Technical report G2

Remediation action plan

Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Remediation Action Plan

Proposed Redevelopment
339 Wallgrove Road, Eastern Creek

Prepared for
Cleanaway Operations Pty Ltd and Macquarie Corporate Holdings Pty Limited, c/- Arup Pty Ltd

Project 84822.03
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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author	Lisa Teng	14 August 2020
Reviewer	P. Gorman	14 August 2020

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Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
96 Hermitage Road
West Ryde NSW 2114
PO Box 472
West Ryde NSW 1685
Phone (02) 9809 0666

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Re□ort on Remediation Action Plan
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□□ Introd□ction

This Remediation Action Plan (RAP) describes the work required to remediate the property at 339 Wallgrove Road, Eastern Creek ('the site', as shown in Drawing 1, Appendix B) to render the site suitable for the proposed redevelopment. The RAP was commissioned by Cleanaway Operations Pty Ltd and Macquarie Corporate Holdings Limited (the client) and was undertaken in accordance with Douglas Partners' (DP) proposal SYD1909230.P.002.Rev5 dated 19 December 2019.

The proposed redevelopment of the site is referred to as the Western Sydney Energy and Resource Recovery Centre (WSERRC).

This RAP is informed by the various previous investigations undertaken at the site, culminating in the Douglas Partners Pty Ltd (DP) *Report on Detailed (Site) Contamination Investigation* (reference 84822.03.R.001.Rev1) dated 14 August 2020 (DP, 2020), and has been prepared to address the requirements of the *State Environmental Planning Policy No. 55 (SEPP 55) - Remediation of Land.* The RAP has also been prepared to support an Environmental Impact Study (EIS) for the proposed development.

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The objective of the RAP is to provide a mechanism by which the site can be remediated in an acceptable manner, with minimal environmental impact, and to a condition suitable for the proposed land-use. The main objective of this RAP is therefore to provide a strategy for site remediation which:

- Minimises impacts from the site on the environment and on public health and safety during site demolition, remediation, civil works and construction;
- Maximises the protection of workers involved with site demolition, remediation, civil works and construction; and
- Renders the site suitable, from a contamination risk perspective, for the proposed WSERRF.

Additional objectives of the RAP are as follows:

- Identify data gaps and additional investigation to be implemented to address those data gaps;
- Set remediation goals;
- Document the remediation options that may be appropriate to the site and contaminants identified;
- Identify the legislative requirements of the relevant regulatory authorities for the remediation works; and
- Comply with the relevant planning instruments and local government policies.

The general scope of work designed to achieve the RAP objectives stated above is described below:

- Provide an adequate description of the site, its history and available background information;
- Provide a summary of the results of the previous site investigations and assess the contamination status of the site;
- Identify remaining data gaps in regard to the site contamination status which will need to be incorporated into the remediation plan and / or be dealt with via an unexpected finds protocol;
- Identify potential remediation options available for the site and nominate the preferred remediation strategy;
- Develop contingency plans for the various situations that may arise during the demolition, remediation, civil works and construction programme; and
- Highlight the requirement for the works to be undertaken in accordance with a Construction Environmental Management Plan (CEMP) and a Work Health and Safety (WHS) Plan prepared for the remediation works.

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□□□ □ite Identi□ication

The site identification is presented in Table 1 below.

Ta□le □□□ite In□ormation

Item	Detail□
Site Address	339 Wallgrove Road, Eastern Creek
Legal Description	Lot 1, DP 1059698.
Local Government	Blacktown City Council
Zoning	unzoned
Site Area	8.23 hectares (approximately)

The nearest residential area is around 1 km to the south of the site in Horsley Park with the Minchinbury residential area located around 3 km to the north-west. Horsley Park Public School is over 2 km south of the site and a childcare centre is within the Eastern Creek industrial area about 1 km to the west of the site.

The site is bounded by the Westlink M7 Motorway to the west with the Eastern Creek industrial area located farther west. The SUEZ Eastern Creek Waste Management Centre, comprising the now-closed landfill site and operational organics recycling facility is located to the north and north-east, with the operational Global Renewables waste management facility located immediately to the east. To the south, the site is bounded by the Warragamba Pipeline Corridor with the Austral Bricks facility located farther south□

The site locality is shown in Drawing 1, Appendix B.

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The 1:100,000 Geological Series Sheet for Penrith indicates the site is underlain by Bringelly Shale of the Wianamatta Group. This shale may be overlain locally by Quaternary Deposits of various types and man-made fill. The Bringelly Shale is described as comprising shale, carbonaceous claystone, claystone, siltstone, fine to medium grained lithic sandstone, rare coal and tuff. The Bringelly Shale is anticipated to be at least 100 m thick in this area.

Many igneous rock bodies occur in the vicinity of the site, the largest being Prospect Picrite. Although not mapped it is possible that basaltic dykes associated with these igneous bodies may be present beneath the site area. Additionally, bore holes have logged unmapped basaltic intrusions in the area (approximately 4 km north).

A review of the NSW Acid Sulfate Soil Risk Map indicates that the site is not located in an area of potential Acid Sulphate Soils (ASS).

The site is moderately sloping from southwest towards the northeast with the north-eastern corner positioned in a low-lying area. The relative elevation of the site varies from approximately 63 m AHD at the south-western corner to 53 m AHD along the north-eastern boundary. A steep embankment separates higher ground at the western hardstand areas and lower ground covered by the eastern grassed areas of the site and dam at the east.

A dam is located centrally along eastern boundary of the site. Reedy Creek is located to the north and west and a tributary of the Eastern Creek is located to the east of the site and Prospect Reservoir is located further to the east of the site. Surface drainage at the site is expected to flow toward the dam at the eastern boundary and it is understood that stormwater down pipes for sheds located at the north of the site drain out to the grassed areas at the north of the site and it is expected that surface water flow across the grassed areas is dominated by an easterly direction toward the dam, expected to be the main water receptor. It was noted that stormwater pipes along the eastern boundary from the SITA Eastern Creek Resource Recovery Park flowed into the site, to the north of the dam onsite. This then drained in a northerly direction, following the eastern boundary of the site.

Previous investigations (see Section 3.3) indicated that the groundwater is likely to flow in a north-easterly direction across the site, although shallow depths to groundwater at the eastern boundary of the site are likely to be associated with the dam.

A search of the NSW Department of Industries Groundwater Bore Database revealed that there are four monitoring bores located up to 1.3 km the south east along the water pipeline running towards Prospect Reservoir. An additional 3 monitoring bores were located 1.5 km to west. Based upon the inferred groundwater flow direction these identified bores are not considered relevant to characterise the groundwater conditions across the site. No residential or recreational use bores were identified in the search.

There is no publicly available existing groundwater level information available within 1 km of this site. The closest water bodies include Eastern Creek, 900 m to both west and east of the site and Prospect Reservoir, 2 km to the east. Hydrogeology of Australia Map (Jacobsen and Lau, 1987) suggests the site is overlying porous, extensive aquifers of low to moderate productivity.

3.1 Review of Previous Reports

The Detailed Site Investigation (DSI)[1] undertaken by DP was reviewed in preparation of this RAP and is summarised below. DP notes that the DSI included the review of previous investigations also undertaken by DP in 2015 and 2019 and are not reviewed separately for the preparation of this RAP. The DSI comprised a desktop study of the site and site history, a review of previous investigations and additional investigations.

In summary, the site was essentially undeveloped until the 1950s. Some warehouses and sheds were constructed in the 1960s and the currently present chicken coups were constructed from around 1970. An examination of historical aerial photos shows that the layout of the site had not changed substantially between the 1970s and 2009. In 2013, the filled area in the south-east of the site was used as a truck storage area. Wrecked cars are present in the 2015 aerial photograph in the truck storage area. A filled area in the north of the site was formed in 2019 as a truck turning area.

A site walkover by DP in 2015 identified the following key site observations:

- Structures at the site included two large chicken egg-laying sheds, four large storage sheds, a toilet block, packing / boxing shed, egg processing room, feed shed, a workshop and two demountable style houses all with concrete floor slabs. Other structures were located around the site such as feed tanks and various sheds;
- Poor drainage was indicated by stagnant pools of water and saturated soils to the east and south of the two egg-laying sheds;
- A workshop featured broken asbestos cement walls and comprised machinery and chemicals stored on shelves / workbenches;
- Behind the feed shed (to the south), oily water was observed within a small pit in which a pump system fed;
- A large number of drums were stored in one of the sheds on pallets and labels indicated contents comprising oil filters, oily rags, 'aqueous waste'. Machinery presumed for the operation of feeders was also located in this storage shed;
- The dam at the time of the site walkover did not appear to have any oil slicks at the water surface and the water was generally clear; and
- Off-gassing processes were occurring during fieldwork to the east of the site, understood to be part of waste processing by the adjacent SITA Resource Recovery Facility.

