

Report on Preliminary Site Investigation (Contamination)

Precinct Rezoning Orchard Hills Precinct, Orchard Hills

Prepared for Department of Planning, Housing and Infrastructure

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

	Signature		Date
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Executive Summary

Douglas Partners Pty Ltd (DP) has been engaged by the Department of Planning, Housing and Infrastructure (DPHI) to complete this preliminary site investigation (contamination) (PSI) for precinct planning and rezoning at the Orchard Hills Precinct, Orchard Hills NSW (the site). The site comprises an approximate area of 1395 hectares (ha) and is shown on Drawing 1, Appendix A.

It is understood that part of the site is to undergo rezoning to provide for a series of new residential neighbourhoods and support a proposed Western Sydney Airport Metro station. The draft Precinct Plan and Stage 1 rezoning Indicative Landuse Plan (ILP) is provided in Appendix A. Douglas notes that areas outside of the Stage 1 rezoning area are not proposed to be rezoned as part of the current precinct planning process.

The objective of this PSI is to assess the potential for gross or widespread contamination, which may preclude rezoning at the site based on past and present land uses, and to comment on the need for further investigation and/or management regarding the proposed rezoning.

A previous PSI (Douglas Ref. 216919.00.02.R.002,Rev0) was prepared by Douglas for the site in July 2023. This revision of the PSI (Rev1) supersedes the previous PSI and was requested by DPHI based on further information provided by the Department of Defence and a Preliminary PFAS Investigation completed by Douglas in April 2024 (as discussed in Section 5.2).

DP completed the following scope of works as part of the PSI:

- A review of available site history and background information to identify potential contamination sources and associated potential contaminants of concern;
- A site inspection to observe features identified in the desktop study; and
- Preparation of this report with reference to relevant EPA guidelines, including development of a conceptual site model and an opinion on contamination constraints which may preclude rezoning of the site.

The results of the desktop investigation identified that the site and surrounds have a history of rural and residential land use since prior to at least 1947. Since the 1960s, commercial and educational land use has occurred in limited areas of the site. The Patons Land Landfill (the landfill) was established in the south-eastern part of the site in the late 1980s. Additionally, Defence Establishment Orchard Hills (DEOH) was established to the south of the site in the 1950s.

Two potential contamination issues associated with DEOH were identified by the previous PSI being:

- The migration of per- and poly-fluoroalkyl substances (PFAS) which may have been used in aqueous firefighting foams during historical training exercises at the establishment; and
- Munition testing that may have resulted in unexploded ordinance (UXO) and exploded ordinance (EO) on the site.

The potential for PFAS contamination and UXO/EO within the site associated with DEOH was not however considered to present an unacceptable risk to the proposed rezoning or affect the suitability of the site based on the results of the preliminary PFAS investigation (Discussed in section 5.2) and the correspondence from Department of Defence that states "*the area outside of DEOH has no risk of UXO, or residual burial activities associated with operation of the depot*".



Patons Lane Landfill is located within the south-eastern part of the site however the landfill boundary is greater than 500 m from the closest additional residential development potential, in the Vines. Potential leachate impacted groundwater and subsurface gas migration associated with decomposing waste material at the Patons Lane Landfill has the potential to constrain development in the vicinity of the landfill. Douglas recommends that an appropriate buffer zone, which excludes residential development within approximately 440 m of Patons Lane Landfill be implemented.

Based on the distance between the landfill and the proposed residential areas shown on the ILP, Douglas considers that the landfill does not present a constraint to the proposed rezoning. Notwithstanding, any future development at or surrounding the landfill should take into consideration potential impacts associated with the landfill. Specific consideration should be given to the construction of above or below ground structures that would increase the risk of landfill gas build up or interception of leachate. Any potential odour issues associated with the landfill should also be assessed by an appropriately qualified consultant.

Several other potential contamination sources (fill; agricultural land use; current and previously demolished structures; fuel and chemical storage; cattle tick dip sites; and septic tanks) were identified within the site. While a detailed assessment of these sources was not completed as part of the PSI, Douglas considers that they present a low potential for gross or widespread contamination and therefore do not constrain rezoning of the site. Further investigation of these sources should be completed with reference to the NEPC (2013) and NSW EPA (2020) following rezoning, and in advance of any development applications for subdivision or bulk earthworks. The further investigations should incorporate the identification and targeted contamination testing of areas of environmental concern. Post rezoning investigations could be completed either wholistically or on a site-by-site basis. Additionally, prior to demolition, structures should be subject to hazardous building material assessments.



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Report on Preliminary Site Investigation (Contamination) Precinct Rezoning Orchard Hills Precinct, Orchard Hills

1. Introduction

Douglas Partners Pty Ltd (Douglas) has been engaged by the Department of Planning, Housing and Infrastructure (DPHI) to complete this preliminary site investigation (contamination) (PSI) for precinct planning and rezoning at the Orchard Hills Precinct, Orchard Hills NSW (the site). The site comprises an approximate area of 1395 hectares (ha) and is shown on Drawing 1, Appendix A.

It is understood that part of the site is to undergo rezoning to provide for a series of new residential neighbourhoods and support a proposed Western Sydney Airport Metro station. The draft Precinct Plan and Stage 1 rezoning Indicative Landuse Plan (ILP) is provided in Appendix A. Douglas notes that areas outside of the Stage 1 rezoning area are not proposed to be rezoned as part of the current precinct planning process.

The objective of this PSI is to assess the potential for gross or widespread contamination, which may preclude rezoning at the site based on past and present land uses, and to comment on the need for further investigation and/or management regarding the proposed rezoning.

The following key guidelines were consulted in the preparation of this report:

- HEPA *PFAS National Environmental Management Plan (NEMP).* Version 2.0: Heads of EPAs Australia and New Zealand and Australian Government Department of the Environment (HEPA, 2020);
- NEPC National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM] (NEPC, 2013);
- NSW DUAP/EPA Managing Land Contamination, Planning Guidelines, SEPP 55 Remediation of Land (NSW DUAP/EPA, 1998);
- NSW EPA *Environmental Guidelines, Solid Waste Landfills, Second Edition* (NSW EPA, 2016); and
- NSW EPA Guidelines for Consultants Reporting on Contaminated Land (NSW EPA, 2020).

The PSI was completed concurrently with a preliminary geotechnical assessment comprising a desktop assessment and site inspection (i.e., no intrusive investigation work), which will be reported separately. This report must be read in conjunction with all appendices, including the notes provided in Appendix A.

A previous PSI (Douglas Ref. 216919.00.02.R.002,Rev0) was prepared by Douglas for the site in July 2023. This revision of the PSI (Rev1) supersedes the former PSI and was requested by DPHI based on further information provided by the Department of Defence and a Preliminary PFAS Investigation completed by Douglas in April 2024 (as discussed in Section 5.2).



2. Scope of Works

DP completed the following scope of works as part of the PSI:

- A review of available site history and background information to identify potential contamination sources and associated contaminants of potential concern (CoPC) including:
 - o A review of topographic, geological, soil, salinity, acid sulfate soil and hydrogeological published information to assess and document the site's environmental setting;
 - o A search for licensed groundwater bores within a 500 m radius of the site;
 - o Review of relevant contaminated land information (provided by the client);
 - o Review of historical aerial photography of the site; and
 - o A search for records of environmental incidents, former environmental licences, or contaminated land notices or notifications, as held by the EPA;
- A site inspection to observe features identified in the desktop study; and
- Preparation of this report with reference to relevant EPA guidelines, including development of a conceptual site model (CSM) and an opinion on contamination constraints which may preclude rezoning of the site.

Section 4.1.2 of NSW DUAP/EPA (1998) includes provision for Generalised Rezoning (i.e., rezonings that cover a large area) where it is difficult for a planning authority to be satisfied that every part of the land is suitable for the proposed use(s) in terms of contamination at the rezoning stage. The guideline states that in these cases, the rezoning should be allowed to proceed, provided measures are in place to ensure that the potential for contamination and the suitability of the land for any proposed use are assessed once detailed proposals are made.

