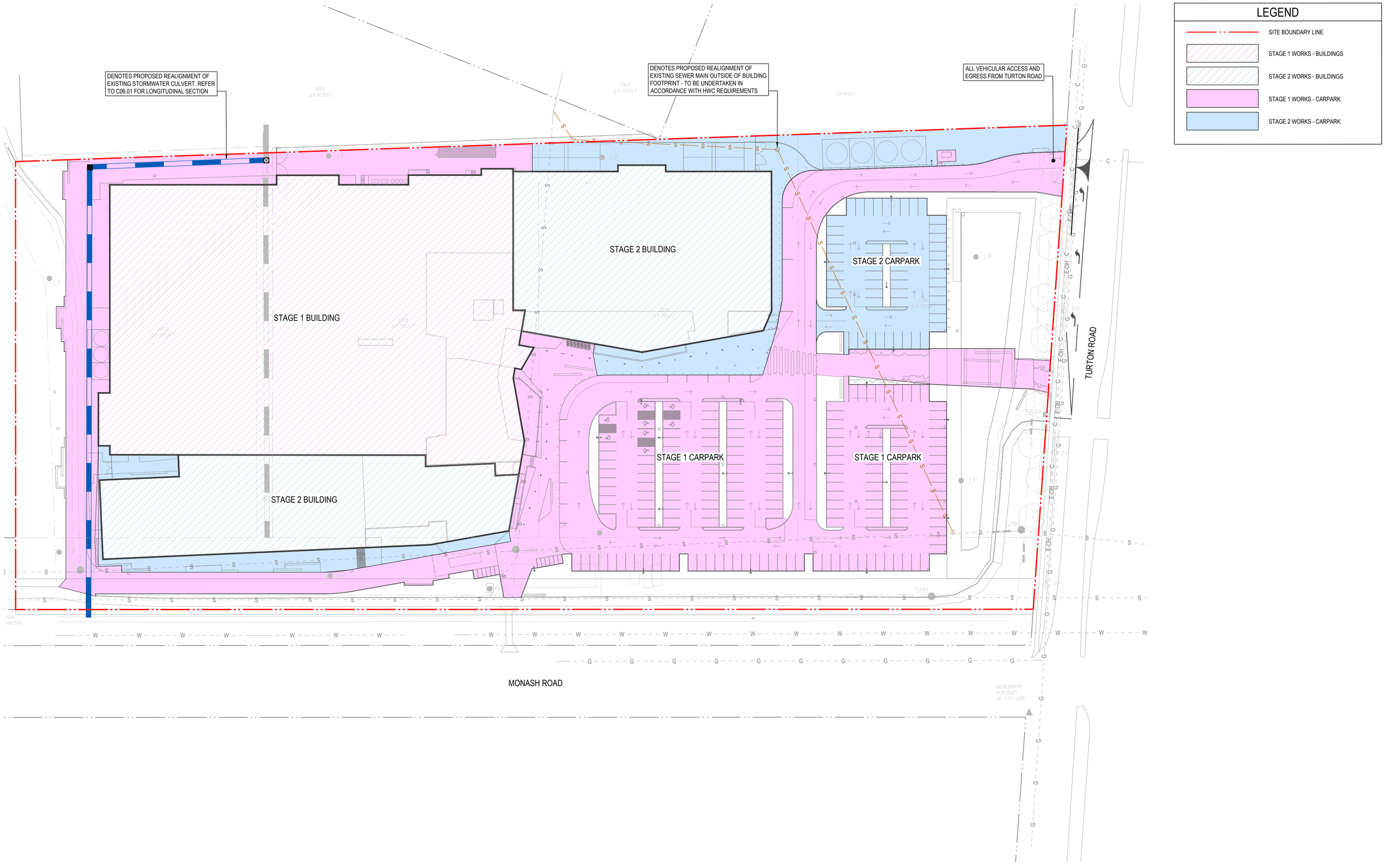

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NORTH

SHEET SIZE A1
SETOUT TBD

GROUNDSWELL ENGINEERS
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2 MONASH ROAD, BROADMEDOW, NSW, 2292

DRAWING TITLE: GENERAL ARRANGEMENT PLAN

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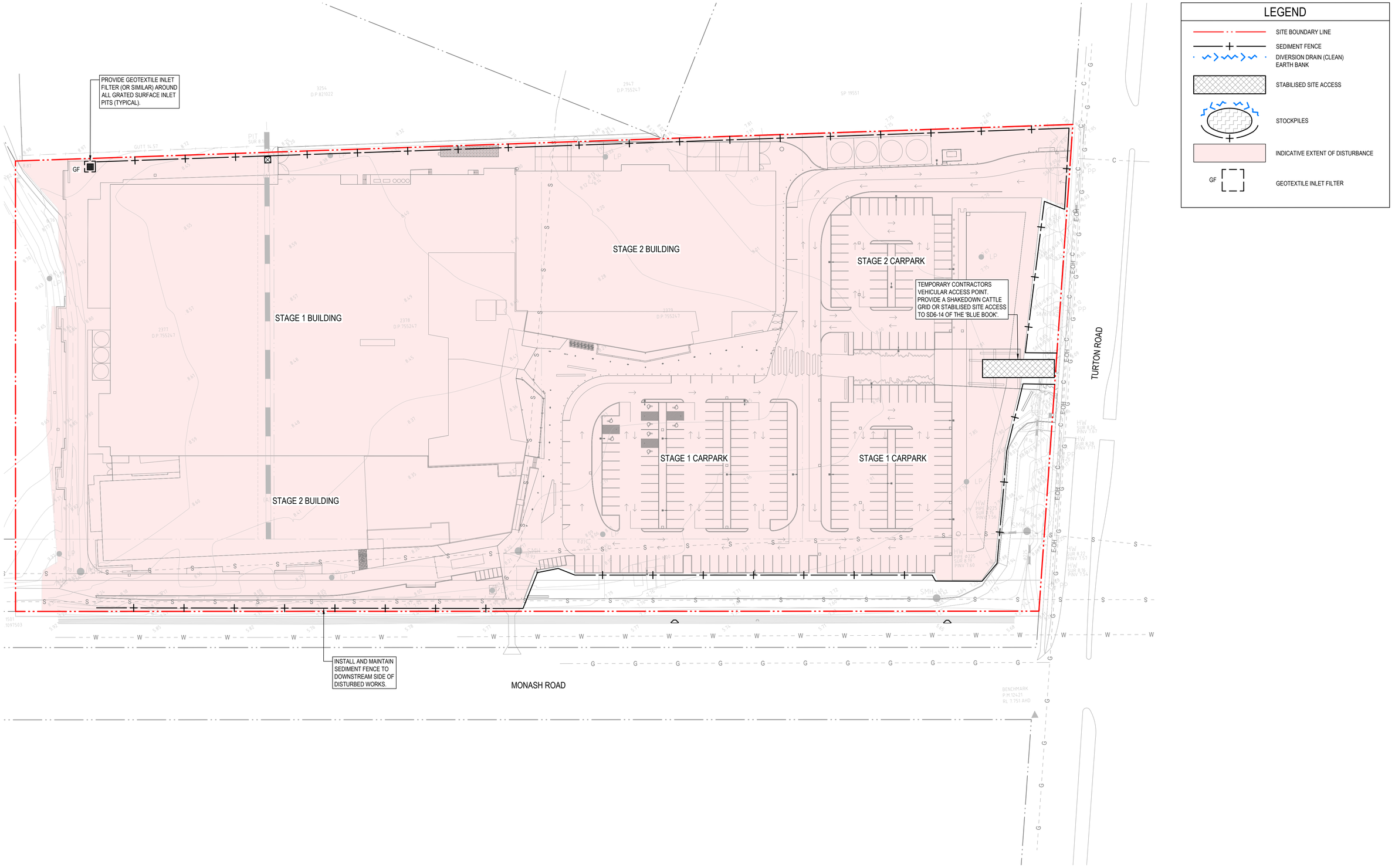

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NORTH

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SETOUT TBD

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54 HUDSON STREET, HAMILTON NSW 2303

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2 MONASH ROAD, BROADMEDOW, NSW, 2292

