Douglas Partners
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Integrated Practical Solutions

Remediation Action Plan

Proposed Upgrade Works
417 Abercrombie Street, Darlington, NSW

Prepared for
NSW Minister of Education, Training and Youth Affairs

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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.

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1. Introduction

Douglas Partners Pty Ltd (DP) was commissioned by Mace Australia Pty Ltd (MA) on behalf of the NSW Minister of Education, Training and Youth Affairs (NSW METY) to prepare a Remediation Action Plan (RAP) for Darlington Public School located at 417 Abercrombie Street, Darlington, NSW (hereinafter referred to as 'the Site', as shown on Drawing 1 in Appendix A). DP understands that the Site currently comprises an operational primary school and childcare centre and redevelopment/upgrading works are proposed for the school complex. The site covers an approximate area of 0.72 ha and is located within the Local Government Area of the City of Sydney.

Previous investigations undertaken by DP, including a Preliminary Site Investigation (ref. 92277.00), a Detailed Site Investigation (ref. 92277.01) and a Soil Vapour Assessment (ref. 92277.02.R.003.Rev0), have identified total recoverable hydrocarbon (TRH), polycyclic aromatic hydrocarbons (PAH) and lead impacted fill across the entire site at concentrations exceeding both adopted health investigation levels (HILs) and ecological investigation levels – The HILs were developed due to health concerns predominantly through ingestion and dermal contact pathways. The contaminated fill at the site therefore requires remediation/management for the site to be rendered compatible with the proposed continued use of the site as a primary school and childcare centre.

The RAP is required to support the redevelopment of the site. The purpose of the RAP is to establish appropriate remediation/management objectives, strategies, methodologies and validation processes to enable remediation/management of the site's soils in accordance with EPA requirements to render the site compatible with the proposed land use.

The RAP has been developed based on the following:

- The results of the previous contaminated land investigations undertaken by DP at the site as discussed in Section 4;
- The Darlington Public School Master Plan (dated 4 October 2019) for the redevelopment/upgrading works and the Request for Tender Documents (SINSW00004/19) provided by MA in an email dated 17 January 2020. The Master Concept Plan map is shown in Attachment B; and
- The available standards and guidelines prepared by the relevant authorities and with reference to the Secretary's Environmental Assessment Requirements (SEARS) as detailed in Table 1 below.

Table 1: Relevant Guidelines and SEARS

Guidelines and SEARS Requirements	Relevant Sections in Report
Relevant Standards and Guidelines	
National Environmental Protection Council (NEPC) *National Environment Protection (Assessment of Site Contamination) Measure 1999*, as amended 2013 (NEPC, 2013).	Throughout RAP and see Sections 4, 5 and 6
NSW Department of Urban Affairs and Planning and Environment Protection Authority *Managing Land Contamination, Planning Guidelines, SEPP55 - Remediation of Land,* (SEPP 55, 1998).	Throughout RAP and see Section 13.3
Sydney *Development Control Plan* (DCP) 2012 and Sydney *Local Environment Plan* (LEP) 2012	Throughout RAP
NSW EPA (2020) *Guidelines for Consultants reporting on contaminated Land: Contaminated land guidelines*	See Section 4
SEARS	
Assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable for the proposed use in accordance with the provisions of SEPP 55.	See Sections 4, 5 and 6
Identify and detail how any asbestos waste, lead-based paint and Polychlorinated biphenyls (PCBs) that may be encountered will be handled, transported and disposed.	See Sections 12.5 to 12.11

2. Objectives of the RAP

The main objective of the RAP is to facilitate the remediation of the site's soils in an acceptable manner, to a condition suitable for the proposed redevelopment and continued use of the site as a primary school and childcare centre.

The specific objectives of this RAP are therefore to provide a strategy for site remediation which:

- Minimises impacts from the site on the environment and on public health and safety during site remediation;
- Maximises the protection of workers involved with site remediation; and
- Renders the site safe, from an environmental perspective, for the proposed land use and substantially reduces potential exposure pathways to contaminants in accordance with remediation acceptance criteria (RAC) as defined in this RAP.

3. Site Information

3.1 Site Identification

The Site comprises the following land parcels as detailed in Table 2 below.

Table 2: Study Area Identification

Lot/Deposited Plan	Current Land Use	Approx. Area (ha)
Darlington Public School, 417 Abercrombie Street, Darlington NSW		
592 / 752049	Primary School	0.49
100 / 623500	Primary School	0.23
Total Approximate Area		**0.72**

3.2 Site Description

The following site description is based on the following:

- DP site inspection completed on 28 February 2018;
- PSI field works completed on 17 March 2018;
- DSI field works completed on 14 to 18 January 2018;
- SVA field works completed on 28 and 29 April 2020; and
- A review of Nearmap Imagery.

Prominent site features are presented on Drawing 2 (Appendix A).

Lot 592 DP 752049

This lot is roughly square shaped and comprises the majority of the school grounds and buildings. A large two storey rectangular building is located in the south western corner of the lot which comprises several school offices and classrooms. The building is constructed of brick walls, concrete slab floors and sheet metal roofing. Several interior walls and ceilings of the building appeared to be constructed of fibre cement sheeting (FCS), possibly containing asbestos. A courtyard is located to the immediate east of the building and is mostly concrete sealed with two small unsealed garden areas containing large established trees and shrubs. Another brick building is located to the immediate east of the courtyard and is also constructed of brick walls, concrete slab floor and metal sheeting roofing.

FCS interior walls and ceilings were also observed in portions of the building.

Another large rectangular shaped building is located across the central western portion of the lot and comprises the school hall and a number of classrooms. The building is constructed similarly to the other buildings onsite. An extension of the building is located to the immediate northwest. An area containing play equipment is located to the immediate east of the building. The play equipment area is sealed with a “soft-fall” safety surface material. A concrete path is located immediately adjacent to the east of the play area with an unsealed garden located further to the east.

Another S – shaped classroom building is located across the central south eastern portion of the lot which is also constructed similarly to the other buildings onsite. The area to the immediate north of the S-shaped building is concrete sealed with unsealed gardens and a grassed area located further beyond in the north eastern portion of the lot.

Lot 100 DP 623500

This lot is roughly L – shaped and consists of a basketball court and playground area. The lot is elevated slightly above the remainder of the site (adjacent lot to the south) indicating that the area has likely been historically filled. The majority of the area is sealed with asphalt and concrete. The far northern portion of the lot is elevated further above the remainder of the lot and is covered with a "soft-fall" safety surface material. Several large established trees also exist within the northern portion of the site. An unsealed garden bed is located along the eastern boundary of the lot and contains several small shrubs.

3.3 Surrounding Land Use

The site is located in a residential/educational precinct area with the land use surrounding the property as follows:

North:	A Sydney University building (residential and educational) with Darlington Lane and residential properties beyond.
East:	Sydney University student accommodation buildings (residential) with Sydney University campus buildings beyond.
South:	Abercrombie Street with residential properties beyond.
West:	Golden Grove Street with residential properties beyond.

3.4 Regional Geology, Soils, Hydrogeology and Hydrology

Reference to the Sydney 1:100 000 Geological Series Sheet indicated that the site is underlain by Ashfield Shale (Rwa) of the Wianamatta Group of Triassic age. This formation typically comprises shale, carbonaceous claystone, laminite, fine to medium grained lithic sandstone and some minor coal bands.

Reference to 1:100 000 *Sydney* Geological Series Sheet 9030 (Edition 1), 1991 indicates that shallow soils at the site comprise Blacktown Soil Landscape (bt) which is characterised by topography of *'gently undulating rises on Wianamatta Group shales and Hawkesbury shale, with local relief to 30 m and slopes usually less than 5%'*. This is a residual landscape which the mapping indicates comprises up to two soil horizons that range from shallow to moderately deep red and brown podzolic soils on crests, upper slopes and well drained areas to yellow podzolic soils on lower slopes and in areas of poor drainage. These soils are typically of low fertility comprising moderately reactive high plasticity subsoils with poor drainage.

A recent search of the NSW Office of Water groundwater bore data was undertaken by DP on 17 August 2020 and identified one bore within 500m of the site. Table 3 below provides a summary of information for the bore in question.

Table 3: Summary of Groundwater Bore Search

Bore ID	Approx. Distance (m) / Direction from Site	Date of Installation	Bore Use	Total Depth (m)	Depth of Water Bearing Zones (m)
GW110247	Northwest/200 m	16/07/2009	Domestic Bore	210	22.0 to 23.0 74.0 to 76.0 188.0 to 188.5

Groundwater monitoring well GW110247 is located up hydraulic gradient of the site.

The nearest surface water receptor down-gradient of the site is Lake Northam located within Victoria Park approximately 850 m northeast of the site.

3.5 Acid Sulphate Soils

Review of NSW Government Office of Environment and Heritage Acid Sulphate Soils Risk mapping indicates that the site is classified as having *'no known occurrence of acid sulphate soil'.*

4. Previous Contamination Investigations

DP is aware of the following environmental investigations having previously been undertaken at the site:

4.1 Parsons Brinkerhoff (2014) Asbestos in Grounds, Asbestos Management Plan

BLP provided DP with an Asbestos Management Plan (AMP) produced for the site by Parsons Brinkerhoff (PB) in 2014. The AMP was an updated version of previous AMPs produced for the site by PB in 2007 and 2013. In August 2007 fragments of asbestos-containing materials (ACM) were identified by PB on ground surfaces across the northern playground area of the site. In order to manage the risk of exposure to asbestos these fragments were removed under the guidance of PB from the ground surfaces in August 2007 and July 2013. In a previous PB inspection report it was proposed that an area delineated as the asbestos zone in the northern playground be encapsulated with an appropriate surface such as hard stand or raised mulch garden beds. The AMP (PB, 2014) outlines the plan for management of the identified asbestos impacted areas (zones).

The asbestos register in Section 3 of the AMP outlines the areas requiring management as:

- The northern playground area; and
- Northern and north eastern raised garden beds adjacent to the school boundary walls.

The AMP (PB, 2014) recommended that asbestos zone management should include regular inspections and maintenance. The PB AMP included a checklist (presented in Appendix A of the AMP) which it was recommended be used whenever walkover inspections or maintenance is carried out. The AMP states that "*the checklist is specific to the requirements of the grounds at the Darlington Public School and sets out the frequency of inspections required*".

In addition, subsection (5.2) within Asbestos Zone Maintenance Works and Management (Section 5) states that "*if work within sub soil areas within school grounds that will disturb or potentially disturb the buried asbestos, the contractor, maintenance person; all Department of Commerce, Department of Education & Communities personnel or other authorised person must engage a licensed asbestos removal contractor with a friable asbestos licence to undertake the work*".