Given the size of the site, the multiple individual lots, and associated access constraints, the scope of the PSI was limited compared to the requirements of NSW EPA (2020) in that:

- The aerial photograph review was undertaken at a relatively low scale with obvious major features noted;
- The site was inspected from publicly accessible areas (i.e., roadways) rather than on a lot-by-lot basis; and
- Other background/desktop information often assessed during preliminary investigations (*i.e.* review of NSW SafeWork Dangerous Goods, Title Deeds and Council Record Searches) were not completed.

Following the guidance of NSW DUAP/EPA (1998), the scope for this PSI was completed with the intention that detailed site investigations (DSI) of the site (likely on a staged basis) will be completed following rezoning, and in advance of any development applications for subdivision or bulk earthworks.

DP notes that State Environmental Planning Policy (SEPP) No. 55 - Remediation of Land (to which NSW DUAP/EPA (1998) relates) has been repealed and replaced by SEPP (Resilience and Hazards) 2021. Notwithstanding, in the absence of a guideline for the Resilience and Hazards SEPP, DP considers the guidance provided in NSW DUAP/EPA (1998) as relevant.



3. Site Information and Proposed Rezoning

3.1 Site Information

Site Address	Orchard Hills Precinct, Orchard Hills.	
Legal Description	The site comprises multiple lots which are summarised in Table B1 (Appendix B).	
Area	Approximately 1395 hectares (ha)	
Zoning	 The site comprises multiple areas of zoning including: Zone RU4 Primary Production Small Lots (most of the site) <u>North-Western Portion of the Site:</u> Zone SP2 Infrastructure (Classified Road, Western Motorway); and Zone SP2 Infrastructure (Water Supply System) <u>Eastern-Portion of the Site:</u> 	
	Zone RE1 Public Recreation	
	Zone RU2 Rural Landscape	
Local Council Area	Penrith City Council	
Current Use	 Rural/residential and residential (most of the site); Educational: Montgrove College (within north-western part of the site); Penrith Christian School (within the western part of the site); and Penrith Anglican College (within the south-western part of the site): Mixed commercial use, including various businesses on site (in the north-western part of the site; Patons Lane Resource Recovery Centre (RRC) and Landfill¹ (south-eastern portion of the site); and Orchard Hills Reservoir (within north-western part of the site). 	
Surrounding Uses	North – Rural/residential and residential; East – Rural residential, South Creek riparian area and limited commercial, beyond which is Mamre Road, followed by residential; South – Orchard Hills Water Filtration Plant (south-west), Defence Establishment Orchard Hills (DEOH) (south), and rural (south-east); West – Penrith Golf Club (south-west) and residential (north-west).	

Of the above referenced site information, the Patons Lane Landfill (located within the south-eastern part of the site) and DEOH (located immediately south of the site) are considered high potential contamination sources and are referenced in subsequent sections of the report.

The site boundary is shown in Figure 1 below, with site features included on Drawing 1.

¹ The Patons Land RRC and Landfill are collectively termed the Patons Lane Landfill or the landfill.





Figure 1: Site Boundary



3.2 Proposed Rezoning

Land use proposed as part of the rezoning is detailed in the indicative layout plan (ILP – provided in Appendix A and Figure 2). Review of the ILP indicates that most of the Stage 1 rezoning area will be rezoned for a variety of residential and mixed uses, local, neighbourhood and community facilities/centres, as well as riparian, open space and constrained land. The Stage 1 rezoning area includes the Orchard Hills Metro Station, its surrounds and the new Metro stabling yard to the south.



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Figure 2: The ILP

Preliminary Site Investigation (Contamination), Precinct Rezoning Orchard Hills Precinct, Orchard Hills



Rezoning of a large area in the south-eastern part of the site is not proposed in the near future (see Figure 3). The area that is not proposed to be rezoned includes part of The Vines

(see Figure 3). The area that is not proposed to be rezoned includes part of The Vines (existing residential area), Samuel Marsden (existing rural residential area), constrained land associated with riparian corridors, a staging area associated with the construction of the Western Sydney Airport Metro (teal shading) and the future Outer Sydney Orbital Stage 1 corridor (grey hatching). This area of the site is specifically relevant to the PSI given potential contamination constraints associated with the Patons Lane Landfill as discussed further in the report. It is understood that the PSI and site-specific constraints that apply to this area have informed the proposed ILP and these areas are not being considered for potential urban land uses.



Figure 3: Excerpt of the ILP showing south-eastern part of the site



4. Environmental Setting

4.1 Topography

Regional topographic data indicates that the site comprises gently undulating rises.

Regional topographic data indicates that the broad scale site topography ranges from reduced level (RL) 50 - 88 m relative to Australian Height Datum (AHD) in the western portion of the site to 26 - 70 m AHD in the eastern portion. The elevation of the northern portion of the site ranges from 104 - 110 m AHD.

4.2 Site Geology

The NSW Seamless Geological Series (GSNSW, 2019) indicates that the site is underlain by Triassic Age Bringelly Shale (mapping unit Twib) of the Wianamatta Group along with Cenozoic aged alluvial floodplain deposits (mapping unit Q_af).

Bringelly Shale typically comprises shale, carbonaceous claystone, claystone, laminite and fine to medium-grained lithic sandstone with occasional coal and tuff. Bringelly Shale typically weathers to form clays of medium to high plasticity. The alluvial floodplain deposits typically comprise silt, very fine to medium grained, lithic to quartz rich sand and clay. The regional geology mapping is presented in Figure 4.



Figure 4: Regional Geology

Where: Dark green = Bringelly Shale (Twib), Yellow = Alluvial Floodplain Deposits (Q_af), site boundary shown in red.



The regional geological mapping also shows some geological structures in the area. A series of igneous dykes which trend in a north-easterly direction have been mapped within the site. These dykes are aligned parallel to the ridges. In addition, the regional map shows some major structural lineaments oriented north and north-east, along which the major creeks in the area flow.

4.3 Soils Landscape

Reference to the Penrith 1:100,000 Soils Landscape Sheet (NSW Government, 1991) indicates that the site is underlain by the Blacktown, Luddenham and South Creek soil landscapes. The distribution of soil landscapes is presented in Figure 5.



 Figure 5: Soil Landscape

 Where:
 Dark green = Blacktown (bt), Pink = Luddenham, South Creek = Light Green, site boundary shown in red

The Blacktown soil landscape (dark green with mapping unit bt) is characterised by topography of gently undulating rises on Wianamatta Group Shale, with local relief to 30 m and slopes usually less than 5%, typically represented by broad rounded crests and ridges with gently inclined slopes. This is a residual soil landscape, which the mapping indicates comprises multiple soil horizons that include shallow red-brown podzolic soils comprising mostly clayey soils on crests and upper slopes, to deep brown to yellow clay soils on mid to lower slopes and in areas of poor drainage. These soils are typically of low fertility, are moderately reactive, highly plastic and generally have a low wet strength.



The Luddenham soil landscape group (pink with mapping unit lu) is an erosional unit found on undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury Sandstone. Local relief is typically 50 - 80 m, with slopes of 5 - 20%. Narrow ridges, hillcrests and valleys are typical. This group comprises soils that pose a high erosion hazard, localised impermeable highly plastic subsoil, and is moderately reactive.

The South Creek soil landscape group (light green) is characterised by floodplains, valley flats and drainage depressions of the channels on the Cumberland Plain. It is usually flat with incised channels. The mapping indicates soil horizons comprise red and yellow podzolic soils which are most common on terraces along with small areas of structured grey clays, leached clay and yellow solodic soils. The soils often comprise very deep layered sediments over bedrock or relict soils. Where pedogenesis has occurred, structured plastic clays or structured loams can be found in and immediately adjacent to drainage lines. This group comprises soils that pose a high erosion hazard and are frequently flooded.