DRAWING TITLE: CONCEPT EROSION AND SEDIMENT CONTROL PLAN

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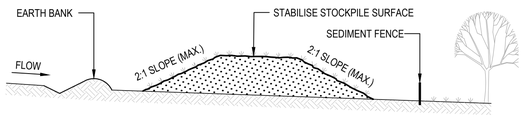
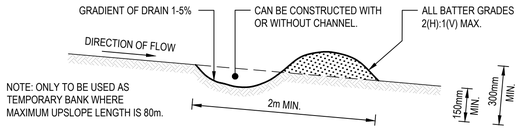


CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2m (PREFERABLY 5m) FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2m IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2m DOWNSLOPE.

STOCKPILES (SD 4-1)

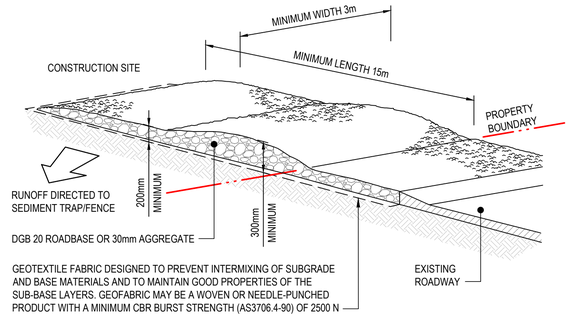


CONSTRUCTION NOTES

1. BUILD WITH GRADIENTS BETWEEN 1 AND 5 PERCENT.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTIONS, NOT V SHAPED.
5. ENSURE THE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITHIN 10 DAYS OF CONSTRUCTION.

