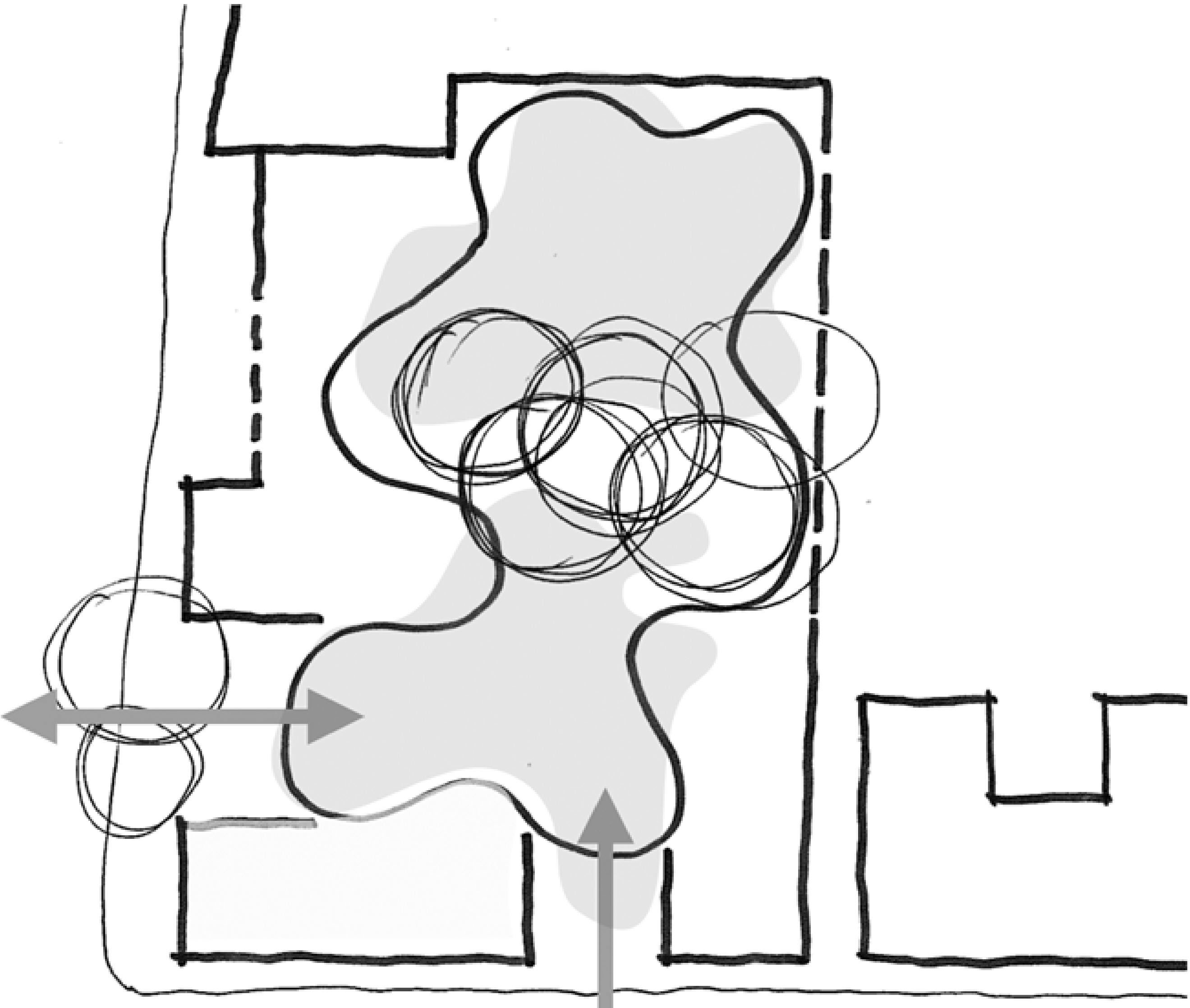
DARLINGTON PUBLIC SCHOOL REDEVELOPMENT

Appendix Q — Detailed Site Investigation

SSD-9914

Prepared by Douglas Partners

For NSW Department of Education



Douglas Partners
Geotechnics / Environment / Groundwater

Report on
Detailed Site Investigation for Contamination

Proposed Upgrade Works
Darlington Public School, 417 Abercrombie Street,
Darlington, NSW

Prepared for
Gardner Wetherill & Associates

Project 92277.01
February 2019

Integrated Practical Solutions

Douglas Partners
Geotechnics / Environment / Groundwater

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

	Signature	Date
Author		19 February 2019
Reviewer	pp for GE	19 February 2019

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Executive Summary

Douglas Partners Pty Ltd (DP) was commissioned by Gardner Wetherill and Associates Pty Ltd (GWA) to complete a Detailed Site Investigation for contamination (DSI) of the Darlington Public School property located at 417 Abercrombie Street, Darlington, NSW (the 'Site'). DP understands that the Site currently comprises an operational primary school and preschool 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.

In April 2018 DP completed a Preliminary Site Investigation for contamination (PSI) (ref: 92277.00) of the site for Billard Leece Partnership Pty Ltd (BLP). This PSI also included a limited programme of soil sampling and analysis. The results of the PSI identified the following Areas of Environmental Concern (AEC) and associated contaminants of concern (COC) which it was considered required further investigation to assess whether the site could be considered suitable for the proposed development:

- Total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAH) and lead impacts were variously identified in shallow filling soils at two locations (BH5 and BH6) in the north western portion of the site and one location (BH2) in the south eastern portion of the site. Concentrations of the COC were detected at levels exceeding the adopted site assessment criteria (SAC) which included human health investigation levels (HILs). Soils in the vicinity of these locations require remediation, management and/or risk assessment for the site to be considered suitable for an ongoing use as a primary/preschool. Further investigation was thus considered necessary to define the lateral and vertical extent of these identified impacted soils;
- TRH and zinc impact to shallow soils at one location (BH9) in the central eastern portion of the site at concentrations exceeding ecological investigation levels (EILs) required further investigation to establish whether the TRH and zinc concentrations are anomalous/isolated occurrences or indicative of greater widespread impact potentially requiring remediation; and
- Potential for asbestos-containing material (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 on-site structures which anecdotally were constructed of asbestos; and importation of filling, the presence of asbestos impacted soils at the site could not be ruled out and, again was considered to require further investigation.

The objective of the DSI was therefore to delineate areas of contamination identified in the PSI and to further investigate/characterise areas of the site not previously investigated.

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 fieldwork was completed at the site on 15 to 18 January 2018 which included completion of the following scope:

- 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]) filling soil samples. Three of the locations (BH19, BH21 and BH24) drilled for the geotechnical investigation were utilised to collect filling samples. Grid based borehole BH20 could not be completed as the areas were 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. Targeted based borehole BH28 could not be completed as the area was inaccessible due to raised garden beds. 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;
- Deeper filling 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 filling soil samples for the identified COC including TRH, BTEX, PAHs, metals and asbestos. A deeper filling 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 COC.

The results of DSI soil sampling identified and confirmed TRH, PAH and lead impact to filling across the site at concentrations exceeding both adopted health investigation levels and ecological investigation levels. The identified impact does not appear to be limited to any particular filling type, filling depth and/or portion of the site. Given the identification of slag and charcoal type material within filling at several of the tested locations contamination of the filling is potentially associated with historic sourcing of filling from an industrial site with blast furnace activities. 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. A feasibility study should be completed to assess the most practical means of limiting contact to impacted filling and should include consideration of remediation, management or risk assessment methods.

It is noted that a hazardous building materials assessment was also completed by DP at the time of the PSI to identify potential hazardous materials within the buildings so that protective measures can be implemented, if required, during redevelopment/upgrading works. It should also be noted that the northern portion (zone) of the site is subject to an AMP due to the potential for asbestos being present within shallow soils. Any work undertaken in the northern zone of the site, as described in the AMP, where there is potential for ground disturbance must be completed with reference to the procedures in the AMP and in accordance with the relevant legislation, regulations and guidance documents.

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Report on Detailed Site Investigation for Contamination
Proposed Upgrade Works
Darlington Public School, 417 Abercrombie Street, Darlington, NSW

1. Introduction

Douglas Partners Pty Ltd (DP) was commissioned by Gardner Wetherill and Associates Pty Ltd (GWA) to complete a Detailed Site Investigation for contamination (DSI) of the Darlington Public School property located at 417 Abercrombie Street, Darlington, NSW (the 'Site') as shown on Drawing 1 (Appendix A). DP understands that the Site currently comprises an operational primary school and preschool 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.

In April 2018 DP completed a Preliminary Site Investigation for contamination (PSI) (ref: 92277.00) of the site for Billard Leece Partnership Pty Ltd (BLP). This PSI also included a limited programme of soil sampling and analysis. The results of the PSI identified the following Areas of Environmental Concern (AEC) and associated contaminants of concern (COC) which it was considered required further investigation to assess whether the site could be considered suitable for the proposed development:

- Total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAH) and lead impacts were variously identified in shallow filling soils at two locations (BH5 and BH6) in the north western portion of the site and one location (BH2) in the south eastern portion of the site. Concentrations of the COC were detected at levels exceeding the adopted site assessment criteria (SAC) which included human health investigation levels (HILs). Soils in the vicinity of these locations require remediation, management and/or risk assessment for the site to be considered suitable for an ongoing use as a primary/preschool. Further investigation was thus considered necessary to define the lateral and vertical extent of these identified impacted soils;
- TRH and zinc impact to shallow soils at one location (BH9) in the central eastern portion of the site at concentrations exceeding ecological investigation levels (EILs) required further investigation to establish whether the TRH and zinc concentrations are anomalous/isolated occurrences or indicative of greater widespread impact potentially requiring remediation; and
- Potential for asbestos-containing material (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 on-site structures which anecdotally were constructed of asbestos; and importation of filling, the presence of asbestos impacted soils at the site could not be ruled out and, again was considered to require further investigation.

The objective of the DSI was therefore to delineate areas of contamination identified in the PSI and to further investigate/characterise areas of the site not previously investigated.

This report must be read in conjunction with the attached notes provided in Appendix H and other explanatory information, and should be kept in its entirety without separation of individual pages or sections.

2. Scope of Works

The following scope of works was undertaken for this DSI:

- Review of previous environmental investigations and results relevant to the Site;
- A site walkover to identify any additional AEC (beyond those identified from the PSI);
- Drilling at grid based and targeted locations across the site and collection of soils samples from encountered filling and from deeper filling samples at previously sampled locations;
- Laboratory analysis of selected soil samples for the identified COC associated with each AEC based on results of PSI and site walkover;
- Interpretation of results in accordance with current NSW EPA endorsed guidelines; and
- Preparation of this report detailing the methodology and results of the investigation including recommendations for future remedial/management options for the Site.

3. Site Information

3.1 Site Identification

The Site comprises the following land parcels as detailed in Table 1 below.

Table 1: 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; and
- A review of Nearmap Imagery.

Prominent site features are presented on Drawing 2 (Appendix A). Photographic Plates showing site conditions are presented in Appendix B.

The site is located within an area which consists of undulating topography comprising low lying and gently sloping hills with shallow soil cover. The site levels slope towards the southeast from between approximately RL 41 m, relative to Australian Height Datum (AHD), in the northwest portion of the site to approximately RL 33 m AHD in the south eastern portion of the site.

The site comprises an irregular shaped property and is accessed via a driveway that leads from Golden Grove Street located to the west of the site and the School gate fronting Abercrombie Street to the south of the site. The site is comprised of two lots as described below.

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 east of the play area with an unsealed garden located further to the east.

Another S – shaped class room 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 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 Landuses

The site is in a residential/educational precinct area with the landuses surrounding the property comprising:

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), published 1991 indicates that shallow soils at the site comprise Blacktown Soil Landscape (bt) which is topographically characterised by *'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 search of the NSW Office of Water groundwater bore data was undertaken by DP on 1 March 2018 and identified one bore within 500 m of the site. Table 2 below provides a summary of information for the bore in question.

Table 2: 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 Sensitive Receptors and Environments

The nearest sensitive receptors and environments have been identified as follows:

- Current and future site users;
- Current and future site workers;
- The nearest residential properties located immediately adjacent to the site's northern and eastern boundaries; and nearby to the west beyond Golden Grove Street and to the south beyond Abercrombie Street;
- The primary environmental receptors down-gradient of the site is Lake Northam located approximately 850 m northeast of the site;
- Groundwater beneath the site; and
- Site flora and fauna.

4. Previous Environmental Investigations and Reports

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 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*".

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 AEC and 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 filling 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 10 locations (BH1 to BH9 and in the vicinity of the power pole) across the site within identified AEC in the vicinity of former/current site structures, areas of filling, the former road/laneway and a power pole onsite. 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 was variously identified in shallow filling 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 filling at these locations contamination of the filling is considered to be potentially associated with historic filling 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 filling, the presence of asbestos impacted soils at the site could not be ruled out.

The PSI sample locations and identified AEC are shown on Drawing 2 (Appendix A).

With respect to site contamination the PSI recommended further assessment should build on the information provided in the PSI report with reference to National Environment Protection Council (NEPC, 1999) National Environment Protection Council (Assessment of Site Contamination) Measure 1999 (amended 2013) (NEPC, 2013). Further assessment should include intrusive investigation, soil sampling, analysis and assessment to evaluate land use suitability.

It is noted that a hazardous building materials assessment was also completed by DP at the time of the PSI to identify potential hazardous materials within the buildings so that protective measures can be implemented, if required, during redevelopment/upgrading works (ref. DP report 92277.00.R.003.Rev0).

5. Soil Sampling

DSI field work was completed at the site between 15 and 18 January 2018 to assess the AEC identified in the PSI requiring further investigation and additional areas of the site not previously investigated.

The field investigation was designed in accordance with the seven step data quality objectives (DQO) process provided in Appendix B, Schedule B2 of the National Environment Protection (Assessment of Site Contamination) Measure 1999 as amended 2013 (NEPC, 2013). The DQO adopted for this DSI are provided in Appendix C.

5.1 Soil Sampling Methodology and Rationale

DSI borehole and sample locations are shown on Drawing 4, Appendix A. Soil sampling was completed at the majority of locations by boring with a hand auger fitted with a 100 mm auger bit. As part of the DP geotechnical investigation, soil sampling was completed at bore holes BH19, BH21 and BH24 using a limited access bobcat fitted with a 150 mm diameter solid flight auger.

To further investigate the AEC previously identified the following scope was completed:

- 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 [bgl]) filling soil samples. Three of the locations (BH19, BH21 and BH24) drilled for the geotechnical investigation were utilised to collect filling samples. Grid based borehole BH20 could not be completed as the areas were 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 m bgl) filling soil samples. Targeted based borehole BH28 could not be completed as the area was inaccessible due to raised garden beds. 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;
- Deeper filling 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;
- Laboratory analysis of all filling soil samples for the identified COC including TRH, BTEX, PAHs, metals and asbestos. A deeper filling 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 COC; and
- Selected samples were additionally analysed for physicochemical characteristics including pH, EC and cation exchange capacity to assist in the calculation of EILs.

5.2 Sampling Procedure and QA/QC

All sampling data was recorded on DP bore logs (Appendix D) with samples also recorded on chain-of-custody (CoC) sheets. The general sampling procedure adopted for the collection of environmental soil samples is summarised below:

- Collection of soil samples was completed using disposable sampling equipment (new nitrile gloves for each sample) from the drilling auger or the hand auger. Samples were collected taking care to not include soil that was directly in contact with either the surface of auger;
- Transfer of samples into laboratory-prepared glass jars, completely filled to ensure the headspace within the sample jar was minimised, and capping immediately to minimise loss of volatiles;
- Label sample containers with individual and unique identification details, including project number, sample location and sample depth;
- Place the glass jars, with Teflon lined lid, into a cooled, insulated and sealed container for transport to the laboratory; and
- Collection of additional replicate samples at a rate of 10% for QC requirements.

Samples designated for analysis were dispatched to NATA accredited laboratory Envirolab Services at Chatswood NSW for analysis of primary samples and intra-laboratory replicates.

5.3 Site Assessment Criteria

The Site Assessment Criteria (SAC) applied in this DSI have been informed by the proposed land use and the PSI CSM - which identified human and ecological receptors to potential contamination on the Site. Analytical results were assessed (as a Tier 1 assessment) against the investigation and screening levels presented in Schedule B1 of the ASC NEPM (NEPC, 2013).

Residential land use criteria with accessible soil (HIL A) were adopted given the site is currently a primary and pre-school (as required by the ASC NEPM). Where required, the derivation of some SAC is included in Appendix C and the adopted SAC are listed in the analytical results table (Table E1 in Appendix E).

6. Field Work Observations and Results

6.1 Geology

Relatively uniform geological conditions were encountered across most of the Site and generally included the following strata:

- Filling or Clayey Silt topsoil, comprising minor gravel inclusions encountered from surface to 0.2 m bgl; overlying;
- Filling comprising grey mottled silty clay from 0.2 to 1.5 m bgl – slag and charcoal type gravel material and/or coal wash material was observed in filling at locations BH2, BH5, BH6, BH7, BH9, BH10, BH13, BH17, BH18 and BH25; overlying
- Silty clay encountered at depths from 0.9 to 2.0 m bgl; and overlying; and
- Weathered sandstone or shale encountered at depths from 0.9 to 2.0 m bgl.

With the exception of boreholes BH1, BH5, BH11, BH12, BH22, BH23, BH24 anthropogenic material including crushed bricks, ceramics and concrete were variously encountered in filling at most locations. A piece of plywood type material was identified in BH9 at a depth of 0.5 m bgl. The piece of plywood material was collected and sent to the laboratory for asbestos identification. No asbestos was identified.

No free groundwater was observed in the bores during drilling for the short time that they were left open.

6.2 Laboratory Analytical Results

The analytical results for the soil samples collected during this DSI are summarised in Table E1 in Appendix E, together with the adopted SAC. The laboratory certificate of analysis for this DSI is provided in Appendix F.

6.2.1 TRH and BTEX

F2 fraction compounds were detected at concentrations exceeding the adopted HIL (230 mg/kg) and EIL (120 mg/kg) in the shallow filling soil sample BH5/0.5 (320 mg/kg).

F3 fraction compounds were detected at concentrations exceeding the adopted EIL of 300 mg/kg in the shallow filling soil samples BH5/0.5 (7,800 mg/kg), BH9/0.5 (440 mg/kg), BH13/0.3 (360 mg/kg), BH15/0.3 (700 mg/kg), BH16/0.3 (420 mg/kg) and BH17/0.3 (330 mg/kg), BH18/0.3 (1,600 mg/kg).

TRH and BTEX were not detected at concentrations exceeding the adopted SAC in the remaining soil samples analysed.

6.2.2 PAHs

Benzo(a)pyrene (BaP) was detected at concentrations in excess of the adopted EIL of 0.7 mg/kg in shallow filling soil samples BH5/0.5 (160 mg/kg), BH6/0.5 (3.2 mg/kg), BH7/0.5 (2.3 mg/kg), BH9/0.5 (1.7 mg/kg), BH12/0.3 (0.71 mg/kg), BH13/0.3 (6.3 mg/kg), BH15/0.3 (1.2 mg/kg), BH17/0.3 (6.6 mg/kg), BH19/0.3 (2.7 mg/kg), BH24/0.3 (2.6 mg/kg). and BH26/0.3 (2.6 mg/kg).

BaP toxic equivalent (TEQ) concentrations exceeding the adopted residential HIL of 3 mg/kg were detected in shallow filling soil samples BH5/0.5 (220 mg/kg), BH6/0.5 (4.6 mg/kg), BH7/0.5 (3.3 mg/kg), BH9/0.5 (2.5 mg/kg), BH13/0.3 (9.1 mg/kg), BH16/0.3 (11 mg/kg), BH17/0.3 (9.3 mg/kg), BH18/0.3 (42 mg/kg), BH19/0.3 (3.9 mg/kg), BH24/0.3 (3.9 mg/kg) and BH26/0.3 (3.6 mg/kg).

Naphthalene was detected at concentrations exceeding the adopted residential HIL of 4 mg/kg in the shallow filling soil sample BH5/0.5 (6 mg/kg).

Total PAHs were detected at concentrations exceeding the adopted residential HIL of 300 mg/kg in the shallow filling soil samples BH18/0.3 (390 mg/kg) and BH5/0.5 (1,800 mg/kg).

PAHs were not detected at concentrations exceeding the adopted SAC in the remaining soil samples analysed.

6.2.3 Metals

Lead was detected at concentrations in excess of the adopted residential HIL of 300 mg/kg in the shallow filling soil samples BH7/0.5 (540 mg/kg), BH9/0.5 (2200 mg/kg), BH18/0.3 (940 mg/kg) and BH19/0.3 (460 mg/kg).

Zinc was detected at a concentration in excess of the adopted EIL of 760 mg/kg in the shallow filling soil sample BH9/0.2 (2,100 mg/kg).

Heavy metals were not detected at concentrations exceeding SAC in the remaining soil samples analysed.

6.2.4 Asbestos

Chrysotile asbestos was identified in a small fragment of fibre cement sheeting in the soil sample collected from BH10/0.3.
Asbestos was not detected in any of the remaining soil samples analysed.

Material suspected of containing asbestos was not observed across the surface of the site or within any of the remaining sampling locations (despite being noted previously by other investigators and site users as outlined in Sections 4.2 and 4.3, above).

6.3 Quality Assurance/Quality Control (QA/QC)

A review of the adopted QA/QC procedures and results presented in Appendix G indicates that the data quality indicators (DQIs) have generally been met. On this basis, the sampling and laboratory methods used during the investigation were found to meet the DQO for this project (as discussed in Appendix C).

7. Discussion

7.1 TRH, PAH and Lead Soil Impact to Filling

COC including TRH (F2 and F3 fraction compounds), PAHs (BaP and BaP TEQ compounds) and lead were previously detected during the PSI at concentrations exceeding SAC in shallow filling samples (0.2 to 0.5 m bgl) collected at two locations (BH5 and BH6) in the north western portion of the site and one location (BH2) in the south eastern portion of the site.

Results of grid based and targeted soil sampling completed during this DSI have additionally detected the identified COC at concentrations exceeding the adopted SAC in:

- Shallow filling samples (collected from between 0.2 and 0.5 m bgl) at locations BH13, BH16, BH17, BH18, BH19, BH24 and BH26; and
- The deeper filling samples (collected at depths greater than0.5 m bgl) at locations BH5, BH6, BH7 and BH9.

Given that concentrations of the identified COC at the majority of these locations generally exceeded 250% of the adopted SAC's (particularly BaP in excess of HILs) these areas are considered to represent contamination hotspots. Locations of contamination hotspots and samples that exceeded SAC are presented on Drawing 5, Appendix A. It is noted that dark slag like material and flecks of dark charcoal type material was observed during the PSI and this DSI in filling samples collected at several of these locations. Given the identified contaminants (longer chain TRH, PAHs and lead) there is potential that hotspot contamination may be associated with these slag and charcoal deposits within the filling. Slag and charcoal type material are often associated with industrial blast furnace activities.

Given that hotspots and exceedances were identified at randomly spaced locations across the site and at various depths within filling the distribution of these COC does not appear to be limited to any particular filling type, filling depth and/or portion of the site. The results indicate that the majority of filling across the site is impacted with COC (TRH, PAHs, lead and zinc) at concentrations exceeding the adopted SAC and therefore requires remediation, management and/or risk assessment for the site to be considered suitable for the proposed building upgrades and ongoing use of the site as primary/pre-school.

Given that identified COC were not detected in any of the natural soils collected during this DSI indicates that the vertical extent of impact appears to be limited to filling at the site. However, this should be confirmed during any future remediation with validation sampling.

7.2 Previously Identified TRH and Zinc Impact to Filling at BH9

TRH C_{16} - C_{34} and zinc were previously detected during the PSI at concentrations (>250%) exceeding the EIL only in a shallow soil sample (0.2 m bgl) collected at location BH9 in an unsealed area in the central eastern portion of the site. Whilst further investigation of the immediate area to BH9 completed during this DSI did not identify zinc at concentrations exceeding EILs, as discussed in Section 7.1, other COC (TRH, PAHs and lead) were identified in deeper filling samples collected from BH9 and at shallow filling samples collected at a location in close vicinity to BH19 exceeding the adopted SAC and therefore the filling will require remediation, management and/or risk assessment.

7.3 Asbestos Soil Impact

Chrysotile (white) asbestos fibres were detected in a small fragment of fibre cement sheeting in the fill soil sample BH10/0.3 collected in the northern portion of the site. Bonded ACM was also identified during previous investigations (PB, 2007) on surface soils across the northern portions (zone) of the site. Removal of asbestos fragments across the site was reported as being undertaken under the guidance of PB between 2007 and 2013. An asbestos management plan (AMP) was prepared by others (PB, 2014) and suggested the encapsulation of ACM in the northern playground area and northern and north eastern raised garden beds to school boundary walls.

Whilst the PB AMP reported that observable fragments across the northern portion of the site had been removed the mostly sealed area described above is now subject to the AMP. Any work in the northern portion (zone) of the site, as described in the AMP, where there is potential for ground disturbance must be completed with reference to the procedures in the AMP and in accordance with the relevant legislation, regulations and guidance documents including:

- NSW *Work Health and Safety Act 2011*;
- NSW *Work Health and Safety Regulation 2017*;
- The Safe Work Australia (SWA) *Code of Practice: How to Manage and Control Asbestos in the Workplace, 2016; and*
- The SWA *Code of Practice: How to Safely Remove Asbestos, 2016.*

(Or revisions thereof.)

Whilst the DP PSI and DSI field observations and laboratory analysis of soil samples collected from across the remainder of the site (excluding northern portions) did not identify asbestos, the potential remains for isolated pockets of asbestos contamination to be present in other areas of the site. DP recommends the development and implementation of an Unexpected Finds Protocol (UFP) for any future soil disturbance works in the remainder of the site given:

- PSI and DSI sampling was limited to accessible areas of the site and did not investigate soils directly under any of the site's buildings;
- Historical aerial photographs suggest demolition of former buildings and sheds across the entire site;
- Anecdotal information suggests bonded ACM fragments may also be present in other portions of the site, particularly beneath current buildings; and
- Site inspection of several interior walls and ceilings of the school buildings indicated construction of FCS materials suspected of containing asbestos.

8. Revised Conceptual Site Model

8.1 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 AMP produced by PB has identified that fragments of asbestos containing materials were previously identified in the northern portion of the site which is now a sealed area subject to an AMP. Asbestos was also detected in one fill soil sample collected during this DSI from the northern portion of the site at BH10.

Anecdotal information also suggests fragments of ACM 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 this DSI have identified and confirmed that the majority of the site has been historically filled with material from an unknown origin 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);
- 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 have not identified any localised point sources of contamination. It considered is unlikely that AEC3 and AEC4 are potential contamination source at the site. Therefore AEC3 and AEC5 have been dismissed as potential significant sources of contamination.

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 COC at concentrations exceeding the adopted SAC therefore AEC4 is no longer considered a potential source.

8.2 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.

8.3 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.

8.4 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 4 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 child care centre.

Table 3: 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. 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 – It is recommended that a feasibility study be completed to assess the most practical means of limiting contact to impacted filling and this should include consideration of remediation, management or risk assessment
	P3 – Leaching of contaminants and vertical migration into groundwater. P4 – Surface water run-off. P5 – Lateral migration of groundwater providing baseflow to watercourses.		
	P6 – Direct contact of contaminated ground with ecological receptors.	R4 – Local ecology.	

Potential Source	Exposure Pathway	Receptor	Requirement for Additional Data and/or Management
			methods. A risk assessment should also be completed to assess potential for pathways to exist in any future development works which involve soil disturbance. Leachability testing of COC in soils at the site is also recommended to assess the potential for contamination impact to groundwater.

9. Conclusions

The results of DSI soil sampling identified and confirmed TRH, PAH and lead impact to filling across the site at concentrations exceeding both adopted health investigation levels and ecological investigation levels. The identified impact does not appear to be limited to any particular filling type, filling depth and/or portion of the site. Given the identification of slag and charcoal type material within filling at several of the tested locations contamination of the filling is potentially associated with historic sourcing of filling from an industrial site with blast furnace activities. 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. A feasibility study should be completed to assess the most practical means of limiting contact to impacted filling and should include consideration of remediation, management or risk assessment methods.

It is noted that a hazardous building materials assessment was also completed by DP at the time of the PSI to identify potential hazardous materials within the buildings so that protective measures can be implemented, if required, during redevelopment/upgrading works. It should also be noted that the northern portion (zone) of the site is subject to an AMP due to the potential for asbestos being present within shallow soils. Any work undertaken in the northern zone of the site, as described in the AMP, where there is potential for ground disturbance must be completed with reference to the procedures in the AMP and in accordance with the relevant legislation, regulations and guidance documents.

10. References

1. DP *Report on Preliminary Site Investigation, Darlington Public School Upgrade, 417 Abercrombie Street, Darlington NSW,* Project 92277.00.R.001.Rev0 (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 (Hazardous Materials Assessment; DP, April 2018a).
3. National Environment Protection Council (2013), *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013*, 11 April 2013.
4. NSW EPA, Contaminated Site, *Guidelines for the NSW Site Auditor Scheme 2nd Edition*, April 2006.
5. NSW EPA, *Managing Land Contamination, Planning Guidelines, SEPP55 - Remediation of Land*, 1988.
6. NSW EPA Contaminated Sites (2011), Guidelines for Consultants Reporting on Contaminated Sites, August 2011.
7. Parson Brinkerhoff. Asbestos in Grounds, Asbestos Management Plan, Darlington Public School, Darlington NSW, (Project reference 1735_ASB_150514_AMP).

11. 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 MAC180298 dated 23 October 2018 and acceptance received from Ross Garden dated 12 December 2018. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Gardner Wetherill and Associates Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

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: 1:800
DATE: 2.01.2019

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

N
MGA

PROJECT No: 92277.01
DRAWING No: 1
REVISION: A

Douglas Partners
Geotechnics | Environment | Groundwater

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

TITLE: **PSI (April 2018) Sampling Locations**
Darlington Public School
417 Abercrombie Street, Darlington NSW

N
MGA

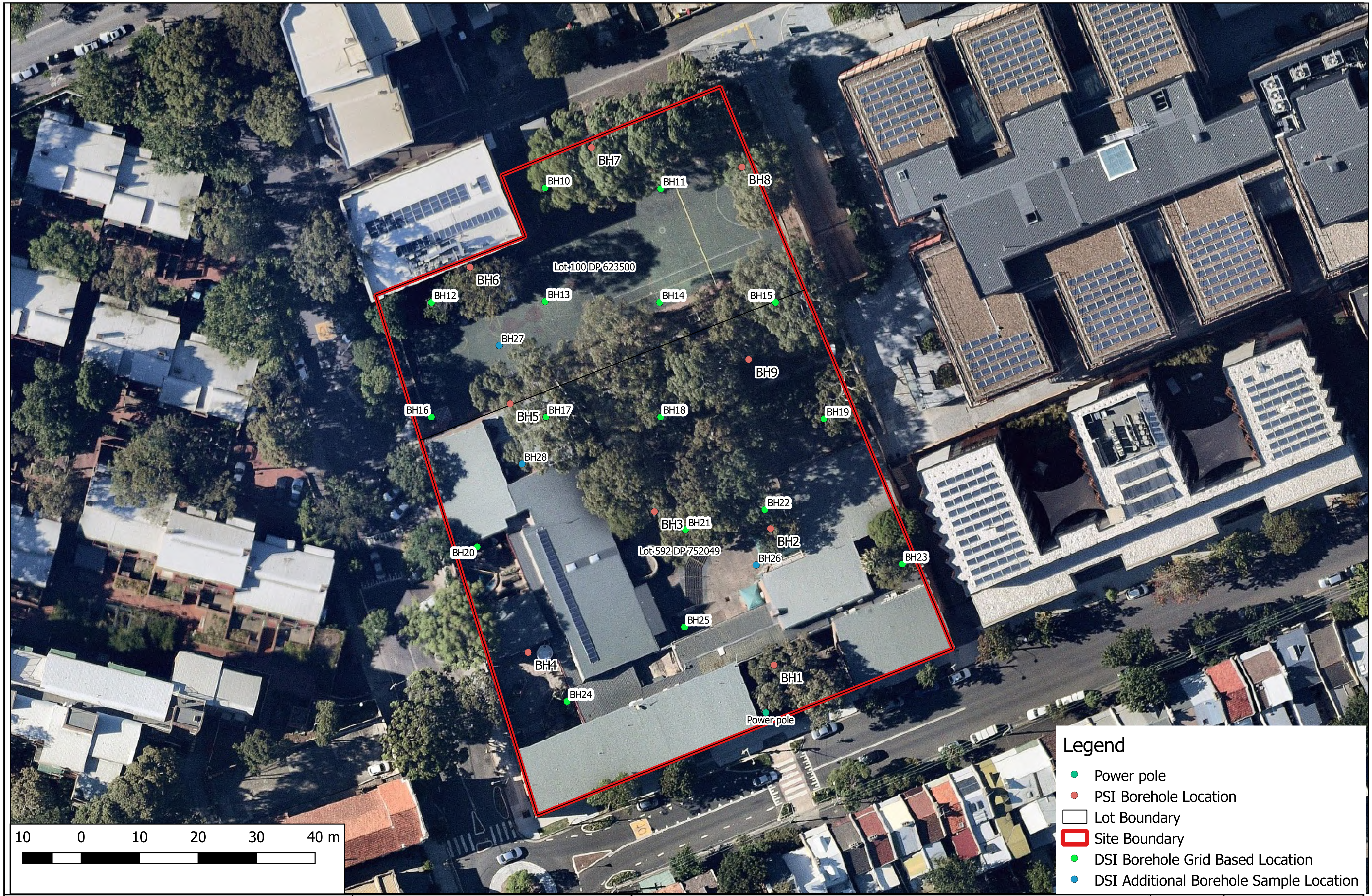
PROJECT No: 92277.01
DRAWING No: 2
REVISION: A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Gardner Wetherill & Associates Pty Ltd
OFFICE: Macarthur
DRAWN BY: GAR
SCALE: 1:661
DATE: 2.01.2019

TITLE: **Site Features Map**
Darlington Public School
417 Abercrombie Street, Darlington NSW

PROJECT No: 92277.01
DRAWING No: 3
REVISION: A



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**
Darlington Public School
417 Abercrombie Street, Darlington NSW

N
MGA

PROJECT No: 92277.01

DRAWING No: 4

REVISION: A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Gardner Wetherill & Associates Pty Ltd
OFFICE: Macarthur
DRAWN BY: GAR
SCALE: 1:515
DATE: 2.01.2019

TITLE: **Contamination Hotspot and SAC Exceedance Location Map**
Darlington Public School
417 Abercrombie Street, Darlington NSW

N
MGA

PROJECT No: 92277.01
DRAWING No: 5
REVISION: A

Appendix B

Site Photographs

Photograph 1 - South facing school building in south western portion of site with Abercrombie Street in foreground

Photograph 2 - Court yard area in southern portion of site

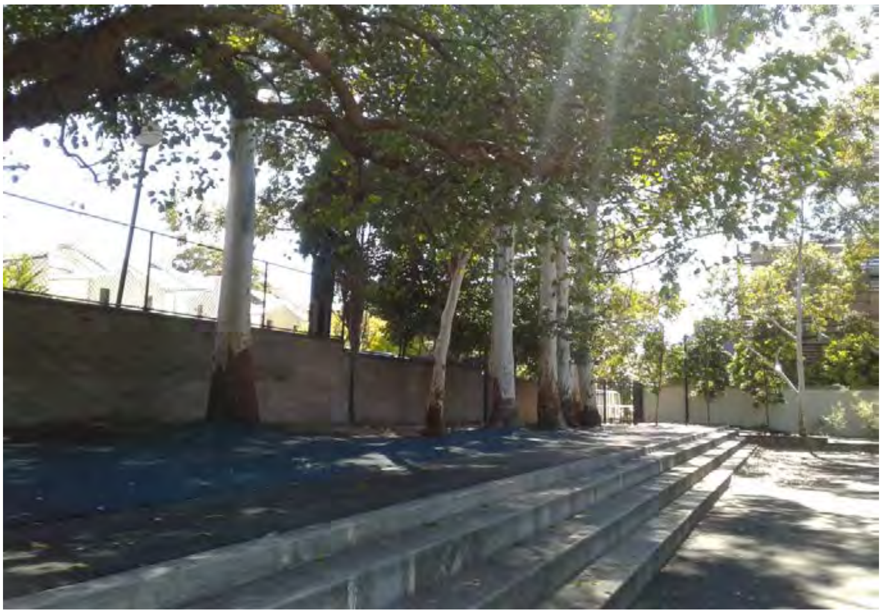
Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT: 92277.00
	Detailed Site Investigation	PLATE No: 1
	417 Abercrombie Street, Darlington NSW	REV: 0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: 14-Feb-19

Photograph 3 - Central portion of site

Photograph 4 - Basketball court area in northern portion of site

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT: 92277.00
	Detailed Site Investigation	PLATE No: 2
	417 Abercrombie Street, Darlington NSW	REV: 0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: 14-Feb-19

Photograph 5 - Unsealed garden bed adjacent to sites eastern boundary



Photograph 6 - Far northern portion of site . Elevated area with rubber safety seal material covering majority of area.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Detailed Site Investigation	PLATE No:	3
	417 Abercrombie Street, Darlington NSW	REV:	0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	14-Feb-19

Photograph 7 - Central northern portion of site

Photograph 8 - Central southern portion of site

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Detailed Site Investigation	PLATE No:	4
	417 Abercrombie Street, Darlington NSW	REV:	0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	14-Feb-19

Photograph 9 - Playground area in central western portion of site with classroom building beyond

Photograph 10 - Golden Grove Street with Church and residential properties beyond to the west of site

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Detailed Site Investigation	PLATE No:	5
	417 Abercrombie Street, Darlington NSW	REV:	0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	14-Feb-19

Photograph 10 - Building used by Sydney University to the immediate northwest of site

Photograph 11 - Abercrombie Street to the south of site with residential properties beyond

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Detailed Site Investigation	PLATE No:	6
	417 Abercrombie Street, Darlington NSW	REV:	0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	14-Feb-19

Appendix C

DQOs and SAC

Appendix C - 1 Data Quality Objectives

The DSI has been devised broadly in accordance with the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of the *National Environment Protection (Assessment of Site Contamination) Measure* 1999 as amended 2013 (NEPC, 2013). The DQO process is outlined as follows:

C1.1 State the Problem

Redevelopment/upgrading works are proposed for the primary school and preschool presently located at the site.

A Preliminary Site Assessment (PSI) of the Site completed in March 2018 identified the following areas of environmental concern (AEC) which require further investigation and/or remediation for the Site to be considered suitable for the proposed development:

- Total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAH) and lead impact variously identified in shallow fill soils at two locations (BH5 and BH6) in the north western portion of the site and one location (BH2) in the south eastern portion of the site. Concentrations of the contaminants of concern (COC) were detected at levels exceeding adopted site assessment criteria (SAC) which included human health investigation levels. Soils in the vicinity of these locations require remediation, management and/or risk assessment for the site to be considered suitable for ongoing use as a primary/preschool. Further investigation was also required to define the lateral and vertical extent of impacted soils;
- TRH and zinc impact to shallow soils at one location (BH9) in the central eastern portion of the site at levels exceeding ecological investigation levels required further investigation to determine whether the TRH and zinc concentrations are anomalous/isolated occurrences or indicative of widespread impact potentially requiring remediation; 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 structure; and importation of filling, the presence of asbestos impacted soils at the site could not be ruled out and required further investigation.

The “problem” to be addressed is the extent and nature of potential contamination at the site and whether the site is suitable for the proposed development.

The objective of the investigation is as follows:

- Assess the contamination status of the site and the suitability of the site, from a contamination standpoint, for the proposed redevelopment/upgrading works and continued use of the site as a primary school and preschool.

C1.2 Identify the Decision/Goal of the Study

The remediation extents determined by the DSI are based upon soil samples collected within the identified AEC and a comparison of the analytical results for identified contaminants of potential concern (COPC) with the adopted SAC. The adopted SAC are provided in Section C2 below.

Based on the findings of the PSI, the main COPC are expected to be total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAH), metals and asbestos.

The following specific decisions were considered as part of the PSI:

- Did field observation and analytical results identify potential contamination sources (AEC) which were not included in the CSM?
- Were COPC present in soil at concentrations that pose a potential risk to identified receptors?
- Is the data sufficient to make a decision regarding the abovementioned risks, the suitability of the site for the proposed development?
- Does contamination at the site, if encountered, trigger the Duty to Report requirements under the CLM Act 1997?
- Are there any off-site migration issues that need to be considered?

C1.3 Identify Information Inputs

Inputs into the decisions are as follows:

- Review of regional geology, topography and hydrogeology information;
- Review of site history information;
- Completion of a site inspection;
- Soil samples were collected in the immediate vicinity of identified potential sources of contamination (AEC) across the Site from a total of nine bore locations and one surface soil sample location;
- The lithology of the Site as described in the bore logs (Appendix D);
- Field and laboratory QA/QC data to assess the suitability of the environmental data for the DSI (Appendix G);
- All analysis was undertaken at a laboratory accredited by the National Association of Testing Authorities (NATA); and
- Laboratory reported concentrations of COPC were compared with the NEPC (2013) criteria as discussed in Section C2.

C1.4 Define the Study Boundaries

The site is located at 417 Abercrombie Street, Darlington NSW within the local government area of Council of the City of Sydney. The site covers an approximate total area of 0.72 hectares and is comprised of the following two lots:

- Lot 592 Deposited Plan 752049; and
- Lot 100 Deposited Plan 623500.

The site location and boundaries are shown on Drawing 1, Appendix A.

The investigation was undertaken to a maximum depth of 3.2 m below ground level (bgl) across the Site.

Field investigations were undertaken on 14 to 18 January 2018 by a DP Environmental Scientist.

C1.5 Develop the Analytical Approach (or Decision Rule)

The information obtained during the assessment was used to characterise the Site in terms of contamination issues and risk to human health and the environment. The decision rules used in characterising the site were as follows:

- The adopted SAC was the NSW Environment Protection Authority (EPA) endorsed criteria; and
- The contaminant concentrations in soil were compared to the adopted SAC to evaluate whether further investigation or remedial action was required.

Field and laboratory test results were considered useable for the assessment after evaluation against the following data quality indicators (DQIs):

- Precision – a measure of variability or reproducibility of data;
- Accuracy – a measure of closeness of the data to the ‘true’ value;
- Representativeness – the confidence (qualitative) of data representativeness of media present on site;
- Completeness – a measure of the amount of usable data from a data collection activity; and
- Comparability – the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event.

The specific limits are outlined in the data QA/QC procedures and results (Appendix G).

C1.6 Specify the Performance or Acceptable Criteria

Decision errors for the respective COPC for fill and natural soils are:

1. Deciding that fill and natural soil at the Site exceeds the adopted SAC when they truly do not; and
2. Deciding that fill and natural soil at the Site is within the adopted SAC when they truly do not.

Decision errors for the PSI were minimised and measured by the following:

- The sampling regime targeted each stratum identified to account for site variability;
- Sample collection and handling techniques were in accordance with DP’s *Field Procedures Manual*;
- Samples were prepared and analysed by a NATA-accredited laboratory with the acceptance limits for laboratory QA/QC parameters based on the laboratory reported acceptance limits and those stated in the NEPC (2013);

- The analyte selection is based on the available site history, past site activities and site features. The potential for contaminants other than those proposed to be analysed is considered to be low;
- The SAC were adopted from established and NSW EPA endorsed guidelines. The SAC have risk probabilities already incorporated; and

C1.7 Optimise the design for obtaining data

Sampling design and procedures that were implemented to optimise data collection for achieving the DQOs included the following;

- A NATA accredited laboratory using NATA endorsed methods were used to perform laboratory analysis;
- Additional soil samples were collected but kept 'on hold' pending details of initial analysis so that they could be analysed if further delineation was required; and
- Adequately experienced environmental scientists/engineers were chosen to conduct field work and sample analysis interpretation.

Appendix C – 2 - Site Assessment Criteria

The SAC applied in the current investigation are informed by the preliminary CSM which identified human and environmental receptors to potential contamination on the site (refer to Section 5). Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising investigation and screening levels as per Schedule B1, *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC, 2013).

The investigation and screening levels applied in the current investigation comprise levels adopted for a recreational land use scenario with garden/accessible soil which includes preschools and primary schools.

C2.1 Health Investigation and Screening Levels

The generic Health Investigation Levels (HILs) and Health Screening Levels (HSLs) are considered to be appropriate for the assessment of human health risk associated with contamination at the site. The adopted soil HILs and HSLs for the COPC are presented in Table C2, with inputs into their derivation shown in Table C1.

As shown in Table C2 the adopted HSLs are based on a potential vapour intrusion pathway, as identified in the CSM. Although the CSM also identifies a direct contact pathway as well as construction worker receptors, the corresponding HSLs are significantly higher than those for the vapour intrusion pathway and are therefore not drivers for further assessment and/or remediation. As such the direct contact and intrusive maintenance worker HSLs have not been listed.

Table C1: Inputs to the Derivation of HSLs

Variable	Input	Rationale
Potential exposure pathway	Inhalation of vapours	Potential exposure pathways
Soil Type	Sand and sandy clay	Dominant soil type in surface soils (see Bore Logs – Appendix D)
Depth to contamination	0 m to <1 m	Potential contamination sources likely to impact surface soils

Table C2: HIL and HSL in mg/kg Unless Otherwise Indicated

Contaminants		HIL- A	HSL- A & B
Metals	Arsenic	100	-
	Cadmium	20	-
	Chromium (VI)	100	-
	Copper	6,000	-
	Lead	300	-
	Mercury (inorganic)	40	-
	Nickel	400	-
	Zinc	7,400	-
PAH	Benzo(a)pyrene TEQ[1]	3	-
	Total PAH	300	-
	Naphthalene	-	4
TRH	F1	-	40
	F2	-	230
	F3	-	-
	F4	-	-
BTEX	Benzene	-	0.6
	Toluene	-	390
	Ethylbenzene	-	NL[3]
	Xylenes	-	95

Notes:

1 Sum of carcinogenic PAH

2 Non dioxin-like PCBs only.

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

C2.2 Ecological Investigation Levels

Ecological Investigation Levels (EILs) and Added Contaminant Limits (ACLs), where appropriate, have been derived in NEPC (2013) for only a short list of contaminants comprising As, Cu, Cr (III), DDT, naphthalene, Ni, Pb and Zn. The adopted EILs, derived using the *Interactive (Excel) Calculation Spreadsheet* (Standing Council on Environment and Water (SCEW) website (http://www.scew.gov.au/node/941)) are shown in the following Table F4, with inputs into their derivation shown on Table F3.

Table C3: Inputs to the Derivation of EILs

Variable	Input	Rationale
Age of contaminants	"Aged" (>2 years)	Given the potential sources of soil contamination are from historic use, the contamination is considered as "aged" (>2 years);
pH	7.2	2 selected samples were tested for pH. The average pH value has been used as an initial screening.
CEC	18 cmolc/kg	2 selected samples were tested for CEC. The average CEC value has been used as an initial screening.
Clay content	10 %	Conservative value for initial screen
Traffic volumes	high	The Site is considered to be located within a high traffic area
State / Territory	New South Wales	-

Table C4: EIL in mg/kg

Analyte		EIL
Metals	Arsenic	100
	Copper	230
	Nickel	250
	Chromium III	410
	Lead	1,100
	Zinc	760
PAH	Naphthalene	170

C2.3 Ecological Screening Levels

Ecological Screening Levels (ESLs) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. The adopted ESLs, based on a fine soil type are shown in the following Table C5.

Table C5: ESL in mg/kg

Analyte		ESL[1]	Comments
TRH	F1	180*	All ESLs are low reliability apart from those marked with * which are moderate reliability
	F2	120*	
	F3	300	
	F4	2,800	
BTEX	Benzene	50	
	Toluene	85	
	Ethylbenzene	70	
	Xylenes	105	
PAH	Benzo(a)pyrene	0.7	

C2.4 Management Limits

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

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

The adopted management limits, based on a fine soil type (Section 11.1), are shown in the following Table C6.

Table C6: Management Limits in mg/kg

Analyte		Management Limit
TRH	$C_6 - C_{10}$ (F1) #	800
	$>C_{10}$-C_{16} (F2) #	1,000
	$>C_{16}$-C_{34} (F3)	3,500
	$>C_{34}$-C_{40} (F4)	10 000

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

C2.5 Asbestos in Soil

NEPC (2013) defines the various asbestos types as follows:

Bonded ACM: Asbestos containing material which is in sound condition, bound in a matrix of cement or resin, and cannot pass a 7 mm x 7 mm sieve.

FA: Fibrous asbestos material including severely weathered cement sheet, insulation products and woven asbestos material. This material is typically unbonded or was previously bonded and is now significantly degraded and crumbling.

AF: Asbestos fines including free fibres, small fibre bundles and also small fragments of bonded ACM that pass through a 7 mm x 7 mm sieve.

Health Screening Levels (HSLs) for asbestos in soil, which are based on likely exposure levels for different scenarios, have been adopted in NEPC (2013) from the Western Australian Department of Health (WA DoH) publication Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia 2009 (WA DoH 2009).

On the basis of the proposed land use, and in accordance with Table 7, Schedule B1, NEPC (2013) the following asbestos HSLs have been adopted:

Table C6: Health Screening Levels for Asbestos Contamination in Soil (% w/w)

Form of Asbestos	HSL
Bonded ACM	0.01%
FA and AF	0.001 %
All Forms of Asbestos	No visible asbestos for surface soil

Appendix D

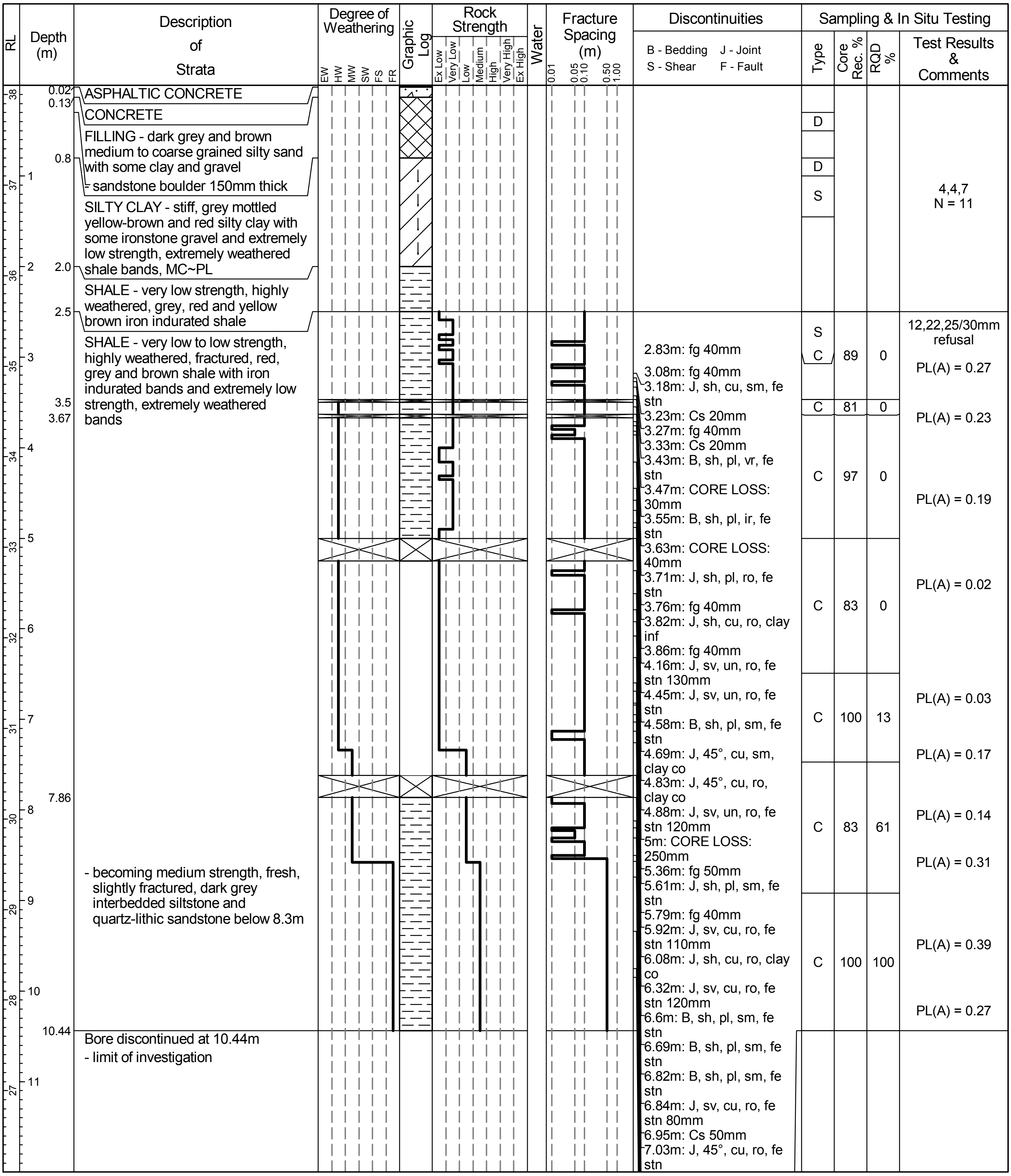
Bore Logs

BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 38.1 mAHD
EASTING: 332579
NORTHING: 6248317
DIP/AZIMUTH: 90°/--

BORE No: A
PROJECT No: 92277.01
DATE: 14/1/2019
SHEET 1 OF 2



Depth (m)	Description of Strata
0.02	ASPHALTIC CONCRETE
0.13	CONCRETE
0.8	FILLING - dark grey and brown medium to coarse grained silty sand with some clay and gravel - sandstone boulder 150mm thick
2.0	SILTY CLAY - stiff, grey mottled yellow-brown and red silty clay with some ironstone gravel and extremely low strength, extremely weathered shale bands, MC~PL
2.5	SHALE - very low strength, highly weathered, grey, red and yellow brown iron indurated shale
3.5 3.67 7.86	SHALE - very low to low strength, highly weathered, fractured, red, grey and brown shale with iron indurated bands and extremely low strength, extremely weathered bands - becoming medium strength, fresh, slightly fractured, dark grey interbedded siltstone and quartz-lithic sandstone below 8.3m
10.44	Bore discontinued at 10.44m - limit of investigation

Discontinuities

B - Bedding J - Joint
S - Shear F - Fault

2.83m: fg 40mm
3.08m: fg 40mm
3.18m: J, sh, cu, sm, fe stn
3.23m: Cs 20mm
3.27m: fg 40mm
3.33m: Cs 20mm
3.43m: B, sh, pl, vr, fe stn
3.47m: CORE LOSS: 30mm
3.55m: B, sh, pl, ir, fe stn
3.63m: CORE LOSS: 40mm
3.71m: J, sh, pl, ro, fe stn
3.76m: fg 40mm
3.82m: J, sh, cu, ro, clay inf
3.86m: fg 40mm
4.16m: J, sv, un, ro, fe stn 130mm
4.45m: J, sv, un, ro, fe stn
4.58m: B, sh, pl, sm, fe stn
4.69m: J, 45°, cu, sm, clay co
4.83m: J, 45°, cu, ro, clay co
4.88m: J, sv, un, ro, fe stn 120mm
5m: CORE LOSS: 250mm
5.36m: fg 50mm
5.61m: J, sh, pl, sm, fe stn
5.79m: fg 40mm
5.92m: J, sv, cu, ro, fe stn 110mm
6.08m: J, sh, cu, ro, clay co
6.32m: J, sv, cu, ro, fe stn 120mm
6.6m: B, sh, pl, sm, fe stn
6.69m: B, sh, pl, sm, fe stn
6.82m: B, sh, pl, sm, fe stn
6.84m: J, sv, cu, ro, fe stn 80mm
6.95m: Cs 50mm
7.03m: J, 45°, cu, ro, fe stn

Sampling & In Situ Testing

Type	Core Rec. %	RQD %	Test Results & Comments
D			
D			
S			4,4,7 N = 11
S			12,22,25/30mm refusal
C	89	0	PL(A) = 0.27
C	81	0	PL(A) = 0.23
C	97	0	PL(A) = 0.19
C	83	0	PL(A) = 0.02
C	100	13	PL(A) = 0.03 PL(A) = 0.17
C	83	61	PL(A) = 0.14 PL(A) = 0.31
C	100	100	PL(A) = 0.39 PL(A) = 0.27

RIG: Bobcat **DRILLER:** Groundtest **LOGGED:** JHB **CASING:** HW to 2.5m
TYPE OF BORING: 150mm diameter SFA to 2.5m, then NMLC coring to 10.44m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56. MC = moisture content; PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 38.1 mAHD
EASTING: 332579
NORTHING: 6248317
DIP/AZIMUTH: 90°/--

BORE No: A
PROJECT No: 92277.01
DATE: 14/1/2019
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering EW HW MW SW FS FR	Graphic Log	Rock Strength Ex Low, Very Low, Low, Medium, High, Very High, Ex High	Water	Fracture Spacing (m) 0.01 0.05 0.10 0.50 1.00	Discontinuities B - Bedding J - Joint S - Shear F - Fault	Sampling & In Situ Testing Type	Core Rec. %	RQD %	Test Results & Comments
26								7.13m: fg 90mm 7.26m: J, sv, cu, ro, fe stn 100mm 7.62m: CORE LOSS: 240mm 7.86m: fg 70mm 8.12m: J, sh, pl, ro, fe stn 8.2m: fg 30mm 8.31m: fg 40mm 8.5m: fg 40mm 8.57m: J, 45°, cu, sm, clay 8.74m: J, sv, cu, ro, cln 230mm 9.34m: J, 45°, cu, sm, cln 9.75m: J, sv, pl, sm, cln 50mm 9.85m: J, 45°, cu, sm, cln				
25	13											
24	14											
23	15											
22	16											
21	17											
20	18											
19	19											
18	20											
17	21											
16	22											
15	23											

RIG: Bobcat **DRILLER:** Groundtest **LOGGED:** JHB **CASING:** HW to 2.5m
TYPE OF BORING: 150mm diameter SFA to 2.5m, then NMLC coring to 10.44m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56. MC = moisture content; PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

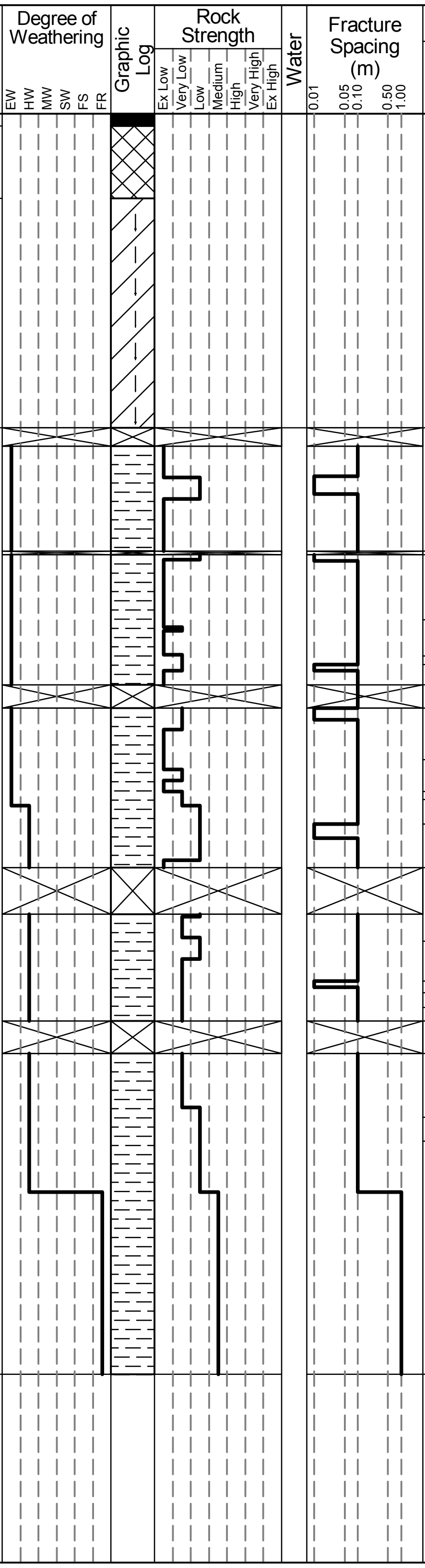
BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 36.0 mAHD
EASTING: 332571
NORTHING: 6248290
DIP/AZIMUTH: 90°/--

BORE No: B
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata
36	0.1	ASPHALT
	0.7	FILLING - brown silty clay with a trace of sand, MC<PL
35	1	SILTY CLAY - very stiff, grey mottled yellow brown and red silty clay with some ironstone gravel and extremely low strength, extremely weathered shale bands, MC~PL
34	2	
	2.6	
	2.75	SHALE - very low to low strength, highly weathered, fractured, grey, red and brown shale with iron indurated bands and extremely low strength, extremely weathered bands
33	3	
	3.65	
32	4	
	4.92	
31	5	
30	6	
	6.63	
29	7	
	7.78	
28	8	
27	9	- becoming medium strength, fresh, unbroken, dark grey interbedded siltstone and quartz-lithic sandstone below 8.93m
26	10	
	10.44	Bore discontinued at 10.44m - limit of investigation
25	11	



Discontinuities

B - Bedding J - Joint
S - Shear F - Fault

2.6m: CORE LOSS: 150mm
3m: fg 150mm
3.39m: B, sh, pl, ro, fe stn
3.62m: CORE LOSS: 30mm
3.65m: fg 50mm
4.19m: B, sh, pl, ro, fe stn
4.49m: J, 45°, cu, ro, fe stn
4.56m: fg 50mm
4.73m: CORE LOSS: 190mm
4.92m: fg 100mm
5.35m: J, 45°, cu, ro, fe stn
5.61m: J, 45°, cu, ro, fe stn
5.68m: J, 45°, cu, ro, fe stn
5.88m: fg 120mm
6.24m: CORE LOSS: 390mm
6.85m: J, sv, cu, ro, cln 200mm
7.18m: fg 50mm
7.28m: J, 60°, cu, ro, fe stn 130mm
7.4m: J, 60°, cu, ro, fe stn 130mm
7.51m: CORE LOSS: 270mm
7.78m: J, sv, un, vr, fe stn 440mm
8.31m: J, sv, ir, ro, cln 110mm
8.51m: J, sv, ir, ro, cln 410mm

Sampling & In Situ Testing

Type	Core Rec. %	RQD %	Test Results & Comments
D			
D			
S			4,7,8 N = 15
D			
S			11,16,25/100mm refusal
C	86		PL(A) = 0.24
C	97		PL(A) = 0.07
C	85	9	PL(A) = 0.13
C	100	62	PL(A) = 0.11
C	33	0	
C	100	11	
C	92	27	PL(A) = 0.2
C	100	100	PL(A) = 0.51 PL(A) = 1.04

RIG: Bobcat **DRILLER:** Groundtest **LOGGED:** JHB **CASING:** HW to 2.5m

TYPE OF BORING: 150mm diameter SFA to 2.5m, wash boring to 2.6m, then NMLC coring to 10.44m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. MC = moisture content; PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

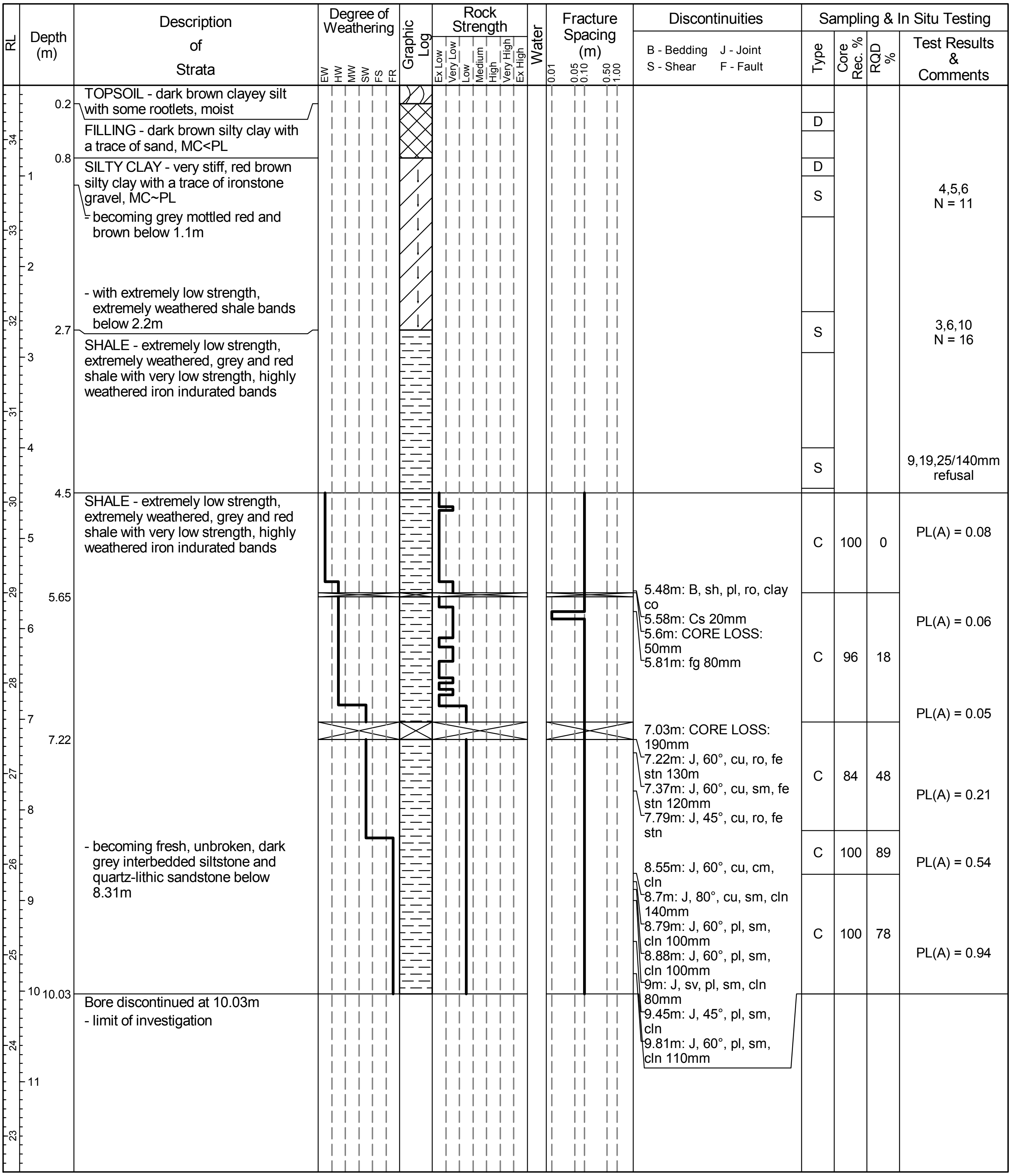
Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 34.6 mAHD
EASTING: 332592
NORTHING: 6248292
DIP/AZIMUTH: 90°/--

BORE No: C
PROJECT No: 92277.01
DATE: 16/1/2019
SHEET 1 OF 1



Depth (m)	Description of Strata
0.2	TOPSOIL - dark brown clayey silt with some rootlets, moist
0.8	FILLING - dark brown silty clay with a trace of sand, MC<PL
2.7	SILTY CLAY - very stiff, red brown silty clay with a trace of ironstone gravel, MC~PL - becoming grey mottled red and brown below 1.1m - with extremely low strength, extremely weathered shale bands below 2.2m
4.5	SHALE - extremely low strength, extremely weathered, grey and red shale with very low strength, highly weathered iron indurated bands
5.65	SHALE - extremely low strength, extremely weathered, grey and red shale with very low strength, highly weathered iron indurated bands
7.22	
10.03	- becoming fresh, unbroken, dark grey interbedded siltstone and quartz-lithic sandstone below 8.31m
	Bore discontinued at 10.03m - limit of investigation

Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)

5.48m: B, sh, pl, ro, clay co
5.58m: Cs 20mm
5.6m: CORE LOSS: 50mm
5.81m: fg 80mm
7.03m: CORE LOSS: 190mm
7.22m: J, 60°, cu, ro, fe stn 130m
7.37m: J, 60°, cu, sm, fe stn 120mm
7.79m: J, 45°, cu, ro, fe stn
8.55m: J, 60°, cu, cm, cln
8.7m: J, 80°, cu, sm, cln 140mm
8.79m: J, 60°, pl, sm, cln 100mm
8.88m: J, 60°, pl, sm, cln 100mm
9m: J, sv, pl, sm, cln 80mm
9.45m: J, 45°, pl, sm, cln
9.81m: J, 60°, pl, sm, cln 110mm

Sampling & In Situ Testing

Type	Core Rec. %	RQD %	Test Results & Comments
D			
D			
S			4,5,6 N = 11
S			3,6,10 N = 16
S			9,19,25/140mm refusal
C	100	0	PL(A) = 0.08
C	96	18	PL(A) = 0.06 PL(A) = 0.05
C	84	48	PL(A) = 0.21
C	100	89	PL(A) = 0.54
C	100	78	PL(A) = 0.94

RIG: Bobcat **DRILLER:** Groundtest **LOGGED:** JHB **CASING:** HW to 2.5m
TYPE OF BORING: 110mm diameter SFA to 2.5m, wash boring to 4.5m, then NMLC coring to 10.03m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56. MC = moisture content; PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

