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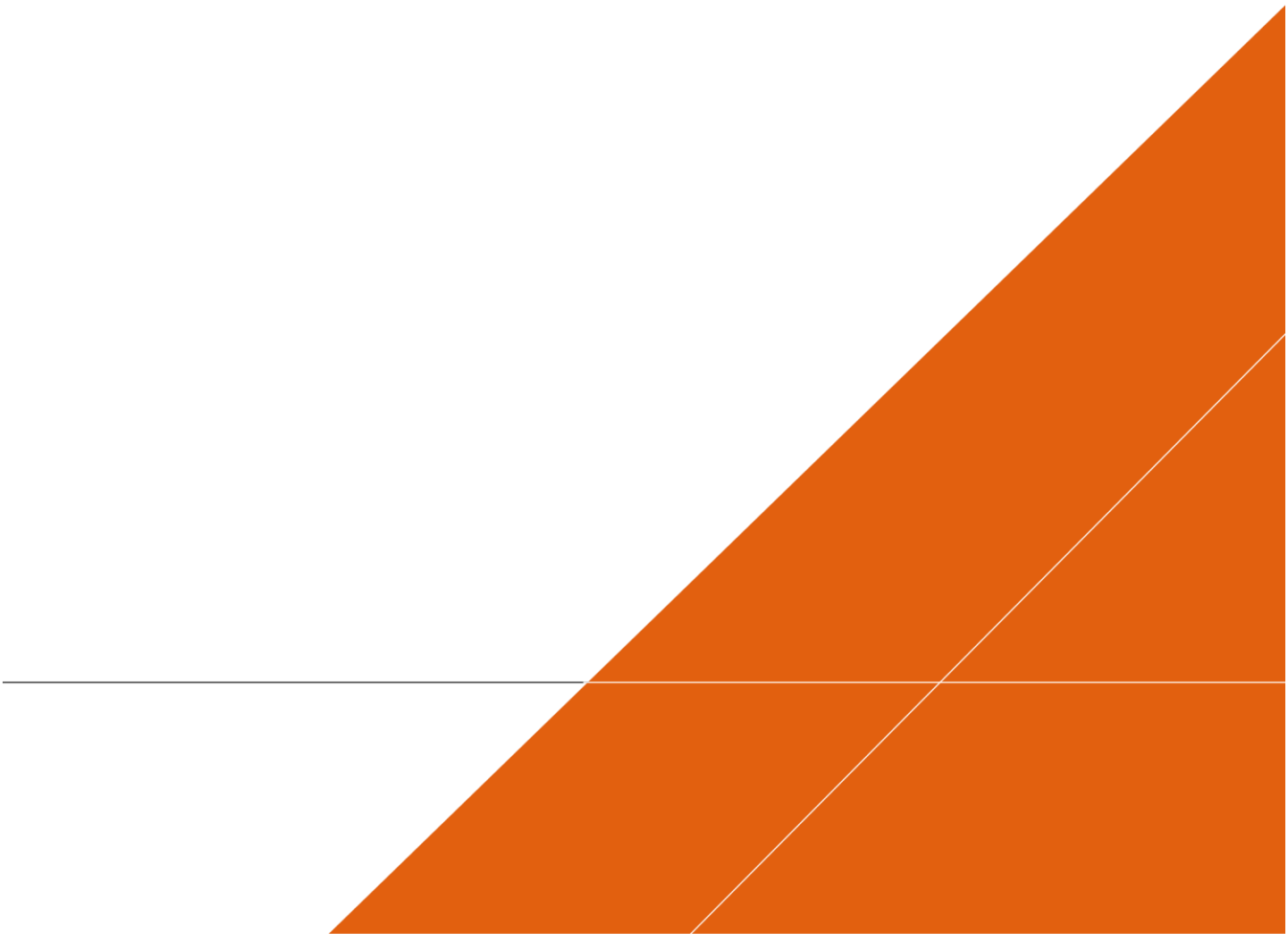
GROUNDWATER MANAGEMENT PLAN

Yiribana Logistics Estate

Prepared for The GPT Group

30 APRIL 2021



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Yiribana Logistics Estate

The GPT Group

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REVISIONS

Revision	Date	Description	Prepared by	Approved by
V0	8/04/2021	Draft for client review	PM	JC
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APPENDICES

1 INTRODUCTION

Arcadis Australia Pacific (**Arcadis**) was engaged by The GPT Group (**GPT**) to prepare a Groundwater Management Plan (**GMP**) to support the proposed development of an industrial estate, to be known as Yiribana Logistics Estate, for warehouse or distribution purposes located at 754-770 and 784-786 Mamre Road, Kemps Creek, NSW (the **Site**). Arcadis understands that a GMP is required to satisfy the Secretary's Environmental Assessment Requirements (**SEARs**) for a State Significant Development Application (**SSDA**). The location of the Site is illustrated in Figure 1, **Appendix A**.

The Site is legally described as Lots 59 and 60 on DP259135 and comprises an approximate area of 33.36 hectares (**ha**). The Site is located within the suburb of Kemps Creek, which sits within the Penrith City Council Local Government Area (**LGA**).

The Site has currently been rezoned from RU2 Rural Landscape to IN1 General Industrial zoning within the Western Sydney Employment Area (**WSEA**) stipulated within *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (**SEPP WSEA**).

1.1 Background

The Site has approximately 211 m of frontage to Mamre Road, which provides vehicular access via Mamre Road to the M4 Motorway in the north and Elizabeth Drive to the south. Known historical land uses at the Site include rural residential, grazing, dairy farming, poultry farming and horticulture.

Ministerial Local Planning Direction 3.5 precludes future residential development of the site due to its proximity to the Western Sydney Airport ANEF 20 noise contour. However, future land uses relevant to employment generating purposes, such as warehouse and logistics facilities, are consistent with the SEPP WSEA.

The proposed redevelopment of the Site will facilitate land uses consistent with commercial and industrial use, as prescribed in the National Environmental Protection Measure, as amended in 2013 (NEPC 2013). The SSDA seeks consent for the following activities:

- Concept masterplan comprising five industrial warehouses, internal road network, 25 m riparian zone, building location, Gross Floor Area (**GFA**), setbacks, car parking and built form parameters.
- Stage 1 consent for:
  - Construction and use of Warehouse 1 and 3 for the purposes of other manufacturing industries and/or warehouse and distribution centres which will operate 24 hours/day, seven days/week.
  - Provision of Site servicing infrastructure to allow the operation of the industrial unit for warehouse and distribution and/or other manufacturing industries.
  - Bulk earth works.
  - Construction of retaining walls.
  - Internal road network (north-south).
  - Associated carparking.
  - Signage.
  - Landscaping to the site and adjacent to the E2 Environmental Conservation zone located on-site.
- Stage 2 of the Estate, including construction of Warehouse Buildings 2, 4 and 5 will be subject to separate development applications.

1.2 Purpose

The purpose of this GMP is to describe the requirements for ongoing management at the Site, which is proposed to undergo development for industrial and/or commercial land uses.

This GMP has been prepared with due consideration of the results from site investigations and reports undertaken by other consultants at the Site in between September 2019 and March 2021 (KPMG 2021b).

1.3 Objectives

The objectives of the GMP are to document a procedure that ensures that exposure of identified receptors to impacted groundwater is minimised, and to comply with regulatory requirements. Specifically, the objectives are to:

- Outline the geology and hydrogeology of the Site.
- Assess if groundwater dewatering will be required during the re-development.
- If dewatering is to occur develop a dewatering strategy that meets the requirements of relevant policy and legislation.
- Outline any licensing requirements.
- Estimate the volume of groundwater that may be extracted during the redevelopment.
- Assess whether there are any further investigations required to assess potential groundwater impacts.

1.4 Scope of Work

To complete the objectives, Arcadis undertook the following scope to develop the GMP:

- Reviewed relevant reports to establish Site characteristics relevant to groundwater considerations, reviewed the baseline groundwater analytical data and assessed the likely groundwater flow direction.
- Review of the following provided documents:
  - Preliminary Site Investigation (**PSI**) (KPMG 2021a).
  - Groundwater and Surface Water Sampling Event (**GWSWSE**) letter report (KPMG 2020).
  - Remediation Action Plan (**RAP**) (KPMG 2021b).
  - Request for SEARs (Urbis 2020).
  - Preliminary earthworks and design plans for the proposed warehouse development.
  - Geotechnical Investigation (PSM 2021).
- Prepared a site-specific GMP detailing the following:
  - Entity responsible for ensuring the GMP is implemented.
  - The location and frequency of ongoing monitoring.
  - The Chemicals of Potential Concern (CoPC) which require ongoing analysis.
  - The triggers and contingency plans for additional monitoring/remediation.

1.5 Proposed Redevelopment

Arcadis understands that the redevelopment will involve demolition of all infrastructure at the site including buildings, sheds, fencing and farm dams.

The new buildings to be constructed are understood to be single storey industrial warehouses built on a concrete slab. It is further understood that the slabs are to be elevated above the existing ground level founded on fill to be imported to site or removed from hillslope cuts on site, negating the requirement to excavate for building foundations. Costin Roe Consulting has indicated that approximately 420,600 m^3 of fill will be cut and 127,680 m^3 of materials need to be imported to support earthworks undertaken as part of the site redevelopment works. No basements are to be excavated.

