

14 May 2018

Doma Holdings (Honeysuckle) Pty Ltd
Attn: Chris Farrington
4/3 Sydney Avenue Barton ACT

By email: chris@domagroup.com.au

Dear Chris

RE: INTERIM AUDIT ADVICE – SUITABILITY OF THE 2018 REMEDIAL ACTION PLAN

Date 14/05/2018

1. INTRODUCTION

As a NSW Environment Protection Authority (EPA) accredited Contaminated Sites Auditor, I am conducting an Audit in relation to the site, described as 42 Honeysuckle Drive, Newcastle. This initial review has been undertaken to provide an independent review of the suitability and appropriateness of a Remediation Action Plan (RAP).

Doma Holdings are proposing development of residential towers on the site and will submit a development application seeking approval for the development. A previous remedial action plan was prepared for the site in 2004 and an audit of the suitability of the RAP was prepared by My Graeme Nyland. Since this time, further investigation has been completed and the RAP has been revised. Doma has requested that an Auditor review of the suitability of the RAP be undertaken. The audit is non-statutory at this time.

This interim letter is based on a review of the documents listed below, as well as discussions with Doma and Douglas Partners (DP) who undertook the subsequent investigation.

The reports reviewed were:

- 'Report on Contamination and Acid Sulfate Soil Assessment', 30 October 2017, DP
- 'Acid Sulfate Soils Management Plan', 22 November 2017, DP
- 'Remediation Action Plan', 13 April 2018, DP

1.1 Summary of Previous Investigations and Remediations

Previous investigations have been completed by PPK, Parsons Brinkerhoff (PB) and RCA Australia (RCA). Contamination in the form of total recoverable

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hydrocarbons (TRH), Polycyclic Aromatic Hydrocarbons (PAH) and metals was reported in the fill material. In 2004, site remediation and validation works were completed by RCA and were reviewed by a NSW EPA accredited Site Auditor, Mr Graeme Nyland, as detailed in the ENVIRON 'Summary Audit Report' (2004). The auditor concluded that the site was suitable for commercial/industrial land use subject to: capping the site with suitable materials including clean soils or a building slab; notice of contaminated soil on the Section 10.7 certificate (formally Section 149); maintenance of the site capping; and groundwater is not abstracted for use.

2. SITE DETAILS

2.1 Location

The site details are shown in **Table 2.1**.

Table 2.1: Site Details

Site Details	Description
Street address:	42 Honeysuckle Drive, Newcastle, NSW 2300 (Attachment 1)
Identifier:	Lot 22 DP1072217
Local Government:	Newcastle City Council
Owner:	Doma Holdings (Honeysuckle) Pty Ltd
Site Area:	3728 m ²
Zoning:	B3 Commercial Core under the Newcastle City Council Local Environmental Plan (2012)

The boundaries of the site are not well defined along the western boundary with Lot 23. The remaining boundaries are well defined by streets, former railway line and adjoining properties.

2.2 Site Condition

DP noted:

- The site was vacant, predominantly grassed and contained mounded fill
- The fill mound covers the majority of the site footprint, which has raised site levels 1.5 m to 2 m above the street level. The fill mound extends into the adjacent allotment to the west (Lot 23) and batters down to Cottage Creek
- Several localised surface disturbances (likely to be former test pit locations) were evident across the site
- Where present, building materials (i.e. concrete, timber and bricks), slag, asphalt were observed at the surface
- A fibro sheet fragment (possible asbestos containing material (ACM)) was observed at the disturbed surface of a former test pit within the south west corner of the site

The Auditor agrees with the description provided by DP.

2.3 Adjacent Uses

The site is located within an area of commercial/industrial use. The surrounding site use includes:

North: Honeysuckle Drive, followed by concrete carpark area

East: Commercial/Industrial buildings

South: former railway line, followed by commercial/industrial buildings

West: Vacant grass land (Lot 23) sloping towards Cottage Creek, followed by a vacant land parcel with grassed surface

Current uses of the adjacent areas has not been identified as likely to result in contamination at the site.

2.4 Proposed Development

It is understood that the proposed development will comprise a nine storey mixed use building, with parking, serviced apartments and retail development on the ground floor, four storeys of parking and hotel rooms above the ground floor and an additional four storeys of residential apartments above the hotel. No basement is proposed as part of the proposed development, however the ground floor will be approximately 0.5 m to 1.5 m below existing site levels. The southern part of the site will require filling of up to 0.5m to reach base slab level. Deeper excavations will be required for the five lift pits / services. Allocated areas around the boundary of the site are proposed for landscaped areas.

For the purposes of this audit, the 'residential with minimal opportunities for soil access' land use scenario will be assumed.

3. SITE HISTORY

3.1 Previous Investigations

Preceding the DP Contamination and Acid Sulfate Soil Assessment, a number of previous investigations were completed by others at the Site and the area known as 'Lee 5 South', which comprised Lot 22 DP 1165985.

DP outlined a brief site history based on previous investigations and it is summarised in **Table 3.1**.

Table 3.1: Site History

Date	Activity
unknown	Cottage Creek previously traversed through the centre of the site
1896-1944	The site and surrounding area was reclaimed from Newcastle Harbour using hydraulic sand fill
1944-1993	The site was used for rail and port activities
up until 1993	Railway lines were present on Lot 23, located immediately adjacent to Lot 22
Early - Mid 2000s	Soil/fill excavated from surrounding Honeysuckle developments (including Worth Place and Honeysuckle Drive) has been stockpiled on the site

The historical investigations undertaken were reviewed by DP and pertinent information relating to the site history has been summarised by the Auditor below. Historical sample locations are shown on **Attachment 2**.