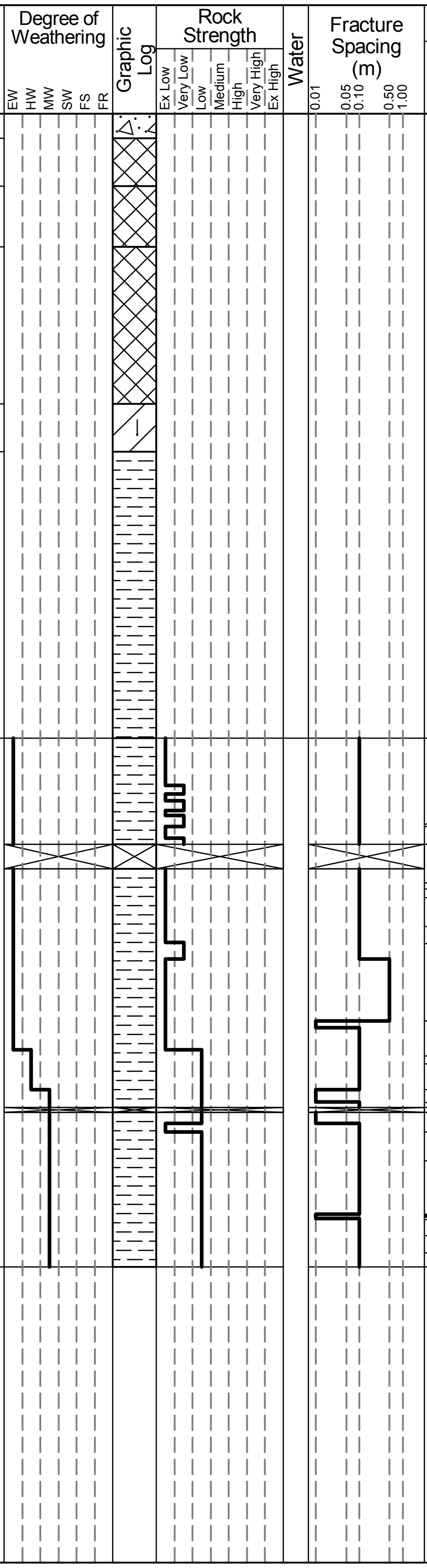
BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 33.0 mAHD
EASTING: 332574
NORTHING: 6248260
DIP/AZIMUTH: 90°/--

BORE No: D
PROJECT No: 92277.01
DATE: 17/1/2019
SHEET 1 OF 2

Depth (m)	Description of Strata
0.2	CONCRETE
0.6	FILLING - red brown silty clay with a trace of sand, MC~PL
1.1	FILLING - yellow and light brown medium grained clayey sand, dry
2.4	FILLING - brown, red, grey and yellow silty clay with some sand and gravel, MC<PL - becoming dark brown below 1.7m
2.8	SILTY CLAY - very stiff, grey mottled red and brown silty clay with a trace of ironstone gravel
5.17	SHALE - extremely low strength, extremely weathered, grey and red shale with very low strength, highly weathered iron indurated bands
6.25	SHALE - extremely low strength, extremely weathered, fractured, grey and red shale with very low strength, highly weathered iron indurated bands
8.27	
9.55	Bore discontinued at 9.55m - limit of investigation



Discontinuities

B - Bedding J - Joint
S - Shear F - Fault

- 5.74m: J, 45°, cu, ro, fe stn
- 5.88m: J, sh, cu, ro, fe stn
- 5.9m: J, sh, cu, ro, fe stn
- 6.05m: CORE LOSS: 200mm
- 6.367m: B, sh, pl, ro, fe stn
- 6.42m: B, sh, pl, ro, fe stn
- 6.49m: B, sh, pl, ro, fe stn
- 6.73m: B, sh, pl, ro, fe stn
- 6.87m: J, sv, ir, vr, fe stn 130mm
- 7.51m: fg 60mm
- 7.8m: J, sh, pl, ro, fe stn
- 7.87m: J, 45°, cu, ro, fe stn
- 8.08m: fg 100mm
- 8.19m: J, 45°, cu, ro, fe stn
- 8.23m: CORE LOSS: 40mm
- 8.27m: fg 90mm
- 8.43m: J, sv, ir, ro, fe stn 140mm
- 8.67m: J, sh, cu, vr, fe stn
- 9.11m: J, sh, cu, sm, fe stn
- 9.12m: J, sh, cu, sm, fe stn
- 9.13m: J, sh, cu, sm, fe stn
- 9.14m: J, sh, cu, sm, fe

Sampling & In Situ Testing

Type	Core Rec. %	RQD %	Test Results & Comments
D			
D			
S			7,10,10 N = 20
D			
S			3,6,10 N = 16
S			7,11,21 N = 32
C	100	0	PL(A) = 0.44
C	77	0	PL(A) = 0.08
C	100	14	PL(A) = 0.12
C	100	55	PL(A) = 0.14 PL(A) = 0.11 PL(A) = 0.09

RIG: Bobcat **DRILLER:** Groundtest **LOGGED:** JHB **CASING:** HW to 2.5m; HQ to 5.17m

TYPE OF BORING: Concrete coring to 0.2m, 110mm diameter SFA to 2.5m, wash boring to 5.17m, then NMLC coring to 9.55m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. MC = moisture content; PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 33.0 mAHD
EASTING: 332574
NORTHING: 6248260
DIP/AZIMUTH: 90°/--

BORE No: D
PROJECT No: 92277.01
DATE: 17/1/2019
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering EW HW MW SW FS FR	Graphic Log	Rock Strength Ex Low, Very Low, Low, Medium, High, Very High, Ex High	Water	Fracture Spacing (m) 0.01 0.05 0.10 0.50 1.00	Discontinuities B - Bedding J - Joint S - Shear F - Fault	Sampling & In Situ Testing Type	Core Rec. %	RQD %	Test Results & Comments
21								stn 9.16m: J, sv, ir, ro, cln 60mm 9.29m: B, sh, pl, ro, fe stn 9.43m: B, sh, pl, ro, fe stn				
20	13											
19	14											
18	15											
17	16											
16	17											
15	18											
14	19											
13	20											
12	21											
11	22											
10	23											

RIG: Bobcat **DRILLER:** Groundtest **LOGGED:** JHB **CASING:** HW to 2.5m; HQ to 5.17m

TYPE OF BORING: Concrete coring to 0.2m, 110mm diameter SFA to 2.5m, wash boring to 5.17m, then NMLC coring to 9.55m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. MC = moisture content; PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

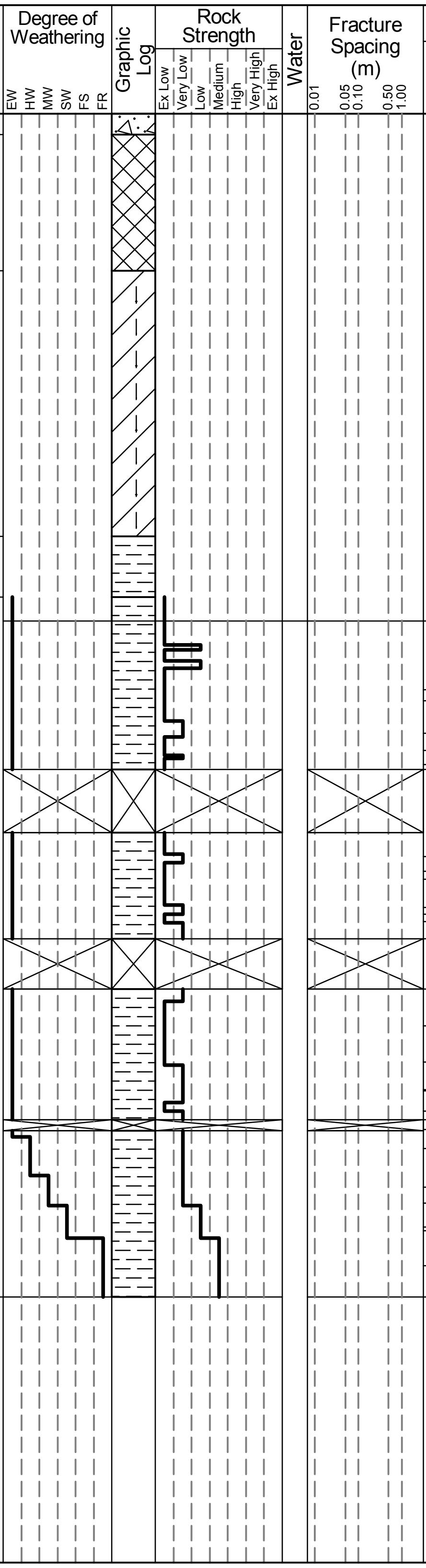
BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 34.1 mAHD
EASTING: 332550
NORTHING: 6248228
DIP/AZIMUTH: 90°/--

BORE No: E
PROJECT No: 92277.01
DATE: 18/1/2019
SHEET 1 OF 1

Depth (m)	Description of Strata
0.17	CONCRETE
1.3	FILLING - brown, red and grey silty clay with a trace of ironstone gravel, MC~PL
3.5	SILTY CLAY - very stiff, grey mottled red and brown silty clay with a trace of ironstone gravel, MC~PL - with extremely low strength, extremely weathered iron indurated shale bands below 2.7m
4.0	SHALE - extremely low strength, extremely weathered, grey and red shale with very low strength, highly weathered iron indurated bands
5.95 7.25 8.42 9.8	SHALE - extremely low strength, extremely weathered, grey and red shale with very low strength, highly weathered iron indurated bands - becoming medium strength, slightly weathered, slightly fractured interbedded siltstone and quartz lithic sandstone below 9.04m - becoming fresh below 9.31m
	Bore discontinued at 9.8m - limit of investigation



Discontinuities

B - Bedding J - Joint
S - Shear F - Fault

4.16m: J, sv, ir, vr, clay inf 40mm
4.6m: J, sh, pl, ro, clay inf
4.77m: Cs 20mm
4.86m: J, 80°, ir, ro, clay inf 100mm
5.13m: J, sh, cu, ro, fe stn
5.27m: J, sh, cu, ro, fe stn
5.39m: J, sh, cu, ro, fe stn
5.43m: CORE LOSS: 520mm
6.15m: Cs 20mm
6.27m: fg 60mm
6.34m: J, 60°, cu, ro, fe stn 110mm
6.57m: J, sh, cu, ro, fe stn
6.63m: J, 45°, cu, ro, fe stn
6.69m: J, sv, ir, vr, fe stn 140mm
6.83m: CORE LOSS: 420mm
7.25m: fg 100mm
7.55m: J, 45°, cu, ro, fe stn
7.85m: J, sv, ir, vr, fe stn 20mm
8.08m: J, 45°, cu, sm, fe stn
8.09m: J, sv, ir, ro, fe stn 100mm
8.26m: fg 50mm
8.33m: CORE LOSS: 90mm
8.41m: fg 70mm
8.57m: fg 230mm
8.89m: B, sh, pl, ro, cln
9.02m: fg 30mm
9.22m: B, h, pl, sm, cln
9.25m: B, h, pl, sm, cln
9.54m: J, 45°, cu, sm, cln

Sampling & In Situ Testing

Type	Core Rec. %	RQD %	Test Results & Comments
D			
D			
S			4,5,7 N = 12
D			
S			5,8,13 N = 21
S			23,25/50mm,- refusal
C	100	0	PL(A) = 0.51 PL(A) = 0.06 PL(A) = 0.02
C	64	0	PL(A) = 0.56
C	73	0	PL(A) = 0.08
C	92	63	PL(A) = 0.13 PL(A) = 0.48

RIG: Bobcat **DRILLER:** Groundtest **LOGGED:** JHB **CASING:** HW to 2.5m; HQ to 4.0m

TYPE OF BORING: Concrete coring to 0.17m, 110mm diameter SFA to 2.5m, wash boring to 4.0m, then NMLC coring to 9.8m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. MC = moisture content; PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

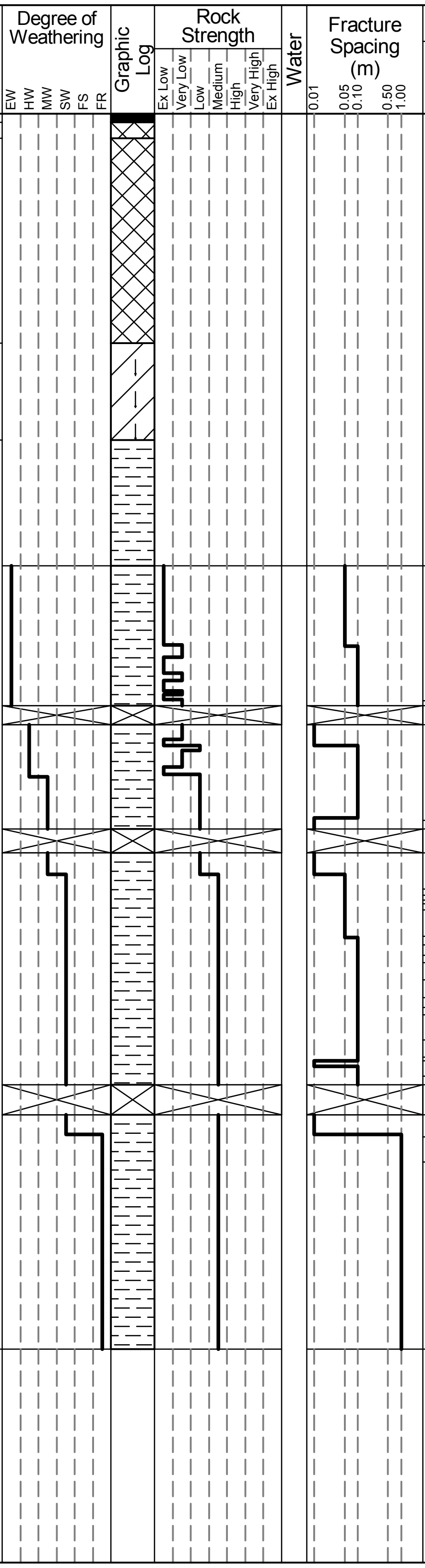
BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 34.9 mAHD
EASTING: 332545
NORTHING: 6248280
DIP/AZIMUTH: 90°/--

BORE No: F
PROJECT No: 92277.01
DATE: 17/1/2019
SHEET 1 OF 2

Depth (m)	Description of Strata
0.07	ASPHALTIC CONCRETE
0.2	FILLING - brown clayey sand with some silt and gravel, moist
	FILLING - brown silty clay with some gravel and sand, MC<PL - becoming dark brown with a trace of ceramic and ash below 0.8m
1.9	SILTY CLAY - hard, grey mottled red and light brown silty clay with extremely low strength, extremely weathered iron indurated shale bands and a trace of gravel, MC~PL
2.7	SHALE - extremely low strength, extremely weathered, grey and red shale with very low strength, highly weathered iron indurated bands
3.74	
5.06	
6.12	
8.29	- becoming medium strength, fresh, unbroken, dark grey interbedded siltstone and quartz lithic sandstone below 8.45m
10.23	Bore discontinued at 10.23m - limit of investigation



Discontinuities

B - Bedding J - Joint
S - Shear F - Fault

4.63m: J, sv, cu, vr, fe stn 40mm
4.86m: J, sv, cu, vr, fe stn 40mm
4.9m: CORE LOSS: 160mm
5.06m: J, sv, un, vr, fe stn 210mm
5.85m: fg zone 50mm
5.92m: CORE LOSS: 200mm
6.12m: fg zone 170mm
6.42m: J, sh, cu, sm, fe stn
6.47m: J, 45°, cu, sm, fe stn
6.51m: J, sh, cu, sm, fe stn
6.54m: J, sh, cu, sm, fe stn
6.59m: J, sh, cu, sm, fe stn
6.81m: J, sh, cu, sm, fe stn
6.88m: J, sh, cu, sm, fe stn
6.97m: J, sh, cu, sm, fe stn
7.03m: J, sh, cu, sm, fe stn
7.17m: J, sh, cu, sm, fe stn
7.32m: J, sh, cu, sm, fe stn
7.4m: J, sh, cu, sm, fe stn
7.46m: J, sh, cu, sm, fe stn
7.67m: J, sh, cu, sm, fe stn
7.81m: J, 45°, cu, sm, fe stn
7.84m: fg 50mm
7.97m: J, 45°, cu, sm, fe stn

Sampling & In Situ Testing

Type	Core Rec. %	RQD %	Test Results & Comments
D			
D			
S			3,6,6 N = 12
D			
S			9,13,22 N = 35
C	100	0	PL(A) = 0.05
C	84	0	PL(A) = 0.17 PL(A) = 0.05
C	91	43	PL(A) = 0.54
C	84	59	PL(A) = 0.32 PL(A) = 0.69
C	100	100	PL(A) = 0.54

RIG: Bobcat **DRILLER:** Groundtest **LOGGED:** JHB **CASING:** HW to 2.5m
TYPE OF BORING: 110mm diameter SFA to 2.5m, wash boring to 3.74m, then NMLC coring to 10.23m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56. MC = moisture content; PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 34.9 mAHD
EASTING: 332545
NORTHING: 6248280
DIP/AZIMUTH: 90°/--

BORE No: F
PROJECT No: 92277.01
DATE: 17/1/2019
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering EW HW MW SW FS FR	Graphic Log	Rock Strength Ex Low, Very Low, Low, Medium, High, Very High, Ex High	Water	Fracture Spacing (m) 0.01 0.05 0.10 0.50 1.00	Discontinuities B - Bedding J - Joint S - Shear F - Fault	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
								8.04m: CORE LOSS: 250mm 8.29m: fg 160mm 8.47m: J, sv, pl, sm, cln 130mm 8.68m: J, 45°, cu, sm, cln				
22	13											
21	14											
20	15											
19	16											
18	17											
17	18											
16	19											
15	20											
14	21											
13	22											
12	23											
11												

RIG: Bobcat **DRILLER:** Groundtest **LOGGED:** JHB **CASING:** HW to 2.5m

TYPE OF BORING: 110mm diameter SFA to 2.5m, wash boring to 3.74m, then NMLC coring to 10.23m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. MC = moisture content; PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 34.1 mAHD
EASTING: 332586
NORTHING: 6248268
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 92277.01
DATE: 16/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
34		CONCRETE	△	D	0.03				
	0.15	FILLING - brown sandy clayey silt with some gravel	▨						
	0.3	Bore discontinued at 0.3m - refusal on sandstone cobble							
33	1								1
32	2								2
31	3								3

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A

TYPE OF BORING: Concrete coring to 0.15m, then hand auger to 0.3m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 34.3 mAHD
EASTING: 332545
NORTHING: 6248275
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 92277.01
DATE: 16/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		ASPHALTIC CONCRETE	■						
	0.1	CONCRETE	▨						
	0.2	FILLING - gravel with some coalwash	⊠						
34	0.3	FILLING - brown silty clay with gravel, MC<PL	⊠						
	0.5	Bore discontinued at 0.5m - refusal on cobble		D	0.5				
33	1								1
32	2								2
31	3								3

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A
TYPE OF BORING: Concrete coring to 0.2m, then hand auger to 0.5m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT:	Gardner Wetherill & Associates	**SURFACE LEVEL:**	40.5 mAHD	**BORE No:**	6
PROJECT:	Proposed Upgrade Works	**EASTING:**	332538	**PROJECT No:**	92277.01
LOCATION:	Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW	**NORTHING:**	6248304	**DATE:**	16/1/2019
		DIP/AZIMUTH:	90°/--	**SHEET**	1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.02	RECYCLED RUBBER							
		CONCRETE							
	0.2	FILLING - dark brown sandy silt and gravel with glass, flecks of dark charcoal and dark slag-like gravel, MC<PL							
40	0.5	FILLING - red brown sandy silt with a trace of gravel and dark slag		D	0.5				
	1								1
	1.2	Bore discontinued at 1.2m - limit of investigation		D	1.2				
39									
	2								2
38									
	3								3
37									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A

TYPE OF BORING: Concrete coring to 0.2m, then hand auger to 1.2m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 37.5 mAHD
EASTING: 332561
NORTHING: 6248325
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
	0.02	RUBBER SHEETING							
		FILLING - brown sandy silty clay with gravel and crushed concrete gravel, moist	☒						
37	0.5	FILLING - dark brown silty clay with some sand, MC<PL	☒	D	0.5				
	0.7	SILTY CLAY - brown, grey and red silty clay with some iron induration and a trace of ironstone gravel	▨						
	1.2	- becoming red mottled grey below 1.2m Bore discontinued at 1.2m - limit of investigation		D*	1.2				

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A

TYPE OF BORING: Hand auger

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. * Replicate sample BD1/1501019 collected

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics | Environment | Groundwater

BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 43.1 mAHD
EASTING: 332596
NORTHING: 6248284
DIP/AZIMUTH: 90°/--

BORE No: 9
PROJECT No: 92277.01
DATE: 16/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.05	TOPSOIL (FILLING) - organic silty sand topsoil with some rootlets, moist							
43	0.1	FILLING - black (potentially a trace of ash) below 0.1m							
		FILLING - brown and grey sandy silt with some ply wood and a trace of sandstone							
	0.5	- with some gravel and a trace of crushed concrete gravel below 0.5m							
		SILTY CLAY - grey mottled red silty clay with some ironstone gravel, MC<PL							
	1								1
42									
	1.2	Bore discontinued at 1.2m - limit of investigation							
	2								2
41									
	3								3
40									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A

TYPE OF BORING: Hand auger

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 38.9 mAHD
EASTING: 332551
NORTHING: 6248324
DIP/AZIMUTH: 90°/--

BORE No: 10
PROJECT No: 92277.01
DATE: 16/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
	0.05	ASPHALTIC CONCRETE	■						
	0.3	FILLING - brown clayey silt with a trace of sandstone and dark slag gravel, MC<PL	▨	D	0.3				
		Bore discontinued at 0.3m - limit of investigation							
38									
	1								1
37									
	2								2
36									
	3								3
35									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A
TYPE OF BORING: Concrete coring to 0.05m, then hand auger to 0.3m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics | Environment | Groundwater

BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 37.1 mAHD
EASTING: 332573
NORTHING: 6248321
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
37		CONCRETE	△						
	0.16	FILLING - gravel with some sand, moist	▨						
	0.3	Bore discontinued at 0.3m - limit of investigation							
	1								1
36									
	2								2
35									
	3								3
34									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A

TYPE OF BORING: Concrete coring to 0.16m, then hand auger to 0.3m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics | Environment | Groundwater

BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 38.7 mAHD
EASTING: 332527
NORTHING: 6248295
DIP/AZIMUTH: 90°/--

BORE No: 12
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
	0.04	ASPHALTIC CONCRETE	■						
	0.3	FILLING - brown and grey sandy silt with some gravel, dry	▨	D	0.3				
		Bore discontinued at 0.3m - limit of investigation							
38									
	1								1
37									
	2								2
36									
	3								3
35									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A
TYPE OF BORING: Concrete coring to 0.04m, then hand auger to 0.3m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 40.3 mAHD
EASTING: 332562
NORTHING: 6248297
DIP/AZIMUTH: 90°/--

BORE No: 13
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.1	ASPHALTIC CONCRETE	■						
	0.2	CONCRETE	△						
40	0.3	FILLING - brown fine grained sand with some dark slag-like gravel, MC<PL	⊠	D	0.3				
		Bore discontinued at 0.3m - limit of investigation							
	1								1
39									
	2								2
38									
	3								3
37									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A
TYPE OF BORING: Concrete coring to 0.2m, then hand auger to 0.4m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 39.3 mAHD
EASTING: 332570
NORTHING: 6248298
DIP/AZIMUTH: 90°/--

BORE No: 14
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
		ASPHALTIC CONCRETE							
	0.1	CONCRETE - loosely placed concrete filling							
39	0.3	FILLING - brown coarse grained gravelly sand, sandstone and basaltic gravel, moist		D	0.3				
	0.4	Bore discontinued at 0.4m - limit of investigation							
	1								1
38									
	2								2
37									
	3								3
36									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A

TYPE OF BORING: Concrete coring to 0.3m, then hand auger to 0.4m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 44.1 mAHD
EASTING: 332602
NORTHING: 6248294
DIP/AZIMUTH: 90°/--

BORE No: 15
PROJECT No: 92277.01
DATE: 16/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
44	0.02	TOPSOIL - dark brown silty sand with some rootlets							
		FILLING - dark brown silty sand with some sandstone, rootlets, plastic and a trace of ironstone gravel	☒						
	0.3	Bore discontinued at 0.3m - limit of investigation		D	0.3				
43	1								1
42	2								2
41	3								3

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A
TYPE OF BORING: Hand auger
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 39.9 mAHD
EASTING: 332544
NORTHING: 6248272
DIP/AZIMUTH: 90°/--

BORE No: 16
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Sampling & In Situ Testing: Depth	Sampling & In Situ Testing: Sample	Sampling & In Situ Testing: Results & Comments	Water	Well Construction Details
	0.05	ASPHALTIC CONCRETE							
	0.1	CONCRETE							
		CONCRETE							
	0.3								
	0.4	FILLING - dark brown silty clay with a trace of sand, MC~PL		D	0.4				
		Bore discontinued at 0.4m - limit of investigation							
39									
	1								1
38									
	2								2
37									
	3								3
36									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A

TYPE OF BORING: Concrete coring to 0.3m, then hand auger to 0.4m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 36.0 mAHD
EASTING: 332558
NORTHING: 6248295
DIP/AZIMUTH: 90°/--

BORE No: 17
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing Type	Sampling & In Situ Testing Depth	Sampling & In Situ Testing Sample	Sampling & In Situ Testing Results & Comments	Water	Well Construction Details
36	0.03	RECYCLED RUBBER							
	0.1	FILLING - dark brown sandy clayey silt with some gravel and roots							
	0.3	FILLING - brown fine grained sand with gravel and dark slag		D	0.3				
		Bore discontinued at 0.3m - limit of investigation							
35	1								1
34	2								2
33	3								3

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A

TYPE OF BORING: Hand auger

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 34.8 mAHD
EASTING: 332597
NORTHING: 6248282
DIP/AZIMUTH: 90°/--

BORE No: 18
PROJECT No: 92277.01
DATE: 16/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.02	FILLING - dark brown silty sand with some rootlets (topsoil)	▨						
	0.3	FILLING - brown silty sand with some gravel and a trace of anthropogenics comprising crushed bricks, gravel, dark grey slag gravel and some clinker	▨	D	0.3				
		Bore discontinued at 0.3m - limit of investigation							
34									
	1								1
33									
	2								2
32									
	3								3
31									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A
TYPE OF BORING: Hand auger
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 36.4 mAHD
EASTING: 332585
NORTHING: 6248274
DIP/AZIMUTH: 90°/--

BORE No: 22
PROJECT No: 92277.01
DATE: 16/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
	0.02	FILLING - brown sandy silt with some rootlets (topsoil)	▨						
		FILLING - brown sandy silt with a trace of gravel and sand	▨						
	0.3	Bore discontinued at 0.3m - limit of investigation		D	0.3				
36									
	1								1
35									
	2								2
34									
	3								3
33									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A

TYPE OF BORING: Hand auger

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 38.4 mAHD
EASTING: 332616
NORTHING: 6248265
DIP/AZIMUTH: 90°/--

BORE No: 23
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		CONCRETE							
	0.2	FILLING - brown, red and grey silty clay with a trace of sand							
	0.3	SILTY CLAY - light grey silty clay, MC~PL							
38	0.4	Bore discontinued at 0.4m - limit of investigation		D	0.4				
	1								1
37									
	2								2
36									
	3								3
35									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A

TYPE OF BORING: Concrete coring to 0.2m, then hand auger to 0.4m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 34.1 mAHD
EASTING: 332551
NORTHING: 6248287
DIP/AZIMUTH: 90°/--

BORE No: 24
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
	0.07	ASPHALTIC CONCRETE	■						
34	0.2	FILLING - gravel	☒						
	0.3	FILLING - gravelly sand with some basaltic gravel	☒	D	0.3				
		Bore discontinued at 0.3m - limit of investigation							
	1								1
33									
	2								2
32									
	3								3
31									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A
TYPE OF BORING: Concrete coring to 0.2m, then hand auger to 0.3m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 33.0 mAHD
EASTING: 332581
NORTHING: 6248251
DIP/AZIMUTH: 90°/--

BORE No: 25
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
33		CONCRETE	△						
	0.2	FILLING - dark brown clayey silt with a trace of sand, dark slag and ironstone, MC~PL	⊠						
	0.4	Bore discontinued at 0.4m - limit of investigation		D	0.4				
32	1								1
31	2								2
30	3								3

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A
TYPE OF BORING: Concrete coring to 0.2m, then hand auger to 0.4m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 31.6 mAHD
EASTING: 332591
NORTHING: 6248260
DIP/AZIMUTH: 90°/--

BORE No: 26
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details
				Type	Depth	Sample	Results & Comments		
	0.2	CONCRETE	△						
	0.4	FILLING - brown clayey sand with some gravel and crushed brick gravel and a trace of ironstone	▨						
		Bore discontinued at 0.4m - refusal on heavily compacted filling							
31									
	1								1
30									
	2								2
29									
	3								3
28									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A
TYPE OF BORING: Concrete coring to 0.2m, then hand auger to 0.4m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Gardner Wetherill & Associates
PROJECT: Proposed Upgrade Works
LOCATION: Darlington Public School, Cnr Golden Grove and Abercrombie Streets. Darlington, NSW

SURFACE LEVEL: 34.7 mAHD
EASTING: 332543
NORTHING: 6248286
DIP/AZIMUTH: 90°/--

BORE No: 27
PROJECT No: 92277.01
DATE: 15/1/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.07	ASPHALTIC CONCRETE	■						
	0.2	FILLING - gravel	☒						
	0.3	FILLING - gravelly sand with some basaltic gravel	☒	D	0.3				
		Bore discontinued at 0.3m - limit of investigation							
34									
	1								1
33									
	2								2
32									
	3								3
31									

RIG: Hand auger **DRILLER:** LAR **LOGGED:** LAR **CASING:** N/A
TYPE OF BORING: Concrete coring to 0.07m, then hand auger to 0.3m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Appendix E

Summary Table E1

Table E1 - 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 F

Lab Certificates of Analysis and Chain-of-Custody Documentation

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 209723

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Grant Russell
Address	18 Waler Crescent, Smeaton Grange, NSW, 2567

Sample Details

Your Reference	**92277.00, Darlington Public School Contam**
Number of Samples	26 Soil, 1 Material
Date samples received	17/01/2019
Date completed instructions received	17/01/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	24/01/2019
Date of Issue	24/01/2019

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Asbestos Approved By
Analysed by Asbestos Approved Identifier: Lucy Zhu
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Giovanni Agosti, Group Technical Manager
Jeremy Faircloth, Organics Supervisor
Ken Nguyen, Senior Chemist
Lucy Zhu, Asbestos Analyst
Nick Sarlamis, Inorganics Supervisor
Steven Luong, Senior Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		209723-1	209723-2	209723-3	209723-4	209723-5
Your Reference	UNITS	BH10	BH11	BH12	BH13	BH14
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	85	87	90	90	90

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		209723-6	209723-7	209723-8	209723-9	209723-10
Your Reference	UNITS	BH15	BH16	BH17	BH18	BH22
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	16/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	85	86	88	91	93

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		209723-11	209723-12	209723-13	209723-14	209723-15
Your Reference	UNITS	BH23	BH25	BH26	BH27	BH2
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		15/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	88	83	87	84	80

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		209723-16	209723-17	209723-20	209723-22	209723-24
Your Reference	UNITS	BH5	BH6	BH7	BH9	D1
Depth		0.5	0.5	0.5	0.5	-
Date Sampled		15/01/2019	16/01/2019	15/01/2019	16/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	2	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	88	88	86	88	87

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		209723-25	209723-26	209723-27
Your Reference	UNITS	D2	TB	TS
Depth		-	-	-
Date Sampled		16/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019
TRH C_6 - C_9	mg/kg	<25	<25	[NA]
TRH C_6 - C_{10}	mg/kg	<25	<25	[NA]
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	[NA]	[NA]
Benzene	mg/kg	<0.2	<0.2	98%
Toluene	mg/kg	<0.5	<0.5	97%
Ethylbenzene	mg/kg	<1	<1	96%
m+p-xylene	mg/kg	<2	<2	95%
o-Xylene	mg/kg	<1	<1	95%
naphthalene	mg/kg	<1	[NA]	[NA]
Total +ve Xylenes	mg/kg	<1	[NA]	[NA]
Surrogate aaa-Trifluorotoluene	%	90	91	75

svTRH (C10-C40) in Soil						
Our Reference		209723-1	209723-2	209723-3	209723-4	209723-5
Your Reference	UNITS	BH10	BH11	BH12	BH13	BH14
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	19/01/2019
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	220	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	200	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	360	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	130	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	490	<50
Surrogate o-Terphenyl	%	89	89	92	99	90

svTRH (C10-C40) in Soil						
Our Reference		209723-6	209723-7	209723-8	209723-9	209723-10
Your Reference	UNITS	BH15	BH16	BH17	BH18	BH22
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	16/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	19/01/2019	19/01/2019	19/01/2019	19/01/2019	19/01/2019
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	270	280	210	1,100	<100
TRH C_{29} - C_{36}	mg/kg	610	210	160	780	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	700	420	330	1,600	<100
TRH >C_{34} -C_{40}	mg/kg	390	120	<100	440	<100
Total +ve TRH (>C10-C40)	mg/kg	1,100	550	330	2,100	<50
Surrogate o-Terphenyl	%	96	98	97	123	91

svTRH (C10-C40) in Soil						
Our Reference		209723-11	209723-12	209723-13	209723-14	209723-15
Your Reference	UNITS	BH23	BH25	BH26	BH27	BH2
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		15/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	19/01/2019	19/01/2019	19/01/2019	19/01/2019	19/01/2019
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH $>C_{10}$ -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH $>C_{10}$ - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH $>C_{16}$ -C_{34}	mg/kg	<100	<100	120	<100	<100
TRH $>C_{34}$ -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	120	<50	<50
Surrogate o-Terphenyl	%	88	91	93	89	96

svTRH (C10-C40) in Soil						
Our Reference		209723-16	209723-17	209723-20	209723-22	209723-24
Your Reference	UNITS	BH5	BH6	BH7	BH9	D1
Depth		0.5	0.5	0.5	0.5	-
Date Sampled		15/01/2019	16/01/2019	15/01/2019	16/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	19/01/2019	19/01/2019	19/01/2019	19/01/2019	19/01/2019
TRH C_{10} - C_{14}	mg/kg	96	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	5,400	120	130	170	<100
TRH C_{29} - C_{36}	mg/kg	3,300	<100	<100	370	<100
TRH $>C_{10}$ -C_{16}	mg/kg	320	<50	<50	<50	<50
TRH $>C_{10}$ - C_{16} less Naphthalene (F2)	mg/kg	320	<50	<50	<50	<50
TRH $>C_{16}$ -C_{34}	mg/kg	7,800	150	<100	440	<100
TRH $>C_{34}$ -C_{40}	mg/kg	1,500	<100	180	270	<100
Total +ve TRH (>C10-C40)	mg/kg	9,700	150	180	710	<50
Surrogate o-Terphenyl	%	#	100	95	96	93

svTRH (C10-C40) in Soil		
Our Reference		209723-25
Your Reference	UNITS	D2
Depth		-
Date Sampled		16/01/2019
Type of sample		Soil
Date extracted	-	18/01/2019
Date analysed	-	19/01/2019
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	110
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	120
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	120
Surrogate o-Terphenyl	%	95

PAHs in Soil						
Our Reference		209723-1	209723-2	209723-3	209723-4	209723-5
Your Reference	UNITS	BH10	BH11	BH12	BH13	BH14
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Naphthalene	mg/kg	<0.1	<0.1	<0.1	2.5	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.2	1.7	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	0.7	<0.1
Phenanthrene	mg/kg	0.2	<0.1	0.7	9.7	0.1
Anthracene	mg/kg	<0.1	<0.1	0.2	2.1	<0.1
Fluoranthene	mg/kg	0.5	<0.1	1.2	10	0.3
Pyrene	mg/kg	0.5	<0.1	1.1	9.7	0.2
Benzo(a)anthracene	mg/kg	0.3	<0.1	0.6	5.1	0.2
Chrysene	mg/kg	0.3	<0.1	0.6	4.9	0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.5	<0.2	1	9.1	0.3
Benzo(a)pyrene	mg/kg	0.3	<0.05	0.71	6.3	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	<0.1	0.4	3.3	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.2	<0.1	0.5	4.5	<0.1
Total +ve PAH's	mg/kg	3.0	<0.05	7.1	71	1.3
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	0.9	9.1	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	1	9.1	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.5	<0.5	1.0	9.1	<0.5
Surrogate p-Terphenyl-d14	%	101	100	101	101	100

PAHs in Soil						
Our Reference		209723-6	209723-7	209723-8	209723-9	209723-10
Your Reference	UNITS	BH15	BH16	BH17	BH18	BH22
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	16/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Naphthalene	mg/kg	<0.1	0.8	0.4	0.7	<0.1
Acenaphthylene	mg/kg	0.4	1.8	1.6	6.0	<0.1
Acenaphthene	mg/kg	<0.1	0.6	<0.1	0.7	<0.1
Fluorene	mg/kg	0.3	1.3	0.8	4.3	<0.1
Phenanthrene	mg/kg	2.5	10	10	58	0.2
Anthracene	mg/kg	0.5	3.0	2.3	12	<0.1
Fluoranthene	mg/kg	3.3	16	14	77	0.3
Pyrene	mg/kg	2.9	15	13	68	0.3
Benzo(a)anthracene	mg/kg	1.4	8.0	6.9	33	0.1
Chrysene	mg/kg	1.2	6.8	6.0	28	0.1
Benzo(b,j+k)fluoranthene	mg/kg	2	11	9.7	45	0.2
Benzo(a)pyrene	mg/kg	1.2	7.9	6.6	30	0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	0.4	3.3	2.8	12	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.8	0.7	2.9	<0.1
Benzo(g,h,i)perylene	mg/kg	0.6	4.1	3.4	14	<0.1
Total +ve PAH's	mg/kg	16	90	78	390	1.4
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.5	11	9.3	42	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.6	11	9.3	42	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.6	11	9.3	42	<0.5
Surrogate p-Terphenyl-d14	%	102	101	100	104	101

PAHs in Soil						
Our Reference		209723-11	209723-12	209723-13	209723-14	209723-15
Your Reference	UNITS	BH23	BH25	BH26	BH27	BH2
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		15/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Naphthalene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.7	<0.1	0.1
Acenaphthene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	0.7	<0.1	<0.1
Phenanthrene	mg/kg	0.2	0.2	4.1	<0.1	0.4
Anthracene	mg/kg	<0.1	<0.1	1.0	<0.1	0.1
Fluoranthene	mg/kg	0.3	0.4	5.2	0.2	0.7
Pyrene	mg/kg	0.3	0.4	4.8	0.1	0.8
Benzo(a)anthracene	mg/kg	0.2	0.2	2.6	0.1	0.4
Chrysene	mg/kg	0.2	0.2	2.2	0.1	0.4
Benzo(b,j+k)fluoranthene	mg/kg	0.3	0.4	3.7	0.2	0.7
Benzo(a)pyrene	mg/kg	0.2	0.3	2.6	0.1	0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.1	1.1	<0.1	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.2	1.4	<0.1	0.3
Total +ve PAH's	mg/kg	1.6	2.4	31	0.89	4.6
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	3.6	<0.5	0.6
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	3.6	<0.5	0.7
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	3.6	<0.5	0.7
Surrogate p-Terphenyl-d14	%	104	101	102	101	102

PAHs in Soil						
Our Reference		209723-16	209723-17	209723-20	209723-22	209723-24
Your Reference	UNITS	BH5	BH6	BH7	BH9	D1
Depth		0.5	0.5	0.5	0.5	-
Date Sampled		15/01/2019	16/01/2019	15/01/2019	16/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Naphthalene	mg/kg	6.0	0.2	0.1	<0.1	<0.1
Acenaphthylene	mg/kg	31	0.6	0.4	0.2	<0.1
Acenaphthene	mg/kg	4.0	0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	16	0.4	0.1	0.1	<0.1
Phenanthrene	mg/kg	200	4.4	1.2	1.1	<0.1
Anthracene	mg/kg	46	1.0	0.3	0.3	<0.1
Fluoranthene	mg/kg	320	7.6	3.0	2.6	<0.1
Pyrene	mg/kg	310	6.8	3.2	2.8	<0.1
Benzo(a)anthracene	mg/kg	160	3.9	2.0	1.5	<0.1
Chrysene	mg/kg	140	3.1	1.8	1.5	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	220	5.0	3.5	2.6	<0.2
Benzo(a)pyrene	mg/kg	160	3.2	2.3	1.7	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	66	1.3	1.1	0.8	<0.1
Dibenzo(a,h)anthracene	mg/kg	13	0.4	0.3	0.2	<0.1
Benzo(g,h,i)perylene	mg/kg	81	1.4	1.4	1.0	<0.1
Total +ve PAH's	mg/kg	1,800	40	21	16	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	220	4.6	3.3	2.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	220	4.6	3.3	2.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	220	4.6	3.3	2.5	<0.5
Surrogate p-Terphenyl-d14	%	122	106	104	101	104

PAHs in Soil		
Our Reference		209723-25
Your Reference	UNITS	D2
Depth		-
Date Sampled		16/01/2019
Type of sample		Soil
Date extracted	-	18/01/2019
Date analysed	-	18/01/2019
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	0.2
Pyrene	mg/kg	0.2
Benzo(a)anthracene	mg/kg	0.1
Chrysene	mg/kg	0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.2
Benzo(a)pyrene	mg/kg	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	0.1
Total +ve PAH's	mg/kg	1.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	104

Acid Extractable metals in soil						
Our Reference		209723-1	209723-2	209723-3	209723-4	209723-5
Your Reference	UNITS	BH10	BH11	BH12	BH13	BH14
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Arsenic	mg/kg	4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	0.4	0.4	<0.4	4
Chromium	mg/kg	16	17	24	8	15
Copper	mg/kg	12	15	28	15	39
Lead	mg/kg	120	26	190	32	51
Mercury	mg/kg	0.2	<0.1	0.1	<0.1	0.2
Nickel	mg/kg	6	10	13	5	10
Zinc	mg/kg	67	54	96	34	110

Acid Extractable metals in soil						
Our Reference		209723-6	209723-7	209723-8	209723-9	209723-10
Your Reference	UNITS	BH15	BH16	BH17	BH18	BH22
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	16/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Arsenic	mg/kg	41	5	5	5	<4
Cadmium	mg/kg	<0.4	<0.4	0.5	0.4	<0.4
Chromium	mg/kg	15	16	21	14	10
Copper	mg/kg	49	38	52	59	11
Lead	mg/kg	74	150	160	940	57
Mercury	mg/kg	0.1	0.6	1.0	0.2	<0.1
Nickel	mg/kg	6	10	51	10	5
Zinc	mg/kg	500	140	180	470	44

Acid Extractable metals in soil						
Our Reference		209723-11	209723-12	209723-13	209723-14	209723-15
Your Reference	UNITS	BH23	BH25	BH26	BH27	BH2
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		15/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Arsenic	mg/kg	4	5	5	<4	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	0.9	0.9
Chromium	mg/kg	13	16	18	13	20
Copper	mg/kg	11	18	29	44	30
Lead	mg/kg	41	51	100	49	100
Mercury	mg/kg	<0.1	0.1	0.1	<0.1	0.4
Nickel	mg/kg	11	17	7	9	12
Zinc	mg/kg	39	80	180	90	520

Acid Extractable metals in soil						
Our Reference		209723-16	209723-17	209723-20	209723-22	209723-24
Your Reference	UNITS	BH5	BH6	BH7	BH9	D1
Depth		0.5	0.5	0.5	0.5	-
Date Sampled		15/01/2019	16/01/2019	15/01/2019	16/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Arsenic	mg/kg	<4	7	7	<4	<4
Cadmium	mg/kg	0.7	0.5	0.6	<0.4	<0.4
Chromium	mg/kg	14	21	21	12	13
Copper	mg/kg	56	83	76	41	4
Lead	mg/kg	220	88	540	2,200	28
Mercury	mg/kg	0.4	0.2	0.3	0.2	<0.1
Nickel	mg/kg	6	24	6	8	<1
Zinc	mg/kg	330	91	260	570	22

Acid Extractable metals in soil			
Our Reference		209723-25	209723-28
Your Reference	UNITS	D2	BH23 - [TRIPLICATE]
Depth		-	0.3
Date Sampled		16/01/2019	15/01/2019
Type of sample		Soil	Soil
Date prepared	-	18/01/2019	18/01/2019
Date analysed	-	18/01/2019	18/01/2019
Arsenic	mg/kg	<4	<4
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	10	5
Copper	mg/kg	13	3
Lead	mg/kg	40	24
Mercury	mg/kg	0.1	<0.1
Nickel	mg/kg	6	1
Zinc	mg/kg	57	9

Misc Inorg - Soil			
Our Reference		209723-1	209723-11
Your Reference	UNITS	BH10	BH23
Depth		0.3	0.3
Date Sampled		16/01/2019	15/01/2019
Type of sample		Soil	Soil
Date prepared	-	21/01/2019	21/01/2019
Date analysed	-	21/01/2019	21/01/2019
pH 1:5 soil:water	pH Units	7.9	7.0

CEC			
Our Reference		209723-1	209723-11
Your Reference	UNITS	BH10	BH23
Depth		0.3	0.3
Date Sampled		16/01/2019	15/01/2019
Type of sample		Soil	Soil
Date prepared	-	21/01/2019	21/01/2019
Date analysed	-	21/01/2019	21/01/2019
Exchangeable Ca	meq/100g	23	10
Exchangeable K	meq/100g	0.6	0.3
Exchangeable Mg	meq/100g	0.70	3.6
Exchangeable Na	meq/100g	0.26	0.26
Cation Exchange Capacity	meq/100g	25	14

Moisture						
Our Reference		209723-1	209723-2	209723-3	209723-4	209723-5
Your Reference	UNITS	BH10	BH11	BH12	BH13	BH14
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	21/01/2019	21/01/2019	21/01/2019	21/01/2019	21/01/2019
Moisture	%	16	14	7.3	3.8	14

Moisture						
Our Reference		209723-6	209723-7	209723-8	209723-9	209723-10
Your Reference	UNITS	BH15	BH16	BH17	BH18	BH22
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	16/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	21/01/2019	21/01/2019	21/01/2019	21/01/2019	21/01/2019
Moisture	%	8.5	17	7.4	9.9	7.1

Moisture						
Our Reference		209723-11	209723-12	209723-13	209723-14	209723-15
Your Reference	UNITS	BH23	BH25	BH26	BH27	BH2
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		15/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	21/01/2019	21/01/2019	21/01/2019	21/01/2019	21/01/2019
Moisture	%	17	18	15	13	20

Moisture						
Our Reference		209723-16	209723-17	209723-20	209723-22	209723-24
Your Reference	UNITS	BH5	BH6	BH7	BH9	D1
Depth		0.5	0.5	0.5	0.5	-
Date Sampled		15/01/2019	16/01/2019	15/01/2019	16/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/01/2019	18/01/2019	18/01/2019	18/01/2019	18/01/2019
Date analysed	-	21/01/2019	21/01/2019	21/01/2019	21/01/2019	21/01/2019
Moisture	%	7.5	9.8	14	11	19

Moisture		
Our Reference		209723-25
Your Reference	UNITS	D2
Depth		-
Date Sampled		16/01/2019
Type of sample		Soil
Date prepared	-	18/01/2019
Date analysed	-	21/01/2019
Moisture	%	9.6

Asbestos ID - soils						
Our Reference		209723-1	209723-2	209723-3	209723-4	209723-5
Your Reference	UNITS	BH10	BH11	BH12	BH13	BH14
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	21/01/2019	21/01/2019	21/01/2019	21/01/2019	21/01/2019
Sample mass tested	g	44.08g	Approx. 60g	Approx. 60g	Approx. 40g	Approx. 45g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown fine-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	Chrysotile asbestos detected Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	YES	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		209723-6	209723-7	209723-8	209723-9	209723-10
Your Reference	UNITS	BH15	BH16	BH17	BH18	BH22
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		16/01/2019	15/01/2019	15/01/2019	16/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	21/01/2019	21/01/2019	21/01/2019	21/01/2019	21/01/2019
Sample mass tested	g	Approx. 30g	Approx. 40g	Approx. 60g	Approx. 30g	Approx. 35g
Sample Description	-	Brown fine-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		209723-11	209723-12	209723-13	209723-14	209723-15
Your Reference	UNITS	BH23	BH25	BH26	BH27	BH2
Depth		0.3	0.3	0.3	0.3	0.3
Date Sampled		15/01/2019	15/01/2019	15/01/2019	15/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	21/01/2019	21/01/2019	21/01/2019	21/01/2019	21/01/2019
Sample mass tested	g	Approx. 50g	Approx. 100g	Approx. 50g	Approx. 50g	Approx. 45g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		209723-16	209723-17	209723-20	209723-22	209723-24
Your Reference	UNITS	BH5	BH6	BH7	BH9	D1
Depth		0.5	0.5	0.5	0.5	-
Date Sampled		15/01/2019	16/01/2019	15/01/2019	16/01/2019	15/01/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	21/01/2019	21/01/2019	21/01/2019	21/01/2019	21/01/2019
Sample mass tested	g	Approx. 55g	Approx. 40g	Approx. 35g	Approx. 45g	Approx. 25g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown clayey soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils		
Our Reference		209723-25
Your Reference	UNITS	D2
Depth		-
Date Sampled		16/01/2019
Type of sample		Soil
Date analysed	-	21/01/2019
Sample mass tested	g	Approx. 20g
Sample Description	-	Brown fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO
Trace Analysis	-	No asbestos detected

Asbestos ID - materials		
Our Reference		209723-18
Your Reference	UNITS	BH6/0.5_PACM
Depth		0.5
Date Sampled		16/01/2019
Type of sample		Material
Date analysed	-	21/01/2019
Mass / Dimension of Sample	-	40x28x5mm
Sample Description	-	Brown fibrous board
Asbestos ID in materials	-	No asbestos detected Organic fibres detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. ‘EQ PQL’values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. ‘EQ zero’values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. ‘EQ half PQL’values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	209723-2
Date extracted	-			18/01/2019	1	18/01/2019	18/01/2019		18/01/2019	18/01/2019
Date analysed	-			18/01/2019	1	18/01/2019	18/01/2019		18/01/2019	18/01/2019
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	98	87
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	98	87
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	107	94
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	100	88
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	91	81
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	96	85
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	94	84
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	91	1	85	89	5	92	82

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	209723-24
Date extracted	-			[NT]	11	18/01/2019	18/01/2019		18/01/2019	18/01/2019
Date analysed	-			[NT]	11	18/01/2019	18/01/2019		18/01/2019	18/01/2019
TRH C_6 - C_9	mg/kg	25	Org-016	[NT]	11	<25	<25	0	91	95
TRH C_6 - C_{10}	mg/kg	25	Org-016	[NT]	11	<25	<25	0	91	95
Benzene	mg/kg	0.2	Org-016	[NT]	11	<0.2	<0.2	0	99	108
Toluene	mg/kg	0.5	Org-016	[NT]	11	<0.5	<0.5	0	93	113
Ethylbenzene	mg/kg	1	Org-016	[NT]	11	<1	<1	0	84	116
m+p-xylene	mg/kg	2	Org-016	[NT]	11	<2	<2	0	89	116
o-Xylene	mg/kg	1	Org-016	[NT]	11	<1	<1	0	87	114
naphthalene	mg/kg	1	Org-014	[NT]	11	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	[NT]	11	88	82	7	88	97

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	25	18/01/2019	18/01/2019		[NT]	[NT]
Date analysed	-			[NT]	25	18/01/2019	18/01/2019		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	[NT]	25	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	[NT]	25	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-016	[NT]	25	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-016	[NT]	25	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-016	[NT]	25	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-016	[NT]	25	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-016	[NT]	25	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-014	[NT]	25	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	[NT]	25	90	89	1	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	209723-2
Date extracted	-			18/01/2019	1	18/01/2019	18/01/2019		18/01/2019	18/01/2019
Date analysed	-			19/01/2019	1	18/01/2019	18/01/2019		18/01/2019	18/01/2019
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	102	99
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	<100	<100	0	102	100
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	<100	<100	0	100	120
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	<50	0	102	99
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	<100	<100	0	102	100
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	<100	<100	0	100	120
Surrogate o-Terphenyl	%		Org-003	96	1	89	92	3	101	89

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date extracted	-			[NT]	11	18/01/2019	18/01/2019		18/01/2019	[NT]
Date analysed	-			[NT]	11	19/01/2019	19/01/2019		19/01/2019	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	[NT]	11	<50	<50	0	100	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	101	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	114	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	[NT]	11	<50	<50	0	100	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	101	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	[NT]	11	<100	<100	0	114	[NT]
Surrogate o-Terphenyl	%		Org-003	[NT]	11	88	89	1	104	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	25	18/01/2019	18/01/2019		[NT]	[NT]
Date analysed	-			[NT]	25	19/01/2019	19/01/2019		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	[NT]	25	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	[NT]	25	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	[NT]	25	110	100	10	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	[NT]	25	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	[NT]	25	120	110	9	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	[NT]	25	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-003	[NT]	25	95	95	0	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	209723-2
Date extracted	-			18/01/2019	1	18/01/2019	18/01/2019		18/01/2019	18/01/2019
Date analysed	-			18/01/2019	1	18/01/2019	18/01/2019		18/01/2019	18/01/2019
Naphthalene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	97	96
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	94	94
Phenanthrene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.4	67	95	94
Anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	1	0.5	0.7	33	96	96
Pyrene	mg/kg	0.1	Org-012	<0.1	1	0.5	0.7	33	94	94
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	1	0.3	0.4	29	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	1	0.3	0.4	29	111	111
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	1	0.5	0.6	18	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	1	0.3	0.4	29	118	115
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.2	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.2	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	108	1	101	101	0	124	123

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date extracted	-			[NT]	11	18/01/2019	18/01/2019		18/01/2019	[NT]
Date analysed	-			[NT]	11	18/01/2019	18/01/2019		18/01/2019	[NT]
Naphthalene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	98	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	95	[NT]
Phenanthrene	mg/kg	0.1	Org-012	[NT]	11	0.2	<0.1	67	97	[NT]
Anthracene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	[NT]	11	0.3	0.2	40	100	[NT]
Pyrene	mg/kg	0.1	Org-012	[NT]	11	0.3	0.2	40	99	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	[NT]	11	0.2	0.1	67	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	[NT]	11	0.2	0.1	67	113	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	[NT]	11	0.3	<0.2	40	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	[NT]	11	0.2	0.1	67	120	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	[NT]	11	104	103	1	128	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	25	18/01/2019	18/01/2019		[NT]	[NT]
Date analysed	-			[NT]	25	18/01/2019	18/01/2019		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-012	[NT]	25	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	[NT]	25	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	[NT]	25	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	[NT]	25	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-012	[NT]	25	<0.1	0.2	67	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-012	[NT]	25	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	[NT]	25	0.2	0.3	40	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-012	[NT]	25	0.2	0.3	40	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	[NT]	25	0.1	0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	[NT]	25	0.1	0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	[NT]	25	0.2	0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	[NT]	25	0.2	0.1	67	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	[NT]	25	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	[NT]	25	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	[NT]	25	0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	[NT]	25	104	105	1	[NT]	[NT]

Client Reference: 92277.00, Darlington Public School Contam

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	209723-2
Date prepared	-			18/01/2019	1	18/01/2019	18/01/2019		18/01/2019	18/01/2019
Date analysed	-			18/01/2019	1	18/01/2019	18/01/2019		18/01/2019	18/01/2019
Arsenic	mg/kg	4	Metals-020	<4	1	4	<4	0	116	101
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	105	94
Chromium	mg/kg	1	Metals-020	<1	1	16	15	6	114	95
Copper	mg/kg	1	Metals-020	<1	1	12	12	0	117	#
Lead	mg/kg	1	Metals-020	<1	1	120	110	9	110	77
Mercury	mg/kg	0.1	Metals-021	<0.1	1	0.2	0.2	0	92	94
Nickel	mg/kg	1	Metals-020	<1	1	6	5	18	110	109
Zinc	mg/kg	1	Metals-020	<1	1	67	53	23	112	#

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date prepared	-			[NT]	11	18/01/2019	18/01/2019		18/01/2019	[NT]
Date analysed	-			[NT]	11	18/01/2019	18/01/2019		18/01/2019	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	11	4	<4	0	115	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	11	<0.4	<0.4	0	104	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	11	13	5	89	112	[NT]
Copper	mg/kg	1	Metals-020	[NT]	11	11	3	114	116	[NT]
Lead	mg/kg	1	Metals-020	[NT]	11	41	23	56	109	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	11	<0.1	<0.1	0	95	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	11	11	1	167	109	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	11	39	9	125	111	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	25	18/01/2019	18/01/2019		[NT]	[NT]
Date analysed	-			[NT]	25	18/01/2019	18/01/2019		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	25	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	25	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	25	10	10	0	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	25	13	13	0	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	25	40	41	2	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	25	0.1	0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	25	6	6	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	25	57	57	0	[NT]	[NT]

Client Reference: 92277.00, Darlington Public School Contam

QUALITY CONTROL: Misc Inorg - Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	[NT]
Date prepared	-			21/01/2019	1	21/01/2019	21/01/2019		21/01/2019	[NT]
Date analysed	-			21/01/2019	1	21/01/2019	21/01/2019		21/01/2019	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	7.9	7.9	0	103	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	[NT]
Date prepared	-			21/01/2019	[NT]	[NT]	[NT]	[NT]	21/01/2019	[NT]
Date analysed	-			21/01/2019	[NT]	[NT]	[NT]	[NT]	21/01/2019	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

TRH Soil C10-C40 NEPM - # Percent recovery for the surrogate is not possible to report as the high concentration of analytes in sample 16 has caused interference.

Sample 209723-1; Chrysotile asbestos identified embedded in a fragment of fibre cement, it is estimated to be 1.70g/kg in 44.08g of soil (i.e. > reporting limit for the method of 0.1g/kg).

Asbestos: Excessive sample volumes were provided for asbestos analysis.
A portion of the supplied samples were sub-sampled according to Envirolab
procedures.
We cannot guarantee that these sub-samples are indicative of the entire sample.
Envirolab recommends supplying 40-50g (50mL) of sample in its own
container as per AS4964-2004.
Note: Samples 209723-1-17, 20, 22 & 23 were sub-sampled from bags provided by the client.

Asbestos: A portion of the supplied samples were sub-sampled for asbestos
analysis according to Envirolab procedures.
We cannot guarantee that these sub-samples are indicative of the entire sample.
Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples 209723-24 & 25 were sub-sampled from jars provided by the client.

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 209723-11 for Cr, Cu, Pb, Ni and Zn. Therefore a triplicate result has been issued as laboratory sample number 209723-28.

Acid Extractable Metals in Soil:
Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name: Darlington Public School Contam
Project No: 92277.00 **Sampler:** Lizbeth Rodriguez
Project Mgr: Grant Russell **Mob. Phone:** 0418 116 545
Email: Grant.Russell@Douglaspartners.com.au;
Date Required: Standard

To: Envirolab Services
12 Ashley Street, Chatswood NSW 2067
Attn: Tania Notaras
Phone: (02) 9910 6200 **Fax:** (02) 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type	Container Type	Analytes									Notes/preservation
			S - Soil W - water	G - Glass P - Plastic	Combo 3a	CEC	pH	TRH & BTEX	Asbestos ID				Hold	
BH10/0.3	1	16/01/19	S	G/P	x	x	x							
BH11/0.3	2	15/01/19	S	G/P	x									
BH12/0.3	3	15/01/19	S	G/P	x									
BH13/0.3	4	15/01/19	S	G/P	x									
BH14/0.3	5	15/01/19	S	G/P	x									
BH15/0.3	6	16/01/19	S	G/P	x									
BH16/0.3	7	15/01/19	S	G/P	x									
BH17/0.3	8	15/01/19	S	G/P	x									
BH18/0.3	9	16/01/19	S	G/P	x									
BH22/0.3	10	16/01/19	S	G/P	x									

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No. 209723
Date Received: 17/1/2019
Time Received: 17.25
Received by: Pr
Temp: [✓ Cool]/Ambient
Cooling: Ice/[✓ Icepack]
Security: [✓ Intact]/Broken/None

Lab Report No:
Send Results to: Douglas Partners Pty Ltd **Address** 18 Waler Crescent, Smeaton Grange 2567 **Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886
Relinquished by: LAR **Transported to laboratory by:**
Signed: **Date & Time:** 17/01/2019 **Received by:** PRaj 17/1/2019

Form COC

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Darlington Public School Contam			**To:**	Envirolab Services
Project No:	92277.00	**Sampler:**	Lizbeth Rodriguez		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Grant Russell	**Mob. Phone:**	0418 116 545	**Attn:**	Tania Notaras
Email:	Grant.Russell@Douglaspartners.com.au;			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type	Container Type	Analytes									Notes/preservation
			S - Soil W - water	G - Glass P - Plastic	Combo 3a	CEC	pH	TRH & BTEX	Asbestos ID				Hold	
BH23/0.3	11	15/01/19	S	G/P	x	x	x							
BH25/0.3	12	15/01/19	S	G/P	x									
BH26/0.3	13	15/01/19	S	G/P	x									
BH27/0.3	14	15/01/19	S	G/P	x									
BH2/0.3	15	15/01/19	S	G	x									
BH5/0.5	16	15/01/19	S	G/P	x									
BH6/0.5	17	16/01/19	S	G/P	x									only Plastic bag for Hold
BH6/0.5 PACM	18	16/01/19	S	P					x					
BH6/1.2	19	16/01/19	S	G/P									x	
BH7/0.5	20	15/01/19	S	G/P	x									

Lab Report No:			
Send Results to: Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567	**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by: LAR		**Transported to laboratory by:**	
Signed:	**Date & Time:** 17/01/2019	**Received by:** Ray	17/1/2019

209723

Form COC

Page 2 of 3

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY

Project Name:	Darlington Public School Contam			**To:**	Envirolab Services
Project No:	92277.00	**Sampler:**	Lizbeth Rodriguez		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Grant Russell	**Mob. Phone:**	0418 116 545	**Attn:**	Tania Notaras
Email:	Grant.Russell@Douglaspartners.com.au;			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type S - Soil W - water	Container Type G - Glass P - Plastic	Analytes Combo 3a	CEC	pH	TRH & BTEX	Asbestos ID				Hold	Notes/preservation
BH7/1.2	21	15/01/19	S	G/P									x	
BH9/0.5	22	16/01/19	S	G/P	x									
BH9/1.2	23	16/01/19	S	G/P									x	
D1	24	15/01/19	S	G	x									
D2	25	16/01/19	S	G	x									
TB	26	15/01/19	S	G				x						
TS	27	15/01/19	S	G				x						

Lab Report No:

Send Results to: Douglas Partners Pty Ltd **Address** 18 Waler Crescent, Smeaton Grange 2567 **Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886

Relinquished by: LAR **Transported to laboratory by:**

Signed: **Date & Time:** 17/01/2019 **Received by:** 209723

17/1/2019

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 210158

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Grant Russell
Address	18 Waler Crescent, Smeaton Grange, NSW, 2567

Sample Details

Your Reference	**92277.00, Darlington Public School**
Number of Samples	3 SOIL
Date samples received	23/01/2019
Date completed instructions received	23/01/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	31/01/2019
Date of Issue	29/01/2019

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Asbestos Approved By
Analysed by Asbestos Approved Identifier: Lucy Zhu
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Giovanni Agosti, Group Technical Manager
Jeremy Faircloth, Organics Supervisor
Lucy Zhu, Asbestos Analyst
Steven Luong, Senior Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		210158-1	210158-2	210158-3
Your Reference	UNITS	BH19	BH21	BH24
Depth		0.3	0.3	0.3
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	24/01/2019	24/01/2019	24/01/2019
Date analysed	-	25/01/2019	25/01/2019	25/01/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	87	91	81

svTRH (C10-C40) in Soil				
Our Reference		210158-1	210158-2	210158-3
Your Reference	UNITS	BH19	BH21	BH24
Depth		0.3	0.3	0.3
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	24/01/2019	24/01/2019	24/01/2019
Date analysed	-	24/01/2019	25/01/2019	25/01/2019
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50
Surrogate o-Terphenyl	%	100	98	99

PAHs in Soil				
Our Reference		210158-1	210158-2	210158-3
Your Reference	UNITS	BH19	BH21	BH24
Depth		0.3	0.3	0.3
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	24/01/2019	24/01/2019	24/01/2019
Date analysed	-	25/01/2019	25/01/2019	25/01/2019
Naphthalene	mg/kg	0.1	<0.1	0.2
Acenaphthylene	mg/kg	0.5	<0.1	0.7
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.3	<0.1	0.3
Phenanthrene	mg/kg	3.4	0.1	5.0
Anthracene	mg/kg	0.9	<0.1	1.2
Fluoranthene	mg/kg	5.3	0.2	6.2
Pyrene	mg/kg	5.1	0.2	5.3
Benzo(a)anthracene	mg/kg	2.6	0.1	2.8
Chrysene	mg/kg	2.4	0.1	2.5
Benzo(b,j+k)fluoranthene	mg/kg	3.9	0.2	4.1
Benzo(a)pyrene	mg/kg	2.7	0.2	2.6
Indeno(1,2,3-c,d)pyrene	mg/kg	1.3	<0.1	1.2
Dibenzo(a,h)anthracene	mg/kg	0.4	<0.1	0.4
Benzo(g,h,i)perylene	mg/kg	1.5	0.1	1.4
Total +ve PAH's	mg/kg	30	1.2	34
Benzo(a)pyrene TEQ calc (zero)	mg/kg	3.9	<0.5	3.9
Benzo(a)pyrene TEQ calc(half)	mg/kg	3.9	<0.5	3.9
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	3.9	<0.5	3.9
Surrogate p-Terphenyl-d14	%	109	106	105

Acid Extractable metals in soil				
Our Reference		210158-1	210158-2	210158-3
Your Reference	UNITS	BH19	BH21	BH24
Depth		0.3	0.3	0.3
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	24/01/2019	24/01/2019	24/01/2019
Date analysed	-	24/01/2019	24/01/2019	24/01/2019
Arsenic	mg/kg	6	6	10
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	14	12	19
Copper	mg/kg	41	19	27
Lead	mg/kg	460	25	110
Mercury	mg/kg	0.2	<0.1	0.2
Nickel	mg/kg	14	8	6
Zinc	mg/kg	180	24	130

Moisture				
Our Reference		210158-1	210158-2	210158-3
Your Reference	UNITS	BH19	BH21	BH24
Depth		0.3	0.3	0.3
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	24/01/2019	24/01/2019	24/01/2019
Date analysed	-	25/01/2019	25/01/2019	25/01/2019
Moisture	%	9.7	9.3	17

Asbestos ID - soils				
Our Reference		210158-1	210158-2	210158-3
Your Reference	UNITS	BH19	BH21	BH24
Depth		0.3	0.3	0.3
Type of sample		SOIL	SOIL	SOIL
Date analysed	-	24/01/2019	24/01/2019	24/01/2019
Sample mass tested	g	Approx. 35g	Approx. 40g	Approx. 40g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	210158-2
Date extracted	-			24/01/2019	1	24/01/2019	24/01/2019		24/01/2019	24/01/2019
Date analysed	-			25/01/2019	1	25/01/2019	25/01/2019		25/01/2019	25/01/2019
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	96	97
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	96	97
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	96	97
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	92	93
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	96	96
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	98	99
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	97	96
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	90	1	87	90	3	89	88

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	210158-2
Date extracted	-			24/01/2019	1	24/01/2019	24/01/2019		24/01/2019	24/01/2019
Date analysed	-			24/01/2019	1	24/01/2019	24/01/2019		24/01/2019	25/01/2019
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	100	107
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	<100	<100	0	90	106
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	<100	<100	0	100	100
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	<50	0	100	107
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	<100	<100	0	90	106
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	<100	<100	0	100	100
Surrogate o-Terphenyl	%		Org-003	99	1	100	99	1	106	98

Client Reference: 92277.00, Darlington Public School

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	210158-2
Date extracted	-			24/01/2019	1	24/01/2019	24/01/2019		24/01/2019	24/01/2019
Date analysed	-			25/01/2019	1	25/01/2019	25/01/2019		25/01/2019	25/01/2019
Naphthalene	mg/kg	0.1	Org-012	<0.1	1	0.1	<0.1	0	99	100
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	1	0.5	0.2	86	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	1	0.3	<0.1	100	97	100
Phenanthrene	mg/kg	0.1	Org-012	<0.1	1	3.4	1.2	96	98	103
Anthracene	mg/kg	0.1	Org-012	<0.1	1	0.9	0.3	100	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	1	5.3	2.0	90	97	103
Pyrene	mg/kg	0.1	Org-012	<0.1	1	5.1	2.0	87	96	102
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	1	2.6	1	89	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	1	2.4	1	82	111	115
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	1	3.9	2	64	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	1	2.7	1.0	92	113	115
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	1	1.3	0.5	89	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	1	0.4	0.2	67	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	1	1.5	0.6	86	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	107	1	109	104	5	125	123

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	210158-2
Date prepared	-			24/01/2019	1	24/01/2019	24/01/2019		24/01/2019	24/01/2019
Date analysed	-			24/01/2019	1	24/01/2019	24/01/2019		24/01/2019	24/01/2019
Arsenic	mg/kg	4	Metals-020	<4	1	6	6	0	116	97
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	102	87
Chromium	mg/kg	1	Metals-020	<1	1	14	14	0	111	103
Copper	mg/kg	1	Metals-020	<1	1	41	41	0	129	120
Lead	mg/kg	1	Metals-020	<1	1	460	430	7	108	91
Mercury	mg/kg	0.1	Metals-021	<0.1	1	0.2	0.2	0	106	106
Nickel	mg/kg	1	Metals-020	<1	1	14	14	0	112	97
Zinc	mg/kg	1	Metals-020	<1	1	180	160	12	99	70

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

Asbestos: Excessive sample volume was provided for asbestos analysis. A portion of the supplied sample was sub-sampled according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g (50mL) f sample in its own container as per AS4964-2004.
Note: Samples 210158-1 to 2 were sub-sampled from bags provided by the client.