4.4 Surface Water and Groundwater

The following watercourses (as shown on Figure 6) are present with the site:

Western Portion of the Site

- Claremont Creek and its subsequent tributaries flowing in a south-west to north-east direction; and
- Two unnamed creeks and subsequent tributaries in the south-western portion of the site, both of which are flowing in an east to west direction.

Eastern Portion of the Site

- Blaxland Creek and its subsequent tributaries, flowing in a south-west to north-east direction;
- A tributary of South Creek, flowing in a south-west to north-east direction; and
- An unnamed creek in the south-eastern portion of the site, flowing in a west to east direction.

South Creek is present along the eastern boundary of the site and flows in a south to north direction, eventually draining into the Hawkesbury River.





Figure 6: Surface Water Bodies

Extensive investigations by DP have been undertaken on the Bringelly Shale Formation in western Sydney. The results of in situ testing indicate that:

- The transmissivity of the shale/siltstone is low to very low with estimated hydraulic conductivity of 10⁻⁶ to 10⁻⁹ m/sec; and
- The groundwater is typically highly saline.

Historical data published by Old A.N (1942) reported chloride ion concentrations in the Blacktown area of 6 - 8 g/L, with a peak value from the Bringelly Shale of 31.75 g/L.

The hydrogeology of the Bringelly Shale is usually characterised by shallow seepage along the soil and shale interface and a deep fractured rock aquifer tens of metres below surface levels. Aquifer recharge is minimal due to the low permeability of the near surface clays, and horizontal flow velocities in the soil and rock are commonly less than 10 m per year. It is noted that there is a deeper aquifer typically located at depths greater than 150 m below the site within the Hawkesbury sandstone.

Groundwater is typically found in two zones within the Wianamatta shales (present at the site), both shallow and deep, neither of them very permeable. The upper zone, comprises water contained within the residual soils and colluvium derived from the shales, and in the shale weathering profile itself, to a typical depth of 3 - 10 m. This zone is typically expressed as a "perched" system and expresses itself as seepage at the soil rock interface. The lower shale bedrock zone occurs below the base of weathering. Given the local geology (ie: Bringelly Shale), the groundwater in the fractured rock beneath the site is anticipated to be saline and very low yield. Below the Bringelly Shale is Hawkesbury Sandstone which is known for higher groundwater yields with good quality water.



A search of the publicly available registered groundwater bore database indicated that there are 14 registered groundwater bores on site or within 500 m of the site. The locations of the on site and nearby groundwater bores are presented in Figure 7 and are summarised in Table 1.



Figure 7: Registered Groundwater Bores



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Table 1: Summary of Registered Water Bores

Bore ID - Date	Location Relative to Site*	Depth (m)	Standing Water Level (m bgl)	Yield (L/s)	Salinity (g/L)
GW060794 – 1985	400 m north	78.10	ND	0.02 - 0.06 ⁽¹⁾	ND
GW103764 – 1995	450 m north	231.60	ND	$0.4 - 0.8^{(2)}$	ND
GW105054 – 2002	South-east (on site)	210.00	46.00	0.1 – 0.9 ⁽²⁾	3.0 – 4.4 ⁽²⁾
GW105382 – 2004	200 m south	252.00	24.00	0.6 – 1.1 ⁽²⁾	$2.5 - 3.8^{(2)}$
GW108906 – 2008	Western boundary (on site)	186.00	30.00	0.4 ⁽¹⁾ 1.1 ⁽²⁾	10 ⁽¹⁾ 2.4 ⁽²⁾
GW110454 – 2009	South-east (on site)	30.30	6.30	1.4 ⁽¹⁾	10 ⁽¹⁾
GW110455 – 2009	South-east (on site)	44.40	ND	ND	ND
GW112799 – 2012	South-east (on site)	21.00	ND	ND	ND
GW113238 – 2012	South-east (on site)	18.50	ND	ND	ND
GW114591 – 2011	100 m west	7.00	ND	ND	ND
GW114592 – 2011	115 m west	8.00	ND	ND	ND
GW114593 – 2011	90 m west	7.50	ND	ND	ND
GW114594 – 2011	85 m west	7.00	ND	ND	ND

Note: (1) Values for Bringelly Shale

(2) Values for Hawkesbury Sandstone (geology unit beneath Bringelly and Ashfield Shale)

* Approximate location

ND = No Data

Based on the regional topography and the inferred flow direction of nearby watercourses, the anticipated flow direction of groundwater beneath the site is to the east, towards South Creek, eventually draining into the Hawkesbury River, the likely receiving surface water body for the groundwater flow path.

4.5 Salinity

Reference to the Salinity Potential in Western Sydney Plan prepared by the Department of Infrastructure, Planning and Natural Resources in 2002, shows the site is located in an area of moderate salinity potential, with high salinity potential along the lower slopes and creek lines where water accumulation is high (orange) along with areas of known saline soils. It is noted that the mapping is based on soil type, surface level and general groundwater considerations but is not generally ground-truthed, hence actual soil salinity needs to be assessed to confirm the potential salinity. An extract of the salinity potential from available mapping is presented in Figure 8.





Figure 8: Salinity Potential Where: Yellow = Moderate Salinity Potential, Orange = High Salinity Potential, Red = Known Salinity, site boundary in black

4.6 Acid Sulfate Soils

Reference to the acid sulfate soils information provided by the CSIRO Australian Soil Resource Information System website (CSIRO, 2014) indicates the site is in an area mapped as having an extremely low probability of occurrence (C4 rating) of acid sulfate soils.

5. Previous Reports

The following reports are relevant to this investigation:

- Chapter 16 (Soil and Contamination) of the Sydney Metro Western Sydney Airport Environmental Impact Statement (the EIS); and
- Douglas Partners Pty Ltd (2024) Report on Preliminary PFAS Investigation, Precinct Rezoning, Orchard Hills Precinct, Orchard Hills, ref. 216919.02.R.002.Rev1, dated 4 April 2023 (Douglas 2024 the Preliminary PFAS Investigation).



5.1 The EIS

Douglas reviewed Chapter 16 (Soil and Contamination) of the Sydney Metro – Western Sydney Airport Environmental Impact Statement (the EIS). The EIS includes a contamination assessment for the Western Sydney Airport Metro construction site, including the identification of areas of environmental concern (AEC). Figure 9 shows the extent of the Western Sydney Airport Metro construction site within the site and the location of identified AEC (AEC11 to AEC35).

Potential contamination sources associated with the AEC identified in the EIS within the site are summarised below:

- Potential workshops and above ground storage tanks;
- Unlicenced waste disposal to land (refuse and fill);
- Storage and use of fuel, chemical and hazardous building materials;
- Historical use of herbicides and pesticides; and
- Potential cattle tick dip sites.



Figure 9: Extract of Figure 16-2b of the EIS



The Western Sydney Airport Metro construction site also passes through DEOH which is identified as an AEC. Cited potential sources of contamination for DEOH are:

- Unexploded ordinance and exploded ordinance (UXO and EO);
- Waste burial areas;
- Hazardous building materials; and
- Potential historical use of aqueous firefighting foams.

The EIS cites the requirement for further investigation of these AEC, and where required, remediation and validation. Given that construction of the Western Sydney Airport Metro had commenced prior to the preparation of this report, DP assumes that the above discussed further investigation, and potential remediation and validation, has been completed. However, associated reports were not reviewed by DP as part of this PSI.

5.2 The Preliminary PFAS Investigation

The previous PSI (Douglas Ref. 216919.00.02.R.002,Rev0) identified the potential for migration of PFAS, which may have been used in aqueous firefighting foams during historical training exercises at Defence Establishment Orchard Hills (DEOH). DEOH is located adjacent to the southwest of the site, as a potential source of contamination at the site. In April 2024, Douglas completed a Preliminary PFAS Investigation of the site to provide preliminary data to assess the potential for PFAS migrating from DEOH that may constrain the suitability of the site for rezoning.