Environmental site assessments were completed by PPK (2002), PB (2003) and RCA (2003). Investigations found fill materials containing PAH, Benzo(a)pyrene (B(a)P) and TPH concentrations in excess of commercial/industrial landuse guidelines that were relevant at the time of the investigation. No asbestos was observed at the site at the time of the investigation. Groundwater was sampled and found to contain PAHs and metals at both the upgradient and downgradient boundaries. Groundwater impacts were considered to be attributed to off site sources or typical of regional groundwater conditions.

RCA prepared a remedial action plan in 2004 which proposed the removal of heavily impacted soils and on-site retention of all other soils. Remediation was completed by RCA and comprised the removal of the hardstand area and surrounding material of approximately 3,600 m² with an average thickness of 0.5 m targeting three contaminated layers of the soil profile. Material overlying the contaminated layers was not remediated and RCA noted that the material comprised hotspots that were random and not distinguishable. This material was used to reinstate the site after excavation.

Mr Graeme Nyland, prepared a Site Audit Report and Site Audit Statement in 2004 which stated that the remediation completed by RCA to remove the highly contaminated material has been effectively completed. Mr Nyland considered that capping of remaining soils can be achieved to minimise risk to human health and the environment providing the site is appropriately capped, the presence of contamination is noted on the Section 149 certificate and groundwater use is restricted.

Subsequent to the Site Audit Statement, DP prepared a waste classification report (2008) and indicated that a disused underground electrical service bisects the site and was observed to exit the south-western corner of the site and which may contain asbestos materials. In addition, DP also identified the natural soils underlying the identified fill materials are likely to be Potential Acid Sulphate Soils (PASS).

DP report that no other activities have been carried out at the site since this time that could result in site contamination.

3.2 Auditor's Opinion

In the Auditor's opinion, the site history information provided is adequate to identify the major sources of contamination at the site which comprise filling for land reclamation and imported fill from other Honeysuckle Developments, former rail and port activities, historical demolished buildings and former road pavement remnants. The site remediation works and validation were reviewed by a NSW EPA accredited Site Auditor as detailed in the ENVIRON 'Summary Site Audit Report'. The then auditor concluded that the site was suitable for commercial/industrial landuse, subject to capping with suitable materials that may include clean soils or a building slab, notation of contaminated soil of the Section 149 planning certificate, maintenance of site capping, and that groundwater is not abstracted for use. The auditor also recommended any landscape areas should be validated or capped with imported VENM/ENM and a suitable marker layer.

4. CONTAMINANTS OF CONCERN

DP provided a list of the contaminants of concern and potentially contaminating activities. These have been tabulated in **Table 4.1**.

Table 4.1: Contaminants of Concern

Area	Potential Contaminants
Filling present within the site (including land reclamation, imported fill from other Honeysuckle developments)	TRH, BTEX, PAH, Metals, OCP/OPP, PCB, asbestos
Former rail and port activities	TRH, BTEX, PAH, Metals, OCP/OPP, asbestos
Demolished Buildings (where present)	Asbestos, PCBs, Metals, building debris
Former road pavements remnants (tarry residues)	TRH, BTEX, PAH, Metals
Metals	Arsenic, cadmium, chromium (total), copper, lead, mercury, nickel and zinc
TPHs	Total petroleum hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, xylene
PAHs	Polycyclic aromatic hydrocarbons
OCP	Organochlorine pesticides
OPP	Organophosphorus pesticides
PCBs	Polychlorinated biphenyls

4.1 Auditor's Opinion

The Auditor considers that the analyte list used by DP adequately reflects the site history and condition.

5. STRATIGRAPHY AND HYDROGEOLOGY

Following a review of the reports provided, a summary of the site stratigraphy and hydrogeology was compiled as follows.

5.1 Stratigraphy

The sub-surface profile of the site is summarised from the boreholes logs provided in the Contamination and Acid Sulfate Soils Assessment and is outlined in **Table 5.1**.

Table 5.1: Stratigraphy

Depth (mbgl)	Subsurface Profile
0.0 – 2.9 / 3.7	Fill; silty fine to medium grained sand/ silty sand, some rootlets, trace of coal gravels and ash and quarry gravel, trace of subrounded gravel. Trace of sandstone cobbles at 0.6m at BH201 and trace of bricks over the centre at BH202 at 0.4m
3.0 to depth	Alluvial sands generally occur at 3 m, however over the centre and north-west were not encountered till 3.5-3.7 mbgl.

mbgl – metres below ground level

5.2 Hydrogeology

DP undertook a search of the groundwater information database maintained by the NSW Government and identified six registered groundwater bores within a 0.5 km radius of the site. The bores were stated to be upgradient of the site.

Three groundwater wells were installed as part of the DP investigation. Groundwater was encountered between 2.4 – 3 mbgl during drilling. DP believe the groundwater flow direction is to the north, north-east towards the Hunter River/Cottage Creek. The Auditor notes Cottage Creek is located to the west of the Site, which could represent groundwater flow direction to the north, north-west. The groundwater wells installed by DP were for geotechnical purposes and no analytical sampling was undertaken.

Previous limited groundwater investigations completed by RCA (2004) identified heavy metals and PAH concentrations upgradient of the site and heavy metals down-gradient, which were attributed to offsite sources of contamination. As part of the Site Audit Report (ENVIRON, 2004), one of the conditions included that groundwater is not abstracted for use.