PAHs in Soil - The RPD for duplicate results is accepted due to the non homogenous nature of sample 1.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY

Project Name:	Darlington Public School Contam			**To:**	Envirolab Services	
Project No:	92277.00	**Sampler:**	Lizbeth Rodriguez		12 Ashley Street, Chatswood NSW 2067	
Project Mgr:	Grant Russell	**Mob. Phone:**	0418 116 545	**Attn:**	Tania Notaras	
Email:	Grant.Russell@Douglaspartners.com.au;			**Phone:**	(02) 9910 6200	**Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au	

Sample ID	Lab ID	Date Sampled	Sample Type	Container Type	Analytes									Notes/preservation
			S - Soil W - water	G - Glass P - Plastic	Combo 3a	CEC	pH	TRH & BTEX	Asbestos ID				Hold	
BH19/0.3	1	joel	S	G/P	x									
BH21/0.3	2	joel	S	G/P	x									
BH24/0.3	3	joel	S	G/P	x									

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 210158
Date Received: 23/1/19
Time Received: 18:31
Received by: TN
Temp: [✓ Cool]/Ambient
Cooling: Ice/[✓ Icepack]
Security: [✓ Intact]/Broken/None

Lab Report No:			
Send Results to: Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567	**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by: LAR		**Transported to laboratory by:**	
Signed:	**Date & Time:** 23/01/2019	**Received by:** T.Nguyen 23/1/19 18:31	

Form COC

Page 1 of 1

Envirolab Services Pty Ltd
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ph 02 9910 6200   fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 209723-A

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Lizbeth Rodriguez, Grant Russell
Address	18 Waler Crescent, Smeaton Grange, NSW, 2567

Sample Details

Your Reference	**92277.00, Darlington Public School Contam**
Number of Samples	26 Soil, 1 Material
Date samples received	17/01/2019
Date completed instructions received	30/01/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	01/02/2019
Date of Issue	01/02/2019

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Asbestos Approved By
Analysed by Asbestos Approved Identifier: Matt Tang
Authorised by Asbestos Approved Signatory: Matt Tang

Results Approved By
Giovanni Agosti, Group Technical Manager
Jeremy Faircloth, Organics Supervisor
Matthew Tang, Asbsestos Analyst
Steven Luong, Senior Chemist

Authorised By

Jacinta Hurst, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		209723-A-19	209723-A-21	209723-A-23
Your Reference	UNITS	BH6	BH7	BH9
Depth		1.2	1.2	1.2
Date Sampled		16/01/2019	15/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil
Date extracted	-	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	01/02/2019	01/02/2019	01/02/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	97	94	88

svTRH (C10-C40) in Soil				
Our Reference		209723-A-19	209723-A-21	209723-A-23
Your Reference	UNITS	BH6	BH7	BH9
Depth		1.2	1.2	1.2
Date Sampled		16/01/2019	15/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil
Date extracted	-	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	31/01/2019	31/01/2019	31/01/2019
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50
Surrogate o-Terphenyl	%	91	92	94

PAHs in Soil				
Our Reference	UNITS	209723-A-19	209723-A-21	209723-A-23
Your Reference		BH6	BH7	BH9
Depth		1.2	1.2	1.2
Date Sampled		16/01/2019	15/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil
Date extracted	-	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	01/02/2019	01/02/2019	01/02/2019
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.2	<0.1	<0.1
Pyrene	mg/kg	0.2	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.09	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	0.5	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	102	114	109

Acid Extractable metals in soil				
Our Reference		209723-A-19	209723-A-21	209723-A-23
Your Reference	UNITS	BH6	BH7	BH9
Depth		1.2	1.2	1.2
Date Sampled		16/01/2019	15/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil
Date prepared	-	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	31/01/2019	31/01/2019	31/01/2019
Arsenic	mg/kg	<4	<4	6
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	17	8	22
Copper	mg/kg	8	4	<1
Lead	mg/kg	18	22	18
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	2	<1	<1
Zinc	mg/kg	16	18	6

Moisture				
Our Reference		209723-A-19	209723-A-21	209723-A-23
Your Reference	UNITS	BH6	BH7	BH9
Depth		1.2	1.2	1.2
Date Sampled		16/01/2019	15/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil
Date prepared	-	31/01/2019	31/01/2019	31/01/2019
Date analysed	-	01/02/2019	01/02/2019	01/02/2019
Moisture	%	15	17	24

Asbestos ID - soils				
Our Reference		209723-A-19	209723-A-21	209723-A-23
Your Reference	UNITS	BH6	BH7	BH9
Depth		1.2	1.2	1.2
Date Sampled		16/01/2019	15/01/2019	16/01/2019
Type of sample		Soil	Soil	Soil
Date analysed	-	01/02/2019	01/02/2019	01/02/2019
Sample mass tested	g	Approx. 25g	Approx. 25g	Approx. 20g
Sample Description	-	Brown clayey soil & rocks	Brown clayey soil & rocks	Brown clayey soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			31/01/2019	[NT]	[NT]	[NT]	[NT]	31/01/2019	[NT]
Date analysed	-			01/02/2019	[NT]	[NT]	[NT]	[NT]	01/02/2019	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	91	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	91	[NT]
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	[NT]	[NT]	97	[NT]
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	[NT]	[NT]	92	[NT]
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	88	[NT]
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	90	[NT]
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	89	[NT]
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	95	[NT]	[NT]	[NT]	[NT]	92	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			31/01/2019	[NT]	[NT]	[NT]	[NT]	31/01/2019	[NT]
Date analysed	-			31/01/2019	[NT]	[NT]	[NT]	[NT]	31/01/2019	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	104	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	114	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	104	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	114	[NT]
Surrogate o-Terphenyl	%		Org-003	98	[NT]	[NT]	[NT]	[NT]	111	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			31/01/2019	[NT]	[NT]	[NT]	[NT]	31/01/2019	[NT]
Date analysed	-			01/02/2019	[NT]	[NT]	[NT]	[NT]	01/02/2019	[NT]
Naphthalene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Phenanthrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	113	[NT]
Pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	113	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	120	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	[NT]	[NT]	[NT]	[NT]	125	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	123	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	111	[NT]	[NT]	[NT]	[NT]	123	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			31/01/2019	[NT]	[NT]	[NT]	[NT]	31/01/2019	[NT]
Date analysed	-			31/01/2019	[NT]	[NT]	[NT]	[NT]	31/01/2019	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	98	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	82	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	89	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	80	[NT]

Result Definitions	
NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions	
Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

Organics analysed outside of RHT

Asbestos: A portion of the supplied samples were sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that these sub-samples are indicative of the entire sample.
Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples 209723-A-19, 21 & 23 were sub-sampled from jars provided by the client.

Andrew Fitzsimons

From: Nancy Zhang
Sent: Wednesday, 30 January 2019 3:15 PM
To: Grant Russell
Cc: Lizbeth Rodriguez; Samplereceipt
Subject: RE: Results for Registration 209723 92277.00, Darlington Public School Contam

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Grant,

No problem, when do you need the results by?

Ref: 209723-A
TAT: 2 day
Due: 1/1/19

Regards,

Nancy Zhang | Assistant Lab Manager | Envirolab Services Pty Ltd

Great Science, Great Service.

12 Ashley Street Chatswood NSW 2067
T 612 9910 6200 **F** 612 9910 6201
E nzhang@envirolab.com.au | **W** www.envirolab.com.au

Please note that all samples submitted to the Envirolab Group laboratories will be analysed under the Envirolab Group Terms and Conditions. The Terms and Conditions are accessible by clicking this link

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From: Grant Russell [mailto:Grant.Russell@douglaspartners.com.au]
Sent: Wednesday, 30 January 2019 3:01 PM
To: Nancy Zhang <NZhang@envirolab.com.au>
Cc: Lizbeth Rodriguez <Lizbeth.Rodriguez@douglaspartners.com.au>
Subject: FW: Results for Registration 209723 92277.00, Darlington Public School Contam
Importance: High

Hi Nancy,
Also can I get the following samples (that were initially put on hold) now analysed for combo 3A:

- BH6/1.2 (Lab ID 19);
- BH7/1.2 (Lab ID 21); and
- BH9/1.2 (Lab ID 23).

Regards
Grant

Andrew Fitzsimons

From: Grant Russell <Grant.Russell@douglaspartners.com.au>
Sent: Wednesday, 30 January 2019 3:16 PM
To: Nancy Zhang
Cc: Lizbeth Rodriguez; Samplereceipt
Subject: RE: Results for Registration 209723 92277.00, Darlington Public School Contam

Hi Nancy,
It would be good to get them by this Friday so probably best to put on ~~3~~ 2 day TAT.
Regards
Grant

209723-A
Due: 1/1/19

Grant Russell | Senior Environmental Scientist
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
18 Waler Crescent Smeaton Grange NSW 2567
P: 02 4647 0075 | F: 02 4646 1886 | M: 0418 116 545 | E: Grant.Russell@douglaspartners.com.au

FINANCIAL REVIEW
CLIENT CHOICE AW
WINNER

From: Nancy Zhang [mailto:NZhang@envirolab.com.au]
Sent: Wednesday, 30 January 2019 3:15 PM
To: Grant Russell
Cc: Lizbeth Rodriguez; Samplereceipt
Subject: RE: Results for Registration 209723 92277.00, Darlington Public School Contam

Hi Grant,

No problem, when do you need the results by?

Regards,

Nancy Zhang | **Assistant Lab Manager | Envirolab Services Pty Ltd**

Great Science, Great Service.

12 Ashley Street Chatswood NSW 2067
T 612 9910 6200 **F** 612 9910 6201
E nzhang@envirolab.com.au | **W** www.envirolab.com.au

Please note that all samples submitted to the Envirolab Group laboratories will be analysed under the Envirolab Group Terms and Conditions. The Terms and Conditions are accessible by clicking this link

Appendix G

QA/QC

Appendix G
Data Quality Assurance and Quality Control Assessment

G1 Data Quality Indicators

Field and laboratory procedures were assessed against the following data quality indicators (DQIs):

Table G1: Data Quality Indicators

DQI	Performance Indicator	Acceptable Range
Precision		
Field considerations	SOPs appropriate and complied with	Field staff follow SOPs in the DP *Field Procedures Manual*
	field replicates	Precision average relative percent difference (RPD) result <5 times PQL, no limit; results >5 times PQL, 0% - 30%
Laboratory considerations	laboratory duplicates	Precision average RPD result <5 times PQL, no limit; results >5 times PQL, 0% - 50%
	laboratory-prepared volatile trip spikes	Recovery of 60 - 140%
Accuracy (bias)		
Field considerations	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*
Laboratory considerations	Analysis of:	
	laboratory-prepared volatile trip spikes	Recovery of 60-140%
	Laboratory-prepared trip blanks (field blanks)	<PQL
	method blanks (laboratory blanks)	Recovery of 60-140%
	matrix spikes	Recovery of 70-130% (inorganics); 60 - 140% (organics)
	matrix spike duplicates	Recovery of 70-130% (inorganics); 60 - 140% (organics); Recovery 70 “low” to 130% “high” indicates interference
	surrogate spikes	Recovery of 70 - 130% (inorganics); 60 - 140% (organics)
	laboratory control samples	Recovery of 70-130% (inorganics); 60 - 140% (organics)
Completeness		
Field considerations	All critical locations sampled	All critical locations sampled in accordance with the DQO’s (Appendix D)
	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*
	Experienced sampler	Experienced DP Environmental Engineer to conduct field work and sampling
	Documentation correct	Maintain COC documentation at all times
	Sample holding times complied with	Sample holding times complied with

DQI	Performance Indicator	Acceptable Range
Laboratory considerations	All critical samples analysed according to DQO's	All critical locations analysed in accordance with the DQO's
	Appropriate methods and PQLs	Appropriate methods and PQLs have been used by the contract laboratory
	Sample documentation complete	Maintain COC documentation at all times
Comparability		
Field considerations	Same SOPs used on each occasion	Field staff to follow SOPs in the DP *Field Procedures Manual*
	Experienced sampler	Experienced DP Environmental Scientist/Engineer to conduct field work and sampling
	Same types of samples collected	Same types of samples collected
Laboratory considerations	Sample analytical methods used (including clean-up)	Methods to be NATA accredited
	Sample PQLs (justify/quantify if different)	Consistent PQLs to be used
	Same laboratories (justify/quantify if different)	Same analytical laboratory for primary samples to be used
Representativeness		
Field considerations	Appropriate media sampled according to DQO's (Appendix D)	Appropriate media sampled according to DQO's (Appendix D)
	All media identified in DQO's sampled	All media identified in DQO's sampled
Laboratory considerations	All samples analysed according to DQO's	All samples analysed according to DQO's

Notes to Table 1: SOP – Standard Operating Procedure
DQO – Data Quality Objectives (Appendix D)

G2 Field Quality Assurance and Quality Control

The field QC procedures for sampling as prescribed in the standard operating procedures (SOPs) in the Douglas Partners *Field Procedures Manual* were followed at all times during the assessment. All sample locations and media were in accordance with the DQO (i.e. as per scope of work in DP's proposal).

G2.1 Sampling Team

Sampling was undertaken by an experienced DP Environmental Scientist.

G2.2 Sample Collection and Weather Conditions

Sample collection procedures and dispatch are reported in body of the report. Sampling was undertaken during sunny and hot conditions.

G2.3 Logs

Logs for each soil sampling location were recorded in the field. The individual samples were recorded on the field logs along with the sample identity, location, depth, initials of sampler, duplicate locations, duplicate type and site observations. Logs are presented in Appendix D.

G2.4 Chain-of-Custody

Chain-of-Custody information was recorded on the Chain-of-Custody (COC) sheets and accompanied samples to the analytical laboratory. Signed copies of COCs are presented in Appendix F, prior to the laboratory certificates.

G2.5 Sample Splitting Techniques

Replicate samples were collected in the field as a measure of precision of the results. Field replicates samples for soil were collected from the same location and an identical depth to the primary sample. Equal portions of the primary sample were placed into the sampling jars and sealed. The sample was not homogenised in a bowl to prevent the loss of volatiles from the soil. Replicate samples were labelled with a DP identification number, recorded on DP logs, so as to conceal their relationship to their primary sample from the analysing laboratory.

G2.6 Duplicate Frequency

Field sampling comprised intra-laboratory duplicate sampling, at a rate of approximately one duplicate sample for every ten primary samples.

G2.7 Relative Percentage Difference

A measure of the consistency of results for field samples is derived by the calculation of relative percentage differences (RPDs) for duplicate samples. RPDs have only been considered where a concentration is greater than five times the practical quantitation limit (PQL).

G2.7.1 Intra-Laboratory Replicate Analysis

Replicates were tested to assess data ‘precision’ and the reproducibility within the primary laboratory (Envirolab Pty Ltd) as a measure of consistency of sampling techniques. Two replicate samples were analysed. The Relative Percent Difference (RPD) between replicate results is used as a measure of laboratory reproducibility and is given by the following:

$$\mathrm{RPD} = \frac{(\text{Replicate result }1 - \text{Replicate result }2)}{(\text{Replicate result }1 + \text{Replicate result }2)/2} \mathrm{x}\,100$$

The RPD can have a value between 0% and 200%. An RPD data quality objective of up to 30% is considered to be within the acceptable range.

The comparative results of analysis between primary and duplicate samples are summarised in the table below. Where one or both results were below the PQL, an RPD was not calculated.

Table G2: RPD Results

Sample	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
BH7/0.5	7	0.6	21	76	540	0.3	6	260
D1	<4	<0.4	13	4	28	<0.1	<1	22
Difference	-	-	8	72	512	-	-	238
RPD (%)	-	-	47 %	180 %	180 %	0 %	0 %	2 %
BH22/0.3	<4	<0.4	10	11	57	<0.1	5	44
D2	<4	<0.4	10	13	40	0.1	6	57
Difference	0	0	0	2	17	-	1	13
RPD (%)	0 %	0 %	5 %	16 %	35 %	-	18 %	25%

Notes: Bold RPD >30
Concentration of either paired duplicated not greater than five times PQL

All RPD values were within the acceptable range of ± 30 with the exception of:

- Chromium, copper and lead in intra-laboratory duplicate pair BH7/0.5 and D1; and
- Lead in intra-laboratory duplicate pair BH22/0.3 and D2.

The exceedances are considered likely due to the heterogeneity of the fill soil. The exceedance is not considered to affect the results of the investigation.

Overall, the intra-laboratory and inter-laboratory comparisons indicate that the sampling technique was consistent and repeatable and therefore acceptable precision was achieved.

G3 Laboratory Quality Assurance and Quality Control

Envirolab Services was used as the primary laboratory. Appropriate methods and PQLs were used by the laboratory. Sample methods were NATA accredited (noting the exception for fibrous asbestos (FA) and asbestos fines (AF) quantification to 0.001% w/w).

G3.1 Surrogate Spike

This sample is prepared by adding a known amount of surrogate, which behaves similarly to the analyte, prior to analysis to each sample. The recovery result indicates the proportion of the known concentration of the surrogate that is detected during analysis and is used to assess data ‘accuracy’. Results within acceptance limits indicate that the extraction technique was effective.

G3.2 Reference and Daily Check Sample Results – Laboratory Control Sample (LCS)

This sample comprises spiking either a standard reference material or a control matrix (such as a blank of sand or water) with a known concentration of specific analytes. The LCS is then analysed and results compared against each other to determine how the laboratory has performed with regard to sample preparation and analytical procedure and is used to assess data ‘accuracy’. LCSs are analysed at a frequency of one in 20, with a minimum of one analysed per batch.

G3.3 Laboratory Duplicate Results

These are additional portions of a sample which are analysed in exactly the same manner as all other samples and is used to assess data ‘precision’. The laboratory acceptance criteria for duplicate samples is: in cases where the level is <5Xpql - any RPD is acceptable; and in cases where the level is >5xPQL - 0-50% RPD is acceptable.

G3.4 Laboratory Blank Results

The laboratory blank, sometimes referred to as the method blank or reagent blank is the sample prepared and analysed at the beginning of every analytical run, following calibration of the analytical apparatus and is used to assess data ‘accuracy’. This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, it can be determined by processing solvents and reagents in exactly the same manner as for samples. Laboratory blanks are analysed at a frequency of 1 in 20, with a minimum of one per batch.

G3.5 Matrix Spike

This is a sample duplicate prepared by adding a known amount of analyte prior to analysis, and then treated exactly the same as all other samples. The recovery result indicates the proportion of the known concentration of the analyte that is detected during analysis and is used to assess data ‘accuracy’. The laboratory acceptance criteria for matrix spike samples are generally 70 - 130% for inorganic/metals; and 60 - 140% for organics; and 10 - 140% for SVOC and speciated phenols.

G3.6 Results of Laboratory QC

The laboratory QC for surrogate spikes, LCS, laboratory duplicate results, laboratory blanks and matrix spikes results are reported in the laboratory certificate of analysis.

The laboratory quality control samples were within the laboratory acceptance criteria. It is considered that an acceptable level of laboratory precision and accuracy was achieved and that surrogate spikes, LCS, laboratory duplicate results, laboratory blanks and matrix spike results were of an acceptable level overall. On the basis of this assessment, the laboratory data set is considered to have complied with the DQIs.

G3.7 Overall Assessment of QA/QC

Specific limits associated with sample handling and laboratory QA/QC was assessed against the DQIs and a summary of compliance is presented in the following table.

Table G5: Data Quality Indicators

DQI	Performance Indicator	Acceptable Range	Compliance
Precision			
Field considerations	SOPs appropriate and complied with	Field staff follow SOPs in the DP *Field Procedures Manual*	C
	field replicates	Precision average relative percent difference (RPD) result <5 times PQL, no limit; results >5 times PQL, 0% - 30%	C
Laboratory considerations	laboratory duplicates	Precision average RPD result <5 times PQL, no limit; results >5 times PQL, 0 - 50%	C
	laboratory-prepared volatile trip spikes	Recovery of 60-140%	C
Accuracy (bias)			
Field considerations	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*	C
Laboratory considerations	Analysis of:		
	laboratory-prepared volatile trip spikes	Recovery of 60 - 140%	C
	laboratory-prepared trip blanks (field blanks)	<PQL	C
	method blanks (laboratory blanks)	Recovery of 60 - 140%	C
	matrix spikes	Recovery of 70 - 130% (inorganics); 60 - 140% (organics)	C
	matrix spike duplicates	Recovery of 70 - 130% (inorganics); 60 - 140% (organics); Recovery 70 "low" to 130% "high" indicates interference	C
	surrogate spikes	Recovery of 70 - 30% (inorganics); 60 - 40% (organics)	C
	laboratory control samples	Recovery of 70 - 130% (inorganics); 60 - 140% (organics)	C
Completeness			
Field considerations	All critical locations sampled	All critical locations sampled in accordance with the SAQP	C
	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*	C
	Experienced sampler	Experienced DP Environmental Scientist/Engineer to conduct field work and sampling	C
	Documentation correct	Maintain COC documentation at all times	C
	Sample holding times complied with	Sample holding times complied with	C

DQI	Performance Indicator	Acceptable Range	Compliance
Laboratory considerations	All critical samples analysed according to SAQP	All critical locations analysed in accordance with the SAQP	C
	Appropriate methods and PQLs	Appropriate methods and PQLs have been used by the contract laboratory	C
	Sample documentation complete	Maintain COC documentation at all times	C
Comparability			
Field considerations	Same SOPs used on each occasion	Field staff to follow SOPs in the DP *Field Procedures Manual*	C
	Experienced sampler	Experienced DP Environmental Scientist/Engineer to conduct field work and sampling	C
	Same types of samples collected (filtered)	Field filtering for metals	NA
Laboratory considerations	Sample analytical methods used (including clean-up)	Methods to be NATA accredited	C
	Sample PQLs (justify/quantify if different)	Consistent PQLs to be used	C
	Same laboratories (justify/quantify if different)	Same analytical laboratory for primary samples to be used	C
Representativeness			
Field considerations	Appropriate media sampled according to DQOs	Appropriate media sampled according to DQOs	C
	All media identified in DQOs sampled	All media identified in DQOs sampled	C
Laboratory considerations	All samples analysed according to DQOs	All samples analysed according to DQOs	C

Notes to Table 5:	C – Compliance
	PC – Partial Compliance
	NC – Non-Compliance
	NA – Not Applicable
	SOP – Standard Operating Procedure
	DQO – Data Quality Objectives

A review of the adopted QA/QC procedures and results indicates that the DQIs have generally been met with compliance and a minor partial-compliance. On this basis, the sampling and laboratory methods used during the investigation were found to meet DQOs for this project.

Appendix H

About This Report

About this Report

Introduction

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

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

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

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.

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.

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 2007. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approximate Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

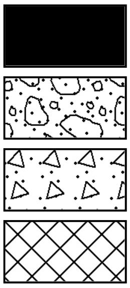
fg	fragmented
bnd	band
qtz	quartz

May 2017

Symbols & Abbreviations

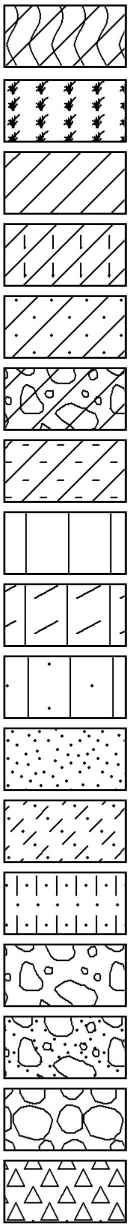
Graphic Symbols for Soil and Rock

General



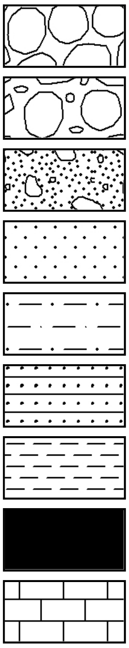
- Asphalt
- Road base
- Concrete
- Filling

Soils



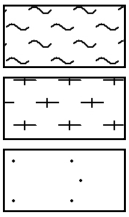
- Topsoil
- Peat
- Clay
- Silty clay
- Sandy clay
- Gravelly clay
- Shaly clay
- Silt
- Clayey silt
- Sandy silt
- Sand
- Clayey sand
- Silty sand
- Gravel
- Sandy gravel
- Cobbles, boulders
- Talus

Sedimentary Rocks



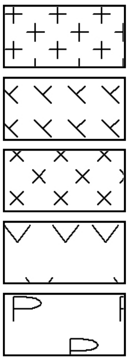
- Boulder conglomerate
- Conglomerate
- Conglomeratic sandstone
- Sandstone
- Siltstone
- Laminite
- Mudstone, claystone, shale
- Coal
- Limestone

Metamorphic Rocks



- Slate, phyllite, schist
- Gneiss
- Quartzite

Igneous Rocks



- Granite
- Dolerite, basalt, andesite
- Dacite, epidote
- Tuff, breccia
- Porphyry

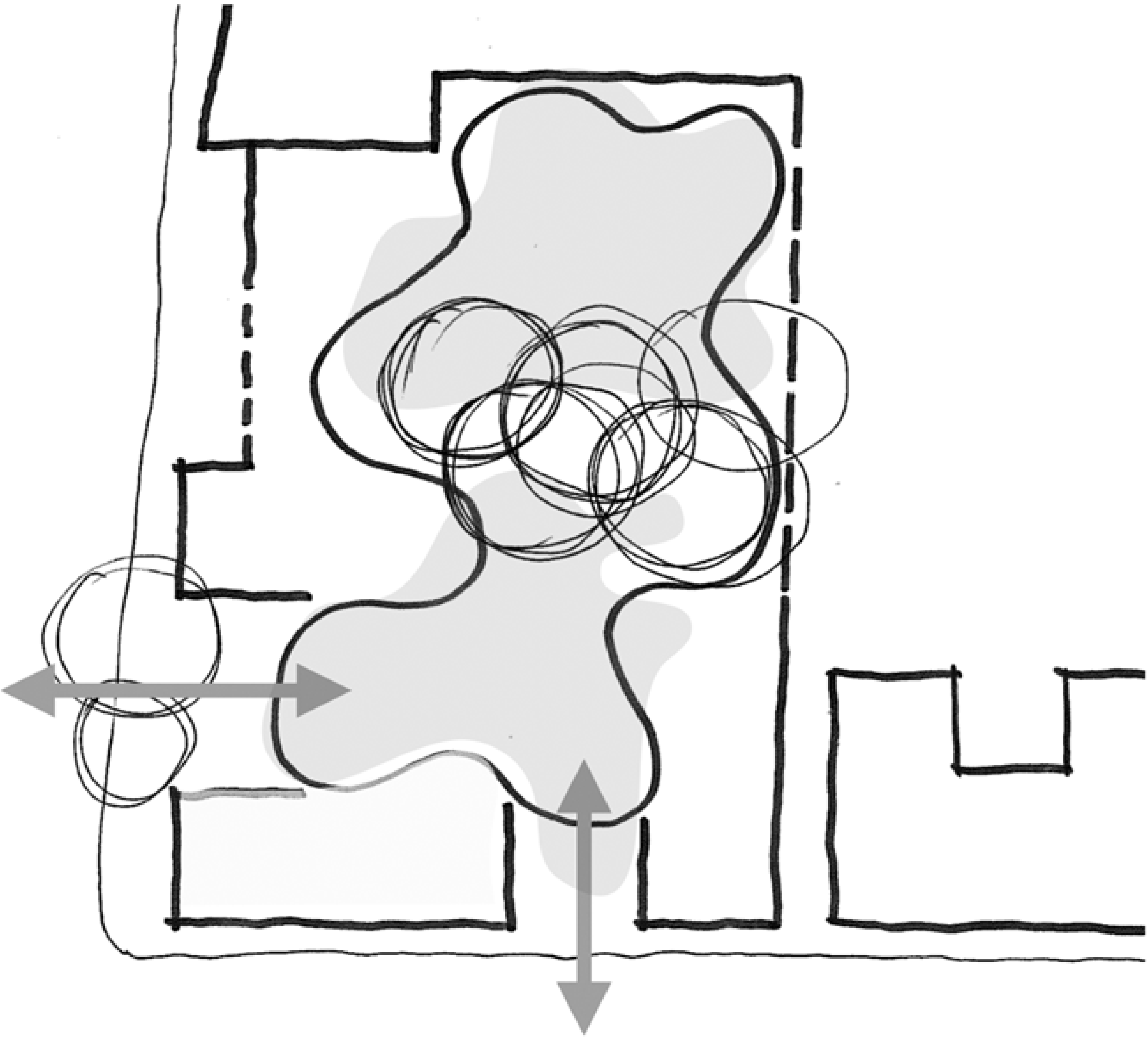
DARLINGTON PUBLIC SCHOOL REDEVELOPMENT

Appendix R — Remediation Action Plan

SSD-9914

Prepared by Douglas Partners

For NSW Department of Education



Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Remediation Action Plan

Proposed Upgrade Works
417 Abercrombie Street, Darlington, NSW

Prepared for
NSW Department of Education

Project 92277.02
June 2020

Douglas Partners
Geotechnics | Environment | Groundwater

Document History

Document details

Project No.	92277.02	Document No.	R.001.Rev2
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Site address	417 Abercrombie Street, Darlington, NSW		
Report prepared for	NSW Department of Education		
File name	92277.02.R.001.Rev2		

Document status and review

Status	Prepared by	Reviewed by	Date issued
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Revision 2	1	0	Daniel Luliano on behalf of NSW Department of Education

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

	Signature	Date
Author		4 June 2020
Reviewer		4 June 2020

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Table of Contents

Report on Remediation Action Plan
Proposed Upgrade Works
417 Abercrombie Street, Darlington, NSW

1. Introduction

Douglas Partners Pty Ltd (DP) was commissioned by Mace Australia Pty Ltd (MA) on behalf of the NSW Department of Education (NSW DoE) 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 child care 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 child care 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 and 5
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
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 and 5
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 9.4 to 9.9

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 child care 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 class room 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.

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 was 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).

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. 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 3: 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

6. 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.

6.1.1 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.

6.1.2 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 9.

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.

6.2 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.

7. 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 9.

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 4.

Table 4: RAC

Contaminant of Concern	RAC	Rationale
Lead	300 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 <1m 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

Contaminant of Concern		RAC	Rationale
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)	

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).

8. 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.

9. Remediation Strategy

9.1 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.

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.9.3.3) 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 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 un – impacted fill is to be increased to at least 0.5 m; and
- 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.

Further details of the remediation and validation strategy for the areas are provided in Sections 9 and 10.

9.2 General Remediation Procedures and Sequence

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 which will be produced following preparation of the Civil drawings.

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 WorkCover 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 (i.e. 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 Safework 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.

9.3 Remediation Scope

The proposed remediation scope is described in Sections 9.3.1 to Section 9.3.4.

9.3.1 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.

9.3.2 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 10. 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.

9.3.3 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 9.1.

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.

9.3.4 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.

9.4 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.

9.5 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.

9.6 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.

9.7 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.

9.8 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, i.e. 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.

9.9 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.

9.10 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 11.2; 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.

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

10. Validation Plan

10.1 Validation Scope

10.1.1 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.

10.1.2 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;
2. Sampling and analysis of the soil by the environmental consultant with reference to NEPC (2013) and guidelines as follows:
    - 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).

- 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.

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

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

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 9.3.3.

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.

10.2 Quality Assurance Plan

10.2.1 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.

10.2.2 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.

10.2.3 Laboratory Quality Assurance and Quality Control

A National Association of Testing Authorities (NATA) accredited laboratory will be used to conduct analysis. As discussed in Table 1, for consistency with previous investigations, Envirolab Services Pty Ltd must be used as the analytical laboratory for asbestos analysis.

10.2.4 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.

10.2.5 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* (2011). 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.

11. 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*.

11.1 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 Council of the City of Sydney.

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.

11.2 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;
- 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 6.5 of this RAP; and
- Noise and vibration levels at the site boundaries comply with the legislative requirements.

11.3 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.

12. 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 child care 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.

13. 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).

14. 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

N
MGA

PROJECT No: 92277.02
DRAWING No: 1
REVISION: A

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 Features Map**
Remediation Action Plan
Darlington Public School
417 Abercrombie Street, Darlington NSW

N
MGA

PROJECT No: 92277.02
DRAWING No: 2
REVISION: A

Douglas Partners
Geotechnics | Environment | Groundwater

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

TITLE: **PSI (April 2018) Sampling Locations**
Remediation Action Plan
Darlington Public School
417 Abercrombie Street, Darlington NSW

N
MGA

PROJECT No: 92277.02
DRAWING No: 3
REVISION: A

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

N
MGA

PROJECT No: 92277.02
DRAWING No: 4
REVISION: A

Legend
- ● PSI Borehole Location
- ☐ Lot Boundary
- ● DSI Borehole Grid Based Location
- ⊕ Soil Vapour Bore Location
- ● Indoor air cannister

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 = 7,253m^2

GFA

FECA = 3748m^2
UCA = 1664m^2

Total GFA = 5412m^2

Play Space

Ground Level Play Space:

COLA = 167m^2
Open Space = 3874m^2
Games Court = 576m^2
Assembly Area = 420m^2

Total Ground Level Play Space is **5037m^2**

Cola on upper levels = 735m^2

Total Play Space = 5772m2
with 415 Students is 13.9m^2 per student

Appendix C

About this Report

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

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

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.

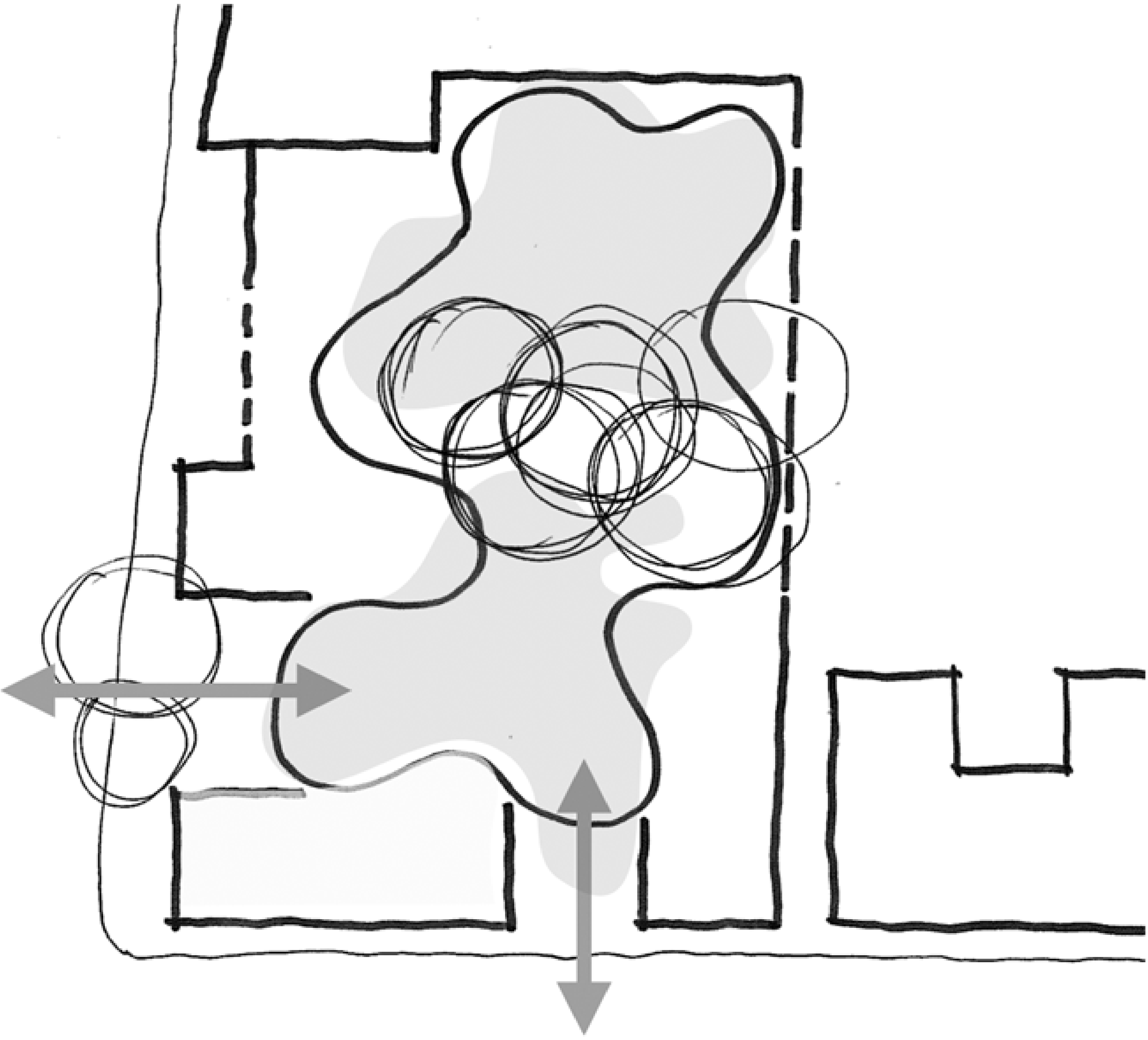
DARLINGTON PUBLIC SCHOOL REDEVELOPMENT

Appendix S — Hazardous Materials Survey

SSD-9914

Prepared by Douglas Partners

For NSW Department of Education



Douglas Partners
Geotechnics / Environment / Groundwater

Report on
Hazardous Building Materials Assessment

Darlington Public School Upgrade
Darlington Public School, Darlington, NSW

Prepared for
Billard Leece Partnership Pty Ltd

Project 92277.00
April 2018

Integrated Practical Solutions

Document History

Document details

Project No.	92277.00	Document No.	R.003.Rev0
Document title	Report on Hazardous Building Materials Assessment Darlington Public School Upgrade		
Site address	Darlington Public School, Darlington, NSW		
Report prepared for	Billard Leece Partnership Pty Ltd		
File name	92277.00.R.003.Rev0		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Grant Russell	Tim Kulmar	20 April 2018

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0	1	0	Billard Leece Partnership Pty Ltd - Mr Shane Wood

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

	Signature	Date
Author		20 April 2018
Reviewer	pp for TK	20 April 2018

bsi. ISO 9001 Quality Management

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Executive Summary

Douglas Partners Pty Ltd (DP) was engaged by Billard Leece Partnership Pty Ltd (BLP) to conduct a hazardous building materials (HBM) assessment of the building structures located at Darlington Public School, 417 Abercrombie Street, Darlington, NSW.

The site currently comprises an operational primary school and preschool. Redevelopment / upgrading works are proposed for the school buildings. A HBM assessment is required to identify potential hazardous materials within the buildings so that appropriate controls can be implemented if required.

HBM were identified or assumed present during the survey as summarised in Table 1 below.

Table 1: Summary of Results

Building / Area	Non-Friable Asbestos	Friable Asbestos	SMF	Lead Paint	Lead Dust	ODS	PCB
B00A	✓	✗	✗**	✓	✓	✗	✗*
B00B	✓	✗	✗**	✗	✓	✗	✗*
B00C	✓	✗	✗**	✓	✓	✗	✗*

SMF = Synthetic Mineral Fibre, PCB = Polychlorinated Biphenyls, ODS = Ozone Depleting Substances, ✓ = identified or assumed present, ✗ = not identified, ✗* = assumed unlikely due to fluorescent lights throughout building in new and good condition, ✗** = SMF not identified in site inspection however may be present beneath sarking within building ceiling cavities

Limited or no access was available to certain areas of the site. Inaccessible areas should be assumed to contain HBM unless assessment of these areas by a Competent Person confirms otherwise.

HBM should be managed in accordance with the requirements of the NSW Work Health and Safety (WHS) Act 2011 (WHS Act), NSW WHS Regulation 2017 (WHS Regulation) and relevant Codes of Practice, Australian Standards and guidelines.

HBM should be removed prior to any significant disturbance including from maintenance, refurbishment and demolition work.

Limitations apply to this HBM survey and report as outlined in Section 7.

This report should be read in its entirety and may not be reproduced other than in full, except with the prior written approval of DP.

Table of Contents

Report on Hazardous Building Materials Assessment
Darlington Public School Upgrade
Darlington Public School, Darlington, NSW

1. Introduction

Douglas Partners Pty Ltd (DP) was engaged by Billard Leece Partnership Pty Ltd (BLP) to conduct a hazardous building materials (HBM) assessment of the building structures located at Darlington Public School, 417 Abercrombie Street, Darlington, NSW (the site).

The site currently comprises an operational primary school and preschool. Redevelopment / upgrading works are proposed for the school buildings. A HBM assessment is required to identify potential hazardous materials within the buildings so that appropriate controls can be implemented if required. The assessment was undertaken to assess the location, extent and condition of the following HBM:

- Asbestos containing materials (ACM);
- Synthetic mineral fibre (SMF);
- Polychlorinated biphenyls (PCBs) in fluorescent light fittings;
- Lead paint systems;
- Lead dust in ceiling cavities; and
- Ozone depleting substances (ODS) comprising refrigerants in air conditioning units.

A drawing that identifies relevant site and lot boundaries and the general location of the school is provided in Appendix A.

The results of the survey, including details of the HBM identified and the results of ACM risk assessments, are provided in the HBM Register (the Register) in Appendix B.

Laboratory analysis certificates for the samples collected and analysed as part of the survey are provided in Appendix C.

Site and building plans are provided in Appendix D.

A photographic record collected during the site inspection and is presented in Appendix E.

Limited or no access was available to certain areas as outlined in the Register and Section 5 of this report.

2. Site Description

The following site description is based on a site inspection completed on 28 February 2018, a hazardous materials inspection completed by DP hygienist Grant Russell on 14 March 2018 and review of Nearmap Imagery.

The site is an irregular shaped property and is accessed via a driveway that leads from Golden Grove Street located to the west of the site and the School gate fronting Abercrombie Street to the south of the site. The site is comprised of two lots as described below.

Lot 592 DP 752049

The lot is roughly square shaped and comprises the majority of the school grounds and buildings. A large two storey rectangular building (Building B00A) is located in the southwest corner of the lot which is used for administrative and schooling purposes and comprises several school offices and class rooms. 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). A court yard is located to the immediate east of the building and is mostly concrete with two small unsealed garden areas containing large trees and shrubs. Another brick building (B00B) is located to the immediate east of the courtyard and is also constructed of brick walls, concrete slab floor and metal sheet roofing. FCS interior walls and ceilings were also observed in portions of the building.

Another ‘S’ shaped class room building (part of B00B) 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 with unsealed gardens and a grassed area located further beyond in the north eastern portion of the lot.

Another large rectangular shaped building is located across the central western portion of the lot (B00C) and comprises the school hall and a number of classrooms. The building is constructed similarly as 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 rubber like safety surface material. A concrete path is located immediately adjacent east of the play area with an unsealed garden located further to the east.

Lot 100 DP 623500

The lot is roughly ‘L’ shaped and consists mainly of a basketball court and playground area. The lot is elevated slightly above the remainder of the site (adjacent lot to the south) indicating 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 rubber like safety surface material. Several large 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. Survey Method

The HBM assessment was completed by DP hygienist on 14 March 2018. The survey consisted primarily of a visual inspection of safely accessible areas supplemented by a limited program of sample collection and laboratory analysis.

Relevant information, including asbestos analysis results, contained in the NSW Department of Education asbestos register for Darlington Public School, were incorporated into this assessment and report. The asbestos register is identified as *Asbestos Register (Hazardous Materials and Risk Assessment), Darlington Public School (1735), Sydney, Newtown* reviewed by Parsons Brinckerhoff on 28 February 2017 (PB, 2017).

Samples of suspected ACM were collected by DP using hand tools (e.g. knife or pliers) and analysed for asbestos by a National Association of Testing Authorities (NATA) accredited laboratory. Sample size is typically limited to minimise disturbance of the material and potential structural or aesthetic impacts. The samples were analysed by polarised light microscopy (PLM) with dispersion staining in accordance with AS4964-2004 *Method for the qualitative identification of asbestos in bulk samples*.

Samples of suspected lead paint were collected by DP and analysed for lead by a NATA accredited laboratory using Inductively Coupled Plasma – Atomic Emission Spectrometry/Mass Spectrometry (ICP-AES/MS). Paint samples contained approximately equal portions of all layers of paint at the location sampled, to the extent practicable, and therefore typically reflect the average lead content of the overall paint system at location sampled.

SMF was identified primarily by visual inspection or incidentally as a result of laboratory analysis for asbestos.

Where safe access (i.e. electrical isolation) is provided to DP selected light fittings are partially dismantled to obtain capacitor details. Capacitor details are then compared to the list of PCB - containing and PCB - free equipment in *Identification of PCB-Containing Capacitors: An Information Booklet for Electricians and Electrical Contractors, 1997* prepared by the Australian and New Zealand Environment and Conservation Council (ANZECC).

Lead dust samples were collected from ceiling or wall cavities or internal areas found to contain significant settled dust loadings. Samples were collected from a specified surface area (normally 100 or 900 cm^2) and submitted for laboratory analysis to assess lead content. Analysis was conducted by a NATA accredited laboratory using ICP-AES/MS. The sampling area and laboratory analysis result (total lead in µg) was used to calculate the lead dust loading which is expressed as milligrams of lead per square metre (mg/m^2).

Assessment of air conditioning units for ozone depleting substances was limited to a visual inspection of external compliance plates and/or other relevant labelling/signage that may indicate the refrigerant present.

Material sampling and analysis programs are necessarily limited. In the case of similar or repetitive buildings, building elements or rooms/areas representative bulk sampling protocols may be adopted.

4. Asbestos Risk Assessment Method

ACM poses a health risk if asbestos fibres are released to the atmosphere and inhaled. There is also a risk of environmental contamination whenever asbestos is disturbed. The degree of risk associated with any given ACM depends on a range of factors such as the friability, extent, condition, and location/accessibility of the material, the asbestos mineral type(s) present, the nature of site activities and ventilation.

The asbestos risk assessment method employed by DP considers several key factors that influence risk and a numerical score is assigned to each (refer Table 2 below). These scores are then added together to determine an overall risk rating for the ACM (refer Table 3 below). A degree of professional judgement may be applied when determining the final risk rating since it is not practicable to include in Table 2 all risk factors that may be relevant to a given situation.

Risk assessments for ACM should be reviewed on a regular basis including when:

- The Asbestos Management Plan is reviewed;
- Further asbestos or ACM is identified at the workplace;
- Asbestos is removed, disturbed, sealed, enclosed or undergoes any other change in condition;
- There is evidence that the risk assessment is no longer valid;
- There is evidence that control methods are not effective; or
- A significant change is proposed for the workplace or for work practices or procedures relevant to the risk assessment.

An asbestos risk assessment review is to be conducted at least every 5 years. The review is to be performed by a Competent Person.

Table 2: Key Risk Factors

Risk Factor	Score	Description
Friability	0	Non-friable (fibre reinforced vinyls, bituminous materials, adhesives)
	1	Non-Friable (fibre reinforced cement products such as wall and roof sheeting)
	2	Semi-Friable (low density insulation board, millboard, ropes, paper, textiles, gaskets or highly weathered asbestos cement)
	3	Friable (thermal insulation to pipes/boilers, sprayed insulation, loose fill insulation)
Condition	0	Very Good. Very little or no visible indication of damage. Structurally sound. No significant repairs required. Material performs as intended.
	1	Good - Minor damage in small, localised areas. Structurally sound. Minor preventative action may be required as a precaution and/or to prolong material life. Material generally performs as intended.
	2	Fair. Localised damage in various areas. Material is generally structurally sound however local removal and replacement of damaged sections may be required. Material performance may be somewhat impaired in areas.
	3	Poor. Material exhibits significant damage throughout. Overall structural stability may be compromised. Material performance is significantly impaired.

Risk Factor	Score	Description
Treatment	0	Fully enclosed, encapsulated or sealed. ACM is entirely contained and the enclosure/encapsulation/sealing material is in good condition.
	1	Generally enclosed, encapsulated or sealed. ACM is generally contained however enclosure/encapsulation/sealing material may not be completely continuous or exhibits minor damage/penetrations.
	2	Partially enclosed, encapsulated or sealed. ACM is contained in area(s) however enclosure/encapsulation/sealing material is not present, significantly damaged or ineffective in area(s).
	3	Enclosure/encapsulation/sealing material is significantly damaged and/or generally ineffective or there is no treatment.
Accessibility	0	The ACM is not directly accessible to occupants. Contact is highly unlikely unless a significant, dedicated effort is made. Substantial demolition, dismantling and/or special access equipment would be required.
	1	The ACM is generally not accessible to occupants. Contact is unlikely but could be made with special tools or equipment (e.g. elevating work platform) or minor demolition/dismantling.
	2	Some portion(s) of ACM are accessible to occupants. Direct contact may occur periodically but often requires basic tools/equipment (e.g. step ladder).
	3	The majority of the ACM is accessible to occupants. Direct contact is a common occurrence and may be made with minimal or no effort.
Activity	0	Area generally not occupied. Normally very little or no activity. Activities may be highly restricted or area secured. Examples may include subfloor voids, ceiling cavities, confined spaces and other inaccessible areas.
	1	Low level occupancy. Some activity in parts or area only occupied periodically. Examples may include plant rooms and store rooms.
	2	Moderate level occupancy. Activity normally present throughout area. May include offices, laboratories, classrooms, workshops, and warehouses.
	3	High level occupancy. Generally high levels of activity. Activities may be wide-ranging and/or largely unrestricted. Examples may include production/manufacturing areas, construction sites and public areas/thoroughfares.
Ventilation	0	Exterior area where natural ventilation and associated dilution is largely unlimited. Significant retention and/or build-up of airborne contaminants is unlikely.
	1	Interior area. Natural ventilation and dilution is limited but area is not particularly confined. Limited retention and/or build-up of airborne contaminants is possible.
	2	Confined areas where ventilation and associated dilution is significantly limited. Significant retention and/or build-up of airborne contaminants is possible or likely.
	3	Asbestos material subject to direct ventilation (e.g. inside an AC system or near a fan or air exhaust) which may result in disturbance and/or elevated fibre concentrations in air.

Table 3: Risk Rating

Overall Score	Risk Rating	Description
15-18	High (H)	The ACM poses an elevated and typically unacceptable risk of exposure and/or environmental contamination. Controls should generally be implemented as soon as possible to address the risk. Removal of the whole or part of the ACM is typically required. Other controls such as enclosure, encapsulation and/or sealing may also be necessary if portion(s) of ACM are to remain in place. As an interim measure, access to the area should be appropriately restricted. Air monitoring is often recommended to confirm airborne asbestos concentrations and provide a written record for future reference.

Overall Score	Risk Rating	Description
10-14	Moderate (M)	The ACM poses a moderate risk of exposure and/or environmental contamination. Often there has been minor damage or there is potential for disturbance/degradation in the foreseeable future. Consideration should be given to implementing appropriate controls in the short to medium term to address the risk(s) and/or prolong the lifespan of the material. Relevant controls typically include enclosure, encapsulation and/or sealing. Extensive removal is generally not required and the material can generally be managed on site if desired and serving a useful purpose.
0-9	Low (L)	The risk of exposure and environmental contamination is generally low while the material remains undisturbed and in its present condition. The material may generally remain in place without the requirement for significant, material-specific control measures such as removal, enclosure, encapsulation or sealing.

Note: If the ACM is likely to be disturbed (e.g. by maintenance, refurbishment or demolition work) and/or is no longer serving a useful purpose then the ACM should generally be removed. All ACM should be clearly identified with a label where reasonably practicable.

5. Results

The results of the survey, including details of the HBM identified, are tabulated in the Register in Appendix A and summarised in Table 1 in the Executive Summary of this report.

A licensed electrician was not provided to DP to isolate and de-energise light fittings or other electrical plant/services during the survey and therefore it was generally not possible to dismantle and inspect all fluorescent light fittings or other electrical plant/services to confirm the presence/absence of HBM.

A visual inspection of fluorescent light fittings stored in room AR1007 identified lights fittings used for the building as follows:

- Sylvania FL20T12 / 840 - 4000K; and
- Philips TLRS 20W / 840.

The two types of light fittings identified in the store room are not considered to contain PCB capacitors.

Although physical confirmation was not undertaken of all light fittings throughout the buildings the fluorescent lights appeared to be relatively new and in good condition. It is considered unlikely that lights within the buildings house PCB containing capacitors.

Several split system air conditioning unit were observed in the courtyard on the south western portion of the site. The refrigerant used in the units was identified as R410A which is not known as an ozone depleting substance (ODS).

Limited or no access was available to certain areas as outlined in the Register (Appendix A) and Table 4 below.

Table 4: Access Limitations*

Location / Area	Access Type	Reason(s)
Areas/materials at height (e.g. roofs)	Limited	Access limited to safely accessible areas and use of 1.8 m step ladder. Work at height and use of specialised access equipment not included in survey scope.
Plant, equipment and services in general (e.g. electrical panels, HVAC plant etc.)	Limited	Inspection limited to safely accessible exterior surfaces. Isolation and detailed dismantling and/or demolition typically required for further assessment.
Confined spaces	Nil	Not included in survey scope.
Air handling ductwork (interior portion)	Nil	Generally enclosed behind metal linings. Inspection of typically requires isolation by HVAC technician and/or electrician and/or detailed dismantling/demolition.
Ceiling cavities and subfloor voids	Limited	Access generally limited by height, services and clearance within cavity/void. Inspection of crawl spaces not included in survey scope.
Below flooring materials (e.g. carpet, vinyl sheeting etc.)	Limited	Access limited due to ongoing occupation, stored items, fixtures/furnishings and potential for damage to current finish.
Below ceramic tiled surfaces (e.g. walls and floors in wet areas)	Generally nil	Typically requires destructive removal of tiles and damage to current finish.
Enclosed building cavities and voids (e.g. service risers)	Nil	Detailed dismantling/demolition typically required. Access generally impractical.

* Refer also to the Register (Appendix A).

6. Recommendations

A summary recommendation for each HBM identified or assumed present at the site is provided in the Register (Appendix A).

The general recommendations in Section 6.1 onwards are provided for informative purposes and should be considered where the relevant HBM has been identified or assumed present by DP or is subsequently suspected to be present based on reasonable grounds.

The presence of identified and assumed HBM at the site, and the potential presence of any as-yet undetected HBM, should be considered during the risk assessment for any proposed work at the site or site use. Additional targeted inspection, sampling and analysis for HBM should be considered prior to any work that may result in the disturbance of such HBM.

6.1 General

HBM should be managed in accordance with the requirements of the WHS Act, WHS Regulation and subordinate Codes of Practice, Australian Standards and guidelines.

A hazardous materials management plan should be developed to aid compliance with the requirements of the WHS Act and Regulation including those that relate to the identification of hazards and control of associated risks.

HBM should be visually inspected on a regular basis. Any change to the condition of the material or relevant site conditions should be reported.

HBM should be removed prior to any significant disturbance such as maintenance, refurbishment and demolition work.

Prior to any work involving hazardous materials a risk assessment should be conducted and Safe Work Method Statement (SWMS) developed. The SWMS should outline the controls necessary to ensure that the risk of exposure to the hazardous materials is adequately controlled.

Hazardous materials remediation and removal work should be undertaken in controlled conditions.

Waste should be assessed and classified for disposal in accordance with the NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste*, November 2014.

At the completion of hazardous material remediation and removal work a clearance inspection should be conducted by a Competent Person, or in the case of friable asbestos, by a Licensed Asbestos Assessor.

6.2 Asbestos-containing Material (ACM)

ACM must be managed in accordance the WHS Regulation, the Safe Work Australia (SWA) *Code of Practice: How to Manage and Control Asbestos in the Workplace, 2016* and the SWA *Code of Practice: How to Safely Remove Asbestos, 2016.*

Exposure to airborne asbestos in the workplace must be eliminated to the extent that is reasonably practicable. If it is not reasonably practicable to eliminate exposure it must be minimised to the extent that is reasonably practicable.

An Asbestos Management Plan must be developed to enable compliance with the WHS Regulation (Regulation 429).

The presence and location of asbestos or ACM identified at a workplace must be clearly indicated by a label if it is reasonably practicable to do so.

Warning labels and signs should be consistent with the examples provided in the SWA *Code of Practice: How to Manage and Control Asbestos in the Workplace, 2016* and comply with AS1319 *Safety Signs for the Occupational Environment*.

Non-friable ACM that are structurally intact and in good to fair condition may typically remain in place provided that they are not significantly disturbed.

Tools and equipment that generate dust must generally not be used on asbestos. These include high-speed abrasive power and pneumatic tools (e.g. angle grinders, sanders, saws and high-speed drills, brooms and brushes).

Tools and equipment that cause the release of asbestos, including power tools and brooms, may only be used on asbestos if the equipment is enclosed and/or designed to capture or suppress asbestos fibres and/or the equipment is used in a way that is designed to capture or suppress asbestos fibres safely. In such a case, other controls including PPE may also be required based upon the results of a pre-work risk assessment and the SWMS adopted.

The use of high-pressure water sprays and compressed air on asbestos or ACM is specifically prohibited under the WHS Regulation.

If ACM become damaged they should be repaired or removed and replaced with an alternative, non-asbestos building product as soon as possible.

The scope of asbestos removal work should be outlined in a technical specification (i.e. Scope of Work Report) developed by a Competent Person (in the case of non-friable asbestos) or a Licensed Asbestos Assessor (in the case of friable asbestos).

Removal of friable asbestos must only be undertaken by a Class A licensed asbestos removal Contractor.

Removal of 10 m^2 or more of non-friable asbestos must only be undertaken by a Class A or Class B licensed asbestos removal contractor.

Air monitoring is required during removal of friable asbestos. Air monitoring should also be considered during removal of non-friable asbestos particularly where sensitive receptors exist such as at schools, hospitals and similar sites.

Air monitoring must be undertaken in accordance with the National Occupational Health and Safety Commission (NOHSC) *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres, 2nd Edition* [NOHSC:3003(2005)].

All air monitoring samples must be analysed by a National Association of Testing Authorities (NATA) Accredited laboratory that holds accreditation for the required analysis.

At the completion of asbestos removal a clearance inspection must be conducted by a Competent Person (for non-friable asbestos removal) or a licensed asbestos assessor (for friable asbestos removal).

Air monitoring and clearance inspections must be performed by person/s independent of the asbestos removal contractor.

All waste should be classified for disposal in accordance with the NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste*, November 2014. Asbestos waste is preclassified as Special Waste under these guidelines.

Asbestos transporters and facilities receiving asbestos waste must report the movement of asbestos waste to the EPA. Entities involved with the transport or disposal of asbestos waste in NSW, or arranging the transport of asbestos waste in NSW, must use the EPA's online tool, WasteLocate.

All asbestos waste must be disposed at a waste collection facility licensed to receive asbestos waste. All disposal receipts should be retained.

A person who relinquishes management or control of the workplace must ensure that the Asbestos Register is given to the person, if any, assuming management or control of the workplace.

6.3 Synthetic Mineral Fibre (SMF)

SMF materials may generally remain in place providing that they are in good condition and unlikely to disturbed.

To reduce the potential for disturbance, exposure and environmental contamination SMF materials may be encapsulated or enclosed. Higher risk materials, such as loose fill insulation, may also be removed and replaced.

SMF work is to be undertaken in accordance with the requirements of the WHS Regulation and subordinate Codes of Practice, Guidance Notes and other documents. These include:

- National Standard for Synthetic Mineral Fibres [NOHSC:1004(1990)];
- National Code of Practice for the Safe Use of Synthetic Mineral Fibres [NOHSC:2006(1990)];
- WorkCover NSW *Safe management of synthetic mineral fibres (SMF) – glasswool and rockwool*;
- Safe Work Australia *Guide to Handling Refractory Ceramic Fibres, December 2013*; and
- Guidance Note on the Membrane Filter Method for the Estimation of Airborne Synthetic Mineral Fibres [NOHSC:3006(1989)].

Where reasonable concern exists over possible respirable fibre concentrations in any application, the first step shall be to confirm that the work practices, as recommended for the particular product in the schedules to [NOHSC:2006(1990)] are being followed. Air monitoring is not required when it has been clearly established that the work practices outlined in the schedules are being carried out.

Notwithstanding the above, exposures should not exceed the relevant SWA exposure standards outlined in Table 5 below.

Table 5: SWA Exposure Standards for SMF

Standard Name	**Time Weighted Average (TWA) Exposure Standard**
Glass wool, rock (stone) wool, slag wool and continuous glass filament and low biopersistence Man Made Vitreous Fibres (MMVF)	2 mg/m^3 (inhalable dust)
Refractory ceramic fibres (RCF), special purpose glass fibres and high biopersistence MMVF	0.5 f/mL (respirable) 2 mg/m^3 (inhalable dust)

SMF waste should be disposed at a licensed waste collection facility. Synthetic fibre waste (from materials such as fibreglass, polyesters and other plastics) packaged securely to prevent dust emissions is pre-classified as General Solid Waste (non-putrescible) under the NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste*, November 2014.

All disposal receipts should be retained.

6.4 Polychlorinated Biphenyls (PCBs)

Fluorescent lights were observed throughout the building however they are unlikely to house capacitors that contain PCB capacitors. Identifying criteria for PCB containing capacitors is adapted from ANZECC (1997) and includes:

- Resonant start;
- A capacitor that is cylindrical or rectangular, encased in an aluminium container with a weld running all the way around the top edge with two terminals with quick connect tags;
- A date mark from 1950s, 1960s, or 1970s;
- A capacitor encased in a rectangular tin container with soldered seams; and
- Slightly heavier than similar types of capacitors manufactured after the 1970s (which do not contain PCBs).

Prior to any significant disturbance, such as demolition, refurbishment or maintenance works, fluorescent light fittings should be electrically isolated and inspected in detail for metal canister-type capacitors that may contain PCB's. Any capacitors containing or suspected to contain PCB should be removed by a suitably qualified and experienced contractor.

PCB containing capacitors should be managed in accordance with the general requirements of the WHS Regulation 2017 and the:

- Environmentally Hazardous Chemicals (EHC) Act 2008 and subordinate *Polychlorinated Biphenyl (PCB) Chemical Control Order 1997*; and
- *Polychlorinated Biphenyls Management Plan, Revised Edition, April 2003*, issued by the Environment Protection and Heritage Council (EPHC).

Any PCB containing capacitors that exhibit leakage should be removed and replaced by a suitably qualified and experienced contractor as soon as possible. Access to areas containing leaking capacitors should be suitably restricted.

The conveyance and disposal of PCB material and PCB waste is subject to special requirements outlined in the *Polychlorinated Biphenyl (PCB) Chemical Control Order* 1997.

All disposal receipts should be retained.

6.5 Lead Paint

The potential presence of lead paint(s) at the Site should be considered during the risk assessment for any proposed works. Additional, targeted sampling and analysis for lead paints should be considered prior to any work that may result in significant disturbance of paint system(s).

Lead paints should be managed in accordance with the WHS Regulation including (including Chapter 7, Part 7.2 Lead) and:

- AS4361.1 – 2017, *Guide to hazardous paint management - Lead and other hazardous metallic pigments in industrial applications*; and
- AS4361.2 – 2017, *Guide to hazardous paint management - Lead paint in residential, public and commercial buildings*.

Lead paint that is in sound condition, not directly accessible (e.g. over-painted with lead-free paint) and unlikely to be disturbed may not require any immediate action.

Area(s) of lead paint that are in poor condition (e.g. flaking, delaminating) should generally be removed along with any lead paint debris and associated dust.

Exposed area(s) of lead paint that are intact may be stabilised by over-painting with a lead-free paint, or by covering with a suitable encapsulant. Stabilisation can provide an interim to long-term solution to a lead paint hazard.

The lead paint removal method and control measures adopted should be determined by risk assessment and a detailed knowledge of the workplace and proposed use/activities.

Exposure to airborne lead must be maintained below the relevant SWA exposure standards pertaining to lead. The SWA 8 hour TWA exposure standard for lead (inorganic dusts and fumes) is 0.15 mg/m^3. Other exposure standards apply for substances such as lead chromate.

Air monitoring for lead may be required during lead paint remediation works based on risk assessment and the requirements to maintain airborne lead levels below the abovementioned exposure standards.

At the completion of lead paint removal a clearance inspection should be conducted by a Competent Person. The Competent Person should determine the requirements for clearance including any air monitoring or sample analysis that may be required.

Lead paint waste should be assessed and classified for disposal in accordance with the NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste*, November 2014:

- Waste contaminated with lead (including lead paint waste) from residential premises or educational or child care institutions is pre-classified as general solid waste (non-putrescible); and
- Lead paint waste arising otherwise than from residential premises or educational or child care institutions is pre-classified as hazardous waste.

All disposal receipts should be retained.

6.6 Lead Dust

Laboratory analysis results for lead dust should be taken as approximate only since sampling is limited and the concentration of lead in dust may vary considerably between locations within the same general area.

No recognised Australian guidelines have been identified for the direct assessment of lead dust concentrations in ceiling cavities. Notwithstanding this, AS4361.2-1998 *Guide to Lead Paint Management, Part 2: Residential and Commercial Buildings* (superseded) outlined acceptance limits for lead in surface dust after lead paint management activities. These limits were:

- Interior floors: 1 mg/m^2 (as lead);
- Interior window sills: 5 mg/m^2 (as lead); and
- Exterior surfaces: 8 mg/m^2 (as lead).

The United States Environmental Protection Authority (US EPA) 40 CFR Part 745 *Lead; Identification of Dangerous Levels of Lead; Final Rule* establishes the following standards for lead hazard identification:

- Floors - 40 µg/ft^2 (~0.43 mg/m^2) lead; and
- Interior Window sills – 250 µg/ft^2 (~2.7 mg/m^2) lead.

The above acceptance limits may be used as a guide to assessing lead concentrations in settled dust. As a precaution, and due to the sensitive nature of the site (i.e. primary school), a lead concentration of >0.5 mg/m^2 has used to identify potential hazardous conditions in this assessment.

Where the concentration of lead in in settled dust exceeds 0.5 mg/m^2 further detailed assessment should be considered along with identification of appropriate control and/or remedial measures via risk assessment and with a detailed knowledge of the workplace and proposed use/activities.

Where ceiling and/or wall cavities that contain lead dust are effectively enclosed and provide very limited or no opportunity for lead dust to enter occupied areas the dust may typically remain in place. In such a case access to the ceiling/wall cavity should be suitably restricted and all entrances signposted with appropriate warning signs.

Any personnel required to enter areas containing elevated concentrations of lead in dust should undertake an appropriate risk assessment and develop a Safe Work Method Statement (SWMS) for the work. The SWMS must identify controls that ensure the risk of exposure to lead remains at an acceptable level for personnel entering the cavity and other building occupants.

Consideration should be given to removal of lead dust when:

- The lead dust is located within occupied areas of a building;
- There is a significant risk of the lead entering into occupied areas; or
- Significant disturbance of lead dust is likely due to maintenance, refurbishment or demolition work or other reason(s); or
- Removal is a reasonably practical means of eliminating the hazard.

Removal of lead dust should be undertaken by a suitably qualified and experienced removal contractor.

The lead dust removal method and control measures adopted should be determined by risk assessment and a detailed knowledge of the workplace and proposed use/activities.

Exposure to airborne lead must be maintained below the relevant SWA exposure standards pertaining to lead. The SWA 8 hour TWA exposure standard for lead (inorganic dusts and fumes) is 0.15 mg/m^3.

Air monitoring for lead may be required based on the results of the risk assessment and the requirement to maintain airborne lead concentrations below the abovementioned exposure standard(s).

At the completion of lead dust removal a clearance inspection should be conducted by a Competent Person. The Competent Person should determine the requirements for clearance including any air monitoring or sample analysis that may be required.

Lead waste should be assessed and classified for disposal in accordance with the NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste*, November 2014.

All disposal receipts should be retained.

6.7 Ozone Depleting Substances

Ozone depleting substances were not identified during this assessment. In the event that air conditioning units are no longer required on site it is recommended that these units be degassed and removed by a suitably qualified, experienced and licensed contractor.

It is an offence under the *NSW Protection of the Environment Operations Act 1997* to wilfully or negligently cause any controlled substance to be emitted into the atmosphere in contravention of the regulations under the Act and in a manner that harms or is likely to harm the environment.

Controlled substances are defined under the Ozone Protection Act 1989 to include any substance specified in Schedule 1 (Ozone depleting substances) and certain other substances prescribed by the regulations as an ozone depleting substance.

7. Limitations

Douglas Partners Pty Ltd (DP) has prepared this Hazardous Building Materials Assessment report for this project at Darlington Public School, 417 Abercrombie Street, Darlington NSW in accordance with DP's proposal dated 13 March 2018 and acceptance received from Michael Cashell of Billard Leece Partnership Pty Ltd dated 16 March 2018. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Billard Leece Partnership Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the conditions on the site only at the specific inspection, sampling and/or testing locations, and then only to the extent safely accessible at the time the work was carried out. Site conditions can change and such changes may occur after DP's inspection, sampling and/or 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 site conditions across the site between and beyond the inspection, 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.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been inspected, sampled and/or analysed. This is either due to undetected variations in site conditions or to budget constraints (as discussed above), or to parts of the site being inaccessible and not available for inspection/sampling, or to occupants, furnishings or stored items preventing access for inspection and/or sampling. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond the inspection, sampling and/or testing locations, and hence no warranty can be given that all HBM have been identified.

Inspections are limited to areas that are safely accessible at the time of the inspection without undue damage to building finishes or disturbance of occupants. Inspections exclude hidden and inaccessible locations such as within building cavities, voids and enclosed sections of risers/shafts as well as materials encased within the building structure or located below the exposed ground surface (e.g. pipes, drains and formwork). In addition, residual asbestos materials (e.g. asbestos lagging to pipes and vessels) may remain undiscovered below newer, asbestos-free materials (e.g. preformed SMF insulation). Such residual asbestos materials may not be identified without extensive intrusive investigation and/or dismantling/demolition work.

Any disturbance of building materials, such as during renovation, maintenance or demolition work, may reveal additional HBM.

Limitations apply to the laboratory analytical methods used. For example, it can be very difficult or impossible to detect the presence of asbestos in some bulk materials (e.g. vinyl tiles) using the polarised light microscopy analytical method, even after ashing or disintegration of samples. This is due to the small length or diameter of asbestos fibres present in the material, or attributed to the fact that very fine fibres have been dispersed individually throughout the material.