2 SITE DESCRIPTION AND ENVIRONMENTAL SETTING

2.1 Site Identification

The location and layout of the Site are shown in Figures 1 and 2, **Appendix A**. The Site details are provided in Table 2-1 below and described in detail in the following sections.

Table 2-1 Site Detail Summary

Site Characteristic	Detail
Street Address	754-770 and 784-786 Mamre Road, Kemps Creek, NSW
Deposited Plan	Lots 59 and 60 on DP259135
Closest Cross Road(s)	Mamre Rd and Bakers Ln
Local Government Area	Penrith City Council
Land Use Zoning Information	IN1 General Industrial (WSEA SEPP)
Site Coordinates to the approximate centre of the site (Geographic)	Latitude: -33.838425 Longitude: 150.786845
Current Land Use	Rural residential and agricultural properties. The Site also is used for vehicle or plant/equipment storage, with associated Aboveground Storage Tank (**AST**), Underground Storage Tanks (**UST**) and Underground Petroleum Storage Systems (**UPSS**).
Proposed Future Land Use (Assumed)	Employment purposes (industrial and/or commercial land use).
Approximate Site Area	Approximately 333,600 m^2

2.2 Site Description

The following Site description is based on the conditions of the Site observed during an inspection conducted on the 9 March 2021 by a suitably qualified Arcadis Environmental Engineer. Site photographs taken during the inspection are presented in **Appendix B**.

- The Site is primarily vacant, vegetated and is used for rural-residential purposes. The Site is generally permeable (grass covered with some mature vegetation), with some impermeable hardstand coverings located at the north western and central portion of the Site. The hardstand coverings observed on Site are in poor condition and extremely weathered and/or partially removed.
- The topography of the Site is undulating with a western aspect. There is a steep crest located at the north eastern portion of the Site.
- Residential buildings, workshop buildings and metal sheds are located on-site, mainly towards the centre of the Site. There are smaller sheds scattered around the Site, particularly around dams.

There is an operational drilling company (Robar Boring Contractors PTY LTD) located at the centre of the Site. A parking area for multiple drill rigs, a storage space for large pipes, office buildings, workshops and associated metal sheds were observed in this area. It should be noted that Arcadis did not enter this area due to it being an operational workshop.

- Several mounds were observed at the north eastern portion of the Site, particularly under the asphalted hardstand. This may indicate the presence of fill material.
- Building waste including fragments of brick and piece of pipe were observed on top of one of the asphalted areas at the north western corner of the Site. A large stockpile of rubble was also observed in this area.
- It was noted that one of the dams located in the north western portion of the Site has been completely drained and dug out. This is the dam that was sampled by KPMG during their GWSWSE (2020).
- No staining or vegetation stress was observed in the areas inspected by Arcadis.
- There were no olfactory indicators of possible contamination noted on-site.

2.3 Topography

The Site is located within a generally flat alluvial plain with localised undulating rises/falls and generally slopes toward Kemps Creek and South Creek, which are located to the west of the Site. The western portion of the Site is relatively flat with an average elevation of approximately 54 metres Australian Height Datum (**mAHD**). The eastern portion of the Site slopes upward towards the eastern boundary from approximately 56 mAHD to 74 mAHD.

2.4 Hydrology

Site inspections undertaken by KPMG (2021a) verified that the majority of the Site is unsealed with a number of dams located on-site. The largest dam is located in the eastern section of the Site and is estimated by KPMG (2021a) to be 10,500 m^2.

The nearest surface water bodies include several small dams on neighbouring properties with the nearest down gradient off-site surface water feature being a dam located 75 m south of the Site. KPMG (2021a) anticipated that the majority of stormwater captured on-site would drain to ground through unsealed areas and/or be captured in the dams.

Kemps Creek is located approximately 600 m to the west of the Site. Kemps Creek drains into South Creek approximately 900 m west of the Site, before ultimately discharging into the Hawksbury River located approximately 26 kilometres (**km**) north of the Site.

2.5 Geology

The Sydney 1:100,000 Geological Survey of NSW map indicates that the site is underlain by the Triassic aged Bringelly Shale of the Wianamatta Group. This is described as comprising shales, carbonaceous clay, laminate, and coal.

The eSPADE NSW Soil and Land Information database indicates that the site is underlain by Blacktown and Luddenham Soil Landscapes.

KPMG (2021a) stated that during previous investigations, subsurface lithology around the ASTs and UPSS identified on-site comprised “shallow fill (<0.5 m) overlying firm clays, overlying weathered shales to a maximum investigation depth of 5 metres below ground level (**mbgl**)”. Bore logs of soil boreholes advanced by KPMG during previous intrusive investigations confirm the general strata of topsoil/fill, overlying clay, overlying shale on the Site.

2.6 Hydrogeology

Groundwater is present within the Bringelly Shale. Typically, the Bringelly Shale yields low volumes of saline groundwater. The shale generally has low water transmitting properties, displaying a very low primary porosity with the majority of flow being via saturated structural features such as fractures, joints and laminations. Groundwater can be perched at the base of the weathered soil profile along the interface with fresh bedrock. The regional aquifer within the shale is often confined or partially confined and rises once intersected in a borehole.

A search of the Bureau of Meteorology – Australian Groundwater Explorer undertaken by KPMG (2021a) indicated that no registered groundwater wells were located within a 1 km radius of the Site. The closest registered groundwater well was located approximately 1.25 km north-west of the Site and installed to a depth of 0.75 mbgl for monitoring purposes. This is consistent with groundwater in the Kemps Creek area having low beneficial use due to poor groundwater quality and the presence of surface water.

Two groundwater wells exist at the central portion of the Site. KPMG sampled these two on-site groundwater wells in October 2020 and reported the depth to groundwater to be approximately 3.5 to 4.5 mbgl.

2.7 Acid Sulfate Soil and Salinity

Acid sulfate soils (ASS) are generally associated with low-lying coastal areas, including estuarine flood plains, rivers and creeks. KPMG (2021a) state that since the Site lies within an area with an extremely low probability of acid sulfate soils.

Salts are naturally present in soil, bedrock and groundwater. In Western Sydney salts naturally occur within the Bringelly Shale and are mobilised in the subsurface by the movement of groundwater. When saline groundwater is present close to the surface the salts can precipitate on the ground as the saline groundwater is drawn to the surface by fluctuating water tables combined with capillary action. Seepage of saline groundwater can cause corrosion of building materials, prevent growth of all but highly salt tolerant vegetation contributing to increased soil erosion. Salinity hazard mapping (DIPNR 2012) indicates the site is of moderate salinity potential due to the Site being located on Bringelly Shale. Off-site adjacent to drainage lines near Kemps Creek the salinity potential is considered high as the saline groundwater becomes shallower near natural surface water features where there is an increased potential of groundwater reaching the ground surface.

2.8 Summary of Previous Investigations and Design Information

2.8.1 Environmental Investigations (KPMG)

Arcadis reviewed a PSI report prepared by KPMG (2021a) which summarised various environmental investigations that were previously undertaken on-site. It must be noted that Arcadis did not directly receive any of these other environmental reports, with exception to the Groundwater and Surface Water Sampling Event report (KPMG 2020). The environmental investigations summarised in the PSI (KPMG 2021a) included the following:

- Costin Roe Consulting – Preliminary Bulk Earthworks Plans (March 2021)
- KPMG SGA Property Consultancy Pty Ltd – Targeted Environmental Investigation, 754-786 Mamre Road, Kemps Creek, NSW (21 November 2019).
- KPMG Property and Environmental Services Pty Ltd – Limited Environmental and Asbestos Assessment, 772-782 Mamre Road, Kemps Creek, NSW (27 August 2020).
- KPMG Property and Environmental Services Pty Ltd – Limited Asbestos Assessment, 754 & 784-786 Mamre Road, Kemps Creek, NSW (27 August 2020).
- KPMG Property and Environmental Services Pty Ltd – Environmental Assessment, 754 Mamre Road, Kemps Creek, NSW (29 September 2020).
- KPMG Property and Environmental Services Pty Ltd – Groundwater and Surface Water Sampling Event, 754 & 772-782 Mamre Road, Kemps Creek, NSW (22 December 2020).

The above listed reports have been briefly summarised in Sections 2.8.1.1 to 2.8.1.6, followed by a summary of the PSI (KPMG 2021a) in Section 2.8.1.7. A remedial action plan (**RAP**) is summarised in Section 2.8.1.8.