5.3 Auditor's Opinion

The Auditor agrees with the previous Site Audit Report that groundwater is not abstracted for use.

Overall, the Auditor considers that the subsurface conditions at the site have been adequately characterised for the purpose of the Audit.

6. EVALUATION OF QUALITY ASSURANCE AND QUALITY CONTROL

The Auditor has assessed the overall quality of the data by review of the information presented in the referenced reports. The Auditor's assessment follows in **Table 6.1** and **Table 6.2**.

Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
<p>Data Quality Objectives (DQO)</p> <p>DP did not specifically define DQOs for the Contamination and Acid Sulfate Soil Assessment.</p> <p>Sampling pattern and locations</p> <p>Four investigation locations were spaced to gain coverage of the majority of the site while targeting the proposed tank room where a localised deep excavation is proposed (Bore 202).</p> <p>The following known and potential primary sources identified in the DP CSM include:</p> <ul style="list-style-type: none"> Filling present within the site (including land reclamation, imported fill from other Honeysuckle developments etc) Former rail and port activities Demolished buildings (where present) Former road pavements remnants (tarry residues). <p>During the field works, DP reported the site was vacant, predominantly grassed and contained mounded fill.</p> <p>Three groundwater monitoring wells (201-203) were positioned across the site. Wells were positioned in the south-west, centre and north-east portions of the site, in line with each other.</p> <p>Sampling density and sample depths.</p> <p>Soil: The sampling density of four locations over approximately 3728m² was below the minimum recommended by EPA (1995) Sampling Design Guidelines. However, is sufficient when in combination with historical sampling completed at the site.</p> <p>TRH, PAH, BTEXN and metals were reported as the main contaminants of concern, and 18 samples were submitted for analysis. Additional analysis was completed for OCP/OPP/PCB on nine select samples and two select samples for asbestos and an additional one fibro fragment was analysed for the presence of asbestos.</p> <p>Samples were collected from the near surface and approximately every 0.5m intervals within the shallow fill (0.2-3.4 m below ground surface). One to two samples from each borehole were collected from the underlying sands. Boreholes were terminated within the underlying sands at approximately 6 m below ground surface.</p> <p>Observations of potential contamination including coal, ash and hydrocarbon odours were observed/noted in a number of the boreholes. Bricks were reported at 202, where it was considered there was the potential for asbestos to be apparent in building waste.</p> <p>Groundwater: A total of three groundwater wells were installed at the site within the upper unconfined sand/ fill aquifer. The wells were installed to assist in determining groundwater levels as part of the geotechnical assessment.</p> <p>Well construction</p>	<p>On the basis that the consultant has clearly stated the project objectives and has designed effective sampling strategies to achieve them, overall the Auditor considers that the omission of specific DQOs does not affect the outcome of the audit.</p> <p>Sampling locations were chosen to gain coverage of the site and to target the proposed tank room where a deep excavation is proposed. No other potential primary sources of contamination were noted to be targeted with the exception of filling within the site.</p> <p>Asbestos contamination and specific areas of 'hotspots' were not remediated as part of the validation works completed by RCA as asbestos was not identified to be a COC and the hotspots were not 'readily' identifiable as mentioned in the DP Report. Some point sources of contamination 'hot spots' may exist and there is an associated risk of unidentified contamination.</p> <p>The Auditor considers the extent of investigation sufficient in combination with an adequately robust unexpected finds protocol. Contingencies are required during remediation and bulk earthworks to manage the potential risk of unidentified contamination and local areas of filling that may contain 'hotspots' or asbestos as well as residual contamination that may remain.</p> <p>Acceptable. The soil analysis and sampling depths undertaken and the number of samples (18) submitted for analysis were considered adequate for the site.</p> <p>Physico-chemical parameters for groundwater were completed, however no laboratory analysis for contaminants of concern was undertaken.</p> <p>The Auditor notes that, whilst it is preferable for monitoring wells to screen over a discrete short vertical interval, considering the site specific conditions, and noted varying groundwater levels overtime, the wells</p>