A site walkover by DP in September 2019 identified the following key observations:

- The permanent site features and storage items were largely unchanged from 2015;
- The truck turning bay (aggregate filled area) in the northern part of the site had been formed; and
- The dam adjacent to the central eastern boundary of the site, at the time of the site walkover did not appear to have any oil slicks at the water surface and the water was generally clear.

[1] DP, Report on *Detailed Site (Contamination) Investigation, Proposed Redevelopment, 339 Wallgrove Road, Eastern Creek, NSW* dated August 2020, report reference: 84822.03.R.001.Rev1 (the 'DSI')(DP, 2020);

A site walkover by DP in February 2020 identified the following key site observations:

- The permanent site features and storage items were largely unchanged from 2015;
- All the previous tenants had vacated the site;
- The vehicles and plant on the raised fill platform in the south had been removed;
- The demountable houses had been removed; and
- The surface water bodies around the site including the sump underneath the slab of one of the buildings in the middle of the site were still present and in similar condition to those observed in 2019.

Based on the history of the site a conceptual site model, identifying the contaminants of concern, was developed, as shown in Section 4 of this RAP.

The intrusive investigations undertaken on the site prior to the DSI included:

- A hazardous building materials survey was undertaken by DP in 2015. The survey was completed on only accessible areas of the existing buildings, both internally and externally. Many of the buildings were not able to be accessed at the time;
- An investigation undertaken by DP in 2015 comprised of 20 boreholes (BH1 to BH20), three of which were soil gas and groundwater monitoring wells (BH2, BH4 and BH20) and the collection of an additional 17 surface samples (S1 to S17) spread across the site, a surface water sample and a sediment sample both from the existing dam on site. A total of 35 soil 2 samples from the boreholes, 17 surface soil samples, 1 sediment samples and 3 groundwater samples were analysed. In field oil gas concentrations for general gases were also obtained; and
- An additional investigation undertaken by DP in 2019 comprised the drilling of nine boreholes (BH202, BH203, BH205, BH206, BH207, BH 209, BH 210, BH 211, and BH 212) for soil sampling and four additional boreholes (BH201, BH 204, BH 208 and BH 213) which were converted into soil gas and groundwater monitoring wells. Groundwater samples from the four new wells and two existing wells (BH2 and BH4), a selected number of soil samples collected from the boreholes, 11 surface soil samples ((BH214 to BH225, except BH217), six surface water samples (SW1 to SW6) from the dam and soil gas samples were analysed.

The investigation undertaken as part of the DSI comprised:

- Drilling of an additional 4 boreholes (ABH01, ABH02 and ABH03 and ABH08) all of which were converted to groundwater monitoring wells as well as excavating 15 test pits (TP01 to TP15) in and around the fill platform in the south-west of the site, including the assessment of asbestos to the Western Australian Department of Health - *Guidelines for the Assessment, Remediation, and Management of Asbestos Contaminated Sites in Western Australia* (DoH, 2009), which are referenced in the national guidelines *National Environment Protection Measure 1999, as amended 2013* (NEPC, 2013); and
- In field soil gas concentrations for general gases were taken from the existing six soil gas wells (BH2, BH4, BH201, BH204, BH208 and BH213). Ten groundwater samples, ten soil gas samples, six surface water samples, and selected soil samples were analysed.

The borehole, well and sampling locations undertaken by DP to date are shown on Drawing 2, Appendix B.

Based on observations, the subsurface profile at the site can be broadly summarised as:

- FILLING - Variable filling comprising mixtures of silty clays, sand and gravel filling generally to shallow depths across the hardstand area (up to 0.6 m bgl) and generally across the site. Deeper fill was encountered in the south-eastern part of the site to depths of up to 4.5 m bgl;

  Anthropogenics were noted in the elevated fill platform in the south eastern portion of the site and nearby areas including trace quantities of asbestos containing materials (ACM), concrete, bitumen and brick fragments, wood, organic fibres, gravel, metal, glass, terracotta and ceramics;
- CLAYS - Firm to very stiff, brown, red, orange and grey silty or shaly clays underlain the filling or were recorded from the surface to depths up to 5.7 m bgl, underlain by; and
- SHALE - Extremely low strength, increasing to high strength dark grey shale.

During purging and sampling, no phase separated hydrocarbons or odours were detected in groundwater. Based on the measured water levels, preferential groundwater flow was shown to be in a north-easterly direction across the site.

The field measured gas concentrations for 2019 and 2020 were generally low. The highest methane concentration recorded was at well 201 at 0.6% (v/v) during the 2019 sampling event, and the highest being 0.1% (v/v) across most wells during the 2020 sampling event. In consideration of the remaining gas readings, overall these readings characterise the gas situation at the site at 1 corresponding to a very low risk as outlined in NSW EPA *Assessment and Management of Hazardous Ground Gases, 2019* (EPA, 2019), requiring no further action.

Soil, groundwater and soil vapour analytical results were assessed (as a Tier 1 assessment) against the investigation and screening levels of Schedule B1, *National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013* (NEPC, 2013). NEPC (2013) is endorsed by the NSW EPA under the CLM Act 1997. Petroleum based health screening levels for direct contact were adopted from the *Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) Technical Report no.10 Health screening levels for petroleum hydrocarbons in soil and groundwater* (2011) as referenced by NEPC (2013).

Methane gas concentrations were assessed against criteria specified in the NSW EPA *'Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases'* (November 2012).

In general, all soil, water and gas concentrations were within the adopted site assessment criteria (SAC), with the exception of the following:

- Asbestos impacted soils (exceeding the adopted health screening level (HSL) of 0.05% w/w) at sample locations TP10 (ATP10) / 0-0.5 m, and TP14 (ATP14) / 0-0.2 m. Asbestos below the HSL was also found in other samples in the fill within and around the filled area in the south eastern portion of the site;
- ACM found in near surface soil (exceeding the adopted HSL of "no visible asbestos at the surface") at sample locations TP03 (ATP03) and TP04 (ATP04); and
- Lead exceeding the environmental investigation level (EIL) at sample location S12, located beneath one of the workshops.

In addition to the above, the hazardous materials building survey identified asbestos, lead and PCB contaminants as part of the building fabric in a number of the existing buildings. As such, the DSI stated that a thorough assessment of the building footprints post demolition must be undertaken to assess any surface soil impacts imparted by the historical weathering or demolition of the buildings. The locations and areas discussed above are shown on Drawing 3, Appendix B.

Furthermore, the DSI considered the site had a relatively low potential for soil, water and / or vapour contamination and recommended the following:

- *Update the hazardous building materials survey (HAZMAT) to include all buildings, noting that a number of buildings were not accessible in 2015;*
- *Removal of hazardous materials from existing buildings in accordance with relevant legislation, then validation of the building envelopes upon completion of building demolition;*
- *Continued rounds of soil gas sampling at a suggested quarterly interval for a period of one year to assess seasonal influences, if possible;*
- *Continued rounds of groundwater sampling (a potential source for soil gas) at a suggested quarterly interval at the same time as soil gas, if possible;*
- *Preparation of a remediation action plan (RAP) to outline the processes for managing identified soil contamination, outlining additional investigations (i.e., building envelopes), monitoring of soil gas and water, and attention to unexpected finds during future civil and construction works; and*
- *Implementation of the RAP.*

□□ Conce□t□al □ite Model

A Conceptual Site Model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future i.e., it enables an assessment of the potential source - pathway - receptor linkages (complete pathways).

The CSM shown in Table 2 below has been adopted from the DSI (DP, 2020).

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□o□rce	Tran□□ort Pat□□a□	Potential Rece□tor	Ri□□ Mana□ement Action Recommended
Existing Fill Contaminants of concern (COC): Lead and asbestos	Direct contact	Construction and maintenance workers End users	Intrusive investigations have not identified high levels of contaminants of potential concern identified in the DSI (DP,2020) with the exception of lead and asbestos in soil at some locations. There is potential for asbestos to be present in fill in other areas of the site, particularly where building rubble is present (e.g., BH7, BH9 and BH14). Where asbestos contamination is known or found to be present, risk mitigation actions for construction and maintenance workers include the use of appropriate PPE during excavations into the fill. If contaminants are found to be exceeding the SAC, risk mitigation actions for end users can include excavation and disposal of the impacted fill, burial and capping of the impacted fill, or treatment of the fill to reduce concentrations (if appropriate). A procedure for the management of known and potential contamination is to be outlined in a remediation action plan.
Existing buildings COC: Hazardous building materials including lead paint, PCB capacitors, synthetic mineral fibres (SMF) and asbestos	Ingestion and dermal contact Inhalation of dust and/or vapours	Construction and maintenance workers End users Adjacent users	A hazardous building materials assessment report has been conducted separately (DP, 2015). The report needs to be updated to address buildings previously inaccessible. Where identified hazardous materials would need to be removed in accordance with relevant legislation and guidelines prior to demolition, with the footprint of the buildings validated upon completion of demolition. Surface sampling from around and within building footprints have not identified the presence of asbestos or other contaminants in high concentrations. However, there remains a high probability that surface soils in these areas at present and / or following building demolition will contain asbestos to some extent. Past oil spills / leaks can often be detected through this post-demolition validation process also. The validation process is to be outlined in the remediation action plan.