4.2 DP (April 2018) Preliminary Site Investigation

DP completed a PSI of the site for BLP in April 2018 which was required as part of a master plan and concept design and to support future development applications being made to the City of Sydney. The aim of the PSI was to provide preliminary contamination, salinity and acid sulfate soil information regarding the site's suitability for the proposed redevelopment/upgrade works.

A site walkover and a desktop review of site history information were undertaken to identify areas of environmental concern (AEC) and contaminants of concern (CoC) which may have arisen from previous and current land uses and activities. The desktop investigation was limited to a review of aerial photographs, a number of NSW EPA database searches and listing of other potential site contamination issues based on DP experience with sites of a similar nature and scale.

The results of the site walkover and desktop investigation identified the following AEC that had the potential for contamination of near surface soils and/or fill at the site:

- AEC1: Presence of demolished former buildings and sheds (hazardous building materials contained within);
- AEC2: Presence of imported filling of an unknown origin;
- AEC3: Presence of former and current sheds (potential chemical storage);
- AEC4: Presence of a power pole (potential contaminants associated with pole treatment/protection); and
- AEC5: Presence of a former road/laneway.

Targeted sampling was undertaken at ten locations across the site within identified AEC in the vicinity of former/current site structures and areas of fill (BH1 to BH6, BH8 and BH9), the former road/laneway (BH7) and a power pole onsite (Power pole). The results of site inspection and soil sampling identified the following that will require remediation, management and/or risk assessment or further investigation for the site to be considered suitable for the proposed upgrading works and ongoing use as a primary/pre-school:

- TRH, PAH and lead impact were variously identified in shallow fill at two locations in the north western portion of the site (BH5 and BH6) and one location in the south eastern portion of the site (BH2). Given the identification of slag and charcoal type material within fill at these locations contamination of the fill is considered to be potentially associated with historic fill from an industrial site with blast furnace activities;

- TRH and zinc impact to shallow soils in the central eastern portion of the site; and
- Potential for ACM impact to shallow soils across the site. Whilst ACM was not identified in the PSI soil sampling, given the preliminary nature of the PSI; the historical demolition of numerous structures; and importation of fill, the presence of asbestos impacted soils at the site could not be ruled out.

The PSI sample locations are shown on Drawing 3 (Appendix A).

The tabulated data summary table of soil sampling results from both the PSI and DSI is presented in Table C1 in Appendix C.

4.3 DP (February 2019) Detailed Site Investigation

A DSI was completed to further investigate the above issues to update the PSI report on contamination to inform ongoing concept design for the school. DSI field work was completed at the site on 15 to 18 January 2018 which included completion of the following scope of work:

- Completion of 16 probability-based boreholes (BH10 to BH19 and BH21 to BH25) across the site on a 19.5 m grid and collection of shallow (between 0.2 and 0.5 metres below ground level [m bgl]) fill soil samples. Three of the locations (BH19, BH21 and BH24) drilled for a concurrent geotechnical investigation were utilised to collect fill samples. Grid based borehole BH20 could not be completed as the area was inaccessible due to raised garden beds. The number of grid samples, including sample locations completed during the PSI, satisfies NSW EPA sampling requirements for the area of the property (total area of approx. 0.72 ha). The grid is sufficient to detect a 22.9 m diameter hotspot with a 95% upper confidence level. The grid was positioned so that grid locations could also investigate the lateral extent of impact to filling at locations BH2, BH5, BH6, BH7 and BH9 where CoC were identified during the PSI that require some form of remediation, management and/or risk assessment;
- Completion of two targeted locations (BH26 and BH27) and collection of shallow (between 0.2 and 0.5 mbgl) filling soil samples. The locations were positioned at points at a distance of approximately 5 – 7 m from previously identified impacted locations (BH2, BH5 and BH6) to further investigate the immediate lateral extent of impact at these locations where concentrations of the CoC were detected at levels exceeding human health investigation levels. It should be noted that these locations were used in conjunction with grid-based locations to investigate the lateral extent of impact and define either remediation, management and/or risk assessment requirements. Targeted borehole BH28 could not be completed as the area was inaccessible due to the presence of raised garden beds;
- Deeper fill samples (between 0.5 and 1.0 m bgl) and natural soil samples were also collected at locations BH2, BH5, BH6, BH7 and BH9 where CoC were identified during the PSI to investigate the vertical extent of impact at these locations; and
- Laboratory analysis of all fill soil samples for the identified CoC including TRH, BTEX, PAHs, metals and asbestos. A deeper fill sample from BH5 and native samples collected at depths of approximately 1.2 m bgl from boreholes BH7 and BH9 were also analysed for the identified CoPC.

The DSI (including PSI) sample locations are shown on Drawing 4 (Appendix A).

The results of DSI soil sampling identified and confirmed TRH, PAH and lead impact to fill across the site at concentrations exceeding both adopted HILs and EILs. The identified impact does not appear to be limited to any particular fill type, fill depth and/or portion of the site. Given that most of the site is sealed with either asphalt, concrete or "soft-fall" safety surface material the potential for complete human health or ecological pathways to exist between impacted filling is considered limited. However, due to unsealed areas in the central eastern portions of the site there is a potential pathway to contamination.

4.4 DP (May 2020) Soil Vapour Assessment

A SVA was completed to further investigate the identified elevated concentrations of F2 and naphthalene exceeding the adopted Tier 1 health screening levels (HSLs) in one fill soil sample collected a location (BH5) at a depth of 0.5 m bgl in the central western portion of the site presenting a potential soil vapour risk.

SVA field work was completed at the site on 28 to 29 April 2020 which included completion of the following scope of work:

- Completion of three hand auger boreholes (BH101 to BH103) and collection of additional fill samples in the vicinity of BH5 on 28 April 2020 to determine the approximate lateral extent of F2 and naphthalene impact to fill presenting a potential vapour risk;
- Installation of Waterloo passive soil vapour samplers (WMGS) within the boreholes completed in the vicinity of BH5. Each WMGS was left for a period of approximately 24 hours before retrieval and sent to the laboratory for F2 (TRH C10-C16 less Naphthalene) and naphthalene analysis; and
- Placement of a summa cannister air gas sampler (SVI1) within the nearest building to the immediate south of BH5 to assess the current indoor air concentrations. The indoor air sample was also collected over an approximate 24-hour period and sent to the laboratory for F2 and naphthalene analysis.

The SVA sample locations are shown on Drawing 5 (Appendix A).

Results of the investigation did not identify F2 and naphthalene at concentrations above the adopted Site Assessment Criteria (SAC) in any of the soil, soil vapour or indoor air samples submitted for laboratory analysis.

Based on the results of the SVA the concentrations of F2 and naphthalene in fill previously detected at 0.5 m bgl at BH5 located in the central western portion of the site were not considered to present a complete vapour intrusion pathway or an actual vapour risk to either the current or proposed school buildings.

5. Site History Summary

The following site history, as presented in Table 4, is based on a review of previous investigations, particularly the aerial photograph review completed as part of the PSI.

Table 4: Summary of Likely Site History

Period	Site	Surrounds
Prior to 1961	Most of the site appeared to be used for residential purposes. A large building that may have been used for commercial/industrial purposes existed in the south eastern portion of the site	Land to the immediate north and west of the site appeared to be used for commercial/industrial purposes. Land to the east and south appears to have been used for residential purposes.
1961 to 1975	The large building in the south eastern portion of the site was demolished and removed from site sometime between 1961 and 1975. Several of the residential properties across the central, northern and western portions of lot 592 also appear to have been demolished. Residential land use continued on the remainder of the site.	Several of the residential dwellings to the east of the southern half of the site have been demolished and the land appears vacant.
1975 to present	Several large buildings have been built in the south eastern portion of the site sometime between 1975 and 1986. The buildings appear to be similar to the present day school buildings. It appears likely that the site has been used as a school from at least 1975.	Land to the west of the site was redeveloped for residential land use sometime between 1975 and 1986.

6. Contamination Summary

Review of the previous investigations and the concept master plans provided by MA showing the proposed building layout indicate TRH, PAH and lead impacted fill across the entire site at concentrations exceeding both adopted HILs and EILs requires remediation and/or management for the site to be considered suitable for the proposed upgrading and continued use of the site as a primary school and preschool. The HILs were developed due to health concerns predominantly through ingestion and dermal contact pathways. Whilst potential for complete pathways to impacted fill at the site is currently considered limited remediation/management is required to reduce exposure pathways in the proposed development.

Table 5: Summary of AEC Requiring Remediation, Contaminant of Concern and Assessment Criteria

AEC	Description of AEC Requiring Remediation	Contaminant of Concern, depth etc	Site Assessment Criteria
2B	TRH, PAH and lead impact to fill across the entire site at concentrations exceeding both adopted health investigation levels (HILs) and ecological investigation levels	TRH C_{10} – C_{40} (maximum of 1,600 mg/kg for TRH C_{16} – C_{34} at BH18 at 0.3 m bgl) PAH (maximum of 42 mg/kg for BaP TEQ contaminants) detected in shallow fill at BH18 at depth of 0.3 m bgl Lead detected at a maximum of 2,200 mg/kg in shallow fill at BH9 at depth of 0.5 m bgl	TRH C_{16} – C_{34} EIL – 300 mg/kg BaP TEQ HIL - 3 mg/kg Lead HIL – 300 mg/kg

7. Conceptual Site Model

7.1 Potential Sources of Contamination

Hazardous Building Materials (AEC1)

Historical aerial photographs and a site inspection identified a number of residential dwellings and associated sheds previously located across the site which have since been demolished in the period between 1961 to 1984. Review of the PB AMP (PB 2014) identified that fragments of ACM were previously identified in the northern portion of the site which is now a sealed area subject to an AMP (AMP, Project reference 1735_ASB_150514_AMP). Asbestos was also detected in one fill soil sample collected during the DSI from the northern portion of the site at BH10.

Anecdotal information also suggests that ACM fragments have previously been identified beneath a building in the central western portion of the site.

There is therefore potential for contamination of shallow soils across the site to be impacted by hazardous building material related contaminants of potential concern (CoPC) including:

- Asbestos; and
- Lead.

Whilst the DP PSI and DSI field observations and laboratory analysis of soil samples collected from across the remainder of the site did not identify asbestos, the potential remains for isolated pockets of asbestos contamination to be present in other areas of the site.

Areas of Filling (AEC2)

The results of the PSI and DSI identified and confirmed that most of the site has been historically filled with material from an unknown origin potentially from an industrial site with blast furnace activities and also indicate the majority of the filling is impacted with the following CoC at concentrations exceeding adopted SAC:

- Total Recoverable Hydrocarbons (TRH);
- Benzene, toluene, ethylbenzene and xylenes (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs); and
- Metals (Pb and Zn).