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
<p>The DP wells (201-203) were completed to 6 m depth and were constructed of 50 mm PVC with a screen length of approximately 4.5m, extending to 1.5m below the ground surface.</p> <p>The wells were completed in the shallow sand/fill aquifer.</p> <p>Sample collection method</p> <p>Soil: Sample collection was via a Geoprobe. Samples were collected with a nickel-plated sampler tube. Sampler tubes were fitted with clear, disposable PVC sleeves and sand catchers were used to prevent loss of sample.</p> <p>Samples were collected directly from the disposal PVC sleeves using stainless steel sampling equipment and/or disposable nitrile gloves.</p> <p>Groundwater: Wells were installed via push tubes and developed using new dedicated Waterra foot valves. No groundwater samples were collected for analysis.</p> <p>Decontamination procedures</p> <p>Soil: Sampling equipment was cleaned with detergent and tap water prior to collecting each sample to prevent cross contamination. New gloves were reportedly used for each new sample. Disposable PVC sleeves were used for each borehole.</p> <p>Groundwater: Dedicated sampling equipment was used to develop each well.</p> <p>Sample handling and containers</p> <p>Samples were placed into prepared sample jars provided by the laboratory and chilled during storage and subsequent transport to the laboratory. No cooling method was listed for sample 203/3.5.</p> <p>Bulk soil samples were submitted to the laboratory for asbestos analysis. The laboratory noted the sample had to be sub-sampled.</p> <p>Chain of Custody (COC)</p> <p>Completed chain of custody forms were provided in the report.</p> <p>Detailed description of field screening protocols</p> <p>Field screening for volatiles was undertaken using a PID. PID readings are provided on borehole logs.</p> <p>The highest PID concentration was <5 ppm.</p> <p>PID screening procedure was provided and involved placing the samples in ziplock plastic bags and measuring VOCs in the headspace.</p> <p>The headspace of the well and groundwater collected from the well was also screened for the presence of volatile organic compounds (VOCs) using a calibrated Photo-ionisation Detector (PID) following development.</p> <p>A oil/water interface probe was used in each well to assess the presence of floating product.</p> <p>Calibration of field equipment</p> <p>Calibration certificates were not provided. The PID was reported to have been calibrated prior to use.</p> <p>Groundwater field parameters were measured during well development. Meters were reported to have been calibrated prior to the start of each day. No calibration certificate for the water quality meter was provided.</p> <p>Sampling logs</p> <p>Soil logs are provided within the report, indicating sample depth, PID readings and lithology. The logs reported traces of ash, bricks and coal.</p> <p>Groundwater sampling records were not provided for well development, although a summary of the field parameters was included in the report.</p>	<p>are sufficient to provide an indication of the groundwater levels at the site.</p> <p>Acceptable, whilst is preferable to undertake test pits to adequately assess soil profiles and identify asbestos contamination this method was considered acceptable when combined with historical investigations.</p> <p>Acceptable</p> <p>Acceptable, noting some uncertainty for sample 203/3.5 analysed for PAHs in soil where cooling was not documented.</p> <p>Acceptable</p> <p>On the basis that all 18 samples were submitted for TPH/BTEX analysis, the lack of calibration certificates for the PID and water quality meter is considered acceptable.</p> <p>Acceptable</p>

Table 6.2: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Auditor's Opinion
<p>Field quality control samples</p> <p>Field quality control samples including two intra-laboratory replicate samples (D202 and D204) were undertaken at appropriate frequencies.</p> <p>No trip blanks or spikes were analysed. This was not considered to affect the usability of the data since no volatile compounds (including BTEX and TPH C₆-C₁₀) were detected in the soil samples analysed.</p> <p>Wash blanks were not required since the majority of sampling involved dedicated sampling equipment used for each location.</p> <p>Inter-laboratory replicates were not collected, however Envirolab are NATA accredited to ISO17025 (Accreditation No 2901). The results were found to be acceptable.</p> <p>Field quality control results</p> <p>RPDs for the intra-laboratory soil replicate samples ranged from 0% to 188%. All primary sample results reported higher concentrations than the replicate sample with the exception of total positive PAHs, Fluoranthene and Fluorene which were reported higher in the duplicate sample. DP state the cause of elevated RPD results is due to sample heterogeneity and have adopted the highest result in the duplicate pair for inclusion in the results.</p> <p>NATA registered laboratory and NATA endorsed methods</p> <p>Laboratory used was Envirolab. Laboratory certificates were NATA stamped.</p> <p>Analytical methods</p> <p>Analytical methods were included in the laboratory test certificates. Envirolab provided brief method summaries of in-house NATA accredited methods used based on USEPA and/or APHA methods (excluding asbestos) for extraction and analysis in accordance with the NEPM (1999).</p> <p>Asbestos identification was conducted by Envirolab using polarised light microscopy with dispersion staining by method AS4964-2004 "Method for the Qualitative Identification of Asbestos Bulk Samples".</p> <p>Holding times</p> <p>Review of the COCs and laboratory certificates indicate that the holding times had been met. DP also reported that generally the holding times have been met.</p> <p>Practical Quantitation Limits (PQLs)</p> <p>Soil: PQLs (except asbestos) were less than the threshold criteria for the contaminants of concern.</p> <p>Asbestos: The limit of detection for asbestos in soil was 0.01% w/w. Absence/presence identification was conducted on samples.</p>	<p>The absence of trip spike, trip blank and wash blank is not considered significant in the context of the results reported and the sampling methodology.</p> <p>The absence of the inter-laboratory replicate is not considered significant in the context of the intra-laboratory replicates and frequencies.</p> <p>Sample 203/3.5 sampled for PAHs in laboratory report appears to be missing in summary table. The auditor has reviewed the results and noted that all concentrations were reported below the PQL.</p> <p>Acceptable. The Auditor consider's the adoption of the highest result from the primary/duplicate sample should be used as part of the QA/QC assessment.</p> <p>Overall, in the context of the dataset reported, the elevated RPD results are not considered significant.</p> <p>Acceptable</p> <p>The analytical methods are considered acceptable for the purposes of the site audit, noting that the AS4964-2004 is currently the only available method in Australia for analysing asbestos. DOH (2009) and enHealth (2005) state that "until an alternative analytical technique is developed and validated the AS4964-2004 is recommended for use".</p> <p>The Auditor notes that excess sample volume was provided for asbestos analysis. A portion of the supplied sample was sub-sampled according to Envirolab procedures. Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.</p> <p>Overall, the analytical methods adopted are considered acceptable.</p> <p>Acceptable</p> <p>Overall the soil PQLs are acceptable.</p> <p>Asbestos: Due to the limited asbestos investigation, DP adopted a limit of reporting of 0.1g/kg as an initial screen. In the absence of any other validated analytical method, the detection limit for asbestos is considered acceptable. A positive result would be considered to exceed the "no asbestos detected in soil" criteria, providing this is applied within a weight of evidence approach to assess the significance of the exceedance, accounting for the history of the site and frequency of the occurrence.</p>