Soil and sediment sampling was completed during the preliminary PFAS investigation at a total of 49 locations, targeting lower lying areas and areas of drainage near the DEOH boundary and within the Vines and Samuel Marsden residential areas. Surface water sampling was also completed at a total of 17 locations targeting areas of drainage and areas of surface water runoff near the DEOH boundary and within the Vines and Samuel Marsden areas. Douglas also completed a review of DOEH groundwater and surface water monitoring results provided by DPHI on 20 March 2024.

Whilst the results of the Preliminary PFAS Investigation identified concentrations of PFAS in most onsite soil and sediment samples, the concentrations were below the adopted site assessment criteria (SAC) with the exception of one sample located immediately adjacent to the DEOH boundary between Wentworth Road and the DEOH boundary. The results of nearby soil and sediment delineation sampling, however, did not suggest grossly elevated PFAS impact to surface soils in the vicinity of this exceedance. The PFAS concentrations in onsite soil and sediment samples collected were considered typical of levels commonly encountered in a rural land use setting.

The review of the provided DEOH analytical results summary indicated PFOS was detected in surface water samples collected at a location within the DEOH property near Blaxland Creek at concentrations exceeding both the 99% and 95% species protection levels. Elevated concentrations of PFOS were identified in onsite surface water samples, particularly in onsite surface water samples collected in Blaxland Creek near the DEOH boundary, which suggested a potential PFOS source from the DEOH property. PFOS, however, was not detected at concentrations exceeding the 95% species protection levels in any onsite surface water samples.

The identified onsite concentrations of PFAS in soil, sediment and surface water samples were considered to be at levels commonly encountered in similar rural residential land use settings where the application of fertilisers and agricultural/horticultural practices have occurred, and where streams have been modified, cleared of significant riparian vegetation and receive stormwater runoff from road and horticultural activities.



The review of the DEOH analytical results summary indicated PFAS compounds were not detected in the groundwater samples collected from DEOH monitoring wells at concentrations exceeding the laboratory limit of reporting (LOR). It was noted that review of the laboratory certificates of analysis (lab report #ES2406006) for the recent DEOH sampling completed 22 February 2024 indicated the laboratory LOR for PFOS (LOR of 0.01 μ g/L shown on laboratory report and LOR of 0.02 shown on (Table 1) exceeds the adopted screening SAC EWQG for 99% species protection value (0.00023 μ g/L) therefore the potential for PFAS concentrations, albeit at relatively low concentrations, likely to be present in groundwater entering the site cannot be completely ruled out. The laboratory LOR for PFOS was however below the EWQG 95% species protection value (0.13 μ g/L).

Based on Douglas' previous experience with investigations on similar nearby rural residential areas, where 95% species protection levels have generally been accepted for comparative screening purposes, the results of the preliminary PFAS investigation and the DEOH groundwater investigations, PFAS was not identified in onsite samples or in the DEOH groundwater samples at concentrations that presented an unacceptable human health or ecological risk. Moreover, the reported results do not appear to present an unacceptable constraint on the suitability of the site for rezoning. In addition, it was noted that a draft HEPA NEMP 3.0 had been out for consultation and feedback since 2022 and is due to be released in the near future, and it therefore remains possible that guidelines relating to PFAS will be revised in the final version of HEPA NEMP 3.0.

The Preliminary PFAS Investigation also concluded that the previous PSI had identified several other potential contamination sources (fill; agricultural land use; current and previously demolished structures; fuel and chemical storage; cattle tick dip sites; and septic tanks) within the site. PFAS has also been identified as a contaminant of potential concern associated with some of these possible contamination sources. The former PSI considered that they present a low potential for gross or widespread contamination and do not constrain rezoning of the site.

Further investigation of these sources should be completed with reference to NEPC (2013), HEPA (2020) and NSW EPA (2020) following rezoning, and in advance of any development applications for subdivision or bulk earthworks. The further investigations should incorporate the identification and targeted contamination testing of areas of environmental concern on a lot-by-lot basis and confirmatory groundwater sampling of the DEOH wells and surface water sampling near the DEOH boundary to confirm PFAS concentrations are not increasing with time. Additionally, prior to demolition, structures should be subject to hazardous building material assessments.

6. Site History

6.1 Historical Aerial Photography

Historical aerial photographs from 1947, 1955, 1965, 1975, 1986, 1991, 1998 and 2005 (supplied by NSW Spatial Services) and from 2009, 2016 and 2022 (supplied by MetroMap) were reviewed to identify potential contamination sources at, and surrounding, the site. The aerial photographs are included as Drawings 2 to 11 in Appendix A. A summary of key features observed for the site and surrounding land is presented in Table 2.



Table 2: Summary of Historical Aerial Photographs

Year	Site	Surrounding Land Use
1947 Drawing 2	The eastern part of the site mostly comprised undeveloped land potentially used for grazing and pastoral purposes. Homestead Road, Calverts Road and Wentworth Road were visible as unsealed roads in the central western portion of the site. A large water tank, associated with Orchard Hills Reservoir was present in the north-western portion of the site. Agricultural activities (likely cropping) were evident, as shown through cropping/tilling lines in the central and western portions of the site.	Most of the site's surroundings was undeveloped land with tree and grass cover. Few rural properties were present in all cardinal directions from the site.
1955	Most of the site remained relatively unchanged since the	Most of the site's surroundings
Drawing 3	1947 aerial photograph.	remained relatively unchanged since the 1947 aerial photograph. Several structures were present within DEOH.
1965	A second water tank associated with the Orchard Hills Reservoir was constructed in the north-western portion	Most of the site's surroundings
	Several residential dwellings were also constructed in the north-western, north-eastern, and western portions of the site. Farm dams have been constructed in the north to north-eastern portions of the site.	since the 1955 aerial photograph (noting limited coverage of the 1965 aerial photograph – specifically to the south-west of the site).
1975 Drawing 5	The Western Motorway was visible in the north-western portion of the site and along the northern boundary. Additional residential dwellings were constructed in the north-western and western portions of the site and small ground disturbances were also visible surrounding the structures. Farm dams were constructed in the western portion of the site. Vegetation density also decreased in the eastern portion of the site likely due to clearing.	An increase in residential dwellings had occurred in the north-western to north-eastern areas of the site. Bulk earthworks and ground disturbance was visible approximately 300 m south-west of the site boundary, associated with the construction of the Orchard Hills Water Filtration Plant. Additional structures were also present within DEOH.
1986	A building associated with the Penrith Christian School was constructed in the western portion of the site	Residential expansion occurred
Drawing 6	Former structures, possibly greenhouses, appeared to have been removed in the western portion of the site. Additional dwellings were constructed, and areas of ground disturbances appeared visible throughout the site. Ground disturbances were present in the south-eastern portion of the site, in the future location of the Patons Lane Landfill.	A golf course (Penrith Golf Club) was visible immediately west of the site.



Year	Site	Surrounding Land Use
1991 Drawing 7	Additional residential dwellings and associated streets/unsealed driveways were established throughout the site. Ground disturbance was visible in the south-eastern portion of the site, associated with the expansion of Patons Lane Landfill.	Residential expansion occurred north of the site. Dam-like structures known as 'backwash lagoons', associated with the Orchard Hills Water Filtration Plant were also constructed south-west of the site.
1998 Drawing 8	Additional residential dwellings and associated streets/unsealed driveways were established in the south-western, central and eastern portions of the site. Ground disturbance was visible in the south-eastern portion of the site, associated with further expansion of Patons Lane Landfill.	Residential expansion occurred north of the site.
2005 Drawing 9	Additional residential dwellings were constructed throughout the site with further cropping / tilling lines present in the central portion of the site, indicative of cropping activities. Greenhouses were also visible in the north-eastern portion of the site. Patons Lane Landfill also underwent further expansion.	Ground disturbances, bulk earthworks and buildings were visible approximately 2 km east to south-east from the site boundary, associated with Cleanaway Erskine Park Landfill (CEPL) and the surrounding industrial area.
2009 Drawing 10	Most of the site remained relatively unchanged since the 2005 aerial photograph.	Additional buildings have been constructed approximately 2 km east to south-east of the site boundary, associated with CEPL and the surrounding industrial area.
2016 Drawing 11	Montgrove College was constructed in the northern portion of the site. Areas of general ground disturbance, exposed fill and additional houses were also visible throughout the site.	Residential housing increased in the northern and south-western areas of the site. Expansion of warehouses in the industrial area approximately 2 km south-east of the site also occurred.
2023 Drawing 1	Two large construction sites were evident in the north- eastern and south-eastern parts of the site. The works are associated with the development of the Western Sydney Metro. The area occupied by Patons Lane Landfill appears to also have expanded.	Additional warehouses were constructed approximately 2 km south-east of the site boundary, associated with the general industrial area. An increase in housing was also visible north and south-west of the site boundary.