□o□rce	Tran□□ort Pat□□a□	Potential Rece□tor	Ri□□ Mana□ement Action Recommended
Adjacent Resource Recovery Facility COC: Methane gas, BTEX, TRH, VOC	Inhalation of vapours	Construction and maintenance workers End users	Soil gas field readings and laboratory results suggest that migrating gases from adjoining sites are not likely to present a hazardous risk to the proposed development. However, this result is based on only three rounds of monitoring. Additional rounds of monitoring are required to counter for seasonal and temperature changes. The relatively impermeable sub-surface profile of clay and shale provides an effective buffer to soil gas migration, should such gases be generated from neighbouring sites.

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Prior to any remediation / management options being undertaken, further investigations must be implemented to confirm and delineate the location and extent of soil contamination across the site.

Based on DP (2020), and as discussed in Section 3, the following areas of environmental concern (AEC) have been identified:

- Lead exceedance of the adopted EIL around surface sample S12;
- Asbestos detected either on the surface or in test pits at test locations ATP04, ATP03, ATP10 and ATP14 and the area shaded yellow on Drawing 3, Appendix B; and
- Buildings on site with identified or potential hazardous building materials (and the subsequent building footprints following demolition).

Further assessment of the lead impact at S12 will be incorporated into the investigation of the building footprints, as discussed below.

No additional investigation of the asbestos impacts in the fill platform in the south-west of the site is proposed at this stage.

The footprints of current buildings on site, as shown shaded green in Drawing 3, Appendix B, occupy an approximate area of 1.8 hectares. Under the NSW EPA (1995) *Sampling Design Guidelines*, a minimum of 28 sampling locations is recommended to appropriately characterise the soils (particularly surface soils) within the building footprints and peripheries. The recommended investigation includes the following:

- An update of the hazardous building materials survey to include all buildings and areas not previous accessible for survey;
- The removal of identified hazardous building materials by a contractor licensed to conduct such removal works;

- Clearance by a licensed asbestos assessor to document the complete removal of hazardous building materials;
- Completion of bulk building demolition following the clearance by the asbestos assessor;
- At the completion of building demolition, an asbestos clearance of the surface soils in the building footprints and peripheries;
- Sampling of the surface soils and fill in the building footprints and peripheries by a qualified environmental consultant, from a minimum of 28 locations (or as determined by the environmental consultant);
- Analysis of recovered samples for contaminants of concern as identified in the CSM, including metals, asbestos (gravimetric) and PCB (plus any other potential contaminants identified through the updated hazardous building materials survey);
- Assessment of the analytical data against the adopted SAC;
- Determination of any additional areas of environmental concern (AEC) requiring remediation or management in accordance with this RAP; and
- The environmental consultant is to issue and addendum or amendment to this RAP on the basis of the results of the investigation.

As recommended in DP (2020) additional monitoring will be undertaken as follows:

- Rounds of soil gas, groundwater and surface water sampling at a suggested quarterly interval for a period of one year to assess seasonal influences, if possible. It is therefore recommended that a further three rounds of monitoring be undertaken in addition to the monitoring round reported in DP (2020). These should be planned for April, July and October 2020.

The environmental consultant will prepare monitoring reports at the completion of each round and, if required, prepare an addendum or amendment to the RAP to address any contamination issues identified.

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The primary remediation goal is to render the site suitable, from a contamination risk perspective, for the proposed land use. This is achieved by mitigating any unacceptable risks to receptors identified in the CSM.

□□□ □□tent o□Remediation

In the absence of any additional AEC that may be identified through the investigations proposed in Section 5, the current remediation extent is as follows:

- Fill in the south-eastern part of the site, primarily comprising the elevated fill platform. Asbestos in the form of bonded ACM has been identified in fill or on the surface, exceeding the SAC, at ATP03, ATP04, ATP10 and ATP14 (Drawing 3, Appendix B). Trace asbestos (below the SAC) was also found in other samples in the fill in the same area. For the purposes of this RAP, asbestos remediation or management is required for the entire fill area, as shown on Drawing 3, Appendix B;
- Lead exceedance of the adopted EIL at surface sample S12. The extent of the lead impact is not known, and the investigations of the building footprints as outlined in Section 5 will assist in delineating the impact. It is possible that a statistical assessment of the data following the additional investigations may render this location no longer an AEC.

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The remediation hierarchy for the site is based on Section 4.3 of *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd edition)*, NSW EPA, 2017. These guidelines state that site auditors must ensure that adequate consideration has been given to the nature and extent of contamination, and the risks which the contamination may be posing to human health and the environment. Options for consideration include:

- On-site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level; and
- Off-site treatment of excavated soil which, depending on the residual levels of contamination in the treated material is then returned to the site, removed to an approved waste disposal site or facility or used as fill or landfill.

Should it not be possible for either of these options to be implemented, then other options to be considered include:

- Consolidation or isolation of the soil by covering with a properly designed barrier;
- Removal of a contaminated soil to an appropriate site or facility, followed, where necessary, by replacement with clean fill; or
- Where remediation would have no net environmental benefit or would have a new adverse environmental effect, implementation of an appropriate management strategy.

The soil remediation options considered to be suitable to achieve the remediation goals, and for the contaminants identified, are listed below in the order of the preferred remediation hierarchy:

- Treatment;
- Physical barrier systems; and
- Removal to landfill.

8.3 Remediation Option

8.3.1 Treatment

The investigation of the fill platform in the south-east did not identify friable asbestos or asbestos fines. The investigation did find some ACM, as discussed in this report. As such, the soils may be amenable to a treatment process of removing observed ACM followed by re-assessment for site suitability. The following general procedure would typically be adopted for the removal of ACM at concentrations exceeding the SAC:

- The fill would be excavated in 10 m^3 batches and spread out in a layer no thicker than 0.1 m in a nominated asbestos treatment area (ATA);
- Observed clods of clay would be manually broken down;
- The layer would be inspected by a licensed asbestos removal contractor by walking a team (with appropriate PPE) on a 1 m transect grid. Observed ACM would be removed by hand, double bagged and stored on site in the secure designated ACM storage area;
- Following the inspection, material in the ATA would be re-worked, re-layered and re-inspected with removal of observed ACM. Re-inspections would be made along the transect grid with a 90° direction change to the previous inspection;
- Each inspection would be documented with information including stockpile ID, date and time, number of inspections and number of asbestos finds per inspection;
- The above steps would be repeated until no ACM was observed during three consecutive inspections; and
- All collected ACM will be disposed to a licensed landfill facility.

Following treatment, the treated soils will be validated in accordance to the procedure outlined in Section 9.

Once validated, the treated material could be used as general fill across the site.

Given the generally low concentrations, treatment of the lead contamination at S12 is not a viable remediation option.

This remediation option has the benefit of lower cost (compared to landfill disposal), low impact on surrounding roads, the ability to re-use soils for filling on site, and minimising the filling of landfill. The process, however, does require space and time, as well as tight controls on the tracking of soil movement and measures used to mitigate risks to workers on the site.

8.3.2 Physical Barrier System

Physical barrier systems limit access to the impacted soil / groundwater, mitigate surface water infiltration through the underlying material (where necessary) and control or reduce migration of the contaminants into the surrounding environment (where necessary). This option can include creating barriers around and / or on top of the impacted soil / groundwater or relocating the contaminants on-site to a constructed entombment. In addition, the physical barrier can also be used to control the emission of odours or volatiles (if present) and to reduce erosion, infiltration and improve site aesthetics.

Physical barrier layers can include clean filling, low permeability soils such as clays, synthetic membranes such as high density polyethylene (HDPE), geotextile fabrics, bituminous materials, paving and concrete. Appropriate site grading and drainage systems may also be required to remove water from the capped areas (pavements and slabs) and to control surface run-off. Concrete barriers, bituminous pavements and various membranes may be vulnerable to cracking or shearing, depending on their proposed use, loading and exposure but these cracks or ruptures can be repaired providing appropriate inspection and maintenance is conducted as necessary.

The primary contaminant identified to date at the site is ACM. This contaminant is conducive to remediation through a physical barrier system. The ACM impacted soils could be relocated to areas of the site a capped with an appropriate physical barrier as discussed above. The process is also suitable for lead impacted soils.