Field and Lab QA/QC	Auditor's Opinion
<p>Laboratory quality control samples</p> <p>Laboratory quality control samples including laboratory control samples, matrix spikes, surrogate spikes, blanks, internal standards and duplicates were undertaken by the laboratory.</p> <p>Laboratory quality control results</p> <p>The laboratory quality control results were typically within the acceptance criteria adopted by the laboratories. However, some percent recoveries in PCBs, TRH, PAH and metals were not possible due to sample interference by other analytes. Some high RPD values for laboratory duplicates were reported for manganese, lead and zinc.</p> <p>Data Quality Indicators (DQI) and Data Evaluation (completeness, comparability, representativeness, precision, accuracy)</p> <p>Predetermined data quality indicators (DQIs) were set for laboratory analyses including blanks, replicates, duplicates, laboratory control samples, matrix spikes, surrogate spikes and internal standards. These were discussed with regard to the five category areas. There was limited discussion regarding actions required if data do not meet the expected objectives.</p>	<p>Acceptable</p> <p>The Auditor notes a limited laboratory QA/QC assessment was completed by DP.</p> <p>The Auditor has reviewed the laboratory QA/QC data and noted the following:</p> <ul style="list-style-type: none"> -Due to high RPD values for some metals for the laboratory duplicate, a triplicate result was issued by the laboratory. -The non-recovery of some PCBs, TRH, PAHs is considered to be due to the high concentration of analytes and is not considered to affect the usability of the data. An acceptable LCS in metals was determined for soil. <p>In the context of the dataset reported, the elevated RPDs and the non recoveries are not considered significant and the laboratory quality control results are acceptable.</p> <p>An assessment of the data quality with respect to the five category areas has been undertaken by the Auditor and is summarised below.</p>

In considering the data as a whole the Auditor concludes that:

- The data are likely to be representative of the overall site conditions. Poor duplicate pair results indicate that soils are heterogeneous however this does not affect the remedial solution adopted.
- The investigation data are considered to be complete.
- There is a high degree of confidence that the data are comparable.
- The laboratories provided adequate information to conclude that the data are of sufficient precision, though noting heterogeneity in the samples.
- There is a high degree of confidence that the data are accurate.

7. ENVIRONMENTAL QUALITY CRITERIA

The Auditor has assessed soil data provided by DP in reference to criteria from National Environmental Protection Council (NEPC) 'National Environmental Protection (Assessment of Site Contamination) Measure 1999', as Amended 2013 (NEPC, 2013). Groundwater samples were not analysed during the DP investigation and therefore assessment criteria for groundwater are not included here.

Based on the proposed development (nine storey mixed use building, with parking, landscaped areas, serviced apartments and retail development on the ground floor), the Tier 1 (screening) criteria for 'residential with minimal opportunities for soil access', or an Urban Residential setting were referred to. The stratigraphy of the site identified coarse and fine textured soils, therefore the lowest criteria have been adopted (typically coarse).

- Human Health Assessment
 - Health Based Investigation Levels (HIL B)
 - Soil Health Screening Levels (HSL B) for Vapour Intrusion. The most conservative criteria were adopted i.e. assumed depth to source < 1 m and sand
 - Asbestos Health Screening Levels (HSL B)
- Terrestrial Ecological Assessment
 - Ecological Screening Levels (ESL Urban Residential) assuming coarse soil
 - Ecological Investigation Levels (EIL Urban Residential and Commercial/Industrial). The EILs were calculated using the most conservative soil-specific added contaminant limits (ACL) for aged contaminants and added background concentration (ABC) referenced from Olszowy et al (1995)
- Management Limits (ML Residential/Open Space) assuming coarse soil
- Aesthetics
 - The Auditor has considered the need for remediation based on 'aesthetic' contamination as outlined in the NEPM (2013)

7.1 Auditor's Opinion

The environmental quality criteria referenced by the Auditor are generally consistent with those adopted by DP for the investigations. However, there were some minor differences in the adopted/calculated EILs including the use by DP of some site specific soil physico-chemical data (pH and cation exchange capacity) that was collected during the assessment. These differences did not have a material impact on conclusions for the site.

8. EVALUATION OF SOIL ANALYTICAL RESULTS

Soil samples were analysed for a variety of contaminants including petroleum hydrocarbons, PAHs, PCBs, OCP/OPP, asbestos and heavy metals. The historical results from investigations completed from 2004 until the current investigation have also been assessed against the environmental quality criteria and summarised in **Table 8.1**. Soil sampling locations are presented in **Attachment 2**.

Table 8.1: Evaluation of Historical Soil Analytical Results – Summary Table (mg/kg)

Analyte	n	Detection s	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	n > Terrestrial Ecological Screening Criteria (NEPM, 2013)
Metals					
Arsenic	82	71	33	0	0
Beryllium	43	0	<PQL	0	0
Boron	43	7	7	0	0
Cadmium	85	48	9.6	0	0
Chromium (III+VI)	85	81	14	0	0
Copper	84	82	390	0	29
Iron	43	18	52000	0	0
Lead	85	81	710	0	0
Manganese	52	27	636	0	0
Mercury	85	46	0.7	0	0
Molybdenum	43	10	17	0	0
Nickel	85	74	120	0	3
Selenium	43	0	<PQL	0	0
Zinc	85	83	1500	0	37
Petroleum Hydrocarbons					
C6 □C10	11	11	30	0	0
C10 □C16	15	3	420	0	0
C16 □C34	9	9	1800	0	2
C34 □C40	15	3	820	0	0
C6 □C10 less BTEX (F1)	11	49	49.2	2	0
C10 □C16 less Naphthalene (F2)	11	97	475	62	58
BTEX					
Benzene	59	0	<PQL	0	0
Ethylbenzene	59	0	<PQL	0	0
Toluene	59	0	<PQL	0	0
Xylene (m & p)	18	0	<PQL	0	0
Xylene (o)	18	0	<PQL	0	0
Xylene Total	59	0	<PQL	0	0
PAHs					
Total Positive PAHs	11	95	1400	3	0
Benzo(a) pyrene	11	85	125	0	61
Benzo(a)pyrene TEQ	11	83	125	37	0
Naphthalene	11	69	3.1	1	0
PCBs					