While work is undertaken in a professional manner the nature of HBM and the limitations of the method(s) used mean that we cannot guarantee that all HBM have been identified. This report should therefore not be considered a definitive account of all HBM that may be present at the site.

DP personnel are not licenced or accredited quantity surveyors. Any quantities quoted in this report are provided for general guidance only and should not be relied upon. The services of a licenced quantity surveyor should be engaged in order to determine reliable quantities.

The recommendations and conclusions contained in this report shall not abrogate a person of their responsibility to work in accordance with statutory requirements, codes of practice, standards, guidelines, safety data sheets, work instructions or industry best practice.

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

Drawing 1

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd

OFFICE: Macarthur

DRAWN GAR

SCALE: 1:948

DATE: 16.03.2018

TITLE: **Site Locality Map**
Hazardous Building Materials Assessment
417 Abercrombie Street, Darlington NSW

PROJECT No: 92277.00

DRAWING No: 1

REVISION: A

Appendix B

Hazardous Building Materials (HBM) Register

DP Project No: 92277.00
Hazardous Building Materials (HBM) Register
417 Abercrombie Street, Darlington NSW

						Asbestos Risk Assessment									
Building	**Location (General)**	**Location (Specific)**	**Material**	**Sample No.**	**Material Status**	**Friability**	**Condition**	**Treatment**	**Accessibility**	**Activity**	**Ventilation**	**Risk Score**	**Action Priority**	**Photo No.**	**Summary Recommendation**
B00A - R0002	interior	garage walls	brick	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	1	No hazardous material identified.
B00A - R0003	interior	vermiculite in ceiling structure	vermiculite	Refer A1	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0004	interior	ceiling structure	vermiculite	Refer A1	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0005	interior	ceiling structure	vermiculite	Refer A1	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0006	interior	ceiling structure	vermiculite	Refer A1	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	2	No hazardous material identified.
B00A - R0006	interior	flooring material	vinyl tiles	A6	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	3	No hazardous material identified.
B00A - R0007	interior	ceiling structure	vermiculite	Refer A3	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0008	interior	ceiling structure	vermiculite	Refer A3	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0009	interior	flooring material	vinyl tiles	A2	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	4	No hazardous material identified.

DP Project No: 92277.00
Hazardous Building Materials (HBM) Register
417 Abercrombie Street, Darlington NSW

						Asbestos Risk Assessment									
Building	**Location (General)**	**Location (Specific)**	**Material**	**Sample No.**	**Material Status**	**Friability**	**Condition**	**Treatment**	**Accessibility**	**Activity**	**Ventilation**	**Risk Score**	**Action Priority**	**Photo No.**	**Summary Recommendation**
B00A - R0010	interior	ceiling structure	vermiculite	Refer A1	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0011	interior	ceiling structure	vermiculite	Refer A1	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	5	No hazardous material identified.
B00A - R0012	interior	ceiling structure	vermiculite	A1	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0013	interior	ceiling structure	flat fibre cement sheeting	R0013 - S1 in PB (2017)	asbestos detected by analysis	1	0	1	1	2	1	6	Low	-	Enclose asbestos - Consider enclosing asbestos within a separate and continuous physical barrier. Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R0014	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00A - R0015	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00A - R0016	interior	ceiling structure	vermiculite	Refer A3	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0017	interior	ceiling structure	vermiculite	A3	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	6	No hazardous material identified.
B00A - R0017	interior	flooring material	vinyl tiles	A4	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	7	No hazardous material identified.

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						Asbestos Risk Assessment									
Building	Location (General)	Location (Specific)	Material	Sample No.	Material Status	Friability	Condition	Treatment	Accessibility	Activity	Ventilation	Risk Score	Action Priority	Photo No.	Summary Recommendation
B00A - R0017	interior	steel bars on windows	paint	L1	lead paint (>0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	refer 7	Lead paint - Areas of damaged/flaking lead paint and any associated debris should be removed by a suitably qualified and experienced contractor. Consider sealing or enclosing any remaining lead paint per AS4361. Reinspect condition on a regular basis. Avoid disturbance.
B00A - R0017	interior	above light fitting	dust	D1	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	refer 6	Dust settled on surfaces - Consider further investigation of lead concentrations in dust to assess the risk of exposure during building occupation. Lead contaminated dust should be removed by a suitably qualified and experienced contractor and a clearance certificate should be issued by a Competent Person for the removal work.
B00A - R0018	interior	distribution board	-	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00A - R0019	interior	flooring material	vinyl tiles	Refer A4	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0019	interior	hand rails on stairs	yellow paint	L3	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8	No hazardous material identified.
B00A - R0020	interior	general store room	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0021	interior	partitions in toilet	compressed fibre cement sheeting	A5	asbestos detected by analysis	1	1	1	2	2	1	8	Low	10	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R0022	interior	partitions in toilet	compressed fibre cement sheeting	Refer A5	asbestos (assumed)	1	1	1	2	2	1	8	Low	9	Enclose asbestos - Consider enclosing asbestos within a separate and continuous physical barrier. Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).

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Building	Location (General)	Location (Specific)	Material	Sample No.	Material Status	Asbestos Risk Assessment								Photo No.	Summary Recommendation
						Friability	Condition	Treatment	Accessibility	Activity	Ventilation	Risk Score	Action Priority		
B00A - R0023	interior	brick walls	beige paint	L4	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11	No hazardous material identified.
B00A - R0024	interior	flooring material	vinyl tiles	AR0009 -S2 in PB (2017)	asbestos detected by analysis	0	1	1	1	2	1	6	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R0025	interior	flooring material	vinyl tiles	A7	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	12	No hazardous material identified.
B00A - R0026	interior	flooring material	vinyl tiles	AR0027 -S5 in PB (2017)	asbestos detected by analysis	0	1	2	2	2	1	8	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R0027	interior	flooring material	vinyl tiles	AR0027 -S5 in PB (2017)	asbestos detected by analysis	0	1	2	2	2	1	8	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).

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Building	Location (General)	Location (Specific)	Material	Sample No.	Material Status	Asbestos Risk Assessment								Photo No.	Summary Recommendation
						Friability	Condition	Treatment	Accessibility	Activity	Ventilation	Risk Score	Action Priority		
B00A - R0029	interior	partitions in toilet	compressed fibre cement sheeting	Refer A5	asbestos (assumed)	1	1	1	2	2	1	8	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R0030	interior	partitions in toilet	compressed fibre cement sheeting	Refer A5	asbestos (assumed)	1	1	1	2	2	1	8	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R0030	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0031	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0032	interior	flooring material	vinyl tiles under flooring	AR0009 - S2 in PB (2017)	asbestos detected by analysis	0	0	1	1	2	1	5	Low	13	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R0034	interior	stairs	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0035	interior	timber cornices	white paint	L21	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	No hazardous material identified.
B00A - R0035	interior	manhole	dust	D7	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	Dust settled on surfaces - Consider further investigation of lead concentrations in dust to assess the risk of exposure during building occupation. Lead contaminated dust should be removed by a suitably qualified and experienced contractor and a clearance certificate should be issued by a Competent Person for the removal work.

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						Asbestos Risk Assessment									
Building	**Location (General)**	**Location (Specific)**	**Material**	**Sample No.**	**Material Status**	**Friability**	**Condition**	**Treatment**	**Accessibility**	**Activity**	**Ventilation**	**Risk Score**	**Action Priority**	**Photo No.**	**Summary Recommendation**
B00A - R0036	interior	ceiling structure	vermiculite	Refer A6	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R0037	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R1001	interior	brick walls	beige paint	L13	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	14	No hazardous material identified.
B00A - R1002	interior	brick walls	beige paint	L12	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	No hazardous material identified.
B00A - R1002	interior	timber rafters	dust above rafters	D3	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15	Dust settled on surfaces - Consider further investigation of lead concentrations in dust to assess the risk of exposure during building occupation. Lead contaminated dust should be removed by a suitably qualified and experienced contractor and a clearance certificate should be issued by a Competent Person for the removal work.
B00A - R1002	interior	flooring material	vinyl tiles	A13	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R1003	interior	ceiling structure	fibre cement sheeting	A11	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R1003	interior	timber rafters	brown paint	L11	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	16	No hazardous material identified.

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Building	Location (General)	Location (Specific)	Material	Sample No.	Material Status	Asbestos Risk Assessment								Photo No.	Summary Recommendation
						Friability	Condition	Treatment	Accessibility	Activity	Ventilation	Risk Score	Action Priority		
B00A - R1004	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00A - R1005	interior	flooring material	vinyl tiles under flooring	AR0009 -S2 in PB (2017)	asbestos detected by analysis	0	0	1	1	2	1	5	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R1006	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00A - R1007	interior	distribution board	-	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00A - R1008	interior	wall in hallway	gyprock / plaster board type material	A12	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00A - R1008	interior	light fitting	dust above fitting	D11	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	Dust settled on surfaces - Consider further investigation of lead concentrations in dust to assess the risk of exposure during building occupation. Lead contaminated dust should be removed by a suitably qualified and experienced contractor and a clearance certificate should be issued by a Competent Person for the removal work.
B00A - R1009	interior	partitions in toilet	compressed fibre cement sheeting	Refer A5	asbestos (assumed)	1	1	1	1	2	1	7	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R1010	interior	partitions in toilet	compressed fibre cement sheeting	Refer A5	asbestos (assumed)	1	1	1	1	2	1	7	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).

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Building	**Location (General)**	**Location (Specific)**	**Material**	**Sample No.**	**Material Status**	**Friability**	**Condition**	**Treatment**	**Accessibility**	**Activity**	**Ventilation**	**Risk Score**	**Action Priority**	**Photo No.**	**Summary Recommendation**
B00A - R1011	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00A - R1012	interior	ceiling	fibre cement sheeting	A24	asbestos detected by analysis	1	1	1	1	2	1	7	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R1013	interior	partitions in toilet	compressed fibre cement sheeting	Refer A5	asbestos (assumed)	1	1	1	1	2	1	7	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R1013	interior	flooring material	vinyl tiles under flooring	AR0009 - S2 in PB (2017)	asbestos detected by analysis	0	0	1	1	2	1	5	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R1014	interior	partitions in toilet	compressed fibre cement sheeting	Refer A5	asbestos (assumed)	1	1	1	1	2	1	7	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R1014	interior	flooring material	vinyl tiles under flooring	AR0009 - S2 in PB (2017)	asbestos detected by analysis	0	0	1	1	2	1	5	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R1015	interior	ceiling structure	flat fibre cement sheeting	AR1013 - S6 in PB (2017)	asbestos detected by analysis	1	0	1	1	2	1	6	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R1016	interior	ceiling structure	flat fibre cement sheeting	AR1013 - S6 in PB (2017)	asbestos detected by analysis	1	0	1	1	2	1	6	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R1016	interior	timber cornices	flaking paint	L17	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	No hazardous material identified.

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Building	**Location (General)**	**Location (Specific)**	**Material**	**Sample No.**	**Material Status**	**Friability**	**Condition**	**Treatment**	**Accessibility**	**Activity**	**Ventilation**	**Risk Score**	**Action Priority**	**Photo No.**	**Summary Recommendation**
B00A - R1017	interior	throughout	materials in general	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	17	No hazardous material identified.
B00A - R1018	interior	partitions in toilet	compressed fibre cement sheeting	Refer A14	asbestos detected by analysis	1	1	1	2	2	1	8	Low	18	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R1019	interior	partitions in toilet	compressed fibre cement sheeting	A14	asbestos detected by analysis	1	1	1	2	2	1	8	Low	19	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00A - R1020	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.

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						Friability	Condition	Treatment	Accessibility	Activity	Ventilation	Risk Score	Action Priority		
B00B - R0001	interior	ceiling structure	vermiculite	Refer A21	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0002	interior	ceiling structure	vermiculite	Refer A21	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0003	interior	ceiling structure	vermiculite	Refer A21	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0004	interior	ceiling structure	vermiculite	Refer A21	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0005	interior	ceiling structure	vermiculite	A21	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0005	interior	concrete ceiling beam	white paint	L23	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0006	interior	flooring material	vinyl tiles under flooring	AR0027 - S5 in PB (2017)	asbestos detected by analysis	0	0	0	1	2	1	4	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00B - R0007	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0008	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.

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B00B - R0009	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0010	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0011	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0012	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0013	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0014	interior	ceiling structure	vermiculite	A17	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0014	interior	brick walls	blue paint	L20	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0015	interior	timber door	brown paint	L19	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.

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B00B - R0016	interior	within manhole	dust above manhole cover	D6	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NIL	-	Ceiling/floor cavity - Restrict access. Persons entering the area should undertake a risk assessment and implement suitable controls to prevent exposure. Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00B - R0016	interior	flooring material	vinyl tiles under flooring	A16	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0017	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0018	interior	flooring material	vinyl tiles under flooring	Refer A16	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0019	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0020	interior	flooring material	vinyl tiles under flooring	Refer A16	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0020	interior	timber rafters	blue paint	L24	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	20	No hazardous material identified.
B00B - R0021	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.

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B00B - R0022	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0023	interior	wall in hallway	vermiculite	Refer A17	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0024	exterior	awning	flaking yellow paint	L18	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0024	interior	board on wall	fibre material	A20	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R0025	interior	fibre cement sheeting on wall	fibre cement sheeting	A19	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	21	No hazardous material identified.
B00B - R0025	interior	fibre cement sheeting on wall	fibre cement sheeting	A23	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	22	No hazardous material identified.

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						Friability	Condition	Treatment	Accessibility	Activity	Ventilation	Risk Score	Action Priority		
B00B - R0025	interior	fibre cement sheeting on wall	fibre cement sheeting	A18	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	23	No hazardous material identified.
B00B - R1002	interior	flooring material	vinyl tiles under flooring	AR0027 - S5 in PB (2017)	asbestos detected by analysis	0	0	0	1	2	1	4	Low	24	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00B - R1003	interior	flooring material	vinyl tiles under flooring	A15	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	25	No hazardous material identified.
B00B - R1003	interior	light fitting	dust above light fitting	D5	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	26	Dust settled on Surfaces - Consider further investigation of lead concentrations in dust to assess the risk of exposure during building occupation. Lead contaminated dust should be removed by a suitably qualified and experienced contractor and a clearance certificate should be issued by a Competent Person for the removal work.
B00B - R1004	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R1006	interior	ceiling structure	flat fibre cement sheeting	AR1013 - S6 in PB (2017)	asbestos detected by analysis	1	0	1	1	2	1	6	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00B - R1007	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R1008	interior	timber rafters	brown paint	L14	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	27	No hazardous material identified.

DP Project No: 92277.00
Hazardous Building Materials (HBM) Register
417 Abercrombie Street, Darlington NSW

						Asbestos Risk Assessment									
Building	**Location (General)**	**Location (Specific)**	**Material**	**Sample No.**	**Material Status**	**Friability**	**Condition**	**Treatment**	**Accessibility**	**Activity**	**Ventilation**	**Risk Score**	**Action Priority**	**Photo No.**	**Summary Recommendation**
B00B - R1008	interior	brick wall	dust above brick wall	D4	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	Dust settled on Surfaces - Consider further investigation of lead concentrations in dust to assess the risk of exposure during building occupation. Lead contaminated dust should be removed by a suitably qualified and experienced contractor and a clearance certificate should be issued by a Competent Person for the removal work.
B00B - R1009	interior	timber cornices near ceiling	paint	L16	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R1010	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00B - R1011	interior	timber skirting board near flooring	yellow paint	L15	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	28	No hazardous material identified.
B00B - R1012	interior	fibre cement sheeting on wall	fibre cement sheeting	Refer A18, A19 and A23	non asbestos (assumed)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R1013	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00B - R1014	interior	ceiling structure	white flaking paint	BR1014 - L22	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	29	No hazardous material identified.

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Hazardous Building Materials (HBM) Register
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						Asbestos Risk Assessment									
Building	**Location (General)**	**Location (Specific)**	**Material**	**Sample No.**	**Material Status**	**Friability**	**Condition**	**Treatment**	**Accessibility**	**Activity**	**Ventilation**	**Risk Score**	**Action Priority**	**Photo No.**	**Summary Recommendation (Management Survey)**
B00C - R0001	interior	timber door frame	brown paint	AR0001 - L5	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	No hazardous material identified.
B00C - R0001	interior	door frame	dust above door frame	D9	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NIL	-	Dust settled on surfaces - Consider further investigation of lead concentrations in dust to assess the risk of exposure during building occupation. Lead contaminated dust should be removed by a suitably qualified and experienced contractor and a clearance certificate should be issued by a Competent Person for the removal work.
B00C - R0002	interior	timber door frame	brown paint	L9	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	31	No hazardous material identified.
B00C - R0003	interior	flooring material	vinyl tiles under flooring	AR0027 - S5 PB (2017)	asbestos detected by analysis	0	0	1	1	2	1	5	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00C - R0004	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00C - R0005	interior	ceiling structure	fibre cement sheeting	A8	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	32	No hazardous material identified.
B00C - R0005	interior	ceiling structure	dust above water pipe	D12	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NIL	33	Dust settled on surfaces - Consider further investigation of lead concentrations in dust to assess the risk of exposure during building occupation. Lead contaminated dust should be removed by a suitably qualified and experienced contractor and a clearance certificate should be issued by a Competent Person for the removal work.
B00C - R0006	interior	flooring material	vinyl tiles	A9	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	34	No hazardous material identified.

						Asbestos Risk Assessment									
Building	**Location (General)**	**Location (Specific)**	**Material**	**Sample No.**	**Material Status**	**Friability**	**Condition**	**Treatment**	**Accessibility**	**Activity**	**Ventilation**	**Risk Score**	**Action Priority**	**Photo No.**	**Summary Recommendation (Management Survey)**
B00C - R0007	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00C - R0008	interior	flooring material	vinyl material under flooring	CR0008 - S8 in PB (2017)	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00C - R0010	interior	partitions in toilet	compressed fibre cement sheeting	Refer A14	asbestos (assumed)	1	1	1	1	2	1	7	Low	35	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00C - R0010	interior	partitions in toilet	beige paint	L7	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	No hazardous material identified.
B00C - R0011	interior	partitions in toilet	compressed fibre cement sheeting	Refer A14	asbestos (assumed)	1	1	1	1	2	1	7	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00C - R0013	interior	ceiling structure	ceiling sheeting	A10	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00C- R0014	interior	ceiling structure	flat fibre cement sheeting	AR1013 - S6 in PB (2017)	asbestos detected by analysis	1	0	1	1	2	1	6	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00C - R0014	interior	flooring material	vinyl tiles under flooring	CR0008 - S8 in PB (2017)	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00C - R0016	interior	flooring material	vinyl tiles under flooring	Refer AR0027 - S5 in PB (2017)	asbestos detected by analysis	0	0	1	1	2	1	5	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).

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Hazardous Building Materials (HBM) Register
417 Abercrombie Street, Darlington NSW

Building	Location (General)	Location (Specific)	Material	Sample No.	Material Status	Asbestos Risk Assessment								Photo No.	Summary Recommendation (Management Survey)
						Friability	Condition	Treatment	Accessibility	Activity	Ventilation	Risk Score	Action Priority		
B00C - R0017	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00C - R0018	interior	flooring material	vinyl tiles under flooring	CR0008 - S8 in NPB (2017)	no asbestos detected by analysis	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00C - R0019	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00C - R0020	interior	timber door	yellow paint	L6	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00C - R0021	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00C - R0022	interior	door frame	dust above door frame	D2	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	Dust settled on surfaces - Consider further investigation of lead concentrations in dust to assess the risk of exposure during building occupation. Lead contaminated dust should be removed by a suitably qualified and experienced contractor and a clearance certificate should be issued by a Competent Person for the removal work.
B00C- R0023	interior	ceiling structure	flat fibre cement sheeting	CR0013 - S9 in PB (2017)	asbestos detected by analysis	1	0	1	1	2	1	6	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00C - R0024	exterior	hand rails	yellow paint	L10	lead paint (>0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	36	Lead paint (damaged) - Areas of damaged/flaking lead paint and any associated debris should be removed by a suitably qualified and experienced contractor. Consider sealing or enclosing any remaining lead paint per AS4361. Reinspect condition on a regular basis. Avoid disturbance.

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Hazardous Building Materials (HBM) Register
417 Abercrombie Street, Darlington NSW

						Asbestos Risk Assessment									
Building	**Location (General)**	**Location (Specific)**	**Material**	**Sample No.**	**Material Status**	**Friability**	**Condition**	**Treatment**	**Accessibility**	**Activity**	**Ventilation**	**Risk Score**	**Action Priority**	**Photo No.**	**Summary Recommendation (Management Survey)**
B00C- R0024	interior	ceiling structure	flat fibre cement sheeting	CR0023 - S9 in PB (2017)	asbestos detected by analysis	1	0	1	1	2	1	6	Low	-	Reinspect hazardous material - Reinspect condition on a regular basis. Remove material prior to any significant disturbance (e.g. renovation, demolition or maintenance work).
B00C - R0025	interior	brick column	dust above column	D10	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	37	Dust settled on surfaces - Consider further investigation of lead concentrations in dust to assess the risk of exposure during building occupation. Lead contaminated dust should be removed by a suitably qualified and experienced contractor and a clearance certificate should be issued by a Competent Person for the removal work.
B00C - R0029	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	38	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00C - R0030	interior	flooring material	vinyl tiles under flooring	N/A	no asbestos identified visually	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No asbestos/hazardous materials identified in PB (2017) or this assessment.
B00C - R0031	interior	timber door	brown paint	Refer L10	lead paint (>0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	36	Lead paint (damaged) - Areas of damaged/flaking lead paint and any associated debris should be removed by a suitably qualified and experienced contractor. Consider sealing or enclosing any remaining lead paint per AS4361. Reinspect condition on a regular basis. Avoid disturbance.
B00C - R0031	interior	timber door	dust above door frame	D8	elevated lead (>0.5 mg/m2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	Dust settled on surfaces - Consider further investigation of lead concentrations in dust to assess the risk of exposure during building occupation. Lead contaminated dust should be removed by a suitably qualified and experienced contractor and a clearance certificate should be issued by a Competent Person for the removal work.
B00C - R0032	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.

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Building	Location (General)	Location (Specific)	Material	Sample No.	Material Status	Asbestos Risk Assessment: Friability	Condition	Treatment	Accessibility	Activity	Ventilation	Risk Score	Action Priority	Photo No.	Summary Recommendation (Management Survey)
B00C - R0033	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.
B00C - R0034	interior	timber door	brown paint	L8	non-lead paint (≤0.1% lead w/w)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	39	No hazardous material identified.
B00C - R0035	interior	-	-	-	nil hazardous materials identified	N/A	N/A	N/A	N/A	N/A	N/A	0	NIL	-	No hazardous material identified.

Appendix C

Laboratory Certificate(s) of Analysis and Chain-of-Custody documentation

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200   fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 187473

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Grant Russell
Address	18 Waler Crescent, Smeaton Grange, NSW, 2567

Sample Details

Your Reference	**92277.00, Darlington Public Hazmat Survey**
Number of Samples	23 Material, 24 Paint, 12 Swab
Date samples received	16/03/2018
Date completed instructions received	16/03/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	23/03/2018
Date of Issue	23/03/2018

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Asbestos Approved By
Analysed by Asbestos Approved Identifier: Jessica Hie
Authorised by Asbestos Approved Signatory: Lulu Scott

Results Approved By
Jaimie Loa-Kum-Cheung, Senior Chemist
Long Pham, Team Leader, Metals
Lulu Scott, Asbestos Supervisor

Authorised By

David Springer, General Manager

Client Reference: 92277.00, Darlington Public Hazmat Survey

Asbestos ID - materials						
Our Reference		187473-1	187473-2	187473-3	187473-4	187473-5
Your Reference	UNITS	A1	A2	A3	A4	A5
Date Sampled		14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Type of sample		Material	Material	Material	Material	Material
Date analysed	-	21/03/2018	21/03/2018	21/03/2018	21/03/2018	21/03/2018
Mass / Dimension of Sample	-	12x10x1mm	16x12x4mm	15x12x3mm	23x14x4mm	6x6x1mm
Sample Description	-	Beige crumbly mica material	Blue brittle vinyl tile	Beige crumbly mica material	Blue brittle vinyl tile	Beige fibre cement material
Asbestos ID in materials	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	Chrysotile asbestos detected

Asbestos ID - materials						
Our Reference		187473-6	187473-7	187473-8	187473-9	187473-10
Your Reference	UNITS	A6	A7	A8	A9	A10
Date Sampled		14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Type of sample		Material	Material	Material	Material	Material
Date analysed	-	21/03/2018	21/03/2018	21/03/2018	21/03/2018	21/03/2018
Mass / Dimension of Sample	-	20x11x4mm	30x20x2mm	100x20x5mm	25x12x2mm	20x15x3mm
Sample Description	-	Blue brittle vinyl tile	Green flexible vinyl tile	Beige compressed fibre cement material	Green flexible vinyl tile	White crumbly plaster material
Asbestos ID in materials	-	No asbestos detected	No asbestos detected	No asbestos detected Organic fibres detected	No asbestos detected	No asbestos detected

Asbestos ID - materials						
Our Reference	UNITS	187473-11	187473-12	187473-13	187473-14	187473-15
Your Reference		A11	A12	A13	A14	A15
Date Sampled		14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Type of sample		Material	Material	Material	Material	Material
Date analysed	-	21/03/2018	21/03/2018	21/03/2018	21/03/2018	21/03/2018
Mass / Dimension of Sample	-	40x25x2mm	50x50x10mm	40x20x3mm	20x14x2mm	47x22x2mm
Sample Description	-	Beige fibrous membrane	Plaster & fibrous membrane	Blue brittle vinyl tile	Beige compressed fibre cement material	Green brittle vinyl tile
Asbestos ID in materials	-	No asbestos detected Organic fibres detected	No asbestos detected Organic fibres detected	No asbestos detected Organic fibres detected	Chrysotile asbestos detected	No asbestos detected

Asbestos ID - materials						
Our Reference	UNITS	187473-16	187473-17	187473-18	187473-19	187473-20
Your Reference		A16	A17	A18	A19	A20
Date Sampled		14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Type of sample		Material	Material	Material	Material	Material
Date analysed	-	21/03/2018	21/03/2018	21/03/2018	21/03/2018	21/03/2018
Mass / Dimension of Sample	-	25x18x2mm	15x8x4mm	30x20x3mm	30x10x3mm	10x6x4mm
Sample Description	-	Blue flexible vinyl tile	Beige crumbly mica material	Beige layered fibre cement material	Grey fibre cement material	Woodchip material
Asbestos ID in materials	-	No asbestos detected	No asbestos detected	No asbestos detected Organic fibres detected	No asbestos detected Organic fibres detected	No asbestos detected Organic fibres detected

Asbestos ID - materials				
Our Reference		187473-21	187473-22	187473-23
Your Reference	UNITS	A21	A23	A24
Date Sampled		14/03/2018	14/03/2018	14/03/2018
Type of sample		Material	Material	Material
Date analysed	-	21/03/2018	21/03/2018	21/03/2018
Mass / Dimension of Sample	-	14x12x2mm	40x20x2mm	30x20x3mm
Sample Description	-	Beige crumbly mica material	Grey layered fibre cement material	Beige compressed fibre cement material
Asbestos ID in materials	-	No asbestos detected	No asbestos detected Organic fibres detected	Chrysotile asbestos detected Organic fibres detected

Lead in Paint						
Our Reference		187473-24	187473-25	187473-26	187473-27	187473-28
Your Reference	UNITS	L1	L2	L3	L4	L5
Date Sampled		14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Type of sample		Paint	Paint	Paint	Paint	Paint
Date prepared	-	19/03/2018	19/03/2018	19/03/2018	19/03/2018	19/03/2018
Date analysed	-	20/03/2018	20/03/2018	20/03/2018	20/03/2018	20/03/2018
Lead in paint	%w/w	0.58	<0.05	0.08	<0.05	<0.05

Lead in Paint						
Our Reference		187473-29	187473-30	187473-31	187473-32	187473-33
Your Reference	UNITS	L6	L7	L8	L9	L10
Date Sampled		14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Type of sample		Paint	Paint	Paint	Paint	Paint
Date prepared	-	19/03/2018	19/03/2018	19/03/2018	19/03/2018	19/03/2018
Date analysed	-	20/03/2018	20/03/2018	20/03/2018	20/03/2018	20/03/2018
Lead in paint	%w/w	<0.05	<0.05	<0.05	<0.05	0.3

Lead in Paint						
Our Reference		187473-34	187473-35	187473-36	187473-37	187473-38
Your Reference	UNITS	L11	L12	L13	L14	L15
Date Sampled		14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Type of sample		Paint	Paint	Paint	Paint	Paint
Date prepared	-	19/03/2018	19/03/2018	19/03/2018	19/03/2018	19/03/2018
Date analysed	-	20/03/2018	20/03/2018	20/03/2018	20/03/2018	20/03/2018
Lead in paint	%w/w	<0.05	<0.05	<0.05	<0.05	<0.05

Lead in Paint						
Our Reference		187473-39	187473-40	187473-41	187473-42	187473-43
Your Reference	UNITS	L16	L17	L18	L19	L20
Date Sampled		14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Type of sample		Paint	Paint	Paint	Paint	Paint
Date prepared	-	19/03/2018	19/03/2018	19/03/2018	19/03/2018	19/03/2018
Date analysed	-	20/03/2018	20/03/2018	20/03/2018	20/03/2018	20/03/2018
Lead in paint	%w/w	<0.05	<0.05	<0.05	<0.05	<0.05

Lead in Paint					
Our Reference		187473-44	187473-45	187473-46	187473-47
Your Reference	UNITS	L21	L22	L23	L24
Date Sampled		14/03/2018	14/03/2018	14/03/2018	14/03/2018
Type of sample		Paint	Paint	Paint	Paint
Date prepared	-	19/03/2018	19/03/2018	19/03/2018	19/03/2018
Date analysed	-	20/03/2018	20/03/2018	20/03/2018	20/03/2018
Lead in paint	%w/w	<0.05	<0.05	<0.05	<0.05

Lead in swab						
Our Reference		187473-48	187473-49	187473-50	187473-51	187473-52
Your Reference	UNITS	D1	D2	D3	D4	D5
Date Sampled		14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Type of sample		Swab	Swab	Swab	Swab	Swab
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Lead in Swabs	µg/swab	29	37	12	16	16

Lead in swab						
Our Reference		187473-53	187473-54	187473-55	187473-56	187473-57
Your Reference	UNITS	D6	D7	D8	D9	D10
Date Sampled		14/03/2018	14/03/2018	14/03/2018	14/03/2018	14/03/2018
Type of sample		Swab	Swab	Swab	Swab	Swab
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Lead in Swabs	µg/swab	20	14	12	7	55

Lead in swab			
Our Reference		187473-58	187473-59
Your Reference	UNITS	D11	D12
Date Sampled		14/03/2018	14/03/2018
Type of sample		Swab	Swab
Date prepared	-	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018
Lead in Swabs	µg/swab	39	39

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Metals-004	Digestion of Paint chips/scrapings/liquids for Metals determination by ICP-AES/MS and or CV/AAS.
Metals-005	Digestion of Dust wipes/swabs and /or miscellaneous samples for Metals determination by ICP-AES/MS and/or CV-AAS

QUALITY CONTROL: Lead in Paint						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	[NT]
Date prepared	-			19/03/2018	41	19/03/2018	19/03/2018		19/03/2018	[NT]
Date analysed	-			20/03/2018	41	20/03/2018	20/03/2018		20/03/2018	[NT]
Lead in paint	%w/w	0.05	Metals-004	<0.05	41	<0.05	<0.05	0	101	[NT]

QUALITY CONTROL: Lead in Paint						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	[NT]
Date prepared	-			[NT]	[NT]	[NT]	[NT]	[NT]	19/03/2018	[NT]
Date analysed	-			[NT]	[NT]	[NT]	[NT]	[NT]	20/03/2018	[NT]
Lead in paint	%w/w	0.05	Metals-004	[NT]	[NT]	[NT]	[NT]	[NT]	104	[NT]

QUALITY CONTROL: Lead in swab					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			22/03/2018	[NT]	[NT]	[NT]	[NT]	22/03/2018	[NT]
Date analysed	-			22/03/2018	[NT]	[NT]	[NT]	[NT]	22/03/2018	[NT]
Lead in Swabs	μg/swab	1	Metals-005	<1	[NT]	[NT]	[NT]	[NT]	111	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Darlington Public School Hazmat Survey			**To:**	Envirolab Services		
Project No:	92277.00	**Sampler:**	Grant Russell		12 Ashley Street, Chatswood NSW 2067		
Project Mgr:	Grant Russell	**Mob. Phone:**	0418 116 545	**Attn:**	Tania Notaras		
Email:	Grant.Russell@Douglaspartners.com.au;			**Phone:**	(02) 9910 6200	**Fax:**	(02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au		

Sample ID	Lab ID	Date Sampled	Sample Type S - Soil M - Material	Container Type G - Glass P - Plastic	Analytes Asbestos	Lead								Notes/preservation
A1	1	14/03/18	M	P	x									
A2	2	14/03/18	M	P	x									
A3	3	14/03/18	M	P	x									
A4	4	14/03/18	M	P	x									
A5	5	14/03/18	M	P	x									
A6	6	14/03/18	M	P	x									
A7	7	14/03/18	M	P	x									
A8	8	14/03/18	M	P	x									
A9	9	14/03/18	M	P	x									
A10	10	14/03/18	M	P	x									
A11	11	14/03/18	M	P	x									
A12	12	14/03/18	M	P	x									
A13	13	14/03/18	M	P	x									

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No 187473
Date Received: 16/3/18
Time Received: 18.30
Received by: RN
Temp: Cool/[✓ Ambient]
Cooling: Ice/Icepack
Security: [✓ Intact]/Broken/None

Lab Report No:

Send Results to: Douglas Partners Pty Ltd **Address:** 18 Waler Crescent, Smeaton Grange 2567 **Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886

Relinquished by: LOC **Transported to laboratory by:**

Signed: **Date & Time:** 16/3/18 **Received by:** ELS Rebecca RN 16/3/18 18.30

Form COC

Page 1 of 1

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Darlington Public School Hazmat Survey			**To:**	Envirolab Services
Project No:	92277.00	**Sampler:**	Grant Russell		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Grant Russell	**Mob. Phone:**	0418 116 545	**Attn:**	Tania Notaras
Email:	Grant.Russell@Douglaspartners.com.au;			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type	Container Type	Analytes									Notes/preservation
			S - Soil M - Material	G - Glass P - Plastic	Asbestos	Lead								
A14	14	14/03/18	M	P	x									
A15	15	14/03/18	M	P	x									
A16	16	14/03/18	M	P	x									
A17	17	14/03/18	M	P	x									
A18	18	14/03/18	M	P	x									
A19	19	14/03/18	M	P	x									
A20	20	14/03/18	M	P	x									
A21	21	14/03/18	M	P	x									
~~A22~~		~~14/03/18~~	~~M~~	~~P~~	~~x~~									
A23	22	14/03/18	M	P	x									
A24	23	14/03/18	M	P	x									
L1	24	14/03/18	M	P		x								

Lab Report No:	187473				
Send Results to:	Douglas Partners Pty Ltd	**Address:** 18 Waler Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 16/03/2018	**Received by:**	16/3	

Form COC

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Darlington Public School Hazmat Survey			**To:**	Envirolab Services
Project No:	92277.00	**Sampler:**	Grant Russell		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Grant Russell	**Mob. Phone:**	0418 116 545	**Attn:**	Tania Notaras
Email:	Grant.Russell@Douglaspartners.com.au;			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type	Container Type	Analytes									Notes/preservation
			S - Soil M - Material	G - Glass P - Plastic	Asbestos	Lead								
L2	25	14/03/18	M	P		x								
L3	26	14/03/18	M	P		x								
L4	27	14/03/18	M	P		x								
L5	28	14/03/18	M	P		x								
L6	29	14/03/18	M	P		x								
L7	30	14/03/18	M	P		x								
L8	31	14/03/18	M	P		x								
L9	32	14/03/18	M	P		x								
L10	33	14/03/18	M	P		x								
L11	34	14/03/18	M	P		x								
L12	35	14/03/18	M	P		x								
L13	36	14/03/18	M	P		x								
L14	37	14/03/18	M	P		x								

Lab Report No: 187473

Send Results to: Douglas Partners Pty Ltd **Address:** 18 Waler Crescent, Smeaton Grange 2567 **Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886

Relinquished by: LOC **Transported to laboratory by:**

Signed: **Date & Time:** 16/03/2018 **Received by:** RN 16/3

Form COC

Page 3 of 5

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name: Darlington Public School Hazmat Survey
Project No: 92277.00
Sampler: Grant Russell
Project Mgr: Grant Russell
Mob. Phone: 0418 116 545
Email: Grant.Russell@Douglaspartners.com.au;
Date Required: Standard

To: Envirolab Services
12 Ashley Street, Chatswood NSW 2067
Attn: Tania Notaras
Phone: (02) 9910 6200 **Fax:** (02) 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type	Container Type	Analytes									Notes/preservation
			S - Soil M - Material	G - Glass P - Plastic	Asbestos	Lead								
L15	38	14/03/18	M	P		x								
L16	39	14/03/18	M	P		x								
L17	40	14/03/18	M	P		x								
L18	41	14/03/18	M	P		x								
L19	42	14/03/18	M	P		x								
L20	43	14/03/18	M	P		x								
L21	44	14/03/18	M	P		x								
L22	45	14/03/18	M	P		x								
L23	46	14/03/18	M	P		x								
L24	47	14/03/18	M	P		x								
D1	48	14/03/18	M	P		x								
D2	49	14/03/18	M	P		x								
D3	50	14/03/18	M	P		x								

Lab Report No: 187473
Send Results to: Douglas Partners Pty Ltd **Address:** 18 Waler Crescent, Smeaton Grange 2567 **Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886
Relinquished by: LOC
Signed: **Date & Time:** 16/03/2018
Transported to laboratory by:
Received by: RW 16/3

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Darlington Public School Hazmat Survey			**To:**	Envirolab Services		
Project No:	92277.00	**Sampler:**	Grant Russell		12 Ashley Street, Chatswood NSW 2067		
Project Mgr:	Grant Russell	**Mob. Phone:**	0418 116 545	**Attn:**	Tania Notaras		
Email:	Grant.Russell@Douglaspartners.com.au;			**Phone:**	(02) 9910 6200	**Fax:**	(02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au		

Sample ID	Lab ID	Date Sampled	Sample Type S - Soil M - Material	Container Type G - Glass P - Plastic	Analytes Asbestos	Lead								Notes/preservation
D4	51	14/03/18	M	P		x								
D5	52	14/03/18	M	P		x								
D6	53	14/03/18	M	P		x								
D7	54	14/03/18	M	P		x								
D8	55	14/03/18	M	P		x								
D9	56	14/03/18	M	P		x								
D10	57	14/03/18	M	P		x								
D11	58	14/03/18	M	P		x								
D12	59	14/03/18	M	P		x								

Lab Report No: 187073

Send Results to: Douglas Partners Pty Ltd **Address:** 18 Waler Crescent, Smeaton Grange 2567 **Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886

Relinquished by: LOC **Transported to laboratory by:**

Signed: **Date & Time:** 16/03/2018 **Received by:** 16/3

Form COC

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200   fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Grant Russell

Sample Login Details	
Your reference	92277.00, Darlington Public Hazmat Survey
Envirolab Reference	187473
Date Sample Received	16/03/2018
Date Instructions Received	16/03/2018
Date Results Expected to be Reported	23/03/2018

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	23 Material, 24 Paint, 12 Swab
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	Ambient
Cooling Method	-
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Sample ID	Asbestos ID - materials	Lead in Paint	Lead in swab
A1	✓		
A2	✓		
A3	✓		
A4	✓		
A5	✓		
A6	✓		
A7	✓		
A8	✓		
A9	✓		
A10	✓		
A11	✓		
A12	✓		
A13	✓		
A14	✓		
A15	✓		
A16	✓		
A17	✓		
A18	✓		
A19	✓		
A20	✓		
A21	✓		
A23	✓		
A24	✓		
L1		✓	
L2		✓	
L3		✓	
L4		✓	
L5		✓	
L6		✓	
L7		✓	
L8		✓	
L9		✓	

Sample ID	Asbestos ID - materials	Lead in Paint	Lead in swab
L10		✓	
L11		✓	
L12		✓	
L13		✓	
L14		✓	
L15		✓	
L16		✓	
L17		✓	
L18		✓	
L19		✓	
L20		✓	
L21		✓	
L22		✓	
L23		✓	
L24		✓	
D1			✓
D2			✓
D3			✓
D4			✓
D5			✓
D6			✓
D7			✓
D8			✓
D9			✓
D10			✓
D11			✓
D12			✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Appendix D

Site and Building Plans

1735 - Darlington Public School

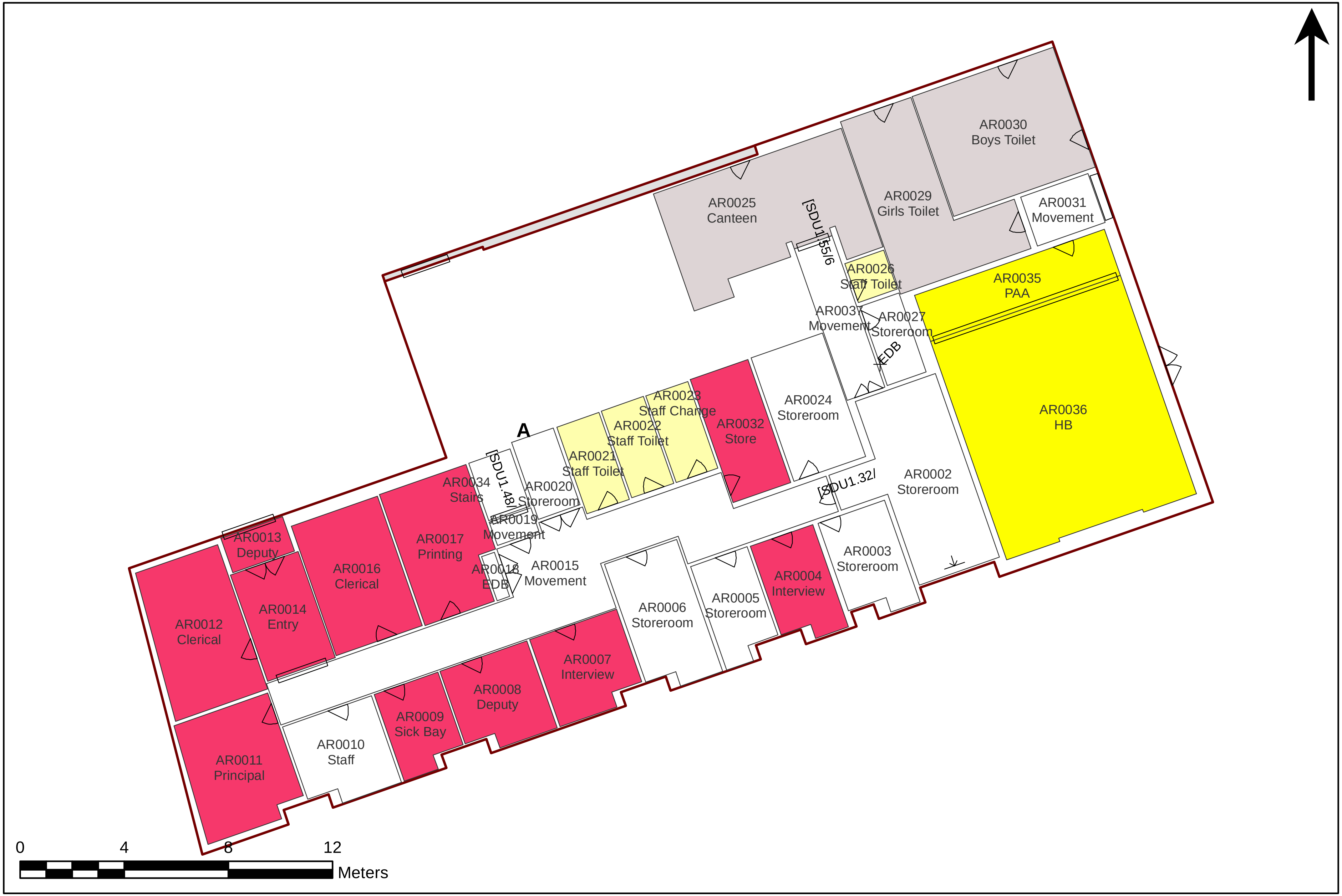
Site Plan (11902)

1:494

Printed: 03-Feb-2017

1735 - Darlington Public School

Administration/Library (B00A) - Ground Floor (Room Function)



1:182

Printed: 03-Feb-2017

1735 - Darlington Public School

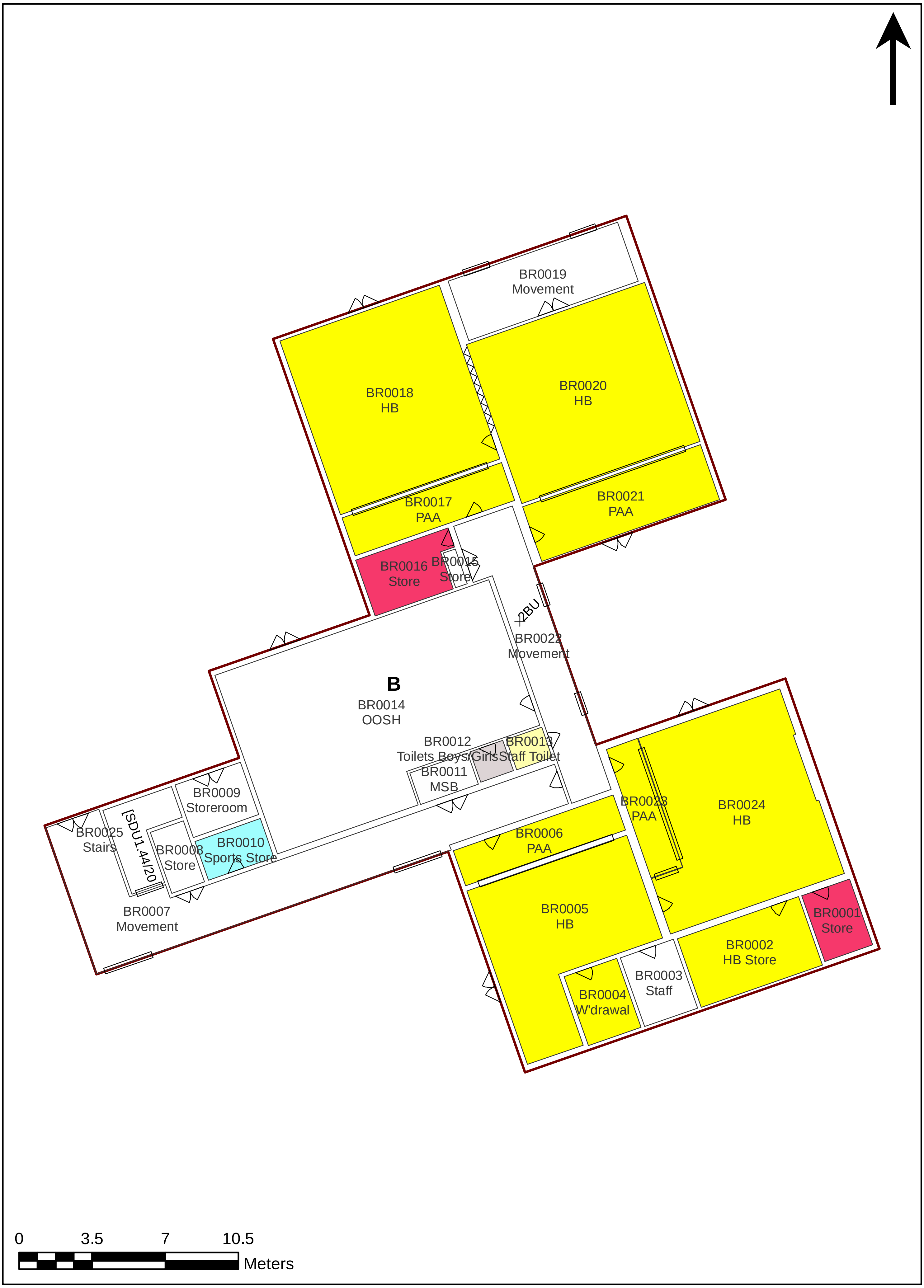
Administration/Library (B00A) - 1st Floor (Room Function)

1:182

Printed: 03-Feb-2017

1735 - Darlington Public School

General Learning/Other-After School Care (B00B) - Ground Floor (Room Function)

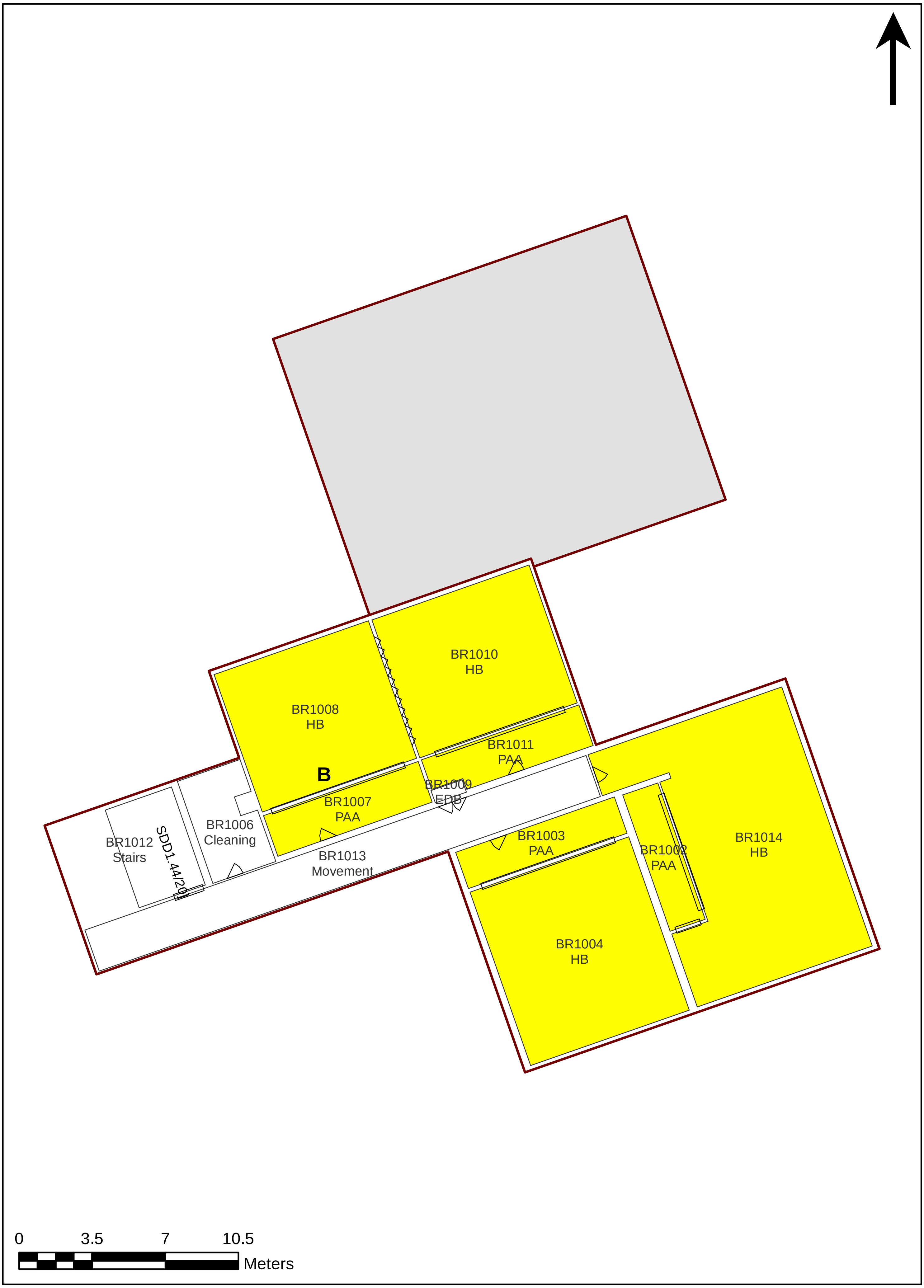


1:225

Printed: 03-Feb-2017

1735 - Darlington Public School

General Learning/Other-After School Care (B00B) - 1st Floor (Room Function)

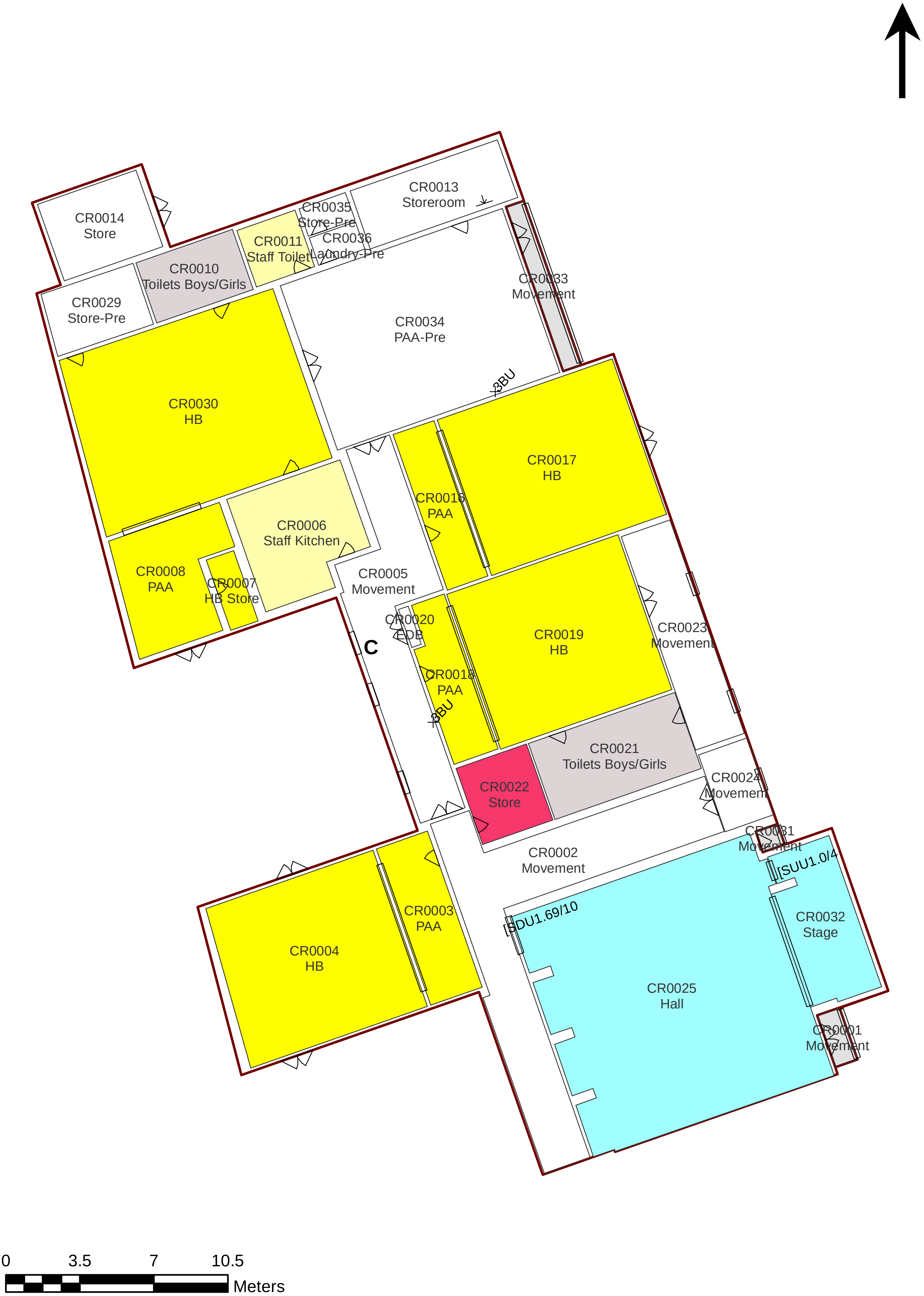


1:225

Printed: 03-Feb-2017

1735 - Darlington Public School

General Learning/Communal Facilities (B00C) - Ground Floor (Room Function)



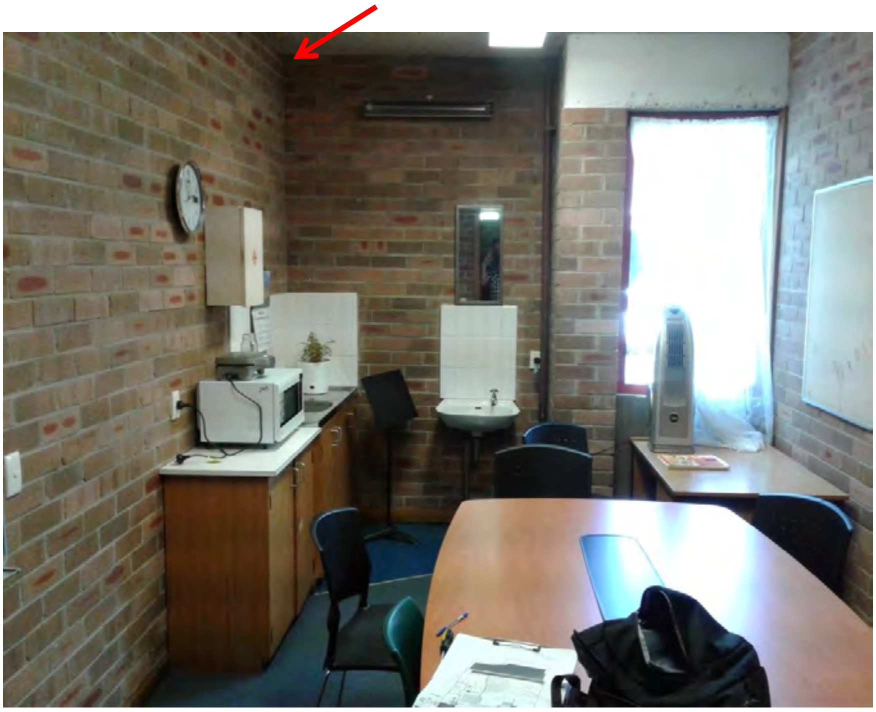
1:228

Printed: 03-Feb-2017

Appendix E

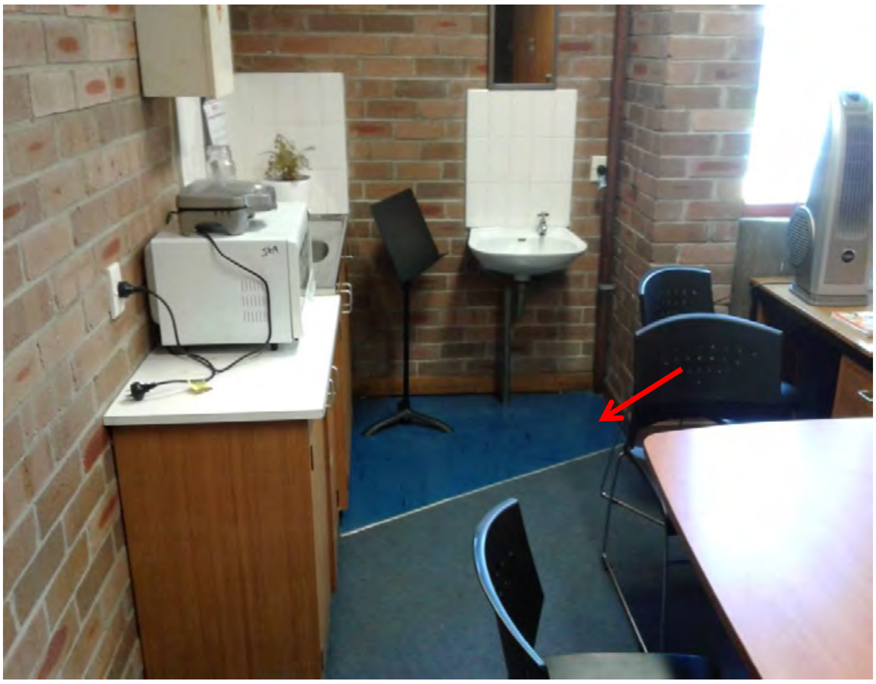
Photographic Plates

Photograph 1: B00A - R0002, Interior, Garage walls, Brick, nil hazardous materials identified.

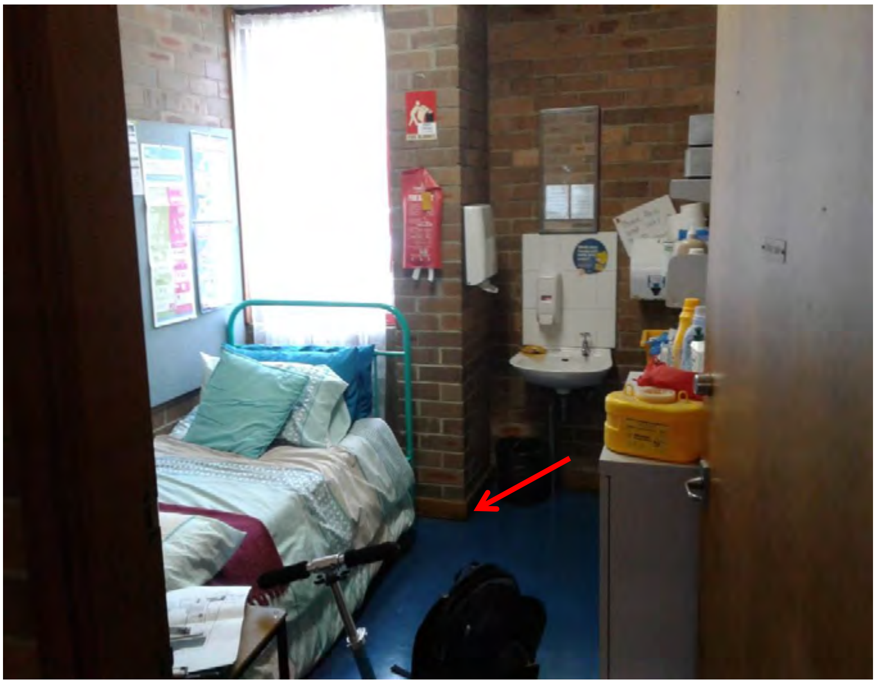


Photograph 2: B00A - R0006, Interior, Ceiling structure, Vermiculite, no asbestos detected by analysis.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Hazardous Building Materials (HBM) Register	PLATE No:	1
	417 Abercrombie Street, Darlington NSW	REV:	A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	Mar-18

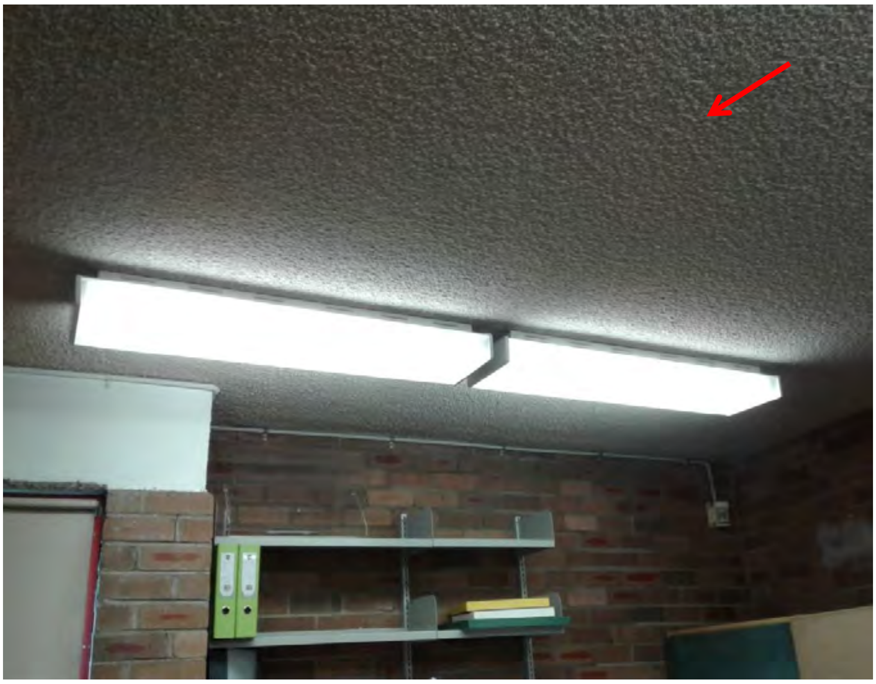


Photograph 3: B00A - R0006, Interior, Flooring material, Vinyl tiles, no asbestos detected by analysis.

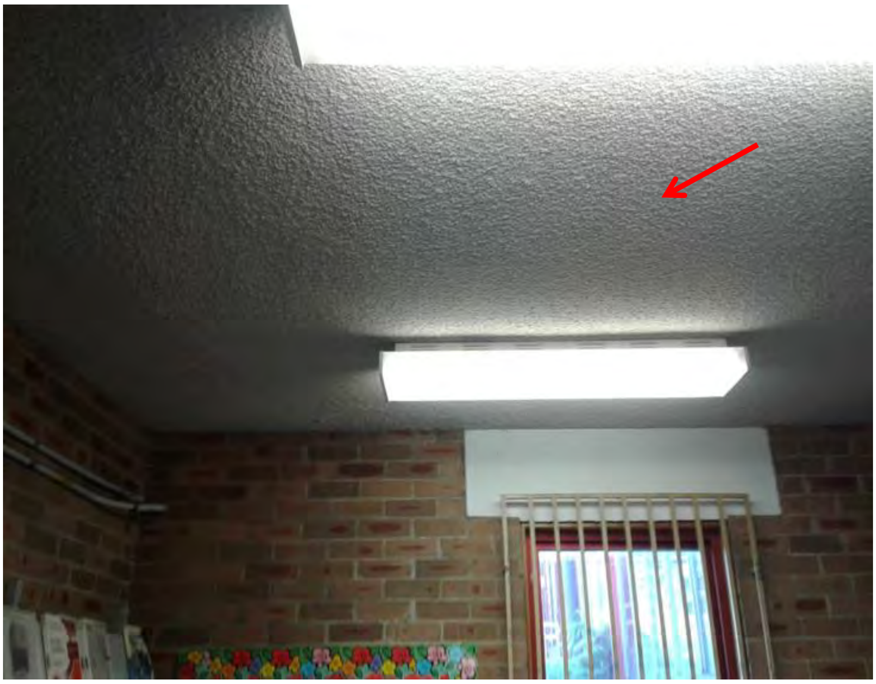


Photograph 4: B00A - R0009, Interior, Flooring material, Vinyl tiles, no asbestos detected by analysis.

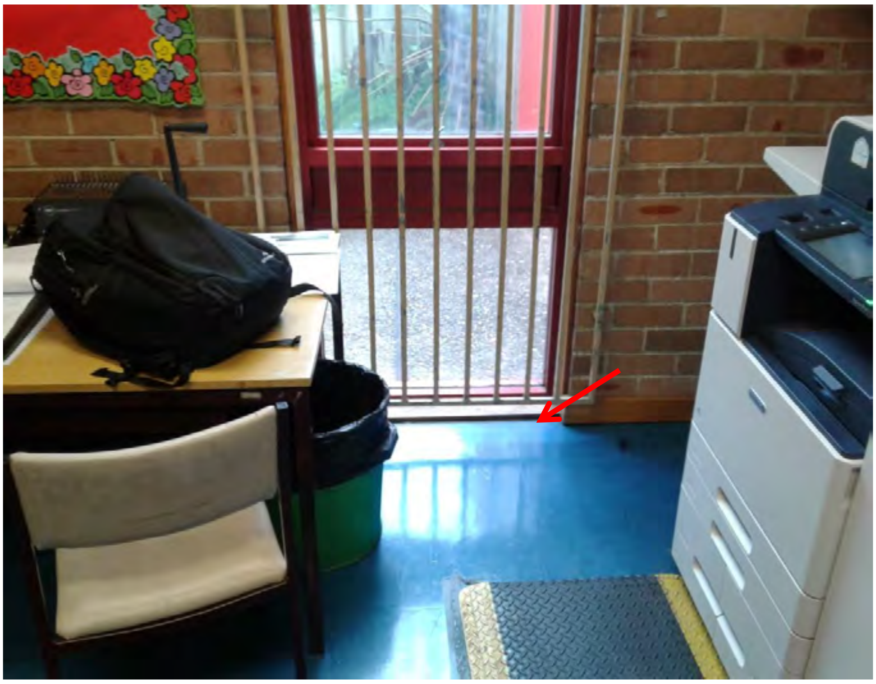
Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT: 92277.00
	Hazardous Building Materials (HBM) Register	PLATE No: 2
	417 Abercrombie Street, Darlington NSW	REV: A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: Mar-18



Photograph 5: B00A - R0011, Interior, Ceiling structure, Vermiculite, no asbestos detected by analysis.



Photograph 6: B00A - R0017, Interior, Ceiling structure, Vermiculite, no asbestos detected by analysis.



Photograph 7: B00A - R0017, Interior, Flooring material, Vinyl tiles, no asbestos detected by analysis.

Photograph 8: B00A - R0019, Interior, Hand rails on stairs, Yellow paint, non-lead paint (≤0.1% lead w/w).

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Hazardous Building Materials (HBM) Register	PLATE No:	4
	417 Abercrombie Street, Darlington NSW	REV:	A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	Mar-18

Photograph 9: B00A - R0021, Interior, Partitions in toilet, Compressed FCS sheeting, asbestos detected by analysis.

Photograph 10: B00A - R0022, Interior, Partitions in toilet, Compressed FCS sheeting, asbestos detected by analysis.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Hazardous Building Materials (HBM) Register	PLATE No:	5
	417 Abercrombie Street, Darlington NSW	REV:	A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	Mar-18

Photograph 11: B00A - R0023, Interior, Brick walls, Beige paint, non-lead paint (≤0.1% lead w/w).