2.8.1.1 Costin Roe Consulting – Preliminary Bulk Earthworks Plans (March 2021)

The preliminary bulk earthwork plans prepared by Costin Roe Consulting (**CRC**) were based upon a proposed development comprising five warehouses. These would require cut and fill earthworks across the Site to facilitate benching of construction pads. Assuming a stripping of 200 millimetres (**mm**) of topsoil and accounting for significant cut and fill earthworks, CRC calculated a net requirement of 127,680 m^3 of material to be imported to the Site. It should be noted that the proposed development appears to have changed from seven warehouses to five warehouses, which would likely alter the required net imported fill. Updated volumes have been included in Section 2.8.2

2.8.1.2 KPMG SGA – Targeted Environmental Investigation, 754-786 Mamre Road, Kemps Creek, NSW (21 November 2019)

A Targeted Environmental Investigation (**TEI**) was undertaken by KPMG to assess the presence and nature of Contaminants of Potential Concern (CoPCs) within Site soils as part of due diligence considerations associated with potential acquisition of the Site.

The following Areas of Environmental Concern (**AEC**) were identified:

- Above ground and underground fuel storage – identified at 784-786 Mamre Road adjacent to a vehicle workshop.
- Other chemical storage – identified in the south-western section of the Site, within 784-786 Mamre Road.
- Vehicle workshops – one workshop was identified at 754-770 Mamre Road, and another at 784-786 Mamre Road.
- Washdown activities – a vehicle/equipment washdown area was identified at 754-770 and 784-786 Mamre Road.
- Former market garden – identified at the western section of 754-770 Mamre Road.

KPMG conducted intrusive investigations on the 19 and 20 September 2019. The fieldwork included the following:

- Twenty soil boreholes advanced using a drill rig on a targeted basis to at least 0.5 m into natural soil, or until refusal was met.
- Two soil boreholes were advanced with a hand auger in a dam wall in the eastern section of the Site.
- Three locations were advanced within stockpiled material using a hand auger in the north western section of the Site.

The general findings from the investigation are as follows:

- Concentration of CoPC within most analysed soil samples were below laboratory limit of detection and the adopted guidelines for commercial/industrial land use.
- Hydrocarbon staining was observed on surface material around the vehicle workshop and refuelling area at 784-786 Mamre Road. A surface soil sample collected from this area contained concentrations of total recoverable hydrocarbons (**TRH**) above adopted ecological and management limit guidelines.
- Concentrations of heavy metals (chromium, copper, nickel and zinc) in soil samples collected from around the vehicle workshop and refuelling area at 784-786 Mamre Road, and one sample from 754-770 Mamre Road were above adopted ecological guidelines.
- Concentrations of benzo(a)pyrene (**BaP**) in a surface soil sample collected from a storage area at 754-770 Mamre Road were above adopted ecological guidelines.
- Elevated concentrations of TRH were identified in locations adjacent to ASTs and USTs, however these were below adopted guideline levels.

Based upon the findings of the TEI, KPMG considered that the Site was generally suitable for commercial/industrial land use subject to the following being undertaken:

- Production of a RAP to document the below remediation works:
  - Remediation of TRH impacted surface soils around the workshop area at 784-786 Mamre Road.
  - Decommissioning of the UPSS by removal, with the area remediated and a Validation Report provided in accordance with the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019.
  - Consideration of the need to remediate heavy metal and BaP impacted soils which exceeded guidelines for the protection of ecological receptors. KPMG noted this may not be required if these soils are emplaced beneath hardstand areas rather than used as landscaping material.

2.8.1.3 KPMG – Limited Environmental and Asbestos Assessment, 772-782 Mamre Road, Kemps Creek, NSW (27 August 2020)

KPMG was engaged by GPT to undertake a Limited Environmental and Asbestos Assessment (**LEAA**) at 772-782 Mamre Road, Kemps Creek, NSW. This property is legally described as Lot 61 on DP259135 and is not included on the SEARs. A site inspection for the LEAA was conducted on 29 July 2020.

The general findings from the assessment are as follows:

- One groundwater monitoring well was identified along the eastern boundary of the Site. KPMG assumed this well was associated with geotechnical investigations.
- All buildings on 772-782 Mamre Road were inspected and KPMG identified Asbestos Containing Materials (**ACM**) and/or Potentially Asbestos Containing Material (**PACM**) in almost all buildings. These occurrences mostly comprised fibre cement sheeting which was generally observed to be in good condition and considered to pose a low risk to current site users. Corrugated fibre cement sheet roofing was also observed. These occurrences were considered to pose a higher risk to current site users.
- Importation of fill material containing demolition waste was present in the north-eastern section of 772-782 Mamre Road. KPMG recommended that environmental investigation occur prior to redevelopment, in order to assess the suitability of the fill material there remaining on-site in terms of risks to human health and ecological receptors.

Overall, KPMG considered that the Site posed a low environmental risk for future commercial/industrial land use.

2.8.1.4 KPMG – Limited Asbestos Assessment, 754 & 784-786 Mamre Road, Kemps Creek, NSW (27 August 2020)

KPMG was engaged by GPT to undertake a Limited Asbestos Assessment (**LAA**) at 754-770 & 784-786 Mamre Road, Kemps Creek, NSW. This property is legally described as Lots 59 and 60 on DP259135, and is included on the SEARs. A site inspection for the LEAA was conducted on the 29 July 2020.

The general findings from the assessment are as follows:

- All buildings were inspected and KPMG identified Asbestos Containing Materials (**ACM**) and/or Potentially Asbestos Containing Material (**PACM**) in Buildings C, E and F. These occurrences mostly comprised fibre cement sheeting which was generally observed to be in good condition and considered to pose a low risk to current site users.

2.8.1.5 KPMG – Environmental Assessment, 754 Mamre Road, Kemps Creek, NSW (29 September 2020)

KPMG were engaged to undertake an Environmental Assessment (**EA**) to provide an update to the previous TEI conducted by KPMG (2019) to assess if any changes had been made to 754 Mamre Road since September 2019 which may have impacted site soils or groundwater. The Site was inspected on the 29 July 2020. One groundwater monitoring well was observed adjacent to the access road to the south-central residential building.

Following assessment, KPMG considered it unlikely that any site activities undertaken since the TEI fieldwork had the potential to significantly impact site soil or groundwater.

2.8.1.6 KPMG – Groundwater and Surface Water Sampling Event, 754 & 772-782 Mamre Road, Kemps Creek, NSW (22 December 2020)

KPMG were engaged by GPT to undertake a GWSWSE at 754 and 772-782 Mamre Road (Lots 60 and 61 on DP259135). The sampling event was conducted on 29 July 2020.

Groundwater samples were collected from two existing permanent groundwater monitoring wells (monitoring wells GW01 and GW02), and surface water samples were collected from an on-site dam (located at the central-northern portion of the Site). The GWSWSE did not identify any significant impacts to groundwater or surface water samples analysed. However, both collected groundwater sampes reported exceedances of the adopted guidelines for heavy metals (copper, nickel and zinc). Both surface water samples also reported an exceedance in adopted guidelines for copper, and elevated concentrations of total nitrogen and phosphorous.

The surface water within the central-northern dam, which was sampled, was considered by KPMG to be chemically suitable to be dam on the western section of the Site. KPMG noted, however, that there was potential for the concentrations of nutrients to lead to algal blooms in the receiving water.

Arcadis notes that the GWSWSE was not undertaken for Lot 59 on DP259135 which contains the largest dam on the Site.

2.8.1.7 KPMG – Prelimary Site Investigation, 754-786 Mamre Road, Kemps Creek, NSW (19 January 2021)

KPMG prepared a PSI to satisfy the SEARs for a SSDA. A copy of the PSI is provided in **Appendix C**. The general findings from the PSI are as follows:

- The Site was generally used for rural residential and agricultural purposes from before 1955 to present day.
- Additional buildings were constructed in the central portion of the Site (on 754-770 and 784-786 Mamre Road) between 1982 and 1991 for vehicle or plant/equipment storage.
- By 2002, ASTs and a UPSS were installed at 784-786 Mamre Road.
- By 2002, the north-western portion of 754-770 Mamre Road was developed for horticultural (market garden) purposes. This continued until circa 2010.
- The primary AEC was identified as the above and underground storage of chemicals associated with the vehicle workshop and refuelling area located at 784-786 Mamre Road.
- No off-site sources of contamination were identified during the PSI.

Based upon the findings of the PSI and in consideration of the CSM, KPMG considered that the Site was generally suitable for commercial/industrial land use subject to the following being undertaken:

- An environmental investigation in the north-eastern section of 772-782 Mamre Road prior to redevelopment, in order to assess the suitability of the fill material there remaining on-site in terms of risks to human health and ecological receptors.
- Production of a RAP to document the below remediation works:

  - Decommissioning of the UPSS by removal, with the area remediated and a Validation Report provided in accordance with the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019.
  - Consideration of the need to remediate heavy metal and BaP impacted soils which exceeded guidelines for the protection of ecological receptors. KPMG noted this may not be required if these soils are emplaced beneath hardstand areas rather than used as landscaping material.
- Implementation of remediation activities which are documented within the above-mentioned RAP.

2.8.1.8 KPMG - Remediation Action Plan, 754-786 Mamre Road, Kemps Creek, NSW (24 March 2021)

KPMG prepared a Remediation Action Plan for the Site, including all areas that will be included as part of the proposed development, with a focus on the remediation of hydrocarbon and heavy metal contamination identified in previous environmental investigations.