Analyte	n	Detection s	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	n > Terrestrial Ecological Screening Criteria (NEPM, 2013)
PCBs (Sum of total)	9	0	<PQL	0	0
OCP					
Endosulfan	12	1	0.025	0	0
Aldrin + Dieldrin	12	1	0.05	0	0
DDT	12	1	0.1	0	0
DDT+DDE+DDD	9	0	<PQL	0	0
Endrin	9	0	<PQL	0	0
Heptachlor	9	0	<PQL	0	0
Hexachlorobenzene	9	0	<PQL	0	0
Methoxychlor	12	1	0.1	0	0
OPP					
Chlorpyrifos	9	0	<PQL	0	0
Asbestos					
Asbestos in soil	2	0	Absent	0	-
Asbestos fragment	1	1	Present	1	-

n number of samples
<PQL less than Practical Quantitation Limit

The majority of soil samples were collected from the fill material and anthropogenic inclusions were observed in all boreholes. Ash was observed in boreholes 201, 203 and 204, coal was observed in boreholes 201, 202 and 204 and a hydrocarbon odour was noted in borehole 203. Fibro sheet fragment was observed at the disturbed surface of a former test pit within the south west corner of the site. No asbestos in soil was present underlying the asbestos fragment.

Review of previous analytical results in conjunction with the current investigation reported heavy metals below the health based screening criteria with elevations above the ecological screening criteria reported for copper and zinc. However these were not considered to be indicative of a significant potential for contamination. Results of the current investigation reported elevated concentration of Asbestos, TRH (F2), Total PAHs, naphthalene and B(a)P TEQ in excess of the health based screening criteria which is consistent with the historical investigations to date. TRH C16-C34, TRH (F2) and B(a)P were reported in excess of the ecological screening criteria. Bricks and building debris in fill are considered to pose an aesthetic concern when visible.

8.1 Acid Sulfate Soils

DP undertook acid sulphate soil tests (i.e. chromium suite) on seven selected soil samples following the screening tests based on field pH results. The results indicate that soils below RL0.2 m AHD contain ASS and will be managed under an Acid Sulfate Soils Management Plan which was completed by DP in 2017.

8.2 Auditor's Opinion

In the Auditor's opinion, the soil analytical results are consistent with the site history and field observations. The soil investigations were adequate to identify potential widespread soil contamination at the site and identified data gaps were noted by DP, associated with historical hotspot and asbestos contamination at the site. The chemical characterisation for the site remains consistent with that described in the previous site audit report.

9. EVALUATION OF PROPOSED REMEDIATION AND SITE MANAGEMENT

9.1 Conceptual Site Model

A CSM is a representation of the source, pathway and receptor linkages at a site. DP prepared a CSM in the contamination assessment report. The same CSM was reported in the RAP.

Table 9.1 presents the Auditor's review of the summary CSM presented in the RAP.

Table 9.1: Review of the Conceptual Site Model

Element of CSM	Consultant	Auditor's Opinion
Contaminant source and mechanism	Imported fill materials – placement of fill onsite Former rail and port activities - Spills and leaks from plant/equipment and storage and use of chemicals. Demolished buildings – onsite surface impact/burial of demolition materials Former road pavements remnants (tarry residue) – construction materials used for road construction.	Acceptable.
Affected media	Soil, groundwater and surface water.	Acceptable.
Receptor identification	Current sensitive receptors at the site were considered to include the public, maintenance workers, consultants, trespassers, surface water bodies, groundwater, neighbouring properties in the case of groundwater migration. Future receptors include public (shoppers, hotel guests), residences, site workers, maintenance workers, construction workers, consultants, trespassers, surface water bodies, groundwater neighbouring properties in the case of groundwater migration.	Acceptable. Ecological receptors were not explicitly identified although the discussion of results did consider risk from soil to ecological receptors.
Exposure pathways	Dermal, ingestion and inhalation.	Potential exposure pathways were considered acceptable. Extraction of groundwater for use unlikely based on hydrogeological conditions.
Presence of preferential pathways for contaminant movement	Long-term leaching of contaminants via runoff, rain water infiltration / percolation and potential disturbance during development.	Considered acceptable based on investigation data.
Evaluation of data gaps	Not presented in the CSM. However, the DSA noted that limited surface access due to dense vegetation presents a risk of unexpected finds of fill or dumped material.	Acceptable.

9.2 Remediation Required

A RAP was prepared by DP for remediation of the site based on the data obtained for the site. The contaminants of concern that require remediation have been summarised in **Table 9.2**. Soil has been impacted mainly by metals, TRH and PAH compounds with the potential for asbestos contamination to be present and acid sulfate soils identified at depth.

Remedial works are proposed comprising the disposal of impacted soils from the upper fill profile as required by the construction/development (i.e. excess soils) and remaining contaminated soils

managed by placement of a suitable capping layer to prevent exposure and accessibility. The adopted remediation approach will restrict the re-use of groundwater and is consistent with the previous SAR recommendations for restrictions on groundwater use.