Any contaminated soils retained on site under such a system are to be noted on title. Additionally, a long-term Environmental Management Plan (EMP), which is legally enforceable, will need to be prepared and implemented in perpetuity to ensure that the physical barrier remains intact.

This remediation option has the benefit of lower cost (compared to landfill disposal), low impact on surrounding roads, the ability to re-use soils for filling on site, and minimising the filling of landfill. The process, however, does require space and time, as well as tight controls on the tracking of soil movement and measures used to mitigate risks to workers on the site.

Removal to Landfill

Removal to landfill involves physically excavating and moving impacted soil to an off-site location for storage, treatment or disposal. Disposal to landfill may require prior treatment of the impacted soil if the chemical levels exceed landfill criteria as defined in the *Waste Classification Guidelines* (NSW EPA, 2014).

The soil landfill disposal process would be undertaken as follows:

- The Environmental Consultant (EC) may conduct further investigations in an attempt to delineate various anticipated waste streams (e.g., asbestos impacted and general solid waste);
- The EC will prepare a formal waste classification report to NSW EPA (2014) to identify the waste classification of stockpiles or *in situ* soils;
- The waste classification report(s) will be provided to the nominated landfill facility which will confirm or otherwise that they are appropriately licensed to accept the waste;
- The transport and disposal of soils containing asbestos will be undertaken by a contractor licensed by SafeWork NSW for asbestos removal;
- Excavation and loading of soils destined for landfill disposal. The EC may be present during excavation to observe the nature of the soils being excavated, if there is considered to be a possibility that the waste classification could change on the basis of observations; and
- Disposal of the soils to the nominated landfill facility. Disposal dockets will be retained as part of the validation process.

Following the removal of the impacted soils, the remaining area will be validated in accordance to the procedure outlined in Section 9.

This remediation option may cause potential impacts on the local community from waste transport, as well as imposing an unnecessary burden on the capacity of the receiving landfill. This option is also a high cost option. However, it removes the identified contamination from the site and therefore mitigates any ongoing liabilities.

This option can be used in combination with other remediation options, targeting only those soils with the higher contaminant concentrations, or where soils are in surplus to the needs of the development.

Remediation trate and Rationale

The proposed development will include opportunities for the beneficial use of the materials from the fill platform in the south-east of the site. As such, the options for treatment and physical barrier system are viable under the proposed development.

Landfill disposal will be considered for (a) soils with high level contaminants, exceeding SAC, (b) soils considered structurally unsuitable, and (c) surplus soils.

A detailed remediation strategy will be documented in a Remediation Works Plan once the details of the proposed development, the structural suitability of the soils and the cut to fill volumes are confirmed. The Remediation Works Plan will also incorporate any additional areas requiring remediation as determined through the additional proposed investigations following building demolition.

Ado ted Remediation Action Criteria RAC

The remediation works will be validated as meeting an acceptable standard for the proposed waste treatment facility land use. The validation protocols will be dependent on the remediation strategies adopted, and will comprise visual inspection, field screening, sample analysis and review of disposal dockets as discussed in Section 9.

The RAC are informed by the CSM and at this stage are the same as the SAC developed as part of the DSI. The derivation and listing of the SAC are included in Appendix C.

The RAC will also be used for the assessment of analytical data obtained through the further investigations recommended in Section 5.

9. Site Management During Remediation

This section provides general information which is to be considered during the remedial works.

9.1 Management

The remediation works should be conducted by experienced and appropriately licensed contractors. An experienced environmental consultant will be engaged to inspect the progress of the works and to provide ongoing advice and recommendations as required. The success of remediation works will be validated by the Environmental Consultant.

All works must be conducted in accordance with project planning requirements.

All works must be also undertaken in accordance with the relevant regulatory criteria, including *inter alia*:

- NSW *Work Health and Safety Act* 2011 (WHS Act);
- NSW *Work Health and Safety Regulation* 2011 (WHS Regulation);
- NSW *Contaminated Land Management Act* 1997;
- National Environment Protection Council, *National Environment Protection Measures 2013 (NEPM)*;
- *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (WA DoH 2009);
- SafeWork NSW: *Code of Practice How to Manage and Control Asbestos in the Workplace September 2016*; and
- SafeWork NSW: *Code of Practice How to Safely Remove Asbestos September 2016.*

9.2 Roles and Responsibilities

The following roles and responsibilities are required for the implementation of this RAP. DP notes that additional documentation requirements for the validation process required by the following are described in Section 9.4.

9.2.1 Principal

Cleanaway Operations Pty Ltd and Macquarie Corporate Holdings Pty Ltd retain overall responsibility for ensuring that this RAP is appropriately implemented. They are to nominate a representative (the Principal's Representative - PR), who is responsible for overseeing the implementation of this RAP. The actual implementation of the RAP will be conducted by the Principal Contractor.

Principal Contractor

The Principal Contractor is the party responsible for the day to day implementation of this RAP and shall fulfil the responsibilities of the Principal Contractor as defined by SafeWork. It is noted that the Principal Contractor may appoint appropriately qualified sub-contractors or sub-consultants to assist in fulfilling the requirements of the procedures.

In addition to the implementation of the RAP, it will be the Principal Contractor's responsibility:

- To obtain specific related approvals as necessary to implement the earthworks, including for example, permits for removal of asbestos-containing materials, SafeWork NSW notification, etc.;
- To develop or request and review plans to manage site works;
- That all site works, and other related activities are undertaken in accordance with this RAP;
- To maintain all site records related to the implementation of the RAP;
- That sufficient information has been provided to engage or direct all required parties, including sub-contractors, to implement the requirements of the RAP other than those that are the direct responsibility of the Principal Contractor;
- To manage the implementation of any recommendation made by those parties in relation to work undertaken in accordance with the RAP;
- To inform, if appropriate, the relevant regulatory authorities, of any non-conformances with the procedures and requirements of the RAP in accordance with the procedures outlined in this document;
- To retain records of any contingency actions;
- On completion of the project, to review the RAP records for completeness and update as necessary; and
- To recommend any modification to general documentation which would further improve the environmental outcomes of this RAP.

Asbestos Contractor

The Asbestos Contractor will be responsible for preparing an Asbestos Management Plan, undertaking all asbestos works involving any asbestos impacted soils and will hold a minimum of Class A licence for the removal of friable asbestos (issued by SafeWork NSW) and a minimum of Class B licence for the removal of bonded asbestos (issues by SafeWork NSW). The Asbestos Contractor can be the same as the Principal Contractor.

Environmental Consultant

The Environmental Consultant will provide advice on implementing this RAP.

The Environmental Consultant will be responsible for:

- Undertaking the additional investigations outlined in this RAP;
- Preparing the Remediation Works Plan;

- Undertaking any required assessments where applicable (e.g., waste classification, asbestos validation sampling etc.);
- Providing advice and recommendations arising from inspections;
- Reviewing documentation and results provided by the contractor (e.g., surveys, compaction results, proposed materials to be imported);
- Notifying their client with the results of any assessments and any observed non-conformances in a timely manner; and
- Validating the implementation of the RAP.

Occupational Hygienist

The Occupational Hygienist will provide advice on WHS issues related to any asbestos related works. The Occupational Hygienist will hold a NSW SafeWork Asbestos Assessor Licence, in accordance with the WHS Regulations.

The Occupational Hygienist will be responsible for:

- Where appropriate reviewing (or preparing) the asbestos management plan (AMP), work health safety plans and advice on request by the Contractor;
- Undertaking airborne asbestos monitoring (where required);
- Undertaking asbestos clearance inspections;
- Asbestos sampling (where required);
- Providing advice and recommendations arising from monitoring and/or inspections; and
- Notifying their client with the results of any assessments and any observed non-conformances in a timely manner.

The Environmental Consultant and Occupational Hygienist can be the same entity.

Site Worker

All workers on site are responsible for observing the requirements of this and other management plans. These responsibilities include the following:

- Being inducted on site and advised of the general nature of the remediation/environmental issues at the site;
- Being aware of the requirements of this plan;
- Wearing appropriate PPE;
- Only entering restricted areas when permitted; and
- Requesting clarification when unclear of requirements of this or any other plans (e.g., SWMS).

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It is envisaged that temporary stockpiles will be formed during the works. Stockpiles must be managed to minimise the risk of dust generation and erosion given the likely presence of contaminants in some of the stockpiled materials. The measures required to achieve this should include:

- Use proper tracking documentation to record the movement of stockpiles;
- Restrict the height of stockpiles to reduce dust generation (less than 2 m);
- Construct suitable erosion and sediment control measures;
- Cover stockpiles at the end of each day or when not in use with geofabric or plastic; and
- Keep temporary stockpiles moist, by using water spray where required.