As the previous investigations have not delineated the extent of contamination though a detailed site investigation, additional investigations have been proposed in the RAP, with an addendum to the RAP expected to clarify the extent of contamination and the area of remedial activities. The remedial option selected was excavation and contaminated soil disposal. Validation of residual soil is required to achieve the remedial objectives. An unexpected finds protocol (**UFP**) was developed for remedial and construction activities.

2.8.2 Proposed Development Earthworks and Design Drawings

The Costin Roe Consulting drawing was reviewed to assess proposed cut and fill locations and retaining walls against groundwater depths to determine potential groundwater interference. A copy of the drawing is provided in **Appendix C**. The groundwater data set used during this process was that from KPMG (2021a). It should be noted that this investigation was not a comprehensive hydrogeological study, with only two locations at the toe of the slope sampled. A summary review of the updated cut and fill plan (CRC, 10 March 2021), including retaining walls, has been included below:

- Topsoil removal (200 mm strip) = 66,700 m^3
- Cut 420,600 m^3
- Fill 614,180 m^3
- Balance (to be imported) 127,680 m^3
- 13 Retaining walls. It is expected that keystone retaining walls will have an excavated toe.
  - Maximum height of 20 m in the north east corner.
  - Maximum length of 300 m to contour the eastern portion of the Site.
  - Construction types including keystone, fill and Crib and Shotcrete.

The level of cut ranges from approximately 84.00 to 65.00 mAHD in the north east corner, with lesser cuts to a minimum of 41 mAHD in the south east corner of the site. The risk of groundwater interception is high where large cuts and retaining structures are being constructed.

2.8.3 PSM - 754-786 Mamre Road, Kemps Creek – Results of Geotechnical Investigation

The geotechnical investigation by PSM advanced shallow test pits, one auger and one borehole into the underlying material. Water was only encountered at TP01 and TP16, with these locations inferred to produce small amounts of water from the adjacent dams in north west and east of the site. No other water bearing zones were referenced in the PSM geotechnical investigation.

3 CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) describes the potential environmental and human health risks of identified areas of possible soil and groundwater contamination. The CSM outlines the complete and/or potential pathways between the known or potential source(s) and the receptor(s).

Based on the information available for the site from the KPMG GWSWSE (2020) and PSI (2021) and the previous investigations summarised within these reports, the following preliminary CSM has been prepared.

3.1 Source

Potential sources of contamination at the site and the associated contaminants of potential concern (CoPC) are listed below in Table 3-1.

Table 3-1 Potential On-Site Contaminant Sources

Source	Associated Chemicals	CoPC
Historic horticultural activities (market gardens)	Pesticides, herbicides	Organochlorine pesticides (OCPs), organophosphate pesticides (OPPS), heavy metals
Hazardous building materials in historic and current site structures	Asbestos containing materials (ACM), lead based paints, electrical components containing Polychlorinated Biphenyls (PCBs)	Asbestos, lead, PCBs
ASTs, UPSS and vehicle workshop activities	Total Recoverable Hydrocarbons (TRHs), pesticides, herbicides, ACM, Benzene, Toluene, Ethylbenzene, Xylene, (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs), Volatile Organic Compounds (VOCs)	TRHs, OCPs, OPPs, asbestos, BTEX, PAHs, VOCs
Fill materials of unknown origin	Asbestos, ash, slag, construction waste, demolition waste	Heavy metals, TRH, BTEX, PAHs, OCPs, OPPs, PCBs, phenols and asbestos
Contaminated groundwater/surface water *	Heavy metals, total nitrogen, phosphorous	Heavy metals, total nitrogen, phosphorous

** From the results of the groundwater samples collected by KPMG in October 2020, it was found that some wells exceeded the adopted guidelines for some metals. These metals were determined to be of background origin and are not considered a potential contaminant source (See Section 5.2.2).*

3.2 Potentially Affected Media

The potentially affected media at the site includes:

- Soil;
- groundwater; and
- surface water (in the dams).

3.3 Pathways

Pathways or transport mechanisms by which receptors may be exposed to contamination on and off-site include:

- Direct contact with contaminated soil/groundwater/surface water.
- Ingestion of dust/abstracted groundwater/surface water.
- Inhalation of asbestos fibres.
- Groundwater/surface water flow off-site.

3.4 Receptors

Potential receptors to contamination include:

- Demolition/construction workers.
- Future site users.
- Surrounding residents.
- Environmental receptors (Kemps Creek and South Creek).
- Groundwater use (off-site).

3.5 Exposure Assessment

Based on the preliminary CSM discussed in Section 3.1 to Section 3.4, the potential for contamination to be present at the site is considered to be **Moderate**. This level of contamination risk can be minimised or removed if precautionary measures are taken. The potentially complete and incomplete pathways are discussed in more detail in the Table 3-2 below.

Table 3-2 Exposure Assessment

Source	Pathway	Receptor	Exposure Assessment	Pathway completeness
Historic horticultural activities (market gardens)	Direct contact	Demolition/construction workers, future site users	Demolition and construction workers developing the site will come into contact with potentially contaminated soil. Workers in service trenches may also encounter groundwater. Depending on the landscaping of the proposed developed on the site, future site workers may be directly exposed to potentially contaminated soil via open grass areas.	**The pathway is potentially complete and should be managed during construction works with an Unexpected Finds Protocol (UFP).**
		Surrounding residents	Surrounding residents will not come into direct contact with any potentially contaminated soil or groundwater. No groundwater abstraction wells were noted around the site.	**The pathway is incomplete.**
	Ingestion	Demolition/construction workers, surrounding residents, future site user	Demolition/construction workers and surrounding residents have the potential to be exposed to dust and/or groundwater during the construction phase of the proposed development. Depending on the landscaping of the proposed developed on the site, future site workers may also be directly exposed to potentially contaminated dust via open grass areas.	**The pathway is potentially complete and should be managed during construction works with a UFP.**
Hazardous building materials	Direct contact, inhalation of asbestos fibres	Demolition/construction workers	If any hazardous building materials are present in the currently existing structures, demolition/construction workers may be exposed during demolition works.	**The pathway is potentially complete and should be managed through a hazardous materials (HAZMAT) assessment and a Construction Environmental Management Plan (CEMP) during construction works.**
		Surrounding residents, future site residents	Surrounding residents will not be allowed access onto the site and therefore will not come into contact with any hazardous building materials. Additionally, hazardous materials should be removed from the site before the construction of the proposed development, therefore future residents will not be exposed.	**The pathway is incomplete.**

Source	Pathway	Receptor	Exposure Assessment	Pathway completeness
	Ingestion	Demolition/construction workers	Demolition/construction workers may be at risk of ingesting hazardous materials during intrusive site construction works.	**Intrusive site works are to occur after remedial activities are completed. The pathway is incomplete.**
		Surrounding residents, future site residents	These receptors will not come into contact with any hazardous building materials during or after construction.	**The pathway is incomplete.**
ASTs, UPSS and vehicle workshop activities	Direct contact, ingestion	Demolition/construction workers, future site users	Demolition and construction workers developing the site will come into contact with potentially contaminated soil. Additionally, future site workers may be directly exposed to potentially contaminated soil via open grass areas.	**The pathway is potentially complete and should be managed through a UFP and CEMP during construction works.**
		Surrounding residents	Surrounding residents will not come into direct contact with any potentially contaminated soil or groundwater. No groundwater abstraction wells were noted around the site.	**The pathway is incomplete.**
Fill materials	Direct contact, ingestion	Demolition/construction workers, future site users, surrounding residents	Demolition and construction workers developing the site will come into contact with underlying fill during the construction phase. Depending on the landscaping of the proposed developed on the site, future site workers may be directly exposed to potentially contaminated soil via open grass areas. Surrounding residents have the potential to be exposed to dust during the construction phase.	**The pathway is incomplete.**
	Inhalation of asbestos fibres	Demolition/construction workers	Demolition/construction workers may be exposed to fragments of asbestos in the fill material during demolition works. If the fill is still present and/or exposed on the Site after completion of the proposed development, future site workers may also be exposed via open grassed areas.	**The pathway is potentially complete and should be managed during construction works through an UFP and a CEMP. HAZMAT assessment prior to demolition is recommended.**

Source	Pathway	Receptor	Exposure Assessment	Pathway completeness
		Surrounding residents	Surrounding residents will not come into contact with any fill material during or after construction.	**The pathway is incomplete.**
Contaminated groundwater	Direct contact	Demolition/construction workers	Demolition and construction workers developing the site may come into contact with potentially contaminated groundwater during excavation of service trenches and retaining walls.	**The pathway is potentially complete**. Cut to below groundwater (4.3 mbgl) is expected and retaining structures will cut up to 20 m into landscape features.
	Ingestion	Future site users, surrounding residents	Future site users and surrounding residents will not come into contact with any groundwater during or after construction, as groundwater is not to be extracted on-site.	**The pathway is incomplete.**
	Groundwater flow	Environmental receptors (e.g., Kemps Creek and South Creek)	Kemps Creek and South Creek are located down gradient of the site and therefore are potential receptors to contaminated groundwater.	**The pathway is potentially complete as groundwater was impacted at GW01.**
		Off-site groundwater users	No groundwater boreholes were present around the site; therefore, it is unlikely that off-site receptors will come into contact with any potentially contaminated groundwater.	**The pathway is incomplete.**

4 LEGISLATION AND POLICY

4.1 Legislative Framework

Groundwater in NSW is regulated by DPIE-Water under the *Water Act 1912* (**Water Act**), the *Water Management Act 2000* (**WMA 2000**) and Water Management (General) Regulation (2011). The WMA 2000 is gradually replacing the planning and management frameworks in the Water Act, although some provisions of the Water Act remain in operation. The WMA 2000 regulates groundwater extraction under the NSW Aquifer Interference Policy (**AIP**).

