11 May 2020

Fabcot Pty Ltd
1 Woolworths Way
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Attn: Michael Rumble

By email: mrumble@woolworths.com.au

Dear Michael

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Ref 318000944

RE: INTERIM AUDIT ADVICE LETTER NO. 1 - 11-13 PERCY STREET, AUBURN NSW

1. INTRODUCTION

As a NSW Environment Protection Authority (EPA) accredited Contaminated Sites Auditor, I am conducting an Audit in relation to the subject site. This initial review has been undertaken to provide an independent review of the suitability and appropriateness of the environmental investigations undertaken at the site to date and provide recommendations for any additional actions required to ensure the site is suitable for the proposed commercial/industrial use.

Woolworths propose to redevelop the site as a Customer Fulfillment Centre (CFC) which will comprise a single storey warehouse and distribution centre for online sales. The site has a history of industrial use with previous occupiers including a plastics packaging facility and a white goods manufacturer. Filling of portions of the site is likely to have occurred to achieve current site levels. The site is currently occupied by two large warehouses: one of which is used for storage by a stage lighting supplier; and one occupied by a Holden new vehicle accessories and auto detailing service centre.

This interim audit advice (IAA) letter is based on a review of the documents listed below and observations made on a site visit on 18 March 2020.

The reports reviewed were:

- 'Phase 1 & 2 Environmental Site Assessment, 11-13 Percy Street, Auburn, NSW' dated 14 January 2000, OTEK Australia Pty Ltd (OTEK).
- 'Stage 1 & 2 Environmental Site Investigation, 11-13 Percy Street, Auburn, NSW' dated 12 June 2012, WSP Pty Ltd (WSP).

- 'Detailed Site Investigation Report, 11-13 Percy Street, Auburn, NSW' dated 22 November 2019, Geo-Logix Pty Ltd (Geo-Logix).

2. SITE DETAILS

2.1 Location

The site details are as follows:

Street address:	11-13 Percy Street, Auburn, NSW 2144 (Attachment 1)
Identifier:	Lot 1 and 2 in Deposited Plan 1183821 (Attachment 2)
Local Government:	Auburn City Council
Owner:	Lot 1 in DP1183821 is owned by Shadyfield Nominees Pty Ltd and Lot 2 is owned by Fabcot Pty Ltd
Site Area:	Approximately 3.25 ha
Zoning:	General Industrial IN1 under Auburn Local Environment Plan 2010

The boundaries of the site are well defined by Percy Street to the north-west, adjoining properties to the north-east and south-west and Haslams Creek to the south-east.

2.2 Adjacent Uses

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

North-west: Percy Street with commercial land use beyond.

North-east: Commercial/industrial property with Haslams Creek beyond and then the Toohey's Brewery.

South-east: Haslams Creek with commercial/industrial properties beyond.

South-west: Commercial/industrial land use.

Haslams Creek is a concrete lined stormwater channel that flows from south to north along the south-eastern site boundary. The creek receives stormwater run-off from the site and several commercial and industrial sites both up and down gradient of the subject site. Haslams Creek drains into the Parramatta River 3.6 km north-east of the site.

The surrounding commercial/industrial site use has the potential to include off-site sources of contamination. OTEK (2000) identify the site to the south of the site as a potential source, noting that several underground storage tanks (USTs) and bowsers are present on the property boundary. This site has undergone redevelopment since the OTEK report was completed and it is assumed USTs and associated infrastructure would have been removed during the redevelopment.

Geo-Logix (2019) report that the commercial/industrial land use to the south-east of the site, beyond Haslams Creek includes the former Offset Alpine Printing facility which they identify as a potential off-site source of chlorinated solvent contamination. The Tooheys Brewery to the north-east is considered to be down gradient of the site and unlikely to have been a source of contamination that would have impacted the site.

2.3 Site Condition

The site layout and site features are shown in Attachment 3. During the site investigation in 2019, Geo-Logix noted the following:

- At the time of the investigation Lot 1 was operating as Chameleon Touring Systems, a stage lighting and equipment supplier and Lot 2 as a Holden new vehicle accessories and auto detailing service centre.
- The site is accessed from Percy Street by two driveways on the southern and northern site boundaries.
- The western half of the site (Lot 1) is largely level and located at an elevation of approximately 7 m Australian Height Datum (AHD). A retaining wall runs north to south through the central portion of the site. The eastern portion (Lot 2) including the Holden building with undercroft area, car parking area and wash bay is slightly undulating with an elevation of 4 – 5 mAHD.
- The front building (Lot 1) is constructed of metal cladding, a saw tooth roof and concrete floor slabs. The roof is constructed from cement sheeting potentially containing asbestos
- The back building (Lot 2) is in the south-eastern portion of the site and is constructed on grade with Lot 1, however, the eastern section of the building is on suspended concrete floor slabs with vehicle parking within the undercroft area below. The building is noted as being constructed of brick and metal cladding. Activities within the building include vehicle washing/detailing, vehicle storage and shipping/receiving of goods.
- The north-eastern portion of Lot 2 contained a car ramp and concrete and bitumen paved car parking. The vehicle washing bay was located in this area.
- A caged area in the south of the site in the undercroft parking area contained polyurethane drums and scrap metal. Two drums were observed tipped over with evidence of polyurethane spillage noted. The caged area also had brown cloudy standing water approximately 50 mm deep with a sheen. Scrap metal, building rubble and general rubbish was also noted in the undercroft parking area in the south of the site.
- A number of waste skips were present on the west side and in between the two buildings.
- The site surface was noted to consist of approximately 15% asphalt (east corner used for car parking), 10% grass (south corner and northwest boundary) and the remainder of the site (75%) concrete.
- One above ground storage tank (AST) was located in the middle of the site with one fuel dispenser.
- Geo-Logix noted fragments of bonded Asbestos Containing Material (ACM) in localised areas of the site including on the north-east site boundary near the north gate driveway, in the undercroft area on Lot 2 and on the southern boundary next to Haslams Creek.

The conditions noted by Geo-Logix are similar to those noted by WSP in 2012. Although WSP also comment on the following:

- The building on Lot 1 was occupied by VIP Packaging, a plastic packaging manufacturer. WSP note that the western portion of the building comprised pallet storage of finished products, redundant equipment storage and the workshop area. The eastern half of the building comprised offices and manufacturing/processing lines. WSP note that, except for some localised spillages of what appeared to be lubricating oil around the base of one or two machines no visual evidence of potential contamination was noted within the building.
- WSP note that it appeared that VIP Packaging used predominantly recycled plastics (provided in chipped / pellets form) and limited volumes of liquid additives or other chemicals to produce a variety of plastic packaging and food containers. Recycled plastic chips /pellets were stored in eight labelled silos located along the south-eastern side of the building on Lot 1 during the 2012 site inspection.

- Three cooling towers, a grease trap, and a liquid carbon dioxide above ground tank were also noted in this area.
- A dangerous goods store with spill kits and secondary containment was identified adjacent to the eastern side of the building on Lot 1.
- A temporary radioactive store was within the building on Lot 1, adjacent to the western site boundary used to store a small quantity of low-level radioactive material used to measure the thickness of plastics as part of the manufacturing process.
- An electricity substation was present adjacent to the southern portion of the site between the buildings.
- The building on Lot 2 was occupied by Holden. A waste oil tank was noted in the north-eastern corner of the Holden building. Secondary containment was noted, however, spillages were observed around the base. An air compressor system was also present in this area.
- Runoff water from the vehicle wash bay on Lot 2 appeared to be directed to an uncontrolled soak away in the undercroft.
- An electricity transformer was noted on a concrete plinth in the south-eastern corner of the undercroft.
- WSP noted a redundant lime-dosing unit on the south-eastern wall of the building on Lot 2.
- WSP also include a summary of a hazardous materials survey they completed in May 2012 which confirmed that ACM was present in wall cladding in the north western wall of the building on Lot 1 and in linoleum within the *'Level 2 storage area/ laundry area'* in the Holden building on Lot 2. In addition, suspected ACM was located throughout both warehouses in roofing and cladding material.

The observations made by Geo-Logix in 2019 are generally consistent with those made by the Auditor during a site visit on 18 March 2020. The Auditor noted that:

- The driveway to the north from Percy Street dropped in elevation by approximately 2 m from the north-western site boundary to the centre of the site with the building on Lot 1 at an elevation level with the elevation of Percy Street.
- The building on the property to the north of the site was at an elevation approximately 1 m lower than the northern driveway.
- The rear of the site was at an elevation approximately 2 to 3 metres below the elevation of Percy Street. The base of the concrete channel of Haslam Creek is approximately 2 m below the site level on the south-eastern boundary.
- The north-eastern portion of the site is within a flood zone.
- The majority of the site is covered in hardstand, with a strip of grassed land along the south-eastern boundary with Haslams Creek.
- The building on Lot 1 was still being used for the storage of stage lighting and sound equipment and Lot 2 was still being used as a Holden new car service centre.
- The AST and dispenser were still present in the centre of the site. There was no evidence of staining on the surrounding ground surface. The dangerous goods shed was also observed.
- Stormwater drains were observed within the wash bay area adjacent to the building on Lot 2 and within the undercroft area which was being used for storage of cars. The polyurethane drums and ACM fragments observed by Geo-Logix in this area were not observed by the Auditor in the undercroft area.

- The former lime-dosing tanks were present on the south-eastern boundary of the building on Lot 2 along with what appeared to be a drainage sump.
- The former rail line along Percy Street observed in historical aerial photographs (Section 3 of IAA) were not observed and this area was grassed.

2.4 Proposed Development

It is understood that the site is to be redeveloped by Fabcot as a distribution centre for online sales. The development is to comprise a single-story warehouse across most of the site footprint (occupying approximately 16,200 m^2) with truck and car parking to the east, south and west of the warehouse.

The eastern portion of the building extends across the lower area of the site currently occupied by the building undercroft, car parking area and wash bay. Due to this portion of the site being a flood zone, the building across this area is proposed to be constructed on a suspended slab. The area below the suspended slab is to be utilised for car parking. The final design detail is not available, and it is currently unclear if this area will be enclosed.

For the purposes of this audit, the 'commercial/industrial' land use scenario will be assumed.

3. SITE HISTORY

All three previous investigations included a summary of the site history based on aerial photographs, site photographs, NSW EPA records, SafeWork NSW dangerous goods records and Certificates of Title. The Auditor has summarised the site history reported by Geo-Logix and the other consultants in Table 3.1.

Table 3.1: Site History

Date	Activity
1899 to 1946	Title search information indicates that the site was owned in 1899 by the Sydney Meat Preserving Company Ltd and was subdivided in 1936. The aerial photograph from 1943 indicates that the site is undeveloped and vacant. Haslams Creek has been realigned and runs along the eastern boundary. The former channel of Haslams Creek is visible in the eastern half of the site. Surrounding land is vacant with residential properties to the south-west.
1946 to 1961	OTEK (200) indicate that Malleys Ltd acquired the site in 1946 and that the site remained undeveloped until the early 1960s. The former channel of Haslam Creek is visible on the aerial photograph from 1951. The photo shows that industrial buildings have been constructed to the south and the north-west of the site.
1961 to 1981	The building present on Lot 1 was constructed by 1965. The land to the east was filled and the building on the eastern portion of the site (Lot 2) was constructed by 1970. Malleys Ltd is reported to have operated a white goods manufacturing facility on the site until 1981 including manufacture of ovens, refrigerators and washing machines. A rail line was observed on the 1965 aerial photograph running along the front of the site, along Percy Street but appeared to have been decommissioned by 1978. Land immediately surrounding the site was developed for commercial/industrial use throughout this period.
1981 to 1989	The site layout remained unchanged from that shown in the 1978 aerial photograph. The site was acquired by the Local Government Superannuation Board in 1981 before being sold to the Public Authorities Superannuation Board in 1985 and the State Authorities Superannuation board in 1989. Viscount Consolidated Industries Pty Ltd, a plastics packing manufacturing company, occupied the site in 1985. Beecham (Aus) Pty Ltd, a timber and hardware wholesale company, occupied the site in 1984. The number of years the tenants occupied the site is not known.

1989 to 2012	The site was acquired by Bivami Pty Ltd, a plastics packaging manufacturing company in 1989. Lot 1 was operated by ACI plastics (manufacturing of polystyrene food trays) and Lot 2 was operated by Air Road Pty Ltd (storage facility for manufactured goods such as air conditioners). Geo-Logix (2019) report that VIP Packaging Ltd, a plastic and steel packaging company acquired the site at an unknown time (after November 1999) and sold the site in 2012 according to online real estate records. OTEK (2000) report that in 1999, two 20,000 L USTs were decommissioned in-situ by filling with concrete. The previous contents of the tanks were unknown but assumed to be petroleum.
2012 to Present	The site remains separated into two Lots, with Lot 1 used as a storage and assembling area for stage lighting and equipment. Lot 2 is occupied by Hunter Holden and used as a pre-delivery storage yard. Activities include vehicle washing / detailing, vehicle storage and shipping / receiving of goods. The majority of the building on Lot 2 is constructed as suspended slab with the undercroft area used for vehicle storage. Waste materials and old drums were stored in a caged area within the undercroft area. Geo-Logix (2019) report that in 2016, two AST were used on site as part of Hunter Holdens activities on Lot 2. Only one AST was noted by Geo-Logix during the site walkover in May 2019.

The summary indicates that the site has been used for commercial/industrial site use since the early 1960s associated with the manufacture of white goods and plastic packaging. WSP reported that, based on observations, VIP Packaging used predominantly recycled plastics (provided in chipped/pellet form) and limited volumes of liquid additives or other chemicals. WSP reported that they observed uncontrolled discharge of contaminants to soil and potentially groundwater in the area of the waste oil tank/soak away and polyurethane storage area in the undercroft of the building of Lot 2. Details of the products and volumes observed being discharged are not provided. Geo-Logix (2019) also noted tipped over drums and "*brown cloudy standing water approximately 50mm deep with a sheen*" present in this area during the site inspection in September 2019.

OTEK summarised the results of a search of the NSW WorkCover (now SafeWork NSW) Dangerous Goods register undertaken by HLA Envirosciences in 1998, which indicated that two 20,000 L USTs had been decommissioned in accordance with Australian Standard AS 1940-1993 by filling with concrete and one above ground storage tank (AST) containing nitrogen had been removed from the site. The search also indicated that small volumes (20-40 L) of xylene and ethyl acetate were previously stored in a flammable liquids cabinet and that 400 L combustible liquid, 300 L of ethyl acetate and 300 L of xylene were stored in a roofed store.

Geo-Logix undertook a search of the SafeWork Stored Chemical Information Database and reported that the search identified three previously held licences related to:

- Confirmation of decommissioning of 2 x 20,000 litre steel fuel storage tanks at the site (ACI Plastics Packaging, 5 March 1999);
- Declaration of no storage or handling of Dangerous Goods at the site (Visy Industrial Plastics, 24 May 2006); and
- Notification of the storage of 1 x 7,000 litre diesel above ground tank and 1 x 12,000 litre petroleum gas above ground tank (Huntermotive Pty Ltd, 20 June 2016).

Geo-Logix reported that no current licenses are held for the site. They also report that a ground penetrating radar survey completed on 16 August 2019 identified what may be a third UST near the known UST in the central portion of the site.

Geo-Logix report that a review of the NSW EPA Contaminated Land Database found no records for the subject site and no records for sites within 1 km of the site. A search by the Auditor in April 2020 confirmed this result. A search of the public register established under Section 308 of the *Protection of the Environment Operations Act 1997* (POEO Act) identified one record relating to an Environmental

Protection Licences for the site. The licence was issued to VISY Industrial Packaging in 2005 and was related to "Hazardous, Industrial or Group A Waste Generation or Storage" of >10 – 100 tonnes. The waste covered under the licence included waste oil / water, hydrocarbon / water mixtures or emulsions.

3.1 Auditor's Opinion

In the Auditor's opinion, the site history provides an adequate indication of past activities. Previous site uses/activities with the most significant potential to cause contamination include filling of land, manufacturing of white goods and plastic packaging, storage of petroleum hydrocarbons in USTs and ASTs, storage and use of other liquid contaminants including chlorinated solvents in drums or ASTs and uncontrolled drainage from the vehicle wash bay to a soak away.

There is also the potential for contamination from surrounding commercial/industrial land uses upgradient of the site to the south and south-east, including the former Offset Alpine Printing facility and the reported historical presence of USTs on the site to the south.

4. CONTAMINANTS OF CONCERN

OTEK and WSP provided a list of the contaminants of concern based on the site history which were similar. The identified potentially contaminating activities and sources and the associated contaminants identified by WSP have been tabulated in Table 4.1.