DIVERSION DRAIN (DIRTY) -	BORROW AREA TO BE ON DISTURBED SIDE OF DRAIN
DIVERSION DRAIN (CLEAN) -	PROVIDE GEOFABRIC LINING TO SECTION OF DRAIN

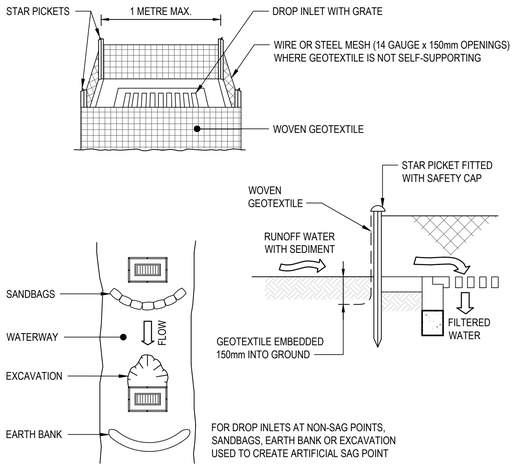
EARTH BANK - LOW FLOW (SD 5-5)



CONSTRUCTION NOTES

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15 METRES LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3 METRES WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO THE SEDIMENT FENCE.

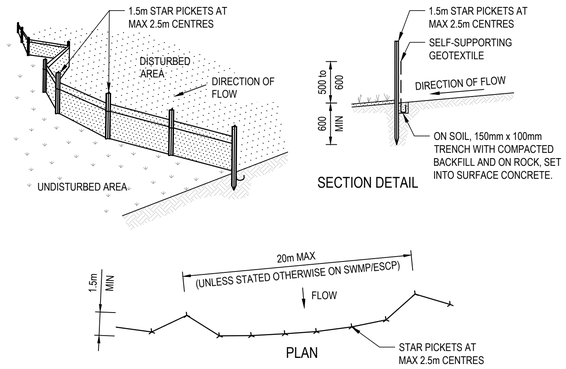
STABILISED SITE ACCESS (SD 6-14)



CONSTRUCTION NOTES

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. FOLLOW STANDARD DRAWING 6-7 AND STANDARD DRAWING 6-8 FOR INSTALLATION PROCEDURES FOR THE STRAW BALES OR GEOFABRIC. REDUCE THE PICKET SPACING TO 1 METRE CENTRES.
3. IN WATERWAYS, ARTIFICIAL SAG POINTS CAN BE CREATED WITH SANDBAGS OR EARTH BANKS AS SHOWN IN THE DRAWING.
4. DO NOT COVER THE INLET WITH GEOTEXTILE UNLESS THE DESIGN IS ADEQUATE TO ALLOW FOR ALL WATERS TO BYPASS IT.

GEOTEXTILE INLET FILTER (SD 6-12)



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5 METRE LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

SEDIMENT FENCE (SD 6-8)

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PROJECT MANAGER: J.HOEY
DESIGNED: T.SQUIRES
DRAFTED: R.HUTCHISON
VERIFIED: TBD

CLIENT: **BASKETBALL ASSOCIATION OF NEWCASTLE**

ARCHITECT: EJE

SCALE: 0 5 10 15 20m — SCALE 1:500

NORTH

SHEET SIZE A1
SETOUT TBD

GROUNDSWELL ENGINEERS
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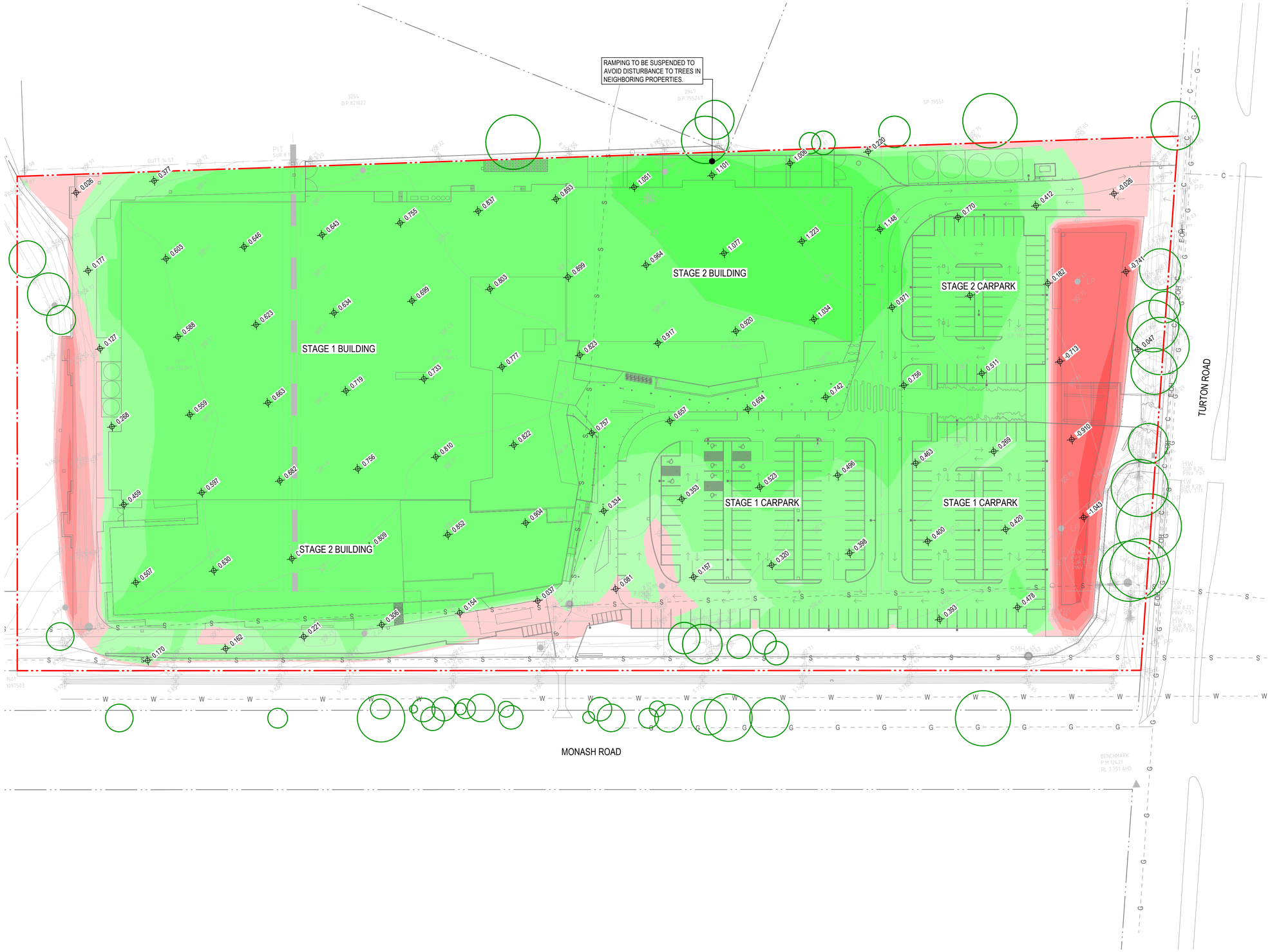