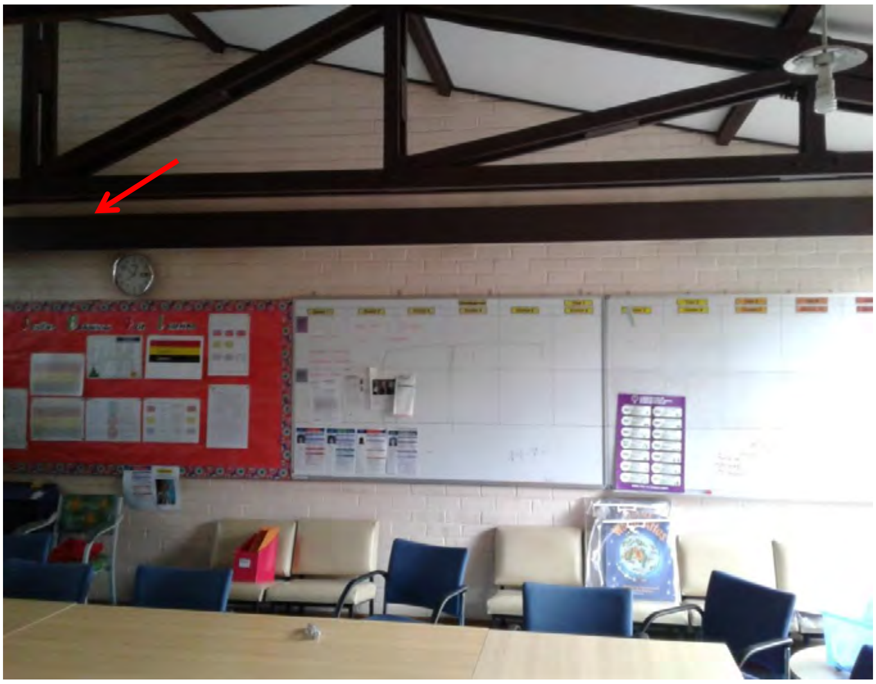
Photograph 12: B00A - R0025, Interior, Flooring material, Vinyl tiles, no asbestos detected by analysis.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT: 92277.00
	Hazardous Building Materials (HBM) Register	PLATE No: 6
	417 Abercrombie Street, Darlington NSW	REV: A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: Mar-18

Photograph 13: B00A - R0032, Interior, Flooring material, Vinyl tiles under flooring, asbestos detected by analysis.

Photograph 14: B00A - R1001, Interior, Brick walls, Beige paint, non-lead paint (≤0.1% lead w/w).

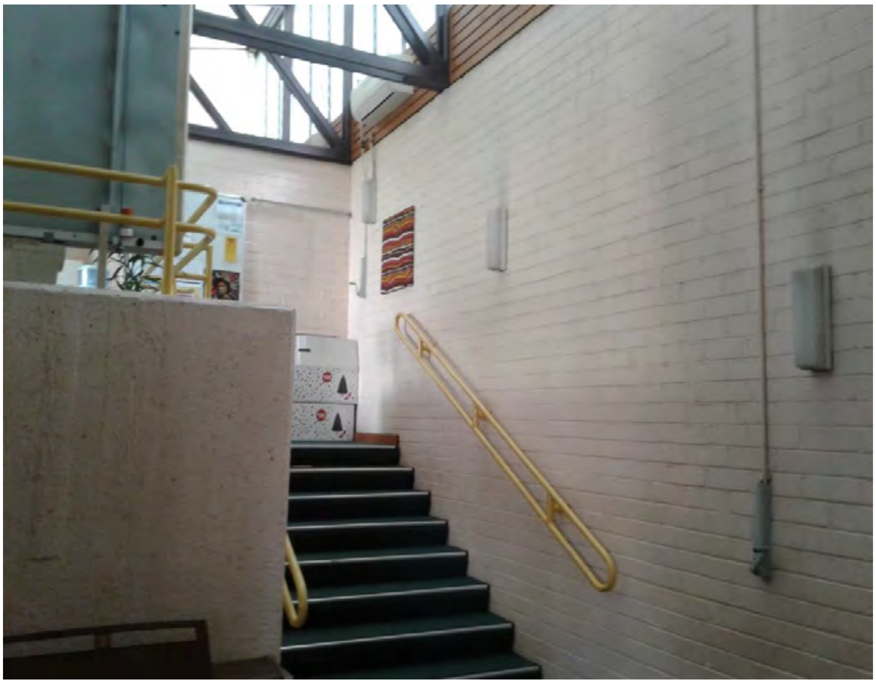
Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Hazardous Building Materials (HBM) Register	PLATE No:	7
	417 Abercrombie Street, Darlington NSW	REV:	A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	Mar-18



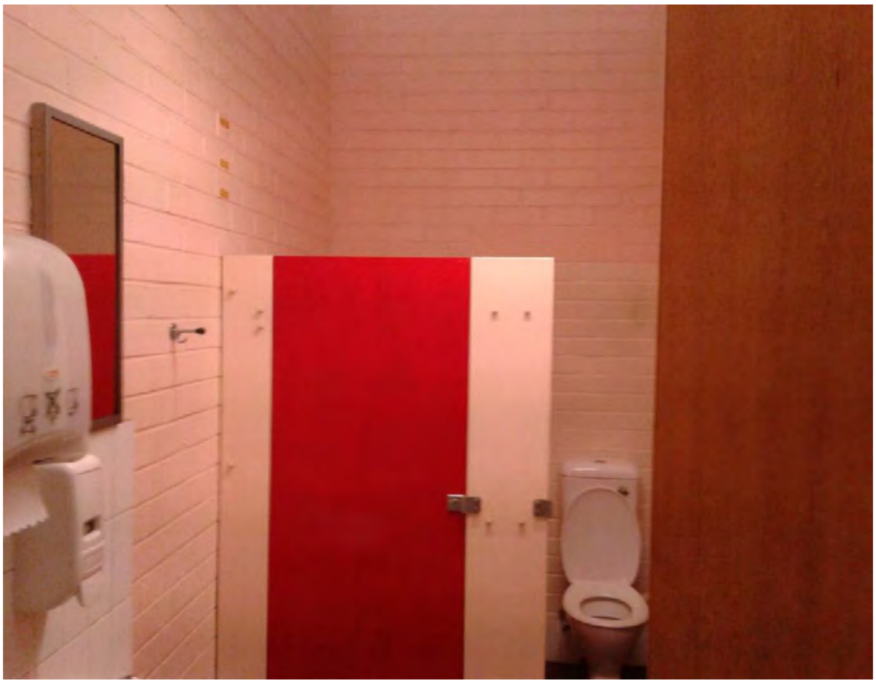
Photograph 15: B00A - R1002, Interior, Timber rafters, Dust above rafters, elevated lead (>0.5 mg/m2).

Photograph 16: B00A - R1003, Interior, Timber rafters, Brown paint, non-lead paint (≤0.1% lead w/w).

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Hazardous Building Materials (HBM) Register	PLATE No:	8
	417 Abercrombie Street, Darlington NSW	REV:	A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	Mar-18



Photograph 17: B00A - R1017, Interior, -, -, nil hazardous materials identified.



Photograph 18: B00A - R1018, Interior, Partitions in toilet, Compressed FCS sheeting, asbestos detected by analysis.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Hazardous Building Materials (HBM) Register	PLATE No:	9
	417 Abercrombie Street, Darlington NSW	REV:	A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	Mar-18

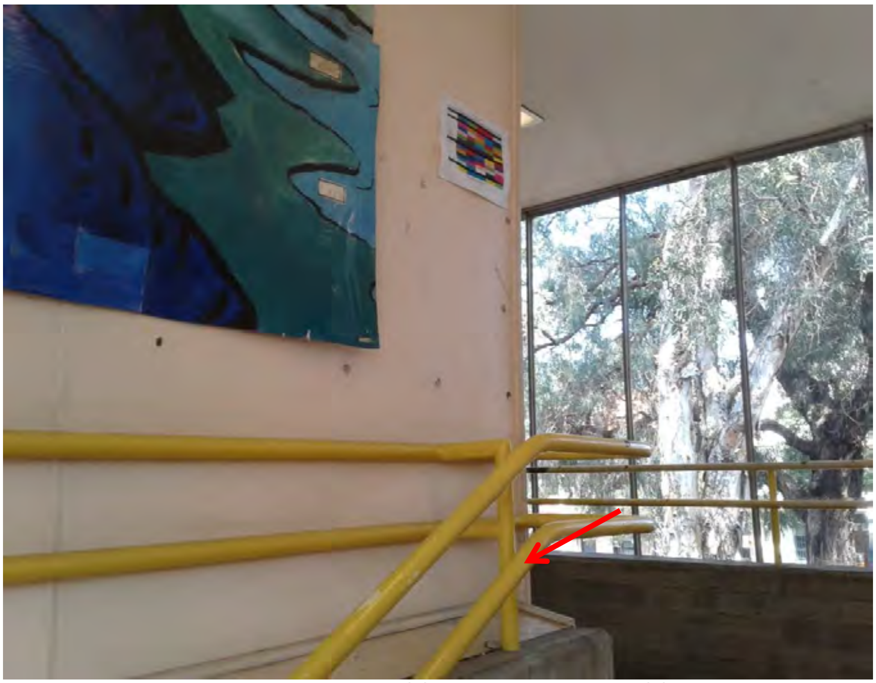
Photograph 19: B00A - R1019, Interior, Partitions in toilet, Compressed FCS sheeting, asbestos detected by analysis.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Hazardous Building Materials (HBM) Register	PLATE No:	10
	417 Abercrombie Street, Darlington NSW	REV:	A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	Mar-18

Photograph 20: B00B - R0020, Interior, Timber rafters, Blue paint, non-lead paint (≤0.1% lead w/w).

Photograph 21: B00B - R0025, Interior, FCS sheeting on wall, FCS sheeting, no asbestos detected by analysis.

Photograph 22: B00B - R0025, Interior, FCS sheeting on wall, FCS sheeting, no asbestos detected by analysis.



Photograph 23: B00B - R0025, Interior, FCS sheeting on wall, FCS sheeting, no asbestos detected by analysis.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT:	92277.00
	Hazardous Building Materials (HBM) Register	PLATE No:	12
	417 Abercrombie Street, Darlington NSW	REV:	A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE:	Mar-18

Photograph 24: B00B - R1002, Interior, Flooring material, Vinyl tiles under flooring, asbestos detected by analysis.

Photograph 25: B00B - R1003, Interior, Flooring material, Vinyl tiles under flooring, no asbestos detected by analysis.

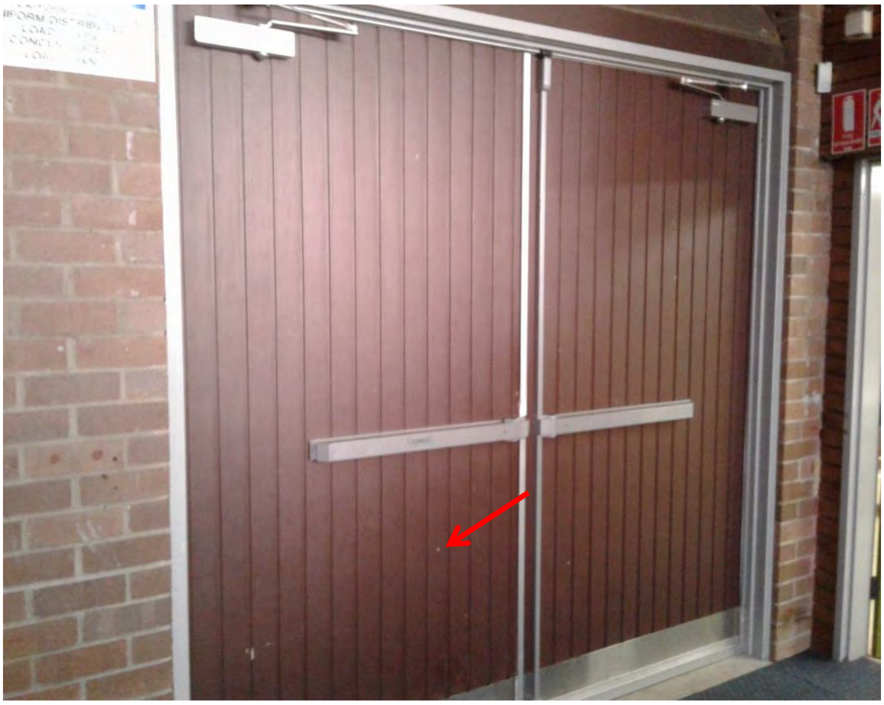
Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Hazardous Building Materials (HBM) Register** **417 Abercrombie Street, Darlington NSW**	PROJECT: 92277.00 PLATE No: 13 REV: A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: Mar-18

Photograph 26: B00B - R1003, Interior, Light fitting, Dust above light fitting, elevated lead (>0.5 mg/m2).

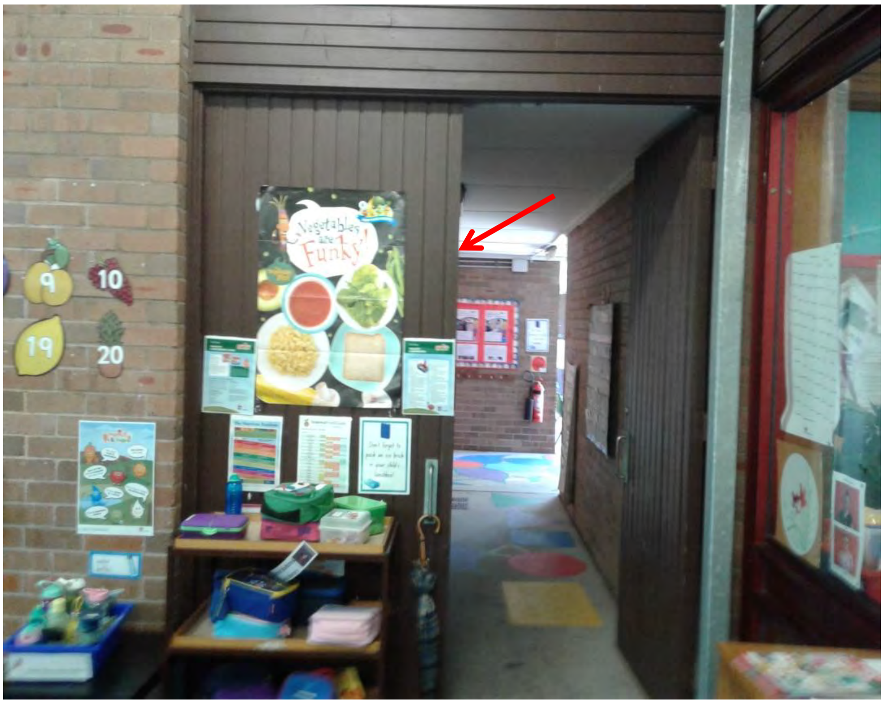
Photograph 27: B00B - R1008, Interior, Timber rafters, Brown paint, non-lead paint (≤0.1% lead w/w).

Photograph 28: B00B - R1011, Interior, Timber skirting board near flooring, Yellow Paint, non-lead paint (≤0.1% lead w/w).

Photograph 29: B00B - R1014, Interior, Ceiling structure, White Flaking Paint, non-lead paint (≤0.1% lead w/w).



Photograph 30: B00C - R0001, Interior, Timber door frame, Brown Paint, non-lead paint (≤0.1% lead w/w).



Photograph 31: B00C - R0002, Interior, Timber door frame, Brown Paint, non-lead paint (≤0.1% lead w/w).

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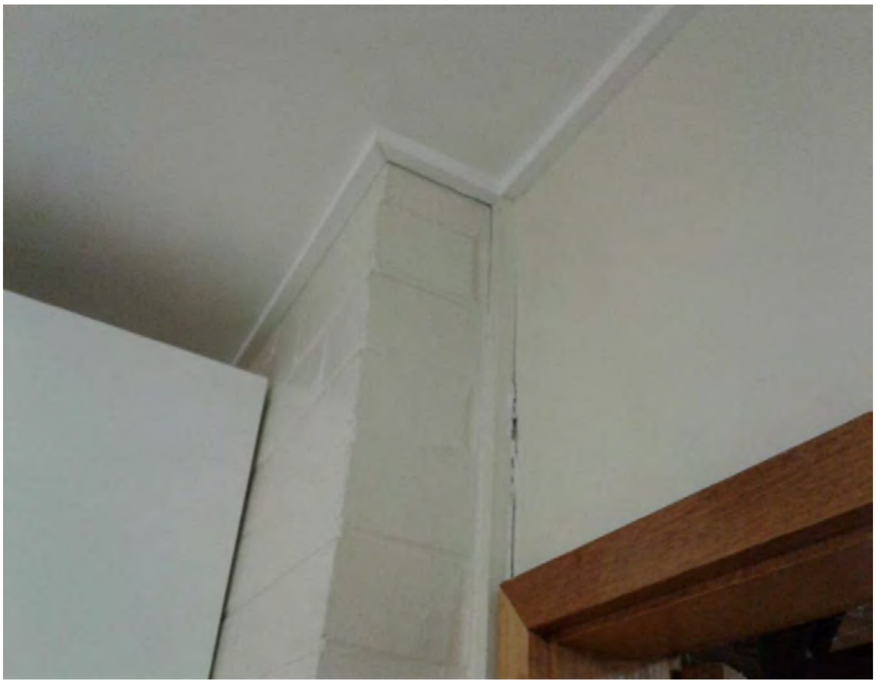
Site Photographs	PROJECT: 92277.00
Hazardous Building Materials (HBM) Register	PLATE No: 16
417 Abercrombie Street, Darlington NSW	REV: A
CLIENT: Billard Leece Partnership Pty Ltd	DATE: Mar-18

Photograph 32: B00C - R0005, Interior, Ceiling structure, FCS sheeting, no asbestos detected by analysis.

Photograph 33: B00C - R0005, Interior, Ceiling structure, Dust above water pipe, elevated lead (>0.5 mg/m2).

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Hazardous Building Materials (HBM) Register** **417 Abercrombie Street, Darlington NSW**	PROJECT: 92277.00 PLATE No: 17 REV: A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: Mar-18

Photograph 34: B00C - R0006, Interior, Flooring material, Vinyl tiles, no asbestos detected by analysis.



Photograph 35: B00C - R0010, Interior, Partitions in toilet, Beige Paint, non-lead paint (≤0.1% lead w/w).

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT: 92277.00
	Hazardous Building Materials (HBM) Register	PLATE No: 18
	417 Abercrombie Street, Darlington NSW	REV: A
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: Mar-18

Photograph 36: B00C - R0024, Exterior, Hand rails, Yellow Paint, lead paint (>0.1% lead w/w).

Photograph 37: B00C - R0025, Interior, Brick column, Dust above column, elevated lead (>0.5 mg/m2).

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Site Photographs

Hazardous Building Materials (HBM) Register

417 Abercrombie Street, Darlington NSW

CLIENT: Billard Leece Partnership Pty Ltd

PROJECT:	92277.00
PLATE No:	19
REV:	A
DATE:	Mar-18

Photograph 38: B00C - R0029, Interior, Flooring material, Vinyl tiles under flooring, no asbestos identified visually.

Photograph 39: B00C - R0034, Interior, Timber door, Brown Paint, non-lead paint (≤0.1% lead w/w).

Douglas Partners
Geotechnics / Environment / Groundwater

Site Photographs	PROJECT:	92277.00
Hazardous Building Materials (HBM) Register	PLATE No:	20
417 Abercrombie Street, Darlington NSW	REV:	A
CLIENT: Billard Leece Partnership Pty Ltd	DATE:	Mar-18

Appendix F

About This Report

Introduction

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

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

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

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.

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.

Rock Descriptions

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Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 2007. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approximate Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Symbols & Abbreviations

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General

■	Asphalt
▨	Road base
▨	Concrete
▩	Filling

Soils

▨	Topsoil
▨	Peat
▧	Clay
▧	Silty clay
▧	Sandy clay
▧	Gravelly clay
▧	Shaly clay
▥	Silt
▥	Clayey silt
▥	Sandy silt
▨	Sand
▧	Clayey sand
▥	Silty sand
▨	Gravel
▨	Sandy gravel
▨	Cobbles, boulders
▨	Talus

Sedimentary Rocks

▨	Boulder conglomerate
▨	Conglomerate
▨	Conglomeratic sandstone
▨	Sandstone
▤	Siltstone
▤	Laminite
▤	Mudstone, claystone, shale
■	Coal
▦	Limestone

Metamorphic Rocks

▨	Slate, phyllite, schist
▨	Gneiss
□	Quartzite

Igneous Rocks

▨	Granite
▨	Dolerite, basalt, andesite
▨	Dacite, epidote
▨	Tuff, breccia
▨	Porphyry

Asbestos Register

(Hazardous Materials and Risk Assessment)

School :	**Darlington Public School (1735)**
Region :	**Sydney**
State Electorate :	**Newtown**
Local Government Area :	**Sydney**

Initial Survey :	**Noel Arnold & Associates : 05 - May - 2008**
Reviewed By :	**Parsons Brinckerhoff : 28 - Feb - 2017**

1735 - Darlington Public School
Site Plan (11902)

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
	Sample No					**Test Result**

B00A - Administration/Library - 1990 - Brick/Block (Brick/Block)

Exterior

Underfloor Voids	No Asbestos Found
Ceiling Voids	No Asbestos Found

Interior

B00A - R0002 - General Storeroom (27.02 m2)

No Asbestos

B00A - R0003 - General Storeroom (10.32 m2)

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00A - R0004 - Interview (9.88 m2)

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00A - R0005 - General Storeroom (8.97 m2)

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00A - R0006 - General Storeroom (15.02 m2)

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
Floor Coverings Res/Textile	Vinyl Tiles	16m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0009/Floor Coverings Res/Textile/S2					**Chrysotile (white asbestos)**
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00A - R0007 - Interview (11.76 m2)

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00A - R0008 - Deputy Principal (11.82 m2)

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00A - R0009 - Sick Bay (8.41 m2)

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
Floor Coverings Res/Textile	Vinyl Tiles	9m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0009/Floor Coverings Res/Textile/S2					**Chrysotile (white asbestos)**
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00A - R0010 - Staff Room Annexe (12 m2)

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00A - R0011 - Principal (18.05 m2)

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00A - R0012 - Clerical Office/Workroom (20.81 m2)

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
	Sample No					**Test Result**
B00A - R0013 - Deputy Principal (3.52 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	4m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0013/Ceiling Structures/Linings/S1					**Chrysotile (white asbestos)**
B00A - R0014 - Entry Vestibule (11.88 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00A - R0015 - Movement (48.59 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00A - R0016 - Clerical Office (18.42 m2)						
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**
	Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works					
B00A - R0017 - Duplicating Workroom (17.46 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	18m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0009/Floor Coverings Res/Textile/S2					**Chrysotile (white asbestos)**
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**
	Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works					
B00A - R0018 - Distribution Board (0.93 m2)						Note: No inspection of live electrical installation.
No Asbestos						
B00A - R0019 - Movement (1.58 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00A - R0020 - General Storeroom (5.27 m2)						
No Asbestos						
B00A - R0021 - Staff Toilet (6.06 m2)						
Partition Walls (Cubicles)	Compressed AC Sheet	4m2	Variable positions	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0021/Partition Walls (Cubicles)/S4					**Chrysotile (white asbestos)**
B00A - R0022 - Staff Toilet (6.02 m2)						
Partition Walls (Cubicles)	Compressed AC Sheet	4m2	Variable positions	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0021/Partition Walls (Cubicles)/S4					**Chrysotile (white asbestos)**
B00A - R0023 - Staff Shower/Change (5.98 m2)						
No Asbestos						
B00A - R0024 - General Storeroom (14.58 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	15m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0009/Floor Coverings Res/Textile/S2					**Chrysotile (white asbestos)**
B00A - R0025 - Canteen (34.16 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	35m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0027/Floor Coverings Res/Textile/S5					**Chrysotile (white asbestos)**
B00A - R0026 - Staff Toilet (3.14 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	4m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0027/Floor Coverings Res/Textile/S5					**Chrysotile (white asbestos)**
B00A - R0027 - General Storeroom (5.06 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	6m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0027/Floor Coverings Res/Textile/S5					**Chrysotile (white asbestos)**
B00A - R0029 - Toilets - Girls (24.89 m2)						

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
	Sample No					**Test Result**
Partition Walls (Cubicles)	Compressed AC Sheet	25m2	Variable positions	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0021/Partition Walls (Cubicles)/S4					**Chrysotile (white asbestos)**
B00A - R0030 - Toilets - Boys (27.96 m2)						
Partition Walls (Cubicles)	Compressed AC Sheet	28m2	Variable positions	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0021/Partition Walls (Cubicles)/S4					**Chrysotile (white asbestos)**
B00A - R0031 - Movement (5.43 m2)						
No Asbestos						
B00A - R0032 - Security Store (11.7 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	12m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0009/Floor Coverings Res/Textile/S2					**Chrysotile (white asbestos)**
B00A - R0034 - Stairs (3.91 m2)						
No Asbestos						
B00A - R0035 - Practical Activities - 1hb (14.44 m2)						
No Asbestos						
B00A - R0036 - Home Base (68.07 m2)						
No Asbestos						
B00A - R0037 - Movement (9.49 m2)						
No Asbestos						
B00A - R1001 - Home Base (54.49 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00A - R1002 - Home Base (81.08 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	10m2	North facing, West facing	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0009/Floor Coverings Res/Textile/S2					**Chrysotile (white asbestos)**
B00A - R1003 - Reading Area (169.24 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00A - R1004 - Library Office/Workroom (16.14 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00A - R1005 - Communications Room (12.57 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	13m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0009/Floor Coverings Res/Textile/S2					**Chrysotile (white asbestos)**
B00A - R1006 - Library Office/Workroom (4.9 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00A - R1007 - Distribution Board (0.93 m2)				Note: No inspection of live electrical installation.		
No Asbestos						
B00A - R1008 - Movement (21.34 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00A - R1009 - Toilets - Boys (5.03 m2)						
Partition Walls (Cubicles)	Compressed AC Sheet	5m2	Variable positions	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0021/Partition Walls (Cubicles)/S4					**Chrysotile (white asbestos)**
B00A - R1010 - Toilets - Girls (5.03 m2)						
Partition Walls (Cubicles)	Compressed AC Sheet	5m2	Variable positions	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0021/Partition Walls (Cubicles)/S4					**Chrysotile (white asbestos)**

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
	Sample No					**Test Result**
B00A - R1011 - Cleaning Supplies (8.61 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00A - R1012 - Movement (78.63 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	80m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
B00A - R1013 - Toilets - Boys (16.86 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	17m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
Floor Coverings Res/Textile	Vinyl Tiles	17m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0009/Floor Coverings Res/Textile/S2					**Chrysotile (white asbestos)**
B00A - R1014 - Toilets - Girls (15.04 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	16m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
Floor Coverings Res/Textile	Vinyl Tiles	16m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0009/Floor Coverings Res/Textile/S2					**Chrysotile (white asbestos)**
B00A - R1015 - Disabled Toilet (3.53 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	4m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
B00A - R1016 - Movement (30.83 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	31m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
B00A - R1017 - Movement (14.21 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00A - R1018 - Staff Toilet (6.29 m2)						
Partition Walls (Cubicles)	Compressed AC Sheet	4m2	Variable positions	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0021/Partition Walls (Cubicles)/S4					**Chrysotile (white asbestos)**
B00A - R1019 - Staff Toilet (6.58 m2)						
Partition Walls (Cubicles)	Compressed AC Sheet	4m2	Variable positions	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0021/Partition Walls (Cubicles)/S4					**Chrysotile (white asbestos)**
B00A - R1020 - Stairs (5.3 m2)						
No Asbestos						

B00B - General Learning/Other-After School Care - 1990 - Brick/Block (Brick/Block)

Exterior

Underfloor Voids	No Asbestos Found
Ceiling Voids	No Asbestos Found

Interior

B00B - R0001 - Security Store (8.11 m2)

Ceiling Structures/Linings	Vermiculite	
	1735/B00A/R0009/Ceiling Structures/Linings/S3	**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00B - R0002 - Home Base Store (21.36 m2)

Ceiling Structures/Linings	Vermiculite	
	1735/B00A/R0009/Ceiling Structures/Linings/S3	**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00B - R0003 - Staff Room Annexe (9.39 m2)

Ceiling Structures/Linings	Vermiculite	
	1735/B00A/R0009/Ceiling Structures/Linings/S3	**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00B - R0004 - Withdrawal Space - 1hb (9.32 m2)

Ceiling Structures/Linings	Vermiculite	
	1735/B00A/R0009/Ceiling Structures/Linings/S3	**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00B - R0005 - Home Base (52.41 m2)

Ceiling Structures/Linings	Vermiculite	
	1735/B00A/R0009/Ceiling Structures/Linings/S3	**Limited Samples Taken**

Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works

B00B - R0006 - Practical Activities - 1hb (14.49 m2)

Floor Coverings Res/Textile	Vinyl Tiles	15m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0027/Floor Coverings Res/Textile/S5					**Chrysotile (white asbestos)**

B00B - R0007 - Movement (67.92 m2)

No Asbestos

B00B - R0008 - Cleaning Distributed Store (5.13 m2)

No Asbestos

B00B - R0009 - General Storeroom (8.83 m2)

No Asbestos

B00B - R0010 - Sports Store (6.54 m2)

No Asbestos

B00B - R0011 - Main Switch Board (4.63 m2)

No Asbestos

B00B - R0012 - Toilets - Boys/Girls (2.54 m2)

No Asbestos

B00B - R0013 - Staff Toilet (2.74 m2)

No Asbestos

B00B - R0014 - Out Of School Hours Care Centre (114.45 m2)

Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found

B00B - R0015 - Cleaning Distributed Store (1.04 m2)

No Asbestos

B00B - R0016 - Security Store (11.95 m2)

Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
	Sample No					**Test Result**
B00B - R0017 - Practical Activities - 1hb (15.51 m2)						
No Asbestos						
B00B - R0018 - Home Base (71.18 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00B - R0019 - Movement (25.77 m2)						
No Asbestos						
B00B - R0020 - Home Base (72.69 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00B - R0021 - Practical Activities - 1hb (24.99 m2)						
No Asbestos						
B00B - R0022 - Movement (31.47 m2)						
No Asbestos						
B00B - R0023 - Practical Activities - 1hb (10.3 m2)						
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**
	Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works					
B00B - R0024 - Home Base (71.75 m2)						
Ceiling Structures/Linings	Vermiculite					
	1735/B00A/R0009/Ceiling Structures/Linings/S3					**Limited Samples Taken**
	Vermiculite Ceilings may contain asbestos. Asbestos testing MUST be conducted prior to any disturbance works					
B00B - R0025 - Stairs (9.89 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	10m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
B00B - R1002 - Practical Activities - 1hb (12.3 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	13m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0027/Floor Coverings Res/Textile/S5					**Chrysotile (white asbestos)**
B00B - R1003 - Practical Activities - 1hb (14.73 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	15m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0027/Floor Coverings Res/Textile/S5					**Chrysotile (white asbestos)**
B00B - R1004 - Home Base (70.83 m2)						
No Asbestos						
B00B - R1006 - Cleaning Supplies (15.66 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	16m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
B00B - R1007 - Practical Activities - 1hb (16.12 m2)						
No Asbestos						
B00B - R1008 - Home Base (54.65 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00B - R1009 - Distribution Board (0.97 m2)						Note: No inspection of live electrical installation.
No Asbestos						
B00B - R1010 - Home Base (55.77 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00B - R1011 - Practical Activities - 1hb (15.48 m2)						
No Asbestos						
B00B - R1012 - Stairs (16.64 m2)						

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
	Sample No					**Test Result**
Ceiling Structures/Linings	Flat AC Sheeting	17m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
Wall Linings Internal	Flat AC Sheeting					
	1735/B00B/R1012/Wall Linings Internal/S7					**No Asbestos Detected**

B00B - R1013 - Movement (52.81 m2)

No Asbestos

B00B - R1014 - Home Base (104.61 m2)

No Asbestos

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
	Sample No					**Test Result**
B00C - General Learning/Communal Facilities - 1990 - Brick/Block (Brick/Block)						
Exterior						
Underfloor Voids	No Asbestos Found					
Eaves Linings	Flat AC Sheeting	40m2	Variable positions	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00C/Eaves Linings/S10					**Chrysotile (white asbestos) , Amosite (brown asbestos)**
Ceiling Voids	No Asbestos Found					
Interior						
B00C - R0001 - External Movement (2.88 m2)						
No Asbestos						
B00C - R0002 - Movement (67.39 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	68m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
B00C - R0003 - Practical Activities - 1hb (20.07 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	21m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0027/Floor Coverings Res/Textile/S5					**Chrysotile (white asbestos)**
B00C - R0004 - Home Base (67.25 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00C - R0005 - Movement (45.95 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	46m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
B00C - R0006 - Staff Kitchen (29.16 m2)						
Floor Coverings Res/Textile	Vinyl Sheet					
	1735/B00C/R0008/Floor Coverings Res/Textile/S8					**No Asbestos Detected**
B00C - R0007 - Home Base Store (4.84 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00C - R0008 - Practical Activities - 1hb (26.74 m2)						
Floor Coverings Res/Textile	Vinyl Sheet					
	1735/B00C/R0008/Floor Coverings Res/Textile/S8					**No Asbestos Detected**
B00C - R0010 - Toilets - Boys/Girls (14.54 m2)						
Partition Walls (Cubicles)	Compressed AC Sheet	4m2	Variable positions	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0021/Partition Walls (Cubicles)/S4					**Chrysotile (white asbestos)**
B00C - R0011 - Staff Toilet (8.23 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	9m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
B00C - R0013 - General Storeroom (21.33 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	22m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
Floor Coverings Res/Textile	Vinyl Sheet					
	1735/B00C/R0008/Floor Coverings Res/Textile/S8					**No Asbestos Detected**
B00C - R0014 - Garden Store (18.94 m2)						

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
	Sample No					**Test Result**
Ceiling Structures/Linings	Flat AC Sheeting	19m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R1013/Ceiling Structures/Linings/S6					**Chrysotile (white asbestos)**
Floor Coverings Res/Textile	Vinyl Sheet					
	1735/B00C/R0008/Floor Coverings Res/Textile/S8					**No Asbestos Detected**
B00C - R0016 - Practical Activities - 1hb (15.88 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	16m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0027/Floor Coverings Res/Textile/S5					**Chrysotile (white asbestos)**
B00C - R0017 - Home Base (68.16 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00C - R0018 - Practical Activities - 1hb (16.06 m2)						
Floor Coverings Res/Textile	Vinyl Sheet					
	1735/B00C/R0008/Floor Coverings Res/Textile/S8					**No Asbestos Detected**
B00C - R0019 - Home Base (66.5 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00C - R0020 - Distribution Board (0.92 m2)						Note: No inspection of live electrical installation.
No Asbestos						
B00C - R0021 - Toilets - Boys/Girls (27.89 m2)						
No Asbestos						
B00C - R0022 - Security Store (13.38 m2)						
Floor Coverings Res/Textile	Vinyl Tiles	14m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00A/R0027/Floor Coverings Res/Textile/S5					**Chrysotile (white asbestos)**
B00C - R0023 - Movement (25.93 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	26m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00C/R0023/Ceiling Structures/Linings/S9					**Chrysotile (white asbestos)**
B00C - R0024 - Movement (9.33 m2)						
Ceiling Structures/Linings	Flat AC Sheeting	10m2	All surfaces	Good Condition (1)	Low (1)	Low Priority (2-3)
	1735/B00C/R0023/Ceiling Structures/Linings/S9					**Chrysotile (white asbestos)**
B00C - R0025 - Communal Space (141.69 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00C - R0029 - General Storeroom - Pre (14.14 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00C - R0030 - Home Base (93.85 m2)						
Vinyl Tiles (Under Floor Covering/Carpet)	No Asbestos Found					
B00C - R0031 - External Movement (1.12 m2)						
No Asbestos						
B00C - R0032 - Raised Platform (25.13 m2)						
No Asbestos						
B00C - R0033 - External Movement (7.27 m2)						
No Asbestos						
B00C - R0034 - Practical Activities - Pre (91.41 m2)						
No Asbestos						
B00C - R0035 - General Storeroom - Pre (3.18 m2)						

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
	Sample No					**Test Result**

No Asbestos

B00C - R0036 - Laundry - Pre (3.16 m2)

No Asbestos

Product	Material Description	Extent	Location Reference	Material Condition	Risk Status	Control Priority
	Sample No					**Test Result**

Demountables

There are no Demountable(s) located at this school as per the AMS records as of 15 Feb 2017.

Listing of Electronic Attachments as of 22/03/2017

Available Asbestos Related Electronic Files

1735_ASB_150514_AMP.pdf

* Note : Refer to AMS for details of the attachment(s).

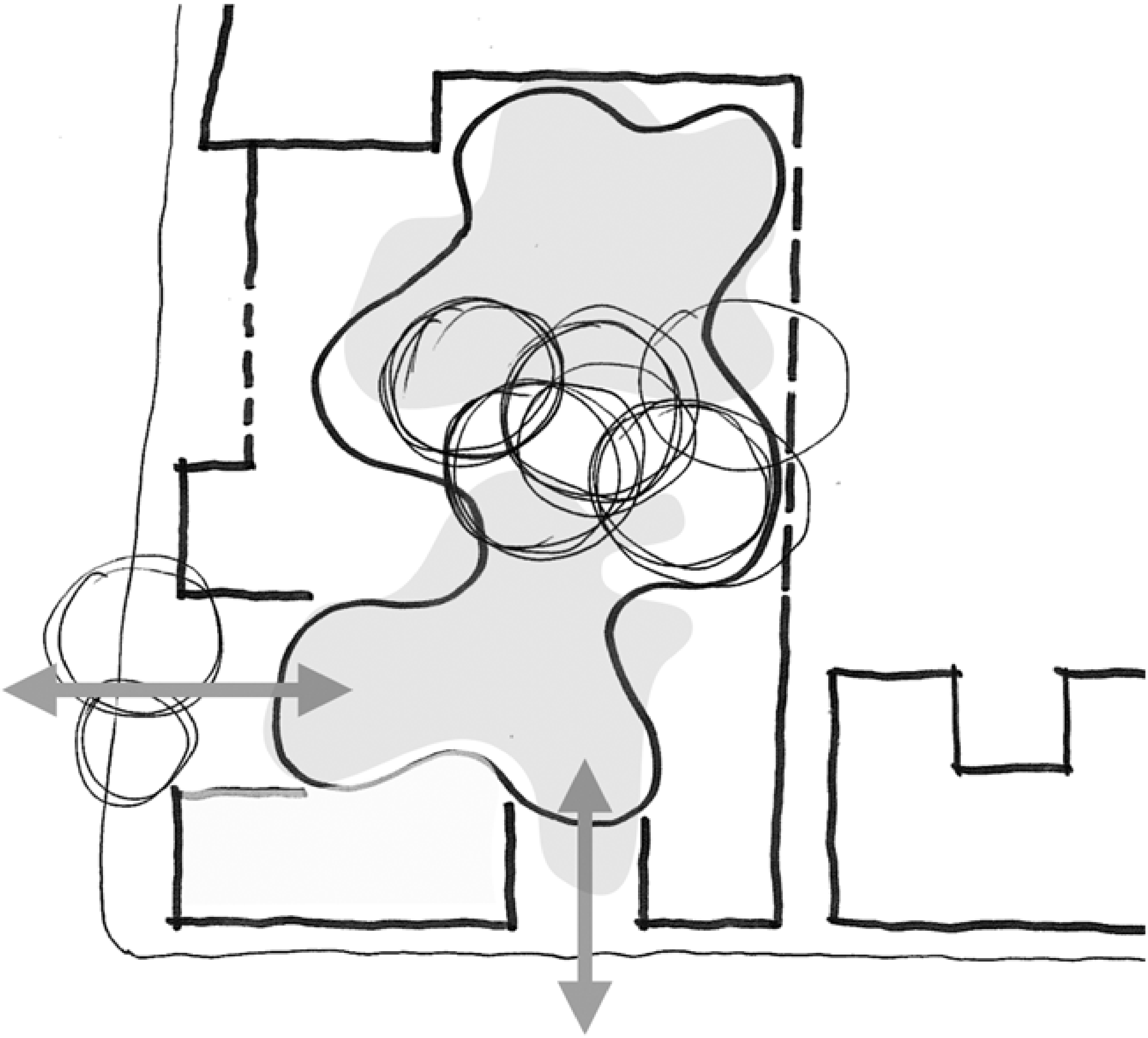
DARLINGTON PUBLIC SCHOOL REDEVELOPMENT

Appendix T — Civil Design Report

SSD-9914

Prepared by Meinhardt/Bonacci

For NSW Department of Education



Proposed Darlington Public School Re-development

Civil Design Report:

Utilities & Infrastructure, Water Cycle Management

&

Drainage, Flooding and Stormwater

&

Sediment, Erosion and Dust Controls

Issued for:

State Significant Development Application

Revision:

11917-BON-CV-SSDRPT-02

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Relevant SEARs Requirements

Relevant Secretary's Environmental Assessment Requirements (SEARs) for this development has been addressed throughout this Civil Schematic Design Report. Table 1-1 outlines the relevant sections report sections addressing the SEARs.

Key Civil Issues	Requirement	Relevant Report Section
Utilities & Infrastructure, Water Cycle Management		
	Obtain endorsement and/or approval from Sydney Water to ensure that the proposed development does not adversely impact on any existing water, waste water or stormwater main, or other Sydney Water asset, including any easement or property.	Appendix A – Sydney Water Correspondence
Drainage, Flooding and Stormwater		
	Detail measures to minimize operational water quality impacts on surface waters and ground water.	Section 4.4
	Stormwater plans detailing the proposed methods of drainage without impacting on downstream properties.	Section 4.3 & 4.5 & Appendix C drawing C031 & C032
	Assess, quantify and report on the runoff impacts during demolition, site preparation, bulk excavation, construction and construction – related work.	Section 4.8 & Appendix C drawing C004 & C005
	Identify flood risk – onsite (detailing the most recent flood studies for the project area) and consideration of any relevant provision of the NSW Floodplain Development Manual (2005), including the potential effects of climate change, sea level rise and an increase in rainfall intensity. If there is a material flood risk, include design solutions for mitigation	Section 4.6
Sediment, Erosion and Dust Controls		
	Provide a Sediment and Erosion Control Plan	Appendix C drawing C004 & C005
	Detail measures and procedures to minimise and manage the generation and off-site transmission of sediment, dust and fine particles during demolition, site preparation, bulk excavation, construction and construction – related work.	Section 4.8

Table 1-1 Secretary's Environmental Assessment Requirements

Report Amendment Register

Rev. No.	Issue/Amendment	Author/Initials		Reviewer/Initials		Date
00	Draft Issue	Eve Wu	EW	Jason Bomans	JB	06/04/2020
01	Amended as per Ethos Urban + MACE Comments	Eve Wu	EW	Jason Bomans	JB	19/04/2020
02	Updated document title as per MACE Comments	Eve Wu	EW	Jason Bomans	JB	20/04/2020

Prepared by: EW

Date: 20/04/2020

Project No: 11917

Issued for: Schematic Design Report for SSDA review

Discipline: Civil

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1. Executive Summary

Meinhardt - Bonacci has prepared this Civil Schematic Design report for the submission of State Significant Development Application for Darlington Public School at 417 Abercrombie Street Darlington within the City of Sydney Local Government Area. The proposed re-development consists of a new building to cater for increased population. The requirements from a civil perspective include the following in accordance with City of Sydney Council DCP, City of Sydney Technical Specifications A4 Stormwater Drainage Design, Sydney Water On-site Detention Guideline and Secretary's Environmental Assessment Requirements (SEARs):

A. On-Site Detention (OSD) must be designed and constructed to store the run-off caused by a storm events up to 100 year Annual Recurrence Interval (ARI) from the site and control the rate of discharge to a prescribed rate to ensure downstream stormwater assets can cater for the run-off.

B. To achieve the on – site detention (OSD) design criteria, the OSD system must be designed to meet two requirements as set out by Sydney Water based on specific site characteristics:

  - Permissible Site Discharge (PSD): 248 L/s maximum
  - Site Storage Requirement (SSR): 124 m^3 minimum

C. To limit the flows discharging to Golden Grove Street to pre-development condition due to the existing constraints

D. To limit the flows discharging to Abercrombie Street to 25 L/s during storm events up to 20 year ARI via a single kerb outlet

E. Water quality post-development pollutant reduction rate according to the following:

  - Gross Pollutants: 90%
  - Total Suspended soils: 85%
  - Total Nitrogen: 45%
  - Total Phosphorous: 65%

F. Incorporate Water Sensitive Urban Design (WSUD) in water quality treatment train.

Preliminary findings from the hydrologic and hydraulic modelling of the site for the existing and proposed scenarios have been documented in this report. Water quantity, water quality and the flooding requirements have been modelled using DRAINS, MUSIC and TUFLOW computer software respectively and findings demonstrated that this development is possible to achieve the above criteria with the proposed civil works.

2. Introduction

Meinhardt - Bonacci (NSW) Pty Ltd has been engaged by NSW Department of Education (DoE) to describe the civil engineering elements associated with the proposed Darlington Public School re-development in Darlington, NSW.

This Civil Schematic Design Report addresses the proposed civil engineering works related to the re-development of Darlington Public School including the drainage network, water quality, water quantity control measures, sediment and control controls and bulk earthworks.

The following relevant existing documents have been referenced for the proposed design:

- Topographical survey by C.M.S Surveyors on 12th March 2020
- Geotechnical Report on Detailed Site Investigation for Contamination by Douglas Partners on February 2019, ref. 92277.01
- Remediation Action Plan by Douglas Partners on March 2020, ref. 92277.02
- Sydney Water advice regarding on-site detention requirements for Darlington Public School
- City of Sydney Council advice for stormwater discharging rate to Golden Grove Street
- Blackwattle Bay Catchment Floodplain Risk Management Plan – Final Report, dated September 2015
- Tuflow flood model supplied by WMA Water in 2018

3. Site Description

3.1. Location

The proposed development is located in Darlington, NSW and within City of Sydney local government area. The site is bounded by Abercrombie Street to the south, Golden Grove Street to the west, a two-storey building on the northwest of the site and a private driveway and a student accommodation to the east. Refer to Figure 1 for a locality and aerial map of the proposed development.

Figure 1 Locality and Aerial Map of the Site (Source: Nearmaps)

3.2. Existing Topography and Drainage

The site is approximately 0.72 ha and generally slopes from the northwest corner of the site at RL 37.15 to the southeast corner of the site at RL 29.97 over 134 m which results in a steep gradient of approximately 5.4%. The site comprises of two basketball courts, teaching buildings and playgrounds. Most of the site (91%) is considered to be impervious (mixture of concrete and bitumen) with limited garden areas.

The existing internal drainage system appears to be discharging via 11 kerb outlets to the kerb and gutter system on Abercrombie Street and Golden Grove Street. The existing overland flow path is running in a north to south direction to Abercrombie Street.

Additional survey provided by C.M.S Surveyor on 12th March 2020 indicates that there is an existing 375mm concrete drainage pipe on Golden Grove Street, the pipe is running in a north-south direction. Survey also indicates that western portion of the site is currently discharging to Golden Grove Street via the kerb outlets, the flows are expected to be captured by the kerb inlets pits further downstream, and eventually conveyed by the 375mm concrete drainage pipe mentioned previously.

No on-site detention structure, rainwater tank or water quality treatment devices have been identified on the survey plans.

A DBYD enquiry has been undertaken, the results show services located outside the site boundary on Golden Grove Street and Abercrombie Street. Survey also identified existing service lines including sewer, gas, water mains and electrical cables running through the site and under the proposed accessway. Relocation, adjustment or extension of the existing services may be required to suit the proposed development. Authorities' approval may be required to relocate, adjust or remove the existing services.

4. Proposed Re-development

The proposed development consists construction of a new building between 2 & 3 stories and new landscape areas. In order to keep the school functioning during the time of construction, staging is proposed.

4.1. Staging

The development is proposed to be undertaken in 2 stages. Stage 1 involves the construction of a new building, while southern portion of the site remains untouched during Stage 1. Stage 2 involves the construction of a new building in the southwest corner of the site. Refer to Figure 2 and Figure 3 for staging plans.

Figure 2 Stage 1 Construction Works (fjmt, 13.03.2020)

Figure 3 Stage 2 Construction Works (fjmt, 13.03.2020)

4.2. Lot Consolidation

As shown in Figure 4 below, information extracted from Six Maps indicates the site is currently comprised of two lots: Lot 100 DP623500 and Lot 592 DP752049. In accordance with City of Sydney DCP, if the lots remain unconsolidated, separate stormwater systems will be required for each lot. However, project manager and planner advised that lot consolidation will occur after stage 1 construction. Council Engineer has no objection on the approach of having one set of water quality/quantity/drainage treatment for this development for during the meeting held with Council on 17th March 2020.

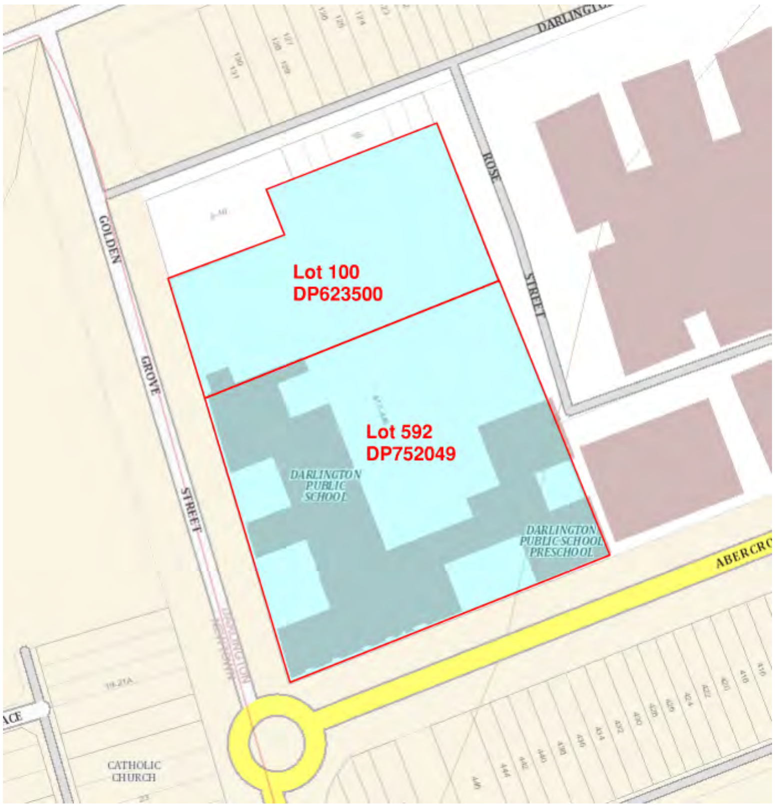


Figure 4 Lot Boundaries (Six Maps)

4.3. Water Quantity

City of Sydney Council has advised that Sydney Water are to approve any additional discharge into the existing street stormwater network. In accordance with Sydney Water On-Site Stormwater Detention Guide (2014), an on-site detention system is required for all education buildings or structures, therefore because of the change in development, Sydney Water would view this a new development enquiry.

Sydney Water has been contacted and they advised that to determine the Permissible Site Discharge (PSD) and Site Storage Requirement (SSR), they required total site area, pre-development and post development areas are to be provided to Sydney Water. Based on the architectural plan by Fjmt Architects dated 21st November 2019, the following information was provided to Sydney Water:

- Total site area: 7,260.65 m^2
- Pre-development impervious area: 5,711.81 m^2
- Post development impervious area: 5,343.43 m^2

Based on above information, Sydney Water advised a detention system with minimum volume of 124 m^3 is to be placed on site to limit the peak flows discharging from the site and (with a Permissible Site Discharge of 248 L/s). Sydney Water further suggested approval for the OSD would only be given as part of the Section 73 application for this development. Correspondence with Sydney Water is shown in **Appendix A**. However, based on the flow restrictions discussed below, the detention system will be larger than required minimum site storage.

The architectural plan was last updated on 01st April 2020; however, the impermeable areas have not been changed significantly. Hence above advice of SSR and PSD from Sydney Water is still valid. The water quantity control measures for different stages have been outlined as below.

As outlined in the report on Detailed Site Investigation for Contamination by Douglas Partners dated February 2019, no free groundwater was observed in the bores during drilling for the short time that they were left open.

4.3.1.Stage 1 Water Quantity Control

A meeting has been held between City of Sydney Council and Meinhardt - Bonacci on 17th March 2020, Council's advice on OSD system has been sought to ensure the proposed design is adequately complying with Council's intended water quantity control.

As discussed in Section 5.1, staging is proposed for this development to maintain school operations, which will result in not having final stormwater quality and quantity control measures in place during stage 1. However, given that the existing stage 1 catchment is approximately 15% more impermeable than the proposed stage 1 catchment, it is anticipated that there is no increase in flow rates before the final installation of the OSD system. Council Engineer had no objection to this design approach.

4.3.2.Stage 2 Water Quantity Control

Following meeting with City of Sydney Council on 17th March to discuss options for stormwater discharge from the site, it was advised by Council engineer that the existing stormwater pit and pipe network on Golden Grove Street is currently at full capacity and undersized. To avoid overloading the existing public drainage system, the discharge rate from the site to Golden Grove Street will be limited to the pre-development condition. A hydraulic model has been set up in DRAINS to assess the existing and proposed drainage conditions.

Additionally, as per City of Sydney Technical Specifications A4 Stormwater Drainage Design, the maximum permitted discharge from any property to kerb outlet is 25 L/s for storms up to and including 20 year ARI. Technical specification advise the proposed development only permits on kerb outlet discharge.

As shown in the existing catchment plan in Figure 5. The catchments have been defined based on the existing points of discharge to Golden Grove Street and Abercrombie Street. As indicated in DRAINS model, the existing flows discharging from the site via the kerb outlets on Golden Grove Street is 60 L/s during 20 year ARI storm events. The existing discharging rate to Abercrombie Street is 288 L/s during 20 year ARI storm events.

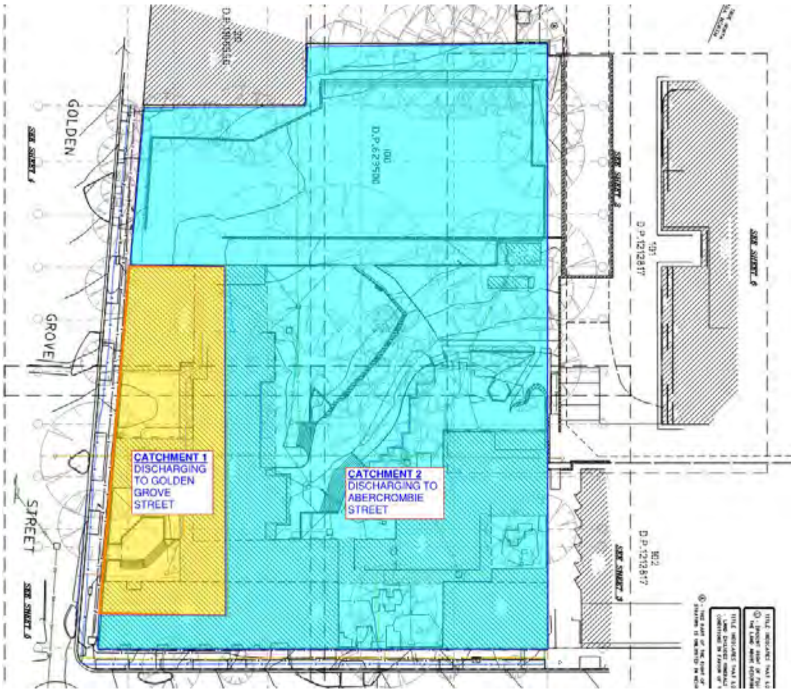


Figure 5 Existing Catchments

To limit the post-development flows to the extent outlined above, detention systems are required on site. 2 on-site detention (OSD) tanks are required – an OSD with an internal volume of 70 m^3 OSD 1 discharging to Golden Grove Street and a second one with an internal volume of 120 m^3 OSD 2 discharging to Abercrombie Street via a single kerb outlet as per Council guideline, refer to Figure 12 for OSDs locations.

DRAINS modelling results in Figure 6 and Figure 7.

The 2 OSD tank detention system is required for the following reasons:

- Additional survey of the existing drainage system on Golden Grove Street (received on 12th March 2020) confirmed the existing invert levels of the stormwater pipes to be higher than most of the southeast portion of the site, therefore it would be impossible to drain the entire site to one location, in this case more area will bypass OSD 1. In order to capture/treat as much stormwater as possible, OSD 2 is required on the lower end of the site and prevent a larger portion of the site from bypassing treatements.

- Demonstrating that no additional flows discharge to Golden Grove St to match the existing condition (60 L/s). Refer to DRAINS result shown in Figure 7 below, the flows discharging to the drainage line on Golden Grove Street is 30 L/s during 20 year ARI after treated by OSD 1, which reduces the flows rates to Golden Grove Street by half.

- City of Sydney have a maximum kerb outlet discharge rate 25 L/s. Refer to DRAINS result shown in Figure 7, the flows discharging to the single Kerb outlet on Abercrombie Street is 25 L/s during 20 year ARI after treated by OSD 2.

- Meeting the minimum Site Storage Requirement (SSR) of 124 m^3 as advised by Sydney Water. With 190 m^3 detention volume, this requirement is met. The OSD is sized up to accommodate the increased volume required to limit the flows as per the above two points.

- The Permissible Site Discharge (PSD) requirement set by Sydney Water is 248 L/s, with a total 81 L/s post development flow rate, this requirement is met with the proposed detention system.

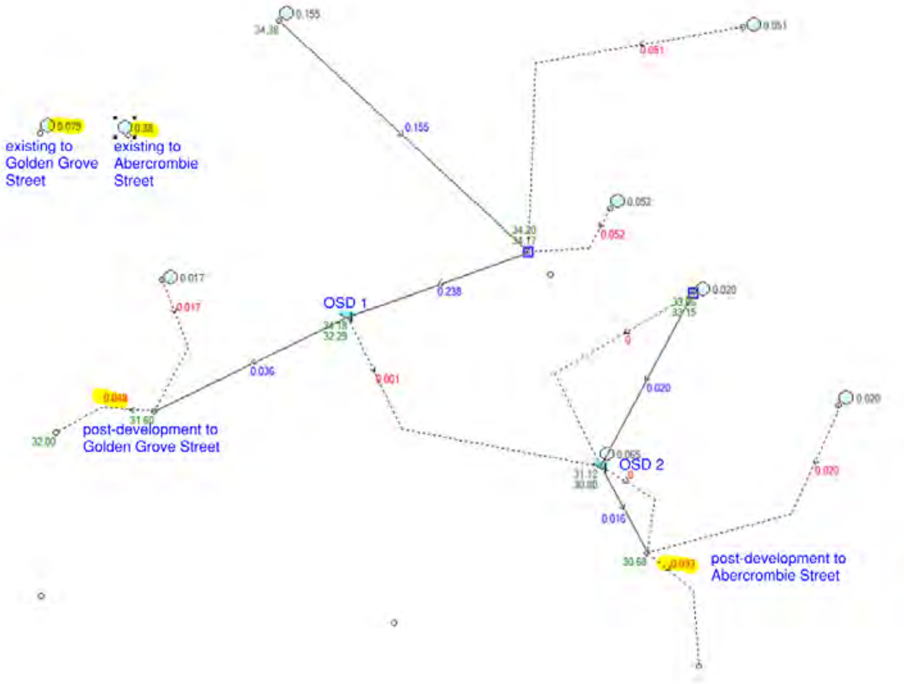


Figure 6 DRAINS Result - Proposed Development 100 Year ARI

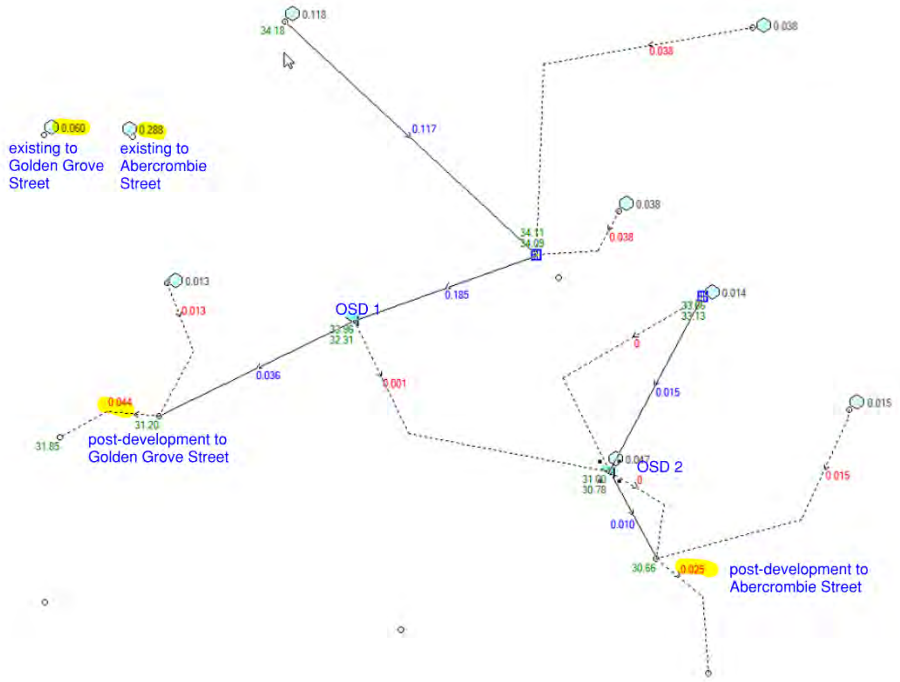
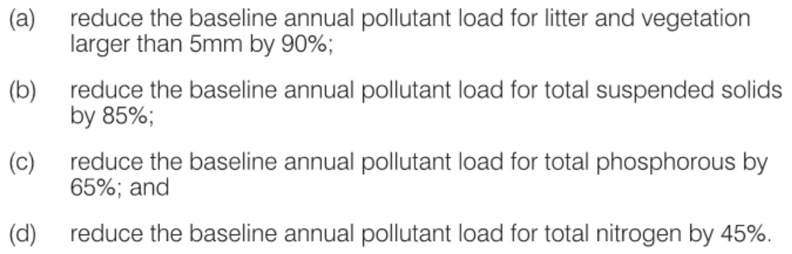


Figure 7 DRAINS Result - Proposed Development 20 Year ARI

4.4. Water Quality

To protect the ecology of City of Sydney, it is expected that this development will require to satisfy the water quality requirements of City of Sydney Council. *Sydney City Council DCP 2012 Section 3* outlines that any development greater than 1000m^2 must undertake a stormwater quality assessment to demonstrate that the development will achieve the post development pollutant load standards indicated below (Figure 8):



(a) reduce the baseline annual pollutant load for litter and vegetation larger than 5mm by 90%;

(b) reduce the baseline annual pollutant load for total suspended solids by 85%;

(c) reduce the baseline annual pollutant load for total phosphorous by 65%; and

(d) reduce the baseline annual pollutant load for total nitrogen by 45%.

Figure 8 City of Sydney Pollution Reduction Target Rates (DCP 2012)

4.4.1.Water Quality Strategy

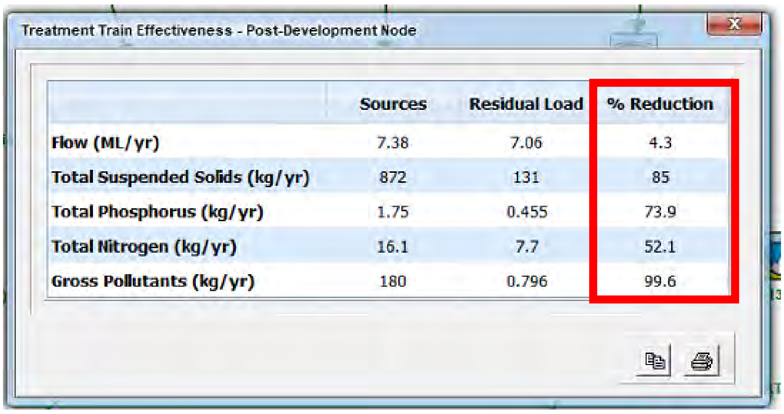
Proprietary water quality treatment products including Enviropods and stormfilter cartridges will be the main treatment measures to achieve Council's adopted pollutants reduction rates. Rainwater runoff from roof will be reticulated into the rainwater tank for landscape irrigation use. Rainwater re-use would also assist in meeting water quality requirements. The proposed development also demonstrates Water Sensitive Urban Design (WSUD), site constraints may not allow bio-retention, however other landscaped measures including swales and small raingarden(s) may be used as part of the water quality treatment train.

Similar to the water quantity control strategy, final water quality control measures will not be in place until the completion of stage 2, however, the pollutant source from the existing land use within the stage 1 extent is a mixture of bitumen pavement and roof while the proposed stage 1 pollutant source is roof and landscape. Therefore, the change of land use already provides water quality improvement to the existing situation.

Above proposed water quality measures have been modelled using software MUSIC (version 6.3), the preliminary MUSIC layout is shown below in Figure 9.

Figure 9 MUSIC Modelling Layout (Background on Architectural Plan Issued 01.04.2020)

The results of MUSIC modelling show that stormwater has been treated and the pollutant removal rate achieves pollutant reduction targets adopted by City of Sydney Council. The results from the MUSIC model are shown in Figure 10. City of Sydney Council MUSIC link report is in **Appendix B**. The MUSIC result also indicates that the 30kL rainwater can meet 95% of the reuse demand.


Treatment Train Effectiveness - Post-Development Node

	Sources	Residual Load	% Reduction
Flow (ML/yr)	7.38	7.06	4.3
Total Suspended Solids (kg/yr)	872	131	85
Total Phosphorus (kg/yr)	1.75	0.455	73.9
Total Nitrogen (kg/yr)	16.1	7.7	52.1
Gross Pollutants (kg/yr)	180	0.796	99.6

Figure 10 MUSIC Modelling Results – Proposed Development with Final Water Quality Control Measures Installed

Given that the stormwater treatment device Stormfilter cartridges will be installed within the OSD tank, similar discussion of staging/lot consolidation applies to water quality system as they will not be available during stage 1 construction.

4.5. Drainage

The re-development will need to install a major/minor stormwater system. Pits and pipes will capture and convey run-off generated from minor storm events up to the 20 year average recurrence interval (ARI) in accordance with Educational Facilities Standards & Guidelines (EFSG).

Stage 1 drainage system will make connection to the existing internal drainage line and eventually discharge via the kerb outlets to Abercrombie Street while stage 2 drainage system will partially make connection to the drainage system on Golden Grove Street after treated by OSD 1 and will partially discharge to Abercrombie Street via a single kerb outlet after treated by OSD 2.

A major system is also required for the proposed development in the form of overland flow paths. The major overland flow system is designed to convey flows surcharged from the underground drainage system for storm events up to and including100 year ARI. The overland flow is to be directed away from the buildings towards the public road kerb and gutter system on Abercrombie Street provided that there are no adverse impacts on the downstream properties.

Refer to Figure 11 and Figure 12 for stormwater drainage system layout and overland flow path for stage 1 and for the final scheme.

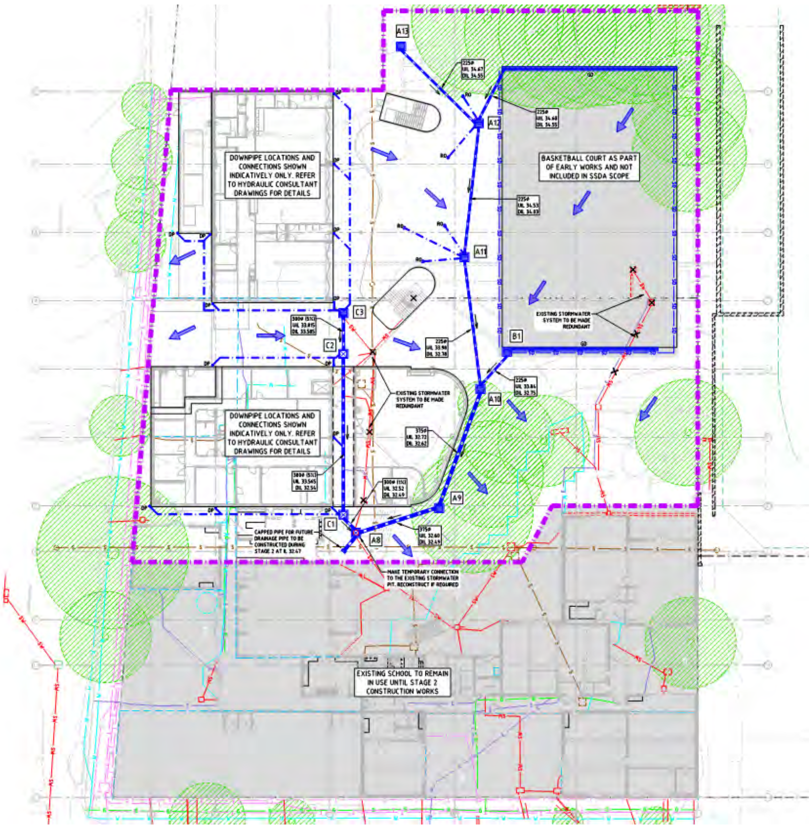


Figure 11 Stage 1 Stormwater Strategy

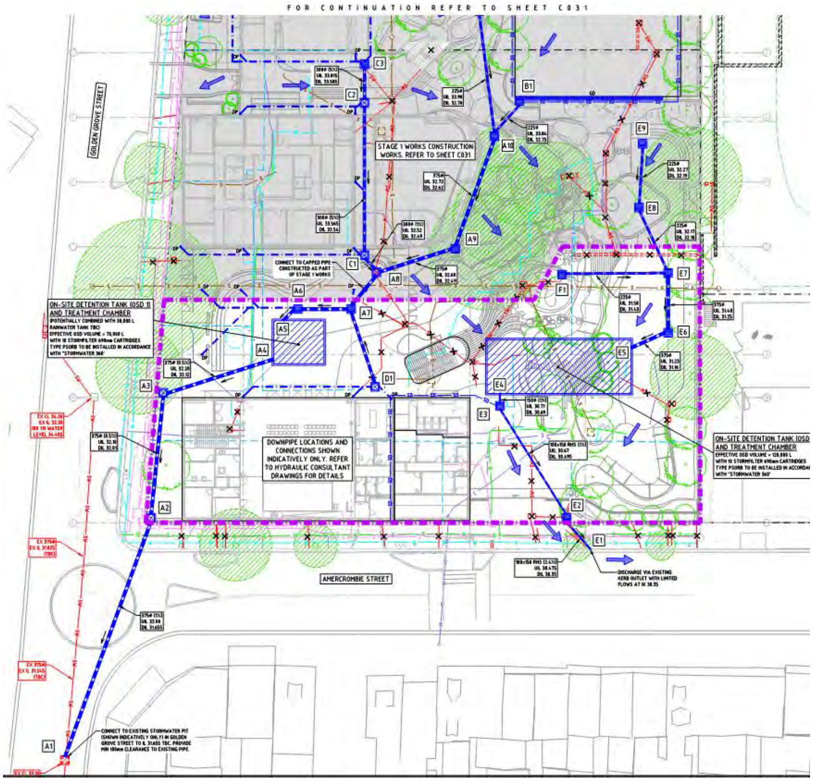


Figure 12 Overall Stormwater Strategy

4.6. Flooding

Based on the flood information from the City of Sydney, specifically the flood report Blackwattle Bay Catchment Floodplain Risk Management Plan by WBA Water dated September 2015, majority of the site is not subject to inundation during the 100 Average Recurrence Interval (ARI) event and Probably Maximum Flood (PMF) as shown in Figure 13 and Figure 14.