Table 4.1: Contaminants of Concern

Identified source	Potential Contaminants
Uncontrolled filling	Total recoverable hydrocarbons (TRH), benzene, toluene, ethyl benzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), total phenols, organochlorine pesticides and organophosphate pesticides (OCP/OPP), polychlorinated biphenyls (PCB) and asbestos.
USTs abandoned in situ	TRH, BTEX, PAH and lead
ASTs	TRH, BTEX, PAH
Former rail line along Percy Street	TRH, BTEX, PAH, total phenols, OCP, heavy metals and asbestos
Substation	TRH, PAH, PCB
Dangerous goods store	Volatile Organic Compounds (VOCs) and Semi Volatile Organic Compounds (SVOCs)
Waste oil tank (Lot 2)	TRH, PAH, total phenols, heavy metals
Air compressor plant (Lot 2)	TRH, PAH, total phenols
Uncontrolled soak away associated with vehicle wash bay	Heavy metals, surfactants, TRH, total phenols
Redundant lime dosing tanks	Heavy metals, pH
Transformer and polyurethane spillage	PCBs, heavy metals, VOC, SVOC
Hazardous building materials	Asbestos, lead in paint, PCBs

WSP used the analyte list in Table 4.1 during the site investigation in 2012. Subsequently, Geo-Logix undertook further investigation at the site and identified the following contaminating activities and associated contaminants:

- Manufacturing of white goods: TRH, VOC and heavy metals.

- Manufacturing of plastic packaging and polystyrene goods: TRH, VOCs, heavy metals, and per and polyfluorinated alkyl substances (PFAS).
- ASTs, USTs and vehicle maintenance: TRH, BTEX, PAH, VOCs and heavy metals.

Geo-Logix indicated that assessment of fill at the site had been completed by OTEK and WSP and the analytical results suggested that fill at the site was not impacted by contaminants of concern at concentrations above the commercial/industrial land use criteria.

4.1 Auditor's Opinion

The Auditor considers that the analyte list used by OTEK, WSP and Geo-Logix adequately reflects the site history and condition. It is noted that while the analyte list is considered complete, the number of samples analysed for each contaminant varies. Only limited analysis of soil and groundwater for chlorinated hydrocarbons, considered by the Auditor to be a main contaminant of concern, was completed by OTEK and WSP with only eight soil and one groundwater sample analysed for VOCs during both investigations. A more detailed assessment of VOC contamination was completed by Geo-Logix. Geo-Logix also included assessment of PFAS in groundwater.

During the investigations, seven samples of fill were analysed for asbestos by WSP. Geo-Logix did not undertake laboratory analysis of soil samples for asbestos but indicated that fragments of bonded asbestos containing material (ACM) were observed in shallow fill (maximum depth of 0.3 m) and surface soils in localised pockets across the site.

5. STRATIGRAPHY AND HYDROGEOLOGY

5.1 Stratigraphy

Geo-Logix reviewed the NSW 1:100,000 Sydney Map (Geological Survey of NSW, 1983) and reported that the majority of the site is underlain by Cenozoic age silty to peaty quartz sand, silt, and clay with occasional ferruginous and humic cementation. The western area of the site is underlain by Triassic age Ashfield shale of the Wianamatta Group comprising black to dark grey shale and laminate.

Investigations by OTEK, WSP and Geo-Logix resulted in the completion of 82 boreholes to various depths across the site (Attachments 3 and 4). During the investigations, fill was encountered across the site at thicknesses of between 0.3 and 1.8 m but was reported by WSP to be thickest (up to 2.5 m in BH5) in the central portion of the site and to the north-east. The depth of fill generally decreased to less than 0.5 m in the west and 1.0 m to the east and fill was not encountered in locations in the south-eastern portion of the site. The exception to this was at location BH1 completed by WSP on the north-western site boundary near Percy Street where fill was encountered to a depth of 3.5 mbgl. The fill material at this location is noted by WSP as being of different composition to that encountered across the rest of the site, comprising sandy clay with slag and ash, glass and scrap metal to 3.5 mbgl. Soil bores completed in this area by OTEK (SB1 and SB14) also encountered ash and slag in fill. These impacts were considered by OTEK and WSP to be associated with the disused railway line in this area.

In comparison, fill material across the remainder of the site is described by WSP as being relatively consistent in composition and comprised *"gravelly silty clay and clay with minor inclusions of ash/asphalt immediately beneath the concrete slab"*. OTEK described the fill as clay with sand and gravel and noted fibrous paper in fill materials beneath the car park in the north-east of the site. Geo-Logix reported that fill was present to a maximum depth of 1.8 mbgl and comprised gravelly sands becoming sandy gravelly clay with depth. Anthropogenic material including bricks, ash and wire were observed by Geo-Logix in fill in MW107, located in the centre of the site, between the two buildings. Geo-Logix commented in the report that fragments of ACM were observed in shallow fill (maximum depth of 0.3 m) and surface soils in localised pockets across the site on the northeast boundary along the north gate driveway, in the undercroft area on Lot 2 and on the southern site boundary next to

Haslams Creek, however these observations are not included on the borelogs and the exact location of the observations is unclear.

Geo-Logix encountered alluvial sediments comprising interbedded layers of mixed sand, silts and clays with occasional peat layers across the eastern and central portion of the site. The sediments were reported to be up to 7 metres deep and originate from infill of the former channel of Haslams Creek which was observed to transect the eastern portion of site from south to north on historical aerial photographs prior to filling of the site.

Fill and alluvial sediments were underlain by natural sandy clay described as yellow/grey, brown, grey, orange or red mottled. Peat was identified by Geo-Logix in two locations, MW105 and MW111, in the north-eastern portion of the site at depths of 0.70 and 3.7 mbgl, respectively. Residual clays were underlain by weathered Ashfield Shale bedrock at depths of between 5.4 and 9.0 mbgl. Geo-Logix inferred that a pronounced south to north oriented 'channel' was present in the bedrock through the centre of the site and concluded that "*the depression mirrors the former channel location and is likely to be an erosional feature of the old creek bed".* The sub-surface profile of the site is summarised by the Auditor in Table 5.1.

Table 5.1: Stratigraphy

Depth (mbgl)	Subsurface Profile
0.0 – 2.5	Fill: gravelly silty sand and sandy clay. Occasional anthropogenic inclusions of ash, asphalt, brick, concrete and wire. Fibrous paper noted in fill in the north-eastern portion of the site. Ash and slag noted in fill in boreholes to the north-west near Percy Street and the former rail line. ACM noted in surface soils and shallow fill by Geo-Logix but the locations are unclear.
0.4 to >4.0	Alluvial deposits: interbedded sands, silt and clay in the central and eastern portion of the site.
Between 0.0 and 3.5 to 9.0	Clay: present from the surface in the south of the site and underlying the fill and alluvial deposits.
Between 5.4 and 9.0 to maximum investigation depth 13.5 mbgl.	Bedrock: Ashfield Shale

mbgl – metres below ground level

WSP reported that review of the Parramatta Acid Sulfate Risk Map covering the site and surrounding areas indicated that acid sulphate soils are not known or expected to occur in this environment. Geo-Logix reviewed the Acid Sulfate Soils Map of the Parramatta River and reported that the subject site is in an area of "Disturbed Terrain" and that soil investigations are typically recommended to assess these areas for acid sulfate potential, however, no field assessment has been undertaken.

5.2 Hydrogeology

Geo-Logix undertook a search for registered bores on the WaterNSW All Groundwater Map website in November 2019 which indicated that there are no registered groundwater bores within 500 m of the site. A search completed by the Auditor in April 2020 confirmed this result.

OTEK installed 3 groundwater monitoring wells (MW1/SB7, MW2/SB2 and MW3/SB33) which were screened from 1.0 to 4.0 mbgl in sandy clay (Attachment 4). MW1 was located in the downgradient north-eastern portion of the site, MW2 was located up gradient in the south-western portion of the site and MW3 was locate near the UST on the southern portion of the site. Standing water levels (SWL) were reported at 0.50, 2.23 and 1.24 mbgl respectively and between 3.84 and 6.04 mAHD. These three wells were sampled in December 1999 for TRH, BTEX and heavy metals.

WSP installed four additional groundwater wells, including two down gradient of USTs (GW2 and GW3, one near the soak away (GW4) and one in the south-western, up gradient portion of the site (GW1)

(Attachment 4). The wells were installed to depths of 4.0 or 4.5 mbgl and screened within the clay or clay and fill units. Water ingress was noted at depths between 1.2 and 3.4 mbgl and SWLs were between 0.62 and 2.48 mbgl.

Geo-Logix undertook a more detailed assessment of the hydrogeology at the site through the installation of fifteen additional on-site shallow wells (MW101-MW104 and MW106-MW116) and five off-site wells (MW117-MW121) screened within the fill, clay and alluvial deposits and three deep on-site wells (MW201-MW203) and two off-site deep wells (MW204 and MW205) installed to depths of between 12 and 14 mbgl and screened within the shale (Attachment 5). In addition to monitoring and sampling of the 25 new wells, Geo-Logix gauged and sampled existing wells GW1, GW2 and GW3 during the investigation in 2019. The investigation indicated that shallow groundwater was present in an unconfined aquifer within the fill, alluvial materials and residual clay and a deeper confined aquifer was present at depths of approximately 8.0 to 10 mbgl in the shale.

Geo-Logix discuss the hydrogeological properties of both the shallow (alluvial) aquifer and the deeper bedrock aquifer recorded in August and October 2019. These details have been summarised in Table 5.2.

Table 5.2: Site-Specific Hydrogeology

Aspect	Shallow (Alluvial) Water Bearing Unit	Deep (Bedrock) Water Bearing Unit
Depth to Water	1-3.5 mbgl. Piezometric head elevations range from 3 mAHD to 6 mAHD. Unconfined aquifer.	8-10 mbgl at approximately -1 mAHD. Piezometric head elevations range from 3.1 mAHD to 4.7 mAHD. Confined aquifer.
Hydraulic Gradient	0.02	0.015
Hydraulic Conductivity	Highly variable based on MiHPT results estimated to be between 1 x 10^{-5} and 3.5 x 10^{-2} cm/s	1 x 10^{-7} cm/s
Effective Porosity	0.01 to 0.3	0.005
Seepage Velocity	Highly variable. Locally could be greater than 100 m/year	0.095 m/year
Interpreted Flow Direction	North and northeast	Northeast
pH	5.06 to 8.18	5.56 to 6.73
Electrical conductivity	208 to 15,732 µS/cm	16,586 to 20,840 µS/cm
Redox	-175 to 102 mV	10 to 53 mV
Oxygen	0.09 to 0.95 mg/L	0.07 to 0.74 mg/L
Temperature	16.7 to 21.6 °C	19.9 to 23.1 °C

Geo-Logix concluded the following based on the groundwater monitoring data:

- The alluvium displays significant heterogeneity with highly variable hydraulic conductivities;
- Groundwater flow direction in the alluvial water bearing zone is generally to the north and northeast;
- Groundwater flow direction in the bedrock water bearing zone is inferred to follow regional groundwater flow towards the northeast and Homebush Bay; and
- The bedrock potentiometric surface is higher than the alluvial potentiometric surface which indicates an upward vertical gradient.

Groundwater samples were collected from paired wells from the alluvial water bearing zone (MW102, GW04, MW108) and the bedrock water bearing zone (MW201, MW202, MW203) for analysis of anions and cations. Geo-Logix reported that the cation / anion balance indicates the alluvial and bedrock water bearing units are not interconnected.

5.3 Auditor's Opinion

The Auditor considers that the depth of fill and underlying stratigraphy have been adequately characterised, however the density of sample locations is lower within the footprints of the buildings compared to other areas of the site and hence there is the potential for fill of greater thickness or different composition to be present beneath these areas. It is also noted that sample locations were completed as boreholes or as hand auger holes which do not allow a good visual assessment of the fill profile.

Given the site history of uncontrolled filling, there is the potential for pockets of fill material to be present that differ to those encountered during the investigation, including asbestos impacted soils. This is discussed further in Section 11.

The site hydrogeological regime is sufficiently characterised. The infilled former channel of Haslams Creek has been identified in the eastern portion of the site and Geo-Logix measured variable hydraulic conductivity within the alluvial sediments. Groundwater flow direction in the shallow aquifer is likely to follow the local flow pathways associated with the former creek channel. Multiple lines of evidence including different SWLs, cation/anion balance and presence of a clay aquitard suggest that the deeper aquifer is not in hydraulic connectivity with the shallow aquifer in the alluvial sediments and fill.

Beneficial use of groundwater as a resource at the site is unlikely given the commercial/industrial site setting and availability of reticulated groundwater supply. The main surface water receptor for groundwater beneath the site is Haslams Creek and the Parramatta River, however the interaction of groundwater with the concrete lined creek immediately east of the site is not discussed by the consultants. The invert of the creek was observed to be approximately 1.5 m below the ground surface of the eastern site boundary and it is not known if the invert is above the groundwater level.

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, supplemented by field observations. The data sources are summarised in Table 6.1. Sample locations are shown on Attachments 3 to 7.

Table 6.1: Summary of Investigations

Investigations	Field Investigations	Analytical Data Obtained
Phase 1 and 2 Environmental Site Investigation (OTEK, 2000)	35 soil boreholes (SB1-SB35) 1 surface sample (SS36) Three soil bores converted to monitoring wells (SB7-MW1, SB2 – MW2 and SB33-MW3) including one upgradient near abandoned UST (MW1), and two downgradient. 3 groundwater samples	Soil: 32 x Metals, 13 x TRH/BTEX, 16 x PAHs, 9 x phenols, 14 x OCPs, OPPs, PCBs, 5 x VOCs Groundwater: 3 x Metals, TRH/BTEX
Stage 1 and 2 Environmental Site Investigation (WSP, 2012)	20 soil boreholes (BH1-BH14, HA1-HA6) Four soil bores converted to monitoring wells (BH2-GW1, BH9-GW2, BH13-GW3, BH14-GW4) 6 groundwater samples (GW1-GW4, MW1 and MW2)	Soil: 20 x lead, 20 x TRH, 17 x BTEX, 13 x metals, 17 x PAHs, 10 x phenols, 7 x OCPs 10 x PCBs, 3 x VOCs, 7 x asbestos (presence/absence) Groundwater: 6 x Metals, TRH/BTEX, PAH, phenols, OCPs, PCBs, 1 x VOC, 1 x surfactants (MBAS)
Detailed Site Investigation (Geo-Logix, 2019)	26 soil boreholes (MW101-MW121, MW201-MW205) and installation as groundwater monitoring wells. 22 high resolution site characterisation (HRSC) bores using a Membrane Interface Hydraulic Profiling Tool (MiHPT) (MIP1-MIP22) 32 groundwater samples (GW1, GW2, GW4, MW101-MW104, MW106-MW121, MW201-MW205, HP1-HP4) 15 x passive sub slab soil vapour samples (SV01-SV15)	Soil: 6 x metals, PAHs and VOCs, 1 x TRH/BTEX Groundwater: 13 x metals, TRH/BTEX, PAH, SVOCs, 32 x VOCs, 6 x PFAS Soil Vapour: 15 x TRH/BTEX and VOCs

The Auditor has assessed the overall quality of the data by review of the information presented in the referenced reports, supplemented by field observations. The Auditor's assessment follows in Tables 6.2 and 6.3.