LEGEND

- SITE BOUNDARY LINE
- BE XX.XX — BULK EARTHWORKS SPOT HEIGHT
- EXISTING TREE TO BE MAINTAINED

DEPTH OF CUT

- 3.0m	TO	- 20.0m
- 2.0m	TO	- 3.0m
- 1.5m	TO	- 2.0m
- 1.0m	TO	- 1.5m
- 0.5m	TO	- 1.0m
- 0.25m	TO	- 0.5m
- 0.1m	TO	- 0.25m
0.1m	TO	-0.1m

DEPTH OF FILL

0.1m	TO	0.25m
0.25m	TO	0.5m
0.5m	TO	1.0m
1.0m	TO	1.5m
1.5m	TO	2.0m
2.0m	TO	3.0m
3.0m	TO	20.0m

NOTES

1. BULK EARTHWORKS LEVELS AND VOLUMES ARE BASED ON A COMPARISON OF THE DESIGN BULK EARTHWORKS SURFACE AND THE EXISTING SURFACE LEVEL AS SURVEYED. NO ALLOWANCE FOR PAVEMENT OF BUILDING PAD.
2. NO ALLOWANCE HAS BEEN MADE FOR SELECT LAYERS OR UNSUITABLE MATERIAL THAT IS LIKELY TO BE PRESENT.
3. NO ALLOWANCE HAS BEEN MADE FOR TEMPORARY SEDIMENT DAMS
4. NO ALLOWANCE HAS BEEN MADE FOR SAND LEVELING LAYER BENEATH BUILDING PADS
5. NO ALLOWANCE HAS BEEN MADE FOR SERVICE TRENCHES, DRAINAGE TRENCHES, DRAINAGE INFRASTRUCTURE (PITS, CULVERTS, ETC) IN THE LEVELS OR VOLUMES PRESENTED ON THIS PLAN.
6. NO ALLOWANCE FOR ANY TEMPORARY BATTERS DURING WORKS.
7. NO BULKING FACTORS HAVE BEEN CONSIDERED/ALLOWED FOR.
8. APPROXIMATE BULK EARTHWORKS VOLUMES BASED ON THE NOTES ABOVE ARE AS FOLLOWS;
   - BULK CUT = 4, 215m^3
   - BULK FILL = 11, 642m^3
   - BULK CUT/FILL BALANCE = 7, 426m^3 (FILL)
9. ALL BULK EARTHWORKS TO BE UNDERTAKEN IN ACCORDANCE WITH SITE SPECIFIC GEOTECHNICAL REPORT AND BULK EARTHWORKS NOTES.
10. ABOVE ALLOWANCE INCLUDES PRELIMINARY TRENCH VOLUMES FOR SEWER AND CULVERT RELOCATIONS.