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All off-site disposals of waste soils are to be undertaken in accordance with the *Protection of the Environment Operations* (POEO) Act and the NSW EPA *Waste Classification Guidelines,* 2014. Copies of all necessary approvals from the receiving site shall be given to the Principal's Representative prior to any contaminated material being removed from the site. Preliminary waste classification has been provided in DP (2020) for reference.

The sampling rate for validation / waste classification / assessment of stockpiled soils is noted in Section 10 (note actual frequency will be determined based on volume).

If contaminated soils are stockpiled, the footprint of the stockpile is to be validated following removal of the contaminated soils. This applies to the asbestos treatment area also, if this remediation option is implemented.

During excavation or stockpiling but prior to loading out the waste material is to be periodically inspected (and sampled if required) by the Environmental Consultant to confirm the waste classification of the material.

No soil is to leave the site without a formal waste classification report. Transport of spoil shall be via a clearly delineated, pre-defined haul route. Copies of all consignment notes for the transport, receipt and disposal of all materials are to be maintained as part of the site log and made available to the Environmental Consultant for inspection and reporting purposes upon request.

All relevant analysis results, as part of waste classification reports, shall be made available to the Contractor and proposed receiving site / waste facility to enable selection of a suitable disposal location.

Importation of Soil

Any soil is to be imported onto the site will be certified and provided by an appropriately licenced supplier. Prior to importation appropriate documentation confirming the soil can be legally imported onto the site under the POEO Act and meets the RAC (as outlined in Section 7) is to be provided to the Environmental Consultant for review.

All proposed imported materials (including but not limited to soil, aggregate, landscaping topsoil, garden mix, and mulch) will be assessed as being legally able to be imported to the site, and suitable under the proposed development. Material proposed to be imported to the site must comprise one of the following:

- Virgin excavated natural material (VENM), including quarried material; or
- Materials complying with a Resource Recovery Order (RRO) as issued by the NSW EPA, allowing land application; and
- Meeting the RAC.

The scope of works for the assessment of imported materials is as follows:

- Principal Contractor to provide certification / reports confirming compliance with one of the above, prior to the materials being imported to the site;
- The Environmental Consultant will review the information made available for compliance with one of the above, prior to the materials being imported to the site;
- If the Environmental Consultant determines compliance, they will recover confirmatory samples of the material either on site or at the source site. Additional samples may be recovered at the discretion of the Environmental Consultant, particularly if materials are recycled;
- Analysis of the samples for a range of potential contaminants, based on the source site, as well as analytes that may be required under the relevant RRO;
- The Environmental Consultant or nominated gate keeper will inspect the materials upon delivery to site for compliance with the information provided;
- The Environmental Consultant or nominated gate keeper will flag any concerns once identified; and
- The Environmental Consultant will issue an email or memorandum confirming acceptance (or otherwise) of the materials, prior to any materials being included in the works. The validation process will be documented in the final site validation report.

Validation Plan

Validation Data Quality Objectives (DQO)

The objective of the validation plan is to assess the results of post remediation testing against the RAC stated within this RAP and to provide information on environmental impacts which may have resulted from the works.

The validation assessment will be conducted in accordance with Data Quality Objectives (DQOs) and Quality Assurance / Quality Control (QA / QC) procedures to demonstrate the repeatability and reliability of the results.

The following DQOs will be adopted based on those provided in Section 8 and Schedule B2 of NEPC (2013). The DQO process is outlined as follows:

- State the Problem;
- Identify the Decision;
- Identify Inputs to the Decision;
- Define the Boundary of the Assessment;
- Develop a Decision Rule;
- Specify Acceptable Limits on Decision Errors; and
- Optimise the Design for Obtaining Data.

A checklist of Data Quality Indicators (DQI) in accordance with NEPM (2013) Schedule B2 is to be completed as part of the validation assessment. The DQIs are:

- Documentation completeness;
- Data completeness;
- Data comparability and representativeness; and
- Data precision and accuracy.

Based on a fulfilment of the DQOs and DQIs an assessment of the overall data quality is to be presented in the validation assessment report.

□□□ □ite In□□ection□

The Environmental Consultant and / or Occupational Hygienist will conduct site inspections as required. This will include, but not be limited to:

- Following the demolition of buildings;
- Post excavations;
- Stockpile footprints;
- As required by the adopted remediation process (e.g. placement of contaminated soils in a cell, then construction of a physical barrier);
- When any issue of concern is identified;
- Following the removal of contaminated materials / wastes; and
- For supplementary waste classification and VENM classification purposes.

The required inspections will be detailed in the Remediation Works Plan.

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Validation soil sampling and testing is required for the following:

- Validation of the base and side walls of excavated impacted soil;
- Validation of soils treated for contaminants and proposed for re-use;
- Validation of the base of stockpiles, following the removal of stockpiled impacted soil; and
- Validation of imported material.

The proposed validation sampling frequencies are set out in Section 10.

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The following documents will need to be reviewed as part of the validation assessment and will need to be provided by the referenced companies and/ or personnel.

□□□□□ Principal's Representative

- Any Licences and Approvals required for the works which are not the responsibility of the Contractor to provide.

□□□□□ Princi□al Contractor

- Any Licences and Approvals required for the works which are the responsibility of the Contractor to provide;
- Tracking records for soil movements within the site and off-site; Transportation Record: this will comprise a record of all truckloads of soil (and waste / exempt materials) entering or leaving the site, including truck identification (e.g., registration number), date, time, load characteristics (i.e., classification, on-site source, destination);
- Disposal dockets: for any soil materials disposed off-site, the contractor will supply records of: transportation records, spoil source, spoil disposal location, receipt provided by the receiving waste facility (where available), a record of receipt from the receiving site will be supplied (i.e., the receiving sites transportation records);
- Imported materials records: records for any soil (or waste-exempt materials) imported onto the site, including source site, classification reports, inspection records of soil upon receipt at site and transportation records; and
- Records relating to any unexpected finds and contingency plans implemented.

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The Environmental Consultant (and / or Occupational Hygienist) will prepare or obtain the following documents:

- Chain-of-Custody documentation and laboratory reports;
- Letters / memos as required to provide instruction or information to the Principal and Contractor;

- Waste classification reports;
- Air monitoring records;
- Clearance reports;
- Inspection records; and
- A final validation report.

□□□ □alidation Re□ortin□

A validation assessment report will be prepared for the site by the Environmental Consultant in accordance with NSW Office of Environment and Heritage (OEH) *Contaminated Sites Guidelines for Consultants Reporting on Contaminated Sites* (reprinted 2011) and other appropriate guidance documentation. The validation report shall detail the methodology, results and conclusion of the assessment and make a clear statement regarding the suitability of the site for the proposed land use.

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It is proposed that any validation, waste classification or additional site characterisation samples be collected and analysed at the following frequency, or as advised otherwise by the Environmental Consultant:

- For stockpiled material:
  - Stockpiles ≤250 m^3: one sample per 25 m^3 or a minimum of three samples;
  - Stockpiles >250 m^3: one sample per 50-250 m^3, or a minimum of 6 samples; and
  - Where contaminated soils are stored or treated on bare soils, the footprint of the stockpile requires validation following removal of the contaminated soils.
- For small to medium excavation or treatment area footprints (base <500 m^2):
  - Base of excavation: one sample per 25-50 m^2 or part thereof; and
  - Sides of excavation: one sample per 10-20 m length or part thereof. Additional samples will be collected at depths of concern where there is more than one depth of concern (e.g., multiple filling horizons).
- For large excavation or treatment area footprints (base >500 m^2):
  - Base of excavation: sampling on a grid at a density in accordance with the EPA *Contaminated Sites: Sampling Design Guidelines* (1995); and
  - Sides of excavation: one sample per 20 m length or part thereof. Additional samples will be collected at depths of concern where there is more than one depth of concern (e.g., multiple filling horizons).
- For imported material:
  - VENM is to be sampled for each source site at a minimum rate of three samples for the first 1,000 m^3 and then one sample per 1,000 m^3 thereafter;

- Sampling of materials documented to comply with a RRO will be undertaken at the discretion of the Environmental Consultant, such that the Environmental Consultant is confident and comfortable in the suitability of the proposed material to use at the site. s

□□□□ □ield Met□od□

When required, the following general sampling methodology is to be implemented for all soil sampling:

- Preparing records of samples, including sample date, location, description, signs of concern, and any field results;
- Sampling from surface or from the utilised plant using disposable sampling equipment or stainless steel hand tools;
- Decontaminating all re-useable sampling equipment prior to collecting each sample using a 3% solution of phosphate free detergent (Decon 90 or similar) and distilled water;
- Transferring suspected asbestos samples into a sealable plastic bag, and then placement in a second plastic bag / sealed container (such as an esky) (i.e., double bagging) (for asbestos analysis);
- Transferring samples into laboratory-prepared glass jars with Teflon-lined lid, and capping immediately (for chemical analytes);
- Labelling sample containers with individual and unique identification, including project number and sample number;
- Placing the glass jars for chemical analysis into a cooled, insulated and sealed container for transport to the laboratory; and
- Using chain-of-custody documentation so that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

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Laboratory analysis of any samples relevant to the validation report is to be undertaken by laboratories with NATA accreditation for the analyte(s) being tested and with appropriate QA / QC assessment. It is noted that AF / FA asbestos analysis as per NEPC 2013 is not a NATA accredited laboratory test and hence is exempt from this requirement.