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Data Quality Objectives (DQO) WSP and Geo-Logix defined specific DQOs in accordance with the seven-step process outlined in Schedule B2 of NEPM 2013. OTEK did not define specific DQOs but did review the site history, identify contaminants of concern and present a sampling and analysis plan that targeted potential sources of contamination. All consultants identified data quality indicators and assessed data against the indicators.	The DQOs identified by WSP and Geo-Logix were considered acceptable for the investigations. Although OTEK did not follow the seven-step process, the sampling and analysis plan and rationale provided are acceptable.
Sampling pattern and locations *Soil:* The 36 soil investigation locations completed by OTEK were generally completed based on a systematic sampling plan to provide coverage of the site for due diligence assessment. However, some locations were positioned to target identified sources of contamination, including USTs, the substation and the wash bay. A lower sample density was completed beneath building footprints. Samples were analysed for different analytes depending on location.	In the Auditor's opinion the soil and groundwater investigation locations adequately target the main areas of concern, however, given the presence of hardstand across the site and the lower density of sampling under building footprints, there is the potential for unidentified contamination, particularly ACM, to be present in localised areas. The implications of this are discussed further in Section 11. The groundwater wells and HRSC sample locations are positioned to assess the potential for TCE impacts to be present in the infilled former creek channel which is likely to act as a preferential pathway for groundwater

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
WSP completed 20 borehole locations based on judgemental and systematic sampling pattern. Judgemental sample locations targeted the USTs, the wash bay and the drum storage area. All samples were analysed for TRH, BTEX and PAH and the majority for heavy metals. While OTEK and WSP targeted the wash bay and drum storage areas, limited sampling of soil for VOCs was completed in either assessment. Geo-Logix undertook limited soil sampling (six locations) from monitoring well locations to target fill and the smear zone. The rationale for the locations targeted for soil sampling is not provided but appears to be to fill gaps in the existing data set. Samples were analysed for metals, PAH and VOCs and only one locations (MW110) for TRH and BTEX. In addition to the soil sampling, HRSC bores were completed by Geo-Logix at 22 locations on an approximate 30 m grid to assess for VOCs in soil and groundwater including 19 locations across the eastern and north-eastern portion of the site and three beneath the footprint of the building on Lot 1. Two of the locations were completed adjacent to wells MW102 and GW4 where VOCs had been detected in groundwater to calibrate the MiHPT. *Groundwater:* OTEK installed three wells, one near the UST in the southern, up gradient portion of the site (MW3), one in the north-eastern (downgradient portion of the site (MW1) and one in the north-western area (MW2). Wells were sampled for TRH, BTEX and metals only. WSP installed four additional wells, GW1 in the south-western, upgradient portion of the site, GW2 and GW3 targeting the USTs and GW4 in the wash bay area. Groundwater from these four wells and MW1 and MW2 were analysed for a range of contaminants although only well (GW4) was analysed for VOCs. Geo-Logix completed a more comprehensive assessment of groundwater through the installation of 20 shallow wells (MW105 was not installed as a well) and five deep wells on and off site (as well as the 22 HRSC locations mentioned above). Wells were installed to target down gradient boundaries, the former creek channel, under the building footprints and to delineate identified TCE impacts in shallow and deep aquifers. All new wells, existing wells GW1, GW2 and GW4 and four hyrdopunch groundwater samples were analysed for VOCs. Thirteen shallow wells spread across the eastern portion of the site were also sampled for other contaminants of concern. Six groundwater samples from wells across the site were sampled for PFAS. *Soil vapour:* 15 sub slab soil vapour samples were collected using passive samplers from the western portion of the site, including 12 on an approximate 30 m grid and three under the building on Lot 1 and analysed for TRH, BTEX and VOCs. No vapour samples were collected from the eastern portion of the site where chlorinated hydrocarbons were detected in groundwater, although two samples were collected from beneath the on-grade portion of the building on Lot 2.	impacts. There is a lower density of groundwater data from below the building footprints. This is compensated for under the building on Lot 1 by the soil vapour sampling locations. There are only two wells situated beneath the building on Lot 2, however these wells are located in the down gradient portion of the building and hence should detect any significant groundwater plume in this area. In addition, seven MiHPT bore locations were completed in the footprint to assess for VOCs. Off-site wells are positioned appropriately to detect off-site migration. Deep wells are positioned to assess for VOCs in deep groundwater where it has been detected in shallow groundwater. The lack of vapour sampling in the eastern portion of the site where VOCs were detected in groundwater is discussed further in Section 10 and 11.
Sampling density and depth	The density of soil analysis for some contaminants of concern was less than that recommended in the

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Soil: The soil sampling density of 61 locations over approximately 3.25 ha exceeds the minimum recommended by EPA (1995) *Sampling Design Guidelines* of 43. However, samples were not analysed from all locations for all contaminants of concern. Metals were analysed from 51 locations (lead from 58), PAH from 39, TRH and BTEX from 31, PCBs from 24, OCPs from 21 and phenols from 19 locations. VOCs were analysed from 17 locations in addition to the 22 HRSC bores completed to provide information on VOC contamination of soil and groundwater. Only seven soil samples were analysed for asbestos in soils over the course of the investigations. No asbestos was detected in these samples or observed in soil by OTEK or WSP. Geo-Logix noted the presence of ACM at the site surface in localised areas. A range of sample depths were analysed but the majority (52 of the 61 locations) targeted the near surface fill and natural soils at depths from below the slab to 1 mbgl. *Groundwater*: A total of 27 shallow groundwater wells were installed at the site and five deep wells. Deep wells were constructed as paired wells with adjacent shallow wells. In addition, four samples of the shallow groundwater were collected using the Hydropunch method. Over the course of the investigations, groundwater samples from the shallow aquifer were analysed for contaminants at the following frequency: 17 wells were sampled for TRH/BTEX, PAH and metals, 6 wells for phenols, OCPs and PCBs, 13 wells for SVOCs, 23 wells for VOCs plus 4 Hydropunch samples, 6 wells for PFAS and one well for surfactants. The six deep wells were analysed for VOCs only. *Soil vapour:* A total of 15 sub slab passive vapour samples wells were installed below the concrete slab at depths of between 0.28 and 0.53 mbgl. Sample locations were on an approximate 30 m grid across the footprint of the building on Lot 1 and two samples were placed beneath the slab in the on-grade portion of the building on Lot 2.	guidelines, however, known potential sources of contamination were targeted and the density and depth of soil sampling locations is considered sufficient to characterise near surface soils (top 2 metres) for most contaminants of concern. The low density of sampling for asbestos in soils was due to no fragments of ACM being observed in soil samples, however, sampling was completed by borehole which limits the ability to visually assess the subsurface. The low density of assessment of soils for ACM is considered a data gap. Groundwater investigation locations targeted known sources and preferential pathways and were sufficient to assess the contamination status of the shallow and deep aquifer with respect to the main contaminants of concern (VOCs). It is noted that analysis of groundwater samples from below the building footprint on Lot 2 was not completed for analytes other than VOCs. No underground storage infrastructure is known to be present in this portion of the site. Should observations made during the redevelopment process indicate that additional sources of contamination may be present, further sampling of groundwater for additional analytes of concern in this portion of the site may be required. Only one round of groundwater data is available for VOC in most wells, hence temporal variation in groundwater levels and contaminant concentrations has not been assessed. This is considered a data gap. The soil vapour sampling locations are considered adequate to assess the vapour intrusion risk to receptors within the building on Lot 1. The lack of soil vapour data from beneath the building on Lot 2 may be a data gap depending on the design of the proposed development and potential for vapour intrusion pathways to exist. The identified data gaps are discussed further in Sections 11 and 12.
Well construction The shallow groundwater monitoring wells were typically installed to depths of between 4.0 and 6.0 mbgl with 3.0 m screens in the sandy clay and clayey sand. Wells GW2, GW3, MW107, MW118 and MW119 were screened across fill and natural clay. Deep wells were installed within shale bedrock at depths of between 11.7 and 14 mbgl with 3.0 m screen, except for MW203 which had a 2.0 m screen. Wells were constructed of 50 mm uPVC. Bentonite seals of 0.1-0.8 m thickness were placed above the screen and the well backfilled with cement grout to the ground surface. The sand filter pack was generally extended to at least 0.2 m above the screen, however in wells MW115 and MW116 the logs indicate only 0.05 m of filter pack is present above the screen. During the groundwater monitoring by Geo-Logix in 2019, SWLs were above the screened interval in wells MW101, MW111, MW117, MW120, MW121, GW2 and GW4 and in all deep wells.	In the Auditor's opinion the well construction was acceptable. Groundwater contaminant concentrations did not indicate that light nonaqueous phase liquid (LNAPL) was present at the site, hence the SWL above the screened interval in some wells is not considered significant.
Sample collection method	Overall the sample collection method was found to be acceptable. Soil sample collection from the auger flights

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Soil: OTEK completed soil sampling locations using a push tube sampler or hand auger. Sample SS36 was a grab sample from surface soil. WSP and Geo-Logix completed soil sample collection via solid stem auger drilling or hand auger. Soil samples were collected by hand, directly from the auger or hand auger. Samples analysed for asbestos were collected as 35 g samples and analysed for presence/absence. *HRSC sampling:* completed using a track mounted rig equipped with a MiHPT to provide a near continuous profile of measurements using three gas chromatography detectors: Photo-ionisation Detector (PID), Flame-ionisation Detector (FID) and Halogen Specific Detector (XSD), an Electrical Conductivity (EC) dipole and water injection pressure (HPT). Two locations (MIP1 and MIP19) were completed adjacent to groundwater wells where TCE had been detected to calibrate the XSD with known groundwater concentrations of chlorinated hydrocarbons. *Groundwater*: Wells were installed by solid flight augers with air hammer used in shale for deeper wells. OTEK developed and sampled wells with a Teflon bailer. WSP developed wells using a stainless-steel bailer and sampled wells using a low flow peristaltic pump with dedicated sample tubing. Geo-Logix developed wells using a dedicated bailer and sampling was completed using low flow methods. No specific sampling procedures adopted to prevent cross contamination by PFAS are discussed. Geo-Logix groundwater samples HP1 to HP4 were collected using the Geoprobe Screen Point 16 (SP16) 'Hydropunch' groundwater sampling system. Solid tip rods were drilled to the target depth by percussive hammer. The rods are retracted exposing a stainless-steel screen. One quarter inch LDPE tubing was inserted down the drilling rods and a groundwater sample collected as per low flow sampling method with the exception that the water level was not monitored. *Soil Vapour:* Concrete coring was undertaken at each location through the concrete slab which varied from 100 to 320 mm thickness. Bores were advanced using a hand auger below the concrete slab to depths between 0.28 and 0.53 mbgl and a Waterloo Membrane Passive Gas Sampler (WMS) was then lowered into the borehole using a polythene sleeve to approximately 5 cm from the bottom of the bore. The ends of the WMS were fitted with stainless steel wire to protect the membrane from contacting any soil surfaces during deployment and retrieval. The bores were sealed using a plastic sleeve and expandable sponge to prevent atmospheric breakthrough, the concrete plug was then reinstalled to protect the WMS. Each WMS was left for a period of between 40 and 48 hours before retrieval with the time and date recorded on the chain of custody. Samples were placed in Teflon sealed jars, placed in light proof bags and transported to the laboratory. The borings were reinstated and finished with concrete.	is not ideal as it can result in loss of volatiles and sample cross contamination. Given the key contaminants at the site include volatile organics, the soil concentrations reported must be considered as indicative only and may underestimate the actual concentrations of volatile contaminants present. It is noted that concentrations of chlorinated hydrocarbons were not detected in soils. Groundwater sampling methodology was acceptable, however no discussion is provided on the methodology employed to minimise the potential for PFAS contamination of samples. Given that PFAS were not detected above the laboratory PQL in five of the six groundwater samples analysed. The potential for cross contamination to have occurred during the sampling event is considered low. The use of the passive WMS sampler for assessing soil vapour is considered acceptable although it is noted that the results are semi-quantitative. The method is sufficient for the purpose of screening for concentrations of VOCs below the slab.
Decontamination procedures The consultants reported that sampling equipment was cleaned with detergent and tap water and rinsed with deionised water prior to sampling and between sampling events or that dedicated sampling equipment	Acceptable

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
was used to prevent cross contamination. New gloves were reportedly used for each new sample. Decontamination of augers between locations was not explicitly reported by WSP or Geo-Logix but was reported by OTEK.	
Sample handling and containers Samples were placed into prepared and preserved sampling containers provided by the laboratory and chilled during storage and subsequent transport to the labs. Samples for asbestos analysis were placed in plastic zip-lock bags. OTEK report that groundwater samples for metals analysis were filtered in the field. WSP and Geo-Logix do not indicate if groundwater samples to be analysed for heavy metals were field filtered or filtered in the laboratory. The metals concentrations reported may therefore be over- or under-estimated depending on the groundwater pH. Soil vapour samples were collected using WMS which were placed in Teflon sealed jars, in light proof bags and transported under chain of custody.	Acceptable
Chain of Custody (COC) Completed chain of custody forms were provided in the reports.	Acceptable
Detailed description of field screening protocols *Soil:* Field screening for volatiles was undertaken using a PID. Soil sub-samples were placed in ziplock plastic bags and the headspace measured for VOCs after allowing time for equilibration. *Groundwater:* Field parameters were measured during well sampling and development by WSP and Geo-Logix and field sample logs are provided. OTEK did not include field screening for groundwater. *Soil vapour:* No field screening protocols for soil vapour are discussed by Geo-Logix.	Acceptable
Calibration of field equipment WSP and Geo-Logix indicated that calibration of field equipment had been undertaken prior to use and checks were performed during use. Field calibration records and calibration certificates from the equipment supplier were provided for PIDs and water quality meters in the Geo-Logix report only.	Acceptable. Calibration certificates were not included in the WSP report; however, it was reported that calibration was completed, and laboratory results agree with field screening results for VOCs.
Sampling logs Soil logs are provided within all reports indicating sample depth, PID readings, lithology and where appropriate, well construction details. A separate sample register was also provided by OTEK and Geo-Logix. Groundwater field sampling records were provided by WSP and Geo-Logix indicating SWL, field parameters, methodology and observations. No soil vapour field sampling records were provided except for the COC that indicated deployment and collection dates and times for each sample.	Acceptable

Table 6.3: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Auditor's Opinion
Field quality control samples OTEK collected field quality control samples including field intra-laboratory duplicates and rinsate blanks for both the soil and groundwater sampling events. No trip blanks or trip spikes were analysed. Intra-laboratory duplicates were collected at a frequency of between 1 in 9 and 1 in 15 samples for the various soil analytes and 1 per 3 samples for the groundwater monitoring event. WSP collected field intra-laboratory and inter-laboratory duplicates at a frequency of between 1 in 6 and 1 in 13 samples for the various soil analytes and 1 in 6 samples for groundwater. A rinsate blank was completed for the groundwater sampling event and reported to serve as a trip blank. The sample is referred to as a trip blank (TB1) in the report. No rinsate blank or trip blank was completed for the soil sampling event. Geo-Logix collected field intra-laboratory and inter-laboratory duplicates at a rate of between 1 in 4 and 1 in 13 samples for groundwater over the six separate groundwater sampling events. A trip blank and trip spike were collected for two sampling events only. Rinsate blanks were collected for each day of groundwater sampling including for the Hydropunch sampling. A field duplicate sample was collected and analysed at a rate of 1 in 15 samples for soil vapour. A trip blank was also analysed for soil vapour. Field duplicate samples were collected for soil but were not analysed.	The field quality control sampling for each investigation is considered acceptable. There is a lack of trip blank and trip spike analysis for soil and groundwater sampling events, however concentrations of volatile contaminants have not been detected in soil and results for trip blanks and trip spikes collected for two groundwater sampling events did not indicate cross contamination of volatiles during transport to the laboratory.
Field quality control results The results of field quality control samples were generally within acceptable limits. The following exceptions were noted. OTEK: The RPD for the inter-laboratory soil duplicate of SB16 for TRH C_{29}-C_{36} was 80%. The highest concentration has been included in the data set. Low concentrations of chromium, copper and zinc at detection levels were detected in the rinsate sample for the soil sampling event. The result was not considered to impact the usability of the data. WSP: The results for asbestos analysis in soils are not tabulated or discussed in the WSP report, however the laboratory certificates indicate that the inter-laboratory sample from BH1 at 2.0 m reported detectable concentrations of asbestos (identified as friable asbestos bundle comprising chrysotile) while the primary sample and the intra-laboratory duplicate did not. Elevated RPDs were reported for arsenic (157%), chromium (97%) and lead (158%) between primary and duplicate soil samples from BH1 and for lead between the primary and the triplicate sample (179%). Some PAH also reported elevated RPDs due to the low concentrations detected. Elevated RPDs for TRH C_{15}-C_{28} (98%) and C_{29}-C_{36} (116%) were reported for the sample from BH12 and its duplicate.	The detection of asbestos fibres in the inter-laboratory duplicate of the soil sample from BH1 at 2.0 m suggests that the sampling methodology adopted for asbestos in soils assessment may not be adequate to detect asbestos contamination. The implications of this result are discussed further in Section 8 and 11. Overall, in the context of the dataset reported, the elevated RPD results and low detections of some contaminants in rinsate blanks are not considered significant and the field quality control results for the main contaminants are acceptable.