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NORTH

SHEET SIZE A1
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GROUNDSWELL ENGINEERS
54 HUDSON STREET, HAMILTON NSW 2303

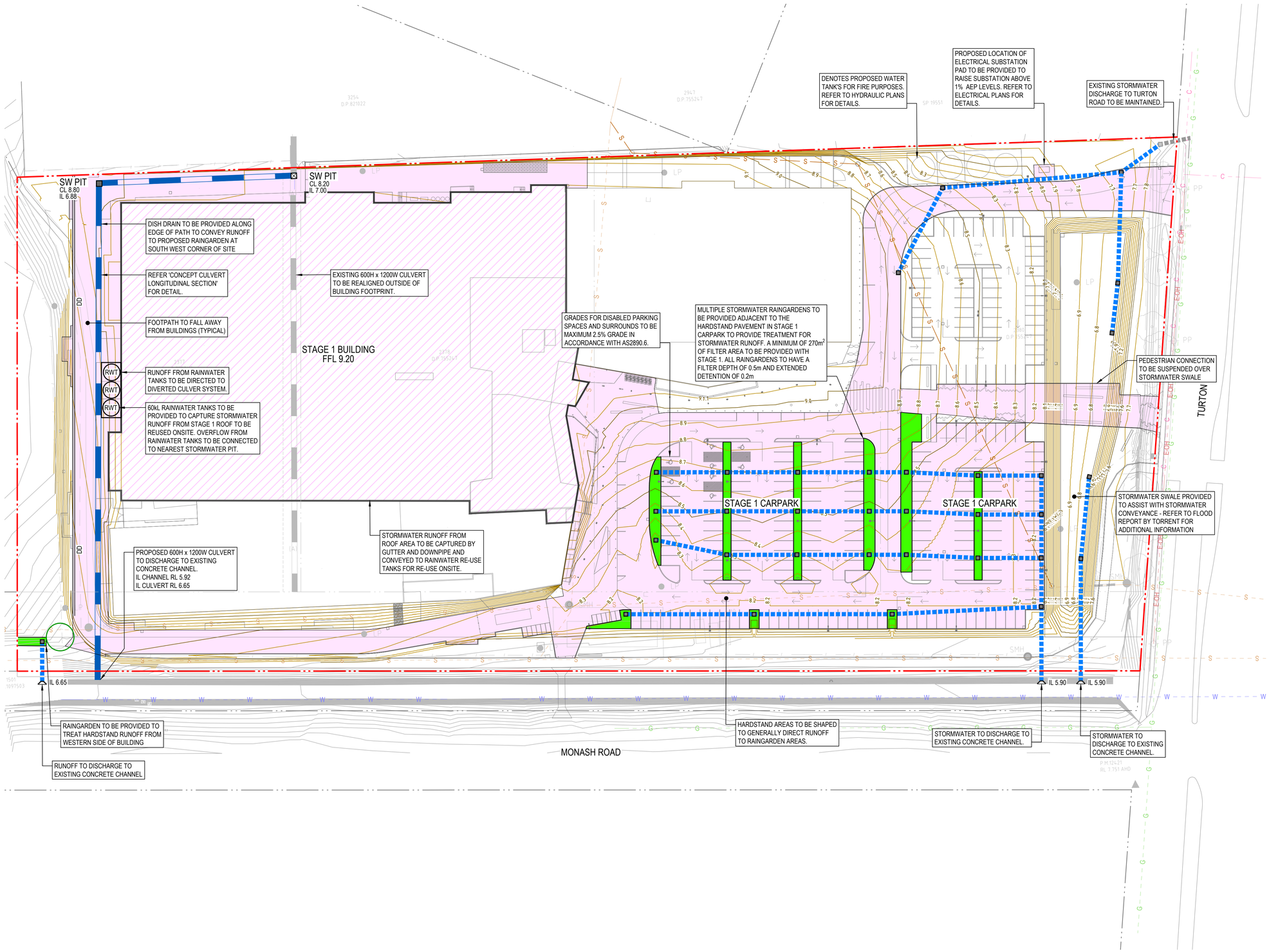
PROJECT TITLE: HUNTER INDOOR SPORTS CENTRE
2 MONASH ROAD, BROADMEDOW, NSW, 2292

DRAWING TITLE: BULK EARTHWORKS PLAN

STATUS: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

PROJECT - SET - DRAWING - SHEET: 250106-DA-210-01

REVISION: 1



REV	DESCRIPTION	ISSD	APP	DATE
A	ISSUED FOR INFORMATION	JH	JH	30.05.25
1	ISSUED FOR APPROVAL	JH	JH	03.06.25

PROJECT MANAGER: J.HOEY
DESIGNED: T.SQUIRES
DRAFTED: R.HUTCHISON
VERIFIED: TBD

CLIENT: **BASKETBALL ASSOCIATION OF NEWCASTLE**

ARCHITECT: EJE

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SCALE: 0 5 10 15 20m — SCALE 1:500