Chemical and Fuel Storage (AEC3) and Presence of a Former Road / Laneway (AEC5)

Whilst the results of the PSI identified several former sheds associated with the former residential dwellings onsite and a former road/laneway as potential contamination sources, the results of PSI and DSI sampling did not identify any localised point sources of contamination. It is considered unlikely that AEC3 and AEC4 are potential contamination sources at the site. Therefore AEC3 and AEC5 have been dismissed as potential significant sources of contamination and are not discussed further.

Power Pole (AEC4)

Results of PSI sampling at the base of the timber power pole in the southern portion of the site did not identify CoPC at concentrations exceeding the adopted SAC therefore AEC4 is no longer considered a potential source and is not discussed further.

7.2 Potential Receptors

The following potential human receptors (R) have been identified for the site:

- R1 – Construction and maintenance workers (during site redevelopment);
- R2 – Current and future site users following development of the site; and
- R3 – Land users in adjacent areas (residential).

The following potential ecological receptors (R) have been identified for the site:

- R4 – Local groundwater, and receiving water bodies;
- R5 – Surface water bodies (offsite lakes or creeks); and
- R6 – Local ecology. DP notes that potential ecological receptors are usually associated with the upper 2 m (root zone and habitation zone for many species) of the soil profile.

7.3 Potential Pathways

Potential pathways for contamination include the following:

- P1 – Ingestion and dermal contact;
- P2 – Inhalation of fibres and/or dust and/or vapours;
- P3 – Leaching of contaminants and vertical migration into groundwater;
- P4 – Surface water run-off;
- P5 – Lateral migration of groundwater providing base flow to watercourses; and
- P6 – Direct contact with ecological receptors.

7.4 Summary of Potential Complete Pathways

A 'source - pathway - receptor' approach has been used to assess the potential risks of harm being caused to human or ecological receptors from contamination sources on or in the vicinity of the Sites, via exposure pathways. The possible pathways between the above sources (AEC1 - AEC2) and receptors (R1 to R6) are provided in Table 6 below. Assessment of the CSM was used to determine data gaps and the requirement for sampling and analysis to assess the suitability of the site for the proposed continued use as a primary school and childcare centre.

Table 6: Conceptual Site Model

Potential Source	Exposure Pathway	Receptor	Requirement for Additional Data and/or Management
AEC1: Presence of former buildings and sheds (hazardous building materials) AEC2: Presence of filling	P1 – Ingestion and dermal contact. P2 – Inhalation of fibres and/or dust and/or vapours.	R1 - Construction and maintenance workers. R2 – Future site users following development of the site. R3 – Land users in adjacent areas. R5 – Surface water bodies. R6 – Local groundwater and receiving water bodies.	The results of the DSI indicate the majority of filling is impacted with CoC including TRH, PAHs and metals (Pb and Zn) and is the primary source of contamination onsite. In its current state the majority of the site is sealed with either asphalt, concrete or "soft-fall" safety surface material thus limiting most onsite direct human health and ecological contact pathways (i.e. Ingestion, dermal contact and inhalation) to impacted filling.

Potential Source	Exposure Pathway	Receptor	Requirement for Additional Data and/or Management
			There are, however, still some areas (central eastern portions) of the site that are grass covered and unsealed therefore the potential for a complete pathway cannot be fully ruled out – remediation and management of the fill at the site is therefore required to limit the identified exposure pathways. Whilst the limited tested samples of natural soils collected during the previous investigations do not indicate transport of contaminants from the fill leachability testing, in the form of ASLP testing, of CoC in soils at the site may also be required to assess the potential for contamination impact to groundwater.

8. Further Investigation Requirements and Recommendations

The northern portion of the site is currently subject to an existing Asbestos Management Plan (AMP, Project reference 1735_ASB_150514_AMP) due to fragments of ACM previously identified by Parsons Brinkerhoff (PB) on ground surfaces across the northern playground area of the site in August 2007. The AMP however was implemented prior to development of the National Environment Protection Measure (2013, amended) which provides guidance to the assessment of asbestos contamination in soil and updated health screening levels which are based on scenario specific likely exposure levels. Whilst fragments of ACM on site surfaces were removed as part of the management works in 2007 the extent and % content of ACM impact to underlying filling at the site remains uncertain. There is potential that further investigation may determine that the AMP is no longer applicable to all or portions of the northern area of the site if ACM concentrations within soil at the site are at safe levels for the upcoming development works and ongoing future use.

In addition, sampling has not been completed beneath any of the current buildings present at the school. Given the previous identification of ACM in the northern portion of the site the potential for presence ACM existing beneath the current buildings cannot be completely discounted without further investigation following demolition of the buildings.

Further asbestos assessment is therefore recommended to:

- Provide updated information on the contamination status of subsurface filling within the northern portions of the site and beneath buildings including estimations of % content of ACM within filling; and
- Provide information on fill depths and volumes across the area to aid with waste classification and upcoming development/bulk excavation.

To complete further asbestos investigation of the northern portion of the site and beneath current buildings (ideally following demolition of the structures) the following scope of works is required to be completed prior to any remedial works at the site:

- Excavation of test pits on an approximate 11 m grid across the northern portion of the site or beneath buildings with a backhoe/excavator;
- Each test pit excavation is to be completed through fill soils to a depth of approximately 0.3 m into underlying native soils or a maximum depth of 3.0 m;
- At each test pit location 10 L bulk soil samples will be collected from each metre of fill encountered and inspected in accordance with WA DOH gravimetric method. In addition, a 500 ml sample of soil will be collected from each metre of fill soil encountered for asbestos identification and quantification in the soil sample; and
- At the completion of field work and receipt of laboratory results, a report will be required to be completed detailing aims and objectives, field methodology, results (compared against RAC in Table 7 below) and suitability of the tested areas of the site, from an asbestos perspective, for the upcoming redevelopment works and future ongoing use.

In addition, in April 2018 DP completed a Hazardous Building Materials Assessment ('The hazardous materials Assessment', DP ref. 92277.00.R.003.Rev0) which identified ACM and lead based paint within several of the site building structures. The assess the potential for any cross-contamination following the demolition of any structure clearance inspections must be completed, which are to include surface sampling, as follows:

- Collection of surface soil samples (0.0 - 0.1 m bgl) within the footprint of the demolished structure at a rate of one sample per 25 - 50 m^2 or part thereof;
- Laboratory analysis of samples of asbestos (500 mL) and lead; and
- Comparison of results to RAC in table 7 below.

9. Remediation Options

The preferred hierarchy for remediation of soil at contaminated sites in a decreasing order of preference, as set out in NEPC (2013) and outlined in NSW EPA *Contaminated Land Management Guidelines for the NSW Site Auditor Scheme* 3rd Edition, 2018 (NSW EPA, 2018) is:

1) Onsite treatment of excavated soil (so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level);

2) Offsite treatment of excavated soil (so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site);

3) Consolidation and isolation of the contaminant by containment within a properly designed barrier; and

4) Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material.

Based on the sensitive landuse (school), the Request for Tender documents (Section 4 of SINSW00004/19), discussion with MA and provided Master Plans, distribution, depth, subsurface conditions, type of contamination and the concentration of the contamination present at the site, the following remediation options were considered:

1. Off-site disposal of contaminated soils to a licensed landfill.

2. On-site management (i.e. delineation and capping) of contaminated soils.

Opportunities and constraints associated with each option were assessed and are broadly summarised in the following sub-sections.

9.1.1 Off-Site Disposal

Off-site disposal of contaminated soils comprises the excavation of the contaminated soils, waste classification of soil and disposal to a facility which can legally receive it. Based on current results all fill soils within site are suitable for off-site disposal without treatment, subject to appropriate waste classification.

In the event ACM impacted fill is encountered off-site disposal of any ACM impacted fill would involve removal of all ACM fragments and any underlying impacted soils, under an appropriate waste classification to a facility which can legally receive it.

Disposal of the contaminated soils or any ACM off-site is technically a straight forward option and could be completed in a relatively short time scale prior to redevelopment of the site. The option would remove from the site any maintenance and risk legacy associated with impacted fill.

Off-site disposal is, however, an expensive option.

9.1.2 Capping and Containment

Capping and containment would generally involve the excavation and creation of an engineered containment cell followed by the placement of contaminated materials within the containment cell and/or placement of a capping layer over impacted fill areas. A physical barrier over the cell would be required to minimise the potential for exposure to contaminated materials. The strategy would reduce the requirement for any off-site disposal with contaminated soil from the site to be placed within the containment cell.

Following the findings of the PSI, DSI and SVA DP considers that capping and containment is suitable for all fill soils across the site subject to a general capping layer of at least 0.3 m of clean un-impacted soil and a physical barrier such as asphalt or concrete or "soft fall" safety surface material being placed over the impacted fill to minimise potential for exposure. Further details, including exceptions and scenarios, regarding the general capping layer and physical barriers are provided in Section 12.

The geotechnical suitability of any placed material would also need to be considered if the cell was located within portions of the site proposed for buildings.

The containment cell and/or capping area(s) would require an associated environmental management plan (EMP) and notice on title and planning consent. Natural material generated during the excavation of the cell could be used to reinstate site levels.

If the capping of a containment cell extends to a depth greater than 3 m below final ground level, the associated environmental management plan and notice on title would likely not be required (refer to NSW EPA *Guidelines for the NSW Site Auditor Scene (2nd Edition)* April 2006.

9.2 Preferred Remediation Strategy

A review of the Request for Tender documents (SINSW00004/19) and discussion with MA indicates the preferred remediation options selected to remove risk associated with impacted fill at the site are:

- Management onsite of contaminated soils (capping and containment). It is noted that the management of contaminated soils onsite may require notation on title and the implantation of an Environmental Management Plan (EMP). Capping and containment of appropriate fill across the site to limit ingestion or dermal contact pathways; and
- Excavation and offsite disposal of any materials that are considered not suitable to remain on site.

Onsite containment of impacted soil (capping and containment) is considered the preferred primary remediation methodology given the following:

- Onsite containment is considered a more environmentally sustainable option compared to the associated transport and landfill requirements of offsite disposal – NSW EPA accredited Auditors are to consider sustainability and refer to the hierarchy of options set out in NEPC (2013) which are endorsed by the NSW EPA; and
- Onsite containment will minimise truck/transport disturbance to nearby offsite areas and site neighbours (key stakeholders) which includes high density residential and commercial properties.