The AIP (NSW DPI 2012) explains the process of administering water policy under the WMA 2000 for activities that interfere with the aquifer. In accordance with the AIP an activity that results in the loss of water from the environment, a water access licence (**WAL**) is required, unless the activities are considered to be of 'minimal impact'.

Under the AIP, groundwater inflows are considered as a minimal impact activity in the construction of trenching and costeaning. In addition, very small water takes up to 3 ML/year are also considered minimal impact activities as long as the water volume can be substantiated (Dent, et al. 2015).

The project is located in the *Greater Metropolitan Region Groundwater Source Water Sharing Plan* (the Plan) (NoW 2011) which commenced on 1 July 2011. Within the Plan, the project footprint is subject to the rules of the Sydney Basin Central Groundwater Source which outline the recommended management approaches of surface and groundwater connectivity and protection of water quality.

4.2 Assessment Criteria

Groundwater quality is screened against the following guidelines:

- ANZG (2018) Guidelines for Fresh and Marine Water Quality - 95% protection for Fresh Water Default Guideline Values.
  - These guidelines supersede the ANZECC 2000 95 % Freshwater criteria and NEPC (2013) Groundwater Investigation Levels (GILs) referenced in the KPMG (2021a) RAP.
- NEPC (2013) Health Screening Level (**HSL**) D (commercial/industrial) from 2 to <8 mbgl in a clay matrix.

Table 4-1 - Groundwater Assessment Criteria

Analyte	ANZG 2018 DGV 95% Freshwater (µg/L)	HSL – D (mg/L)
Arsenic	As (III) – 24 AS (V) – 12	-
Cadmium	0.2	-
Chromium (VI)	1	-
Chromium (III)	-	-
Copper	1.4	-
Lead	3.4	-

Analyte	ANZG 2018 DGV 95% Freshwater (µg/L)	HSL – D (mg/L)
Mercury*	0.06	-
Nickel	11	-
Zinc	8	-
Benzene	950	30
Toluene	180	Non-Limiting (NL)
Ethylbenzene	80	NL
Xylenes	m xylene – 75 o xylene – 350 p xylene – 200	NL
Naphthalene	16	NL
F1 C^{6}-C^{10}	-	NL
F2 >C^{10}-C^{16}	-	NL

*Note ANZG 2018 99% Freshwater concentration applied for mercury due to the effects of bioaccumulation.

5 AVAILABLE GROUNDWATER DATA

A summary of the information collected during the GWSWSE conducted by KPMG in October 2020 is provided in this section, as well as Arcadis' knowledge of the groundwater conditions in the area.

Arcadis notes that only two pre-existing on-site groundwater monitoring wells have been gauged and sampled. This limited data is considered to be insufficient to be considered a comprehensive hydrogeological study, and several data gaps are present.

5.1 Groundwater Levels and Flow Direction

Standing groundwater levels were measured in the two existing monitoring wells on-site (monitoring wells GW01 and GW02) (KPMG 2020). Depth to groundwater measured in October 2020 by KPMG ranged between 4.380 mbgl (GW02) and 4.945 mbgl (GW01). No survey data of the wells is available. Bore logs for these wells are also unavailable as they were not installed by KPMG, though KPMG did note that one of the wells (GW01) may have been installed for geotechnical purposes (KPMG 2021).

As the gauging data for groundwater levels across the Site is limited, a groundwater elevation map cannot be constructed to assess the groundwater flow direction. However, following the natural topography and with Arcadis' experience regarding hydrogeology in the area, Arcadis assumes that groundwater will flow towards the north-west to west, in the direction of Kemps Creek.

KPMG's groundwater level observations are summarised in Table 5-1.

Table 5-1 Groundwater Monitoring Well Observations – KPMG October 2020

Well	Date	Depth to water (m TOC)	Depth to Bottom (m TOC)
GW01	28/10/20	4.945	Unknown
GW02	28/10/20	4.380	Unknown

Notes: Top of casing (TOC)

5.1.1 Groundwater Level Fluctuations

Fluctuations in groundwater must also be considered as a rise in groundwater level will increase the risk of groundwater being encountered during the site redevelopment works. It is noted Western Sydney is experiencing drought conditions and consequently groundwater levels would be expected to be lower than usual. No historical groundwater level monitoring is known to have been undertaken at the site.

Groundwater level fluctuations within the Bringelly Shale present at the Site would be expected to naturally fluctuate between 0.5 and 1 metre. Thus, following prolonged heavy rainfall, groundwater levels would be expected to rise. However due to the clayey hard pan nature of the weathered shale soil profile and the low water transmitting properties of the shale, groundwater infiltration will be limited, restricting groundwater level rises.

5.2 Groundwater Quality

5.2.1 Physicochemical Parameters

Water quality parameters recorded by KPMG during the October 2020 groundwater sampling are provided in the following table.

Table 5-2 Groundwater Monitoring Well Field Quality Parameters – KPMG October 2020

Well	pH	Temperature (ºC)	Electrical Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Redox Potential (mV)	Comments
GW01	6.32	19.5	21,690	1.79	60	Clear, no odour, no sheen
GW02	6.61	16.7	17,510	2.56	67	Clear, no odour, no sheen

Based on the physicochemical data collected from the sampling of the two groundwater monitoring wells, the following conclusions have been made:

- pH values indicate that the groundwater is neutral.
- Electrical conductivity ranged from 17,510 to 21,690 µS/cm, indicating brackish water.
- Dissolved oxygen ranges from 1.79 to 2.56 mg/L, indicating a low level of dissolved oxygen within the groundwater aquifer.
- Oxygen reduction potential (ORP) ranged between 60 to 67 mV, suggesting an oxidative environment.

5.2.2 Analytical Results

The groundwater analytical results as collected by KPMG in October 2020, are summarised in Table 5-3.

Table 5-3 Groundwater Exceedance Analytical Results – KPMG October 2020

Analyte	Guideline Value (µg/L)	Min (µg/L)	Max (µg/L)	Locations Exceeding Adopted Criteria
Copper	1.4 (DGV)	5	6	GW01, GW02
Nickel	11 (DGV)	13	27	GW01, GW02
Zinc	8 (DGV)	63	62	GW01, GW02

Exceedances of the adopted groundwater quality criteria were identified for copper, nickel and zinc. TRH C_{10}-C_{16} was detected in GW01 above the Limits of Reporting (LOR), but below adopted guideline levels. All other analytes (filtered metals, TRHs, BTEX, OCPs, OPPs, phenols, PCBs, VOCs and pH) reported less than LOR.

The minor exceedances for dissolved metals are typical of natural background levels and consistent with previous groundwater monitoring from the Bringelly Shale conducted at Badgerys Creek (PPK, 1998). Further to this, KPMG (2020) stated that the elevated concentrations of dissolved nickel, zinc and copper in groundwater are considered to be attributable to background concentrations sourced from the natural geology as opposed to an anthropogenic source.

KPMG (2020) refer to the Western Sydney Airport Environmental Impact Statement, Groundwater Assessment, undertaken by GHD in October 2015 which identified similar values in electrical conductivity to what was recorded in the groundwater during KPMG's GWSWSE. GHD (2015) considered that the electrical conductivity of the groundwater in the area would render the groundwater unsuitable for a range of beneficial uses such as stock watering, irrigation, or drinking. Based on the differences in electrical conductivity values between groundwater and surface water, GHD (2015) also noted that there appeared to be minimal interactions between groundwater and surface water. Arcadis

note that no physicochemical parameters were collected by KPMG during the GWSWSE in October 2020, so interactions between groundwater and surface water on the Site could not be compared.

5.3 Hydraulic Conductivity

There is no on-site data available for hydraulic conductivity. However, the results of studies undertaken by GHD (2015) in the area for Western Sydney Airport Environmental Impact Statement suggest that the Bringelly Shale present on-site has low values of hydraulic conductivity. Mean values in the Shale aquifer were calculated to be 0.034 m/day. This indicates that the Site has low water transmitting properties.

5.4 Expected Volume of Groundwater to be Extracted

With a knowledge of the local hydrogeology (Sections 2.6 and Sections 5.1 to 5.3) it is expected that groundwater volumes intercepted at cutting locations is expected to be low. The prevailing hydrogeology on site is comprised of residual soil which has a high clay content, and shale which across Western Sydney tends to be a unit of low hydraulic conductivity. These units are generally regarded as aquitards or aquicludes as opposed to productive aquifers. Any groundwater intercepted across the site is expected to be of low volume and the flows are likely to be temporary in nature.