A Construction Environmental Management Plan has been proposed which states that it should include an unexpected finds protocol. A contingency plan is included in the RAP that is proposed to address soil issues that may arise during remediation/construction works.

Table 9.2: Remediation Required and Preferred Options

Description	Extent of Remediation Required	Preferred Options
Impacted soil – metals, TRH, PAH and possible asbestos	Majority of the site - bulk excavation of excess fill materials for off-site disposal within areas of proposed excavation.	Test pit for offsite classification or onsite characterisation and re-use. Excavation and off-site disposal. Possible onsite treatment of ASS soils prior to disposal. Validate onsite soils.
Impacted soil – metals, TRH, PAH and possible asbestos	Majority of the site – soils located beneath proposed concrete slab	Cap and Contain
Impacted soil - metals, TRH, PAH and possible asbestos	Proposed landscaped areas	Excavate contaminated fill from landscaped areas and place beneath concrete pavements, whilst meeting geotechnical requirements. Line with geofabric layer and backfill with 0.5m of VENM/ENM materials or validated clean onsite soils.
Impacted soil - metals, TRH, PAH and possible asbestos	Service trenches and footings	Excavate contaminated fill from trenches and footings and place beneath concrete pavements, whilst meeting geotechnical requirements. Line with geofabric layer and backfill with 0.5m of VENM/ENM materials or validated clean onsite soils.

The Auditor has assessed the RAP by comparison with the checklist included in OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites*. The RAP was found to address the required information, as detailed in **Table 9.3**.

Table 9.3: Evaluation of Remedial Action Plan

Remedial Action Plan	Auditor Comments
<p>Remedial Goal</p> <p>The main objective of this remediation approach will be to place contaminated PAH, TRH (long-chained), heavy metal and possible asbestos contaminated soil beneath a suitable capping layer to prevent exposure and accessibility.</p> <p>Discussion of the extent of remediation required</p> <p>Remediation required for each area was discussed within the RAP (See Table 9.2 above)</p> <p>Remedial Options</p> <p>Remedial options were assessed and included no action, off-site disposal of contaminated soils to a licensed landfill, onsite treatment and re-use of the contaminated soils onsite, onsite management (i.e. containment) of the contaminated soils and a combination of offsite disposal and onsite containment.</p> <p>A number of other options have been listed as contingencies.</p> <p>Selected Preferred Option</p> <p>Preferred option was discussed within the RAP and included the combination of offsite disposal and onsite containment with a long term site management plan.</p> <p>Rationale</p> <p>Rationale for the proposed option aligned with the proposed development of the site</p>	<p>In the Auditor's opinion, this goal is considered appropriate and will meet the site suitability requirements for residential use with minimal opportunities for soil access.</p> <p>Acceptable</p> <p>The Auditor considers that a range of options were considered.</p> <p>The Auditor considers the preferred option to be appropriate.</p> <p>The Auditor considers the rationale to be appropriate.</p>

Remedial Action Plan	Auditor Comments
<p>Containment</p> <p>The RAP proposed capping the majority of the site with a minimum 100mm concrete slab as part of the site development. Removal and offsite disposal of excess soils for levelling the site to ground level will be required prior to capping. Plastic sheeting is proposed beneath concrete slab. Material from landscaped areas, trenches or footings may be placed beneath proposed capping area if it meets geotechnical requirements. Landscaped areas and trenches will be marked with geofabric layer and backfilled with 0.5m imported material or clean onsite soils.</p> <p>Proposed Validation Criteria</p> <p>A proposed validation criteria is provided in the RAP for soils remaining onsite with respect to the proposed landuse and identified contaminants. The proposed validation criteria adopts the most conservative concentration for HIL/HSLs and EILs/ESLs. Concentrations for direct contact and management limits are provided but were not adopted as part of the Remediation Acceptance Criteria (RAC) based on their less conservative concentration.</p> <p>Proposed Validation Testing</p> <p>Excavation:</p> <p>The site will be surveyed prior to capping to confirm appropriate levels are achieved including levels for landscape areas and proposed 0.5m capping layer. The site will be surveyed post capping to ensure all the areas are covered. The validation will be deemed successful when the concrete slab/pavements and soil capping has been successfully installed and inspected by a suitably qualified consultant. A validation report will be prepared and a long-term Site Management Plan will be submitted to Newcastle City Council.</p> <p>Re-use of Excavated Material: Soils for onsite re-use will be validated against the RAC.</p> <p>Imported Material: Imported fill used to reinstate site excavations, raise site levels (if required) and for use in the pavement or landscape areas should be classified as VENM or ENM and should be accompanied by a certificate from the supplier, otherwise detailed assessment (including analysis of representative samples) will be required prior to use on-site.</p> <p>Offsite disposal: A process for waste classification is provided in the RAP in accordance with the NSW EPA guidance. Samples will be collected 1/25m³.</p> <p>Interim Site Management Plan (before remediation)</p> <p>Not proposed</p> <p>Unexpected Finds</p> <p>An unexpected finds procedure is presented in the RAP, including ceasing works, assessing the find and remediating the find if required including validation testing.</p> <p>Site Management Plan (operation phase) including stormwater, soil, noise, dust, odour and OH&S</p> <p>A site management plan is presented in the RAP discussing contingency plans, traffic management, noise, erosion, sediment control, drainage, air quality and asbestos management.</p> <p>Contingency Plan if Selected Remedial Strategy Fails</p> <p>The remedial strategy has a low risk of failure, however the RAP notes offsite disposal to landfill as a potential contingency options.</p> <p>Contingency Plans to Respond to site Incidents</p> <p>Contingency plans for site incidents are recommended to be included as part of the proposed contractor's CEMP.</p> <p>Remediation Schedule and Hours of Operation</p> <p>Remediation Schedule and hours of operation are recommended to be included as part of the proposed contractor's CEMP.</p> <p>Licence and Approvals</p>	<p>The capping thickness is considered adequate subject to ongoing management with a Site Management Plan (SMP) (discussed further below).</p> <p>The Auditor considers the adoption of ESL for B(a)P of 0.7 mg/kg should be included as part of the RAC.</p> <p>The Auditor notes that the inclusion of a photographic log as part of the validation report is required that includes evidence of the marker layer placement.</p> <p>The Auditor notes that imported material must either be VENM, ENM or be classified under a Resource Recovery Exemption. The density of testing would need to be commensurate with the documentation provided and the consistency of the results. Details for sampling density for re-use of excavated material and imported material should be provided as part of the validation testing.</p> <p>Acceptable</p> <p>The Auditor considers the unexpected finds protocols adequate.</p> <p>The Auditor considers the SMP adequate.</p> <p>The Auditor considers the contingency plan adequate.</p> <p>Not provided</p> <p>Not provided</p> <p>Acceptable</p>