Field and Lab QA/QC	Auditor's Opinion
Concentrations of zinc reported RPDs above acceptable limits in the groundwater sample and duplicate and triplicate and naphthalene between the primary and triplicate. In all cases the primary sample contained the higher concentration which was adopted in the data set. Geo-Logix: RPDs for groundwater sampling events were acceptable except for VC in triplicate pair MW104 and TW1, 1,2,4-trimethylbenzene in triplicate pair MW120 and TW3; and ethylbenzene in duplicate pair MW120 and DW3. The highest concentration was adopted in the data set. Soil vapour duplicate results were acceptable, and contaminants were not detected in field blanks for the soil vapour or groundwater sampling events where they were collected. Rinsate blank results were generally within the acceptable criteria except for 2-propanone in R3; bromodichloromethane and chloroform in R6; and chloroform in R7. Geo-Logix conclude that the detected 2-propanone in R3 is not related to an inadequate decontamination procedure.	
NATA registered laboratory and NATA endorsed methods OTEK used Amdel as the primary laboratory. Laboratories used by WSP included Envirolab and ALS. Geo-Logix used Eurofins and ALS. Laboratory certificates were NATA stamped. The Compound specific isotope analysis (CSIA) was undertaken by Microbial Insights.	Acceptable
Analytical methods Analytical methods were included in the laboratory test certificates. Asbestos identification was conducted by Envirolab and ALS using polarised light microscopy with dispersion staining by method AS4964-2004 *Method for the Qualitative Identification of Asbestos Bulk Samples*. The analytical laboratory used for the analysis of the passive vapour samplers (Eurofins) is accredited for the analysis of the WMS sampler. Vapour concentrations are reported as µg/m^3 on the laboratory reports but the uptake factors for each contaminant and time of deployment for each sample are not included in the laboratory reports.	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"*.
Holding times Review of the COCs and laboratory certificates indicate that the holding times had been met for the main contaminants of concern. Geo-Logix also reported that holding times have been met. WSP noted an exceedance of holding time for the one MBAS (surfactant) sample.	Acceptable
Practical Quantitation Limits (PQLs) *Soil:* PQLs (except asbestos) were less than the threshold criteria for the contaminants of concern. *Asbestos:* The limit of detection for asbestos in soil was 0.01% w/w.	*Soil (except asbestos):* Overall the soil PQLs are acceptable. *Asbestos:* 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

Field and Lab QA/QC	Auditor's Opinion
Groundwater: The following assessment criteria were less than the PQLs: • Anthracene 1 µg/L, assessment criteria 0.4 µg/L • Benzo(a)pyrene 1 µg/L, assessment criteria 0.01 µg/L • Vinyl Chloride 3 µg/L, assessment criteria 0.3 µg/L • Heptachlor 5 µg/L, assessment criteria 0.09 µg/L • Endrin 5 µg/L, assessment criteria 0.02 µg/L • g-BHC (Lindane) 5 µg/L, assessment criteria 0.2 µg/L • Elevated PQLs were reported for VOCs in groundwater samples from GW4 and MW102 that exceeded the assessment criteria *Soil vapour:* PQLs were less than the threshold criteria.	evidence approach to assess the significance of the exceedance, accounting for the history of the site and frequency of the occurrence. *Groundwater*: In the context of the results reported and the exposure pathways considered, overall these discrepancies do not materially affect the outcome of the audit. The raised PQLs for volatile TRH and BTEX in groundwater from MW102 and GW4 are related to high concentrations of other contaminants (TCE and its derivatives) and have been considered in assessment of the data.
Laboratory quality control samples Laboratory quality control samples including laboratory control samples, matrix spikes, surrogate spikes, blanks, internal standards and duplicates were undertaken by the laboratories.	Acceptable
Laboratory quality control results The results of laboratory quality control samples were generally within acceptable limits, with the following exceptions: • Minor DQI exceedances were reported by WSP for laboratory duplicates for some metals and minor exceedances of the LCS for VOCs and chromium in soil. One matrix spike recovery for phenols was below the acceptance criteria. • Laboratory reports indicate that the internal laboratory quality control acceptance criteria were met by Eurofins and ALS during the Geo-Logix investigation.	In the context of the dataset reported, the minor DQI exceedances are not considered significant and the laboratory quality control results are acceptable.
Data Quality Indicators (DQI) and Data Evaluation (completeness, comparability, representativeness, precision, accuracy) WSP and Geo-Logix identified predetermined data quality indicators (DQIs) 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. Both consultants concluded that the data was acceptable with Geo-Logix concluding that *"Geo-Logix accepts the integrity of the analytical data."* OTEK did not define DQIs and did not undertake a formal QA/QC data evaluation against the five category areas. They did, however, conclude that *"Based on OTEK's QA/QC program and the internal lab QA/QC, OTEK considers the obtained site analytical data to be reliable"*.	An assessment of the data quality with respect to the five category areas has been undertaken by the Auditor and is summarised below.

6.1 Auditor's Opinion

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

- The data collected is likely to be representative.
- The data is complete.
- The data is likely to be comparable for each sampling and analytical event as similar sampling and analytical methods were adopted. The temporal range over which the data was collected, the different methodology adopted for fractioning TRH and different laboratories used have been considered when drawing conclusions from the data.
- The primary laboratory provided sufficient information to conclude that data is of sufficient precision.
- While most of the data is likely to be accurate, there is some doubt regarding possible loss of volatiles from soils as no trip spikes were used.

7. ENVIRONMENTAL QUALITY CRITERIA

The Auditor has assessed the results against Tier 1 criteria from National Environmental Protection Council (NEPC) *National Environmental Protection (Assessment of Site Contamination) Measure 1999*, as Amended 2013 (NEPM, 2013). Other guidance has been adopted where NEPM (2013) is not applicable or criteria are not provided. Based on the proposed development, the human health criteria and ecological criteria appropriate for 'commercial/industrial' land use were adopted.

7.1 Soil Assessment Criteria

Human Health Assessment Criteria

The Auditor has adopted human health assessment criteria from the following sources:

- NEPM (2013) Health Investigation Levels (HILs) for 'Commercial/Industrial' (HIL-D) land use.
- NEPM (2013) Health Screening Levels (HSLs) for 'Commercial/Industrial' (HSL-D) land use. The HSLs assumed a sand soil type. Depth to source adopted was <1 m as an initial screen.
- NEPM (2013) Management Limits (MLs) for petroleum hydrocarbons for 'Commercial/Industrial' land use and assuming coarse soil texture. Criteria are relevant for operating sites where significant sub-surface leakage of petroleum hydrocarbons has occurred and when decommissioning industrial and commercial sites.
- Presence/absence of asbestos.

Ecological Assessment Criteria

The Auditor has adopted ecological soil assessment criteria from the following sources:

- NEPM (2013) Ecological Screening Levels (ESLs) for 'Commercial/Industrial' land use, assuming coarse soil.
- NEPM (2013) Ecological Investigation Levels (EILs) for 'Commercial/Industrial' land use. In the absence of site-specific soil data on pH, clay content, cation exchange capacity and background concentrations, the published range of the added contaminant limits have been applied as an initial screen.
- Canadian Council of Ministers of the Environment (CCME) (2010) *Canadian soil quality guidelines: carcinogenic and other polycyclic aromatic hydrocarbons (PAHs)* soil quality guideline (SQG) for benzo(a)pyrene for 'Commercial/Industrial' land use. The SQG has been adopted in place of the NEPM (2013) ESL as it is based on a larger and more up-to-date toxicity database than the low reliability NEPM (2013) ESL.

Soil Aesthetic Considerations

The Auditor has considered the need for soil remediation based on 'aesthetic' contamination as outlined in *Section 3.6 Aesthetic Considerations* of NEPM (2013) Schedule B1, which acknowledges that there are no chemical-specific numerical aesthetic guidelines. Instead, site assessment requires a balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity.

7.2 Groundwater Assessment Criteria

Human Health Assessment Criteria

The Auditor has adopted human health assessment criteria from the following sources:

- NEPM (2013) HSLs for 'Commercial/Industrial' (HSL-D) land use. The HSLs assumed a sand soil type and a depth to groundwater of 2 to <4 m.
- NHMRC (2011) *National Water Quality Management Strategy, Australian Drinking-Water Guidelines* (ADWG), Version 3.5 Updated August 2018.
- HEPA (2018) *PFAS National Environmental Management Plan* for drinking water and recreational water criteria for PFOS/PFHxS and PFOA.
- WHO (2017) Guidelines for Drinking-water Quality, Fourth Edition, incorporating the 1st addendum.

Ecological Assessment Criteria

The Auditor has adopted ecological groundwater assessment criteria from the following sources:

- ANZG (2018) *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 (www.waterquality.gov.au/anz-guidelines). Criteria for freshwater and 95% level of protection were adopted.
- HEPA (2018) PFOS/PFHxS and PFOA 'freshwater' criteria developed for the protection of 95% species protection for slightly to moderately disturbed systems.

7.3 Soil Vapour Assessment Criteria

The Auditor has adopted soil vapour assessment criteria from the following sources:

- NEPM (2013) HSLs for 'Commercial/Industrial' land use (HSL-D) were adopted. The HSLs assumed a sand soil type.
- NEPM (2013) interim soil vapour HILs for volatile organic chlorinated compounds. Interim HILs for 'Commercial/Industrial' land use (HIL-D) were adopted.

7.4 Consultants Assessment Criteria

The environmental quality criteria referenced by the Auditor are consistent with those adopted by Geo-Logix, however, Geo-Logix did not adopt ecological assessment criteria for soil since there is to be no soil access at the site and there are no on-site sensitive ecological receptors.

Given the results obtained, the Auditor considers that these discrepancies do not affect the overall conclusions reached by Geo-Logix and the Auditor.

8. EVALUATION OF SOIL RESULTS

OTEK and WSP completed soil assessments that focused on characterisation of fill material and shallow soils at the site. Soil sample locations are shown on Attachments 3 and 4. Geo-Logix undertook further soil assessment through HRSC using a track mounted rig equipped with a MiHPT to complete 22 boring

locations across the site (MIP1 to MIP22). The MiHPT locations are shown on Attachment 5. The MiHPT detects volatile contaminants using a PID, FID and XSD, records electrical conductivity and measures injection pressure to estimate hydraulic conductivity. In addition to the MiHPT sampling bores, Geo-Logix collected six soil samples for laboratory analysis from five locations during the installation of groundwater wells using a drill rig with solid auger (MW103, MW105, MW108, MW109, MW110).

8.1 Field Results

OTEK reported that black stained sands and hydrocarbon odours were detected in soil at location SB16 at a depth of 1.0 mbgl, in SB32 at 0.5 mbgl and SB33 at 1.5 mbgl. Elevated PID readings of 36.7 ppm, 146 ppm and 240 ppm were reported at these sample depths respectively. These bores were all located near former USTs.

WSP report that hand auger locations HA1, HA2 and HA3 were positioned close to an area where surface water with a sheen was noted in the drum storage area in the undercroft of the building on Lot 2. Hydrocarbon odours were noted at locations BH9 and BH10, both of which were located near the abandoned USTs. PID readings ranged between 0.0 ppm and 11 ppm.

Geo-Logix did not report specific field observations made in relation to the soil profile observed during the well installation. The results of the HRSC completed using MiHPT bores are discussed below.

8.2 High Resolution Site Characterisation Results

The 22 HRSC bores were drilled to depths of between 4.1 and 8.4 mbgl with most located in the eastern portion of the site within Lot 2. The locations of the bores are shown in Attachment 5.

Geo-Logix report that the post processing of the log data for the MiHPT bores was used to estimate hydraulic conductivity (K), water table elevation and bedrock elevation at each location. Bore profiles for the responses of the PID (indicative of volatile hydrocarbon impacts), FID (indicative of methane), XSD (indicative of chlorinated hydrocarbons), electrical conductivity meter and estimated K value at each bore location are provided in the Geo-Logix DSI report. Geo-Logix report that *"a strong response was measured by XSD, indicative of a halogenated hydrocarbon (TCE / DCE / VC) in MiHPT borings MIP1 and MIP19, completed adjacent to wells MW102 and GW4 respectively. Comparison against EC data indicated the responses correlated with the upper section of the water column in the alluvial groundwater. No other response on the XSD was measured in all other MiHPT borings."*

FID responses were measured in the majority of bores in the north-eastern portion of the site. Geo-Logix reported that the responses were indicative of methane. PID responses were noted in bores MIP1 and MIP19 where the XSD response indicated the presence of chlorinated hydrocarbons. PID responses were also noted in bores MIP20 and MIP21 but were low.

8.3 Analytical Results

Soil samples were analysed for a variety of contaminants including petroleum hydrocarbons, PAHs, heavy metals, phenols, VOCs and PCBs. Analysis of soils completed by OTEK and WSP was undertaken prior to the NEPM amendment in 2013. There are differences in the criteria and the fractions of petroleum hydrocarbons reported between the original and amended NEPM 1999 (2013). Petroleum hydrocarbon data collected prior to the revision was generally reported as TPH C_6-C_9 (F1 old), TPH C_{10}-C_{14} (F2 old), TPH C_{15}-C_{28} (F3 old), TPH C_{29}-C_{36} (F4 old), and BTEXN. The amendment provides criteria for TRH C_6–C_{10} minus BTEX (F1), TRH >C_{10}–C_{16} minus naphthalene (F2), >C_{16}-C_{34} (F3) and TPH >C_{34}-C_{40} (F4) and laboratories generally now report against these fractions. The historical data reported against the "old" fractions has been assessed by the Auditor in comparison to the equivalent "new" fraction as a conservative approach.

Most of the soil analysis was completed on samples of fill samples or shallow clay soils. The analytical results have been assessed against the environmental quality criteria and summarised in Table 8.1.

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

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
Asbestos in soil	7	**1**	**Detected**	**1 above 0.1 g/kg in TRIP 1, the inter-laboratory duplicate of BH1 at 2.0 m**	-
Asbestos trace analysis	7	0	ND	-	-
Benzene	31	0	ND	0 above HSL D 0-1 m, sand 3 mg/kg	0 above ESL (commercial/industrial) (coarse) 75 mg/kg
Toluene	31	0	ND	0 above HSL D 0-1 m, sand NL	0 above ESL (commercial/industrial) (fine) 135 mg/kg
Ethylbenzene	31	0	ND	0 above HSL D 0-1 m, sand NL	0 above ESL (commercial/industrial) (coarse) 135 mg/kg
Total Xylenes	31	0	ND	0 above HSL D 0-1 m, sand 230 mg/kg	0 above ESL (commercial/industrial) (coarse) 180 mg/kg
F1 (TRH C_6–C_{10} minus BTEX)	1	0	ND	0 above HSL D 0-1 m, sand 260 mg/kg	0 above ESL (commercial/industrial) 215 mg/kg
F2 (TRH >C_{10}–C_{16} minus naphthalene)	1	0	ND	0 above HSL D 0-1 m, sand NL	-
TPH C_6–C_9	30	0	ND	0 above F1 HSL D 0-1 m, sand 260 mg/kg	-
TPH C_{10}–C_{14}	30	2	900	0 above F2 HSL D 0-1 m, sand NL	**1 above ESL (commercial/industrial) 170 mg/kg**
TPH C_{15}-C_{28}	30	4	1900	0 above F3 ML (commercial/industrial, coarse) 3500 mg/kg	**1 above F3 ESL (commercial/industrial) 1700 mg/kg** **SB16_1.2 (1900)**
TPH C_{29}-C_{36}	30	3	700	0 above F4 ML (commercial/industrial) 10,000 mg/kg	0 above F4 ESL (commercial/industrial) 3300 mg/kg
Naphthalene	39	4	2.0	0 above HSL D 0-1 m, sand NL	0 above EIL (commercial/industrial) 370 mg/kg
Benzo(a)pyrene	39	10	3.6	-	0 above CCME SQG (commercial/industrial) 72 mg/kg
Benzo(a)pyrene TEQ	6	1	2.9	0 above HIL D 40 mg/kg	-

Analyte	n	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
Total PAHs	39	17	29	0 above HIL D 4000 mg/kg	-
Total Phenols	19	5	6	0 above HIL D 240,000 mg/kg	-
Arsenic	51	26	18	0 above HIL D 3000 mg/kg	0 above EIL (commercial/industrial) of 160 mg/kg
Cadmium	51	19	31	0 above HIL D 900 mg/kg	-
Chromium	51	48	190	0 above HIL D 3600 mg/kg	0 above most conservative ACL (commercial/industrial) 310 mg/kg
Copper	51	51	890	0 above HIL D 240,000 mg/kg	**10 above most conservative ACL (commercial/industrial) 85 mg/kg**
Lead	58	54	1100	0 above HIL D 1500 mg/kg	0 above generic ACL (commercial/industrial) 1800 mg/kg
Mercury	51	12	0.54	0 above HIL D 730 mg/kg	-
Nickel	51	51	1900	0 above HIL D 6000 mg/kg	**9 above most conservative ACL (commercial/industrial) 55 mg/kg**
Zinc	51	51	1400	0 above HIL D 400,000 mg/kg	**15 above most conservative ACL (commercial/industrial) 110 mg/kg**
PCB	24	0	ND	0 above HIL D 7 mg/kg	-
OCP	21	0	ND	0 above HIL D	0 above EIL
VOCs	17	0	ND	-	-

n number of samples
- No criteria available/used
NL Non-limiting
<PQL Less than the practical quantitation limit

In assessing the results, the Auditor makes the following observations:

- Asbestos was detected in the inter-laboratory duplicate of the soil sample collected from BH1 at a depth of 2.0 m. The description of the material on the ALS laboratory report is "*Dark grey rocky soil with plenty of slag and coke grains plus one small friable asbestos fibre bundle*". BH1 is a location in the western portion of the site, adjacent to Percy Street where fill material of a different composition to that encountered across the rest of the site was identified. The fill was described by WSP as comprising sandy clay with slag and ash, glass and scrap metal to 3.5 mbgl. It is likely, therefore, that the asbestos detection is related to this material. The adopted field and laboratory assessment methodology for asbestos was not in accordance with NEPM (2013) and the sampling density was less than the minimum required for site characterisation. Characterisation of fill material for asbestos is therefore considered to be a data gap.