In the event that excessive groundwater is encountered, the extracted groundwater volume would be required to be measured with a flow meter. The groundwater would be collected and directed to a water storage pond where upon on-site reuse options would be considered as outlined in Section 7.1.1. A WAL as outlined in Section 4.1 is not expected to be required as it is unlikely groundwater is to be intersected let alone any inflows exceeding the 3ML/year criteria.

6 ROLES AND RESPONSIBILITIES

The roles and responsibilities regarding the implementation of this GMP on the site is summarised in the table below.

Table 6-1 Roles and Responsibilities

Entity	Role	Responsibility
Department of Planning, Industry and Environment (DPIE)	Approves the development of the site.	• Provide approval for the development application • Enforces that the steps outlined in this GMP are actioned
GPT (and GPT sub-contractors)	Land developer	• Ensure that the requirements outlined within this GMP for the ongoing management of the Site are complied with
Nominated Environmental Consultant (if required)	Provision of environmental expertise.	• Carry out groundwater scope of works • Provision of report to GPT and Department of Natural Resources
DPIE Water*	To provide water obstruction licensing.	• To provide water obstruction licensing if greater than 3ML/year of groundwater is intersected and removed from the site.

**This entity will only need to undertake their roles and responsibilities if groundwater is encountered at the site in excess of 3ML/year.*

7 GROUNDWATER MANAGEMENT

Based on a review of the available environmental investigation reports and Arcadis' understanding of the redevelopment works, groundwater is likely to be intersected during the construction of retaining structures as slope discharge on battered and retaining structures.

In event that groundwater is intersected during redevelopment works, the following management measures should be applied.

7.1 During Construction

A review of the known redevelopment construction strategy indicates that groundwater may be intersected during the construction of retaining structures and service trenches. In this event, the following management measures as outlined in Table 7-1 are recommended.

Table 7-1 Management Measures for Intersected Groundwater During Construction

Management Measure	Description
Pump groundwater from the excavated area	Intersected groundwater should be pumped from the excavated service trenches/footings and stored in a discharge basin on-site.
Monitor volume of extracted groundwater	The volume of groundwater extracted should be monitored and recorded to assess if the volume extracted does not exceed the 3 ML/year where a WAL is required. If groundwater volumes are higher than expected and it appears that the 3ML/year criteria may be exceeded a WAL application should be completed and submitted to DPIE Water.
Monitor groundwater quality of the extracted groundwater	To assess if the removed groundwater is suitable for on-site re-use, groundwater quality should be monitored for the following parameters: • pH; • Salinity; • Metals; and • Hydrocarbons (TRHs and BTEXN). Groundwater will be screened against the adopted guidelines which are outlined in Section 4 of this report. Groundwater treatment may be required before re-using on site to reduce the pH or salinity. The pH is likely to approach neutral due to aeration caused by pumping. Salinity can be lowered by mixing with dam water. Alternatively, the groundwater could be discharged to stormwater or sewer once this infrastructure is installed with appropriate authorisation from Council or Sydney Water respectively. Alternatively, the water may be discharged at an appropriately licenced wastewater treatment facility.
Monitor groundwater in the existing groundwater wells around the site	If groundwater is intersected during construction works, a round of groundwater level monitoring of the groundwater wells on-site should be triggered to assess any impacts on the water table.

7.1.1 Intersected Groundwater Re-Use

Groundwater re-use options, subject to meeting the adopted groundwater quality guidelines are presented in

Table 7-2 and a groundwater risk assessment.

Table 7-2 Intersected Groundwater Re-Use Options

	Option	Option Description
1	Dust suppression	The intersected groundwater can be used to spray water across the site for dust suppression during the earthworks and construction phases.
2	On-site irrigation	The groundwater can be circulated around the site for irrigation purposes.
3	Wheel washing	The groundwater can be utilised to spray trucks down before they leave the site to reduce tracking of mud and dirt off-site.
4	Topping up neighbouring dams	The groundwater from the on-site dams can be pumped into off-site neighbouring dams, subject to the dam owner's approval.
5	Discharge to an on-site sediment basin	As a contingency, if there is excess groundwater, an option is to discharge to an on-site sediment basin. The water will have to be flocculated and the water quality monitored. If the water is in accordance with the Australian and New Zealand Guidelines for Fresh Water Quality 95% species protection (ANZG 2018), then the water can be discharged to South Creek via Kemps Creek.

Note: These re-use options are viable only if the groundwater meets the adopted criteria.

7.1.2 Intersected Groundwater Treatment or Disposal

If the intersected groundwater does not meet the water quality adopted criteria it must be managed appropriately. Groundwater treatment or disposal options are outlined in Table 7-3.

Table 7-3 Intersected Groundwater Treatment or Disposal Options

	Option	Option Description
1	Treatment (for turbidity)	For excess turbidity issues, the groundwater should be treated by allowing it to settle in the sedimentation pond and then flocculating if the suspended solids do not precipitate out.
2	Treatment (for pH)	If the intersected groundwater has an acidic pH value, lime should be added as a treatment. For alkaline pH aerating the water is likely to reduce the pH.
3	Treatment (for saline groundwater)	If the intersected groundwater is saline, then it can be mixed with on-site surface water from the dams in order to dilute the salinity.
4	Disposal	If treatment options are not suitable, the intersected groundwater (likely to be of low volume) could be tanked off-site for disposal. Alternatively, the groundwater could be detained on-site for discharge to either stormwater or sewer once this infrastructure has been installed on-site and authorisation from Council or Sydney Water respectively is provided.

7.1.3 Records

The following records relating to groundwater management and monitoring are to be maintained by GPT or their on-site representative:

- Spill or incident reports.

- Groundwater inflows into excavations.
- Intersected groundwater quality.
- Groundwater treatment (if necessary).
- Groundwater disposal (if necessary).
- Groundwater level monitoring if triggered.

All records are to be maintained in compliance with record keeping requirements as outlined in the RAP.

7.2 Post Construction

Groundwater is likely to be intersected by the development, however the intercepted volumes are expected to be low and temporary in nature. The groundwater is not expected to be of quality or any beneficial use during the construction and operational phases. Impacts to the local hydrogeological regime are expected to be low.

7.3 Conclusions and Recommendations

Conclusions and recommendations for the ongoing water management of the site are as follows:

- The Site is generally comprised of low hydraulic conductivity material which does not form an extensive productive aquifer beneath the site. Whilst there are several deep cuttings on site which may intercept localised perched water tables, these are expected to drain relatively quickly and not trigger further actions to be taken.
- There are only two groundwater monitoring wells installed on site which are not installed near where the major cuttings are proposed. Whilst an assumption has been made that the material is of low hydraulic conductivity and that groundwater will be intercepted, this has not been proven locally. Prior to construction it is therefore recommended that further local groundwater information is obtained through the installation of a monitoring well near the deepest cutting, and preferably to the base of the proposed cutting. The final location of this monitoring well should be determined by a suitably qualified hydrogeologist.
- Groundwater anticipated to be intercepted at the major cuttings is upgradient of the on-site monitoring wells and is likely representative of background conditions, as was identified in the on-site wells. No source-pathway-receptor linkage is present in the conceptual site model for groundwater produced from deep upgradient cuttings.

8 REFERENCES

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9 LIMITATIONS

The findings of this report are based on the Scope of Work described in this report. Arcadis performed the services in a manner consistent with the level of care and expertise exercised by members of the environmental profession.

No warranties, express or implied, are made. Subject to the Scope of Work, Arcadis' assessment is limited strictly to identifying typical environmental conditions associated with the subject property.

While normal assessments of data reliability have been made, Arcadis assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Arcadis, or developments resulting from situations outside the scope of this project.

Arcadis prepared this report for the sole and exclusive benefit and use of the client. Notwithstanding delivery of this report by Arcadis or the client to any third party, any copy of this report provided to a third party is provided for informational purposes only, without the right to rely. Arcadis cannot accept any responsibility for any use of or reliance on the contents of prepared reports by any third party except where expressly agreed via an agreed and properly executed reliance letter. Subject to the terms of the reliance letter, Arcadis would disclaim all and any liability to any third person in respect of anything or in consequence of anything done or omitted to be done by that person in reliance, whether whole or partial.

Information from samples collected by Arcadis or historical data reviewed relating to soil, groundwater, waste, air or other matrix conditions in this document is considered to be accurate at the date of issue. Surface, subsurface and atmospheric conditions can vary across a particular site or region, which cannot be wholly defined by investigation. As a result, it is unlikely that the results and estimations presented in this report will represent the extremes of conditions within the site that may exist. Subsurface conditions including contaminant concentrations can change in a limited period of time and typically have a high level of spatial heterogeneity.

From a technical perspective, there is a high degree of uncertainty associated with the assessment of subsurface, aquatic and atmospheric environments. They are prone to be heterogeneous, complex environments, in which small subsurface features or changes in geologic conditions or other environmental anomalies can have substantial impact on water, air and chemical movement.

Arcadis' professional opinions are based upon its professional judgment, experience, and training. These opinions are also based upon data derived from the limited testing and analysis described in this report. It is possible that additional testing and analysis might produce different results and/or different opinions. Arcadis has limited its investigation(s) to the scope agreed upon with its client.