Figure 13 Flood Map – 100 Year ARI Design Flood Event (WBA Water dated September 2015)

Figure 14 Flood Map – PMF Design Flood Event (WBA Water on September 2015)

A flood model provided by WMA Water for the University of Sydney has been used to further check the flood conditions. A report for above development – *University of Sydney Flood Risk Management Stage 1 – Campus Flood Study Review* dated on December 2013 outlines that potential effects of climate change, sea level rise and an increase in rainfall intensity has been taken in consideration in the study/flood model.

As indicated below in the flood extent maps generated from above mentioned flood model, Figure 15 and Figure 16 - majority of site is not subject to 100 year ARI and the PMF flooding. However, the flood model shows there is a small batch of water at the western school entrance from Golden Grove Street, this is likely caused by an existing trapped low point. Given that the existing levels around low point is approximated at RL 33.05 while the immediate street level is at RL 34.12, during major storm event, the water from the street side tracks into the low point from the school entrance, the existing grated inlet pit at the low point is filled up and creates localised ponding.

This issue will be removed for the proposed development as the proposed level around the entrance will be higher (RL 34.3) than existing level, additionally, an overland flow path has been provided to Abercrombie Street from the entrance to avoid any trapped low point.

Figure 15 Flood Extent - 100 Year ARI (with 50mm Water Depth Cut-off)

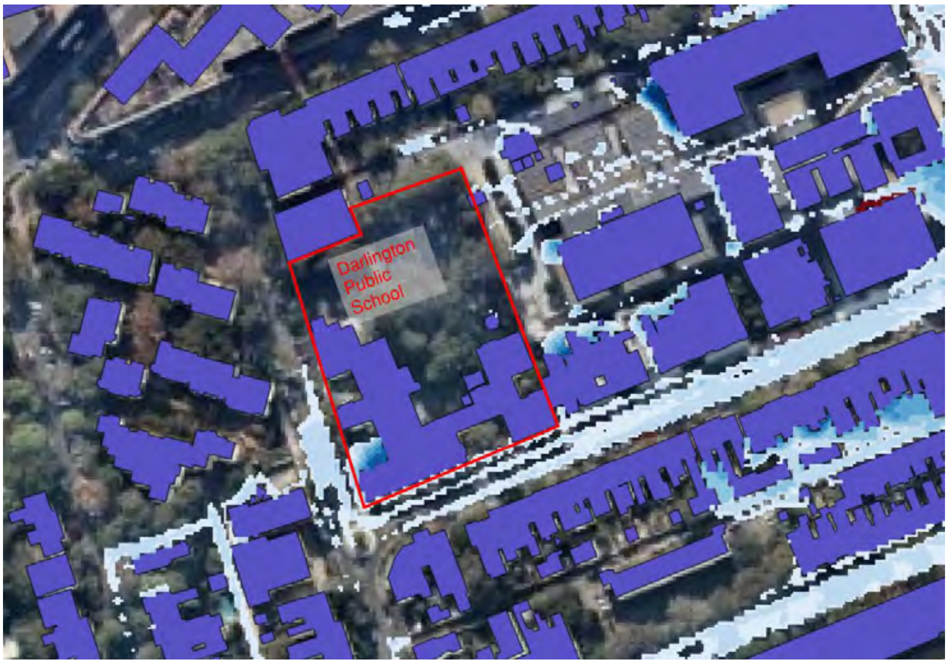


Figure 16 Flood Extent - PMF (with 50mm Water Depth Cut-off)

The above flood maps are produced with 50 mm rainfall cut-off style applied to distinguish flood flows from direct rainfall sheet flows, the results are consistent with the Blackwattle Bay Catchment Floodplain Risk Management Plan by WBA Water. Based on above discussion, it is believed the site is not flood affected and the existing localised trapped low point will be removed from the proposed development.

Additionally, during the meeting with City of Sydney Council, Council Engineer was not opposed to above design approach. Therefore, no further flood modelling will be carried out.

4.7. Bulk Earthworks

Bulk earthwork cut and fill will be required based on the level difference between the proposed surface levels and the existing ground levels. The earthworks cut/fill modelling undertaken in 12D modelling software indicate a volume of 1,675 m^3 fill is required to import to the site. Refer to **Appendix C** Civil Drawings for anticipated bulk earthworks plan and longitudinal sections based on the landscape architectural plan layout issued on 31st March 2020.

The Remediation Action Plan (RAP) provided by the Douglas Partners on 23rd March 2020 outlined that there is TRH and naphthalene impact to fill in the central western portion of the site at a concentration exceeding adopted requirement, capping and containment is recommended for this area. The area will be over excavated to create a minimum clean soil depth of 1 m to reduce vapour risk. This remediation action has been reflected in the bulk earthworks plan.

Further investigation on the vapour risk is currently being prepared by Douglas Partner during the production of the report, the area may be re-classified so that only a 300 mm depth of capping is required. Final earthworks cut/fill volume is to be determined once the remediation action plan is confirmed by the Geotechnical Engineers.

The assumptions for the bulk earthworks are outlined below:

- The communal hall is sitting on fill as advised by the Fjmt Architects and is as in bulk earthworks plan as an option for quantity surveyor to review.
- The existing site is predominantly impervious paving, assumed a 300 mm sacrificial layer of stripping, this is included in the cut/fill volume calculation.

The net cut/fill volume is subject to change with final levels.

4.8. Sediment and Erosion Control (During Construction)

The erosion and sediment control measures for the site will be implemented during construction. The design of these measures are to be in accordance with the Landcom “Blue Book”.

For erosion and sediment control of the site, the following measures are provided to minimise the risk of sediments laden runoff being discharged from the site:

- *A sediment fence/hoarding to be provided around the site*
- *Catch drain (or diversion bund) diverting external catchment away from site*
- *Temporary access to site with shaker pad*
- *An indicative stockpile area with sediment fence around it during construction. The stockpile must be located out of water flow paths (and be protected by earth banks/drains as required).*
- *Geotextile inlet pit filters or sandbags to be placed around existing stormwater pits.*
- *Water cart to spray excavated surfaces to reduce dust pollution.*
- *All disturbed areas are to be stabilised within 14 working days of the completion of earthworks. All disturbed areas are to be protected so that the land is permanently stabilised within six months.*
- *Sediment removed from any sediment trapping device shall be relocated where further pollution to downslope lands and waterways cannot occur.*
- *Water shall be prevented from entering the permanent drainage system unless it is sediment free. Drainage pits are to be protected in accordance with the final approved Sediment and Erosion Control Plan.*

- *Trapped sediment shall be removed immediately from areas subject to runoff or concentrated flow.*

- *Trapped sediment shall be removed where the capacity of sedimentation trapping devices fall below 60%.*

- *Revegetation schemes are to be adhered to and any grass coverings are kept healthy, including watering and mowing.*

5. Summary

The civil design works described in this report comply with City of Sydney Council DCP, City of Sydney Technical Specifications A4 Stormwater Drainage Design, Sydney Water OSD guideline, SEARs, Australian Standards and best-practiced principles.

The proposed stormwater strategy for this SSDA addresses water quantity by providing an on-site detention tanks to reduce peak flow limiting PSD for events up to and including 100 year ARI storm, but limited to existing constraints.

The proposed water quality improvement measures demonstrated that the development complies with the requirements outlined in from City of Sydney Council DCP.

The development removes the existing trapped low point around the entry area from Golden Grove Street.

Appendix A – Sydney Water Correspondence

Eve Wu

From:	Stormwater <Stormwater@sydneywater.com.au>
Sent:	Wednesday, 27 November 2019 3:13 PM
To:	Eve Wu; Stormwater
Subject:	RE: Urgent - Darlington Public School - OSD requirements

Eve,

The On Site Detention requirements for the 7260.65 square meters site at Darlington Public School, are as follows:

On Site Detention	124 cubic meter
Permissible Site Discharge	248 L/s

The approval for the On Site Detention would only be given as part of the Section 73 application for this development. The On Site Detention is to be designed according to the above values and submitted to Sydney Water for approval with the Section 73 application. The following details are to be included in your submission for On Site Detention approval:

- Location of the On Site Detention in relation to the development
- Location of the On Site Detention in relation to overall stormwater network of the property
- Plan and Elevation of the On Site Detention tank with all dimensions
- Orifice plate calculation

Best Regards

Jeya Jeyadevan
Senior Capability Assessor
Liveable City Solutions
Sydney Water, Level 7, 1 Smith Street, Parramatta NSW 2150

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Mob 0409 318 827
jeya.jeyadevan@sydneywater.com.au

From: Eve Wu <ewu@bonaccigroup.com>
Sent: Monday, 25 November 2019 2:00 PM
To: Stormwater <Stormwater@sydneywater.com.au>
Subject: RE: Urgent - Darlington Public School - OSD requirements

Hi Jeya,

Can you please urgently advise the OSD requirements based the following information:

- Development address: Darlington Public School, Golden Grove St, Chippendale NSW 2008
- Total site area: approximately 7260.65m^2
- Existing pre-development impervious area: 5711.81m^2
- Proposed post-development impervious area: 5343.43m^2

Please let me know if above information is enough for PSD and SSR calculation.

Regards,

Eve Wu
Civil Design Engineer

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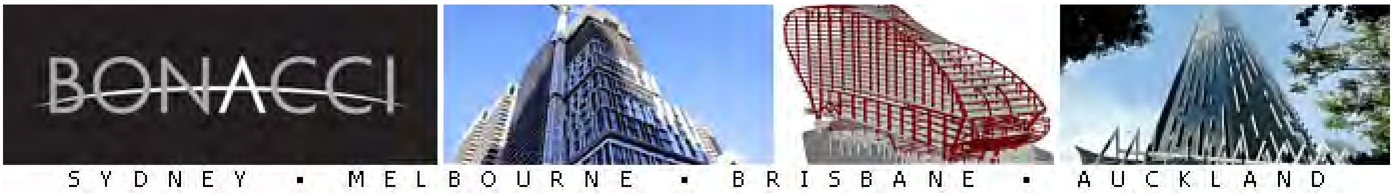

From: Eve Wu
Sent: Wednesday, 28 August 2019 4:56 PM
To: Stormwater <Stormwater@sydneywater.com.au>
Subject: Urgent - Darlington Public School - OSD requirements

Hi Jeya/Duncan,

We are working on the Darlington Public School for NSW Department of Education. The development involves the construction of new buildings and demolition of old buildings. We have the following information to calculate PSD and SSR:

- Development address: Darlington Public School, Golden Grove St, Chippendale NSW 2008
- Total site area: approximately 7246.6m^2
- Existing pre-development impervious area: 5711.81m^2
- Proposed post-development impervious area: 4866.19m^2

Please let me know if above information is enough for PSD and SSR calculation.

Regards,

Eve Wu

Civil Designer Engineer

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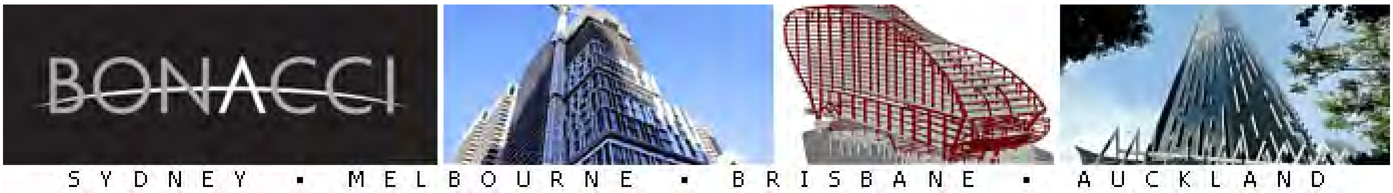

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Regards,

Eve Wu
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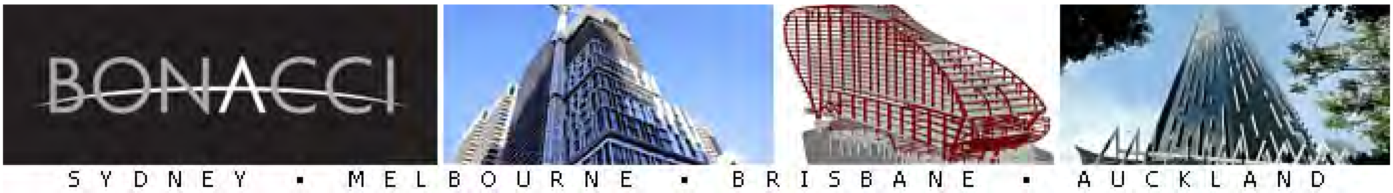

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Appendix B – MUSIC Link Report

MUSIC-*link* Report

Project Details		**Company Details**	
Project:	Darlington Public School	**Company:**	Meinhardt - Bonacci
Report Export Date:	2/04/2020	**Contact:**	
Catchment Name:	200304 Concept design v3	**Address:**	
Catchment Area:	0.665ha	**Phone:**	
Impervious Area*:	85.09%	**Email:**	
Rainfall Station:	66062 SYDNEY		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1982 - 31/12/1986 11:54:00 PM		
Mean Annual Rainfall:	1278mm		
Evapotranspiration:	1265mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	City of Sydney Clay Soil		
Scenario:	City Of Sydney Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		**Treatment Nodes**		**Source Nodes**	
Node: Post-Development Node	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	4.32%	Rain Water Tank Node	1	Urban Source Node	7
TSS	85%	Detention Basin Node	2		
TP	73.9%	Swale Node	1		
TN	52.1%	Buffer Node	1		
GP	99.6%	Generic Node	2		
		GPT Node	5		

Comments

DPS

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Buffer	Buffer	Proportion of upstream impervious area treated	None	None	0.5
Detention	Detention Basin	% Reuse Demand Met	None	None	0
Detention	Detention Basin	% Reuse Demand Met	None	None	0
GPT	1x Enviropod 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	99	0.02
GPT	1x Enviropod 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	99	0.01
GPT	2 x Enviropod 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	99	0.04
GPT	2 x Enviropod 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	99	0.04
GPT	f 1x Enviropod 200 (BCC 2015)	Hi-flow bypass rate (cum/sec)	None	99	0.02
Post	Post-Development Node	% Load Reduction	None	None	4.32
Post	Post-Development Node	GP % Load Reduction	90	None	99.6
Post	Post-Development Node	TN % Load Reduction	45	None	52.1
Post	Post-Development Node	TP % Load Reduction	65	None	73.9
Post	Post-Development Node	TSS % Load Reduction	85	None	85
Rain	30kL Rainwater Tank	% Reuse Demand Met	None	None	94.91
Swale	Swale	Bed slope	0.01	0.05	0.03
Urban	BYPASS 310m2	Area Impervious (ha)	None	None	0.029
Urban	BYPASS 310m2	Area Pervious (ha)	None	None	0.001
Urban	BYPASS 310m2	Total Area (ha)	None	None	0.031
Urban	CAT2_ROOF 1200m2	Area Impervious (ha)	None	None	0.234
Urban	CAT2_ROOF 1200m2	Area Pervious (ha)	None	None	0
Urban	CAT2_ROOF 1200m2	Total Area (ha)	None	None	0.234
Urban	CAT3_basketball court 850m2	Area Impervious (ha)	None	None	0.085
Urban	CAT3_basketball court 850m2	Area Pervious (ha)	None	None	0
Urban	CAT3_basketball court 850m2	Total Area (ha)	None	None	0.085
Urban	CAT4_landscape 1000m2	Area Impervious (ha)	None	None	0.050
Urban	CAT4_landscape 1000m2	Area Pervious (ha)	None	None	0.049
Urban	CAT4_landscape 1000m2	Total Area (ha)	None	None	0.1
Urban	CAT4_landscape 579m2	Area Impervious (ha)	None	None	0.011
Urban	CAT4_landscape 579m2	Area Pervious (ha)	None	None	0.046
Urban	CAT4_landscape 579m2	Total Area (ha)	None	None	0.058
Urban	CAT5_landscape 1309m2	Area Impervious (ha)	None	None	0.131
Urban	CAT5_landscape 1309m2	Area Pervious (ha)	None	None	0
Urban	CAT5_landscape 1309m2	Total Area (ha)	None	None	0.131
Urban	CAT6_BYPASS 260 m2	Area Impervious (ha)	None	None	0.024
Urban	CAT6_BYPASS 260 m2	Area Pervious (ha)	None	None	0.001
Urban	CAT6_BYPASS 260 m2	Total Area (ha)	None	None	0.026

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Detention	Detention Basin	Evaporative Loss as % of PET	100	100	0
Detention	Detention Basin	Evaporative Loss as % of PET	100	100	0
Detention	Detention Basin	Total Nitrogen - k (m/yr)	500	500	0
Detention	Detention Basin	Total Nitrogen - k (m/yr)	500	500	0
Detention	Detention Basin	Total Phosphorus - k (m/yr)	6000	6000	0
Detention	Detention Basin	Total Phosphorus - k (m/yr)	6000	6000	0
Detention	Detention Basin	Total Suspended Solids - k (m/yr)	8000	8000	0
Detention	Detention Basin	Total Suspended Solids - k (m/yr)	8000	8000	0
Urban	BYPASS 310m2	Field Capacity (mm)	127	127	144
Urban	BYPASS 310m2	Groundwater Daily Baseflow Rate (%)	10	10	50
Urban	BYPASS 310m2	Groundwater Daily Recharge Rate (%)	10	10	100
Urban	BYPASS 310m2	Pervious Area Infiltration Capacity coefficient - a	135	135	360
Urban	BYPASS 310m2	Pervious Area Infiltration Capacity exponent - b	4	4	0.5
Urban	BYPASS 310m2	Pervious Area Soil Storage Capacity (mm)	187	187	350
Urban	CAT2_ROOF 1200m2	Field Capacity (mm)	127	127	144
Urban	CAT2_ROOF 1200m2	Groundwater Daily Baseflow Rate (%)	10	10	50
Urban	CAT2_ROOF 1200m2	Groundwater Daily Recharge Rate (%)	10	10	100
Urban	CAT2_ROOF 1200m2	Pervious Area Infiltration Capacity coefficient - a	135	135	360
Urban	CAT2_ROOF 1200m2	Pervious Area Infiltration Capacity exponent - b	4	4	0.5
Urban	CAT2_ROOF 1200m2	Pervious Area Soil Storage Capacity (mm)	187	187	350
Urban	CAT3_basketball court 850m2	Field Capacity (mm)	127	127	144
Urban	CAT3_basketball court 850m2	Groundwater Daily Baseflow Rate (%)	10	10	50
Urban	CAT3_basketball court 850m2	Groundwater Daily Recharge Rate (%)	10	10	100
Urban	CAT3_basketball court 850m2	Pervious Area Infiltration Capacity coefficient - a	135	135	360
Urban	CAT3_basketball court 850m2	Pervious Area Infiltration Capacity exponent - b	4	4	0.5
Urban	CAT3_basketball court 850m2	Pervious Area Soil Storage Capacity (mm)	187	187	350
Urban	CAT4_landscape 1000m2	Field Capacity (mm)	127	127	144
Urban	CAT4_landscape 1000m2	Groundwater Daily Baseflow Rate (%)	10	10	50
Urban	CAT4_landscape 1000m2	Groundwater Daily Recharge Rate (%)	10	10	100
Urban	CAT4_landscape 1000m2	Pervious Area Infiltration Capacity coefficient - a	135	135	360
Urban	CAT4_landscape 1000m2	Pervious Area Infiltration Capacity exponent - b	4	4	0.5
Urban	CAT4_landscape 1000m2	Pervious Area Soil Storage Capacity (mm)	187	187	350
Urban	CAT5_landscape 1309m2	Field Capacity (mm)	127	127	144
Urban	CAT5_landscape 1309m2	Groundwater Daily Baseflow Rate (%)	10	10	50
Urban	CAT5_landscape 1309m2	Groundwater Daily Recharge Rate (%)	10	10	100
Urban	CAT5_landscape 1309m2	Pervious Area Infiltration Capacity coefficient - a	135	135	360
Urban	CAT5_landscape 1309m2	Pervious Area Infiltration Capacity exponent - b	4	4	0.5
Urban	CAT5_landscape 1309m2	Pervious Area Soil Storage Capacity (mm)	187	187	350

Only certain parameters are reported when they pass validation

Appendix C – Civil Drawings

1191701C - DARLINGTON PUBLIC SCHOOL

CIVIL DRAWING REGISTER	
DRAWING NUMBER	**DRAWING TITLE**
C001	COVER PAGE
C002	CONSTRUCTION NOTES
C004	SOIL AND WATER MANAGEMENT PLAN - STAGE 1
C005	SOIL AND WATER MANAGEMENT PLAN - STAGE 2
C006	SOIL AND WATER MANAGEMENT DETAILS
C011	BULK EARTHWORKS PLAN
C021	BULK EARTHWORKS LONGITUDINAL SECTIONS SHEET 1
C022	BULK EARTHWORKS LONGITUDINAL SECTIONS SHEET 2
C023	BULK EARTHWORKS LONGITUDINAL SECTIONS SHEET 3
C031	STORMWATER DRAINAGE PLAN - STAGE 1
C032	STORMWATER DRAINAGE PLAN - STAGE 2
C051	STORMWATER DRAINAGE DETAILS SHEET 1
C052	STORMWATER DRAINAGE DETAILS SHEET 2
C061	SITEWORKS AND PAVEMENT PLAN
C071	SITEWORKS AND PAVEMENT DETAILS SHEET 1
C072	SITEWORKS AND PAVEMENT DETAILS SHEET 2

LOCALITY PLAN

NOT TO SCALE

P1	*70% SSDA REVIEW*	*03.04.20*	*JF*	-
Rev	Description	Date	By	App

DARLINGTON PUBLIC SCHOOL

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COVER PAGE

FOR REVIEW

Designed EW
Drawn JF
Scale -
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref 1191701C
Drawing No C001
Rev P1

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GENERAL NOTES

G1 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ARCHITECTURAL AND OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS OR SKETCHES AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE SUPERINTENDENT BEFORE PROCEEDING WITH WORK.

G2 MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE SPECIFICATION, CURRENT SAA CODES, BUILDING REGULATIONS AND THE REQUIREMENTS OF ANY OTHER RELEVANT STATUTORY AUTHORITIES.

G3 THESE DRAWINGS MUST NOT BE SCALED. ALL DIMENSIONS ARE IN METERS. ALL SET OUT DIMENSIONS AND LEVELS, INCLUDING THOSE SHOWN ON THESE DRAWINGS SHALL BE IN ACCORDANCE WITH THE ARCHITECT'S DRAWINGS AND VERIFIED ON SITE.

G4 ALL SETOUT AND DIMENSIONS OF THE STRUCTURE INCLUDING KERBS AND RETAINING WALLS, AND BULK EARTHWORKS MUST BE TAKEN FROM THE ARCHITECT'S DRAWINGS. SETOUT OF THE STORMWATER PITS BY OTHERS. CONTRACTOR TO CONFIRM SETOUT OF SERVICE TRENCHING INCLUDING SUBSOIL ON SITE.

G5 THE CONTRACTOR SHALL COMPLY WITH ALL REGULATIONS OF AUTHORITIES HAVING JURISDICTION OVER THE WORKS. REFER TO GEOTECHNICAL REPORT BY 'DOUGLAS PARTNERS' PTY LTD PROJECT 92277.01 DATED FEBRUARY 2019

G6 ALL DIMENSIONS AND REDUCED LEVELS MUST BE VERIFIED ON SITE BEFORE THE COMMENCEMENT OF ANY WORK.

G7 THE APPROVAL OF A SUBSTITUTION SHALL BE SOUGHT FROM THE SUPERINTENDENT BUT IS NOT AN AUTHORISATION OF A COST VARIATION. THE SUPERINTENDENT MUST APPROVE ANY COST VARIATION INVOLVED BEFORE ANY WORK STARTS.

G8 ALL LEVELS SHOWN ARE TO THE AUSTRALIAN HEIGHT DATUM.

G9 SERVICE INFORMATION SHOWN IS APPROXIMATE ONLY. PRIOR TO COMMENCEMENT OF ANY WORKS, THE CONTRACTOR SHALL LOCATE ALL UNDERGROUND SERVICES AND COMPLY WITH ALL REQUIREMENTS OF THOSE AUTHORITIES.

G10 EXISTING SURFACE CONTOURS, WHERE SHOWN, ARE INTERPOLATED AND MAY NOT BE ACCURATE.

G11 UNLESS NOTED OTHERWISE, ALL VEGETATION SHALL BE STRIPPED TO A MINIMUM DEPTH OF 150mm UNDER ALL PROPOSED PAVEMENT AND BUILDING AREAS.

G12 MAKE SMOOTH CONNECTION WITH ALL EXISTING WORKS.

SITEWORKS NOTES

S1 PRIOR TO THE PLACEMENT OF ANY PAVEMENTS, BUILDINGS OR DRAINS THE EXPOSED SUBGRADE SHALL BE COMPACTED TO A MINIMUM OF 98% STANDARD COMPACTION IN ACCORDANCE WITH TEST 'E1.1' OF A.S. 1289 FOR THE TOP 300mm. ANY SOFT SPOTS SHALL BE REMOVED AND REPLACED WITH GRANULAR FILL TO THE ENGINEERS APPROVAL AND COMPACTED IN ACCORDANCE WITH THE COMPACTION REQUIREMENTS SET OUT BELOW. ON HIGHLY REACTIVE CLAY AREAS SITE EXCAVATED MATERIAL MAY BE USED WITH THE PRIOR AUTHORISATION OF THE ENGINEER.

S2 ALL FILL AND PAVEMENT MATERIALS SHALL BE COMPACTED IN ACCORDANCE WITH GEOTECHNICAL REPORT BY 'DOUGLAS PARTNERS' PTY LTD PROJECT 92277.01 DATED FEBRUARY 2019
MOISTURE CONTENT TO BE MAINTAINED AT +/- 2% OMC. MINIMUM COMPACTION REQUIREMENTS ARE DETAILED BELOW F0R (ALL REQUIREMENTS ARE TO VERIFIED BY A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER):

• LANDSCAPED AREAS	98% STD.
• FILL UNDER ANY FOOTINGS AND FLOOR SLABS FOR ANY STRUCTURE TO SUBGRADE LEVEL;	
- FINE CRUSHED ROCK	98% STD.
- SELECTED FILL WITHOUT CONSPICUOUS CLAY CONTENT	98% STD.
• BUILDING BASECOURSE	98% MOD
• FILL UNDER ROAD PAVEMENTS;	
- TO WITHIN 500mm OF FINISHED SUBGRADE LEVEL	98% STD.
- UP TO FINISHED SUBGRADE LEVEL	98% STD.
• ROAD PAVEMENT MATERIALS;	
- SUB BASE	98% MOD.
- BASE COURSE	98% MOD.

THE MAXIMUM COMPACTION IS TO BE NO GREAT THAN 4% ON TOP OF THE ABOVE MENTION VALUES.

S3 GRADE EVENLY BETWEEN FINISHED SURFACE SPOT LEVELS. FINISHED SURFACE CONTOURS ARE SHOWN FOR CLARITY. WHERE FINISHED SURFACE LEVELS ARE NOT SHOWN, THE SURFACE SHALL BE GRADED SMOOTHLY SO THAT IT WILL DRAIN AND MATCH ADJACENT SURFACES OR STRUCTURES.

S4 ALL DIMENSIONS GIVEN ARE TO FACE OF KERB, CENTER OF PIPE OR EXTERIOR FACE OF BUILDING UNLESS NOTED OTHERWISE.

S5 ANY STRUCTURES, PAVEMENTS OR SURFACES DAMAGED, DIRTIED OR MADE UNSERVICABLE DUE TO CONSTRUCTION WORK SHALL BE REINSTATED TO THE SATISFACTION OF THE ENGINEER.

S6 ANY FILL REQUIRED SHALL BE APPROVED BY THE ENGINEER / GEOTECHNICAL CONSULTANT

S7 CONTRACTOR IS TO ENSURE THAT ALL EXCAVATIONS ARE MAINTAINED IN A DRY CONDITION WITH NO WATER ALLOWED TO REMAIN IN THE EXCAVATIONS.

S8 ALL FINISHES AND COLOURS TO BE IN ACCORDANCE WITH ARCHITECTURAL SPECIFICATIONS.

S9 REFER TO STRUCTURAL DRAWINGS FOR CONCRETE, REINFORCEMENT AND RETAINING WALL DETAILS.

S10 GENERALLY FOR TRENCHING WORKS THE CONTRACTOR MUST:
A) COMPLY WITH THE GENERAL PROVISIONS OF PART 3.1 "MANAGING RISKS TO HEALTH AND SAFETY" OF NSW WORK AND HEALTH AND SAFETY REGULATION 2011

B) COMPLY PART 6.3 DIVISION 3 "EXCAVATION WORK" OF NSW WORK HEALTH AND SAFETY REGULATION NSW 2011

S11 PRIOR TO THE EXCAVATION OF ANY TRENCH DEEPER THAN 1.5 METRES THE CONTRACTOR MUST:
A) NOTIFY THE OCCUPATIONAL HEALTH AND SAFETY AUTHORITY ON THE APPROPRIATE FORM.

STORMWATER DRAINAGE NOTES

SW1 UNLESS NOTED OTHERWISE BY HYDRAULIC ENGINEERS DRAWINGS, ALL DOWNPIPES & GRATED INLETS SHALL BE CONNECTED TO PITS OR MAIN STORMWATER DRAINS WITH 150 DIA. UPVC PIPES LAID AT A MINIMUM GRADE OF 1 IN 100. FOR SYPHONIC ROOF DRAINAGE SYSTEMS ALL DOWNPIPES CONNECTION DRAIN SIZES TO BE CONNECTED INTO MAIN STORMWATER DRAINS SHALL BE IN ACCORDANCE WITH HYDRAULIC ENGINEERS DRAWINGS.

SW2 ALL MAIN STORMWATER DRAINS SHALL BE CONSTRUCTED USING MATERIALS AS SPECIFIED ON THE DRAWINGS IN ACCORDANCE WITH THE APPROPRIATE A.S. IF NOT SPECIFIED THEN CLASS 2 RRJ RCP SHALL BE USED FOR DIAMETERS > 225mm. SEWER CLASS SEH UPVC IN ACCORDANCE WITH AS1260 SHALL BE USED FOR ϕ225mm OR SMALLER.

SW3 ALL PIPEWORK TO BE INSTALLED IN ACCORDANCE WITH AS3725 FOR RCP AND AS2032 FOR PVC. ALL BEDDING TO BE TYPE H2 UNLESS NOTED OTHERWISE.

SW4 FOR ALL PITS > 1.2m DEEP, STEP IRONS SHALL BE INSTALLED.

SW5 PRECAST PITS MAY BE USED EXTERNAL TO THE BUILDING SUBJECT TO APPROVAL BY BONACCI GROUP.

SW6 ENLARGERS, CONNECTIONS AND JUNCTIONS TO BE PREFABRICATED FITTINGS WHERE PIPES ARE LESS THAN 300 DIA.

SW7 WHERE SUBSOIL DRAINS PASS UNDER FLOOR SLABS AND VEHICULAR PAVEMENTS, UNSLOTTED uPVC SEWER GRADE PIPE IS TO BE USED.

SW8 GRATES AND COVERS SHALL CONFORM WITH AS 3996 AND AS 1428.1 FOR ACCESS REQUIREMENTS.

SW9 CARE IS TO BE TAKEN WITH LEVELS OF STORMWATER LINES. GRADES ARE NOT TO BE REDUCED WITHOUT APPROVAL.

SW10 AT ALL TIMES DURING CONSTRUCTION OF STORMWATER PITS, ADEQUATE SAFETY PROCEDURES SHALL BE TAKEN TO ENSURE AGAINST THE POSSIBILITY OF PERSONNEL FALLING DOWN PITS.

SW11 ALL EXISTING STORMWATER DRAINAGE LINES AND PITS THAT ARE TO REMAIN ARE TO BE INSPECTED AND CLEANED. DURING THIS PROCESS ANY PART OF THE STORMWATER DRAINAGE SYSTEM THAT WARRANTS REPAIR SHALL BE REPORTED TO THE SUPERINTENDENT/ENGINEER FOR FURTHER DIRECTIONS.

KERBING NOTES

K1 ALL CONCRETE TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF 32 MPa U.N.O.

K2 ALL KERBS, GUTTERS, DISH DRAINS AND CROSSINGS TO BE CONSTRUCTED ON 75mm GRANULAR BASECOURSE COMPACTED TO A MINIMUM 98% MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS1289 5.2.1.

K3 EXPANSION JOINTS (EJ) TO BE FORMED FROM 10mm COMPRESSIBLE CORK FILLER BOARD FOR THE FULL DEPTH OF THE SECTION AND CUT TO PROFILE. EXPANSION JOINTS TO BE LOCATED AT DRAINAGE PITS, ON TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX 12m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE EXPANSION JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLAB.

K4 WEAKENED PLANE JOINTS TO BE MIN 3mm WIDE AND LOCATED AT 3m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE WEAKENED PLANE JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLAB.

K5 BROOMED FINISH TO ALL RAMPED AND VEHICULAR CROSSINGS. ALL OTHER KERBING OR DISH DRAINS TO BE STEEL FLOAT FINISHED.

K6 IN THE REPLACEMENT OF KERBS:-
- EXISTING ROAD PAVEMENT IS TO BE SAWCUT 900mm U.N.O. FROM THE LIP OF GUTTER. UPON COMPLETION OF THE NEW KERB AND GUTTER, NEW BASECOURSE AND SURFACE TO BE LAID 600mm WIDE U.N.O.
- EXISTING KERBS ARE TO BE COMPLETELY REMOVED WHERE NEW KERBS ARE SHOWN.

JOINTING NOTES

PEDESTRIAN FOOTPATH JOINTS

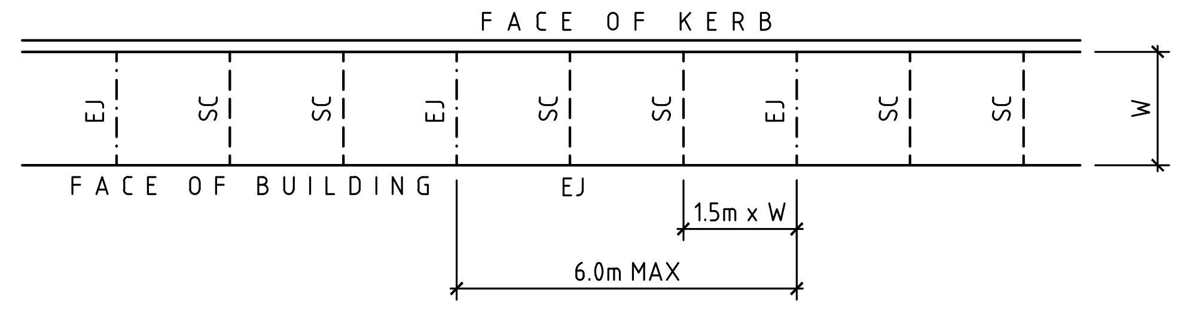
J1 EXPANSION JOINTS (EJ) ARE TO BE LOCATED WHERE POSSIBLE AT TANGENT POINTS OF CURVES AND ELSEWHERE AT 6m CENTRES.

J2 SAWCUT JOINTS (SC) ARE TO BE LOCATED AT A MAX 1.5m x WIDTH OF PAVEMENT. THE TIMING OF THE SAWCUT IS TO BE CONFIRMED BY THE CONTRACTOR ON SITE. SITE CONDITIONS WILL DETERMINE HOW MANY HOURS AFTER THE CONCRETE POUR BEFORE THE SAW CUTS ARE COMMENCED.

J3 WHERE POSSIBLE JOINTS SHOULD BE LOCATED TO MATCH KERBING AND / OR ADJACENT PAVEMENT JOINTS.

J4 PROVIDE 10mm WIDE FULL DEPTH EXPANSION JOINTS (EJ) BETWEEN BUILDINGS AND ALL CONCRETE OR UNIT PAVERS

J5 ALL PEDESTRIAN FOOTPATH JOINTINGS AS FOLLOWS (U.N.O.).



VEHICULAR PAVEMENT JOINTS

J6 ALL VEHICULAR PAVEMENTS TO BE JOINTED AS SHOWN ON DRAWINGS.

J7 LONGITUDINAL WARPING JOINTS (LWJ) SHOULD GENERALLY BE LOCATED AT A MAXIMUM OF 3m TO 4.5m MAX CENTERS. ALL LWJ's SHOULD BE TIED UP TO A MAXIMUM TOTAL WIDTH OF 30m.

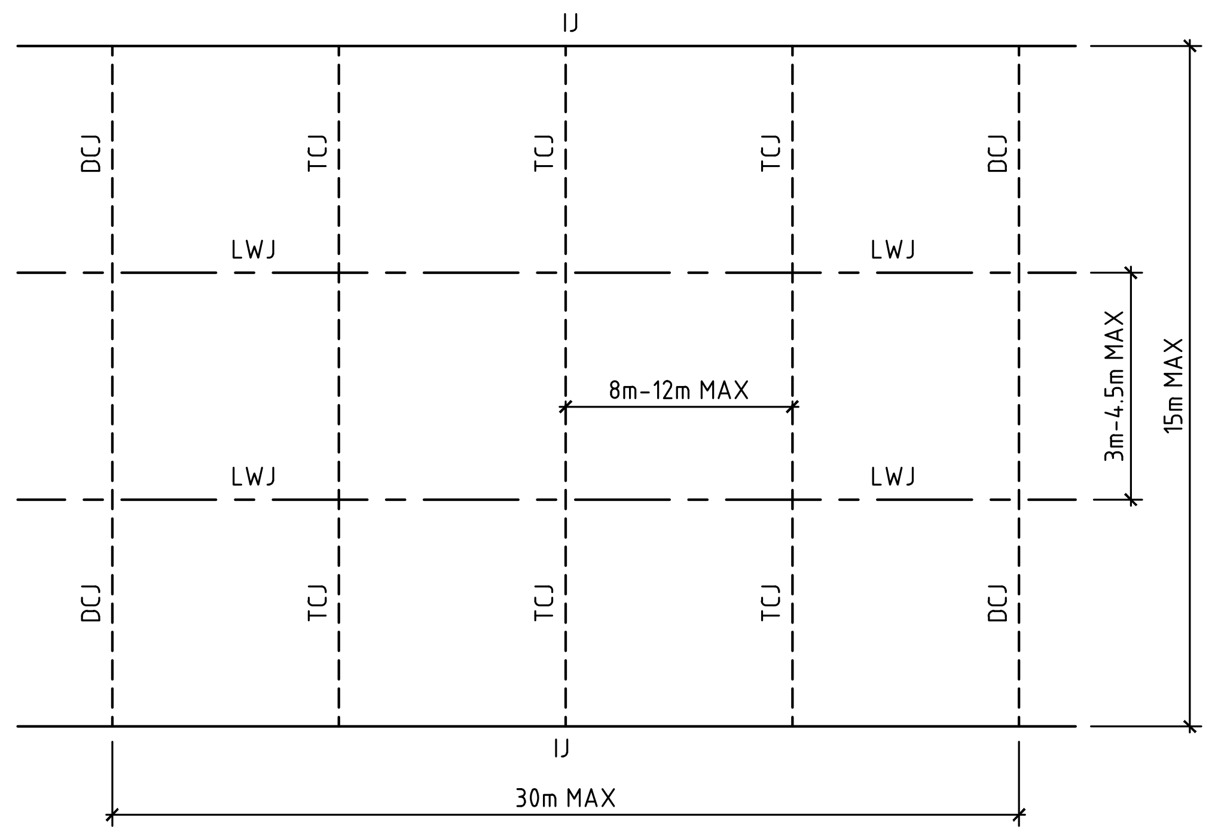
J8 TRANSVERSE CONTRACTION JOINTS (TCJ) SHOULD GENERALLY BE LOCATED AT A MAXIMUM OF 8m TO 12m MAX CENTERS. TCJ's CAN BE SPACED AT SUITABLE INTERVALS UP TO A RECOMMENDED MAXIMUM LENGTH OF 15m.

J9 TRANSVERSE DOWELLED CONSTRUCTION JOINTS (DCJ) TO BE PROVIDED FOR PLANNED INTERRUPTIONS SUCH AS AT THE END OF EACH DAY'S OPERATIONS (POUR BREAK), AT BLOCK OUTS FOR BRIDGES AND INTERSECTIONS OR FOR UNEXPECTED DELAYS WHEN THE SUSPENSION OF OPERATIONS IS LIKELY TO CREATE A JOINT.

J10 ISOLATION JOINTS WITH SUB-GRADE BEAM (IJ) TO BE PROVIDED AT INTERSECTIONS OR AT THE JUNCTION OF A POUR BREAK.

J11 ALL VEHICULAR PAVEMENTS TO BE JOINTED IN ACCORDANCE WITH AUSTROADS AGPT02-12 GUIDE TO PAVEMENT TECHNOLOGY PART 2 STRUCTURAL PAVEMENT DESIGN AND SUPPLEMENT AP-T36-06 PAVEMENT DESIGN FOR LIGHT TRAFFIC

J12 VEHICULAR PAVEMENT JOINTING AS FOLLOWS (U.N.O.)



DIAL BEFORE YOU DIG
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The Essential First Step

ALL EXISTING PROPERTY SERVICES' LOCATIONS AND DEPTHS ARE APPROXIMATE AND MUST BE VERIFIED ON SITE.
THE CONTRACTOR SHOULD SUPPLY PRECISE LOCATIONS AND DEPTHS TO THE ENGINEER FOR REVIEW PRIOR TO ANY WORKS THAT MAY AFFECT THESE SERVICES.

WARNING
NO DRAINAGE WORKS SHALL COMMENCE UNTIL THE CONTRACTOR CONFIRMS THE I.L. OF ALL EXISTING DRAINS, AND CONFIRMS IN WRITING WITH THE ENGINEERING SUPERVISOR.

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES SHOWN ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE.

Rev	Description	Date	By	App
P1	70% SSDA REVIEW	03.04.20	JF	-

DARLINGTON PUBLIC SCHOOL

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CONSTRUCTION NOTES

FOR REVIEW

Designed EW
Drawn JF
Scale -
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref 1191701C
Drawing No C002
Rev P1

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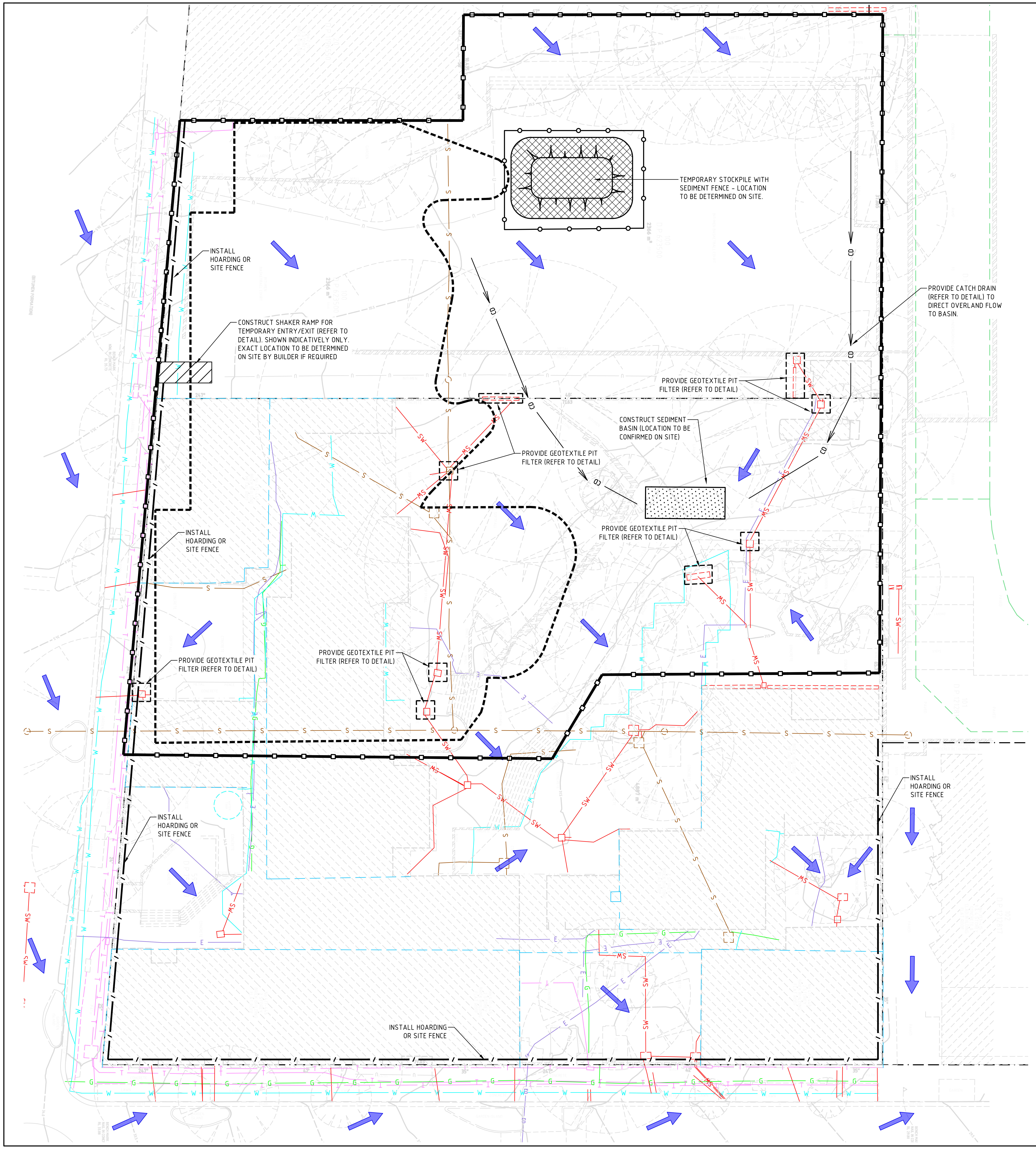

SOIL AND WATER MANAGEMENT LEGEND

—— / ——	HOARDING OR SITE FENCE
——o——o—	SEDIMENT FENCE
——> CD ——	CATCH DRAIN
▨	TEMPORARY SHAKER RAMP FOR ENTRY/EXIT
▒	SEDIMENT BASIN (LOCATION TBC ON-SITE)
▩	TEMPORARY STOCKPILE (LOCATION TBC ON-SITE)
⬚	GEOTEXTILE PIT FILTER / FILTER SURROUND INSTALLED ON EXISTING PIT
/⬚\	SANDBAGS INSTALLED ON EXISTING PIT
➡	OVERLAND FLOW

SURVEY LEGEND

—— —— · ——	SITE BOUNDARY
× 24.50	EX SURFACE LEVEL
5.00	EX SURFACE CONTOUR
✺	EX TREE
—— Ex SW ——	EXISTING STORMWATER DRAINAGE LINE
—— Ex S ——	EXISTING SEWER LINE
—— Ex W ——	EXISTING WATER MAIN
—— Ex G ——	EXISTING GAS LINE
—— Ex T ——	EXISTING TELECOMMUNICATIONS LINE
—— Ex E ——	EXISTING ELECTRICAL LINE
— · —— · —	EXISTING UNKNOWN SERVICE
—×— Ex E —×—	EXISTING SERVICE TO BE MADE REDUNDANT
▭	STAGE 1 AND EARLY WORKS EXTENT (INDICATIVE ONLY).

SOIL AND WATER MANAGEMENT NOTES

1. IT HAS BEEN ASSUMED THAT HOARDINGS/SILT FENCING WILL BE PROVIDED TO THE STAGE BOUNDARY SUFFICIENT TO PREVENT SEDIMENT RUNOFF FROM LEAVING SITE (EXCEPT IN THE CASE OF ENTRY/EXIT LOCATIONS WHERE TEMPORARY CONSTRUCTION ENTRY/EXIT SEDIMENT TRAP ARE PROVIDED). IF THIS IS NOT THE CASE, PROVIDE SEDIMENT FENCE TO STANDARD DETAIL BELOW AS REQUIRED TO PREVENT SEDIMENT FROM LEAVING SITE, DIRECT RUNOFF TO SEDIMENT BASIN.
2. ALL SEDIMENT CONTROL MEASURES TO BE INSTALLED IN ACCORDANCE WITH LANDCOM MANAGING URBAN STORMWATER "BLUE BOOK".

SEDIMENT CONTROL CONDITIONS

1. SEDIMENT FENCES WILL BE INSTALLED AS SHOWN AND ELSEWHERE AT THE DISCRETION OF THE SITE MANAGER TO CONTAIN COARSER SEDIMENT FRACTIONS INCLUDING AGGREGATED FINES) AS NEAR AS POSSIBLE TO THEIR SOURCE.
2. SEDIMENT REMOVED FROM ANY TRAPPING DEVICE WILL BE RELOCATED WHERE FURTHER POLLUTION TO DOWNSLOPE LANDS & WATERWAYS CANNOT OCCUR.
3. STOCKPILES WILL BE PLACED WHERE SHOWN ON DRAWING OR ELSEWHERE AT THE DISCRETION OF THE SITE MANAGER AND NOT WITHIN 5m OF HAZARD AREAS INCLUDING LIKELY AREAS OF HIGH VELOCITY FLOWS SUCH AS WATERWAYS, PAVED AREAS & DRIVEWAYS.
4. WATER WILL BE PREVENTED FROM DIRECTLY ENTERING THE PERMANENT DRAINAGE SYSTEM WITH INLET FILTERS (SEE DETAILS) UNLESS IT IS SEDIMENT FREE.
5. TEMPORARY SEDIMENT TRAPS WILL BE RETAINED UNTIL AFTER THE LANDS THEY ARE PROTECTING ARE COMPLETELY REHABILITATED.
6. CONTRACTOR TO DESIGN/SIZE/CONSTRUCT TEMPORARY SEDIMENT BASIN, WATER SHOULD BE ALLOWED TO SETTLE BEFORE DISCHARGE. CONTRACTOR MUST VERIFY THAT WATER QUALITY MEETS AUTHORITIES REQUIREMENTS PRIOR TO DISCHARGE . ACCUMULATED SEDIMENT SHOULD THEN BE REMOVED & DISPOSED OF IN ACCORDANCE WITH ENVIRONMENTAL MANAGEMENT PROCEDURES.

SITE INSPECTION & MAINTENANCE CONDITIONS

THE SITE MANAGER WILL INSPECT THE SITE AT LEAST WEEKLY AND WILL:

1. ENSURE THAT DRAINS OPERATE PROPERLY & TO EFFECT ANY NECESSARY REPAIRS
2. REMOVE SPILLED SAND OR OTHER MATERIALS FROM HAZARD AREAS, INCLUDING LANDS CLOSER THAN 5m FROM AREAS OF LIKELY CONCENTRATED OR HIGH VELOCITY FLOWS ESPECIALLY WATERWAYS & PAVED AREAS.
3. REMOVE TRAPPED SEDIMENT WHENEVER LESS THAN DESIGN CAPACITY REMAINS WITHIN THE STRUCTURE
4. ENSURE REHABILITATED LANDS HAVE EFFECTIVELY REDUCED THE EROSION HAZARD AND TO INITIATE UPGRADING OR REPAIR AS APPROPRIATE.
5. CONSTRUCT ADDITIONAL EROSION AND/OR SEDIMENT CONTROL WORKS AS MIGHT BECOME NECESSARY TO ENSURE THE DESIRED PROTECTION IS GIVEN TO DOWNSLOPE LANDS AND WATERWAYS.
6. MAINTAIN EROSION & SEDIMENT CONTROL MEASURES IN A FULLY FUNCTIONING CONDITION UNTIL ALL EARTHWORK ACTIVITIES ARE COMPLETED AND THE SITE IS REHABILITATED.
7. REMOVE TEMPORARY SOIL CONSERVATION STRUCTURES AS THE LAST ACTIVITY IN THE REHABILITATION PROGRAM.

AS PART OF THE STATUTORY 'DILIGENCE OF CARE' RESPONSIBILITIES, THE SITE MANAGER WILL KEEP A LOGBOOK MAKING ENTRIES AT LEAST WEEKLY, IMMEDIATELY BEFORE FORECAST RAIN AND AFTER RAINFALL.
ENTRIES WILL INCLUDE:

1. THE VOLUME & INTENSITY OF ANY RAINFALL EVENTS
2. THE CONDITION OF ANY SOIL & WATER MANAGEMENT WORKS
3. THE CONDITION OF VEGETATION & ANY NEED TO IRRIGATE
4. THE NEED FOR DUST PREVENTION STRATEGIES
5. ANY REMEDIAL WORKS TO BE UNDERTAKEN

THE BOOK WILL BE KEPT ONSITE & MADE AVAILABLE TO ANY AUTHORISED PERSON ON REQUEST. IT WILL BE GIVEN TO THE PROJECT MANAGER AT THE CONCLUSION OF WORKS.

Rev	Description	Date	By	App
P1	70% SSDA REVIEW	04.03.20	JF	-

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SOIL AND WATER
MANAGEMENT PLAN
STAGE 1

FOR REVIEW

Designed EW
Drawn JF
Scale 1:200
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref 1191701C
Drawing No C004
Rev P1

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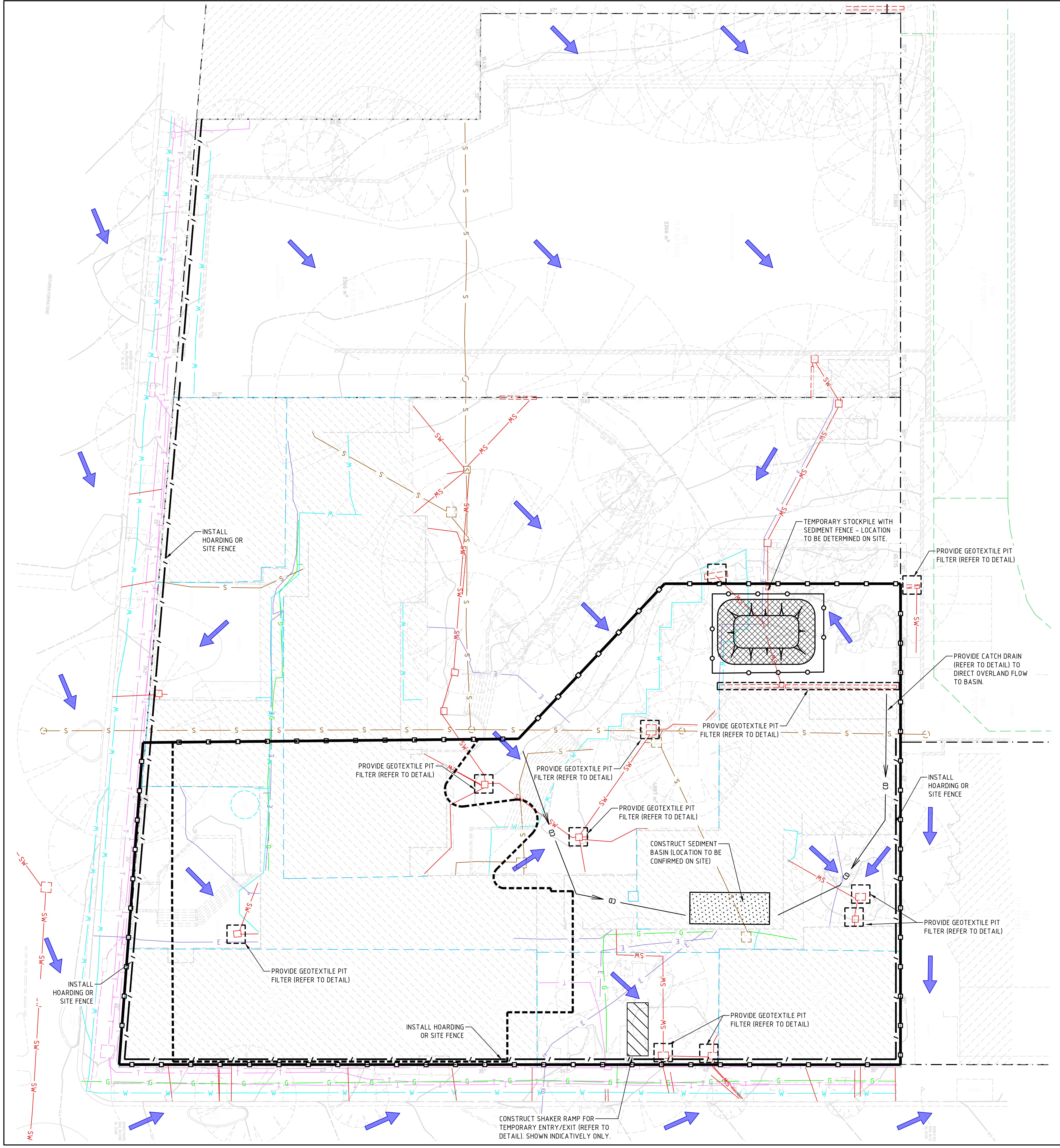

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SOIL AND WATER MANAGEMENT LEGEND

——/——	HOARDING OR SITE FENCE
—o—o—	SEDIMENT FENCE
→ CD —	CATCH DRAIN
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▭	STAGE 2 WORKS EXTENT (INDICATIVE ONLY).

SOIL AND WATER MANAGEMENT NOTES

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P1	*70% SSDA REVIEW*	*04.03.20*	*JF*	*-*

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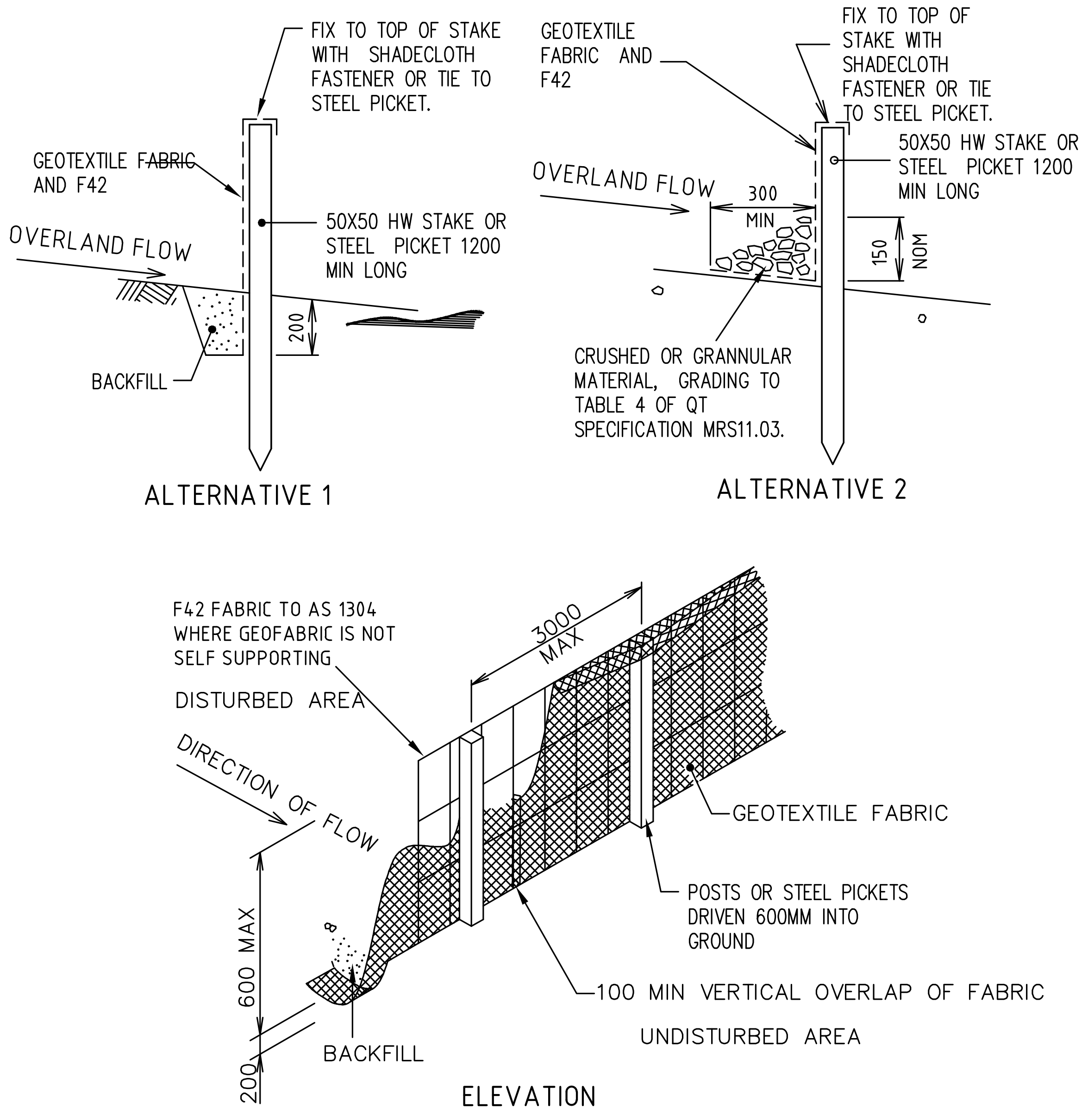
SOIL AND WATER
MANAGEMENT PLAN
STAGE 2

FOR REVIEW

Designed EW
Drawn JF
Scale 1:200
Date FEB 2020
Sheet A1

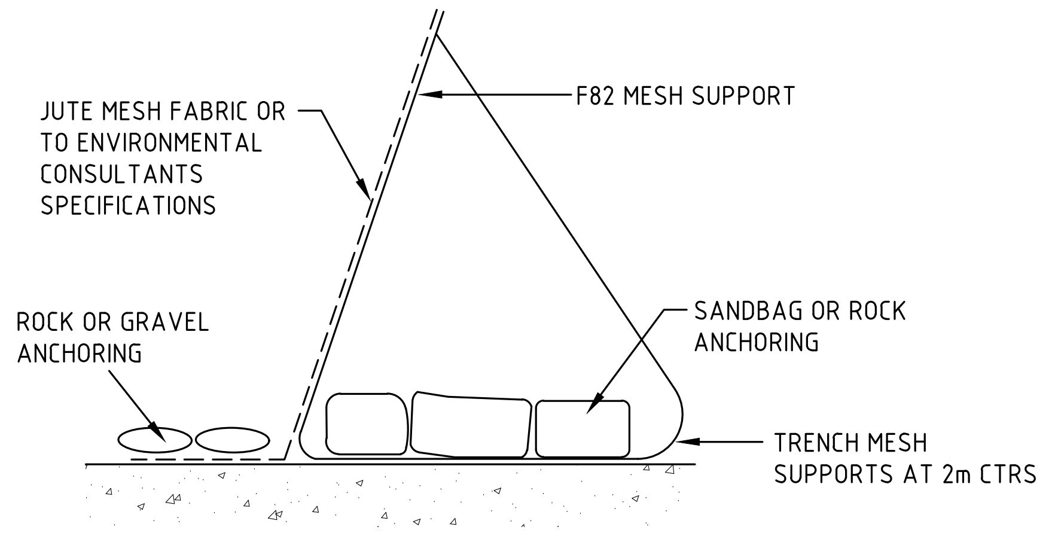
Project Director Approved
Date
North

Project Ref	Drawing No	Rev
1191701C	C005	P1



SEDIMENT FENCE

NOT TO SCALE

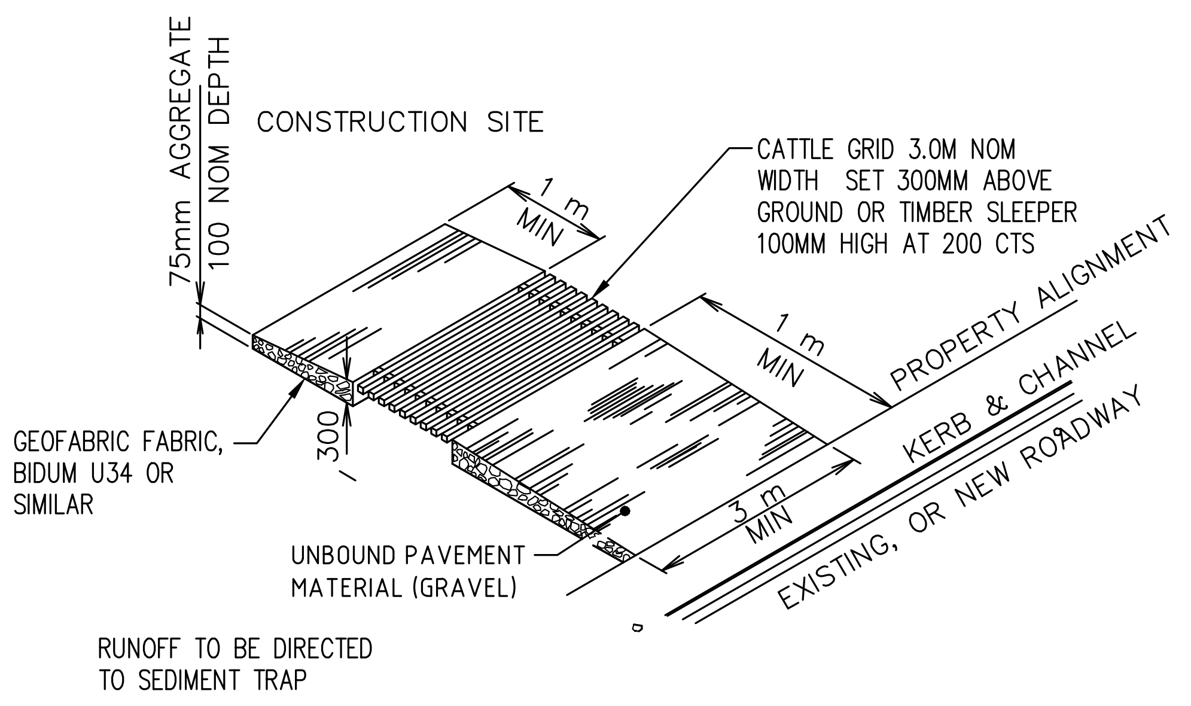


ALTERNATIVE SEDIMENT FENCE

NOT TO SCALE

ALTERNATIVE SEDIMENT FENCE NOTES

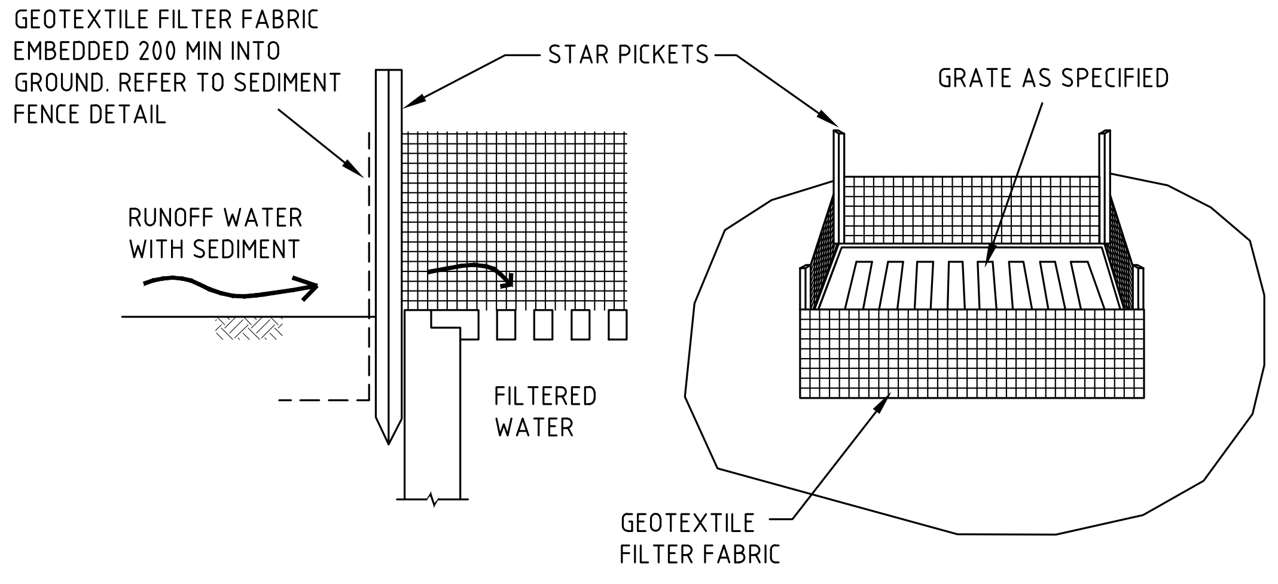
1. INSTALL THIS TYPE OF SEDIMENT FENCE WHEN USE OF SUPPORT POSTS IS NOT DESIRABLE OR NOT POSSIBLE. SUCH CONDITIONS MIGHT APPLY, FOR EXAMPLE, WHERE APPROVAL IS GRANTED FROM THE APPROPRIATE AUTHORITIES TO PLACE THESE FENCES IN HIGHLY SENSITIVE ESTUARINE AREAS.
2. USE BENT TRENCH MESH TO SUPPORT THE F82 WELDED MESH FACING AS SHOWN ON THE DRAWING ABOVE. ATTACH THE JUTE MESH TO THE WELDED MESH FACING USING UV-RESISTANT CABLE TIES.
3. STABILISE THE WHOLE STRUCTURE WITH SANDBAG OR ROCK ANCHORING OVER THE TRENCH MESH AND THE LEADING EDGE OF THE JUTE MESH. THE ANCHORING SHOULD BE SUFFICIENTLY LARGE TO ENSURE STABILITY OF THE STRUCTURE IN THE DESIGN STORM EVENT, USUALLY THE 10 YEAR EVENT.