At least two laboratories will be required to undertake the testing, a primary laboratory, and secondary laboratory which will analyse inter-laboratory replicate samples. In this regard replicates are to be analysed at a rate of 1 replicate sample per 10 primary samples. At least 50% of the replicates are to comprise inter-laboratory analysis.

Samples are to be analysed for the contaminants of concern identified for the sampling purpose, as determined by the Environmental Consultant. These contaminants are to be identified based on available laboratory results from previous testing, field observations and the objective of the analysis.

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Quality Assurance (QA) and Quality Control (QC) procedures should be adopted throughout the field sampling programme to assess sampling precision and accuracy and prevent cross contamination.

This should include confirmation of sampling accuracy and precision through the analysis of 10% field duplicate / replicate samples as well as the collection of field rinsate samples of reusable sampling equipment at a rate of one sample per day of sampling operations. Appropriate sampling procedures should be undertaken to prevent cross-contamination. These should include:

- Following standard operating procedures developed for such testing;
- Site safety plans are developed prior to commencement of works;
- Duplicate or replicate field samples are collected and analysed;
- Equipment rinsate samples are analysed as part of the QA / QC programme;
- Samples are stored under secure, temperature controlled conditions;
- Chain-of-custody documentation is employed for the handling, transport and delivery of samples to the selected laboratory; and
- Proper disposal of contaminated soil, fill or groundwater originating from the site area is completed.

□□□ □n□ironmental Mana□ement Plan D□rin□ Remediation

The remediation work shall be undertaken with all due regard to the minimisation of environmental effects and to meet all statutory requirements. The Principal Contractor shall have in place a Construction Environmental Management Plan (CEMP) such that work on the site complies with the requirements of the following Acts:

- Hazardous Chemicals Act;
- Environmentally Hazardous Chemicals Act;
- Dangerous Goods Act;
- Protection of the Environment Operations Act;
- Construction Safety Act; and
- Work Health and Safety Act (SafeWork NSW).

As a minimum, the site-specific CEMP shall detail the following:

- Works sequence and timeline;
- Health and Safety Protocols;
- Dust minimisation measures;
- Noise minimisation measures;
- Environment protection measures;

- Equipment to be used;
- Nominated landfill/s;
- Truck movements / site access / site egress;
- Proposed source/s of materials for import, and methods of certification; and
- Measures to prevent cross contamination between areas being remediated the remaining site.

The contractor shall also be responsible to ensure that the site works comply with the following conditions:

- Fugitive dust leaving the confines of the site is minimised;
- No water containing any suspended matter or contaminants leaves the site in a manner which could pollute the environment;
- Vehicles shall be cleaned and secured so that no mud, soil or water are deposited on any public roadways or adjacent areas; and
- Noise, odour and vibration levels at the site boundaries comply with the legislative requirements.

The CEMP should also make provision for unexpected finds (e.g., tanks, asbestos etc.) to allow an appropriate response to such finds to be made.

The appointed remediation and construction contractors will be provided with a copy of this RAP so that they are aware of the contamination status of the soils and the remediation methodology to be adopted. A copy of the Remediation Works Plan is also to be provided.

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The remediation works contractor will be required to develop a Work Health and Safety Plan for the project. This plan should be developed in accordance with the relevant Work Health and Safety legislation and guidelines for NSW.

□□□ Comm□nit□ Con□□ltation

Community consultation (if required) will be undertaken in accordance with the planning approval for the project and any associated legislation and planning instruments referenced therein.

□□□ Concl□□ion□

It is considered that the site can be rendered suitable for the proposed development subject to implementation of this RAP.

Limitation

Douglas Partners (DP) has prepared this report for this project at 339 Wallgrove Road, Eastern Creek in accordance with DP's proposal SYD1909230.P.002.Rev5 dated 12 December 2019 and acceptance received from Arup Pty Ltd. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Cleanaway Operations Pty Ltd and Macquarie Corporate Holdings Pty Limited, c/- Arup Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

This RAP has been prepared based on the results of previous investigations at the site. Should site conditions encountered during works differ from those currently understood and as outlined in this report, or the remedial approach amended without DP's knowledge and agreement, this RAP would no longer be valid for remediation of the site.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific testing locations in the cited reports, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

DP's advice is based upon the conditions encountered during previous investigations. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond these previous testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk.

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About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Report

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

□ite Anomalie□

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

In□ormation □or Contract□al P□r□o□e□

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

□ite In□□ection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Drawings

Locality Plan

NOTE:
1: Base drawing from Nearmap.com (Dated 21/07/2019)

Legend

Site Boundary

0 50 100 m

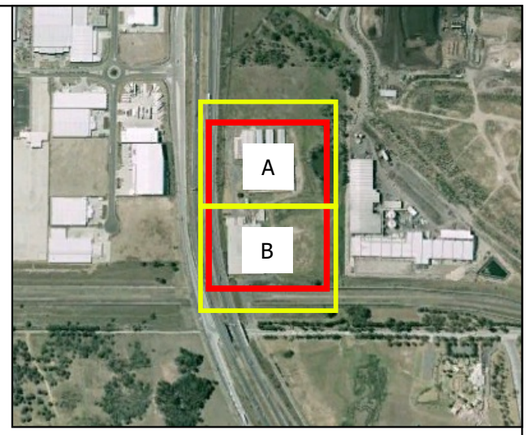
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Cleanaway Operations Pty Ltd		
OFFICE:	Sydney	DRAWN BY:	JJH
SCALE:	1:1750	DATE:	19/03/2019

TITLE: **Site Overview**
Remediation Action Plan
339 Wallgrove Road, EASTERN CREEK

N

PROJECT No:	84822.03
DRAWING No:	1
REVISION:	0



Locality Plan

NOTE:
1: Base drawing from Nearmap.com (Dated 21/07/2019)
2: Drawing 2A and 2B extent shown in locality map

Legend

- Site Boundary
- Surface Water Samples (2019 and 2020)
- Test pit (2020)
- Borehole / Monitoring Well (2020)
- Borehole (2020)
- Boreholes / Monitoring Well (2019)
- Boreholes (2019)
- Hand Augered Boreholes (2019)
- Borehole (2015)
- Borehole / Monitoring Well (2015)
- Surface Samples (2015)
- Bag Sample (2015)

0 25 50 m

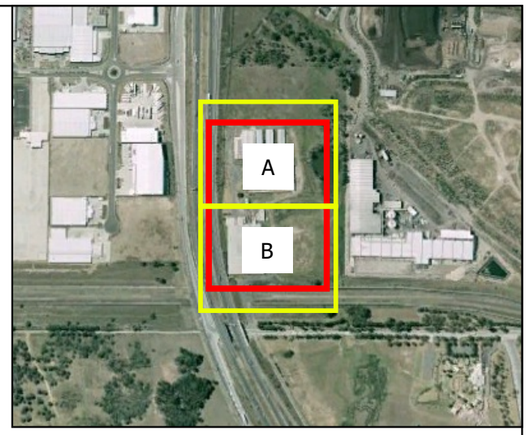
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Cleanaway Operations Pty Ltd		
OFFICE:	Sydney	DRAWN BY:	JJH
SCALE:	1:1000	DATE:	19/03/2019

TITLE: **Current and Previous Test Locations**
Remediation Action Plan
339 Wallgrove Road, EASTERN CREEK

N

PROJECT No:	84822.03
DRAWING No:	2A
REVISION:	0



Locality Plan

NOTE:
1: Base drawing from Nearmap.com (Dated 21/07/2019)
2: Drawing 2A and 2B extent shown in locality map

Legend

- Site Boundary
- Surface Water Samples (2019 and 2020)
- Test pit (2020)
- Borehole / Monitoring Well (2020)
- Borehole (2020)
- Boreholes / Monitoring Well (2019)
- Boreholes (2019)
- Hand Augered Boreholes (2019)
- Borehole (2015)
- Borehole / Monitoring Well (2015)
- Surface Samples (2015)
- Bag Sample (2015)