- Concentrations of volatile hydrocarbons were not detected in the 31 soil samples analysed. Concentration of TPH in the C_{10}-C_{36} range were encountered in fill at locations SB16, SB11, BH12 and BH5. Concentrations were below human health and ecological assessment criteria, with the exception of the TPH C_{10}-C_{14} and TPH C_{15}-C_{28} concentration detected in SB16 during the OTEK investigation in 2000 which exceeded the ESLs for TRH >C_{10}-C_{15} and TRH >C_{16}-C_{34}.
- Elevated lead concentrations were detected by OTEK in SB25 (940 mg/kg) located in the centre of the site in fill material at a depth of 0.5 mbgl and by WSP in BH1 (1100 mg/kg) to the west of the site in fill material considered to be associated with the disused rail line. Concentrations were below assessment criteria.
- Concentrations of copper, nickel and zinc were detected above ecological screening criteria in several samples. Elevated concentrations were present in shallow fill material associated with asphalt gravel.

8.4 Auditor's Opinion

In the Auditor's opinion, the soil analytical results are consistent with the field observations and while the density of analysis for some analytes (including PCB, phenols, and VOCs) was below the minimum density recommended in the NSW EPA (1995) *Sampling Design Guidelines*, samples targeted potential sources of contamination and widespread contamination of fill by these contaminants is unlikely.

The density of analysis for asbestos in soils was also low and asbestos was detected in the inter-laboratory duplicate for one soil sample. While this detection is likely to be related to the localised fill material in the area of BH1 to the west of the site, the assessment of fill material by boreholes limits the ability to visually assess the subsurface and there is the potential that fragments of ACM in fill were not observed in the small volume samples obtained from boreholes in other areas of the site. Geo-Logix reported that fragments of ACM were observed in shallow fill (maximum depth of 0.3 m) and surface soils in localised pockets across the site, specifically "*on the northeast boundary along the north gate driveway, in the undercroft area on Lot 2 and on the south boundary next to Haslams Creek*". The potential for asbestos to be present in near surface soils requires further assessment as discussed in Section 11.

Concentrations of all other contaminants were not detected above the human health criteria for commercial/industrial land use. The elevated metals and TRH concentrations detected above ecological criteria are not considered to impact the suitability of the site for commercial use as the site will be covered by hardstand with limited soil access and the impacts are localised.

The sampling density below the building footprints was lower than in the open areas of the site. Given the size of the building footprints, there is the potential for localised areas of soil contamination to be present beneath buildings related to uncontrolled fill or point sources of contamination from historical activities undertaken within the buildings e.g. related to the drainage system or leak and spills from equipment used within the buildings. There is also the potential for hydrocarbon impacted soils and backfill materials to be present in the vicinity of the two abandoned USTs and a potential third UST identified during the GPR survey completed by Geo-Logix.

While the Auditor is satisfied that no further soil investigation is required at the site prior to redevelopment, the potential for localised areas of contamination to be present should be addressed during the planning of the redevelopment as discussed in Section 11 and 12.

9. EVALUATION OF GROUNDWATER RESULTS

9.1 Overview

OTEK sampled three shallow wells MW1, MW2 and MW3 and analysed groundwater samples for TRH, BTEX and heavy metals. TRH and BTEX were detected in the sample from well MW3 located adjacent to the abandoned UST on the south-western site boundary. This well could not be accessed by WSP and was not sampled by WSP or Geo-Logix.

WSP installed four wells GW1-GW4 and sampled these wells and wells MW1 and MW2 in May 2012. TRH concentrations were detected in wells GW2 and GW4. Groundwater from well GW4, located near the wash bay, was analysed for VOCs and detectable concentrations of trichloroethene (TCE), cis-1,2-dichloroethene (DCE) and vinyl chloride (VC) were reported above adopted assessment criteria. Concentrations of copper and zinc in groundwater were reported by WSP to exceed the adopted freshwater ecological criteria.

Geo-Logix completed a more extensive groundwater investigation in 2019 that involved the sampling of groundwater from an additional 20 wells in the shallow (alluvial) water bearing unit and five wells installed in the deeper (bedrock) aquifer. In addition, four groundwater samples were obtained from the shallow aquifer using the Hydropunch method during the HRSC sampling program. Groundwater samples from all wells were analysed for VOCs and samples from 13 shallow wells were analysed for TRH, BTEX, PAH and metals. The groundwater sampling of on and off-site wells was completed over four events in June, August, September and October 2019. Samples from six wells were collected in November 2019 and analysed for PFAS.

The results of the Geo-Logix groundwater sampling completed in 2019 are summarised below. The location of sampled groundwater wells is shown on Attachment 6.

9.2 Field Results

Geo-Logix reported that phase separated hydrocarbons (PSH) were not observed during the sampling of groundwater. It is not reported if gauging of wells for dense non aqueous phase liquids (DNAPL) was undertaken during well development or sampling. An organic odour and sheen were observed on groundwater from well MW101. Organic odour was also noted on the field sampling sheets for wells MW103, MW104, MW106 and GW4 and off-site wells MW118, MW119. A chemical odour was noted at wells MW102 and MW109 and a diesel odour at off-site well MW120. Off-site wells were not analysed for petroleum hydrocarbons.

9.3 Analytical Results for the Shallow Aquifer

Geo-Logix sampled the shallow and deep wells on and off site between June and November 2019. Wells GW1, GW2 and MW101 to MW104 and MW106 to MW111 were sampled twice over this period, in June and August 2019, and wells GW4, MW102 and MW108 were sampled three times, although analysed for different analytes on different occasions.

The groundwater analytical results for on and off-site shallow wells sampled by Geo-Logix between June and November 2019 are summarised below in Table 9.1. Where wells were sampled on more than one occasion, the highest detected concentration of a contaminant is included. It is noted that raised PQLs were reported for volatile TRH and BTEX compounds in groundwater from wells MW102 and GW4 due to the presence of chlorinated hydrocarbons.

Table 9.1: Summary of Maximum Groundwater Investigation Analytical Results (Shallow Wells Geo-Logix 2019) (µg/L)

Analyte	n	Detections	Maximum	n > Human health criteria	n > Ecological criteria
TRH C_6-C_{10} less BTEX (F1)	13	6	**13,000**	**1 above HSL D, sand 2-<4 m (6,000 µg/L) MW102**	-
TRH >C_{10}-C_{16} less naphthalene (F2)	13	2	90	0 above HSL D, sand 2-<4 m NL	-
TRH >C_{16}-C_{34} (F3)	13	1	<50	-	-
TRH >C_{34}-C_{40} (F4)	13	0	<100	-	-
Benzene	13	0	<1	0 above HSL D, sand 2-<4 m (5,000)	0 above GIL of 950
Toluene	13	1	5	0 above HSL D, sand 2-<4 m NL	0 above GIL of 180
Ethylbenzene	13	0	<1	0 above HSL D, sand 2-<4 m NL	0 above GIL of 80
Total Xylenes	13	1	5	0 above HSL D, sand 2-<4 m NL	0 above GIL of 75
Naphthalene	13	0	<1	0 above HSL D, sand 2-<4 m NL	0 above GIL of 16
Benzo(a)pyrene	13	0	<1	0 above ADWG of 0.01	0 above GIL of 0.1
Tetrachloroethene (PCE)	32	0	<1	0 above ADWG of 50	0 above GIL of 70
Trichloroethene (TCE)	32	3	**8,300**	**2 above WHO drinking water criteria of 20 GW4 (310), MW102 (8300)** MW111 (13)	**1 above GIL 330 MW102 (8300)**
1,1,2-Trichloroethane	32	2	10	**-**	0 above GIL of 6500
Cis-1,2-dichloroethene (DCE)	32	5	**2,000**	**3 above ADWG of 60 GW4 (1,300) MW102 (2,000) MW104 (170)**	-
1,1-dichloroethene	32	3	**260**	**1 above ADWG of 30 GW4 (260) detections in MW102 and MW104**	0 above GIL of 700
Vinyl Chloride (VC)	32	4	**680**	**4 above ADWG of 0.3 GW4 (680) MW102 (33) MW104 (26) MW111 (9)**	**1 above GIL 0f 100 GW4 (680)**

Analyte	n	Detections	Maximum	n > Human health criteria	n > Ecological criteria
Acetone (2-Propanone)	32	8	16	-	-
1,2,4-trimethylbenzene	32	2	6	-	-
1,3,5-trimethylbenzene	32	1	3	-	-
SVOC	13	0	<PQL	-	-
Arsenic	13	10	6	0 above ADWG of 10	0 above GIL of 13
Cadmium	13	0	<0.2	0 above ADWG of 2	0 above GIL of 0.06
Chromium	13	3	**4**	0 above ADWG of 50	**3 above GIL of 3.3**
Copper	13	10	11	0 above ADWG of 2000	8 above GIL of 1.4
Lead	13	1	**5**	0 above ADWG of 10	**1 above GIL of 3.4**
Mercury	13	0	<0.1	0 above ADWG of 1	0 above GIL of 0.06
Nickel	13	12	**16**	0 above ADWG of 20	**3 above GIL of 8**
Zinc	13	11	**47**	-	**9 above GIL of 8**
PFHxS + PFOS	6	1	**0.09**	**1 above NEMP drinking water 0.07 in GW1**	-
PFOS	6	0	<0.01	-	0 above NEMP freshwater 95% species protection level 0.13
PFOA	6	0	<0.01	0 above NEMP drinking water 0.56	0 above NEMP freshwater 95% species protection level 220

n number of samples
- No criteria available/used
<PQL Less than the practical quantitation limit
NL non limiting

In assessing the analytical results, the Auditor makes the following observations:

- Concentrations of chlorinated hydrocarbons were detected in groundwater samples from five wells (GW4, MW102, MW104, MW111 and HP4). Detected compounds included TCE and break down products DCE and VC. The highest concentrations were detected in well MW102 located to the east of the building on Lot 2, adjacent to the creek. TCE was detected above drinking water criteria in two wells (GW4 and MW102), DCE was detected above drinking water criteria in three wells (GW4, MW102 and MW104) and VC above drinking water criteria in four wells (GW4, MW102, MW104, MW111). The impacted wells are all in the eastern portion of the site. Wells MW111, HP4 and MW104 are located on the down gradient (northern and north-eastern) site boundary, however concentrations in these wells were much lower than in upgradient wells GW4 and MW102. Concentrations of TCE, DCE and VC were not detected above laboratory PQL in any off-site down

gradient well. Geo-Logix considered that "*the vertical and lateral extent of TCE / DCE / VC in groundwater appears to be limited and defined*".

- Geo-Logix concluded that *"The results of HRSC and groundwater investigation defined the distribution of TCE, DCE and VC in groundwater which occurs as discontinuous pockets in the alluvial water bearing unit, with decreasing concentration from south to north across the site. Contaminant distribution appears to have followed the former alignment of Haslams Creek from south to north"*. They infer that the discontinuous nature of the chlorinated hydrocarbon impact is likely to be related to back diffusion of contaminants from peat layers in the alluvium rather than migration of a continuous plume through preferential pathways concluding that "*Given the density of groundwater wells and MiHPT borings across the area where TCE has been identified in groundwater, the potential for preferential pathways in the alluvium that have not been identified is considered low. Back diffusion of TCE from organic rich material is considered a more plausible explanation for the presence of TCE in alluvial groundwater as discontinuous pockets*."
- Geo-Logix observe that the concentration of TCE detected in groundwater from well MW102 (8,300 µg/L) was close to 1% of the solubility limit for TCE which is commonly considered an indicator of the potential for DNAPL to be present in the subsurface. However, they conclude that the results of the HRSC sampling and groundwater sampling did not indicate that a source of TCE is present at the site and state that "*With no evidence of a DNAPL existing on the site despite the voluminous data acquired, the assumption is the DNAPL, if present, must exist off-site. Well MW102 is located in close proximity to the Offset Alpine Printing facility".*
- Geo-Logix indicate that the risk to future site users from vapour intrusion from chlorinated hydrocarbon impacts in groundwater is not a complete exposure pathway in the eastern portion of the site as the current and future building in this location are on suspended slab, approximately 2 m above the current ground level. However they do consider that the potential vapour intrusion risk associated with TCE in groundwater to trench workers may be a complete exposure pathway stating that "*With the exception of potential for trench worker inhalation exposure in the eastern portion of the site, no complete exposure pathways between TCE contaminated groundwater and potential receptors have been identified. The potential for trench worker inhalation of TCE requires further investigation."*
- The potential vapour intrusion risk to off-site receptors from concentrations of chlorinated hydrocarbons detected in groundwater at well MW111 on the northern site boundary is addressed by Geo-Logix through application of a screening method applying an attenuation factor of 0.00015 to groundwater concentrations of TCE and DCE reported in well MW111 to obtain indoor air concentrations which were then compared to indoor air criteria back calculated from Table 1A(2) of Schedule B1 of NEPM 2013. The screening indicated that the estimated concentrations of TCE and DCE were below the target indoor air concentrations of 0.008 and 0.03 mg/m^3 respectively.
- Concentrations of TRH F1 were detected in wells where TCE and its degradation products were detected (MW102, GW4, MW104 and MW111). Geo-Logix do not comment on the reported TRH concentrations. The Auditor considers that the detected TRH impacts are attributable to TCE reporting as TRH C_6-C_9 in the standard TRH analysis method. BTEX was not detected in these wells and there is no evidence that significant petroleum hydrocarbon contamination is present in this portion of the site.
- TRH F1 was detected in upgradient wells GW1 and GW2, in the southern portion of the site, at concentrations below the HSL (30 µg/L and 80 µg/L respectively) during the 2019 sampling. Low concentrations of xylene were detected in GW1 (5 µg/L) and TRH F2 in GW2 (70 µg/L). Historically, WSP detected concentrations of TRH in the C_6-C_9 and C_{10}-C_{14} fractions in GW2 (700 µg/L and 680 µg/L respectively). Chlorinated hydrocarbons were not detected in these wells and the Auditor considers the TRH impacts detected in these wells to be related to residual petroleum hydrocarbon

contamination from the USTs in this area. The concentrations of TRH do not pose a potential vapour intrusion risk to future site users.

- Concentrations of acetone (2-propanone) were detected in groundwater from eight wells (MW115, MW116, MW117, MW118, MW119, MW120, MW202 and HP2) between 1 and 16 µg/L. There are currently no drinking water criteria for acetone.
- PFAS were detected in the groundwater sample from well GW1 located in the upgradient (south-western) portion of the site with the concentration of PFHxS + PFOS marginally exceeding the drinking water criteria. PFAS were not detected above PQL in the five other shallow on-site wells.

9.4 Compound Specific Isotope Analysis

Geo-Logix completed analysis of TCE carbon isotope ratios for groundwater samples from wells MW102, GW04 and MW111. The δ 13 C was -18.8‰ in groundwater sample from well MW102, -7.5‰ in the groundwater sample from GW04 and -4.1‰ in the groundwater sample from MW111. Geo-Logix concluded that *"The δ 13 C carbon isotope ratio of -18.8‰ detected in groundwater at well MW102 indicates limited breakdown of TCE and places the well in the vicinity of the source (TCE -23 to -33 δ 13 C)"* and that *"The decreasing TCE concentrations, increasing ratio of degradant products DCE and VC to TCE, and less negative TCE carbon isotope ratio in groundwater samples GW4, MW014, MW111 and HP4 indicate these wells are further from the source"*. The Auditor considers that the conclusions reached by Geo-Logix are plausible, however notes that the range in isotope ratios for TCE may also be related to different sources of TCE in the different areas.

9.5 Analytical Results for the Deep Aquifer

In addition to analysis of groundwater samples from the alluvial aquifer, groundwater samples from five deep wells installed in the bedrock aquifer were collected and analysed for VOCs only. The analytical results indicated that VOCs were not detected above the laboratory PQL in any sample from this aquifer. This included the sampling of well MW201 installed adjacent to shallow well MW102 where the highest VOC concentrations were detected. Geo-Logix concluded that the potential for TCE to migrate vertically was low based on the fact that a clay aquitard exists between the alluvial water bearing unit and the deeper bedrock water bearing unit, the bedrock water bearing unit is confined or semi-confined and subject to upwards vertical gradients; and water quality and cation / anion balance indicate alluvial and bedrock groundwater are two separate groundwater units with little or limited connectivity.

9.6 Auditor's Opinion

The main contaminants of concern detected in groundwater are chlorinated hydrocarbons, specifically TCE and break down products DCE and VC, which have been detected in five groundwater wells in the north-eastern and eastern portion of the site, including at three locations on the down gradient site boundary (MW104, MW111 and HP4). The highest concentrations were detected in well MW102 on the eastern site boundary with lower concentrations detected in well GW4, approximately 100 m to the north (down gradient), near the wash bay area. The Auditor notes that groundwater data for chlorinated hydrocarbons is only available for most wells from between June and October 2019. Groundwater from GW4 was also analysed for VOCs in 2012 by WSP. Concentrations of TCE and VC had decreased in the seven years between sampling events, however the DCE concentration was comparable. While the data set provides an indication of current status of VOC in groundwater, there is a lack of data with which to assess temporal variations. Additional groundwater data would be useful to confirm the extent of the VOC contamination and reduce uncertainty in concentration variability.