RUNOFF TO BE DIRECTED TO SEDIMENT TRAP

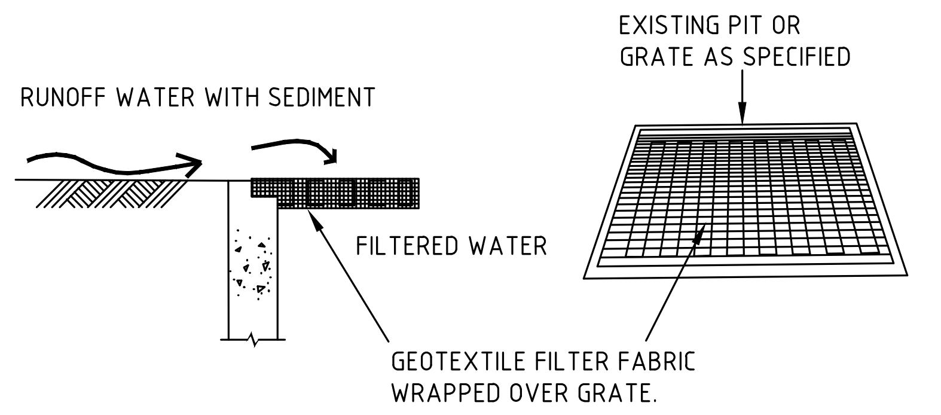
TEMPORARY CONSTRUCTION VEHICLE ENTRY/EXIT SEDIMENT TRAP

NOT TO SCALE



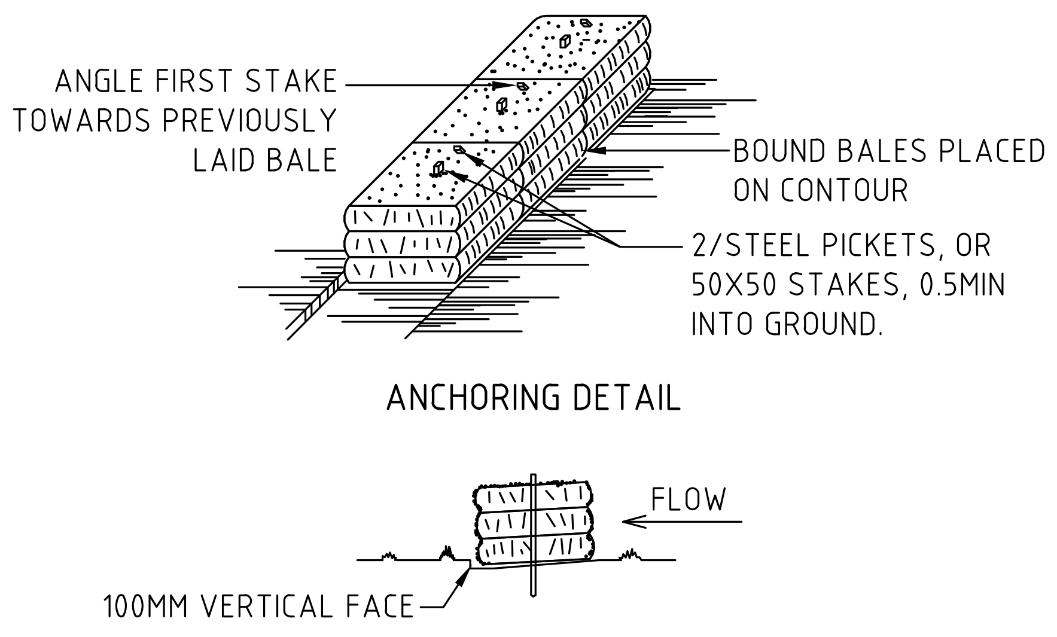
GEOTEXTILE PIT FILTER 1

NOT TO SCALE



GEOTEXTILE PIT FILTER 2

NOT TO SCALE

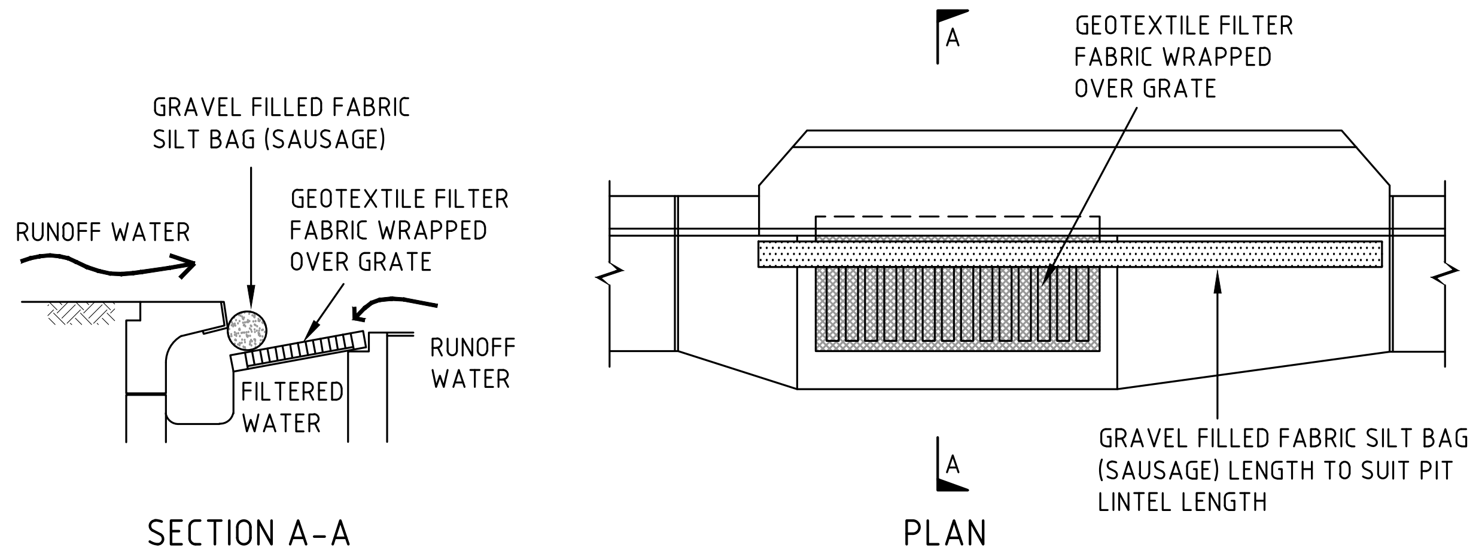


ANCHORING DETAIL

BEDDING DETAIL

STRAW BALE BANK SEDIMENT CONTROL

NOT TO SCALE

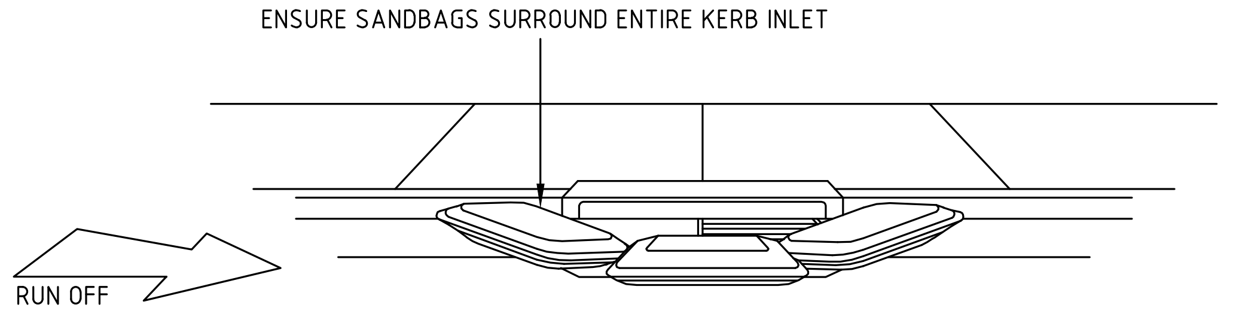


SECTION A-A

PLAN

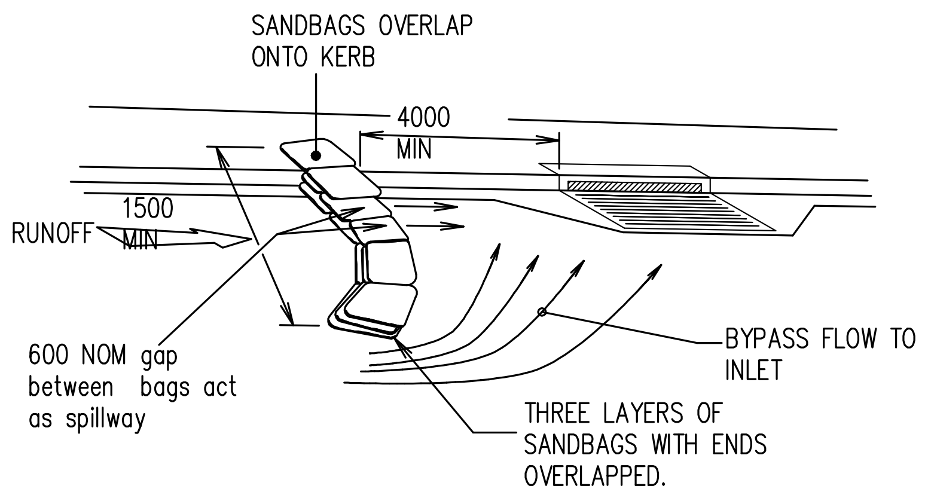
KERB INLET SEDIMENT TRAP

NOT TO SCALE



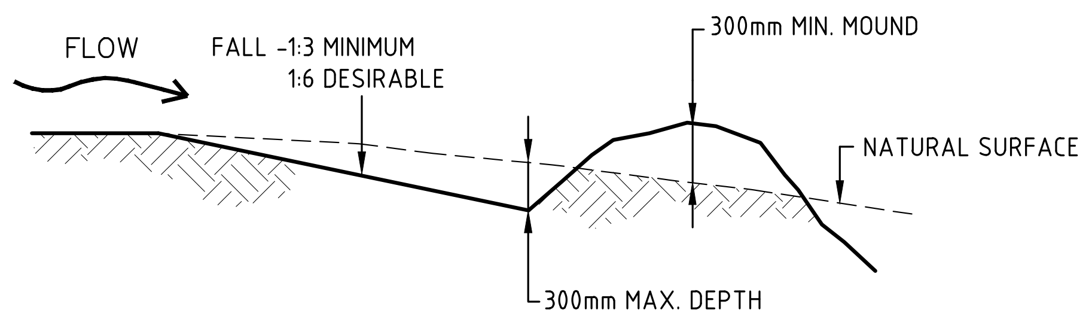
SANDBAG KERB INLET SEDIMENT TRAP

NOT TO SCALE



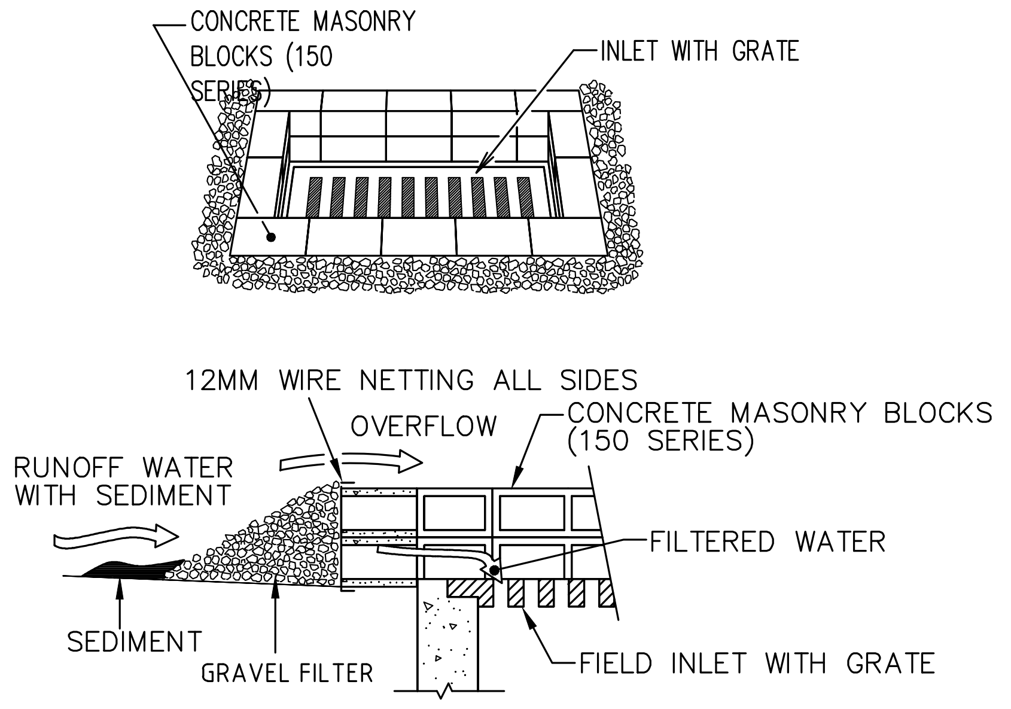
ON GRADE KERB INLET SEDIMENT TRAP

NOT TO SCALE



CATCH DRAIN

NOT TO SCALE



FIELD INLET SEDIMENT TRAP

NOT TO SCALE

Rev	Description	Date	By	App
P1	70% SSDA REVIEW	04.02.20	JF	-

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SOIL AND WATER MANAGEMENT DETAILS

FOR REVIEW

Designed EW
Drawn JF
Scale NTS
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref	Drawing No	Rev
1191701C	C006	P1

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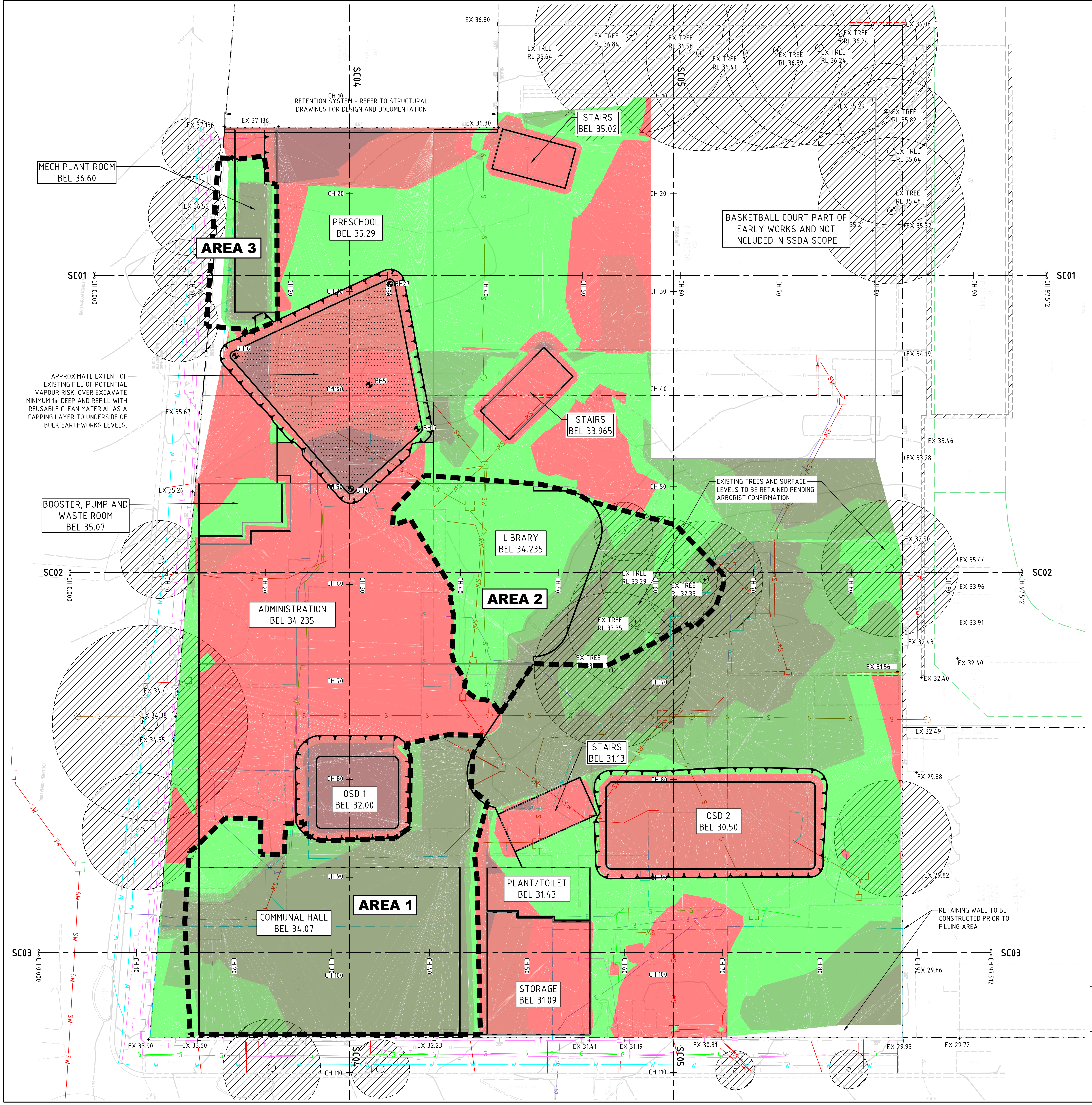


EXCAVATION NOTES

E1 VOLUMES ARE APPROXIMATE ONLY AND DO NOT INCORPORATE BULKING FACTORS AND OVER EXCAVATION. VOLUMES HAVE BEEN CALCULATED BETWEEN 300mm STRIPPED SURFACE LEVELS AND BULK EARTHWORKS LEVELS.

E2 GROUND WATER SEEPAGE MAY OCCUR IN EXCAVATED AREAS. DE-WATERING MAY BE REQUIRED IN THIS INSTANCE.

E3 THIS DRAWING ONLY DETAILS EXCAVATION ASSOCIATED WITH THE BUILDING SLAB (IGNORING STRUCTURAL FOOTINGS, BEAMS AND COLUMNS).

E4 PROVIDE TEMPORARY MAXIMUM 1 IN 1 BATTERS U.N.O. GEOTECH TO CONFIRM BATTER ACCEPTABILITY DURING CONSTRUCTION.

E5 THE EXCAVATED MATERIAL IS TO BE TEMPORARILY STOCKPILED WITHIN THE LANDSCAPED AREAS (TO BE CONFIRMED ON-SITE) AND RE-USED AS LANDSCAPING SOIL BUILD-UP/BACKFILL IN ACCORDANCE WITH LANDSCAPE ARCHITECTS SPECIFICATIONS.

E6 REFER TO ARBORIST REPORT FOR TREE PROTECTION MEASURES IF REQUIRED.

E7 500mm ZONE OFFSET FROM BUILDING HAS BEEN ALLOWED FOR FORM WORK.

E8 NOMINAL 300mm DEPTH TO BULK EARTHWORKS PROVIDED IN LANDSCAPED TURFED AREAS FOR SOIL BUILD UP IN ACCORDANCE WITH LANDSCAPE CONSULTANTS SPECIFICATIONS.

E9 REFER TO CIVIL SHEET C071 FOR EXTERNAL PAVEMENT DETAILS

E10 BASED ON GEOTECHNICAL INFORMATION SUPPLIED BY 'DOUGLAS PARTNERS' PTY LTD PROJECT: 92277.02 DATED MARCH 2020, THE AREA AFFECTED BY ASBESTOS IS ASSUMED TO BE SUITABLE FOR REFILL, HOWEVER, AS STATED BY DP AN ASBESTOS MANAGEMENT PLAN AMP IS REQUIRED FOR ANY WORK WITHIN THIS AREA, INCLUDING ACCORDANCE WITH RELEVANT REGULATIONS. REFER TO REPORT FOR FURTHER INFORMATION

LEGEND

— — · —	SITE BOUNDARY
× 24.50 +EX 32.50	EX SURFACE LEVEL
5.00 - - - -	EX SURFACE CONTOUR
▨	EXISTING TREE TO BE RETAINED PENDING ARBORIST CONFIRMATION
—Ex SW—	EXISTING STORMWATER DRAINAGE LINE
—Ex S—	EXISTING SEWER LINE
—Ex W—	EXISTING WATER MAIN
—Ex G—	EXISTING GAS LINE
—Ex T—	EXISTING TELECOMMUNICATIONS LINE
—Ex E—	EXISTING ELECTRICAL LINE
— · — · —	EXISTING UNKNOWN SERVICE
BEL 34.00	BULK EXCAVATION LEVEL
▒	EXTENT OF EXISTING FILL OF POTENTIAL VAPOUR RISK. REFER TO REMEDIATION ACTION PLAN SUPPLIED BY GEOTECHNICAL CONSULTANT 'DOUGLAS PARTNERS' PTY LTD PROJECT: 92277.02 DATED MARCH 2020
◕ BH5	BOREHOLES INTERPOLATED FROM REPORT SUPPLIED BY GEOTECHNICAL CONSULTANT 'DOUGLAS PARTNERS' PTY LTD PROJECT: 92277.01 DATED FEBRUARY 2019

EARTHWORKS DEPTH RANGE

Lower_value		Upper_value	Colour
-100	to	-1	🟫
-1	to	-.5	🟥
-.5	to	0	🟥
0	to	.5	🟩
.5	to	1	🟩
1	to	100	🟩

EARTHWORKS QUANTITIES SUMMARY (IN-PLACE)

300mm STRIPPED SURFACE = 2,030m^3
(ASSUMED TO BE REMOVED OFF-SITE)

CAPPING LAYER OVER VAPOUR RISK AREA = 290m^3
(MATERIAL TO BE TAKEN OFF-SITE AND
REFILLED WITH CLEAN MATERIAL AS CAPPING LAYER)

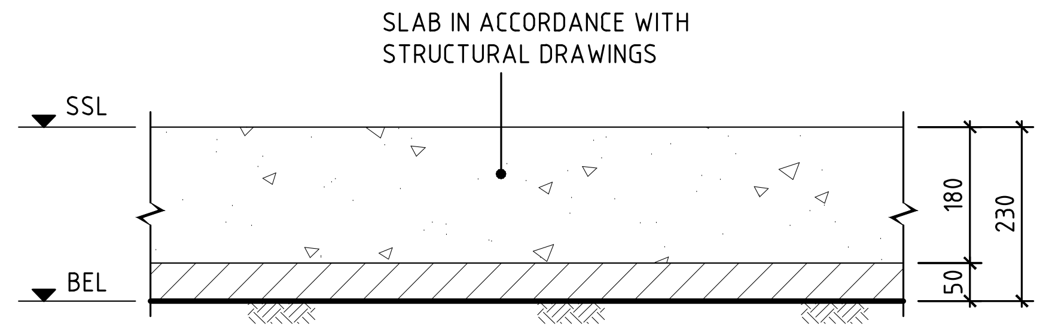
TOTAL CUT VOLUME = 955m^3
TOTAL FILL VOLUME (INCLUDES CAPPING LAYER) = 2,630m^3

IMPORT FILL REQUIRED = 1,675m^3

OPTIONAL AREAS TO REMOVE FILL UNDER SLABS PROVIDING A SUSPENDED STRUCTURE

AREA 1 (COMMUNAL HALL) = 755m^3
AREA 2 (LIBRARY) = 245m^3
AREA 3 MECHANICAL ROOM) = 77m^3

TOTAL = 1,077m^3



BUILDING BULK EXCAVATION DETAIL

SCALE 1:10

Rev	Description	Date	By	App
P2	70% SSDA REVIEW	04.03.20	JF	-
P1	PRELIMINARY ISSUE	12.03.20	JF	-

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BULK EARTHWORKS PLAN

FOR REVIEW

Designed EW
Drawn JF
Scale 1:200
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref	Drawing No	Rev
1191701C	C011	P2

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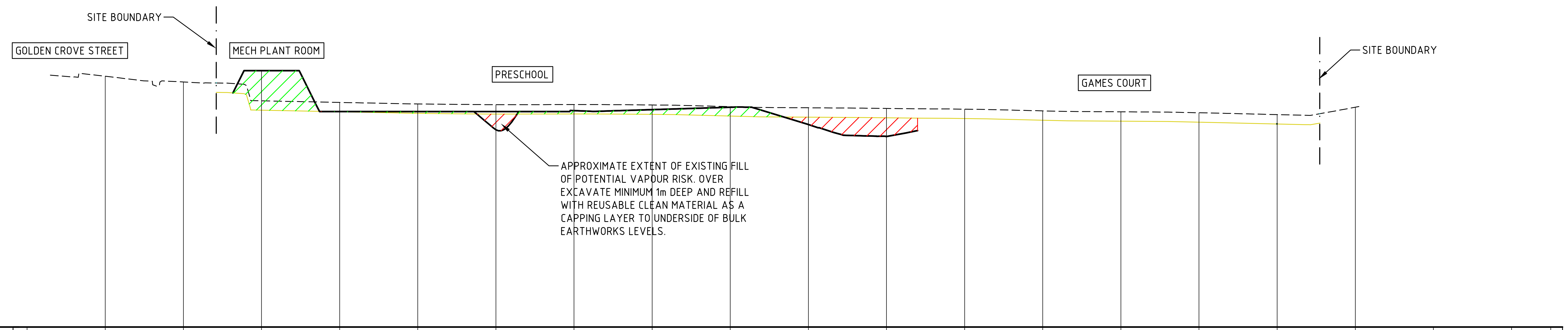


DESIGN GRADELINE

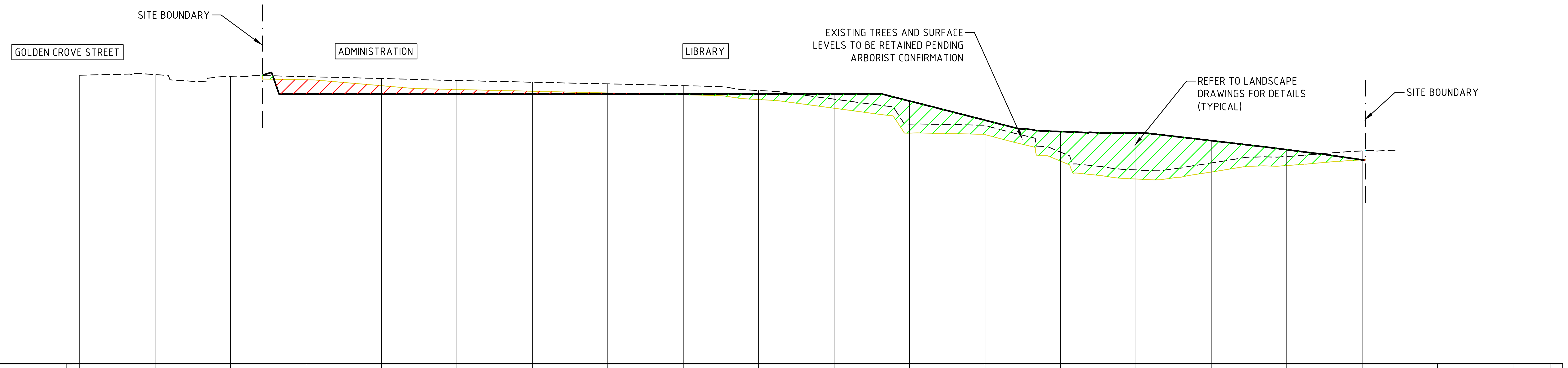
HORIZONTAL GEOMETRY

DATUM 28.4

SC01																					
BULK EARTHWORKS SURFACE				36.600	35.290	35.290	34.708	35.320	35.351	35.430	34.877	34.491									
STRIPPED SURFACE (300mm)				35.334	35.283	35.233	35.210	35.215	35.201	35.147	35.111	35.091	35.066	35.013	34.983	34.952	34.894				
EXISTING SURFACE		36.419	36.237	35.634	35.583	35.533	35.510	35.515	35.501	35.447	35.411	35.391	35.366	35.313	35.283	35.252	35.194	35.430			
CHAINAGES	0.000	5.000	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000	55.000	60.000	65.000	70.000	75.000	80.000	85.000	90.000	95.000	97.512

1 in 200 HORIZONTAL
1 in 100 VERTICAL

SC01 LONGITUDINAL SECTION



DESIGN GRADELINE

HORIZONTAL GEOMETRY

DATUM 25.3

SC02																					
BULK EARTHWORKS SURFACE				34.235	34.235	34.235	34.235	34.235	34.235	34.235	34.235	34.001	33.368	32.989	32.942	32.690	32.390	32.050			
STRIPPED SURFACE (300mm)				34.707	34.512	34.383	34.327	34.271	34.210	34.051	33.764	32.940	32.891	32.010	31.419	31.648	31.864	32.049			
EXISTING SURFACE	34.858	34.879	34.807	34.813	34.749	34.683	34.627	34.571	34.510	34.351	34.064	33.240	33.191	32.310	31.719	31.948	32.164	32.349			
CHAINAGES	0.000	5.000	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000	55.000	60.000	65.000	70.000	75.000	80.000	85.000	90.000	95.000	97.512

1 in 200 HORIZONTAL
1 in 100 VERTICAL

SC02 LONGITUDINAL SECTION

NOTES

1. EXISTING SURFACE LEVELS ARE INTERPOLATED FROM INFORMATION SUPPLIED BY 'CMS SURVEYORS' PTY LTD REFERENCE 17702A ISSUE 3. DATED 04 MARCH 2019

Rev	Description	Date	By	App
P2	70% SSDA REVIEW	04.03.20	JF	-
P1	PRELIMINARY ISSUE	12.03.20	JF	-

DARLINGTON PUBLIC SCHOOL

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BULK EARTHWORKS
LONGITUDINAL SECTIONS
SHEET 1

PRELIMINARY

Designed EW
Drawn JF
Scale AS SHOWN
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref	Drawing No	Rev
1191701C	C021	P2

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PM By: Jonathan Franco

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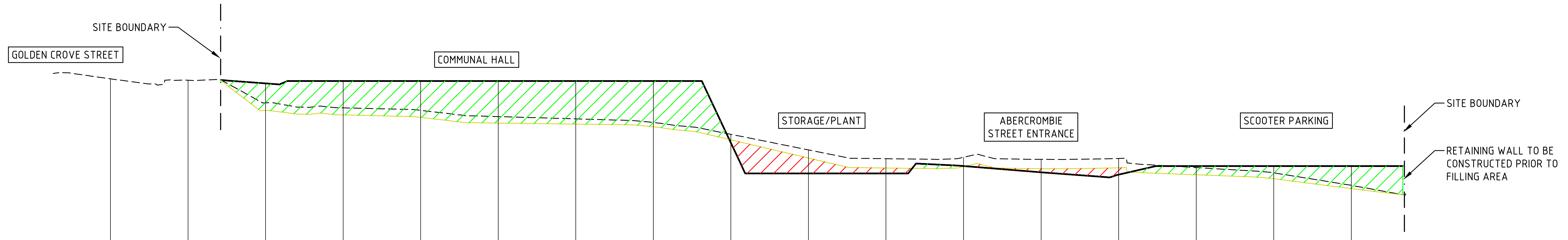


DESIGN GRADELINE

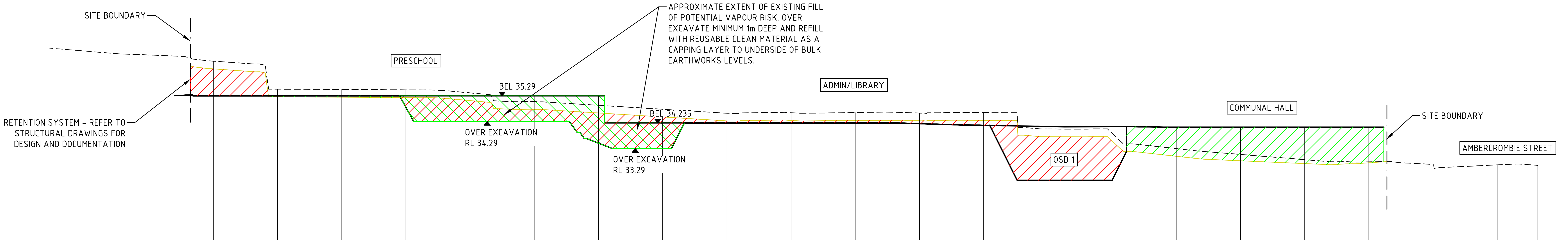
HORIZONTAL GEOMETRY

DATUM 24.3

SC03																				
BULK EARTHWORKS SURFACE				33.991	34.070	34.070	34.070	34.070	34.070	32.071	31.090	31.090	31.324	31.123	31.050	31.325	31.325	31.325		
STRIPPED SURFACE (300mm)				33.117	32.977	32.897	32.712	32.679	32.591	32.171	31.585	31.263	31.309	31.241	31.268	31.044	30.917	30.595		
EXISTING SURFACE		34.140	34.095	33.367	33.204	33.124	32.921	32.848	32.731	32.349	31.846	31.563	31.609	31.541	31.568	31.276	31.106	30.702		
CHAINAGES	0.000	5.000	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000	55.000	60.000	65.000	70.000	75.000	80.000	85.000	90.000	95.000	97.512

1 in 200 HORIZONTAL
1 in 100 VERTICAL

SC03 LONGITUDINAL SECTION



DESIGN GRADELINE

HORIZONTAL GEOMETRY

DATUM 25.9

SC04																								
BULK EARTHWORKS SURFACE				35.290	35.290	35.290	34.841	34.290	34.290	33.444	33.235	34.235	34.235	34.235	34.206	34.140	32.000	32.000	34.070	34.070	34.070	34.070			
STRIPPED SURFACE (300mm)				36.341	35.252	35.237	35.223	35.104	34.763	34.621	34.466	34.310	34.331	34.336	34.316	34.335	33.697	33.532	32.932	32.759	32.650	32.679			
EXISTING SURFACE		37.035	36.882	36.641	35.552	35.537	35.523	35.404	35.063	34.921	34.766	34.610	34.631	34.636	34.616	34.635	33.997	33.832	33.232	33.006	32.803	32.716	32.597	32.598	32.580
CHAINAGES	0.000	5.000	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000	55.000	60.000	65.000	70.000	75.000	80.000	85.000	90.000	95.000	100.000	105.000	110.000	115.000	118.161

1 in 200 HORIZONTAL
1 in 100 VERTICAL

SC04 LONGITUDINAL SECTION

NOTES

1. EXISTING SURFACE LEVELS ARE INTERPOLATED FROM INFORMATION SUPPLIED BY 'CMS SURVEYORS' PTY LTD REFERENCE 17702A ISSUE 3. DATED 04 MARCH 2019

Rev	Description	Date	By	App
P2	*70% SSDA REVIEW*	*04.03.20*	*JF*	-
P1	*PRELIMINARY ISSUE*	*12.03.20*	*JF*	-

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BULK EARTHWORKS
LONGITUDINAL SECTIONS
SHEET 2

FOR REVIEW

Designed EW
Drawn JF
Scale AS SHOWN
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref 1191701C
Drawing No C022
Rev P2

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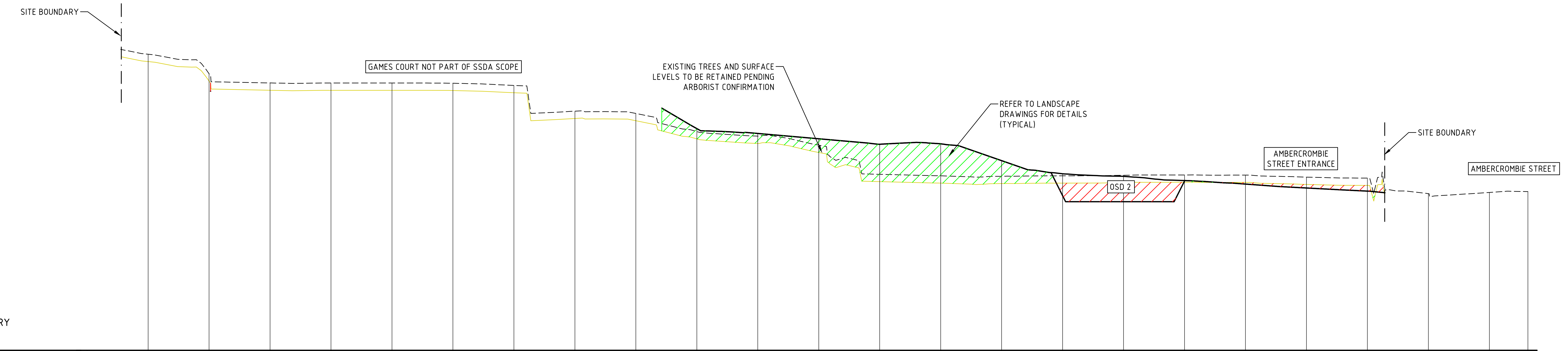

DESIGN GRADELINE

HORIZONTAL GEOMETRY

DATUM 24.4

SC05												
BULK EARTHWORKS SURFACE											33.502	33.302
STRIPPED SURFACE (300mm)		36.255	35.455	35.077	35.073	35.073	35.063	34.974	33.919	33.824	33.082	32.893
EXISTING SURFACE		36.555	35.755	35.377	35.373	35.373	35.363	35.274	34.219	34.124	33.382	33.193
CHAINAGES	0.000	5.000	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000	55.000

SC05													
BULK EARTHWORKS SURFACE	33.084	32.861	32.881	32.186	30.748	30.500	31.352	31.225	31.063	30.935			
STRIPPED SURFACE (300mm)	32.522	31.326	31.264	31.245	31.263	31.287	31.300	31.293	31.209	31.171			
EXISTING SURFACE	32.822	31.626	31.564	31.545	31.563	31.587	31.600	31.593	31.509	31.471	30.832	30.882	30.918
CHAINAGES	60.000	65.000	70.000	75.000	80.000	85.000	90.000	95.000	100.000	105.000	110.000	115.000	118.161

1 in 200 HORIZONTAL
1 in 100 VERTICAL

SC05 LONGITUDINAL SECTION

Rev	Description	Date	By	App
P2	70% SSDA REVIEW	04.03.20	JF	-
P1	PRELIMINARY ISSUE	12.03.20	JF	-

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BULK EARTHWORKS
LONGITUDINAL SECTIONS
SHEET 3

NOTES

1. EXISTING SURFACE LEVELS ARE INTERPOLATED FROM INFORMATION SUPPLIED BY 'CMS SURVEYORS' PTY LTD REFERENCE 17702A ISSUE 3. DATED 04 MARCH 2019

FOR REVIEW

Designed EW
Drawn JF
Scale AS SHOWN
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref 1191701C
Drawing No C023
Rev P2

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PM By: Jonathan Franco

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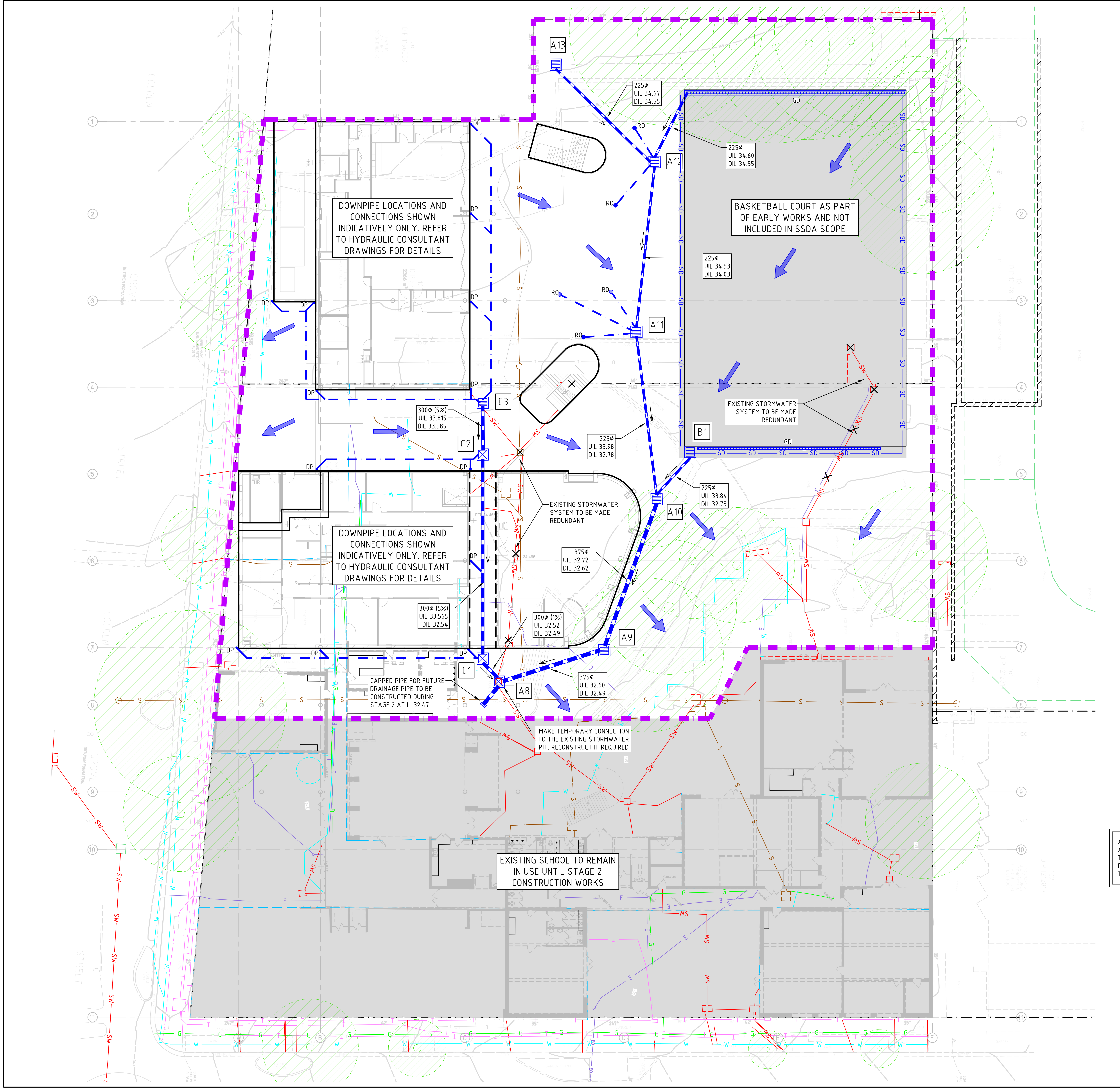

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DRAINAGE LEGEND

▤	SURFACE INLET PIT
☒	JUNCTION PIT
▤	KERB INLET PIT
IL 0.00 PIPE ⌀ IL 0.00	STORMWATER DRAINAGE LINE
GD	GRATED DRAIN
DP ●	DOWNPIPE AND CONNECTION LINE (REFER TO HYDRAULIC DRAWINGS FOR DETAILS)
FOR SD	FLUSHOUT RISER (max 30m CTRS) WITH SUBSOIL DRAINAGE (100⌀ uPVC SLOTTED PIPE UN-SOCKED)
RO	RAINWATER OULET
OD	SWALE DRAIN
Ex SW	EXISTING STORMWATER TO REMAIN
☒ Ex SW ✕	EXISTING STORMWATER TO BE MADE REDUNDANT
☐ Ex SW	EXISTING STORMWATER TO REMAIN
➡	OVERLAND FLOW

SURVEY LEGEND

— — · —	SITE BOUNDARY
▬ ▬ ▬	STAGE 1 BOUNDARY EXTENT
× 24.50	EX SURFACE LEVEL
5.00	EX SURFACE CONTOUR
▨	EXISTING TREE TO BE RETAINED PENDING ARBORIST CONFIRMATION
Ex SW	EXISTING STORMWATER DRAINAGE LINE
Ex S	EXISTING SEWER LINE
Ex W	EXISTING WATER MAIN
Ex G	EXISTING GAS LINE
Ex T	EXISTING TELECOMMUNICATIONS LINE
Ex E	EXISTING ELECTRICAL LINE
— · —	EXISTING UNKNOWN SERVICE
✕ Ex E ✕	EXISTING SERVICE TO BE MADE REDUNDANT

Rev	Description	Date	By	App
P1	70% SSDA REVIEW	03.04.20	JF	-

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The Essential First Step

ALL EXISTING PROPERTY SERVICES' LOCATIONS AND DEPTHS ARE APPROXIMATE AND MUST BE VERIFIED ON SITE.
THE CONTRACTOR SHOULD SUPPLY PRECISE LOCATIONS AND DEPTHS TO THE ENGINEER FOR REVIEW PRIOR TO ANY WORKS THAT MAY AFFECT THESE SERVICES.

WARNING
NO DRAINAGE WORKS SHALL COMMENCE UNTIL THE CONTRACTOR CONFIRMS THE I.L. OF ALL EXISTING DRAINS, AND CONFIRMS IN WRITING WITH THE ENGINEERING SUPERVISOR.

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES SHOWN ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE.

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STORMWATER DRAINAGE PLAN
STAGE 1

FOR REVIEW

Designed EW
Drawn JF
Scale 1:200
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref	Drawing No	Rev
1191701C	C031	P1

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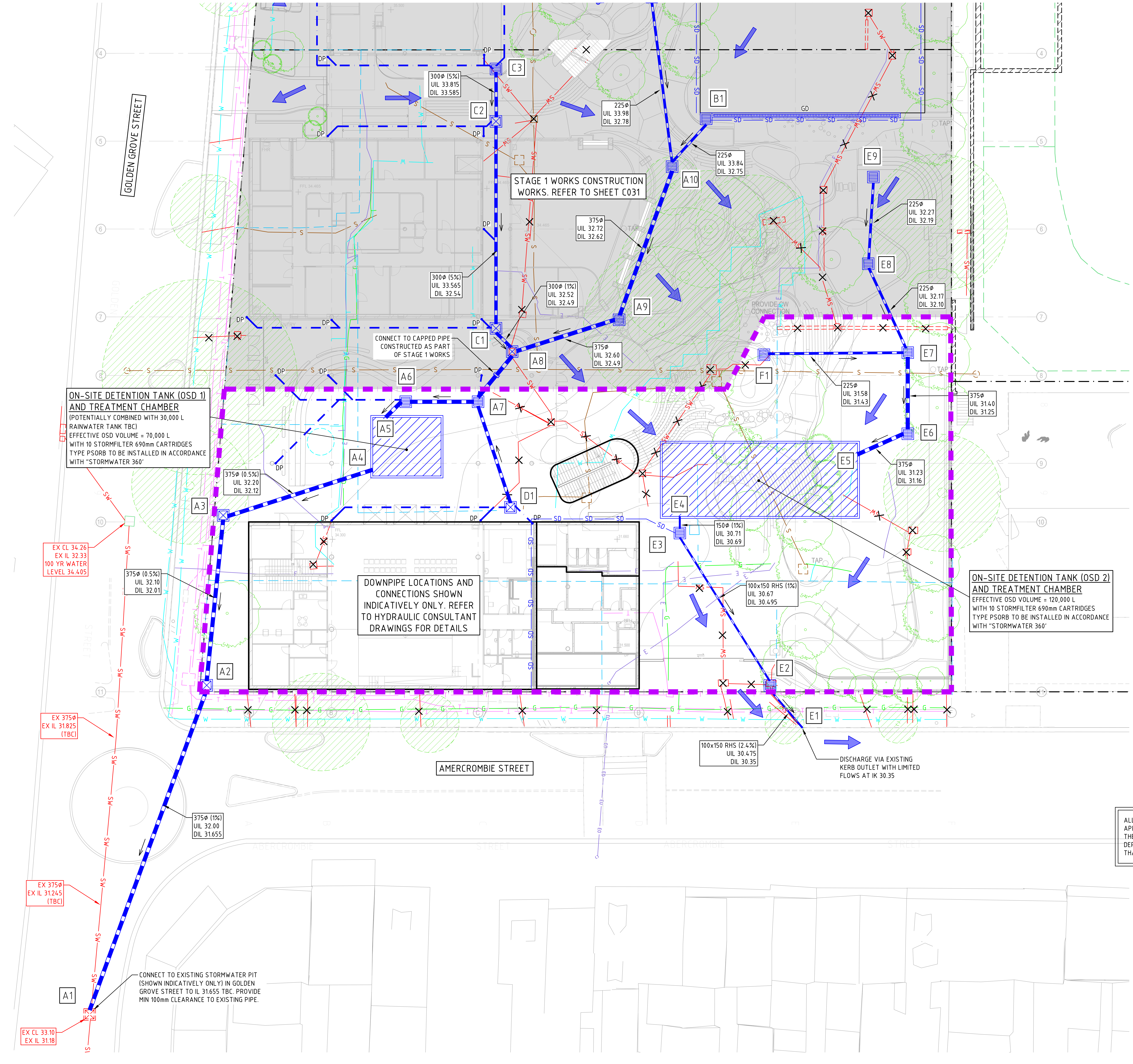
FOR CONTINUATION REFER TO SHEET C031



STAGE 1 WORKS CONSTRUCTION WORKS. REFER TO SHEET C031

CONNECT TO CAPPED PIPE CONSTRUCTED AS PART OF STAGE 1 WORKS

ON-SITE DETENTION TANK (OSD 1) AND TREATMENT CHAMBER
(POTENTIALLY COMBINED WITH 30,000 L RAINWATER TANK TBC)
EFFECTIVE OSD VOLUME = 70,000 L
WITH 10 STORMFILTER 690mm CARTRIDGES
TYPE PSORB TO BE INSTALLED IN ACCORDANCE
WITH "STORMWATER 360'

DOWNPIPE LOCATIONS AND CONNECTIONS SHOWN INDICATIVELY ONLY. REFER TO HYDRAULIC CONSULTANT DRAWINGS FOR DETAILS

ON-SITE DETENTION TANK (OSD 2) AND TREATMENT CHAMBER
EFFECTIVE OSD VOLUME = 120,000 L
WITH 10 STORMFILTER 690mm CARTRIDGES
TYPE PSORB TO BE INSTALLED IN ACCORDANCE
WITH "STORMWATER 360'

DISCHARGE VIA EXISTING KERB OUTLET WITH LIMITED FLOWS AT IK 30.35

CONNECT TO EXISTING STORMWATER PIT (SHOWN INDICATIVELY ONLY) IN GOLDEN GROVE STREET TO IL 31.655 TBC. PROVIDE MIN 100mm CLEARANCE TO EXISTING PIPE.

DRAINAGE LEGEND

▤	SURFACE INLET PIT
☒	JUNCTION PIT
▤	KERB INLET PIT
IL 0.00 PIPE ⌀ IL 0.00	STORMWATER DRAINAGE LINE
GD	GRATED DRAIN
DP	DOWNPIPE AND CONNECTION LINE (REFER TO HYDRAULIC DRAWINGS FOR DETAILS)
FOR SD	FLUSHOUT RISER (max 30m CTRS) WITH SUBSOIL DRAINAGE (100⌀ uPVC SLOTTED PIPE UN-SOCKED)
RO	RAINWATER OULET
OD	SWALE DRAIN
Ex SW	EXISTING STORMWATER TO REMAIN
Ex SW	EXISTING STORMWATER TO BE MADE REDUNDANT
Ex SW	EXISTING STORMWATER TO REMAIN
➡	OVERLAND FLOW

SURVEY LEGEND

— — · —	SITE BOUNDARY
▬ ▬ ▬	STAGE 2 BOUNDARY EXTENT
× 24.50	EX SURFACE LEVEL
5.00	EX SURFACE CONTOUR
○	EXISTING TREE TO BE RETAINED PENDING ARBORIST CONFIRMATION
○	PROPOSED TREES IN ACCORDANCE WITH LANDSCAPE CONSULTANTS DRAWINGS AND SPECIFICATIONS
Ex SW	EXISTING STORMWATER DRAINAGE LINE
Ex S	EXISTING SEWER LINE
Ex W	EXISTING WATER MAIN
Ex G	EXISTING GAS LINE
Ex T	EXISTING TELECOMMUNICATIONS LINE
Ex E	EXISTING ELECTRICAL LINE
— · —	EXISTING UNKNOWN SERVICE
✕ Ex E ✕	EXISTING SERVICE TO BE MADE REDUNDANT

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P1	70% SSDA REVIEW	03.04.20	JF	-

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WARNING
NO DRAINAGE WORKS SHALL COMMENCE UNTIL THE CONTRACTOR CONFIRMS THE I.L. OF ALL EXISTING DRAINS, AND CONFIRMS IN WRITING WITH THE ENGINEERING SUPERVISOR.

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STORMWATER DRAINAGE PLAN STAGE 2

FOR REVIEW

Designed EW
Drawn JF
Scale 1:200
Date FEB 2020
Sheet A1
Project Director Approved
Date
North
Project Ref 1191701C
Drawing No C032
Rev P1

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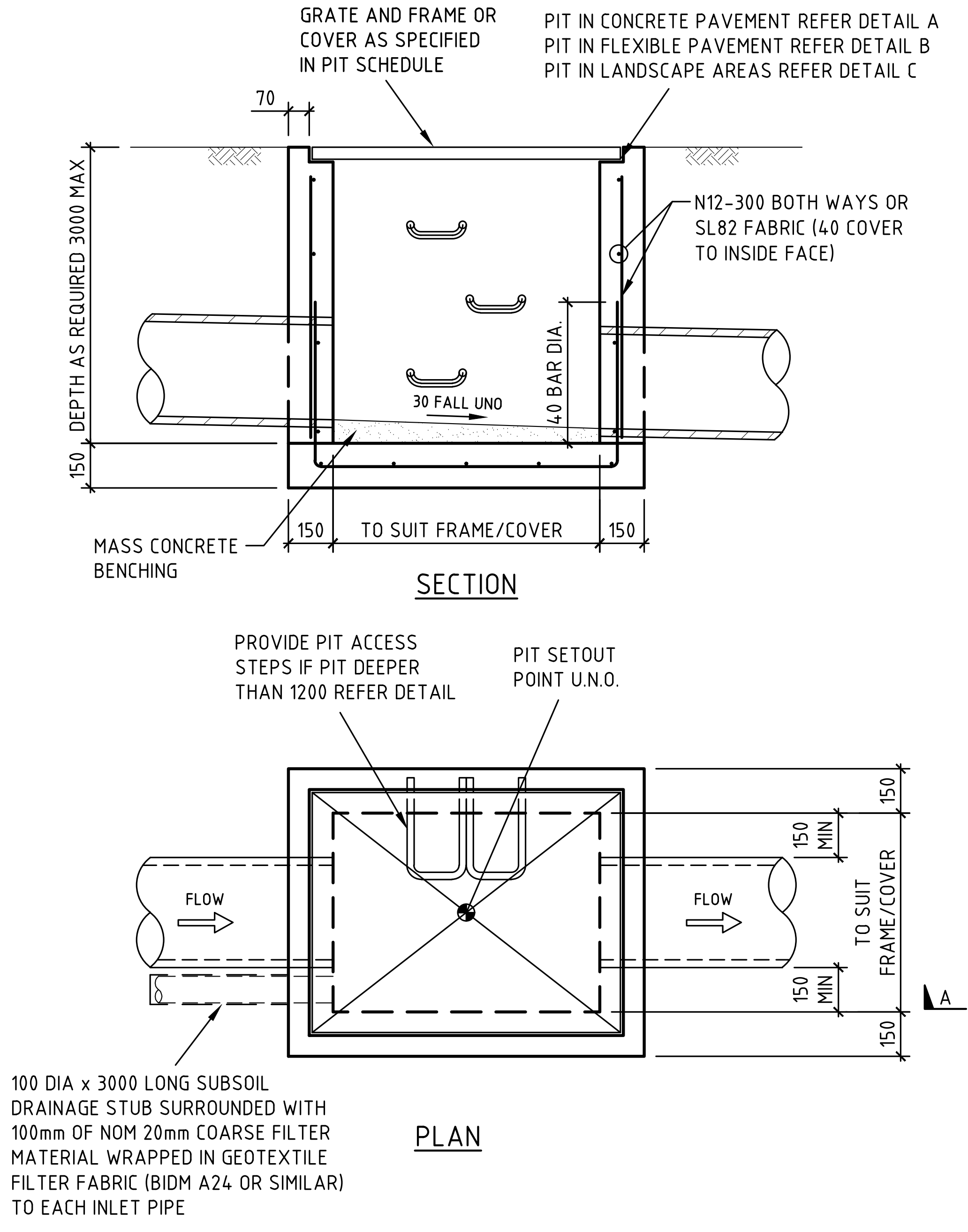
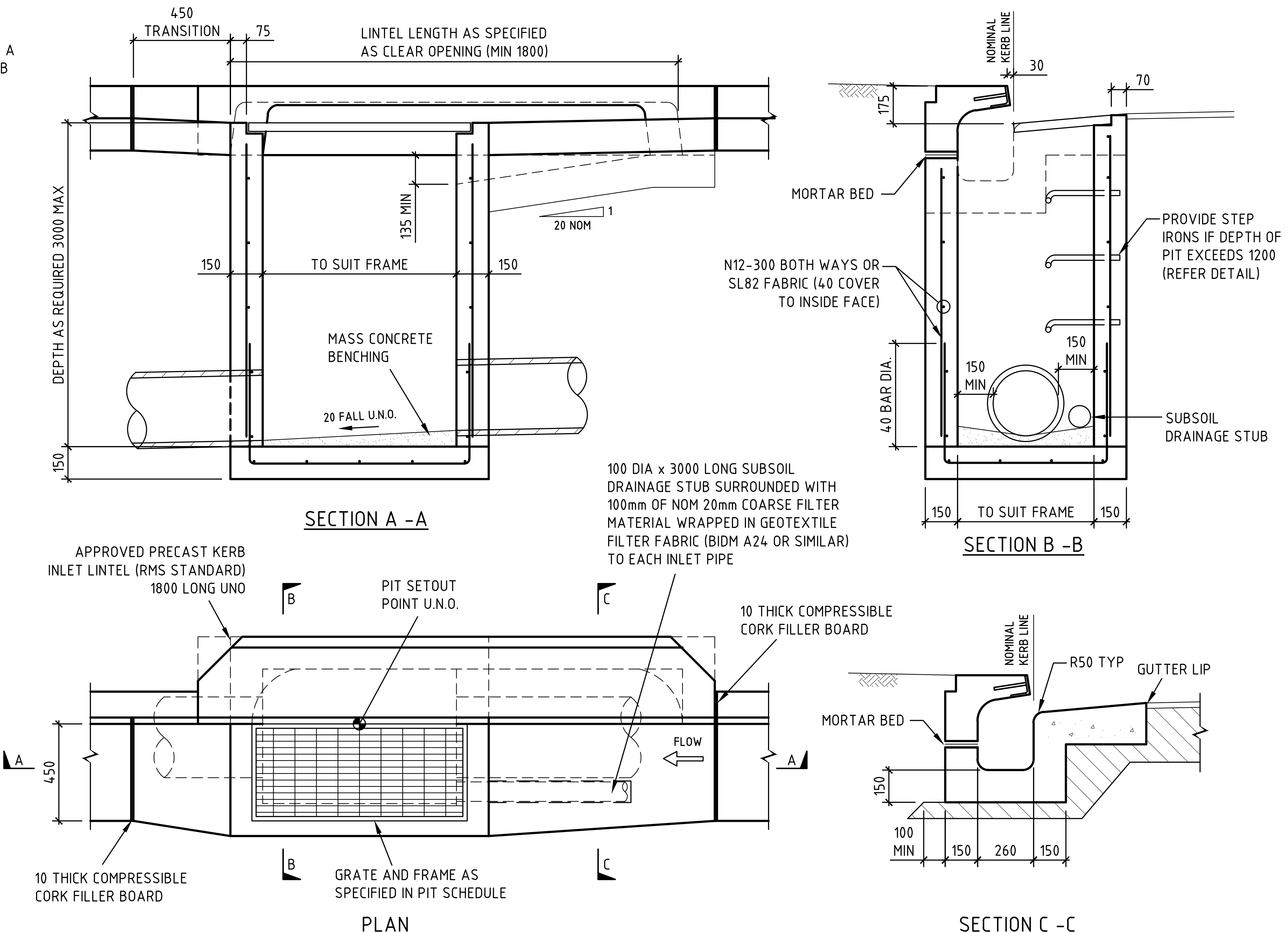


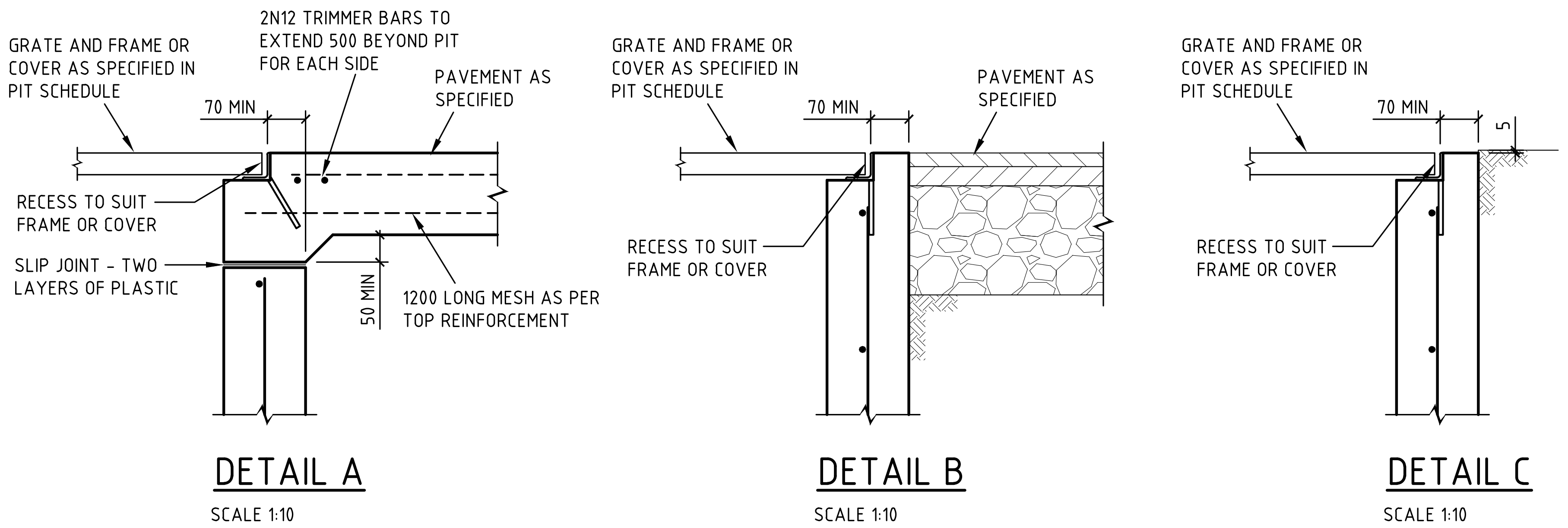
SURFACE INLET/JUNCTION PIT DETAIL

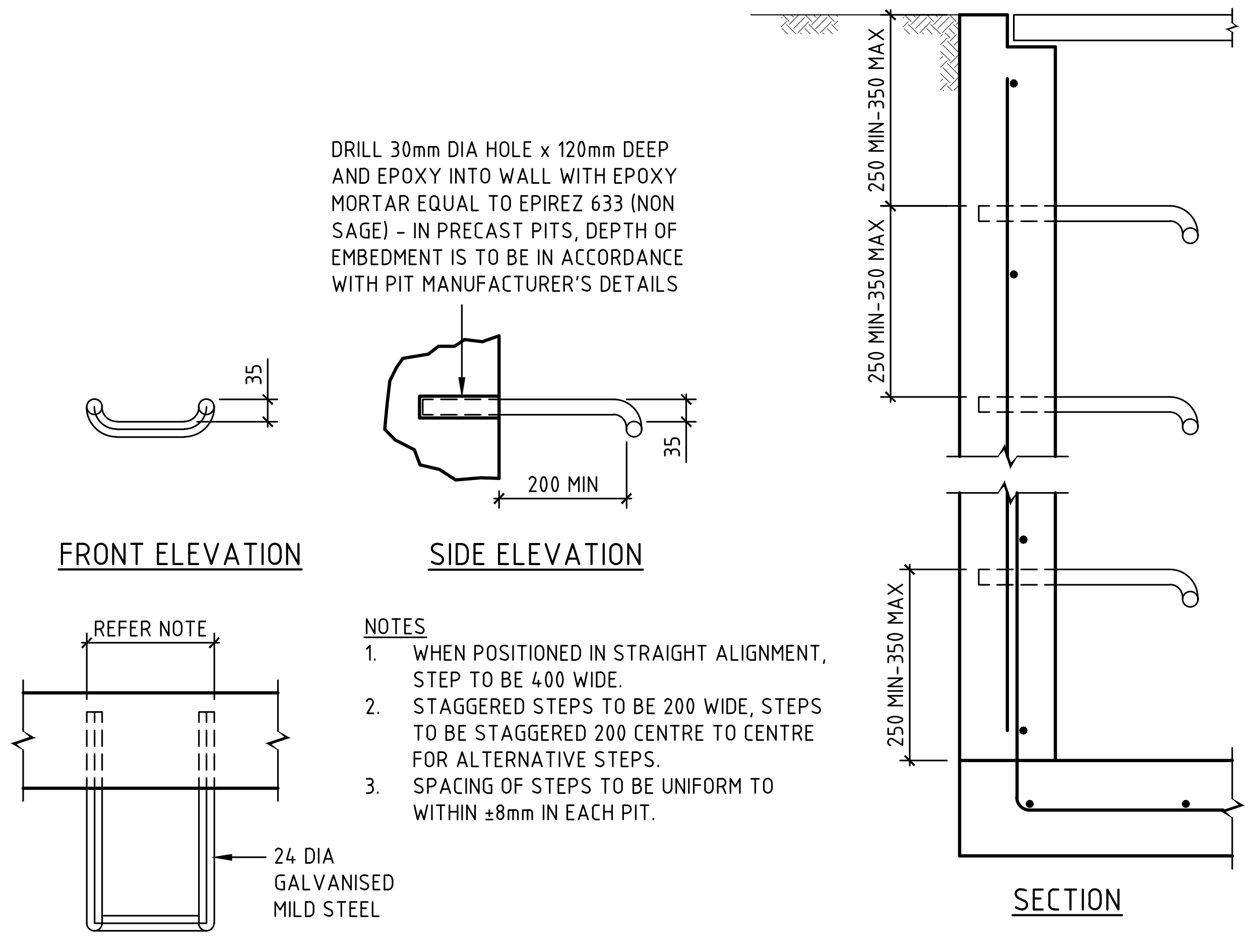
SCALE 1:20



KERB INLET PIT DETAIL

SCALE 1:20





NOTES

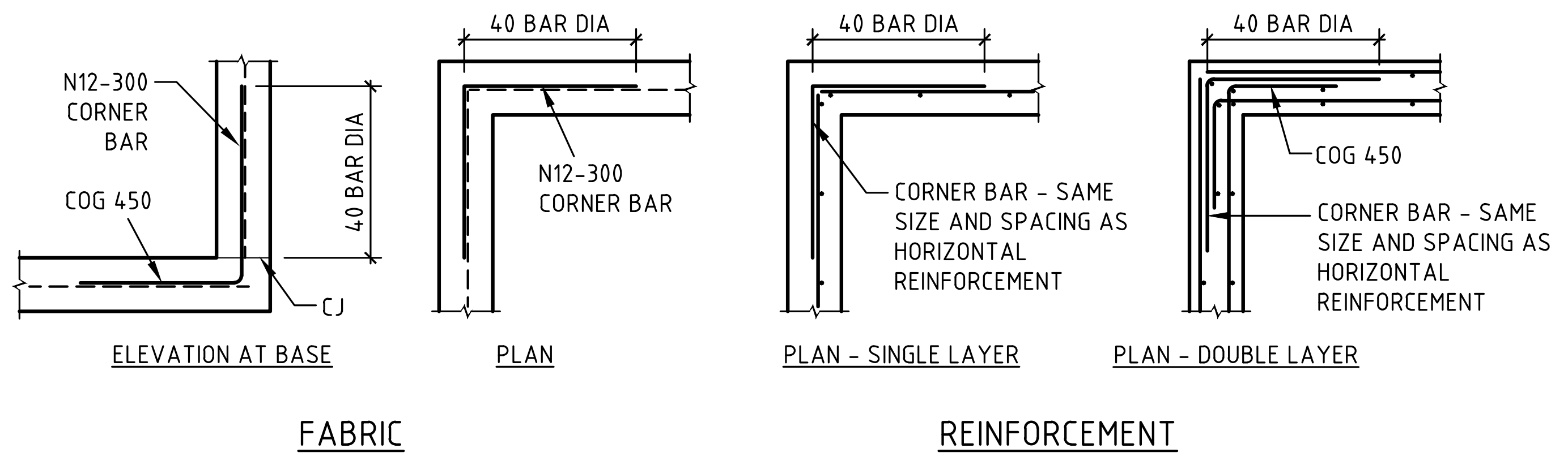
1. WHEN POSITIONED IN STRAIGHT ALIGNMENT, STEP TO BE 400 WIDE.
2. STAGGERED STEPS TO BE 200 WIDE, STEPS TO BE STAGGERED 200 CENTRE TO CENTRE FOR ALTERNATIVE STEPS.
3. SPACING OF STEPS TO BE UNIFORM TO WITHIN ±8mm IN EACH PIT.