Remedial Action Plan	Auditor Comments
<p>Details regulatory requirements and approvals (i.e. SEPP55 and Newcastle City Council Contaminated Land Policy), licences to be held by the Contractor (i.e. friable asbestos license from WorkCover NSW) and other requirements for the disposal of asbestos and contaminated waste.</p> <p>As site development may involve groundwater extraction, a groundwater interference permit through the NOW may need to be obtained prior to construction commencing as per the requirements of the NSW Aquifer Interference Policy September 2012.</p> <p>An appropriately licensed landfill should be selected and the material tracked from the Site to the landfill.</p> <p>Contacts/Community Relations</p> <p>Contacts not provided but will be displayed on signs located adjacent to the site access throughout the remediation program. Direct community consultation will be undertaken.</p> <p>Staged Progress Reporting</p> <p>Not proposed</p> <p>Long term site management plan</p> <p>Upon the completion of remediation and validation works and construction, DP state "a SMP will be drafted for long-term management of capped materials on-site (i.e. measures to reduce the likelihood of future disturbance, and procedures for handling/disposal in the event that identified contaminated materials are disturbed)."</p>	<p>Acceptable</p> <p>Acceptable</p> <p>The outline provided in the RAP provides an adequate management framework for the nature and extent of contamination.</p> <p>Once prepared, the long term SMP will be reviewed by the Auditor and will be documented in a Site Audit Report and Statement in due course.</p> <p>The Auditor will require approval from Council that Council accepts the use of an EMP for the management of retained contaminants at this site.</p>

The remediation approach recommended in the RAP is considered adequate to manage the identified PAH, TRH, metals and possible asbestos contamination as well as acid sulfate soils, subject to successful implementation of the strategy and preparation of a validation report and an appropriate long term SMP.

9.3 Acid Sulfate Soils Management Plan

The acid sulfate soils management plan completed by DP reported that the site is located in an area with high probability of acid sulfate soils occurring between 1 – 3 mbgl. As part of the contamination and acid sulfate soils assessment in 2017, DP completed ASS screening tests and detailed laboratory testing on seven select soils samples for Chromium Suite testing. The results indicated the natural sands/clayey sands and silty sand fill below RL0.2 mAHD are potential acid sulfate soils (PASS) and if disturbed will require management in accordance with the acid sulfate soils management plan (ASSMP). DP identified activities including excavation of trenches, pits etc, installation of piles and localised dewatering that may expose ASS to oxidising conditions during construction. The Auditor considers the neutralisation approach for soils considered to contain ASS or PASS is appropriate. Management, contingency plans and records are proposed to be maintained by the contractor and are considered to be adequate.

9.4 Auditor's Opinion

In the Auditors' opinion, the proposed remediation works are appropriate for remediation of the site. Inspection of the site during remedial works and audit of the validation report and the site management plan will be required by the Auditor at the completion of remediation.

10. CONCLUSIONS AND RECOMMENDATIONS

The Auditor concludes that remediation of the site by capping as described in the RAP prepared by Douglas Partners 2018 is acceptable. The outcome of capping is considered suitable subject to:

- An Environmental Management Plan (EMP) for the long term management of the Cap be prepared and approved by the Auditor
- That Council agree to the use of an EMP for the management of retained contaminants on this site
- Inspections of remediation activities are undertaken by the Auditor during the remediation program
- A validation report demonstrating the remediation has been successfully implemented

The Audit is currently non-statutory however it is anticipated that the Development Consent Conditions will request that an audit be completed. At this point the audit will become statutory.

* * *

Consistent with the NSW EPA requirement for staged 'signoff' of sites that are the subject of progressive assessment, remediation and validation, I advise that:

- This advice letter does not constitute a Site Audit Report or Site Audit Statement.
- At the completion of the remediation and validation I will provide a Site Audit Statement and supporting documentation.
- This interim advice will be documented in the Site Audit Report.

Yours faithfully

Ramboll Australia Pty Ltd



Fiona Robinson
EPA Accredited Site Auditor 1506

Attachments: 1 Site Locality Plan
2 Borehole and Groundwater Well Location Plan