The source of the TCE impacts is uncertain. Concentrations of chlorinated hydrocarbons were not detected in wells surrounding MW102, including down gradient wells between MW102 and GW4 (MW116, MW103 and HP2) or in the MiHPT bore locations around MW102, suggesting a localised source of contamination in this area. Chlorinated hydrocarbon impacts were detected in well GW4 located further north (downgradient) of MW102 and in wells MW111 and MW104. The distribution of the

chlorinated hydrocarbon impacts suggests localised pockets of contamination as indicated by Geo-Logix. Geo-Logix attribute this distribution to back diffusion of TCE impacts from organic layers within the alluvial material within the former channel of Haslams Creek that runs beneath the site. While this is a plausible explanation, the Auditor considers that the distribution may also be related to discrete sources of TCE contamination from past activities at the site. Well GW4 is located near the wash bay area and MW102 is located near the caged enclosure used historically for storage of chemical drums, both of which have been identified as potential source areas. Geo-Logix infer that the source of the TCE detected in MW102 is an off-site source to the south-east and suggest that the likely source is the Offset Alpine Printing facility. This is plausible given the preferential pathway for migration of contamination in groundwater within the former creek channel that flowed from the south-east onto the site. Alternatively, the contamination detected in well MW102 may be attributed to a point source in this portion of the site from leaks and spills of product or related to the drainage system. The potential source of TCE contamination and implications on the proposed development of the site are discussed further in Section 11.

Geo-Logix conclude that the potential vapour intrusion risk to future commercial site users from TCE contamination in groundwater in the eastern portion of the site is low as the proposed development will be constructed on a suspended slab 2 m above the current ground level, mitigating any vapour intrusion risk. This assumption needs to be confirmed through review of the construction details of the proposed development to ensure that the on-ground land use in this portion of the site does not provide a complete vapour intrusion exposure pathway, including consideration of the potential for preferential pathways for vapour migration. Geo-Logix do indicate that there may be a potential risk to trench workers accessing service trenches in the eastern portion of the site from vapour intrusion pathways. The basis for this conclusion is not specifically discussed but is assumed to be related to concentrations of chlorinated hydrocarbons detected in wells MW102 and GW4. The potential risk associated with this exposure pathway requires further assessment and is discussed further in Section 11.

The potential off-site vapour intrusion risk to commercial users of 15 Percy Street was assessed by Geo-Logix through application of an attenuation factor selected from the Johnson and Ettinger vapour intrusion model (USEPA 2017) to concentrations of TCE and DCE detected in groundwater in well MW111. No justification for the selection of this criteria is provided. The concentrations of TCE and DCE in groundwater from MW111 are below drinking water criteria and unlikely to present a risk from vapour intrusion. Concentration of VC in this well did exceed drinking water criteria. The potential vapour intrusion risk associated with contamination detected in groundwater is discussed further in Section 11.

The concentrations of TCE, DCE and VC detected in well MW111 and DCE and VC in well MW104, both located on the north-eastern site boundary, were reduced compared to concentrations in upgradient wells GW4 and MW102. While Geo-Logix acknowledge that some migration of these contaminants in groundwater off-site may have occurred immediately to the northeast of the site boundary, the chlorinated hydrocarbon impacts are considered by Geo-Logix to be delineated laterally as concentrations were not detected above the laboratory PQL in the off-site shallow groundwater wells installed downgradient on 15 Percy Street. The Auditor agrees that the extent of TCE contamination in groundwater has been delineated down gradient of the north-east of the site, however, the potential for impacted groundwater on the eastern boundary of the site (MW102 and MW104) to flow north-east and impact Haslams Creek should be considered.

Low concentrations of TRH F1 and F2 were detected in well GW2 located near the decommissioned UST in the southern portion of the site. The Auditor considers that there is a potential for some localised groundwater contamination to exist on-site in the vicinity of the two decommissioned USTs and the potential third UST, however given the time since decommissioning (twenty years), and the recent groundwater sampling data for wells near USTs, the potential for petroleum hydrocarbon contamination to be present in groundwater at concentrations that pose a potential risk to receptors and risk of off-site migration is low.

The analytical results for groundwater from deeper wells do not indicate that TCE contamination has migrated vertically and based on the multiple line of evidence provided by Geo-Logix to suggest that the alluvial shallow aquifer is not in hydraulic connectivity with the underlying bedrock aquifer, the Auditor agrees that the contamination has been vertically delineated. It is noted that deeper groundwater wells were not analysed for petroleum hydrocarbons, however the potential for migration of hydrocarbon impacts is considered low for the reasons outlined above.

It is noted that Geo-Logix recommended that the site be notified to the NSW EPA under Section 60 of the Contaminated Land Management Act (1997) based on the concentrations of TCE, DCE and VC in groundwater.

10. EVALUATION OF SOIL VAPOUR RESULTS

Geo-Logix installed 15 passive soil vapour samplers (SV1-SV15) beneath the concrete slab and building footprint in the north-western half of the site (Lot 1) to assess the potential for migration of volatile compounds through the sub-surface. The samples were placed on a 30 m grid across the area of the existing and the proposed slab on grade building. Samples were not collected in the eastern portion of the site where the current (and proposed) building is constructed on a suspended slab. Soil vapour sample locations are shown in Attachment 7.

The passive samplers were Waterloo Membrane Passive Gas Samplers (WMS) placed in bores cored through the concrete and advanced using a hand auger to depths reported to be between 0.28 and 0.53 mbgl. The samplers were deployed for between 40 and 48 hours in June 2019 and analysed to provide a time weighted average concentration for TRH and VOCs.

Analytical results of the maximum soil vapour concentrations reported during the June 2019 monitoring are summarised in Table 10.1 and compared against the screening criteria listed in Section 7.

Table 10.1: Maximum Soil Vapour Results from June 2019 (µg/m^3)

Chemical of Concern in Soil Vapour	Soil Vapour Screening criteria	Detections	Maximum Soil Vapour Concentration	Screening Criteria Reference
Benzene	4,000	0	<27	NEPM (2013) HSL D
Toluene	4,800,000	15	11,000	NEPM (2013) HSL D
Ethylbenzene	1,300,000	0	<3.5	NEPM (2013) HSL D
Xylene	840,000	0	<6.8	NEPM (2013) HSL D
F1 (TRH C_6-C_{10} - BTEX)	680,000	0	<10	NEPM (2013) HSL D
F2 (TRH C_{10}-C_{14} – Naphthalene)	500,000	0	<10	NEPM (2013) HSL D
1,1,1-Trichloroethane	230,000	0	<9.9	NEPM (2013) Interim HIL D
Trichloroethene (TCE)	80	0	<5.6	NEPM (2013) Interim HIL D
Tetrachloroethene (PCE)	8,000	0	<3.8	NEPM (2013) Interim HIL D
Cis 1,2-Dichloroethene (DCE)	300	0	<7.8	NEPM (2013) Interim HIL D
Vinyl Chloride (VC)	100	0	<48	NEPM (2013) Interim HIL D

In assessing the analytical results, the Auditor makes the following observations:

- Concentrations of volatile contaminants were not detected above PQLs at any location except for toluene which was measured at all locations at concentrations of between 97 and 11,000 µg/m^3.

Detected concentrations were below the assessment criteria of 4,800,000 µg/m^3. The source of the toluene is unclear and is not commented on by Geo-Logix.

- Soil vapour sampling was not undertaken in eastern areas of the site where chlorinated hydrocarbons have been detected in groundwater. Geo-Logix indicate that the risk to future site users from vapour intrusion is not a complete exposure pathway in this area as the current and future building in this location are on suspended slab.
- Geo-Logix conclude that *"With the exception of the potential for trench worker inhalation exposure in the eastern portion of the site, no complete exposure pathways between TCE contaminated groundwater and potential receptors have been identified. The potential for trench worker inhalation of TCE requires further investigation."*

10.1 Auditor's Opinion

The passive soil vapour sampling did not identify elevated concentrations of VOCs in soils vapour beneath the current warehouse on Lot 1 and to the west of the retaining wall on Lot 2. While use of passive samplers provides a semi-quantitative assessment of vapour intrusion risks, based on detections of the contaminants of concern below laboratory PQLs, the vapour intrusion pathway is considered incomplete in this portion of the site.

The Auditor notes that soil vapour sampling has not been completed on the lower, eastern section of the site (Lot 2) where the highest concentrations of TRH F1, TCE, DCE and VC were detected in groundwater. While Geo-Logix conclude that the risk to future commercial site users from TCE contamination in groundwater in the eastern portion of the site is low as the building will be constructed on a suspended slab, they indicate that there may be a potential risk to trench workers accessing service trenches in this portion of the site from vapour intrusion pathways. The basis for this conclusion is not specifically discussed but is assumed to be related to concentrations of chlorinated hydrocarbons and petroleum hydrocarbons detected in wells MW102 and GW4. The potentially complete vapour intrusion exposure pathways that require further consideration or assessment are discussed in Section 11.

11. EVALUATION OF CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a representation of the source, pathway and receptor linkages at a site. Geo-Logix developed a CSM to inform the investigation strategy adopted for the DSI and provided an updated CSM based on the results of the DSI. Table 11.1 provides the Auditors review of the final CSM used by Geo-Logix to conclude on site suitability.

Table 11.1: Review of the Conceptual Site Model

Element of CSM	Consultant	Auditor Opinion
Contaminant source and mechanism	Geo-Logix do not specifically identify the contaminant sources and mechanism within the CSM but have undertaken a review of site history and have identified contaminants related with potential site activities including use of the site for the manufacture of white goods, and plastic packaging, USTs, ASTs and vehicle maintenance, uncontrolled filling of the site and neighbouring land uses. Following the DSI, Geo-Logix inferred the source of the TCE and its degradation products was the off-site former printing facility to the south-east of the site and that chlorinated hydrocarbons were migrating on to the site in groundwater within the alluvial	The potential sources of contamination have been identified, however the source of the TCE and its degradation products detected in groundwater in the eastern portion of the site is uncertain and is discussed in the data gaps section below.

Element of CSM	Consultant	Auditor Opinion
	sediments of the former creek channel that underlies the site.	
Affected media	Soil, soil vapour and groundwater	The affected media have been identified. There is limited temporal groundwater data for VOC analysis and the soil vapour risk associated with VOCs in groundwater in the eastern portion of the site has not been investigated.
Receptor identification	Geo-Logix identified the following potential receptors: • On-site commercial users • On-site construction workers • On-site maintenance/trench workers • Neighbouring site users • Terrestrial ecology • Groundwater • Recreational users of surface water • Aquatic ecosystems in Haslams Creek and Parramatta River	The identified receptors are appropriate.
Exposure pathways	Identified exposure pathways considered in the CSM included: • Soil ingestion, dermal contact and dust inhalation • Inhalation of vapours in indoor air and outdoor air derived from soil and groundwater • Leaching of contaminants from soils to groundwater • Abstraction of groundwater • Discharge of contaminated groundwater to surface water Exposure to terrestrial ecology is considered incomplete due to hardstand limiting soil access across the site. Exposure to surface water are identified as being incomplete.	The considered exposure pathways are appropriate, however there is no rationale provided by Geo-Logix for considering the exposure pathway to surface water as incomplete. TCE impacts in groundwater have been delineated to the north-east but are present in one well (MW104) in the north-eastern corner of the site and on the eastern site boundary (MW102) adjacent to Haslams Creek. Concentrations of TCE in MW102 exceed the GIL.
Presence of preferential pathways for contaminant movement	Geo-Logix acknowledges the potential for the infilled creek to act as a preferential pathway for groundwater migration and the presence of peat layers in the alluvial sediments that may act as stores of TCE enabling back diffusion of VOCs into groundwater. The potential for vapour intrusion into future subsurface service trenches is identified.	The Auditor agrees that the potential for vapour intrusion into service trenches requires further consideration. The potential for preferential pathways for vapour intrusion into future on-site buildings and existing off-site commercial buildings is not discussed in the CSM and should be considered further.
Evaluation of data gaps	The potential vapour intrusion risk to trench workers is identified as a data gap. The potential for buried areas of asbestos to be present on the site is identified as requiring further investigation to confirm if any management or remediation is required.	In addition to the identified data gaps, the following data gaps are identified and discussed further below: • The source of the TCE in groundwater is uncertain, particularly impacts at MW102. • Additional temporal groundwater data is required to assess temporal variation in concentrations of VOCs in groundwater

Element of CSM	Consultant	Auditor Opinion
		and confirm the potential vapour intrusion risk to off-site receptors is low. • Details of the final development design are required to confirm assumed exposure scenarios for on-site vapour intrusion pathways are applicable. • Removal of USTs, validation of surrounding soils and assessment of the need for additional groundwater assessment in these areas. • Validation of soils under building footprints and hardstand through visual inspection for ACM and potential unidentified sources of contamination.
Potentially complete source-pathway-receptor (SPR) linkages	Geo-Logix identify the following potentially complete exposure scenarios: • Construction worker exposure to bonded asbestos during site redevelopment • Trench worker exposure to asbestos during operation of the site • Trench worker inhalation of TCE vapour emanating from groundwater while completing sub surface maintenance works. Geo-Logix indicate that any potential risk from the presence of asbestos or TCE in vapour can be managed through implementation of a site-specific long-term Environmental Management Plan (EMP).	In addition to the complete SPR linkages identified by Geo-Logix, the potential vapour intrusion risk to on and off-site receptors from VOCs in groundwater in the eastern portion of the site requires further consideration to confirm that exposure scenarios do not pose a risk following site redevelopment and to confirm that there is no risk posed by preferential pathways for vapour intrusion. This is discussed further below.

Based on the CSM, Geo-Logix conclude that "*the site can be made suitable for the proposed commercial redevelopment. If there is potential for worker exposure presented by either trench worker inhalation of TCE or construction worker exposure to bonded asbestos, the risk could be managed through implementation of a site-specific Environmental Management Plan detailing safe work procedures during construction and long-term operation of the site".*

11.1 Auditor's Opinion

The Auditor is of the opinion that the CSM is a reasonable representation of the contamination at the site although notes that additional information is required to increase certainty in the CSM and confirm site suitability for the proposed development. The data gaps identified by Geo-Logix and by the Auditor in Table 11.1 are discussed below.

11.2 Evaluation of Data Gaps

Temporal variation in concentrations of TCE, DCE and VC in groundwater

Groundwater data for most wells was collected over a limited time period (June to September 2019). Additional groundwater data would be beneficial to confirm contaminant concentrations and the inferred low risk to off-site receptors including the vapour intrusion risk to off-site receptors on 15 Percy Street and the potential risk to Haslams Creek from migration of impacted groundwater.

On-site and Off-site Vapour Intrusion Risk

Concentrations of TCE in shallow groundwater in the eastern portion of the site may pose a potential vapour intrusion risk to on-site construction and maintenance workers undertaking subsurface works

and future commercial site users if complete exposure pathways are present following redevelopment of the site. The Auditor understands that the ground level area beneath the suspended slab will be used as a carpark and that, while the final development design is not available, the car park is unlikely to be enclosed and will not include enclosed work areas. The final design and use of the eastern portion of the site needs to consider potential exposure pathways for soil vapour and the potential for preferential pathways for vapour intrusion to be created through the redevelopment. This includes the potential for piling, service trenches, sumps or elevators to present a potential vapour exposure risk to future site users.

The source of the TCE in the eastern portion of the site is unclear. No soil vapour data has been collected in the vicinity of MW102 to assess the distribution of TCE in the subsurface in the area. Additional assessment of soil vapour in the eastern portion of the site would also assist with determining the lateral extent of soil vapour impact and determine if the source of TCE is present on-site or off-site, which has implications for assessing ongoing risk to on and off-site receptors.

The risk to off-site receptors on 15 Percy Street through vapour intrusion is likely to be low, however, this should be confirmed through collection of additional groundwater data for boundary wells and consideration of preferential pathways for vapour intrusion.

Removal and Validation of USTs

Geo-Logix report that there are potentially three USTs present on the site. It is assumed these USTs will be removed and surrounding soils validated for contaminants of concerns. Based on field observations and soils analytical results, the requirement for additional groundwater investigation should be assessed. The current groundwater data set suggests a low risk to future site users from groundwater impacts associated with USTs. The removal of the USTs could be completed during the redevelopment program.

Validation of Soils for ACM and Unidentified Contamination Sources

Geo-Logix indicate that some fragments of ACM were observed on the ground surface and that these can be remediated through handpicking. They also identify the potential for ACM to be present in fill in portions of the site. A detailed visual inspection of the fill material for ACM has not been completed at the site due to the presence of hardstand and completion of soil sampling locations using relatively small diameter boreholes. The Auditor agrees that validation of the site for ACM is required and can be completed during the redevelopment works.