10. Remediation Acceptance Criteria

The remediation works will be validated as meeting an acceptable standard for the proposed land use. The validation will be undertaken based on visual inspection, field screening, sample analysis and review of disposal dockets as discussed in Section 12.

The remediation acceptance criteria (RAC) for the identified contaminants of concern are based on the HIL, HSL, EIL) and ecological screening levels (ESL) provided in DP (2016) which were established in accordance with Schedule B1, of the National Environment Protection Council, *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC 2013).

The RAC applied will be based on those criteria applied in the previous investigations comprising levels adopted for a recreational land use scenario with garden/accessible soil which includes preschools and primary schools.

The RAC are summarised in Table 7.

Table 7: RAC

Contaminant of Concern		RAC	Rationale
Arsenic*		100 mg/kg	Residential with gardens and accessible soils HIL A
Cadmium*		20 mg/kg	Residential with gardens and accessible soils HIL A
Chromium*		100 mg/kg	Residential with gardens and accessible soils HIL A
Copper*		6000 mg/kg	Residential with gardens and accessible soils HIL A
Lead		300 mg/kg	Residential with gardens and accessible soils HIL A
Mercury*		40 mg/kg	Residential with gardens and accessible soils HIL A
Nickel*		400 mg/kg	Residential with gardens and accessible soils HIL A
Zinc		7,400 mg/kg	Residential with gardens and accessible soils HIL A
Naphthalene		4 mg/kg	Low to high density residential HSL for silty soils 0 m to <1m bgl
TRH Fraction 2		120 mg/kg	Urban residential and public open space ESL - suitable for the uppermost 2 m of the soil profile
		230 mg/kg	Low to high density residential HSL for silty soils 0 m to <1 m bgl
TRH Fraction 3		1,300 mg/kg	Urban residential and public open space ESL for fine soils - suitable for the uppermost 2 m of the soil profile
Benzo(a)pyrene		0.7 mg/kg	
Benzo(a)pyrene TEQ		3 mg/kg	Residential with gardens and accessible soils HIL A
Asbestos	Bonded ACM	No visible ACM on surface and 0.01% (w / w)	For bonded asbestos, no visible asbestos at the surface has been adopted to provide maximum protection at the exposure point, and due to aesthetic issues. HSL for Asbestos Contamination in soil, percentage weight by weight (% w/w). For asbestos fibres, a 'non-detectable' fibres criterion has been adopted.
	Fibrous asbestos (FA) and Asbestos fines (AF)	0.001 % (w / w)	

* Whilst previous investigations have not identified the noted contaminant in soil samples collected at levels exceeding SAC there is still potential for the contaminant to be present to due to presence of slag and charcoal type material within the heterogenous fill at the site.

Soil impacted with contaminants at levels exceeding HILs and/or EILs/ESLs is suitable to remain insitu onsite and at depths of less than 2 m subject to placement beneath a concrete slab, hard stand area or "soft-fall" safety surface material limiting human health and ecological access to affected soils.

Any soil or material removed from the site is subject to waste classification, such that the appropriate disposal practices can be implemented. Materials disposed off-site must be assessed against the NSW EPA *Waste Classification Guidelines* 2014 (EPA, 2014).

11. Personnel and Responsibilities

It is the site owner's responsibility to ensure that appropriate personnel are appointed to manage and conduct the remediation and validation works. This will include:

- The Principal's Representative (PR), who is responsible for overseeing the implementation of this RAP. The PR is responsible for ascertaining that the remediation works have been undertaken in accordance with the RAP;
- The Contractor, who will be responsible for conducting the general remedial works and managing the site; and contractors involved with subsequent construction works. The contractor should appoint a Site Manager or other person responsible for implementation of this RAP. The Contractor will be responsible for preparing a list of contacts, including emergency contacts for the site operations and provision of signage at the site to allow the public to contact nominated site personnel out of hours; and
- In the event asbestos impacted fill in the northern portion of the site (subject to the AMP) is to be disturbed or any other asbestos encountered the Asbestos Contractor will be a suitably licensed and qualified contractor (AS A or B Licence holder) who will be responsible for the handling/removal of the asbestos-cement fragments or any other asbestos containing material which would be classified as asbestos works. The Asbestos Contractor and the contractor can be the same entity.

The Environmental Consultant will be responsible for providing supervision as necessary for the remedial works, providing advice as required and undertaking the validation works in accordance with this RAP. Supervision of the remedial works will be to assist with the contractors understanding of the RAP at the commencement of each phase.

12. Remediation Strategy

12.1 Preliminary Site Design and Containment Cell/Capping Layer Management Area

Remediation and/or validation of the fill and impacted soil is to be incorporated into the construction phase of the site's development and the final design. It is understood, based on plans provide by Mace (Appendix D), that the construction phase is to be completed in a three-stage process as follows:

- Early works – November 2020 – February 2021 – Completion of upper games court, (north east corner of site) and partial demolition of Block C
- Stage 1 – February 2021 – Early 2022 – Construction of new buildings (north west portion of site)
- Stage 2 – Early 2022 – Early 2023 – Complete new build (southern portion of site), including demolition of Block A, B, remainder of C.

It is noted that the central eastern portion of the site, currently a grassed area, has not been included in the staging process. The grassed unsealed area however, will require remediation during the staging process to limit access to the soil. In the interim and given the likely timeframe of the proposed remedial works it is recommended that interim site management including restricting access, by fencing or other such means, to the grassed area in the central portion of the site be implemented to limit exposure to potentially impacted shallow fill.

12.2 Containment Cell/Capping Layer Management Area

Containment Capping Layer Management Area – comprising areas where remediation will be incorporated into the final site design and will generally include all fill across the site.

The management area will generally include a capping layer (ref s.12.5.3) comprising a geo-textile fabric liner and a minimum of 0.3 m of clean fill and the covering of either asphalt, concrete or "soft-fall" safety surface material. Exceptions to the general capping layer and physical barrier requirements include the following scenarios:

- The capping layer depth maybe reduced in the immediate vicinity (<1.5 m from the trunk) of large established trees to limit the potential for the capping layer to damage the trees – In the event that the capping layer is reduced in the vicinity of trees then another barrier (ie: elevated timber boardwalk or fencing) must be implemented to prevent a complete pathway to impacted fill – consultation with a qualified arborist is recommended to determine the most appropriate barrier;
- In areas of the site, such as the areas proposed for soft landscaping (such as flowerbeds), where a covering of asphalt, concrete or "soft fall" is unsuitable or impractical to implement, the capping layer of clean unimpacted fill is to be increased to at least 0.5 m which can include the garden bed soil profile providing that the soil profile comprises clean unimpacted soil;
- In areas of the site that are not proposed for redevelopment and a concrete slab of good condition (as established by a Competent Person) currently exists no further management is required as the existing concrete slab already acts as a suitable barrier to prevent access to contaminated fill; and
- The total thickness of the concrete slab and underlying clean subgrade material is equal to or exceeds 0.3 m.

Further details of the remediation and validation strategy for the areas are provided in Sections 12 and 13.

12.3 Contingency Scenarios

12.3.1 Fill Determined to have Unacceptable Leachable Concentrations of CoPC- Offsite Disposal and/or Placement in a Containment Cell

It is possible that onsite fill contains unacceptable leachable concentrations that have the potential to impact underlying natural soil and groundwater. In this event offsite disposal may be necessary. Materials at the site must undergo waste classification as discussed in section 12.8 and should be transported directly from the excavation to an awaiting truck. Where this is not possible, and materials require ongoing stockpiling, controls should be emplaced as discussed in section 12.9.

Alternatively, fill found to have unacceptable levels of leachable concentrations of CoPC maybe also be suitable to remain onsite subject to placement within an engineered lined containment cell that has a physical separation barrier at the top, base and walls of the containment cell to prevent surface infiltration or the loss of leachate. In such a scenario, the containment cell will also require a properly engineered leachate collection system and the implementation of an ongoing monitoring program to ensure the integrity of the containment system is maintained.

12.3.2 Complaints

Due to the nature of the activities and type of contaminants at the site there is a potential for complaints to be received from the public, relating to environmental issues. All complaints must be directed as per the communications strategy discussed in section 14.1.

12.3.3 Severe Weather

Monitoring of weather should be completed daily by checking the Bureau of Meteorology website for updates on any severe weather forecast. Should severe weather be forecast, especially high winds, works will stop until safe to recommence.

12.4 General Remediation Procedures and Sequence

It is understood that the proposed site development is considered designated development and therefore is considered category 1 work which will require development consent from the planning authorities in accordance with NSW Department of Urban Affairs and Planning and Environment Protection Authority *Managing Land Contamination, Planning Guidelines, SEPP55 - Remediation of Land,* (SEPP 55, 1998).

This report does not include an estimate of the final volume of material requiring emplacement within the containment cell management area or the effective management area and 0.3 m capping layer on the final level of the site. The NSW Department of Education should consult with the engineer and the earthworks contractor prior to, and during the earthworks/remediation stages of the site redevelopment to define final levels.

This information presented in the section is sufficient to allow the civil designer to prepare the civil plans. Further detail will be provided in the work method statement or work plan which will be produced following preparation of the final Civil drawings. The work method statement or work plan must describe in detail how remediation works are to occur and design details for the capping (or containment).

The detailed procedures and sequence for the remediation work will rest with the contractor and will depend upon the equipment to be used and the overall sequence of the remediation or development. It is the contractor's responsibility to devise a safe work method statement (SWMS), or similar, and to implement proper controls that enable the personnel undertaking the remediation to work in a safe environment. This RAP does not relieve the contractor(s) of their ultimate responsibility for occupational health and safety of their workforce and to prevent contamination of areas outside the immediate workspace. This RAP sets out the minimum standards and guidelines for remediation that will need to be used in preparing a method statement.

Any asbestos associated remediation works, particularly in the northern portion of the site subject to the AMP, must be undertaken by an appropriately licensed asbestos remediation contractor and in accordance with *Work Health and Safety Regulation NSW 2011* and any other applicable SafeWork NSW or Safe Work Australia regulations or guidelines.

DP recommends that the asbestos remediation contractor must be licensed for Class B asbestos removal or disturbance. A Class B licence is suitable for the remediation, specifically in the northern portion of the site, given that asbestos at the site has generally been identified in a bonded (non-friable) form (ie: ACM in good condition). It is recommended that air quality monitoring is undertaken during bonded ACM removal work. In the event that significant quantities of AF or FA are observed during the remediation, works shall cease until a Class A asbestos removal license is obtained by the remediation contractor.

A licenced asbestos assessor (DP) must undertake air quality monitoring for all removal work requiring a Class A asbestos removal licence.

The licensed asbestos remediation contractor must give written notice to Safe Work NSW at least five days before remediation work commences.