NORTH

SHEET SIZE A1
SETOUT TBD

GROUNDSWELL ENGINEERS
54 HUDSON STREET, HAMILTON NSW 2303

PROJECT TITLE: HUNTER INDOOR SPORTS CENTRE
2 MONASH ROAD, BROADMEDOW, NSW, 2292

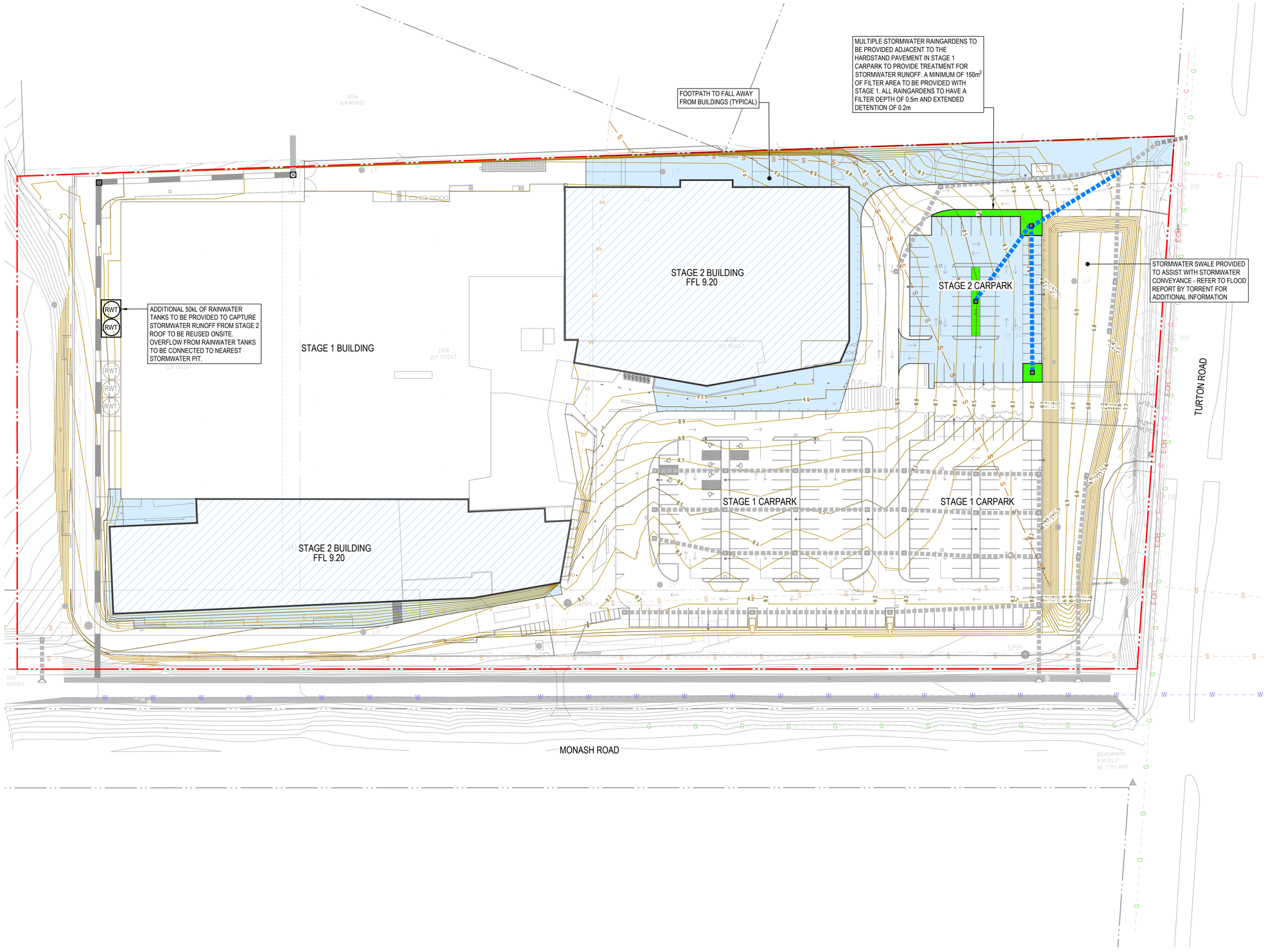
DRAWING TITLE: CONCEPT CIVIL WORKS PLAN STAGE 1

STATUS: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

PROJECT - SET - DRAWING - SHEET: 250106-DA-310-01

REVISION: 1

Date : 03.06.2025 1:59 PM Plotted By : REECE HUTCHISON Found : C:\Users\ReeceHutchison\Groundswell Engineering\Intranet - Documents\Projects\250106 Hunter Indoor Sports Centre\G Drawings\Civil\2. CAD\DA\250106-DA-310 CIVIL WORKS STAGE 1.dwg



LEGEND

- SITE BOUNDARY LINE
- STAGE 2 WORKS - BUILDINGS
- STAGE 2 WORKS - CARPARK
- STORMWATER PIPE
- EXISTING STORMWATER PIPE
- EXISTING 600 x 1200 CULVERT
- PROPOSED 600 x 1200 CULVERT
- SW PIT (CL xx.xx, IL xx.xx) — STORMWATER PIT AND TAG COVER LEVEL / INVERT LEVEL
- RWT — PROPOSED RAINWATER TANK TO FUTURE DETAILS
- PROPOSED SEWER
- EXISTING SERVICES BASED ON SURVEY DATA SUPPLIED
- PROPOSED RAINGARDEN TO FUTURE DETAILS
- DESIGN CONTOURS (0.1m INTERVALS)
- EXISTING CONTOURS (0.1m INTERVALS)

REV	DESCRIPTION	ISSD	APP	DATE
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SCALE: 0 5 10 15 20m — SCALE 1:500