12. CONCLUSIONS AND RECOMMENDATIONS

The Auditor agrees that the site can be made suitable for the future commercial development if the existing data gaps are addressed and provides the following recommendations:

1. Additional assessment to confirm that there is no on-site source of TCE in the vicinity of well MW102.
2. Additional assessment of the potential vapour intrusion risk to on and off-site receptors from chlorinated hydrocarbon concentrations in groundwater on-site. The assessment should include the potential for preferential pathways for vapour migration and temporal considerations.
3. Preparation and implementation of a Remediation Action Plan (RAP) outlining the removal and validation of the identified USTs and the ACM identified at the site surface and in shallow soils by Geo-Logix. The RAP should also consider the need for further groundwater characterisation in the vicinity of the abandoned UST should residual contamination be observed during remediation of the USTs. The RAP should include an inspection process during removal of hardstand to assess for any unidentified sources of contamination.
4. Any material being removed from site should be classified for off-site disposal in accordance the EPA (2014) *Waste Classification Guidelines*.

5. Any material being imported to the site should be assessed for potential contamination in accordance with NSW EPA guidelines as being suitable for the intended use or be classified as VENM.
6. Preparation of a final site validation report by a qualified environmental consultant, certifying the suitability of the site for the proposed development.
7. Preparation of an Environmental Management Plan (EMP) for the management of any contamination remaining on site following the redevelopment that presents a risk to human health or the environment.

* * *

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

Louise Walkden

EPA Accredited Site Auditor 1903

Attachments: 1 Site Locality Plan

2 Site Boundaries

3 Site Layout and Soil Sampling Locations

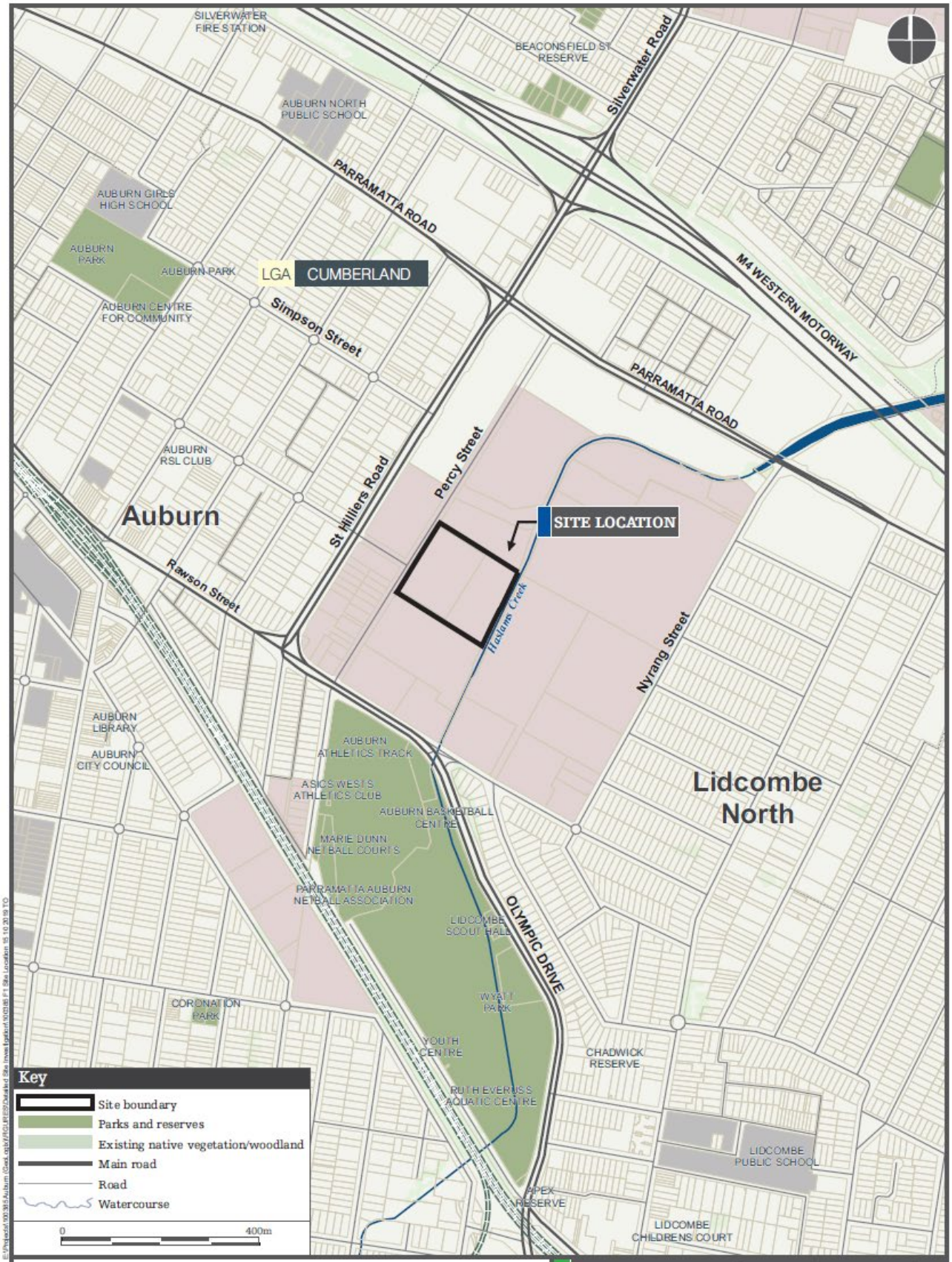
4 OTEK and WSP Sample Locations

5 MiHPT Bore Locations

5 Groundwater Monitoring Well Locations

6 Soil Vapour Sample Locations

Attachment 1: Site Locality Plan



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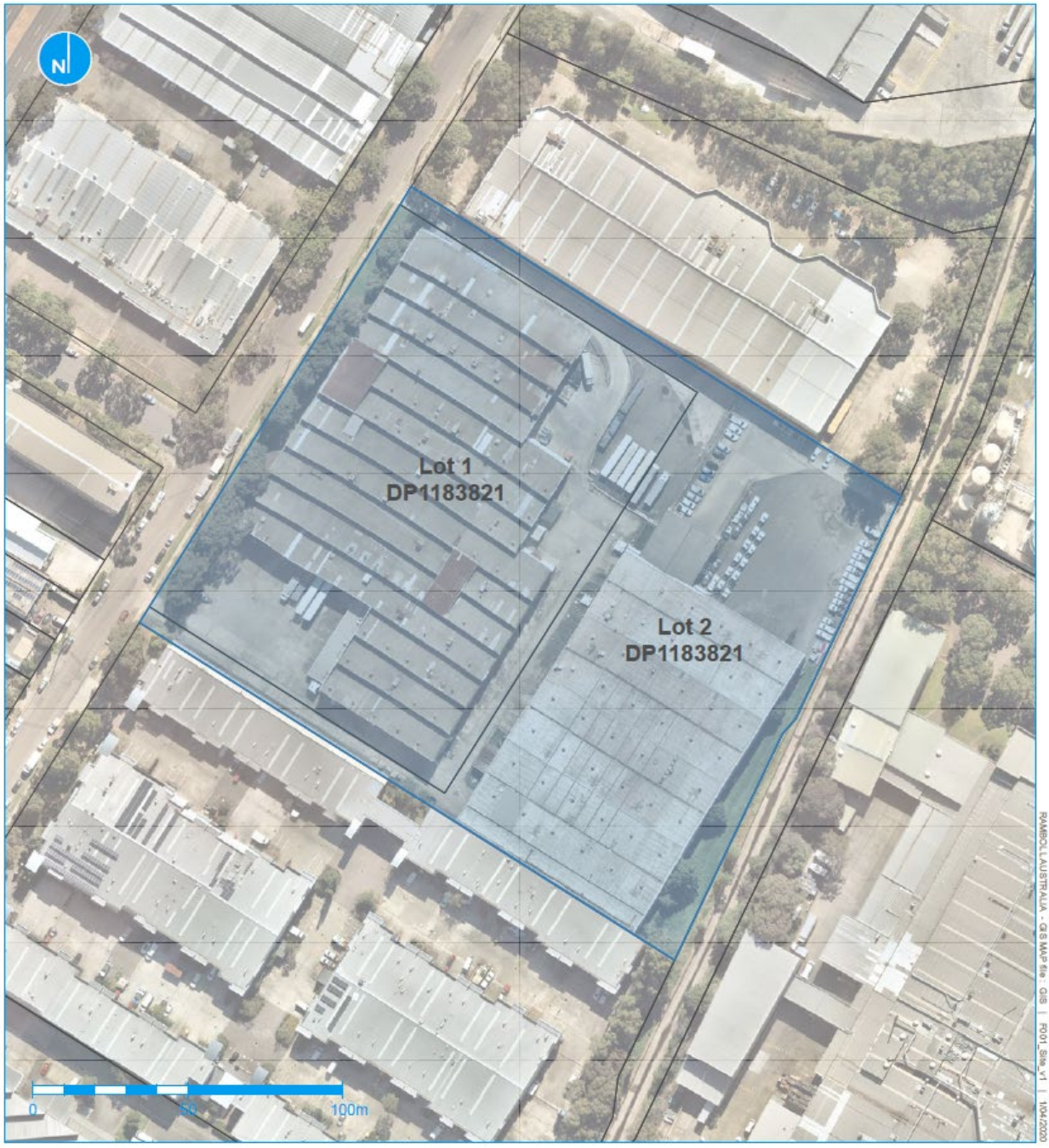
SITE VICINITY MAP

Detailed Site Investigation
11-13 Percy Street, Auburn NSW

Project No. 1901048

Figure 1

Attachment 2: Site Boundaries



Legend

Site boundary
Lot boundaries

A4
1:1,750

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environment • geotech

SOIL SAMPLE LOCATIONS

Detailed Site Investigation
11-13 Percy Street, Auburn NSW

Project No. 1901048

Figure 3

Attachment 3: Site Layout and Soil Sampling Locations

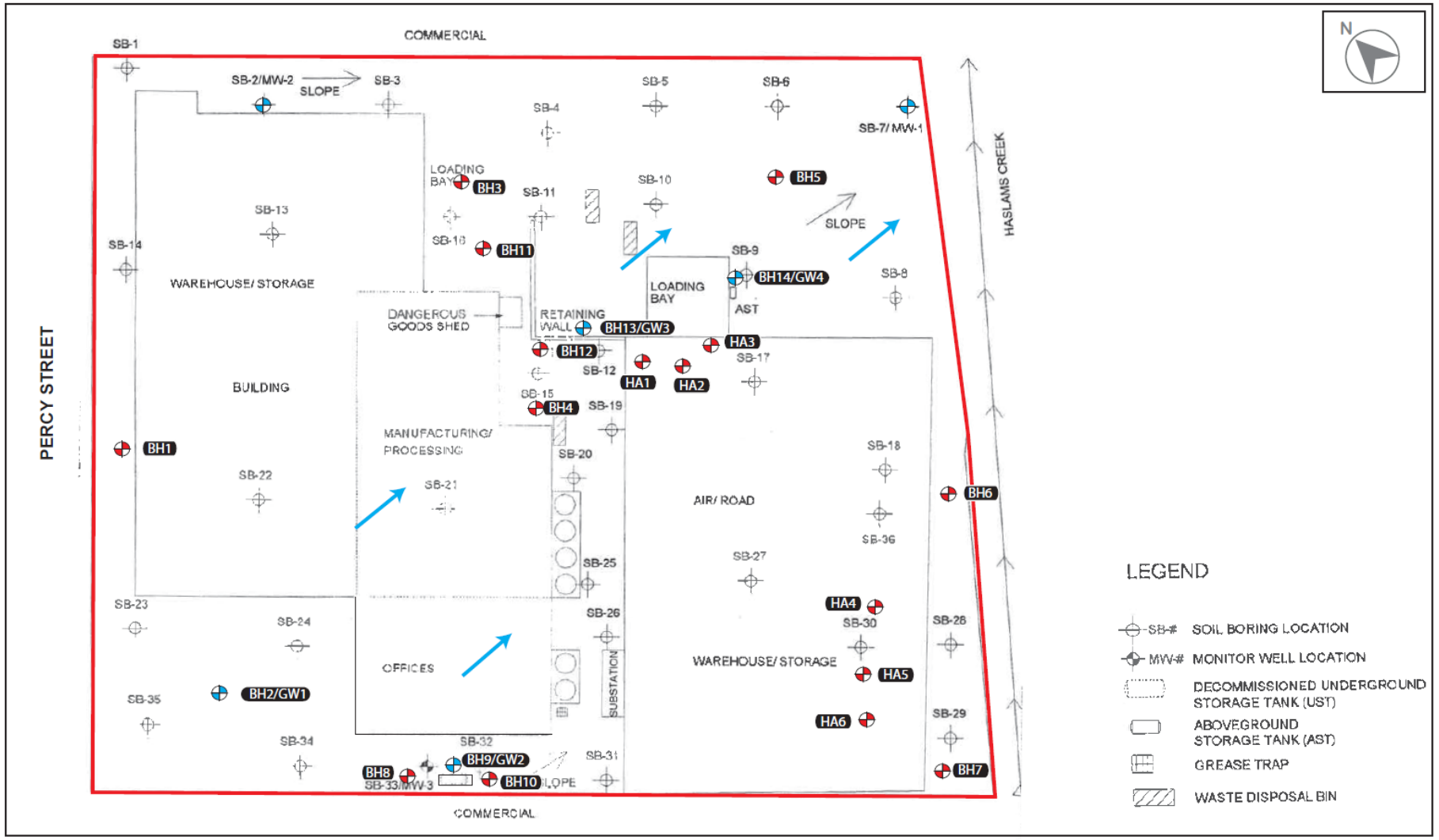

Image Courtesy of OTEK Australia Pty Ltd - S99126 12/12/99

Site Boundary

BH1 Soil Bore Location

GW1 Monitoring Well Location

Inferred Groundwater Flow Direction

*Figure not to scale

Investigation Locations

11-13 Percy Street, Auburn NSW

00030196

FIGURE 3

UNITED BY OUR DIFFERENCE WSP

Attachment 4: OTEK and WSP Sample Locations

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HIGH RESOLUTION SITE CHARACTERISATION LOCATION MAP

Detailed Site Investigation
11-13 Percy Street, Auburn NSW

Project No. 1901048

Figure 5

Attachment 5: MiHPT Bore Locations

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GROUNDWATER WELL LOCATIONS

Detailed Site Investigation
11-13 Percy Street, Auburn NSW

Project No. 1901048

Figure 6

Attachment 6: Groundwater Sampling Locations

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SOIL VAPOUR SAMPLE LOCATIONS

Detailed Site Investigation
11-13 Percy Street, Auburn NSW

Project No. 1901048

Figure 4

Attachment 7: Soil Vapour Sampling Locations

7 August 2020

Fabcot Pty Ltd
1 Woolworths Way
Bella Vista NSW 2153

Attn: Michael Rumble

By email: mrumble@woolworths.com.au

Dear Michael

Ramboll Australia Pty Ltd
Level 3, 100 Pacific Highway
PO Box 560
North Sydney NSW 2060

T +61 2 9954 8100
www.ramboll.com

Ref 318000944

RE: INTERIM AUDIT ADVICE LETTER NO. 2 - DATA GAP ASSESSMENT, 11-13 PERCY STREET, AUBURN NSW

1. INTRODUCTION

As a NSW Environment Protection Authority (EPA) accredited Contaminated Sites Auditor, I am conducting an Audit in relation to the site located at 11-13 Percy Street, Auburn NSW identified as Lots 1 and 2 in DP1183821 (Attachment 1). The audit has been commissioned by Fabcot Pty Ltd (Fabcot) who propose to develop the site as a Woolworths Customer Fulfilment Centre (CFC) which will comprise a single storey warehouse and distribution centre for online sales.

An initial interim audit advice dated 11 May 2020 (**IAA No. 1**) was prepared to provide an independent review of the suitability and appropriateness of the environmental investigations undertaken at the site up until that date and provide recommendations for any additional actions required to make the site suitable for the proposed commercial/industrial use.

IAA No. 1 identified some data gaps that were to be addressed to further characterise the contamination status of the site and confirm site suitability. The recommendations included in IAA No.1 were:

1. *Additional assessment to confirm that there is no on-site source of TCE in the vicinity of well MW102.*
2. *Additional assessment of the potential vapour intrusion risk to on and off-site receptors from chlorinated hydrocarbon concentrations in groundwater on-site. The assessment should include the potential for preferential pathways for vapour migration and temporal considerations.*
3. *Preparation and implementation of a Remediation Action Plan (RAP) outlining the removal and validation of the identified USTs and the ACM identified at the site surface and in shallow soils by Geo-Logix. The RAP*

should also consider the need for further groundwater characterisation in the vicinity of the abandoned UST should residual contamination be observed during remediation of the USTs. The RAP should include an inspection process during removal of hardstand to assess for any unidentified sources of contamination.