6.2 Public Registers and Planning Records

EPA Notices available under Section 58 of the Contaminated Lands Management Act (CLM Act) Database searched: 14 June 2023	There were no records of notices for the site or adjacent sites.
Sites notified to EPA under Section 60 of the CLM Act Database searched: 14 June 2023	The site and adjacent sites were not listed as a notified contaminated site.
Licences listed under Section 308 of the Protection of the Environment Operations Act 1997 (POEO Act) Database searched: 14 June 2023	 There were two licenced premises within the site: SRC Operations Pty Limited – Patons Lane Landfill: 123 – 129 Patons Lane, Orchard hills, NSW (south- eastern portion of the site] – Extractive activities and waste disposal by application to land – Licence 20814 issued 8 November 2016; and SRC Operations Pty Limited – Patons Lane RRC: 123 – 129 Patons Lane, Orchard hills, NSW (south- eastern portion of the site) – Resource recovery and waste storage – other types of waste – Licence 21259 issued 28 June 2019.

Licence 20814 (applicable to the Patons Lane Landfill) allows the storage of asbestos waste which is already on the site and the disposal of General Solid Waste (non-putrescible). The licence also requires the monitoring of surface waste, groundwater, and subsurface gas.

Licence 21259 (applicable to the Patons Lane RRC) allows the storage and processing of General Solid Waste (non-putrescible), excavated natural material, soil (classified under specific resource recovery limits) and other material including building and demolition waste, paper, cardboard, land paper and rubbish.

DP considers there is a potential for leachate impacted groundwater, waste fill and landfill gas associated with the Patons Lane Landfill to constrain development at and surrounding the landfill. As discussed in Section 9.2, the landfill is within part of the site where rezoning is not proposed, based on review of the ILP, and therefore potential contamination issues associated with the landfill are not considered to present a constraint to the rezoning of the balance of the site.

6.3 Previous Land Use Associated with PFAS

Per- and poly-fluoroalkyl substances (PFAS) are an emerging global environmental contaminant of concern that was widely used in fire-fighting foams, waterproofing and other industrial products. PFAS do not naturally break down, and therefore, when released into the environment, PFAS can persist in humans, animals and the environment.



Based on a review of the NSW PFAS Investigation Program², the site is not reported as having large quantities of PFAS substances used on the site. NSW PFAS investigation sites within 10 km of the site are listed below:

- Kemps Creek NSW Rural Fire Service/Kemps Creek Training Facility³ located at 245 Devonshire Road, Kemps Creek, approximately 10 km south-east of the site; and
- Londonderry TestSafe & Fire and Rescue NSW located at 667 The Northern Road, Londonderry, approximately 10 km north of the site.

Douglas does not consider the above sites to be potential sources of PFAS at the site.

Table B1 and B2 of HEPA (2020) list activities associated with PFAS contamination. Based on the review of the activities, and the current and historic land use at the site, Douglas considers the potential for broadscale PFAS contamination at the site, from on-site activities to be low.

Due to legacy use of aqueous firefighting foams in training exercises, defence sites are considered to have a high potential for PFAS contamination. As discussed in Section 3, DEOH is located to the south of the site within the Blaxland Creek catchment. Blaxland Creek drains north from DEOH through the site prior to joining South Creek. Review of Australian Government Defence online information⁴ does not provide any specific information regarding potential PFAS (or other) contamination at DEOH.

As discussed in Section 5.2, based on Douglas' previous experience with investigations on similar nearby rural residential areas where 95% species protection levels have generally been accepted for comparative screening purposes, the results of the preliminary PFAS investigation and the DEOH groundwater investigations, PFAS was not identified in onsite samples or in the DEOH groundwater samples at concentrations that presented an unacceptable human health or ecological risk

The Preliminary PFAS Investigation recommended confirmatory groundwater sampling of the DEOH wells and surface water sampling nearby to the DEOH boundary to confirm PFAS concentrations are not increasing with time.

6.4 Unexploded Ordnance

Review of historical aerial photographs indicates that DEOH was established to the south of the site prior to 1955. A search of the Australian Government Defence website⁵ for sites affected by UXO identifies the DEOH *Defence Controlled Area* immediately south of the site, as shown on Figure 10.

² https://www.epa.nsw.gov.au/your-environment/contaminated-land/pfas-investigation-program (Accessed 13 February 2033)

³ http://www.rfs.nsw.gov.au/news-and-media/pfas-environmental-investigation (Accessed 13 February 2023)

⁴ https://defence.gov.au/Environment/PFAS/

⁵ https://defence.gov.au/UXO/Where/Default.asp (Accessed 17 February 2023)





Figure 10: Unexplained ordnance search results

Based on the proximity of DEOH to the site, the previous PSI (Douglas Ref. 216919.00.02.R.002,Rev0)previously considered there was a potential UXO and EO risk at the site.

DPHI has provided Douglas with correspondence (email dated 22 May 2024) from representatives of the Department of Defence that states "*the area outside of DEOH has no risk of UXO, or residual burial activities associated with operation of the depot*".

Based on the advice from the Department of Defence, the potential for UXO/EO within the site associated with DEOH is therefore not considered to present an unacceptable risk to the proposed rezoning or affect the suitability of the site.

6.5 Site History Integrity Assessment

The information used to establish the history of the site was sourced from reputable and reliable reference documents, many of which were official records held by Government departments/agencies. The databases maintained by various Government agencies potentially can contain high quality information, but some of these do not contain any data at all.

In particular, aerial photographs can provide high quality information that is generally independent of memory or documentation. They are only available at intervals of several years, so some gaps exist in the information from this source. The observed site features are open to different interpretations and can be affected by the time of day and/or year at which they were taken, as well as specific events, such as flooding. Care has been taken to consider different possible interpretations of aerial photographs and to consider them in conjunction with other lines of evidence.



Given the size of the site, the aerial photograph review was undertaken at a relatively low scale with obvious major features noted. Additionally, given the higher number of individual lots, other information associated with the preparation of a PSI (*i.e.* A NSW SafeWork Dangerous Goods, Title Deeds and Council Record Searches) were not completed as part of the assessment. Higher scale review of aerial photographs and completion of relevant searches should be completed during subsequent development application stage investigations.

7. Site Inspection

A site walkover was undertaken by an experienced Senior Environmental Scientist on 15 May 2023. The general site topography was consistent with that described in Section 4.1. The following key site features pertinent to this PSI were observed. Selected photographs are shown in Appendix C.