A survey of the full extent of the remediation and placement (containment cell) areas, supply coordinates and produce a survey drawing showing the extent of the known location of the remediation area and placement areas/depths relative to proposed development layout should be conducted.

12.5 Remediation Scope

The proposed remediation scope is described in Sections 12.5.1 to Section 12.5.4.

12.5.1 Site Establishment

Prior to the implementation of the proposed remediation works, the site is to be established in accordance with all NSW legislative requirements.

For all works requiring a Class B asbestos removal license air quality monitoring for airborne asbestos fibres should be conducted on a daily basis when works involving the excavation and transport of ACM and potential asbestos impacted soils are being conducted within the site. The environmental consultant is to conduct the air quality monitoring or manage the works through an experienced contractor. Air quality monitoring must be undertaken by a licenced asbestos assessor for all works requiring a Class A asbestos removal license.

The NSW Department of Education will be notified by the environmental consultant of any laboratory detections of airborne asbestos fibres during the course of the works. In the event of detections the remediation contractor should make appropriate modifications to work methods, as required.

12.5.2 Excavation and Off-Site Disposal of Soils

Prior to commencing with the remedial excavation of soils, the environmental consultant will establish the identity and extent of any impacted soil to be remediated through this process.

Excavation of impacted soil from the relevant area should include over excavation of underlying soils to a depth of 0.05 m. Excavated impacted soils are to be disposed off-site to an appropriately licenced landfill in accordance with EPA (2014).

Validation of the remediation excavation will be undertaken in accordance with Section 13. A survey of the final remediation excavation areas and depths of any related excavations is to be undertaken and provided to the environmental consultant prior to final validation being undertaken.

12.5.3 Containment Cell/Capping Layer Areas

All fill across the site is suitable for placement below a containment cell/capping layer area subject to general covering with a minimum of 0.3 m of clean fill. The capping layer is to be covered with either asphalt, concrete or “soft-fall” safety surface material to limit human or ecological direct contact to impacted soil. Exceptions to the general capping and physical barrier requirements have been previously discussed in Section 12.2.

In the event a specific containment cell is proposed a designated stockpiling area should be established at the site so that all material requiring containment can be consolidated in one area prior to placement within the containment cell.

In the event a specific containment cell is proposed the containment cell requires the following:

- A suitable size to contain all impacted material and taking into account soil bulking factor;
- Survey of the excavated cell;
- The Contractor shall place the impacted material into the cell; after placement of the material, the surface of the impacted material shall be covered using a coloured geotextile cover layer to act as a physical marker for any future excavation works. If asbestos impacted fill is to be included then asbestos warning tape should be included;
- Suitable soil cover shall be placed above the geotextile cover; and
- Cell to be designed by a civil designer DP to review the design prior to construction.

The Remediation Contractor shall survey the base and top of the containment cell and/or capping layer and confirm the construction of the cell and/or capping layer in as-built drawings. It will be necessary to include the survey as part of the Validation Report and the EMP. A work method statement shall be prepared by DP to provide clear instruction to the remediation contractor on the requirements for construction.

An Environmental Management Plan (EMP) will need to be prepared and a notification on title will be required (Section 10.7 Certificate (formerly Section 149 Certificate). The EMP will provide ongoing control measures to aid in the management of the risks associated with impacted filling at the site to protect human health and the environment. Consultation must be completed with the consent authority and owner to determine the most suitable enforcement mechanism for the implantation of the EMP.

12.5.4 Geo-textile Fabric Requirements

A geo-textile barrier is to be incorporated into the capping layer to provide a warning of the underlying soil contamination. In accordance with Western Australian Department of Health *Guidelines for the Assessment, Remediation, and Management of Asbestos Contaminated Sites in Western Australia*, (DoH 2009) the geotextile fabric should meet the following conditions:

- Water permeable;
- Highly Visible;
- Rot-proof and chemically inert;
- High tensile strength;
- Coverage of the contaminated areas and 0.5 m beyond boundary if practical; and
- Parallel Sheets to be fixed together or overlaid by 0.2 m.

12.6 Contingency for Unexpected Findings

If unexpected conditions are encountered during the remediation (such as buried tanks, unexpected contaminated soil or contaminants including additional ACM or FA/AF asbestos), the following general approach will be adopted:

- Stop work in the area of impact and barricade area to prevent access to unauthorised personnel;
- The remediation contractor is to contact the principle representative (PR) and the environmental consultant (EC);
- The EC will make an assessment of the severity of the find in terms of the potential impact to human health and the environment;
- The EC will liaise with the PR as required;
- The environmental consultant will provide written advice to the PR regarding the recommended course of action;
- NSW Department of Education will obtain necessary approvals from the relevant planning authority; and
- The remediation contractor is to implement the agreed management/remedial strategy.

12.7 Minimisation of Cross-Contamination

In addition to the recommended measures provided in the following sections for management of the remediation works, plant movement within areas of active remediation should be restricted and monitored to ensure vehicles do not unnecessarily pass over validated surfaces or through contaminated areas in order to eliminate or at least minimise the potential for cross contamination.

12.8 Waste Disposal

If materials are required to be disposed of at an off-site location, sampling and analysis of the materials at a frequency of 1 sample per 25 – 50 m^3 of soil (dependent on stockpile volume) will be required to provide a classification of the materials for waste disposal according to the provisions of NSW EPA *Waste Classification Guidelines* (2014) (EPA, 2014b).

The material must be disposed of at a waste facility licensed to receive asbestos waste.

The tipping dockets will require to be provided to the Environmental Consultant for waste reconciliation purposes. In addition, any asbestos disposal must be tracked and reported to the EPA using WasteLocate.

12.9 Stockpiling of Contaminated Material

It is recommended that material handling is minimised as much as possible. However, if required, contaminated material shall be stockpiled at a suitable designated location. Dust and sediment control is necessary for all stockpiled materials and should include light conditioning with water for exposed materials or covering with anchored geotextile or similar.

Should any stockpiles remain in place for over 48 hours they should be appropriately managed to prevent fugitive dust leaving the site (e.g. light wetting or covering with anchored geotextile depending on weather conditions). Geotextile silt fences or hay bales should be erected around each stockpile to prevent losses by surface erosion.

The footprint of the stockpiles is to be validated by visual inspection and soil sampling and laboratory analysis in accordance with Section 11. Removal of stockpiles should include over excavation of underlying soils to a depth of 0.05 m.

12.10 Loading and Transport of Spoil

All transport of waste and disposal of materials must be conducted in accordance with the requirements of the *Protection of the Environment Operations* (POEO) *Act*, 1997. All required licences and approvals required for disposal of the material must be obtained prior to removal of the materials from the site.

Transport of spoil shall be via a clearly delineated, pre-defined haul route, which should be lightly conditioned with water (dust suppression, ie: hose, water cart) and have designated site egress locations with wheel washing facilities.

Removal of waste materials from the site shall only be carried out by a licensed contractor holding the appropriate licence, consent or approvals to dispose of the waste materials according to the classification outlined in EPA (2014) and with the appropriate approvals obtained from the NSW EPA, if required.

The truck dispatch shall be logged and recorded by the contractor for each load leaving the site. A record of the truck dispatch will be provided to the PR.

12.11 Disposal of Material

All materials excavated and removed from the site as part of the remediation shall be disposed in accordance with the POEO Act, 1997 and to a facility/site legally able to accept the material. Copies of all necessary approvals from the receiving site shall be given to the PR prior to any contaminated material being removed from the site.

All relevant analytical results shall be made available to the contractor and proposed receiving waste facility to enable selection of a suitable disposal location.

Details of all contaminated and spoil materials removed from the site as part of the remediation and a record of the disposal of materials will be maintained and documented by the contractor with copies of weighbridge slips, trip tickets and consignment disposal confirmation (where appropriate) provided to the environmental consultant and the PR. A site log will be maintained by the PR to track disposed loads against on-site origin.

12.12 Materials for use in Backfilling and Imported Fill

Any additional material required for redevelopment works, including backfilling of remediation excavations shall be either:

- Materials from validated areas of the site; or
- Imported materials must be certified as VENM or ENM under the appropriate Resource Recovery Order by the supplier (including laboratory analysis), as well as meeting the SAC established in DP (2016). The material and material management should also comply with relevant legislation (e.g. POEO Act, 1997) and any site fill management plan (where relevant).

The report for any imported VENM is to be prepared by a suitably qualified consultant. Sampling and analysis of any imported material should be undertaken to confirm its suitability for use on the site as follows:

- Collection of samples at a density of one sample per 1,000 m^3 of imported VENM, or a minimum of three samples per source site;
- Analysis of samples for metals, PAH, TPH, BTEX, PCB, OCP, OPP, phenol, asbestos and any other identified CoPC;
- Collection and analysis of quality control (QC) samples in accordance with Section 13.2; and
- Comparison of results with published background levels SAC established in the DSI to determine its status as VENM and its suitability for use on the site.

The importation of recovered aggregate is to be avoided if possible. In the event the importation of recovered aggregate is required necessary, testing of imported material should be completed at a rate of one sample per 100 m^3 and includes collection of 500 mL samples for analysis of asbestos (to 0.001% w/w) in accordance with NEPC (2013) endorsed Western Australia Department of Health (2009) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (WA DoH, 2009).

Materials used on site should also meet other requirements (e.g. geotechnical and salinity requirements).

13. Validation Plan

13.1 Validation Scope

13.1.1 Validation Data Quality Objectives (DQO)

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

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

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

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

A checklist of Data Quality Indicators (DQI) will be completed as part of the validation assessment.

13.1.2 Validation of Remedial Excavation of Soils Impacted by CoC

In the event remediation includes excavation and the removal of impacted soils impacted by CoC, the environmental consultant will validate the resultant remedial excavation footprint as follows:

1. Visual inspection of remedial excavation including regular inspections and maintenance of a photographic record during and following remedial excavation works ;
2. Sampling and analysis of the soil by the environmental consultant with reference to NEPC (2013) and guidelines as follows:
    - o For small to medium excavations (base <500 m^2):
        - Base of excavation: one sample per 25 - 50 m^2 or part thereof; and
        - Sides of excavation: one sample per 10 m length or part thereof. Additional samples will be collected at depths of concern where there is more than one depth of concern (e.g. multiple filling horizons).
    - o For Large excavations (>500 m^2):
        - Base of excavation: sampling on a grid at a density in accordance with the EPA *Contaminated Sites: Sampling Design Guidelines* (1995); and
        - Sides of excavation: one sample per 20 m length or part thereof. Additional samples will be collected at depths of concern where there is more than one depth of concern (e.g. multiple filling horizons).