NORTH

SHEET SIZE A1
SETOUT TBD

GROUNDSWELL ENGINEERS
54 HUDSON STREET, HAMILTON NSW 2303

PROJECT TITLE: HUNTER INDOOR SPORTS CENTRE
2 MONASH ROAD, BROADMEDOW, NSW, 2292

DRAWING TITLE: CONCEPT CIVIL WORKS PLAN STAGE 2

STATUS: FOR INFORMATION ONLY
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PROJECT - SET - DRAWING - SHEET: 250106-DA-320-01

REVISION: 1

Date : 03.06.2025 2:00 PM Plotted By : REECE HUTCHISON Found : C:\Users\ReeceHutchison\Groundswell Engineering\Intranet - Documents\Projects\250106 Hunter Indoor Sports Centre\G Drawings\Civil\2. CAD\DA\250106-DA-320 CIVIL WORKS STAGE 2.dwg

LEGEND

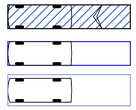
- SITE BOUNDARY LINE
- FOOTPATH TO BE PROVIDED IN ACCORDANCE WITH COUNCIL SD A1401
- DRIVEWAY TO BE PROVIDED IN ACCORDANCE WITH COUNCIL SD A1300
- VC — VEHICLE CROSSING TO BE PROVIDED IN ACCORDANCE WITH COUNCIL SD A1300
- G — EXISTING GAS
- W — EXISTING WATER
- S — EXISTING SEWER
- E-OH — EXISTING ELECTRICITY (OVERHEAD)
- C — EXISTING TELECOMMUNICATIONS

NOTES

1. LIGHTING DESIGN ASSESSMENT TI BE UNDERTAKEN AS PART OF DETAILED DESIGN PROCESS
2. DETAILED PAVEMENT, SIGNAGE & LINEMARKING PLANS TO BE PROVIDED AS PART OF DETAILED DESIGN PROCESS

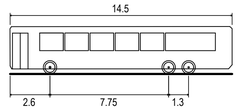
VEHICLE MOVEMENTS

FORWARD MOVEMENT



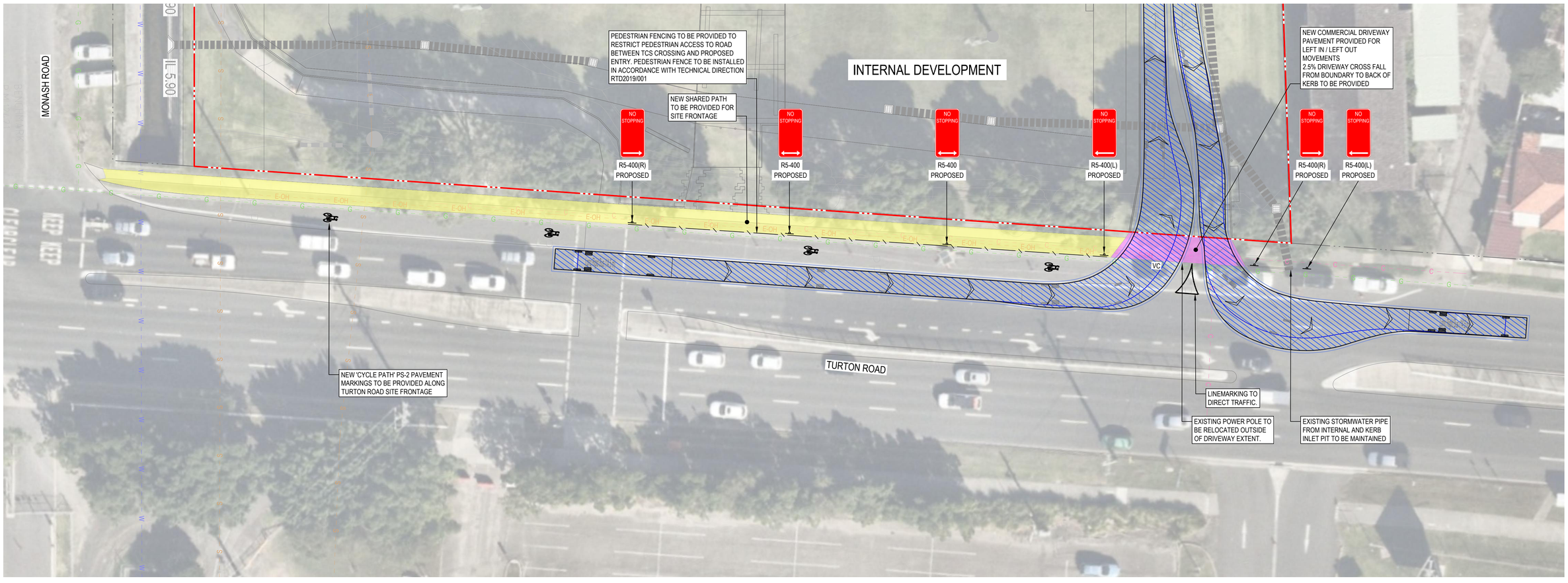
- VEHICLE BODY
- VEHICLE WHEELS
- ADDITIONAL CLEARANCE OFFSET

VEHICLE PROFILE



LONG RIGID BUS (14.5m)