- The site layout appeared to have remained relatively unchanged from the 2023 aerial photograph generally comprising cleared rural land in the east, and broad acre rural residential lots in the west (Photographs 1 to 3);
- Residential structures varied between fibro-clad 1950s homes to more recently constructed estate homes (Photographs 4 and 5). Farm sheds where also present in many of the rural residential areas of the site (Photographs 6 and 7);
- Market gardening activities and vineyards were observed in several lots (Photographs 8 and 9);
- A number of lots were also being used to store trucks and associated equipment (Photograph 10);
- Two Metro construction sites were active in the north-eastern and north-western portions of the site (Photographs 11 and 12);
- The northern and southern parts of the site were separated by the Hume Highway (Photograph 13);
- South Creek was present in the eastern portion of the site (Photograph 14);
- A service station was observed approximately 100 m west (off-site and down gradient) of the north-western site boundary (Photograph 15);
- Several commercial premises were present in the north-western part of the site (Photograph 16); and
- The Patons Lane Landfill was observed in the south-eastern part of the site (Photograph 17). A detailed inspection of the premises was not completed as part of the PSI.

8. Preliminary Conceptual Site Model

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



Potential Sources (S)

Based on the current desktop investigation, limited site walkover, information provided and DP's experience with sites of a similar nature and scale, the following potential sources of contamination, and associated COPC have been identified.

- **S1**: Fill: Associated with illegal importation from unknown sources, and contaminated fill generated from within the site.
- COPC include metals (arsenic [As], cadmium [Cd], chromium [Cr], copper [Cu], lead [Pb], mercury [Hg], nickel [Ni] and zinc [Zn]), total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), organochlorine and organophosphate pesticides (OCP and OPP), phenols and asbestos.
- **S2**: Current and historical agriculture, including market gardening activities and orchards commonly associated with the use of pesticides.
- o COPC include metals, OCP, OPP and herbicides.
- **S3**: Current and previously demolished structures, including fibro clad structures and buried asbestos pipes.
- o COPC include asbestos, metals, synthetic mineral fibres and PCB.
- **S4**: Fuel and chemical storage at residential, rural and commercial properties on the site. Potential spilling of chemicals/oils/fuels stored on site and potential impacts from run-off of stored waste materials.
- o COPC include lead, TRH, BTEX, PAH, and volatile organic compounds (VOC).
- **S5**: Potential cattle tick dip sites:
- o COPC include carbamates, OCP, OPPs, diazinon, herbicides, atrazine, insecticides, fenamiphos, fungicides.
- **S6**: Transpiration pits and septic tanks:
- o COPC include metals, coliforms and nutrients.
- **S7**: Paton's Lane Landfill. There is potential for leachate impacted groundwater and subsurface gas migration, associated with decomposing waste material.
- o COPC include nutrients, Metals, TRH, BTEX, PAH, OCP, OPP, PCB, PFAS (could vary depending on waste type) and dissolved CH4.

Landfill Gas

- o CH4, CO2 and other gases (CO, H2S, H2 and a range of trace gases).
- **S8**: DEOH.

<u>Historic use of aqueous firefighting foams –</u> The Preliminary PFAS Investigation (as discussed in Section 5.2) did not identify PFAS in onsite samples or in the DEOH groundwater samples at concentrations that present an unacceptable human health or ecological risk. Accordingly, the results do not appear to present an unacceptable constraint on the suitability of the site for rezoning.



It was however recommended that confirmatory groundwater sampling of the DEOH wells and surface water sampling near the DEOH boundary be completed to confirm PFAS concentrations are not increasing with time.

Potential Receptors (R)

The following potential human receptors have been identified:

- **R1**: Current users (residents, employees, students, maintenance workers);
- R2: Adjacent is users (residents, employees, students, maintenance workers);
- R4: Construction and maintenance workers; and
- **R4**: End users (residents, employees, students, maintenance workers).

The following potential environmental receptors have been identified:

- R5: Surface water (various on-site and adjacent to site dams, creeks, and tributaries);
- **R6**: Groundwater; and
- **R7**: Terrestrial ecosystems.

Potential Pathways (P)

The following potential pathways in relation to human receptors have been identified:

- **P1**: Ingestion and dermal contact; and
- **P2**: Inhalation of dust and/or vapours.

The following potential pathways in relation to the environmental receptors have been identified:

- P3: Surface water run-off;
- P4: Lateral migration of groundwater providing base flow to water bodies;
- P5: Leaching of contaminants and vertical migration into groundwater;
- **P6**: Contact with terrestrial ecology; and
- **P7**: Lateral migration of ground gases.



Summary of Potentially Complete Exposure Pathways

A 'source–pathway–receptor' approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). The possible pathways between the above sources (S1 to S9) and receptors (R1 to R7) are provided in Table 3. Table 3 provides a brief summary of potentially complete exposure pathways. Preparation of a detailed summary should be completed during subsequent development application stage investigations.

Potential Source	Pathway	Receptor
S1 - Fill	P1 - Dermal contact and ingestion	R1 - Site users
S2 – Agricultural Activities	P2 - Inhalation of dust/vapours	R3 - Construction, maintenance workers R4 - End users
S3 - Structure with HBM	P2 - Inhalation of dust/vapours	R2 - Adjacent site users
S4 – Fuel and chemical storage	P4 - Vertical migration to groundwater	R4 - Groundwater
S5 – Cattle dip sites	P3 – Surface run off	R5 - Surface water
S6 – Septic Tanks	P5 - Lateral migration of groundwater	
S7 – Patons Lane RRC	P6 - Direct contact with ecology	R6 - Terrestrial ecology
S8 - DEOH	P7 - Lateral migration of ground gases	R1 - Site users R2 - Adjacent site users R4 – End users

Table 3: Summary of Potentially	/ Complete Exposure Pathways
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9. Discussion

The results of the desktop investigation identified that the site and surrounds have a history of rural and residential land use since prior to at least 1947. Since the 1960s, commercial and educational land use has occurred in limited areas of the site. The Patons Land Landfill (the landfill) was established in the south-eastern part of the site in the late 1980s. Additionally, Defence Establishment Orchard Hills (DEOH) was established to the south of the site in the 1950s.



The following potential contamination sources (S) were identified as having the potential for contamination of soils, groundwater and/or ground gas at the site:

- **S1**: Fill: Associated with illegal importation from unknown sources, and contaminated fill generated from within the site;
- **S2**: Current and historical agriculture, including market garden activities and orchards;
- **S3**: Current and previously demolished structures, including fibro clad structures and buried asbestos pipes;
- **S4**: Fuel and chemical storage at residential, rural and commercial properties on the site;
- **S5**: Potential cattle tick dip sites;
- **S6**: Transpiration pits and septic tanks;
- **S7**: Patons Lane Landfill; and
- **S8**: DEOH.

9.1 Potential Contamination Sources S1 to S6

Based on the findings of the PSI, DP considers that potential sources S1 to S8 present a low potential for contamination which would be significant enough to constrain the proposed rezoning of the site. For potential sources S1 to S8, further investigations with reference to NEPC (2013) and NSW EPA (2020) should be completed following rezoning, and in advance of any development applications for subdivision or bulk earthworks. The further investigations should incorporate the identification of impacted media (soil, groundwater, sediment, ground gases/vapour, air quality, etc) and targeted contamination testing of AEC on a lot-by-lot basis. Prior to demolition, structures should be subject to hazardous building material assessments.

9.2 Potential Contamination Sources S7 – Patons Lane Landfill

The Patons Lane Landfill is located within the south-eastern part of the site. The landfill is operated under an EPL which includes requirements for leachate and gas monitoring. EPL monitoring reports were not reviewed as part of the PSI.

Potential leachate impacted groundwater and subsurface gas migration associated with decomposing waste material at the landfill has the potential to constrain development in the vicinity of the landfill. NSW EPA (2016) suggests a buffer of 250 m between landfill sites and residential areas. Review of the ILP (see Section 3.2) indicates that a wide area which incorporates, and surrounds the landfill is not proposed to be rezoned. Further, the closest area to be rezoned (proposed residential) is located greater than 500 m to the north of the landfill.