That standard of care may change and new methods and practices of exploration, testing and analysis may develop in the future, which might produce different results.

APPENDIX A FIGURES

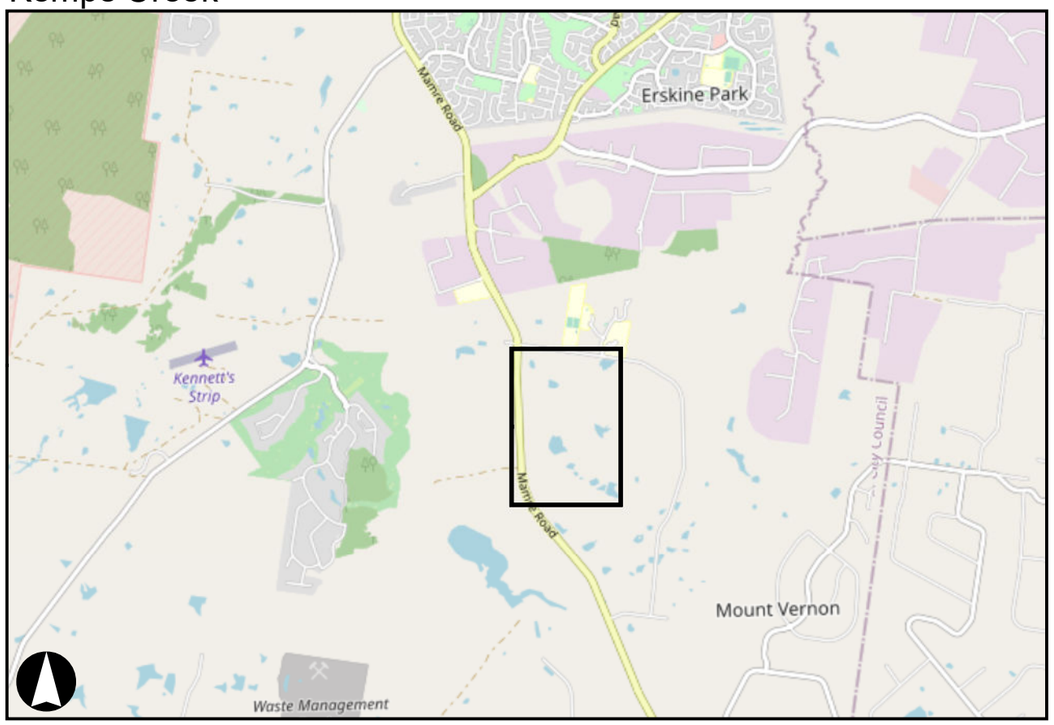
APPENDIX B SITE PHOTOGRAPHS

APPENDIX C HISTORIC DESIGN INFORMATION

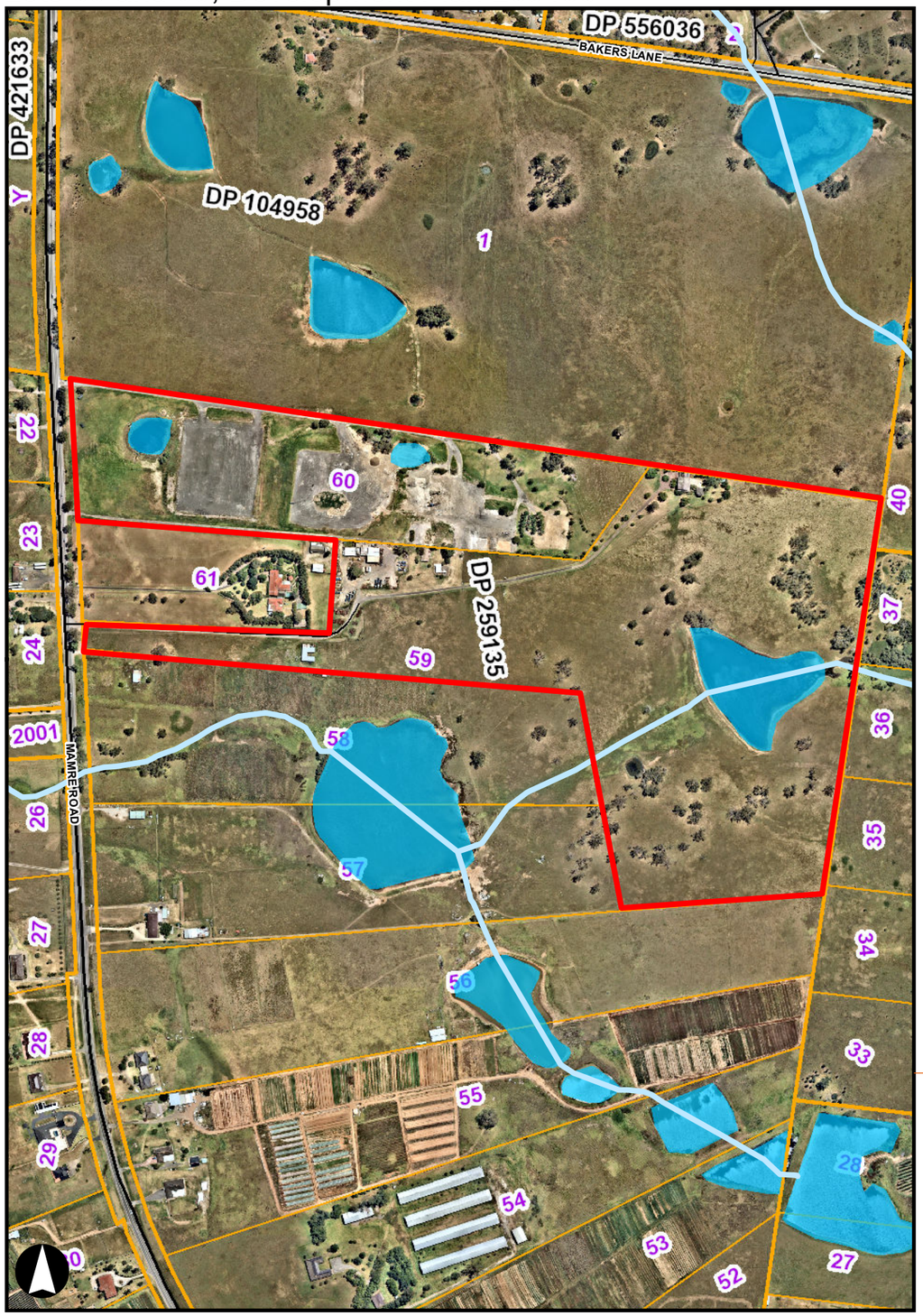
ARCADIS Design & Consultancy for natural and built assets

NSW, Australia

Kemps Creek



Lots 59 and 60, Development Plan 259135



Site Boundary
Drainage Line
Dam / Pondage
Major roads
Local road
SectionExtent
PlanExtent
Lot

ARCADIS

Coordinate System:
GDA 1994 MGA Zone 56
Date issued: March 9, 2021

Figure 1: Site Location

Client: GPT
Drawn by: MA Reviewed by: LM
Date: 09/03/21 Drawing Size: A3

Drawing No: 30081949.1

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Figure 1 - Site Location

Site Boundary
Groundwater Monitoring Wells
Drainage Line
Dam / Pondage
Major roads
Local road
SectionExtent
PlanExtent
Lot

ARCADIS

Coordinate System:
GDA 1994 MGA Zone 56
Date issued: March 9, 2021

Figure 2: Site Layout

Client: GPT
Drawn by: MA Reviewed by: LM
Date: 09/03/21 Drawing Size: A3

Drawing No: 30081949.2

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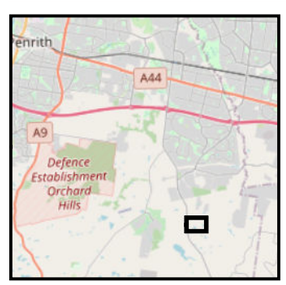


0 25 50 100 150 200 Meters

Figure 2 - Site Layout

Date: 9/03/2021 Path: H:\AAP_ER_GIS\Projects\30081949\Figure 2 - Site Layout.mxd

ARCADIS Design & Consultancy for natural and built assets	SITE PHOTOGRAPHS	
Client Name **GPT**	**Site Location:** **754-770 and 784-786 Mamre Road, Kemps Creek, NSW**	**Project No.** **30081949**

Photo No.	**Date**
1.	9/03/2021

Description:

Photo 1 shows the dam located at the most north western corner of the Site. The dam appeared to be three quarters full. Some red coloured algae was observed along the edges of the dam.

Photo No.	**Date**
2.	9/03/2021

Description:

Photo 2 shows some of the building waste including pipe and brick fragments observed in the fill material mounded on top of the asphalted area at the north west of the Site.

ARCADIS Design & Consultancy for natural and built assets	SITE PHOTOGRAPHS	
Client Name **GPT**	**Site Location:** **754-770 and 784-786 Mamre Road, Kemps Creek, NSW**	**Project No.** **30081949**

Photo No.	**Date**
3.	9/03/2021

Description:

Tire waste was observed on top of the asphalted area at the north west of the Site.