0 25 50 m

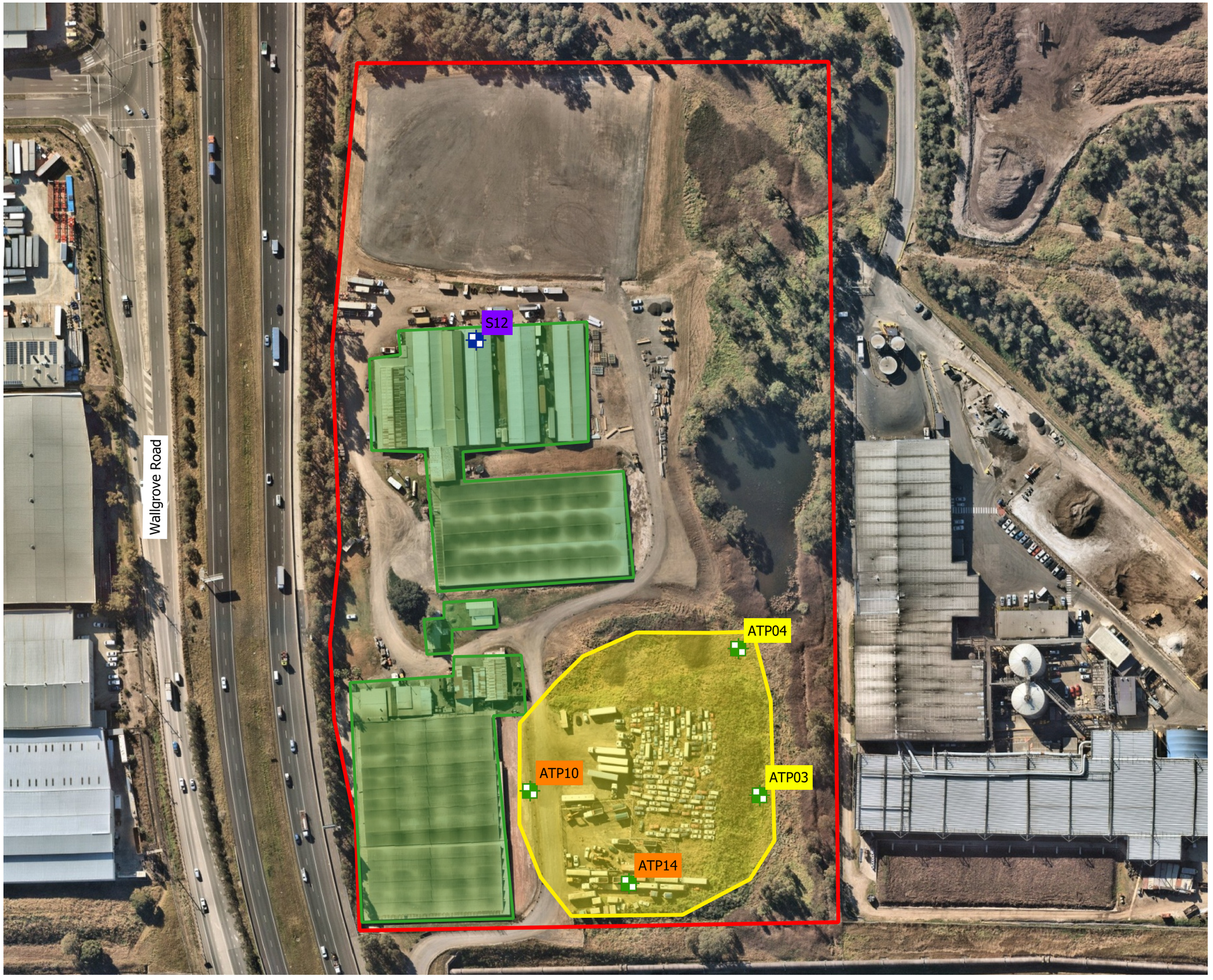
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Cleanaway Operations Pty Ltd		
OFFICE:	Sydney	DRAWN BY:	JJH
SCALE:	1:1000	DATE:	19/03/2019

TITLE: **Current and Previous Test Locations**
Remediation Action Plan
339 Wallgrove Road, EASTERN CREEK

N

PROJECT No:	84822.03
DRAWING No:	2B
REVISION:	0



Locality Plan

NOTE:
1: Base drawing from Nearmap.com (Dated 21/07/2019)

Legend

- Site Boundary
- ACM Detected (HSL Exceedance)
- ACM Detected in near surface soils
- Lead EIL Exceedance
- Area with variable ACM impact to be considered in soil management and off-site disposal
- Areas with high risk of ACM at the surface to be tested following demolition

0 50 100 m

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Cleanaway Operations Pty Ltd		
OFFICE:	Sydney	DRAWN BY:	JJH
SCALE:	1:1750	DATE:	19/03/2019

TITLE: **Identified Contamination**
Remediation Action Plan
339 Wallgrove Road, EASTERN CREEK

N

PROJECT No:	84822.03
DRAWING No:	3
REVISION:	0

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Remediation Action Criteria

A□□endi□ C □Remediation Action Criteria

The proposed development at 339 Wallgrove Road, Eastern Creek will comprise the development of a waste processing facility with possible incineration capabilities.

The Remediation Action Criteria (RAC) applied in the current investigation are informed by the CSM which identified human and ecological receptors to potential contamination on the site. Analytical results from laboratory testing of soil, groundwater and soil vapour analytical results will be assessed (as a Tier 1 assessment) against the investigation and screening levels of Schedule B1, NEPC (2013). NEPC (2013) is endorsed by the NSW EPA under the CLM Act 1997. Petroleum based health screening levels for direct contact have been adopted from the *Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) Technical Report no.10 Health screening levels for petroleum hydrocarbons in soil and groundwater* (2011) as referenced by NEPC (2013).

The investigation and screening levels are applicable to generic land use settings and include consideration of, where relevant, the soil type and the depth of contamination. The investigation and screening levels are not intended to be used as clean up levels. Rather, they establish concentrations above which further appropriate investigation (e.g., Tier 2 assessment) should be undertaken. They are intentionally conservative and are based on a reasonable worst-case scenario. Site-specific conditions and selected inputs for the derivation of the RAC have been adopted from the DSI (DP, 2020) and can be found in Section 8 of the DSI (DP, 2020).

Methane gas concentrations were adopted from the criteria specified in the NSW EPA *'Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases'* (November 2012).

□□ □oil□

□□□ □ealt□ In□e□ti□ation Le□el□ and □ealt□ □creenin□ Le□el□

The Health Investigation Levels (HIL) and Health Screening Levels (HSL) are scientifically-based, generic assessment criteria designed to be used in the first stage (Tier 1) of an assessment of potential human health risk from chronic exposure to contaminants.

HILs are applicable to assessing health risk arising via all relevant pathways of exposure for a range of metals and organic substances. The HIL are generic to all soil types and apply generally to a depth of 3 m below the surface for residential use. Site-specific conditions may determine the depth to which HILs apply for other land uses.

HSLs are applicable to selected petroleum compounds and fractions to assess the risk to human health via inhalation and direct contact pathways. HSLs have been developed for different land uses, soil types and depths to contamination.

The adopted comparative criteria for soils are shown in Table C1.

Table C: Adopted HIL and HSL for Commercial/Industrial Land Use

Contaminant		HIL D	HSL D Direct Contact	HSL D Vapour Intrusion
Metals	Arsenic	3,000	-	-
	Cadmium	900	-	-
	Chromium (VI)	3,600	-	-
	Copper	240,000	-	-
	Lead	1,500	-	-
	Mercury (inorganic)	730	-	-
	Nickel	6,000	-	-
	Zinc	400,000	-	-
PAH	Benzo(a)pyrene TEQ[1]	40	-	-
	Naphthalene	-	11,000	3
	Total PAH	4,000	-	-
TRH	C6 – C10 (less BTEX) [F1]	-	26,000	260
	>C10-C16 (less Naphthalene) [F2]	-	20,000	NL
	>C16-C34 [F3]	-	27,000	-
	>C34-C40 [F4]	-	38,000	-
BTEX	Benzene	-	430	3
	Toluene	-	99,000	NL
	Ethylbenzene	-	27,000	NL
	Xylenes	-	31,000	230
Phenol	Pentachlorophenol (used as an initial screen)	660	-	-
OCP	Aldrin + Dieldrin	45	-	-
	Chlordane	530	-	-
	DDT+DDE+DDD	3,600	-	-
	Endosulfan	2,000	-	-
	Endrin	100	-	-
	Heptachlor	50	-	-
	HCB	80	-	-
	Methoxychlor	2,500	-	-
OPP	Chlorpyrifos	2,000	-	-
PCB [2]		7	-	-
VOC		PQL as initial screening concentration. Reference to national or international standards if above the PQL.		