4. *Any material being removed from site should be classified for off-site disposal in accordance the EPA (2014) Waste Classification Guidelines.*
5. *Any material being imported to the site should be assessed for potential contamination in accordance with NSW EPA guidelines as being suitable for the intended use or be classified as VENM.*
6. *Preparation of a final site validation report by a qualified environmental consultant, certifying the suitability of the site for the proposed development.*
7. *Preparation of an Environmental Management Plan (EMP) for the management of any contamination remaining on site following the redevelopment that presents a risk to human health or the environment.*

Fabcot engaged Geo-Logix Pty Ltd (Geo-Logix) to undertake an additional soil vapour assessment and groundwater monitoring event to address recommendations *1* and *2* above. The results of these investigations were documented in the following reports:

- 'Soil Vapour Investigation Report, 11-13 Percy Street, Auburn, NSW' dated 21 July 2020, Geo-Logix (*the soil vapour investigation*).
- 'Groundwater Monitoring Event, 11-13 Percy Street, Auburn, NSW' dated 29 July 2020, Geo-Logix (*the May 2020 GME*).

This interim advice provides comments on the above reports and summarises the remaining tasks to be completed in the audit process.

It is noted that since the preparation of IAA No. 1, the development design for the CFC has been amended such that there is no enclosed basement level in the south-eastern portion of the site and the building design in this area will be suspended slab with an open and unoccupied area below the suspended slab (the undercroft). The revised design plan is provided in Attachment 2.

It is also noted that, based on the detection of volatile chlorinated hydrocarbons (VCH) in groundwater at the site and on the up-gradient boundary, Fabcot notified the site to the NSW EPA under Section 60 of the *Contaminated Land Management Act 1997* (the CLM Act) in a letter dated 22 April 2020 and received an acknowledgement letter from the EPA dated 21 May 2020 indicating that they are currently reviewing the notification to determine if it is significant enough to warrant regulation under the CLM Act.

In a letter prepared by Geo-Logix entitled 'Response to Interim Audit Advice Letter No 1' dated 21 May 2020, Geo-Logix confirmed that the two known existing underground storage tanks (USTs) at the site had been decommissioned insitu by filling with concrete and that it was intended to leave the tanks insitu during the redevelopment.

2. COMMENTS ON THE SOIL VAPOUR INVESTIGATION

Geo-Logix report that the objectives of this investigation were to evaluate the following:

- Potential vapour inhalation pathways across the south eastern portion of the site where the enclosed 'basement' area was proposed (now proposed to be an undercroft);
- If the caged drum area in the existing undercroft area may be the source of TCE contamination; and

- Vapour intrusion pathway to indoor air of the commercial / industrial building on 15 Percy Street to the north and downgradient of the site.

The objectives are considered appropriate and were assessed through installation and sampling of 16 soil vapour wells across the footprint of the originally proposed basement area and in the area where an onsite detention (OSD) tank is to be located, and three sub-slab vapour samples along the boundary with the offsite property to the north at 15 Percy Street. Soil vapour samples were collected and analysed for volatile organic compounds including VCH. Geo-Logix defined data quality objectives (DQOs) for the investigation. I consider that the sampling density, locations and sampling methodology were acceptable for addressing the investigation objectives. I attended the site during the soil vapour sampling completed on the 26 May 2020 to observe the sampling locations and sampling methodology employed for sampling of the soil vapour wells VP1-VP16.

I am in general agreement with the conclusions of the soil vapour investigation drawn by Geo-Logix. These are that:

- The source of the chlorinated hydrocarbon impact in groundwater appears to be from a source upgradient of the site to the east or south-east and that the soil vapour plume resulting from the groundwater impact is generally delineated in the south-eastern portion of the site.
- Based on the proposed development design, there is no complete exposure pathway to future commercial site occupants from vapour inhalation pathways.
- There is a potential vapour intrusion risk to subsurface maintenance or construction workers in a localised area within the south-eastern portion of the site from vapour inhalation.
- The indoor inhalation risk to occupants of the commercial building to the north of the site on 15 Percy Street is incomplete.

I provide the following specific comments on the report:

1. Section 2.3, sixth paragraph, indicates that '*Scrap metal, building rubble and general rubbish was noted in the undercroft parking area',* does this description include potential asbestos containing materials (ACM)? If ACM was detected, the location and nature of the ACM should be included.
2. Section 2. This section would benefit from a sub-section describing the proposed development and reference development plans included in an Attachment so that the location of the suspended slab can be defined.
3. Section 4, Preliminary Conceptual Model. As the CSM is based on data from the DSI, should the exposure pathway to onsite users from vapour inhalation from groundwater be considered potentially complete, hence one of the objectives of this vapour assessment was to further assess that potential pathway? I understand that subsequently the development design changed, mitigating this exposure pathway, however this was still considered a potential exposure pathway at the outset of the investigation and in the DQOs.
4. Section 7.1. The bullet points refer to soil vapour *samples collected*, should this read soil vapour *wells installed*? Not all installed wells were sampled, and it would be beneficial to identify which wells were not sampled due to water infiltration.
5. Section 7.1. Last paragraph includes a comment that the soil samples collected from VP1-VP16 and VP20 were collected from immediately above the capillary fringe. It would be useful to include the approximate depth to groundwater beneath the undercroft area and at location VP20 from groundwater well monitoring data to confirm the soil vapour sampling intervals in vapour wells installed in the undercroft and at location VP20 are at similar depths above groundwater. This would confirm concentrations of chlorinated hydrocarbons detected in VP20 and VP4 were measured at equivalent depths above groundwater.

6. Section 8.3 RPD results, typo - refers to soil rather than soil vapour.
7. Section 9, Discussion. This section should discuss which wells were not sampled and why (were all unsampled wells waterlogged?).
8. Attachment D Laboratory certificates. Some laboratory certificates have been duplicated e.g. report 723076. Is there a laboratory certification of cleanliness for the summa canister?

3. COMMENTS ON THE MAY 2020 GME

Geo-Logix report that the objective of the May 2020 GME was to *'evaluate current groundwater contaminant conditions to confirm the findings of the Geo-Logix (2019) DSI Report.'*

The scope of works included the sampling of on and off-site groundwater wells and analysis for total recoverable hydrocarbons and VCHs.

The results of the May 2020 monitoring indicated that concentrations of VCH in groundwater were comparable to those in June 2019. Geo-Logix concluded that "*The absence of increasing TCE concentrations and the demonstration of continued degradation of TCE and its breakdown products in groundwater beneath the site confirms the findings of the DSI report. No remediation of groundwater or on-going groundwater monitoring is considered warranted under the proposed Fabcot development*."

I am in general agreement with this conclusion. The extent of VCH in groundwater has been delineated to the north. VCH were detected in groundwater from well MW104 located in the north-eastern corner of the site, and there is the potential that VCH impacts extend offsite to the north-east towards Haslams Creek. The potential risk to downgradient receptors from VCH detected in down-gradient well MW104 should be discussed in the conclusions of the report.

4. CONCLUSIONS AND RECOMMENDATIONS

The reports reviewed in this interim audit advice (IAA No. 2) address data gaps identified in IAA No. 1. ACM has previously been identified at the site and there is the potential for additional underground tanks or other unexpected finds to be encountered during the redevelopment. Therefore, the following actions are proposed to confirm the suitability of the site for the future commercial development:

1. Preparation and implementation of a Remediation Action Plan (RAP) outlining the removal and validation of the ACM identified at the site surface and in shallow soils by Geo-Logix and the protocol to be followed if unexpected finds are encountered. The RAP should include an inspection process during removal of hardstand to assess for any unidentified sources of contamination.
2. Any material being removed from site should be classified for off-site disposal in accordance the EPA (2014) *Waste Classification Guidelines*.
3. Any material being imported to the site should be assessed for potential contamination in accordance with NSW EPA guidelines as being suitable for the intended use or be classified as VENM.
4. Preparation of a final site validation report by a qualified environmental consultant, certifying the suitability of the site for the proposed development.
5. Preparation of an Environmental Management Plan (EMP) for the management of any contamination remaining on site following the redevelopment that presents a risk to human health or the environment.

* * *

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

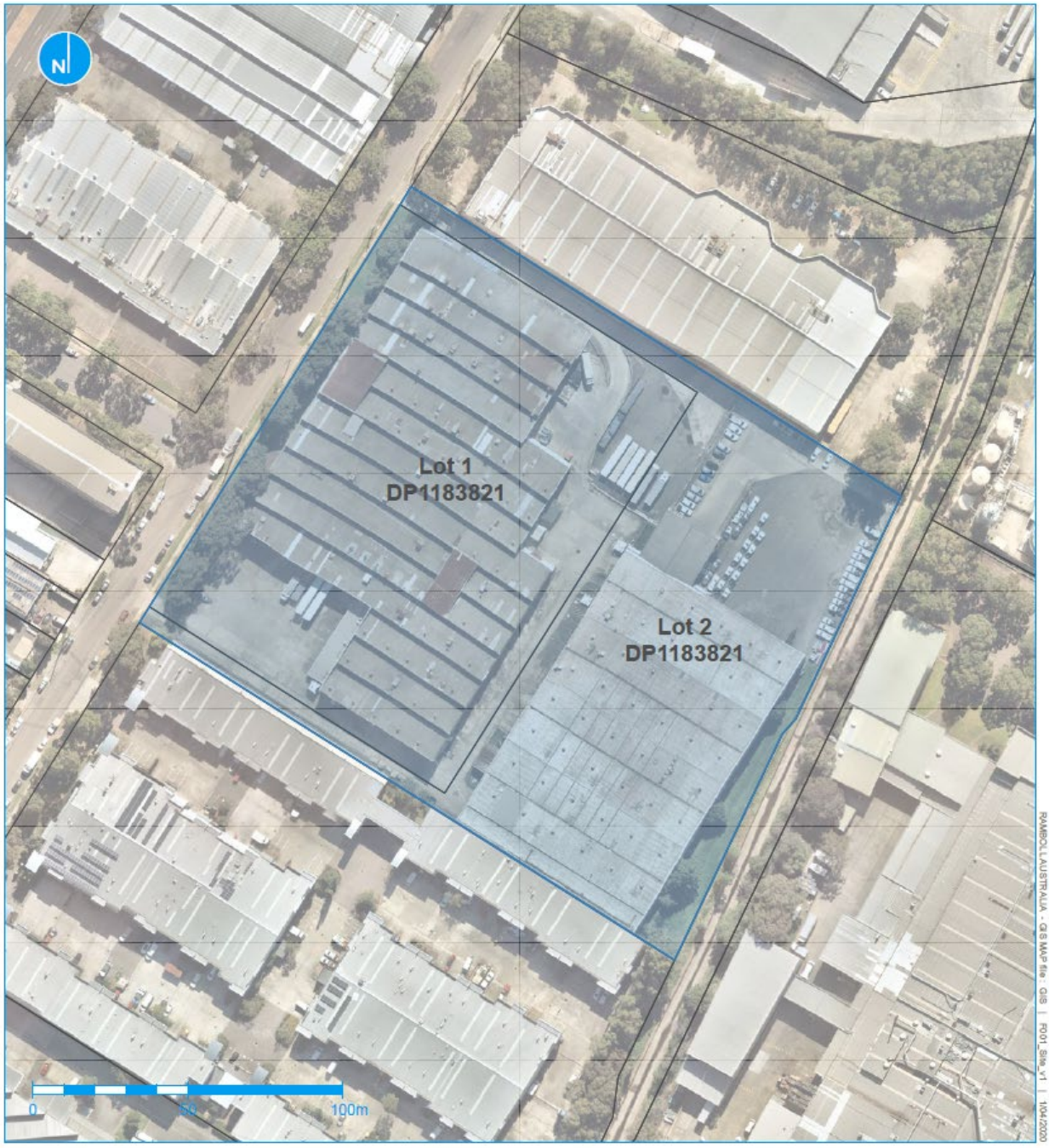
Louise Walkden

EPA Accredited Site Auditor 1903

Attachments: 1 Site Boundaries

2 Proposed Development Plan

Attachment 1: Site Boundaries



Legend

Site boundary
Lot boundaries

A4
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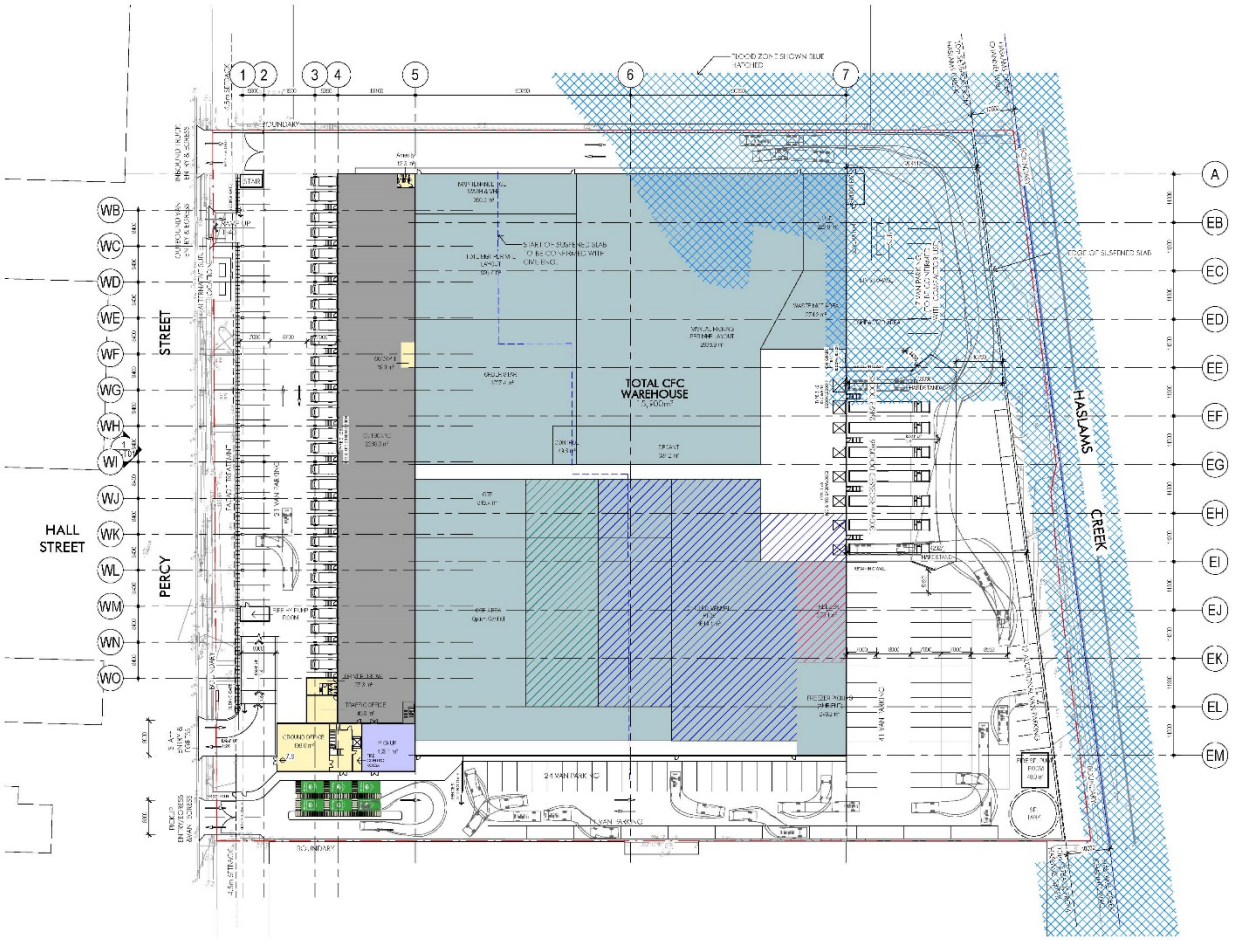

AREA SCHEDULE

WAREHOUSE	**18,720**	m²
GROUND FLOOR (incl. outbound)	15,900	m²
MEZZ. FLOOR	2,820	m²
OFFICE	**888**	m²
CFC OFFICE - GROUND (incl. wh amenity, cockpit, driver break room, traffic office)	302	m²
CFC OFFICE - LEVEL 1	556	m²
CFC OFFICE LOBBY - CARPARK	30	m²
PICKUP	**135**	m²
TOTAL AREA	**19,743**	m²

PARKING

STAFF PARKING	**156**
PICK UP BAYS	**6**
VAN PARKING	**116**
RECEIVING DOCKS 1300mm	6
DELIVERY TRUCK DOCKS 900mm	28
B2B STAGING TRUCKS	2

LEGEND:

FRESH 12°C

CHILL 2°C

FREEZER -18°C

Key Plan

Issue	Description	Date

Client Logo

Builders Logo

Project Name
CFC Percy St. Auburn

Project Address
13 Percy Street, Auburn, NSW 2144

Drawing Title
SITE / GROUND FLOOR PLAN - OPTION 8

Author	Checker	Sheet Size	Scale
Author	Checker	A1	

Drawing Number: **11250_SK030** Issue: **P1**

nettletontribe

Attachment 2: Proposed Development Plan