Photo No.	**Date**
4.	9/03/2021

Description:

A stockpile of building rubble was observed on top of the cleared bare earth area at the north west of the Site.

ARCADIS Design & Consultancy for natural and built assets	SITE PHOTOGRAPHS	
Client Name **GPT**	**Site Location:** **754-770 and 784-786 Mamre Road, Kemps Creek, NSW**	**Project No.** **30081949**

Photo No.	**Date**
5.	9/03/2021

Description:

Photo 5 shows the dam located at the central north western corner of the Site. At the time of inspection, this dam was completely drained and dug out.

Photo No.	**Date**
6.	9/03/2021

Description:

Photo 6 shows a channel attached to the drained dam identified in Photo 6. This channel appeared to lead westward towards the first dam at the north western most portion of the Site.

ARCADIS Design & Consultancy for natural and built assets	SITE PHOTOGRAPHS	
Client Name **GPT**	**Site Location:** **754-770 and 784-786 Mamre Road, Kemps Creek, NSW**	**Project No.** **30081949**

Photo No.	**Date**
7.	9/03/2021

Description:

Photo 7 shows part of the steep crest situated at the north eastern corner of the Site.

Photo No.	**Date**
8.	9/03/2021

Description:

The large dam and surrounding vegetation at the east of the Site can be seen in Photo 8.

ARCADIS Design & Consultancy for natural and built assets	SITE PHOTOGRAPHS	
Client Name **GPT**	**Site Location:** **754-770 and 784-786 Mamre Road, Kemps Creek, NSW**	**Project No.** **30081949**

Photo No.	**Date**
9.	9/03/2021

Description:

A large empty metal shed was observed along the southern boundary of the Site.

Photo No.	**Date**
10.	9/03/2021

Description:

John Robar operates a drilling company from the central portion of the Site. This consisted of office buildings and associated metal sheds and workshop areas. A fenced off area at the left of Photo 10 also depicts a truck parking area for the company's drill rigs. The right of Photo 10 shows one of the many large pipes stored adjacent to John Robar.

ARCADIS Design & Consultancy for natural and built assets	SITE PHOTOGRAPHS	
Client Name **GPT**	**Site Location:** **754-770 and 784-786 Mamre Road, Kemps Creek, NSW**	**Project No.** **30081949**

Photo No.	**Date**
11.	9/03/2021

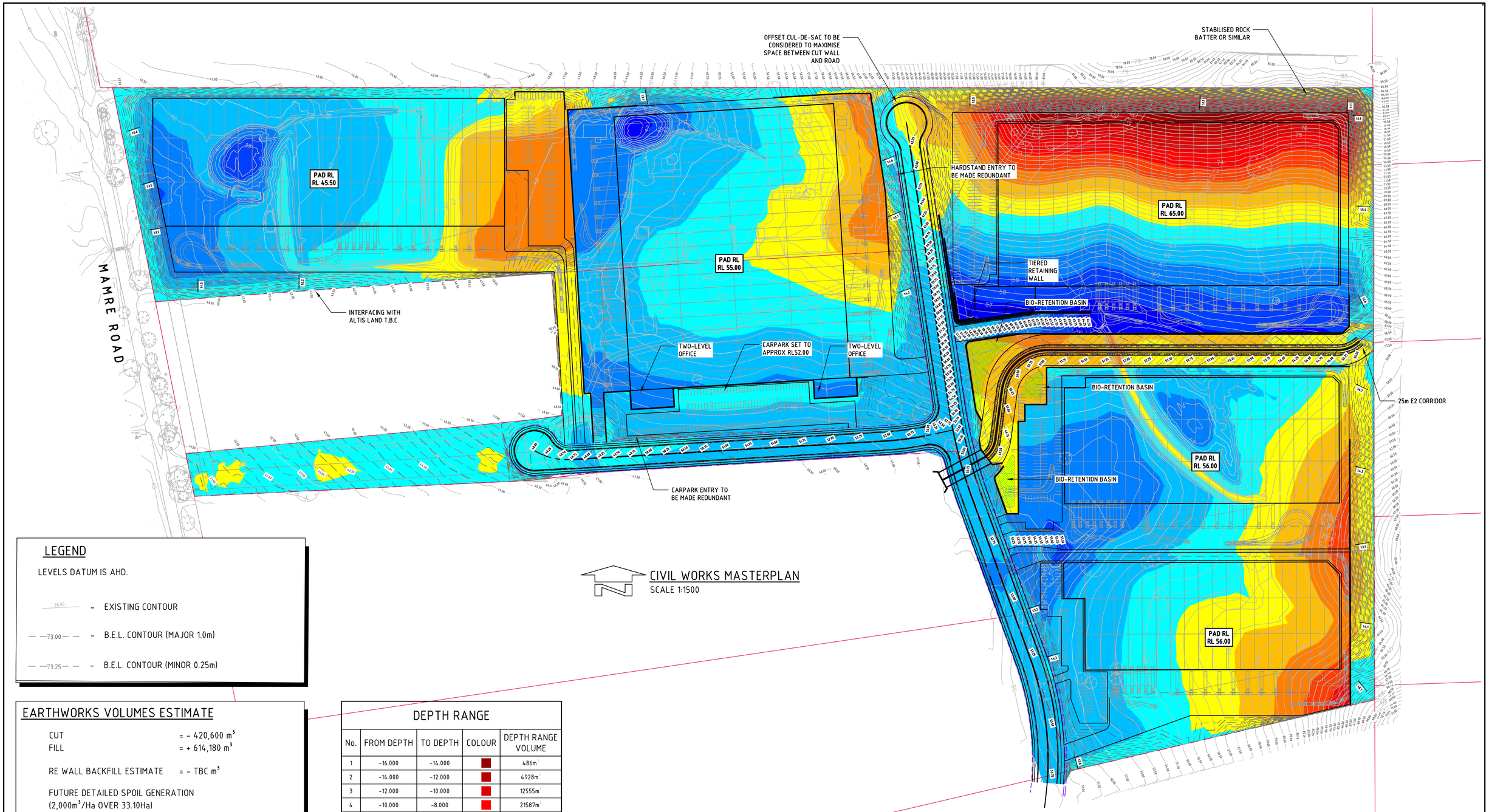
Description:

John Robar's drill rigs parked at the centre of the Site.

Photo No.	**Date**
12.	9/03/2021

Description:

Large pipes were observed to be stored adjacent to John Robar. Beyond this, the large western dam can be seen.



LEGEND

LEVELS DATUM IS AHD.

16.00 - EXISTING CONTOUR

73.00 - B.E.L. CONTOUR (MAJOR 1.0m)

73.25 - B.E.L. CONTOUR (MINOR 0.25m)

CIVIL WORKS MASTERPLAN

SCALE 1:1500

EARTHWORKS VOLUMES ESTIMATE

CUT	= - 420,600 m^3
FILL	= + 614,180 m^3
RE WALL BACKFILL ESTIMATE	= - TBC m^3
FUTURE DETAILED SPOIL GENERATION (2,000m^3/Ha OVER 33.10Ha)	= - 66,200m^3
BALANCE	= + 127,680m^3 (I.E. IMPORT)

EARTHWORK VOLUMES ARE APPROXIMATE ONLY.
NO ALLOWANCE HAS BEEN MADE IN THE ABOVE VOLUMES FOR BULKING OR COMPACTION OF FILLED SOILS, EROSION AND SEDIMENT CONTROL BASINS AND MEASURES, THE REMOVAL OF UNCONTROLLED FILL, TOPSOIL STRIP OR CONTAMINATED MATERIAL, TEMPORARY DRAINAGE SWALES WITHIN BUILDING PADS, RETAINING WALL BACKFILLING OR ANY OTHER UNSPECIFIED EXCAVATION RELATED TO FUTURE WAREHOUSE CONSTRUCTION.

DEPTH RANGE

No.	FROM DEPTH	TO DEPTH	COLOUR	DEPTH RANGE VOLUME
1	-16.000	-14.000		486m^3
2	-14.000	-12.000		4928m^3
3	-12.000	-10.000		12555m^3
4	-10.000	-8.000		21587m^3
5	-8.000	-6.000		33487m^3
6	-6.000	-4.000		55996m^3
7	-4.000	-2.000		109143m^3
8	-2.000	0.000		182373m^3
9	0.000	2.000		356559m^3
10	2.000	4.000		183545m^3
11	4.000	6.000		55651m^3
12	6.000	8.000		16515m^3
13	8.000	10.000		1914m^3

15m 0 15 30 45 60 75 90 105 120 135 150m

SCALE 1:1500 AT A1 SIZE SHEET

PRELIMINARY ONLY

PRELIMINARY ISSUE ONLY	10.03.21	A
AMENDMENTS	DATE	ISSUE

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PROJECT
PROPOSED INDUSTRIAL ESTATE
MAMRE ROAD
KEMPS CREEK NSW

DESIGNED	DRAWN	DATE	CHECKED	SIZE	SCALE	CAD REF:
D.S.	D.S.	JULY '20	M.W.	A0	AS SHOWN	C013874.06 - SK

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