Based on the distance between the landfill and the proposed residential areas shown on the ILP, DP does not consider that the landfill presents a constraint to the proposed rezoning (given that land in the vicinity of the landfill is not proposed to be rezoned). Notwithstanding, any future development at or surrounding the landfill should take into consideration potential impacts associated with the landfill. Specific consideration should be given to the construction of above or below ground structures that would increase the risk of gas migration and build up. Douglas recommends that an appropriate buffer zone, which excludes residential development within approximately 440 m of Patons Lane Landfill be implemented. The buffer zone of 440 m is recommended based on consideration of the following factors:

- Whilst there is potential for future landfill extension, any expansion of the landfill beyond approximately 180 m to the north is considered to be unlikely due to pre-existing residential dwellings located approximately 440 m to the north of the landfill. As discussed previously NSW EPA (2016) suggests a buffer of 250 m between landfill sites and residential areas therefore any future landfill expansion, particularly to the north, will be limited by the pre-existing residential dwellings. In addition, expansion of the landfill will be highly limited to the east (by Western Sydney Airport Metro land located immediately adjacent) and to the south and west (by DEOH land);
- Blaxland Creek is located between the Patons Lane Landfill and the proposed re-zoning areas/preexisting residential areas to the north. Given that Blaxland Creek is likely connected to the regional groundwater table, the creek and water table are expected to provide a barrier to gas migration; and
- As discussed in Section 4.2 the local geology is expected to be Bringelly Shale. Bringelly Shale typically weathers to form clays of medium to high plasticity. These soil and rock types generally have a low permeability and the hydraulic conductivity is expected to be similar to the rates commonly encountered within clays and shales of less than 1 × 10⁻⁹ metres per second. Given the generally low permeability and dense nature of clay and shale the gas permeability within the expected geology at the site is also anticipated to be very low thus providing a sufficient barrier to limit lateral and vertical gas migration.

Any potential landfill odour issues associated with the landfill should be assessed by an appropriately qualified consultant.

9.3 Potential Contamination Sources S8 – DEOH

DEOH is located immediately adjacent to the southern boundary of the site and has been operational since the 1950s. The previous PSI (Douglas Ref. 216919.00.02.R.002,Rev0) identified two potential contamination issues associated with DEOH which had the potential to constrain rezoning of the site being:

- The migration of PFAS which may have been used in aqueous firefighting foams during historical training exercises. DEOH is located within Blaxland Creek Catchment which drains into the south-eastern part of the site; and
- Munition testing that may have resulted in UXO and EO on the site.



The potential for PFAS contamination and UXO / EO within the site associated with DEOH is not however considered to present an unacceptable risk to the proposed rezoning or affect the suitability of the site given:

- The Preliminary PFAS Investigation (as discussed in Section 5.2) did not identify PFAS in onsite samples collected or in the DEOH groundwater samples at concentrations that presented an unacceptable human health or ecological risk and do not appear to present an unacceptable constraint on the suitability of the site for rezoning. It was however recommended that confirmatory groundwater sampling of the DEOH wells and surface water sampling nearby to the DEOH boundary be completed to confirm PFAS concentrations are not increasing with time; and
- DPHI has provided Douglas with correspondence (email dated 22 May 2024) from representatives of the Department of Defence that states "*the area outside of DEOH has no risk of UXO, or residual burial activities associated with operation of the depot*".

10. Conclusions and Recommendations

The PSI was completed to assess the potential for gross or widespread contamination, which may preclude rezoning at the site based on past and present land uses and to comment on the need for further investigation and/or management regarding the proposed rezoning.

The below conclusions and recommendations are made based on the findings of the PSI.

DEOH is located immediately adjacent to the southern boundary of the site and has been operational since the 1950s. A previous PSI identified two potential contamination issues associated with DEOH being:

- The migration of PFAS which may have been used in aqueous firefighting foams during historical training exercises. DEOH is located within Blaxland Creek Catchment which drains into the south-eastern part of the site; and
- Munition testing that may have resulted in UXO and EO on the site.

The potential for PFAS contamination and UXO/EO within the site associated with DEOH was not however considered to present an unacceptable risk to the proposed rezoning or affect the suitability of the site based on the results of the preliminary PFAS investigation (Discussed in section 5.2) and the correspondence from Department of Defence that states "*the area outside of DEOH has no risk of UXO, or residual burial activities associated with operation of the depot*".

Patons Lane Landfill is located within the south-eastern part of the site however is greater than 500 m from the closest additional residential development potential, in the Vines. Potential leachate impacted groundwater and subsurface gas migration associated with decomposing waste material at the Patons Lane Landfill has the potential to constrain development in the vicinity of the landfill. Douglas recommends that an appropriate buffer zone, which excludes residential development within approximately 440 m of Patons Lane Landfill be implemented.



Based on the distance between the landfill and the proposed residential areas shown on the ILP, Douglas considers that the landfill does not present a constraint to the proposed rezoning. Notwithstanding, any future development at or surrounding the landfill should take into consideration potential impacts associated with the landfill. Specific consideration should be given to the construction of above or below ground structures that would increase the risk of gas build up and/or intercept groundwater or leachate. Any potential landfill odour issues associated with the landfill should also be assessed by an appropriately qualified consultant.

Several other potential contamination sources (fill; agricultural land use; current and previously demolished structures; fuel and chemical storage; cattle tick dip sites; and septic tanks) were identified within the site. While a detailed assessment of these sources was not completed as part of the PSI, Douglas considers that they present a low potential for gross or widespread contamination and therefore do not constrain rezoning of the site. Further investigation of these sources should be completed with reference to the NEPC (2013) and NSW EPA (2020) following rezoning, and in advance of any development applications for subdivision or bulk earthworks. The further investigations should incorporate the identification and targeted contamination testing of areas of environmental concern. Post rezoning investigations could be completed either wholistically or on a site-by-site basis. Additionally, prior to demolition, structures should be subject to hazardous building material assessments.

11. References

Chapter 16 (Soil and Contamination) of the Sydney Metro – Western Sydney Airport Environmental Impact Statement (the EIS)

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12. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at Orchard Hills Precinct, Orchard Hills in accordance with DP's proposal dated 22 July 2022 and acceptance received from Carolyn Scott. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of the Department of Planning, Housing and Infrastructure (DPHI) for this project only and for the purposesas described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of information review as part of the desktop assessment and observations made during the site inspection.

The assessment of atypical safety hazards arising from this advice is restricted to the environmental components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

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

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

Douglas Partners Pty Ltd

Appendix A

Drawings 1 to 11 ILP About this Report







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OFFICE:	Macarthur	DRAWN BY: AP
SCALE:	As shown	DATE: 23 May 2024





CLIENT:	Department of Planning, Housing and Infrastructure		
OFFICE:	Macarthur	DRAWN BY: AP	
SCALE:	As shown	DATE: 23 May 2024	







OFFICE:	Macarthur	DRAWN BY: AP
SCALE:	As shown	DATE: 23 May 2024





CLIENT: Department of Planning, Housing and Infrastructure			
OFFICE:	Macarthur	DRAWN BY: AP	
SCALE:	As shown	DATE: 23 May 2024	