Notes:
1 Sum of carcinogenic PAH
2 Non dioxin-like PCBs only
3 The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

With respect to asbestos concentrations, as per NEPM (2013) *Table 7: Health Screening Levels for Asbestos Contamination in Soil* for commercial/industrial land use is no asbestos is to be visible at the surface, bonded ACM is to be less than 0.05% and fibrous asbestos/asbestos fines (FA and AF) are to have a concentration of < 0.001% and are summarised in Table C2 below.

Table C[illegible] LD for asbestos contamination in soil

Form of asbestos	LD [illegible]
Bonded ACM	0.05
FA and AF	0.001
All forms of asbestos	No visible asbestos for surface soil

[illegible] Ecological Investigation Levels and Ecological Screening Levels

Ecological Investigation Levels (EIL) have been derived for selected metals and organic compounds and are applicable for assessing risk to terrestrial ecosystems (NEPC, 2013). EIL depend on specific soil physiochemical properties and land use scenarios and generally apply to the top 2 m of soil, which corresponds to the root zone and habitation zone of many species. Ecological Screening Levels (ESL) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems and apply to the top 2 m of the soil profile as for EIL.

Table C[illegible] Ecological Investigation Level [illegible] EIL in m[illegible]

Analyte		EIL	Comment
Metal	Arsenic	160	Adopted pH of 7.47 and CEC of 28.04 $cmol_c/kg$; assumed conservative clay content 10%
	Copper	320	
	Nickel	420	
	Chromium III	670	
	Lead	1800	
	Zinc	1000	
PAH	Naphthalene	370	
OCP	DDT	640	

Table C: Ecological Screening Level (ESL) in mg/kg

Analyte		ESL	Comment
TRH	C6 – C10 (less BTEX) [F1]	215*	All ESLs are low reliability apart from those marked with * which are moderate reliability
	>C10-C16 (less Naphthalene) [F2]	170*	
	>C16-C34 [F3]	1700	
	>C34-C40 [F4]	3300	
BTEX	Benzene	75	
	Toluene	135	
	Ethylbenzene	165	
	Xylenes	180	
PAH	Benzo(a)pyrene	1.4	

It is noted that the NEPC (2013) ESL for benzo(a)pyrene is low reliability compared to the high reliability CRC CARE (2017) derived ecological guidelines which provide a high reliability guideline for 65% protection level of species (commercial and industrial land use), of 172 mg/kg (95% confidence limits of 57-371 mg/kg).

Management Limits – Petroleum Hydrocarbons

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

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

Management Limits to avoid or minimise these potential effects have been adopted in NEPC (2013) as interim Tier 1 guidance. Management Limits have been derived in NEPC (2013) for the same four petroleum fractions as the HSL (F1 to F4). The adopted Management Limits, from Table 1B (7), Schedule B1 of NEPC (2013) are shown in the following Table C5.

Table C: Management Limits in mg/kg

Analyte		Management Limit
TRH	$C_6 – C_{10}$ (F1) #	700
	$>C_{10}-C_{16}$ (F2) #	1,000
	$>C_{16}-C_{34}$ (F3)	3500
	$>C_{34}-C_{40}$ (F4)	10,000

Separate management limits for BTEX and naphthalene are not available hence these have not been subtracted from the relevant fractions to obtain F1 and F2

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The Groundwater Investigation Levels (GIL) adopted in NEPC (2013) are based on:

- *Australian Drinking Water Guidelines* 2011 (ADWG);
- *Guidelines for Managing Risk in Recreational Waters* 2008 (GMRRW); and
- *National water quality management strategy. Australian and New Zealand guidelines for fresh and marine water quality* 2000 (ANZECC & ARMCANZ).

It is noted that the GILs adopted in NEPC (2013) have since been superseded by the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia (ANZG 2018).

The adopted groundwater RAC are shown in Table C6 below.

Ta□le C□□□ro□nd□ater In□e□ti□ation Le□el□ □in m□□L □nle□□ ot□er□i□e □tated□

Anal□te		A□□□ □□□□□□ □re□□ □ ater□[a]	Comment□
Metal□	Arsenic	0.024 / 0.013	* Corrected for site averaged hardness of 790 mg/kg $CaCO_3$
	Cadmium	0.00037 *	
	Chromium	0.0048	
	Copper	0.0014	
	Lead	0.22 *	
	Mercury	0.0006	
	Nickel	0.18 *	
	Zinc	0.13 *	
PA□	Naphthalene	0.016	
	Benzo(a)pyrene	-	
□T□□	Benzene	0.90	
	Toluene	0.18	
	Ethylbenzene	0.08	
	Xylene (o)	0.35	
	Xylene (m+p)	0.075/0.2	
OCP	Chlordane	0.00003	
	DDT	0.000006	
	Endosulfan	0.00003	
	Endrin	0.00001	
	Heptachlor	0.00001	
	Aldrin + Dieldrin	0.00001	
	Lindane	0.0002	
	Heptachlor Expoxide	0.00001	
OPP	Chlorpyrifos	0.00001	
	Diazinon	0.00001	
	Dimethoate	0.00015	
	Fenitrothion	0.00002	
	Ethion	-	
PC□	Aroclor 1242	0.003	
	Aroclor 1254	0.0001	

Analyte		Adopted investigation levels groundwater[a]	Comments
VOC	Trichloroethene	0.33	Refer to DSI for detailed list of VOCs.
	Chloroform	0.37	

Notes:

a Investigation levels apply to typically slightly-moderately disturbed systems, 95% level of protection (LOP). 99% LOP adopted as recommended by ANZG (2018), further details per analyte provided on Table G2.

The adopted groundwater HSL for vapour intrusion, from Table 1A(4), Schedule B1 of NEPC (2013) are shown in the following Table .

Table C Groundwater Health Screening Level (HSL) for Vapour Intrusion (HSL)

Analyte		HSL D
TRH	$C_6 – C_{10}$ (less BTEX) [F1]	6000
	$>C_{10}-C_{16}$ (less Naphthalene) [F2]	NL
BTEX	Benzene	5000
	Toluene	NL
	Ethylbenzene	NL
	Xylene	NL
PAH	Naphthalene	NL

Note: NL -The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour which is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil-vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for a given scenario. For these scenarios no HSL is presented for these chemicals. These are denoted as not limiting 'NL'.

Methane Gas

The NSW EPA *'Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases'* (November 2012) references Benchmark Technique 19, 'Remediation of Uncontrolled Gas Emissions' from the NSW EPA *'Environmental Guidelines: Solid Waste Landfills'* (1996), with respect to methane concentration criteria within buildings. The benchmark indicates that the gas mitigation criteria for build-up of methane within a building should be < 1.25% by volume in air (this does not include ventilation spaces such as gravel blankets located below or adjacent to the building). The adopted criterion takes into account an intrinsic safety factor of at least 4 given that the methane is explosive at concentrations between 5 - 15% in air, equating to 25% of the lower explosive limit (LEL).

Soil Vapour

The investigation levels for soil vapour have been sourced from NEPC (2013), where available.

The interim health-based investigation levels (HIL) for and commercial / industrial sites provided in NEPC (2013) have been adopted as the initial investigation / screening levels for chlorinated

hydrocarbons in soil vapour. The screening levels for chlorinated hydrocarbons are presented in Table C8, below.

Table C□□Interim □oil □a□o□r □ealt□ In□e□ti□ation Le□el□ □or C□lorinated Com□o□nd□ □m□m□□

C□emical	Commercial □Ind□□trial □On□□ite□
TCE	0.08
1,1,1 – TCA	230
PCE	8
Cis, 1,2, -DCE	0.3
Vinyl chloride (VC)	0.1

For petroleum hydrocarbons, the soil vapour HSLs for vapour intrusion have been adopted as the initial investigation / screening levels. Based on the soil conditions encountered at the site the threshold levels for clay were adopted as the appropriate screening levels and HSL D were adopted. The investigation / screening levels for petroleum hydrocarbons adopted for the monitoring program are presented in Table C9, below.

Table C□□□oil □a□o□r □□L□ □or □a□o□r Intr□□ion □m□m□□

C□emical	□□L D	
	□ to □m	□ to □m
Toluene	6,500	100,000
Ethylbenzene	1,800	31,000
Xylenes	1,200	21,000
Naphthalene	4	85
Benzene	5	80
C6 – C10 (less BTEX) [F1]	1,000	19,000
>C10-C16 (less Naphthalene) [F2]	800	NL

□□ □ a□te Cla□□i□ication Criteria

All soil materials requiring off-site disposal must have a waste classification conducted with reference to the NSW Environment Protection Authority (EPA) *Waste Classification Guidelines* November 2014 (EPA, 2014).