3. Analysis of collected samples for CoC respective specific area;
4. Where the reported concentration of the CoC are greater than the RAC, further chase out at that location will be required and steps 1 to 3 will be repeated; and
5. A survey of the final remediation excavation areas is to be undertaken and provided to the environmental consultant prior to final validation.

In the event the presence of asbestos cannot be discounted in portions of the site by further sampling discussed in Section 8 then validation sampling must also include collection of 500 mL samples for analysis of asbestos (to 0.001% w/w) in accordance with NEPC (2013) endorsed WA DoH (2009).

Development works within the site (other than remediation works detailed in this RAP) should only progress following written confirmation by the environmental consultant.

13.1.3 Validation of the Burial Areas Where Suitable – Containment Cell/Capping Layer

Regular inspections and photography are to be completed during all remedial excavation and capping/containment works.

Final validation of the site will be provided on the understanding that the soils impacted by contaminants are placed below final design levels as constructed surface levels as specified in Section 12.5.3.

A survey of the final fill area, including the depth of cover is to be undertaken and provided to the environmental consultant prior to final validation.

13.2 Quality Assurance Plan

13.2.1 Sample Collection and Handling

The general sampling procedures comprise:

- The use of stainless steel or disposable sampling equipment;
- Decontamination of sampling equipment prior to the collection of each sample;
- Labelling of the sample containers with individual and unique identification details including Project No. and Sample No.; and
- The use of chain-of-custody documentation so that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

13.2.2 Field QA/QC

Appropriate sampling procedures will be undertaken to prevent cross contamination. These include:

- Standard DP operating procedures are followed;
- Replicate field samples are collected and analysed;
- Samples are stored under secure, temperature controlled conditions;
- Chain-of-custody documentation is employed for the handling, transport and delivery of samples to the selected laboratory; and
- Proper disposal of contaminated soil, fill or surface water originating from the site.

13.2.3 Laboratory Quality Assurance and Quality Control

A National Association of Testing Authorities (NATA) accredited laboratory will be used to conduct analysis. For consistency with previous investigations, Envirolab Services Pty Ltd must be used as the analytical laboratory for asbestos analysis.

13.2.4 Achievement of Data Quality Objectives

Based on fulfilment of the DQOs, an assessment of the overall data quality will be presented in the final validation report.

13.2.5 Validation Reporting

A Site Remediation and validation report (SRVR) will be prepared by the environmental consultant in accordance with EPA NSW *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (2020). The objective of the validation report will be to confirm that the site has been remediated to a suitable standard for the proposed redevelopment and that no related adverse human health and environmental effects have occurred as a result of the works. The validation report will also include a summary of the information from previous investigations.

The validation report will include:

- Documentation of the implementation of the Remedial Strategy;
- Details of the location and total estimated volume of materials excavated and replaced within the site and volume of material removed from the site for disposal as well as the tonnages reported by the licensed landfill;
- A photographic record of the works and of final excavations;
- Survey records of excavations and final levels after fill placement;
- Drawings showing contamination assessment sample locations and validation sample locations;
- Detailed analytical results;
- Details of materials imported to the site, as required; and
- Details, including survey records, of the final cover.

14. Site Management Plan

It is the responsibility of the contractor to develop a Site Management Plan detailing site management, environmental management and workplace health and safety (WH&S) plans for the site. This section provides a brief summary of some of the items which need to be included in the contractor's plans.

Works shall comply with all legislative requirements including, but not limited, to those set out under the following legislation and guidance (and subsequent amendments and regulations):

- *Environmentally Hazardous Chemicals Act 1985* (NSW);
- *Environmental Offences and Penalties Act 1989* (NSW);
- *Protection of the Environment Operations Act (POEO) 1997* (NSW);
- *Protection of the Environment Operations Act 1997 (including POEO Amendment (Scheduled Activities and Waste) Regulation 2008)* (NSW);
- *Work Health and Safety Act 2011* (NSW);
- *How to manage and control asbestos in the workplace Code of Practice*, SafeWork Australia, 2011a;
- *How to safely remove asbestos Code of Practice*, SafeWork Australia, 2011b;
- *Code of Practice for the Management and Control of Asbestos in Workplaces*, NOHSC:2018, 2005; and
- *Code of Practice for the Safe Removal of Asbestos 2nd edition*, NOHSC: 2002, 2055.

Should it be encountered all remediation works detailed in this RAP involving asbestos are to be conducted by an appropriately Licenced Asbestos Contractor in accordance with the requirements of NSW WorkCover (2008) *Working with Asbestos – Guide 2008*.

14.1 Site Operations

The schedule of remedial works, including timing and staging is to be prepared by the contractor to meet the requirements of this RAP.

Remediation works will be restricted to the hours set out by the statutory planning authority and the Council of the City of Sydney.

Working hours for the removal of contaminated materials and remediation activities generally may be limited dependent on the nature and risk profile of the work to operate within approved hours as advised by SINSW.

It is the site owner/developer's responsibility to ensure that appropriate personnel are appointed to manage and conduct the remediation and validation works. This will include:

- The PR, who is responsible for overseeing the implementation of this RAP;
- A head contractor, who will be responsible for conducting the remedial works and managing the site; and
- An environmental consultant, who will be responsible for providing advice as required for the remedial works and undertaking the validation works in accordance with this RAP.

Other parties who may be employed to assist in the implementation of this RAP include, but are not limited to, occupational hygienist(s) and asbestos licensed contractor(s).

The PR will be responsible for preparing a list of contacts for the works. The head contractor will be responsible for preparing a list of contacts, including emergency contacts for site operations and provision of signage at the site to allow the public to contact nominated site personnel out of hours.

It is understood the preliminary communications strategy is as follows:

- Community Communications Strategy (CCS) to be developed by SINSW;
- Contact information for SINSW Community Engagement Manager to be confirmed via CCS. All queries, concerns, and complaints will be managed solely by SINSW; and
- The strategy for remediation and any significant contamination activities will be communicated to the school community and local residents via SINSW communications team.

14.2 Environmental Management

The work shall be undertaken with all due regard to the minimisation of environmental effects and to meet all statutory requirements. The contractor shall have in place a Construction Environmental Management Plan (CEMP) which addresses the following items:

- Site stormwater management plan – Relevant Sydney Water Stormwater and Sewer Plans have been included in Appendix E;
- Soil management plan;
- Noise control plan;
- Dust control plan; and
- Contingency measures for environmental incidents.

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

- Fugitive dust leaving the confines of the site is minimised;
- No water containing suspended matter or contaminants leaves the site in a manner which could pollute the environment;
- Vehicles shall be cleaned and secured so that no mud, soil or water are deposited on any public roadways or adjacent areas;
- Spoil is managed in accordance with Section 12.8 to 12.11 of this RAP; and
- Noise and vibration levels at the site boundaries comply with the legislative requirements.

14.3 Occupational Health and Safety

The contractor should develop a site emergency response plan (ERP) and workplace health and safety plan (WHSP). This will ensure the safety of the personnel working on site, given any likely emergency situation which may occur. The OHSP and ERP should include emergency phone numbers and details of local emergency facilities.

Appropriate fencing and signage should be installed around and within the site to prevent unauthorised access to the site, restricted access remedial areas and deep excavations.

All personnel on site are required to wear the following personnel protective equipment (PPE) at all times:

- Steel-capped boots;
- High visibility clothing; and
- Hard hat meeting AS 1801 - 1981 requirements.

The following additional PPE will be worn as required:

- Hearing protection meeting AS 1270 - 1988 requirements when working around machinery or plant equipment if noise levels exceed exposure standards;
- Safety glasses or safety goggles with side shields meeting AS 1337 - 1992 requirements (as necessary, particularly during demolition);
- Appropriate safety masks (i.e. P1 or P2); and
- Any additional protection identified by the Asbestos Removal Contractor or environmental consultant.

All contractors are required to show compliance with the Work Health and Safety Regulation 2011, including the preparation of a Site Safety Management Plan and Safe Work Method Statements.

15. Conclusion

It is considered that remediation and validation of identified contamination, in accordance with this RAP, will render the site compatible with the proposed land use as a primary school and childcare centre. In addition, adherence to the RAP should enable appropriate management of any potential impacts on the environment which may occur during the course of the remediation works.

16. References

1. DP *Report on Preliminary Site Investigation, Darlington Public School Upgrade, 417 Abercrombie Street, Darlington NSW,* Project 92277.00.R.001.Rev0 ('the PSI'; DP, April 2018).
2. DP *Report on Hazardous Building Materials Assessment, Darlington Public School Upgrade, 417 Abercrombie Street, Darlington NSW,* Project 92277.00.R.003.Rev0 ('the Hazardous Materials Assessment'; DP, April 2018a).
3. DP *Report on Detailed Site Investigation, Darlington Public School Upgrade, 417 Abercrombie Street, Darlington NSW,* Project 92277.01.R.002.Rev0 ('the DSI'; DP, February 2019).
4. DP *Soil Vapour Assessment, Darlington Public School Upgrade, 417 Abercrombie Street, Darlington NSW,* Project 92277.02.R.003.Rev0 ('the SVA'; DP, May 2020).
5. National Environment Protection Council (2013), *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013*, 11 April 2013.

6. NSW EPA, Contaminated Site, *Guidelines for the NSW Site Auditor Scheme 2nd Edition*, April 2006.
7. NSW EPA, *Waste Classification Guidelines, Part 1: Classifying Waste*, November 2014.
8. NSW EPA, *Managing Land Contamination, Planning Guidelines, SEPP55 - Remediation of Land*, 1988.
9. NSW EPA Contaminated Sites (2011), Guidelines for Consultants Reporting on Contaminated Sites, August 2011.
10. Parson Brinkerhoff. Asbestos in Grounds, Asbestos Management Plan, Darlington Public School, Darlington NSW, (Project reference 1735_ASB_150514_AMP).

17. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at Darlington Public School 417 Abercrombie Street, Darlington NSW in accordance with DP's proposal dated 23 January 2020 and acceptance received from Tina Johnson on behalf of NSW Department of Educations dated 20 February 2020. The work was carried out under DP's Conditions of Engagement and School Infrastructure NSW Request for Tender Part D – Standard Form Agreement SINSW00004/19. This report is provided for the exclusive use of NSW Department of Education for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

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

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

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

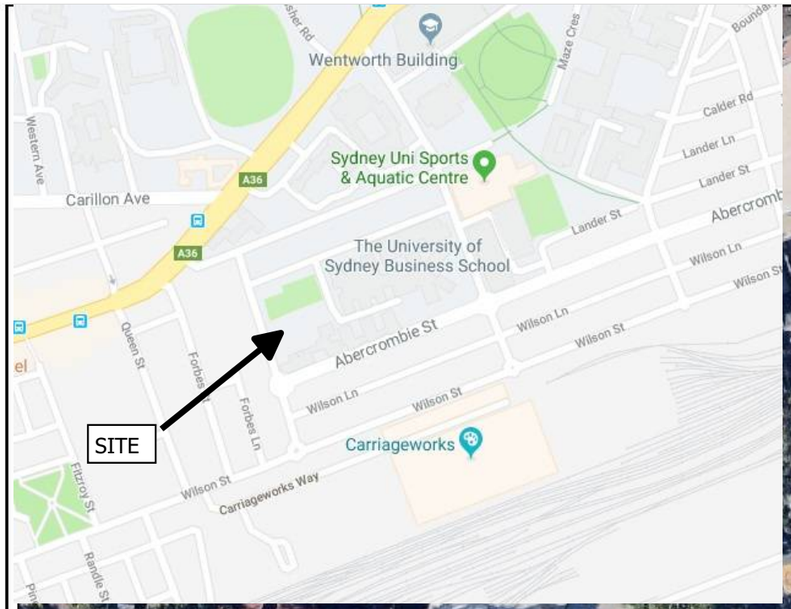
This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the (geotechnical / environmental / groundwater) components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

Drawings 1 to 5



Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Gardner Wetherill & Associates Pty Ltd		
OFFICE: Macarthur	DRAWN BY: GAR	
SCALE: 1:691	DATE: 2.01.2019	

TITLE: **Site Locality Map**
Remediation Action Plan
Darlington Public School
417 Abercrombie Street, Darlington NSW

MGA

PROJECT No: 92277.02
DRAWING No: 1
REVISION: A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Gardner Wetherill & Associates Pty Ltd		TITLE: **Site Features Map** **Remediation Action Plan** **Darlington Public School** **417 Abercrombie Street, Darlington NSW**	PROJECT No: 92277.02
OFFICE: Macarthur	DRAWN GAR		DRAWING No: 2
SCALE: 1:691	DATE: 2.01.2019	N MGA	REVISION: A

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Gardner Wetherill & Associates Pty Ltd		TITLE: **PSI (April 2018) Sampling Locations** **Remediation Action Plan** **Darlington Public School** **417 Abercrombie Street, Darlington NSW**	PROJECT No: 92277.02
OFFICE: Macarthur	DRAWN BY: GAR		DRAWING No: 3
SCALE: 1:600	DATE: 2.01.2019		REVISION: A

N
MGA

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Gardner Wetherill & Associates Pty Ltd		
OFFICE: Macarthur	DRAWN BY: GAR	
SCALE: 1:600	DATE: 2.01.2019	

TITLE: **DSI Sampling Location Map**
Remediation Action Plan
Darlington Public School
417 Abercrombie Street, Darlington NSW

MGA

PROJECT No: 92277.02
DRAWING No: 4
REVISION: A

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: NSW Department of Education	
OFFICE: Macarthur	DRAWN BY: GAR
SCALE: 1:43	DATE: 2.01.2019

TITLE: **SVA - Soil Vapour and Indoor Air Sample Location Map**
Darlington Public School
417 Abercrombie Street, Darlington NSW

N
MGA

PROJECT No:	92277.02
DRAWING No:	5
REVISION:	A

Appendix B

Master Concept Plan

MASTER PLAN CONCEPT

- The option that has been developed for the Master Plan, locates the main bulk of the buildings along the edge of the site following the roads and referencing the walls that currently encircle the school.
- The facade is opened up in selected places, allowing access points into the school, and making the school accessible to the community.
- The built-form along Golden Grove St is pulled back from the site boundary to expand the school drop-off areas and hold back the main volume from the road edge.
- The buildings forms an L-shape to block views in to the school site from the roads and to help enclose and secure the school without the need for extensive fencing.
- The exterior facades are very linear and aligned to a grid to reflect the urban fabric around the site, while in the inward facing facades are softer and curved to provide a gentler character to the school.

Area

Total Site Area = 7,253m²

GFA

FECA = 3748m²
UCA = 1664m²

Total GFA = 5412m²

Play Space

Ground Level Play Space:

COLA = 167m²
Open Space = 3874m²
Games Court = 576m²
Assembly Area = 420m²

Total Ground Level Play Space is **5037m²**

Cola on upper levels = 735m²

Total Play Space = 5772m2
with 415 Students is 13.9m² per student

Appendix C

Tabulated Results Summary Table C1

Table C1 - Summary of Soil Sampling and Chemical Analysis Results (Results in mg/kg - unless specified)

Sample Location	Sample Depth (m)	Sampling Date	Heavy Metals								PAH					TRH				BTEX				OCPs, OPPs & PCBs								
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	B(a)P TEQ	B(a)P	Total PAH	Naphthalene	Phenols	C6-C10 less BTEX [F1]	>C10-C16 (less Naphthalene) [F2]	>C16-C34	>C34-C40	Benzene	Toluene	Ethylbenzene	Total Xylenes	Aldrin + dieldrin	Chlordane	DDT + DDE + DDD	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Asbestos
Practical Quantitation Limit (PQL)			4	0.4	1	1	1	0.1	1	1	0.5	0.05	0.1	1	5	25	50	100	100	0.2	0.5	1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Assessment Criteria																																
NEPC (2013) HIL A / HSL A & B [2]			100	20	100	6000	300	40	400	7400	3	ND	300	4 #	3000	40 #	230 #	ND	ND	0.6 #	390 #	NL	95 #	6	50	240	270	10	6	10	300	ND
NEPC (2013) EIL / ESL [2]			100	ND	410 ###	230 ###	1100	ND	250 ###	760 ###	ND	0.7 ##	ND	170	ND	180 ##	120 ##	300 ##	2800 ##	50 ##	85 ##	70 ##	105 ##	ND	ND	180*	ND	ND	ND	ND	ND	ND
NEPC (2013) Management Limits			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	800	1000	3500	10000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Analytical Results of Boring and Surface Samples - PSI (April 2018)																																
BH1	0.2	17/03/2018	<4	4	10	28	46	<0.1	7	100	<0.5	0.08	0.79	<0.1	<5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH2	0.5	17/03/2018	5	<0.4	16	18	96	0.2	4	210	33	22	250	1.4	<5	<25	<50	1200	330	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NAD
BH3	0.2	17/03/2018	6	<0.4	18	15	170	0.1	9	82	<0.5	0.3	3.1	<0.1	<5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH4	0.2	17/03/2018	7	<0.4	17	10	24	<0.1	14	24	<0.5	0.1	0.85	<0.1	<5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH5	0.2	17/03/2018	4	<0.4	9	48	120	0.3	4	69	57	37	550	3.5	<5	<25	150	2400	360	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NAD
BH6	0.2	17/03/2018	10	1	54	120	650	0.6	42	560	7.8	5.1	66	0.3	<5	<25	<50	360	130	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH7	0.2	17/03/2018	10	<0.4	22	37	91	0.1	6	63	2.4	1.6	21	0.1	<5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH8	0.2	17/03/2018	5	<0.4	11	29	59	<0.1	11	73	0.7	0.5	5.2	<0.1	<5	<25	<50	100	100	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH9	0.2	17/03/2018	8	<0.4	17	21	76	<0.1	6	2100	<0.5	0.06	0.85	<0.1	<5	<25	<50	1100	620	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
Powerpole	0.0 - 0.2	17/03/2018	-	-	-	-	-	-	-	-	<0.5	0.2	1.5	<0.1	-	<25	62	180	150	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
Analytical Results of Boring Samples - DSI (January 2019)																																
BH10	0.3	16/01/2019	4	<0.4	16	12	120	0.2	6	67	<0.5	0.3	3	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	Chry
BH11	0.3	15/01/2019	<4	0.4	17	15	26	<0.1	10	54	<0.5	<0.05	<0.05	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH12	0.3	15/01/2019	<4	0.4	24	28	190	0.1	13	96	1	0.71	7.1	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH13	0.3	15/01/2019	<4	<0.4	8	15	32	<0.1	5	34	9.1	6.3	71	2.5	-	<25	<50	360	130	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH14	0.3	15/01/2019	<4	4	15	39	51	0.2	10	110	<0.5	0.2	1.3	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH15	0.3	16/01/2019	41	<0.4	15	49	74	0.1	6	500	1.6	1.2	16	<0.1	-	<25	<50	700	390	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH16	0.3	15/01/2019	5	<0.4	16	38	150	0.6	10	140	11	7.9	90	0.8	-	<25	<50	420	120	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH17	0.3	15/01/2019	5	0.5	21	52	160	1	51	180	9.3	6.6	78	0.4	-	<25	<50	330	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH18	0.3	16/01/2019	5	0.4	14	59	940	0.2	10	470	42	30	390	0.7	-	<25	<50	1600	440	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH22	0.3	16/01/2019	<4	<0.4	10	11	57	<0.1	5	44	<0.5	0.1	1.4	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH23	0.3	15/01/2019	4	<0.4	13	11	41	<0.1	11	39	<0.5	0.2	1.6	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH25	0.3	15/01/2019	5	<0.4	16	18	51	0.1	17	80	<0.5	0.3	2.4	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH26	0.3	15/01/2019	5	<0.4	18	29	100	0.1	7	180	3.6	2.6	31	0.2	-	<25	<50	120	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH27	0.3	15/01/2019	<4	0.9	13	44	49	<0.1	9	90	<0.5	0.1	0.89	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH2	0.3	15/01/2019	5	0.9	20	30	100	0.4	12	520	0.7	0.5	4.6	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH5	0.5	15/01/2019	<4	0.7	14	56	220	0.4	6	330	220	160	1800	6	-	<25	320	7800	1500	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH6	0.5	16/01/2019	7	0.5	21	83	88	0.2	24	91	4.6	3.2	40	0.2	-	<25	<50	150	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH6	1.2	16/01/2019	<4	<0.4	17	8	18	<0.1	2	16	<0.5	0.09	0.5	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH7	0.5	15/01/2019	7	0.6	21	76	540	0.3	6	260	3.3	2.3	21	0.1	-	<25	<50	<100	180	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH7	1.2	15/01/2019	<4	<0.4	8	4	22	<0.1	<1	18	<0.5	<0.05	<0.05	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH9	0.5	16/01/2019	<4	<0.4	12	41	2200	0.2	8	570	2.5	1.7	16	<0.1	-	<25	<50	440	270	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH9	1.2	16/01/2019	6	<0.4	22	<1	18	<0.1	<1	6	<0.5	<0.05	<0.05	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH19	0.3	16/01/2019	6	<0.4	14	41	460	0.2	14	180	3.9	2.7	30	0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH21	0.3	17/01/2019	6	<0.4	12	19	25	<0.1	8	24	<0.5	0.2	1.2	<0.1	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
BH24	0.3	18/01/2019	10	<0.4	19	27	110	0.2	6	130	3.9	2.6	34	0.2	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	NAD
Analytical Results of Suspected ACM fragments																																
BH9/0.5_PACM	0.5	16/01/2019	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD

Notes:

All results in mg/kg on a dry weight basis unless specified

NAD - No Asbestos Detected

ND - Not detected

HIL - Health Investigation Level

[2] The HIL A/ HSL A/EIL / ESLs were based on National Environmental Protection Measures (NEPC) 2013

HSL A and HSL B assuming sand and sandy clay (0m - <1m depth)

Bold - Concentration exceeding SAC

- Not analysed

Chry - Chrysotile asbestos detected in soil sample

Appendix D

Staging Process Plans


LEGEND
Existing Tree to be removed
Existing Tree to be retained
EARLY WORKS - LANDSCAPE WORKS
Construction Zone
Existing Footpath
New Temporary Footpath
Outdoor Play Area for School Holiday Care
Temporary Preschool Playground
Hoarding Line
Existing Connections
New Temporary Connections
+35.300
CONSTRUCTION ZONE
(NO SCHOOL ACCESS
DURING EARLY WORKS)
EARLY WORKS
Landscape Works
+35.250
Preschool fence to be demolished
+34.580
Regrade for preparation for Playpod.
Provide adjustments
Temporary New Steps - TBC
+32.70
Existing brick wall
retained during early works
Temporary Preschool Outdoor Play Area
Temporary Preschool Landscape Plan 2212
Refer Temporary Preschool Landscape Plan


Existing Tree to be removed
Existing Tree to be retained
Hoarding Line
STAGE 1 - CONSTRUCTION WORKS
Existing Path
New Temporary Footpath
Existing Connections
New Temporary Connections
Temporary Preschool Outdoor Area
STAGE 1 WORKS
Temporary Rock Check
Retain erosion control from EARLY WORKS
Temporary Retaining Wall required
Temporary Preschool Outdoor Play Area


LEGEND
Existing Tree to be removed
Existing Tree to be retained
STAGE 1 - CONSTRUCTION WORKS
STAGE 2 WORKS

Appendix E

Sewer Plans

Guide to reading Sydney Water DBYD Plans

February 2015

Asset Information

Legend

Sewer

Sewer Main (with flow arrow & size type text) — 225 PVC
Disused Main
Rising Main
Maintenance Hole (with upstream depth to invert) — 1.7
Sub-surface chamber
Maintenance Hole with Overflow chamber
Ventshalft EDUCT — VSE
Ventshaft INDUCT — VS
Property Connection Point (with chainage to downstream MH) — 10.5
Concrete Encased Section — Concrete Encased
Terminal Maintenance Shaft — TMS
Maintenance Shaft — MS
Rodding Point — RP
Lamphole
Vertical — VERT
Pumping Station — SP0882
Sewer Rehabilitation

Pressure Sewer

Pressure Sewer Main
Pump Unit (Alarm, Electrical Cable, Pump Unit) — A
Property Valve Boundary Assembly
Stop Valve
Reducer / Taper
Flushing Point — FP

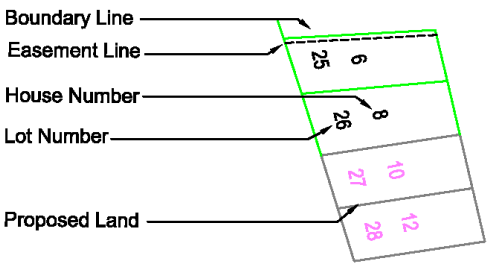
Vacuum Sewer

Pressure Sewer Main
Division Valve
Vacuum Chamber
Clean Out Point

Stormwater

Stormwater Pipe
Stormwater Channel
Stormwater Gully
Stormwater Maintenance Hole

Property Details



Sydney Water Heritage Site (please call **132 092** and ask for the **Heritage Unit**)

Water

WaterMain - Potable (with size type text) — 200 PVC
Disconnected Main - Potable
Proposed Main - Potable
Water Main - Recycled
Special Supply Conditions - Potable
Special Supply Conditions - Recycled
Restrained Joints - Potable
Restrained Joints - Recycled
Hydrant
Maintenance Hole
Stop Valve
Stop Vale with By-pass
Stop Valve with Tapers
Closed Stop Valve
Air Valve
Valve
Scour
Reducer / Taper
Vertical Bends
Reservoir
Recycled Water is shown as per Potable above. Colour as indicated

Private Mains

Potable Water Main
Recycled Water Main
Sewer Main
Symbols for Private Mains shown grey

Asset Information

Pipe Types

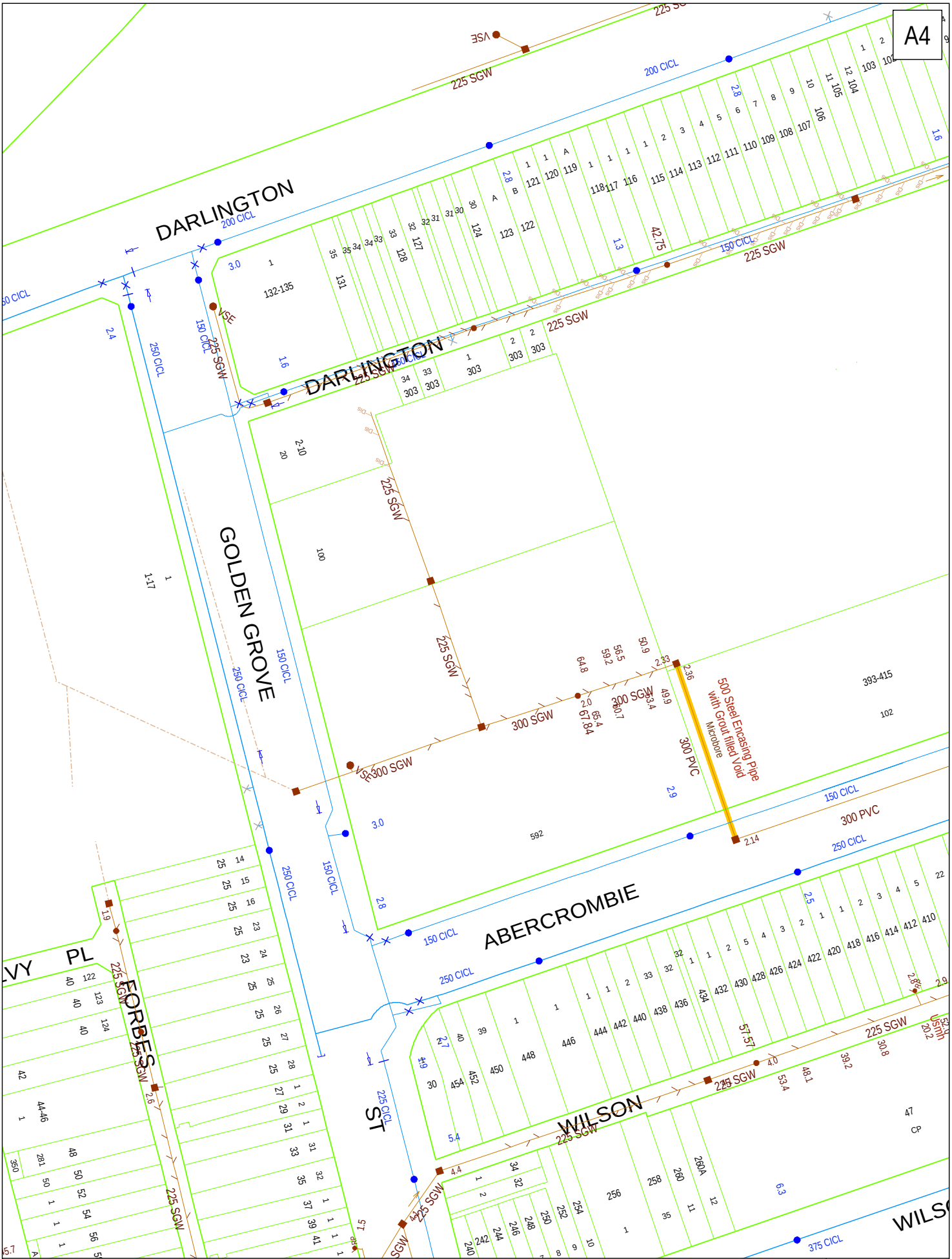
ABS	Acrylonitrile Butadiene Styrene	**AC**	Asbestos Cement
BRICK	Brick	**CI**	Cast Iron
CICL	Cast Iron Cement Lined	**CONC**	Concrete
COPPER	Copper	**DI**	Ductile Iron
DICL	Ductile Iron Cement (mortar) Lined	**DIPL**	Ductile Iron Polymeric Lined
EW	Earthenware	**FIBG**	Fibreglass
FL BAR	Forged Locking Bar	**GI**	Galvanised Iron
GRP	Glass Reinforced Plastics	**HDPE**	High Density Polyethylene
MS	Mild Steel	**MSCL**	Mild Steel Cement Lined
PE	Polyethylene	**PC**	Polymer Concrete
PP	Polypropylene	**PVC**	Polyvinylchloride
PVC - M	Polyvinylchloride, Modified	**PVC - O**	Polyvinylchloride, Oriented
PVC - U	Polyvinylchloride, Unplasticised	**RC**	Reinforced Concrete
RC-PL	Reinforced Concrete Plastics Lined	**S**	Steel
SCL	Steel Cement (mortar) Lined	**SCL IBL**	Steel Cement Lined Internal Bitumen Lined
SGW	Salt Glazed Ware	**SPL**	Steel Polymeric Lined
SS	Stainless Steel	**STONE**	Stone
VC	Vitrified Clay	**WI**	Wrought Iron
WS	Woodstave		

Further Information

Please consult the Dial Before You Dig enquiries page on the Sydney Water website

For general enquiries please call the Customer Contact Centre on **132 092**

In an emergency, or to notify Sydney Water of damage or threats to its structures, call 13 20 90 (24 hours, 7 days)



DBYD Address:
n/a Abercrombie Street
Darlington NSW 2008

DBYD Job No: 13827427
DBYD Sequence No: 69296548

SYDNEY WATER CORPORATION

Scale: 1:1000

Date of Production: 07/03/2018

Plan 1 of 1

N

0m 5m 10m 15m 20m

Appendix F

About This Report

About this Report

Douglas Partners

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

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.