Introduction

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

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

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Borehole and Test Pit Logs

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

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

Groundwater

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

 In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

Appendix B

Orchard Hills Investigation Area – Lot and Deposited Plan Summary



Table B1: List of Lots

Lot Number 70	Deposited Plan (D.P.) 852093	Lot Number 67	Deposited Plan (D.P.) 846098	Lot Number 4	Deposited Plan (D.P.) 1188445	Lot Number 4	Deposited Plan (D.P.) 29318
71 72	852093 852093	35 34	831647 831647	<u>110</u> 121	1224009 1224009	3 7	29318 29318
73 62	852093 852093	29 31	831647 831647	120 113	1224009 1224009	PT9 11	518368 774582
74 69 70	852093 852093	32 70	831647 846098	118 111	1224009 1224009	12 PT1	774582 549637
76 75 61	852093	40 18	831647 831647	109 122 112	1224009 1224009 1224009	PT10 PT2 1	518308 549637 536700
66	852093 852093	2	831647 831647	119	1224009	16	238976
63 65	852093 852093	11 14	845015 845015	16 17	1037710 1258774	1 7	406568 235964
64 39	852093 831647	1 12	841119 845015	50 49	29388 29388	2 2	536700 522885
<u>138</u> 4	778298 557360	15 13	845015 845015	<u>48</u> 47	29388 29388	2 15	406568 238976
2 5	551693 557360	63 62	846098 846098	46 45	29388 29388	8 3	238138 406568
14 3	263498 551693	59 58	846098 846098	44 43	29388 29388	4 3	406568 536700
13 15	263498 263498	60 61	846098 846098	104	128821 576160	6	238138 238138
5 1 12	230075	57 56	846098 846098	31 66	29366 27107 20388	2 1 381	238138
11	263498	55	846098 846098	30	27107	5	238138
2 3	214321 214321	72 74	846098 846098	28 65	27107 29388	4 382	238138 627459
1 2	225604 225604	76 44	846098 846098	64 632	29388 634838	<u> </u>	238976 547616
3	225604 238675	45 47	846098 846098	631 51	634838 29388	1 39B	547616 419014
<u> </u>	546171 225604	49 50	846098 846098	52 53	29388 29388	13 3	238976 547616
5 2	225604 238675 214221	6	846098 869116 860116	55	29388 29388 20388	1	547616 541658 541658
12 6	546171	4 3 1	869116	27	29366 27107 27107	11 410	238976 406761
1 201	528945	2 5	869116 869116	25 101	27107 621807	104 10	128254 238976
7	214321 214321	21	877538 852093	100	621807 29388	53	850645 850645
202	580066 528945	5 84	831647 1003627	58 59	29388 29388	54 51	850645 850645
1 9	238675 214321	85 86	1003627 1003627	1	120624 120577	581 583	866893 866893
10	214321 241024	87 88	1003627 1003627	12	237628 237628	584 582	866893 866893
14 13	237788 237788 237789	89 91	1003627 1003627 1002627	14 15	237628 238495 238405	22 21	1008358 1008358 235964
12	236949	90 83 82	1003627 1003627 1003627	16	238495 238495 20388	6 3 522	235964 521035 557389
3	241024	81	1003627	961	712220	521	557389 238339
12 102	239091 707982	94	1003627	11	237628 238495	5 PT17	238339 238976
101 4	707982 241024	93 92	1003627 1003627	19 20	238495 238495	1 391	200170 1065034
11 5	237788 241024	134 137	778298 778298	90 2	29388 1013984	103 129	128254 1224905
111 17	622402 237788	136 4	778298 831647	3 4	1013984 1013984	131 114	1224905 1224905
18 4	237788 236949	6 2	831647 1033168	6 7	1013984 1013984	107 116	1224905 1224905
6 112 21	241024 622402 227789	1 152 151	578405 1077602 1077602	4	588587 1013984 1013084	133 113 120	1224905 1224905 1224005
5	236949	192 10	1125927	952	605491 237628	106	1224905
113 7	622402 236949	1 4	1033168 1223206	8	1013984 1195473	134	1224905 1224905
<u> </u>	236949 236949	51 501	1225713 1243643	10 40	1195473 738126	112 115	1224905 1224905
1102 1104	809101 809101	7 8	2197 2197	2	700275 700275	132 125	1224905 1224905
105 140	249441 778298	10 11	2197 2197	3 4	700275 700275	126 108	1224905 1224905
10 1103	236949	5	218571	5	700275	110 127	1224905
42 133	818859 778298	22	2197 831409	8	700275 700275	105 122	1224905 1224905
132 139	778298 778298	9 16	2197 831409	12 7	700275 700275	23 21	1243311 1243311
135 2	778298 841119	15 14	831409 831409	13 10	700275 700275	22 20	1243311 1243311
41 11	818859 239091 822422	23 6 106	2197 218571 1224000	14 15	700275	 101 102	877538 1269504 1260504
23	239091	125	1224009 1224009 1224009	8	803128 803128	102 1010 1011	1268289 1268289
101 102	808085	102 105	1224009	<u> </u>	803128 803128	1012 42	1268289 738126
2 C	578405	126 104	1224009 1224009	9	803128 803128	81 53	29388 846098
D 4	33210 238976	127 103	1224009 1224009	11 13	803128 803128	131 61	1276954 1276955
5 61	238976 789411	107 124	1224009 1224009	7 6 5	803128 803128	93 51	1276404 1276956
62 7	789411 238976 239076	46	1344 1344	5 4 500	803128 803128 1105757	132 52	1276954 1276956 1276404
δ 38 37	238976 831647 831647	2 1 2	1344 1344 58/103	500 100 101	1105757 1224905 1224905	92 62 21	1276404 1276955 580547
66 33	846098 831647	4 1	1344 584193	102 103	1224905 1224905	£;	000047
68 69	846098 846098	44 5	1344 1344	120 104	1224905 1224905		
30 77	831647 846098	103 1	1017572 430473	121 2	1224905 793728		
78 28	846098 831647	102 104	1017572 1017572	10	773789 793728		
43 46	846098 846098	96 101	1017572 1017572	69 70	29388 29388		
48 51 52	846098 846098	100 74 73	1017572 1017854 1017854	/1 73 72	29388 29388 20388		
54 7	846098 831647	480 481	1018679 1018679	74 75	29388 29388		
3 1	831647 831647	3	26607	76 77	29388 29388		
41 9	831647 831647	82 98	1031666 1017572	78 79	29388 29388		
10 11	831647 831647	83 97	1031666 1017572	80 36	29388 101589		
12 15	831647 831647	99 84	1017572 1031666	35 34	27107 27107		
16 17	831647 831647 834647	11 12	1028818 1028818 1028848	33 32	2/10/ 27107 20289		
20 21	831647 831647	18 13 71	1028818 1028818 1017854	83 85	29388 29388 29388		
22	831647 831647	72 43	1017854 1037264	<u> </u>	29388 29388		
24 26	831647 831647	14	1028818	197 196	868667 868667		
23 13	831647 831647	42	1037264 1037710	2 9	578819 1013984		
14 65	831647 846098	15 13	1037710 1037710	1 4	521034 551767		
36	831647	3	1188445	6	29318		1

Appendix C

Site Photographs



Photo 2 - View of the eastern portion of the site showing vacant land and rural residential properties

Douglas Partners Geotechnics Environment Groundwater	Site Photographs	PROJECT:	216919.00
	Preliminary Site Investigation (Contamination)		1
	Orchard Hills Precinct, Orchard Hills	REV:	0
	CLIENT: Department of Planning, Housing & Infrastructure (NDATE:	May-24



Photo 3 - Residential properties in the western portion of the site



Photo 4 - Fibro house













Photo 9 - Vineyards on rural residential properties



Photo 10 - Truck storage





Photo 12 - Metro construction site in the south-eastern portion of the site

Douglas Partners Geotechnics Environment Groundwater	Site Photographs	PROJECT:	216919.00
	Preliminary Site Investigation (Contamination)	PLATE No:	6
	Orchard Hills Precinct, Orchard Hills	REV:	0
	CLIENT: Department of Planning, Housing & Infrastructure (NDATE:	May-24



Photo 14 - South creek in the eastern portion of the site





Photo 15 - View of off-site service station



Photo 16 - Commercial premises in the north western portion of the site

Douglas Partners Geotechnics Environment Groundwater	Site Photographs	PROJECT:	216919.00
	Preliminary Site Investigation (Contamination)	PLATE No:	8
	Orchard Hills Precinct, Orchard Hills	REV:	0
	CLIENT: Department of Planning, Housing & Infrastructure (DATE:	May-24



Photo 17 - View of the entrance to the Patons Land Landfill

Douglas Partners Geotechnics Environment Groundwater	Site Photographs	PROJECT:	216919.00
	Preliminary Site Investigation (Contamination)	PLATE No:	9
	Orchard Hills Precinct, Orchard Hills	REV:	0
	CLIENT: Department of Planning, Housing & Infrastructure (DATE:	May-24