OVERALL LENGTH	14.500m
OVERALL WIDTH	2.500m
OVERALL BODY HEIGHT	3.102m
TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s



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CLIENT: **BASKETBALL ASSOCIATION OF NEWCASTLE**

ARCHITECT: EJE

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SCALE: 0 2.5 5 7.5 10m
SCALE 1:250

NORTH

SHEET SIZE A1
SETOUT TBD

GROUNDSWELL ENGINEERS
54 HUDSON STREET, HAMILTON NSW 2303

PROJECT TITLE: HUNTER INDOOR SPORTS CENTRE
2 MONASH ROAD, BROADMEDOW, NSW, 2292

DRAWING TITLE: CONCEPT ACCESS PLAN

STATUS: FOR INFORMATION ONLY
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PROJECT - SET - DRAWING - SHEET: 250106-DA-360-01

REVISION: 1

Date : 03.06.2025 2:00 PM Plotted By : REECE HUTCHISON Found : C:\Users\ReeceHutchison\Groundswell Engineering\Intranet - Documents\Projects\250106 Hunter Indoor Sports Centre\G Drawings\Civil\2. CAD\DA\250106-DA-360 EXT.dwg

VEHICLE MOVEMENTS

FORWARD MOVEMENT

- VEHICLE BODY
- VEHICLE WHEELS
- ADDITIONAL CLEARANCE OFFSET (0.3m FROM BODY)

REVERSE MOVEMENT

- VEHICLE BODY
- VEHICLE WHEELS
- ADDITIONAL CLEARANCE OFFSET (0.3m FROM BODY)

DISCLAIMER

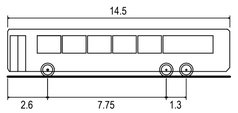
THE VEHICLE SWEPT PATHS / TEMPLATES PROVIDED HAVE BEEN PRODUCED USING SIMULATION SOFTWARE AND ARE TO BE USED AS A GUIDE ONLY. THESE SIMULATIONS MAY NOT REFLECT ACTUAL DRIVER BEHAVIOUR AND / OR EXPERIENCE UNDER ACTUAL DRIVING CONDITIONS.

IT IS GROUNDSWELL'S INTENTION TO UTILISE STANDARD VEHICLES NOMINATED IN AS2890 / AUSTROADS FOR ALL DESIGN / CHECKING VEHICLE SIMULATIONS AT AN IDEAL MOVEMENT SPEED OF 10 km/h WITH A MINIMUM VEHICLE BODY OFFSET OF 0.3m.

IF THE USE OF SPECIFIC VEHICLES (NOT DETAILED UNDER AS2890 / AUSTROADS) IS REQUESTED, IT IS TO BE NOTED THAT THEIR DIMENSIONS AND MANOEUVRING CHARACTERISTICS HAVE BEEN INTERPRETED INTO THE SIMULATION SOFTWARE FROM INFORMATION PROVIDED BY SERVICE PROVIDERS AND VEHICLE MANUFACTURES. GROUNDSWELL ACCEPTS NO RESPONSIBILITY OF THE ACCURACY THESE VEHICLE MOVEMENTS, AND ANY MANOEUVRES PROVIDED SHOULD ONLY BE USED AS A GUIDE WITH ACTUAL DESIGN BEING BASED AROUND ENGINEERING ADVICE AND AUSTRALIAN STANDARDS.

AT ALL TIMES, STANDARD VEHICLE SWEPT PATHS / TEMPLATES ARE TO TAKE DESIGN PRECEDENCE OVER ALL SPECIFIC VEHICLES. UNDER NO CIRCUMSTANCE DOES THE SIMULATION PROVIDED RELIEVE ANY PARTY OF THEIR ROLE AND RESPONSIBILITY FOR PROVIDING DESIGN SOLUTIONS IN ACCORDANCE WITH GOOD DESIGN PRACTICES.

VEHICLE PROFILE



LONG RIGID BUS (14.5m)

OVERALL LENGTH	14.500m
OVERALL WIDTH	2.500m
OVERALL BODY HEIGHT	3.102m
TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s
KERB TO KERB TURNING RADIUS	15.000m
TRAVELLING SPEED	10 km/h

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NORTH

SHEET SIZE A1
SETOUT TBD

GROUNDSWELL ENGINEERS
54 HUDSON STREET, HAMILTON NSW 2303

PROJECT TITLE: HUNTER INDOOR SPORTS CENTRE
2 MONASH ROAD, BROADMEDOW, NSW, 2292

DRAWING TITLE: SWEPT PATH PLAN - 14.5m BUS

STATUS: FOR INFORMATION ONLY
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PROJECT - SET - DRAWING - SHEET: 250106-DA-980-01

REVISION: 1

Date : 03.06.2025 2:00 PM Plotted By : REECE HUTCHISON Found : C:\Users\ReeceHutchison\Groundswell Engineering\Intranet - Documents\Projects\250106 Hunter Indoor Sports Centre\G Drawings\Civil\2. CAD\DA\250106-DA-980 SWEPT PATHS.dwg