PIT ACCESS STEP DETAIL

SCALE 1:10

STORMWATER PIT NOTES

1. CONCRETE TO HAVE A MIN. COMPRESSIVE STRENGTH (F'c) OF 25 MPa AT 28 DAYS.
2. REINFORCEMENT NOT REQUIRED IF DEPTH OF PIT IS LESS THAN 1000mm. PITS GREATER THAN 3000mm DEEP TO HAVE WALL AND BASE 200mm THICK REINFORCED WITH N12-250 EACH WAY EACH FACE WITH CONCRETE STRENGTH F'c = 40 MPa.
3. PROVIDE STEP IRONS AT MAX 350mm CTRS IF DEPTH OF PIT EXCEEDS 1200mm.
4. IF REINFORCING FABRIC IS TO BE USED REFER TO WALL AND CORNER DETAILS
5. PRECAST PITS ARE TO GENERALLY COMPLY WITH THESE DETAILS.
6. PRECAST PIT MAY BE USED SUBJECT TO ENGINEERS APPROVAL.
7. ALL PITS TO BE LOCKABLE.
8. FINAL INTERNAL PIT DIMENSIONS ARE TO COMPLY WITH AS 3500.



PIT CORNER DETAILS

SCALE 1:20

NOTE: DESIGNER TO VERIFY EXTENT OF DETAILING

Rev	Description	Date	By	App
P1	70% SSDA REVIEW	04.03.20	JF	-

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STORMWATER DRAINAGE
DETAILS - SHEET 1

FOR REVIEW

Designed EW
Drawn JF
Scale AS SHOWN
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref 1191701C
Drawing No C051
Rev P1

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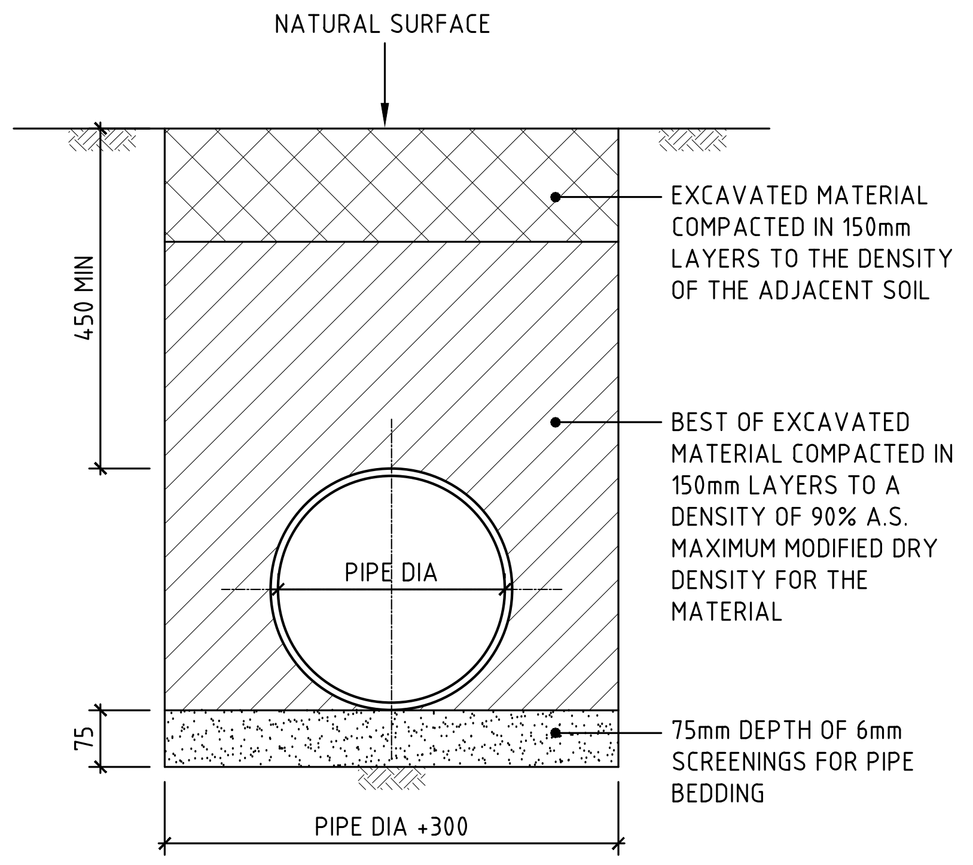
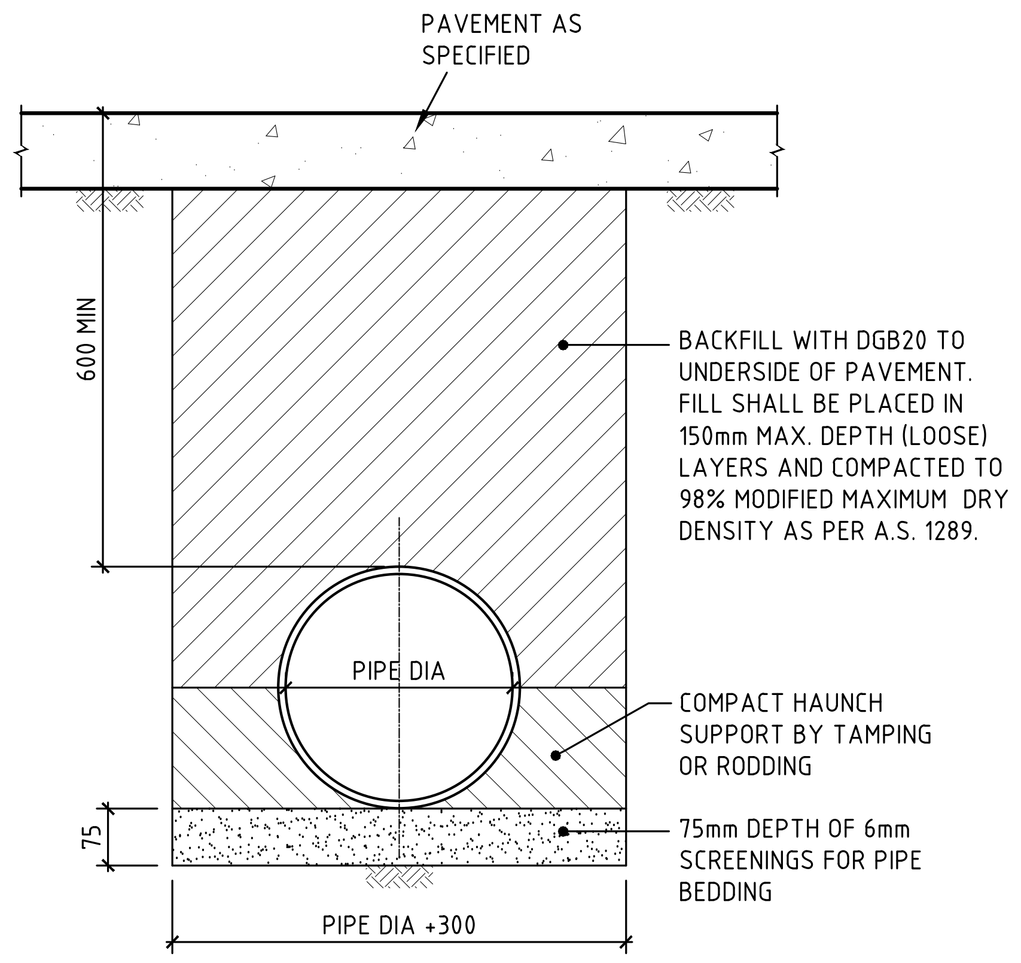


PIPE LAYING DETAIL (ALL PIPES) UNDER LANDSCAPED AREAS

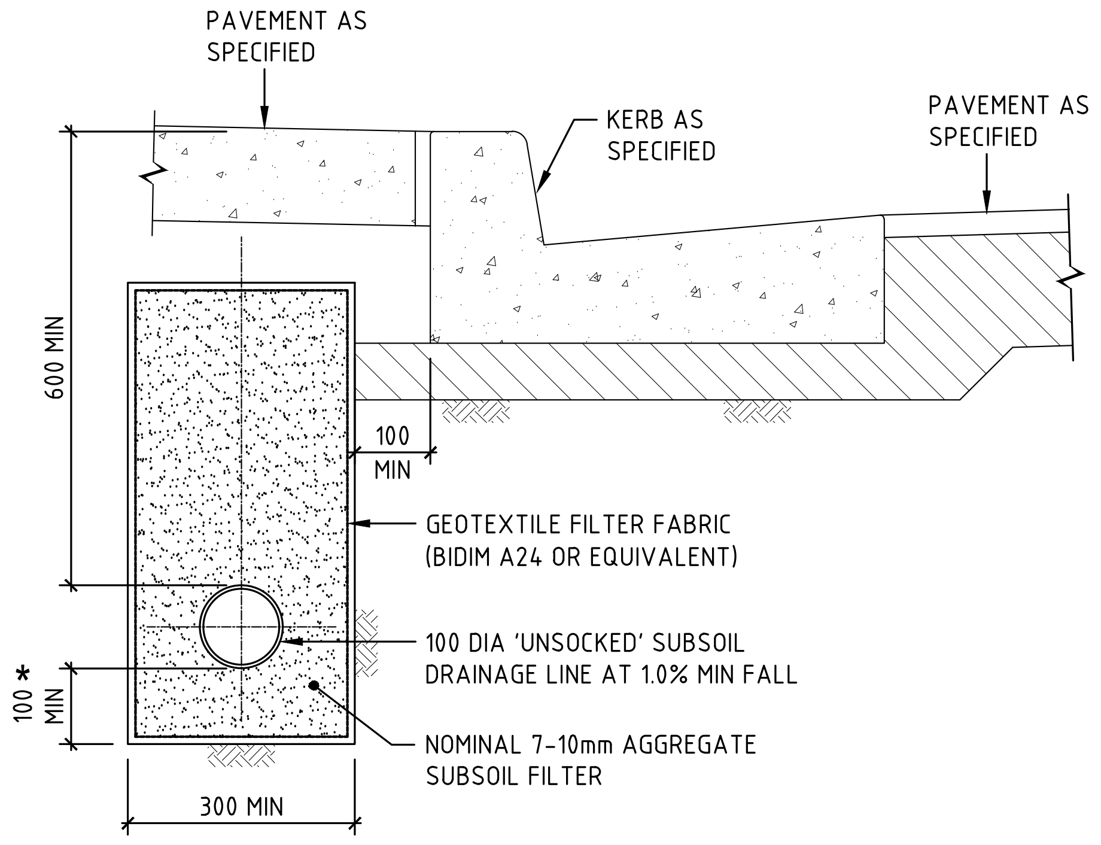
SCALE 1:10



PIPE LAYING DETAILS UNDER ALL PAVEMENTS

SCALE 1:10

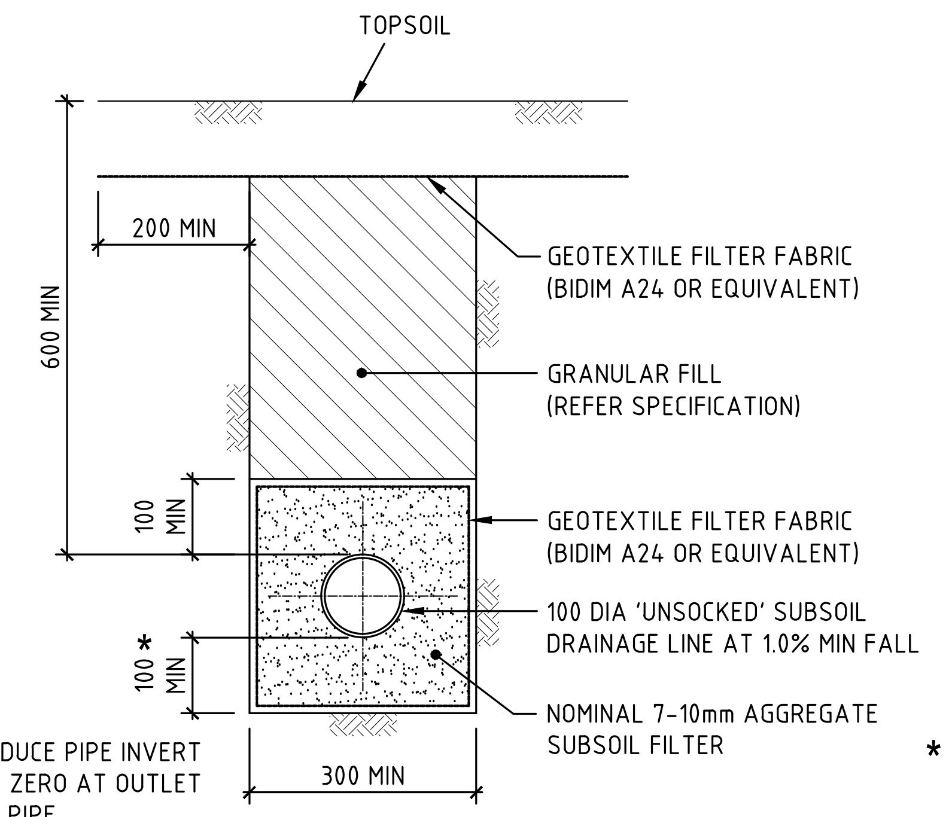
NOTE: AVOID RUNNING CONSTRUCTION EQUIPMENT OVER THE PIPES UNTIL BACKFILL MATERIAL IS 300mm MIN. ABOVE CROWN OF PIPE.



✱ REDUCE PIPE INVERT TO ZERO AT OUTLET OF PIPE

SUBSOIL BEHIND KERB

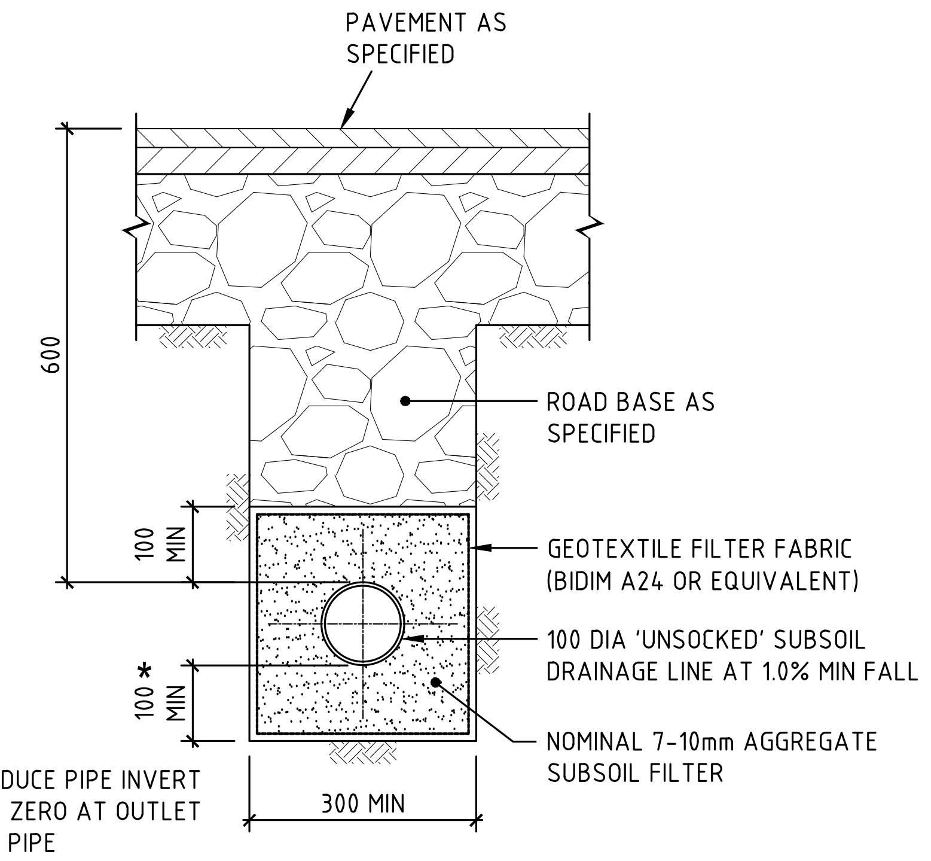
SCALE 1:10



✱ REDUCE PIPE INVERT TO ZERO AT OUTLET OF PIPE

SUBSOIL IN LANDSCAPED AREAS

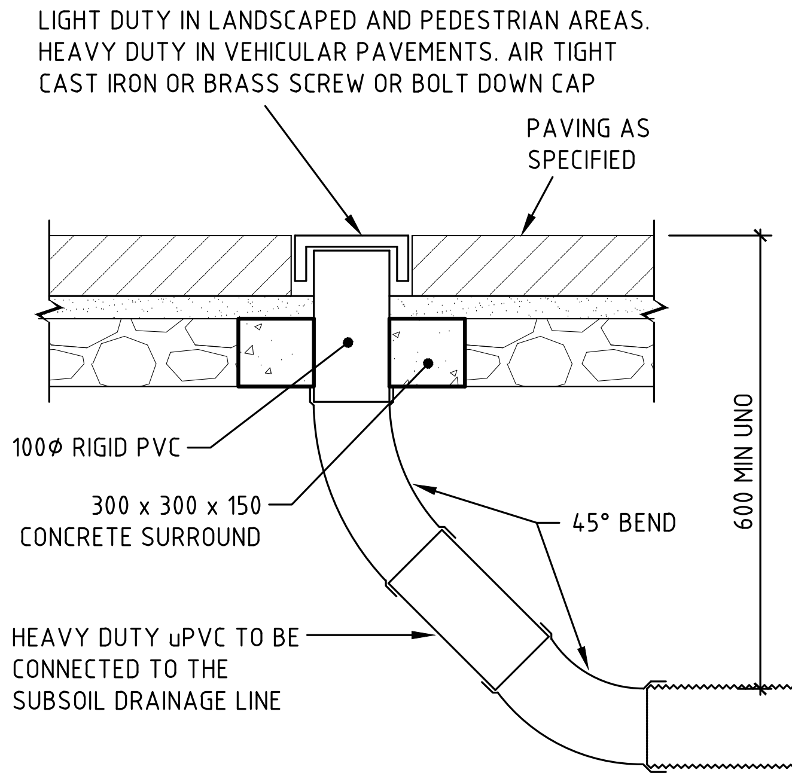
SCALE 1:10



✱ REDUCE PIPE INVERT TO ZERO AT OUTLET OF PIPE

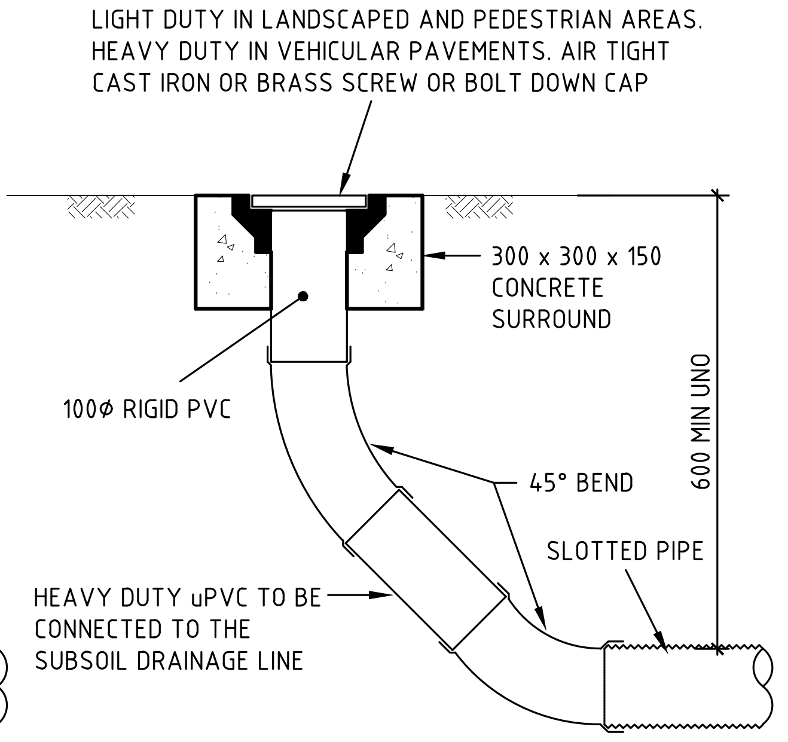
SUBSOIL IN PAVED AREAS

SCALE 1:10



FLUSHOUT RISER (FOR) IN PAVING BRICKS

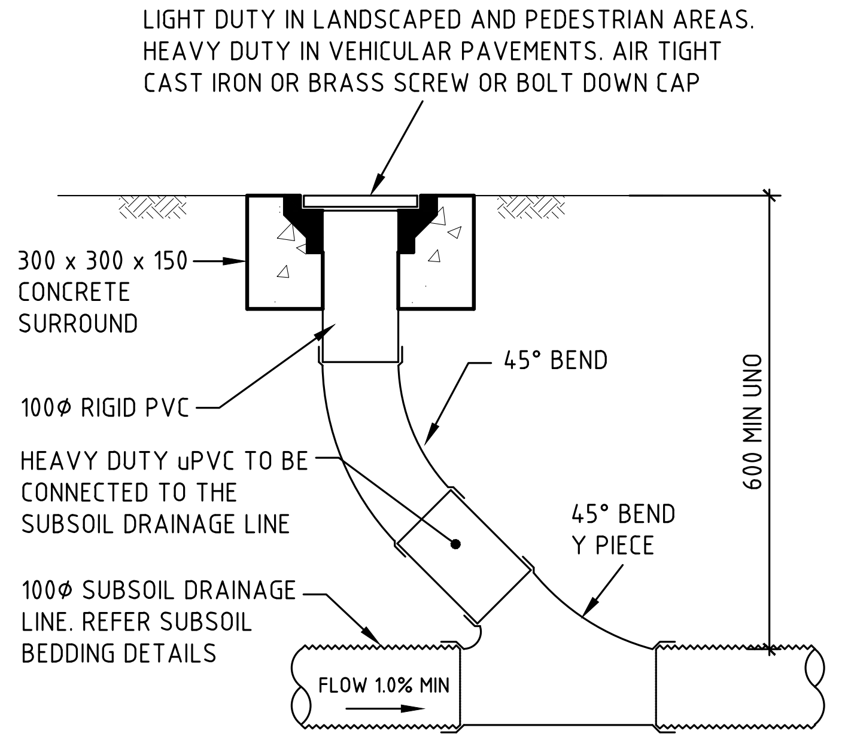
SCALE 1:10



FLUSHOUT RISER (FOR)

SCALE 1:10

NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS WITHIN DRAINAGE LAYER ONLY



INTERMEDIATE RISER

SCALE 1:10

NOTE: SLOTTED RIGID PVC PIPE AND FITTINGS MAY BE USED

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P1	70% SSDA REVIEW	04.03.20	JF	-

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STORMWATER DRAINAGE DETAILS - SHEET 2

FOR REVIEW

Designed EW
Drawn JF
Scale AS SHOWN
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref	Drawing No	Rev
1191701C	C052	P1

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PM By: Jonathan Franco

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

DRAINAGE LEGEND

▤	SURFACE INLET PIT
☒	JUNCTION PIT
▤	KERB INLET PIT

SITEWORKS LEGEND

EX RL 7.25 +	EXISTING FINISHED SURFACE LEVEL
XX % FALL ←	DIRECTION AND GRADE OF FALL
5.00	FINISHED MINOR SURFACE CONTOUR
5.00	FINISHED MAJOR SURFACE CONTOUR

PAVEMENT LEGEND

NOTES

1. ASPHALTIC CONCRETE SHALL CONFORM TO AS2150 AND THE SPECIFICATIONS PAVEMENT BASED ON GEOTECHNICAL REPORT BY 'DOUGLAS PARTNERS' PTY LTD PROJECT 92277.01 DATED FEBRUARY 2019

🟦	PAVEMENT TYPE 2 MEDIUM DUTY ASPHALT PAVEMENT
🟪	PAVEMENT TYPE 5 HEAVY DUTY UNIT PAVERS
🟥	PAVEMENT TYPE 7 CONCRETE FOOTPATH PAVEMENT
🟪	PAVEMENT TYPE 8 LIGHT DUTY UNIT PAVERS
🟨	PAVEMENT TYPE 10 GRAVEL FOOTPATH PAVEMENT

SURVEY LEGEND

— — · —	SITE BOUNDARY
× 24.50	EX SURFACE LEVEL
5.00	EX SURFACE CONTOUR
	EX TREE
Ex SW	EXISTING STORMWATER DRAINAGE LINE
Ex S	EXISTING SEWER LINE
Ex W	EXISTING WATER MAIN
Ex G	EXISTING GAS LINE
Ex T	EXISTING TELECOMMUNICATIONS LINE
Ex E	EXISTING ELECTRICAL LINE
— · — · —	EXISTING UNKNOWN SERVICE
—✕— Ex E —✕—	EXISTING SERVICE TO BE MADE REDUNDANT

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SITEWORKS AND PAVEMENT PLAN

FOR REVIEW

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Drawn JF
Scale 1:200
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref	Drawing No	Rev
1191701C	C061	P1

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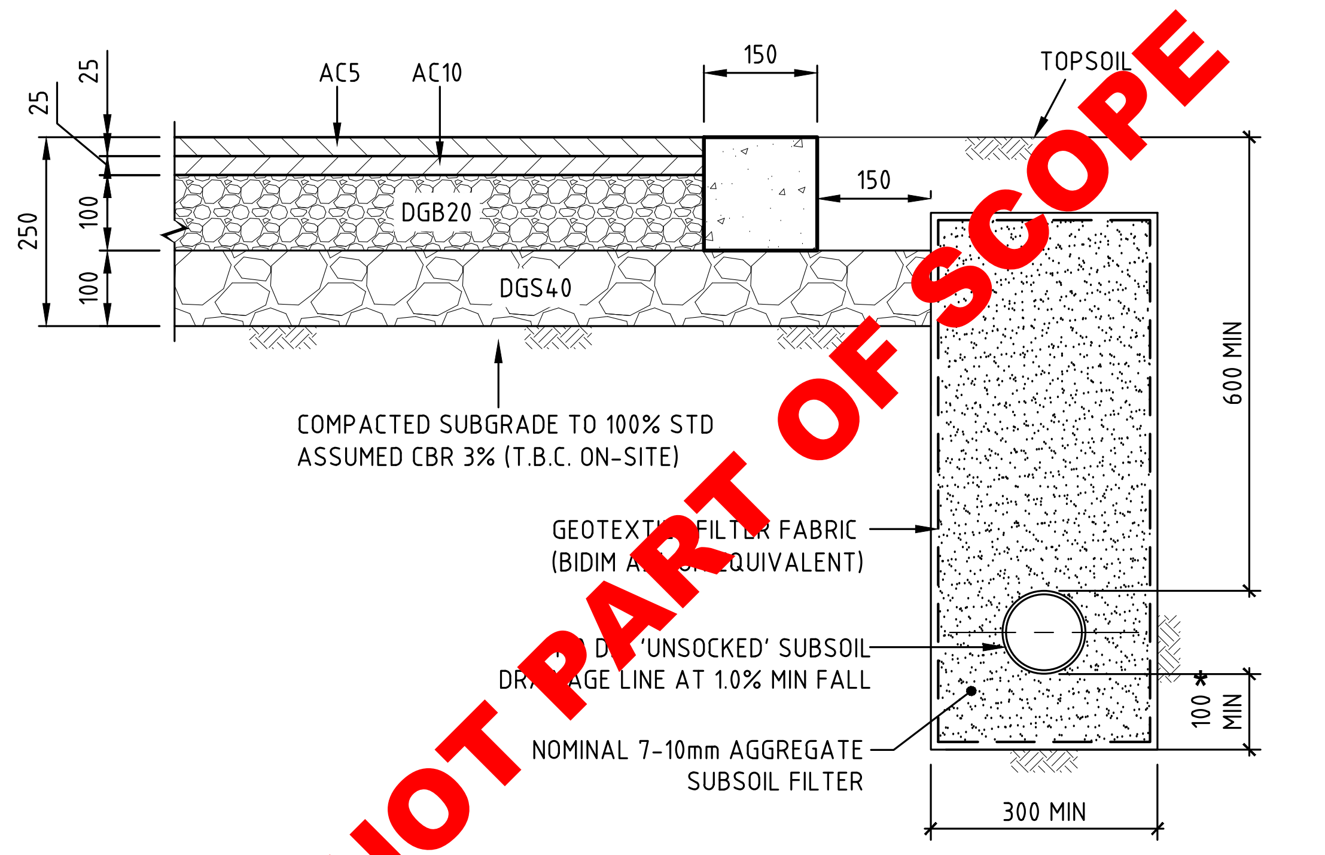


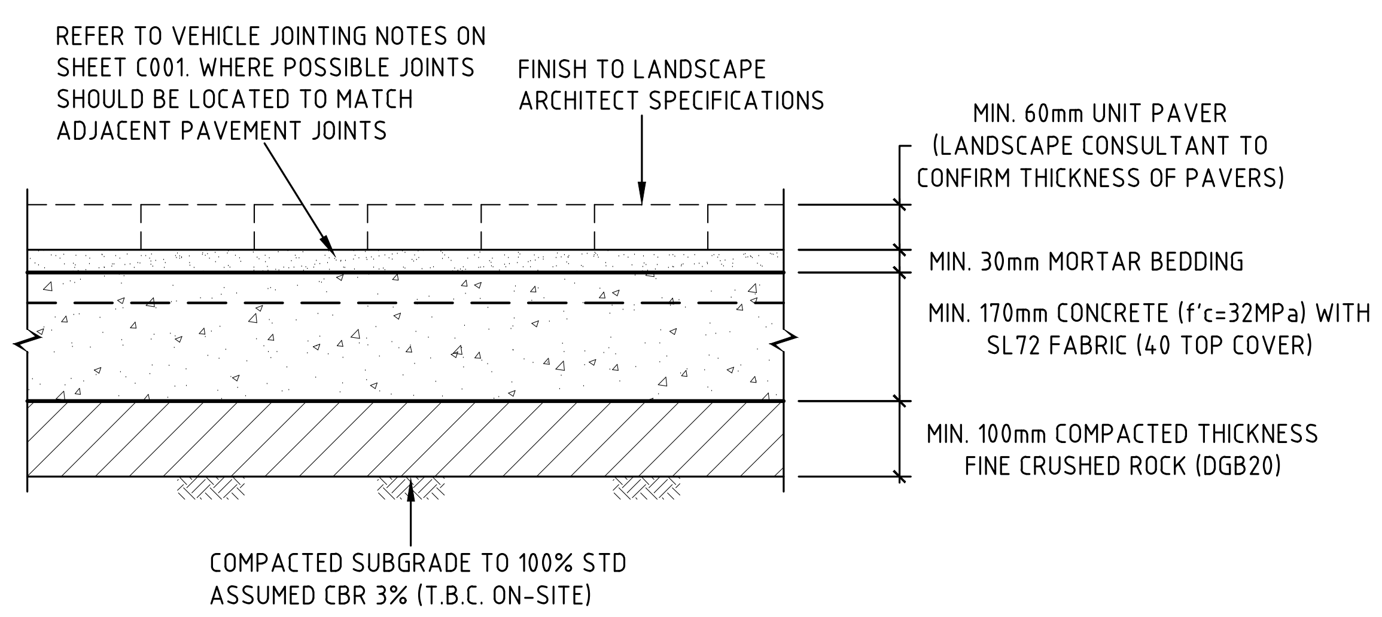
* REDUCE PIPE INVERT
TO ZERO AT OUTLET
OF PIPE

NOT PART OF SCOPE

PAVEMENT TYPE P2
GAMES COURT ASPHALT PAVEMENT

SCALE 1:10

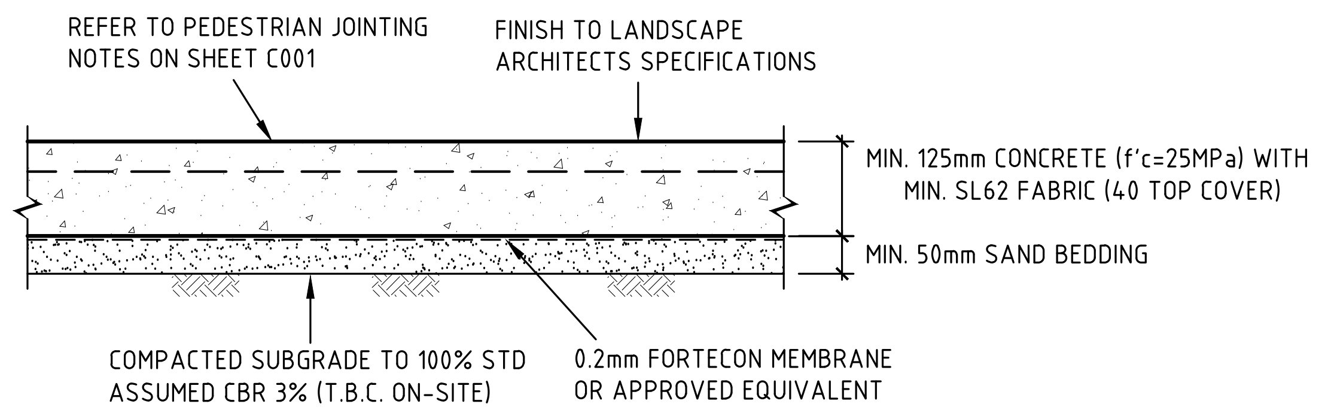
🟦 DENOTED ON PLAN



PAVEMENT TYPE P5
HEAVY DUTY UNIT PAVERS

SCALE 1:10

🟪 DENOTED ON PLAN



PAVEMENT TYPE P7
CONCRETE FOOTPATH PAVEMENT

SCALE 1:10

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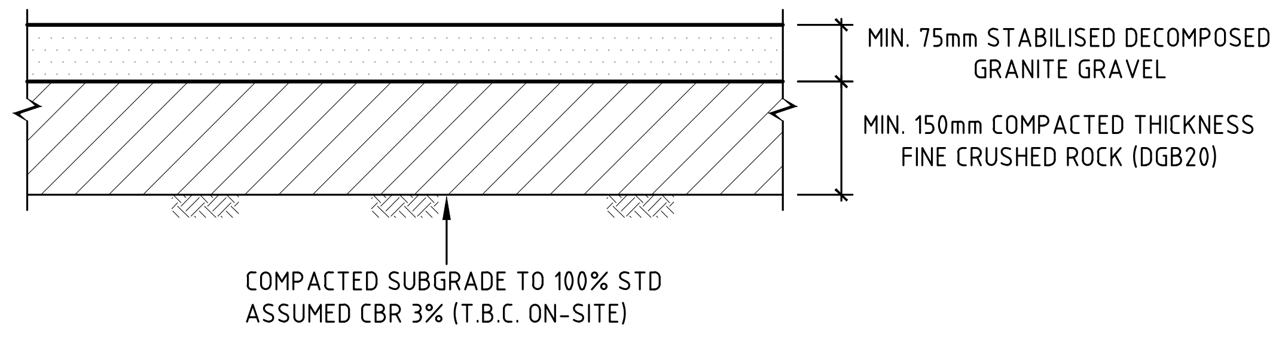
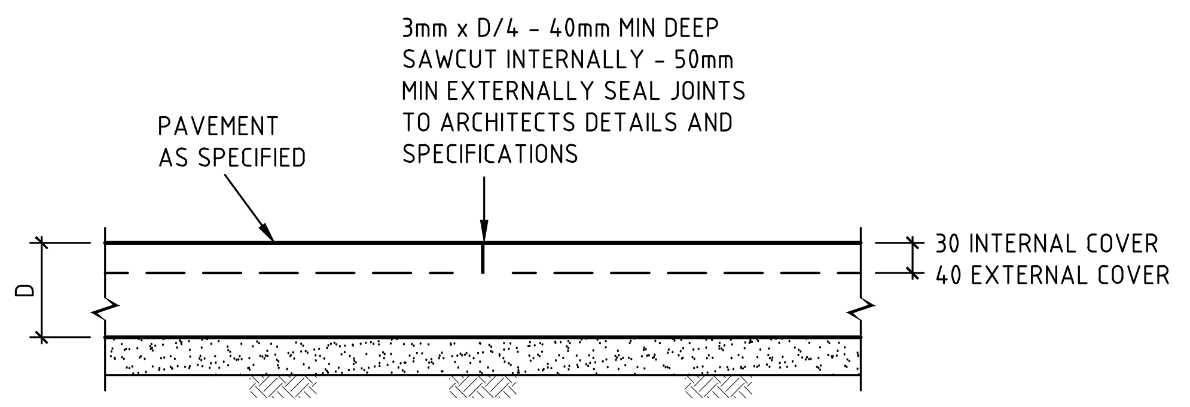


PAVEMENT TYPE P10
GRAVEL FOOTPATH PAVEMENT

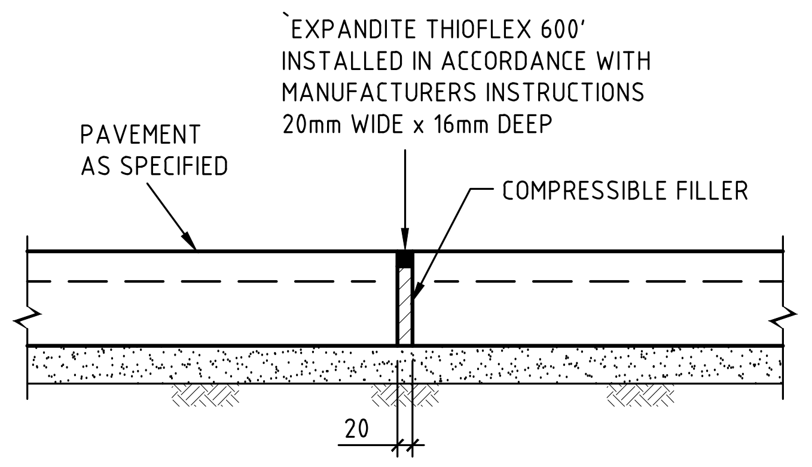
SCALE 1:10

🟫 DENOTED ON PLAN



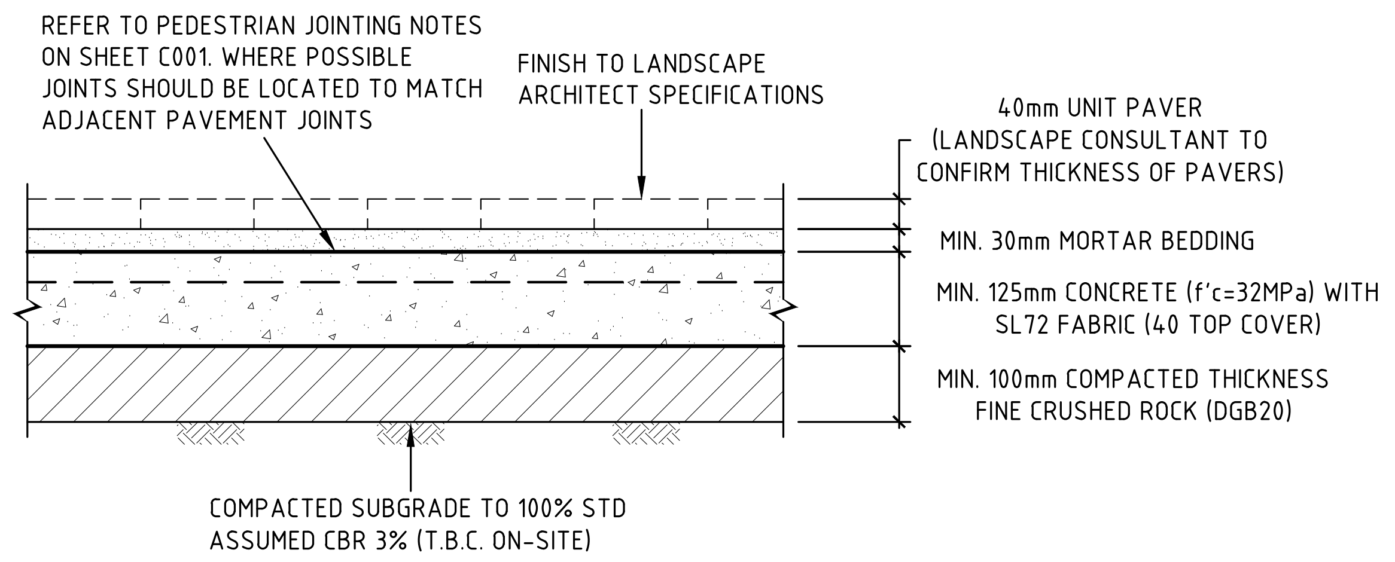
SAWCUT JOINT (SJ)

SCALE 1:10



EXPANSION JOINT (EJ)

SCALE 1:10



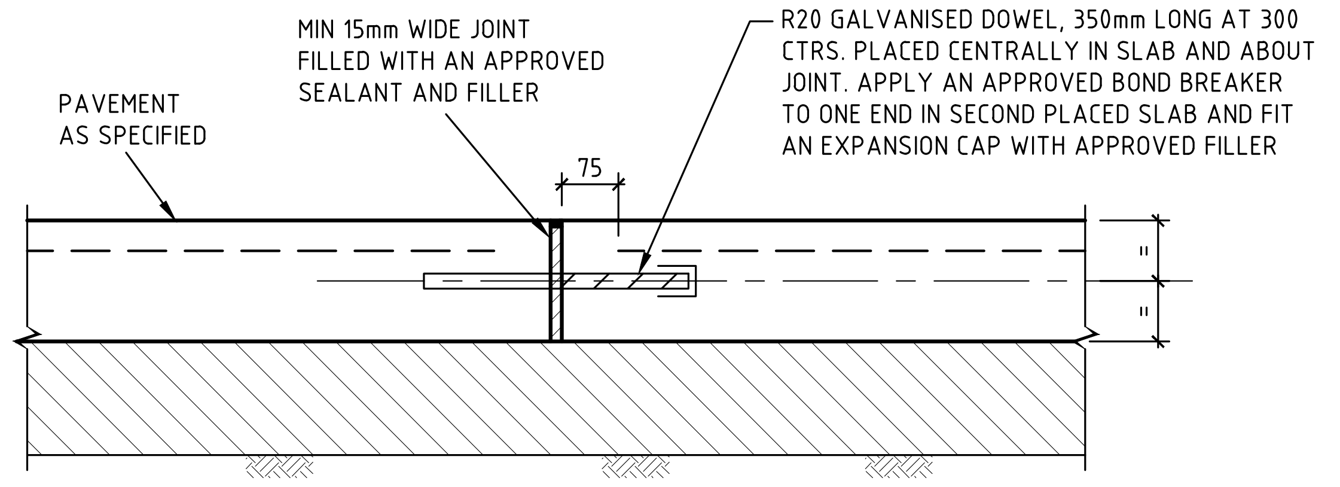
PAVEMENT TYPE P8A
LIGHT DUTY UNIT PAVERS

SCALE 1:10

🟪 DENOTED ON PLAN

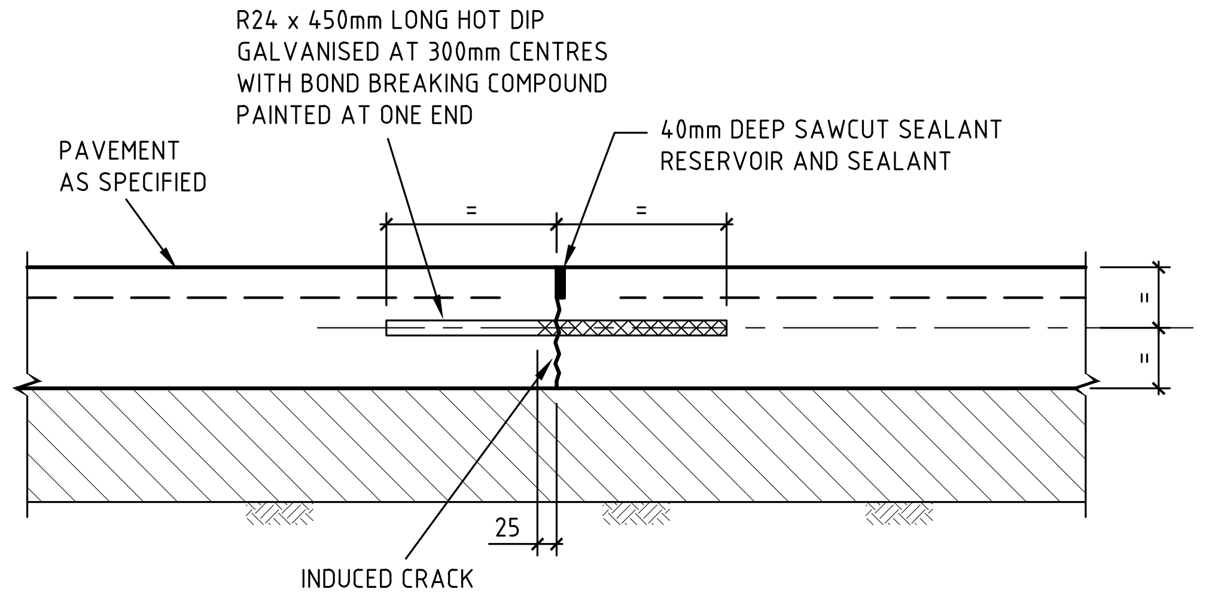
NOTES

1. SLAB MUST BE SAWCUT AS SOON AS PRACTICABLE AFTER FINISHING OF THE SLAB WITHOUT CAUSING DAMAGE TO THE SAWCUT EDGES - USUALLY 12-24 HOURS.
2. SLABS MUST NOT BE POURED IF TEMPERATURE EXCEEDS 32°
3. HOT WEATHER PLACING (25° AND OVER) MAY REQUIRE SLABS TO BE SAWCUT AS SOON AS 5-6 HOURS AFTER POURING.
4. ANY SLAB BAY IN WHICH SHRINKAGE CRACKS OCCUR DUE TO LATE SAWCUTTING MUST BE REMOVED AND REPLACED BY THE BUILDER/CONTRACTOR.



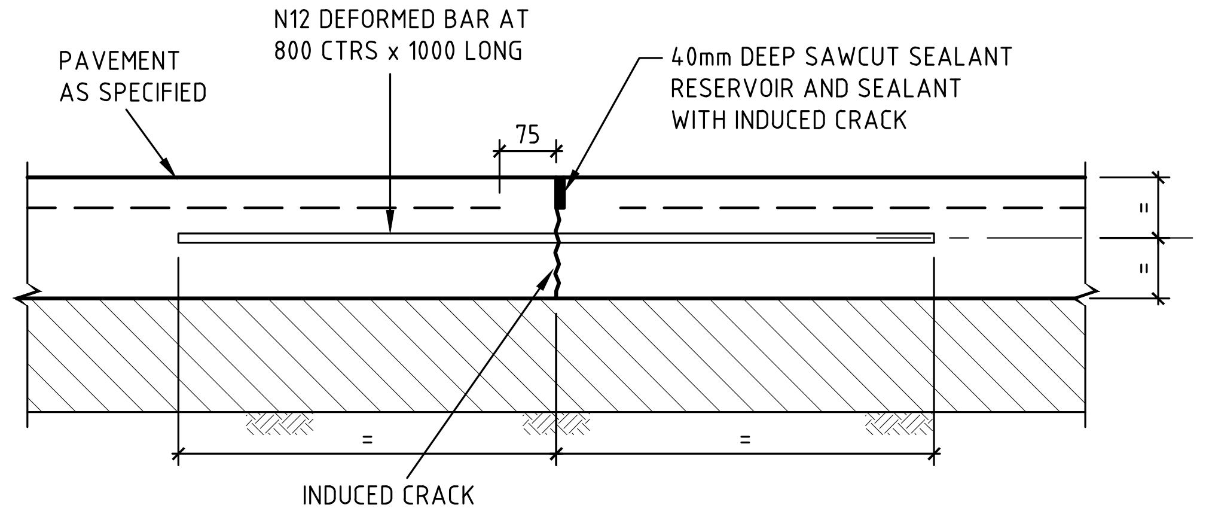
DOWELLED EXPANSION JOINT (DEJ)

SCALE 1:10



TRANSVERSE CONTRACTION JOINT (TCJ)

SCALE 1:10



LONGITUDINAL WARPING JOINT (LWJ)

SCALE 1:10

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SITEWORKS AND
PAVEMENT DETAILS
SHEET 1

FOR REVIEW

Designed EW
Drawn JF
Scale AS SHOWN
Date FEB 2020
Sheet A1

Project Director Approved
Date
North

Project Ref	Drawing No	Rev
1191701C	C071	P1

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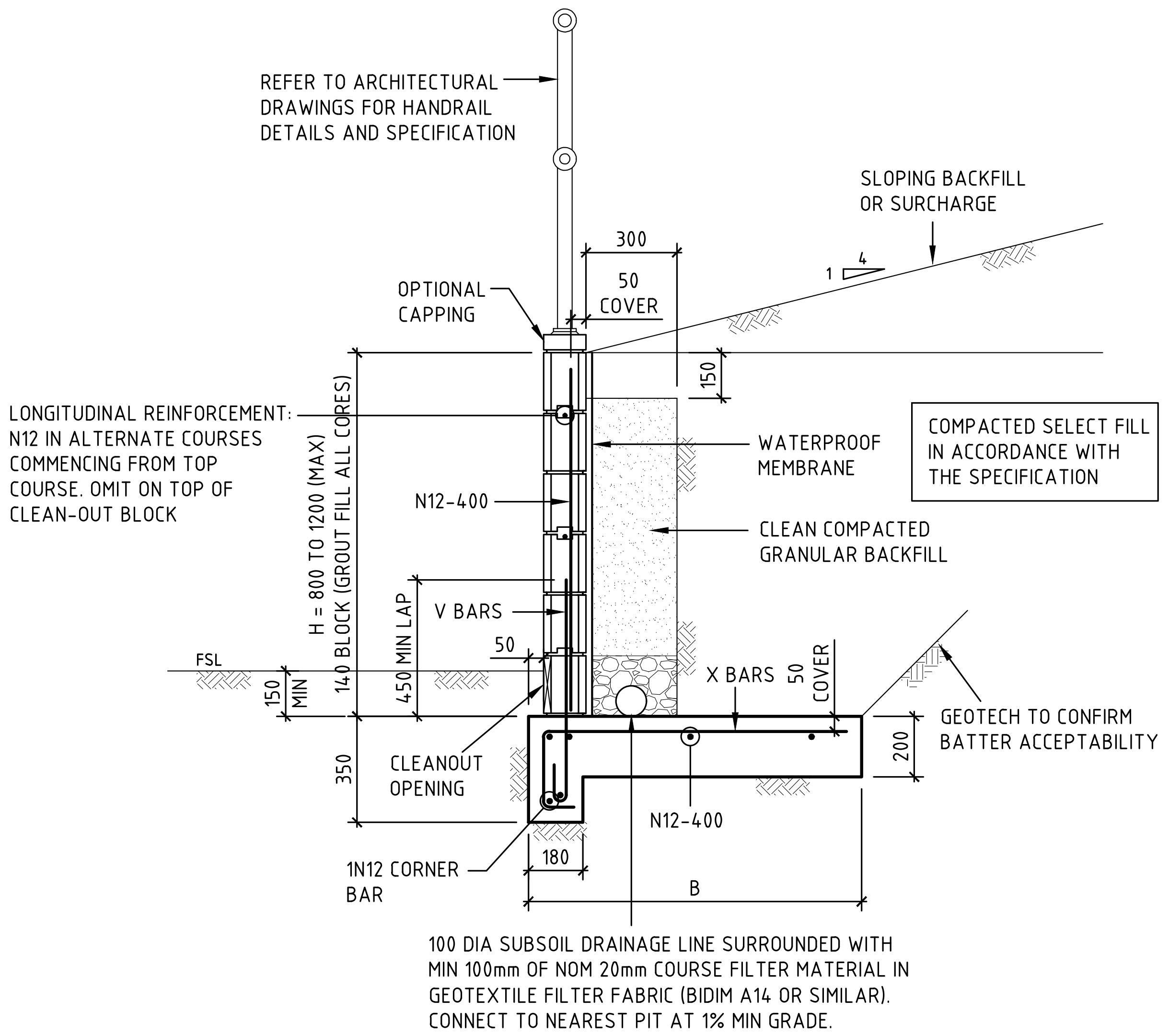
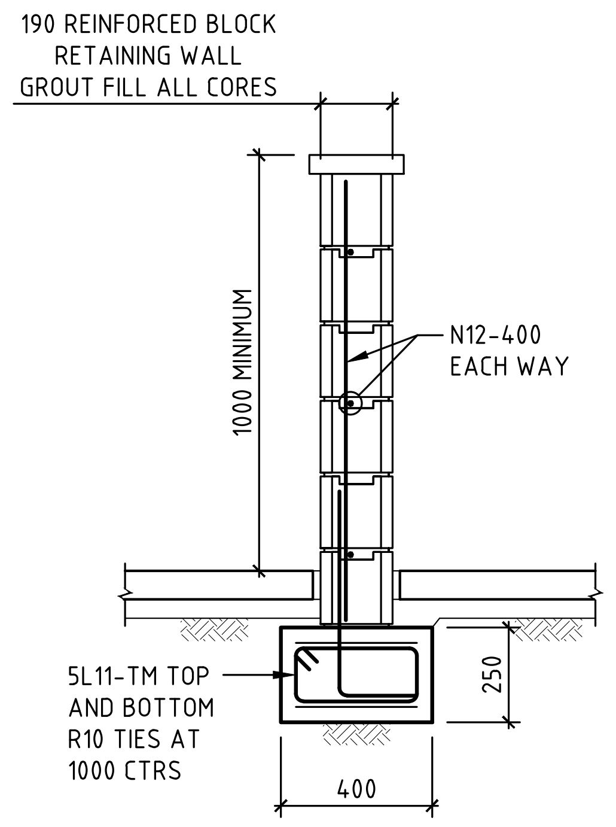


BLOCK RETAINING WALL (MAX 1200 HIGH)

SCALE 1:20

NOTE: DESIGNER TO CHECK THE NEED FOR SHEAR KEY



WALL TYPE 1 (W1)

SCALE 1:20

BLOCK RETAINING WALL BASE TYPE 1

WALL HEIGHT				REINFORCEMENT		BASE DIMENSIONS	
TOTAL HEIGHT (mm) H	HEIGHT OF BLOCKWORK			X-BARS AND V-BARS	K-BARS	WIDTH, B (mm) WITH FOLLOWING BACKFILL CONDITIONS	
	150 SERIES	200 SERIES	300 SERIES			LEVEL	MAX 1:4 SLOPE
800	800	-	-	N12-400	-	800	1000
1000	1000	-	-	N12-400	-	1000	1200
1200	1200	-	-	N12-400	-	1100	1500

Rev	Description	Date	By	App
P1	70% SSDA REVIEW	04.03.20	JF	-

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SITEWORKS AND
PAVEMENT DETAILS
SHEET 2

FOR REVIEW

Designed EW
Drawn JF
Scale AS SHOWN
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Sheet A1

Project Director Approved
Date
North

Project Ref	Drawing No	Rev
1191701C	C072	P1

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PM By: Jonathan Franco

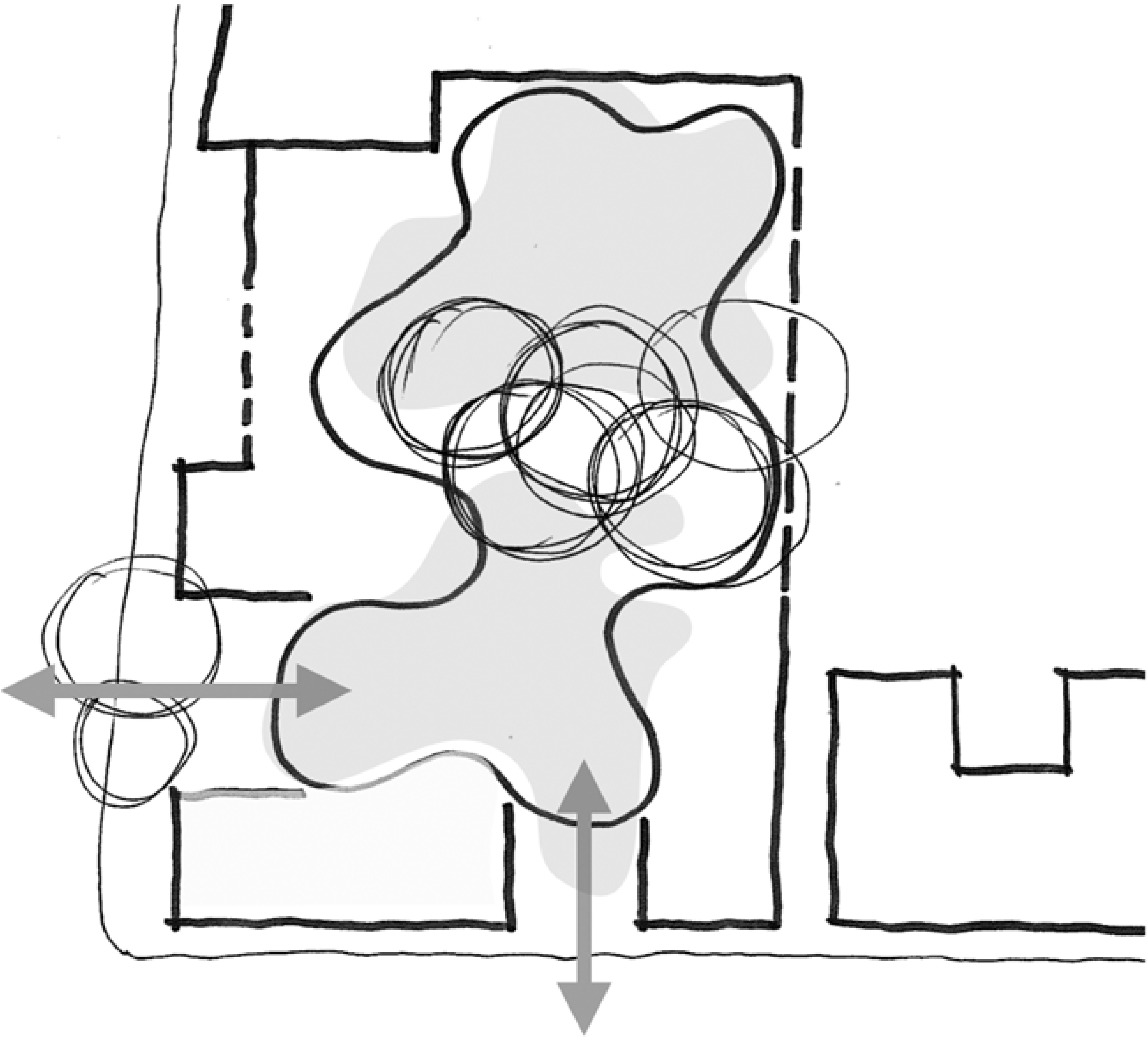
DARLINGTON PUBLIC SCHOOL REDEVELOPMENT

Appendix U — Biodiversity Development Assessment Report

SSD-9914

Prepared by EcoLogical

For NSW Department of Education



Darlington Public School Redevelopment Biodiversity Development Assessment Report

School Infrastructure NSW

A TETRA TECH COMPANY

☎ 1300 646 131
www.ecoaus.com.au

DOCUMENT TRACKING

Project Name	Darlington Public School Redevelopment – Biodiversity Development Assessment Report
Project Number	20SYD_15191
Project Manager	Belinda Failes
Prepared by	Belinda Failes (BASS 18159)
Reviewed by	Nicole McVicar (Accredited Assessor # BASS 18077)
Approved by	Nicole McVicar
Status	Final
Version Number	3
Last saved on	12 May 2020

This report should be cited as 'Eco Logical Australia. 2020 Darlington Public School Redevelopment– Biodiversity Development Assessment Report. Prepared for School Infrastructure NSW.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Daniel Luliano from Mace Group.

Disclaimer

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Template 2.8.1

Executive Summary

Eco Logical Australia Pty Ltd was engaged by School Infrastructure NSW (NSWSI) to prepare a Biodiversity Development Assessment Report for the proposed Darlington Public School State Significant Development. Mace Group on behalf of SINSW proposed to redevelop Darlington Public School (the 'development site') in the City of Sydney local government area. The proposed redevelopment will be assessed as a State Significant Development (SSD) (application SSD 19_9914) in accordance with both the *State Environmental Planning Policy* (Educational Establishments and Child Care Facilities) 2017 and NSW *Environmental Planning and Assessment Act 1979*. The Secretary's Environmental Assessment Requirements (SEARs) have been issued and require the preparation of a Biodiversity Development Assessment Report (BDAR) under the NSW *Biodiversity Conservation Act 2016* (BC Act).

The development site will impact upon biodiversity values within the development site and as such a BDAR is required to assess the vegetation clearing under the BC Act. This report has been prepared to meet the requirements of the Biodiversity Assessment Method 2016 (BAM) established under Section 6.7 of the BC Act. Requirements of the Sydney *Local Environmental Plan 2012* and *Development Control Plan 2012* have also been addressed in this document.

The vegetation within the development site contains planted native and exotic vegetation. Under the BAM all vegetation native to NSW must be assigned a Plant Community Type (PCT). Where native vegetation has been planted and does not clearly confirm to any PCT, a 'best-fit' PCT must be assigned. Based on the available data the planted native vegetation conforms to PCT *1281 Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion*. Although components of this PCT corresponds to Sydney Turpentine-Ironbark Forest listed under the BC Act and Commonwealth *Environment Protection and Biodiversity Act 1999* (EPBC Act), the planted vegetation does not correspond to a threatened ecological community (TEC).

During the field survey two threatened flora species listed under the BC Act and EPBC Act, *Eucalyptus scoparia* (Wallangarra White Gum) and *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) were recorded within the development site. These species are widely cultivated and used in landscape plantings. These species occur in a restricted geographic area in the NSW Northern Tableland which does not include the development site. These species are also used widely used as cultivated and planted specimens in the Sydney region. Therefore, these species do not represent the listed entities under the BC Act.

No other threatened flora or fauna species were recorded within the development site. There is potential that highly mobile threatened species may utilise the vegetation for foraging resources on occasion. Consideration has been given to these highly mobile species during the preparation of this BDAR.

Measures taken to avoid, minimise and mitigate impacts to the vegetation and species habitat present within the development site and methodologies to minimise impacts during construction and operation of the development have been included in this BDAR.

Following consideration of all the above aspects, the residual unavoidable impacts of the project were calculated in accordance with the BAM by utilising the Biodiversity Assessment Method Credit calculator (BAMC). For *PCT 1281_planted* the BAMC generated a vegetation integrity score of 17.1. Under the BAM, two (2) ecosystem credit are required to offset the removal of 0.16 ha of vegetation.

One Matter of National Environmental Significance (MNES) was identified as having potential to be adversely affected by the proposed works. *Pteropus poliocephalus* (Grey-headed Flying-fox) is listed as Vulnerable under the EPBC Act and it is considered that this species is likely to use some of the development site for foraging. Assessment of the Commonwealth Significant Impact Criteria was undertaken for the Grey-headed Flying-fox and concluded that the project would not have a significant impact on this species. Significant Impact Criteria was also conducted for two planted threatened species, *Eucalyptus nicholii* and *E. scoparia* and determined that the proposed works are unlikely to have a significant impact upon these planted species.

Contents

List of Figures

List of Tables

Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	*NSW Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community
DAW&E	Commonwealth Department of Agriculture, Water and the Environment (formally DoEE)
DCP	Development Control Plan
DoE	Department of Education
DoEE	Commonwealth Department of Environment and Energy (Now DAW&E)
DPE	NSW Department of Planning and Environment
DPIE	NSW Department of Planning, Infrastructure and Environment (previously known as OEH)
ELA	Eco Logical Australia Pty Ltd
EP&A Act	*NSW Environmental Planning and Assessment Act 1979*
EPBC Act	*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*NSW Fisheries Management Act 1994*
GIS	Geographic Information System
GHFF	Grey-headed Flying-fox
HBT	Hollow-bearing tree
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matter of National Environmental Significance
NSW	New South Wales
NOW	NSW Office of Water
OEH	NSW Office of Environment and Heritage (now known as DPIE)
PCT	Plant Community Type
SEARs	Secretary’s Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SINSW	School Infrastructure NSW
SSD	State Significant Development
TEC	Threatened Ecological Community
VIS	Vegetation Information System
WM Act	*NSW Water Management Act 2000*

1. Stage 1: Biodiversity assessment

1.1 Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by Belinda Failes, is an Accredited Person (BAAS18159) under the NSW *Biodiversity Conservation Act 2016* (BC Act). The report has been peer reviewed by Nicole McVicar (BAAS18077) who is also an accredited person under the BC Act.

1.1.1 General description of the development site

Mace Group have been engaged by School Infrastructure NSW (SINSW) to assist in the proposed redevelopment of Darlington Public School (SSD 19_9914) in accordance with both the State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017 and *Environmental Protection and Assessment Act 1979* (EP&A Act). The Secretary's Environmental Assessment Requirements (SEARs) have been issued and require the preparation of a Biodiversity Development Assessment Report (BDAR) under the NSW BC Act (see Table 1).

Darlington Public School is located at 417-445 Abercrombie Street at the corner of Abercrombie and Golden Grove Street (referred to as 'the development site'). The development site is 0.75 ha in size and located within the inner-west suburb of Darlington, approximately 3 km south of the Sydney central business district. The northern boundary of the development site abuts the historic University of Sydney Regiment building, Abercrombie Road forms the southern boundary, and Golden Grove Street forms the western boundary. The eastern boundary consists of the University of Sydney Business School and Abercrombie Student Accommodation.

The development site is located within the City of Sydney local government area (LGA). The development site is zoned SP2 Education Establishment under the *Sydney Local Environmental Plan 2012* (LEP). The proposed redevelopment allows for educational opportunities with consent approval under the LEP.

The development site consists of the following lots:

- Lot 100 DP 623500
- Lot 592 DP752049.

Darlington Public School currently accommodates educational facilities for 250 students (preschool and K-6) in 10 permanent home bases, three (3) preschool classrooms and one (1) allocated room used as an out-of-school-hours-care (OSHC) facility. Under the SSD application the proposed redevelopment will increase the capacity by up to 437 primary school students and 60 preschool children. The proposed works will include the demolition and redevelopment of the existing school which is nearing the end of its economic life and replacement with modern educational facilities.

The development site currently contains several multistorey buildings, playground equipment and scattered planted mixed native and exotic vegetation including several clusters of mature Eucalypt species which provides shade and aesthetic value.

This report includes two base maps, the Site Map Figure 1 and the Location Map Figure 2.

1.1.2 Development site footprint

The SSD application seeks consent for demolition of existing school buildings and construction of a new part 2, part 3-storey building, increasing the school capacity from 230 to 437 students. The works also include replacement of the existing child-care facility (to the same capacity of 60 students), earthworks and landscaping. For a detailed project description refer to the EIS prepared by Ethos Urban.

The development site footprint is provided in Figure 3. The proposed development will primarily utilise the existing building footprints and paved open space where available. Scattered planted canopy trees and some landscaped gardens will be impacted or removed to accommodate the new development.

It is understood that Early Works including some tree removal works, will be conducted prior to the SSD (Figure 1). Early Works will be assessed as a separate Development Application under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and submitted to the City of Sydney Council. ELA has been engaged to provide an assessment of the biodiversity impacts of the Early Works. As such Early Works are not assessed as part of this BDAR.

1.1.3 Response to SEARs

Table 1: BDARs response to SEARs

SEARs requirements	Addressed in BDAR
Biodiversity impacts related to the proposed development (SSD 9914) are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the Biodiversity Conservation Act 2016 (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method.	This BDAR reports assesses the biodiversity impacts and has been prepared in accordance with the BC Act, Biodiversity Conservation Regulation 2017 and BAM.
The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.	Avoiding impacts is addressed in Section 2.1 Direct impacts are addressed in Section 2.2. An assessment of Prescribed Impacts was conducted in Section 2.1.3 and determined that there were no Prescribed Impacts for the proposed development.
The BDAR must include details of the measures proposed to address the offset obligation as follows: • the total number and classes of biodiversity credits required to be retired for the development/project • the number and classes of like-for-like biodiversity credits proposed to be retired • the number and classes of biodiversity credits proposed to be retired in accordance with the variation rules • any proposal to fund a biodiversity conservation action • any proposal to make a payment to the Biodiversity Conservation Fund.	The BDAR has provided the total number of ecosystem credits required, like-for-like options and trading group in Section 2.5.5 (see Table 27).
If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	The SSD has not requested approval to use the variation rules.
The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the Biodiversity Conservation Act 2016.	This BDAR has been prepared by an accredited person under the BC Act and peer

SEARs requirements	Addressed in BDAR
	reviewed by an accredited person as stated in Section 1.1 of this BDAR.
Where a Biodiversity Assessment Report is not required, engage a suitably qualified person to assess and document the flora and fauna impacts related to the proposal.	A BDAR is required for State Significant Developments which impact upon biodiversity values.

1.1.4 Sources of information used

The following data sources were reviewed as part of this report:

- Biodiversity Assessment Methodology Calculator
- BioNet Vegetation Classification System
- BioNet / Atlas of NSW Wildlife 5 km database search (DPIE 2020a)
- EPBC Act Protected Matters Search Tool 5 km database search (DAW&E 2020a)
- The Native Vegetation of the Sydney Metropolitan Area (OEH 2013)
- Threatened Species Profiles (DPIE 2020b)
- Biodiversity values map and threshold tool (online tool) (DPIE 2020c)
- Aerial mapping (SIXMaps)
- Additional Geographic Information System (GIS) datasets including soil, topography, geology and drainage
- Architectural and Urban Design Statement (fjmt Studio 2020a)
- Landscape Plans (fjmt Studio 2020b)
- Request for Secretary’s Environmental Assessment Requirements – Darlington Public School Redevelopment (Gardner Wetherill & Associates Pty Ltd 2019)
- Darlington Arboricultural Development Assessment Report (Moore Trees 2020).

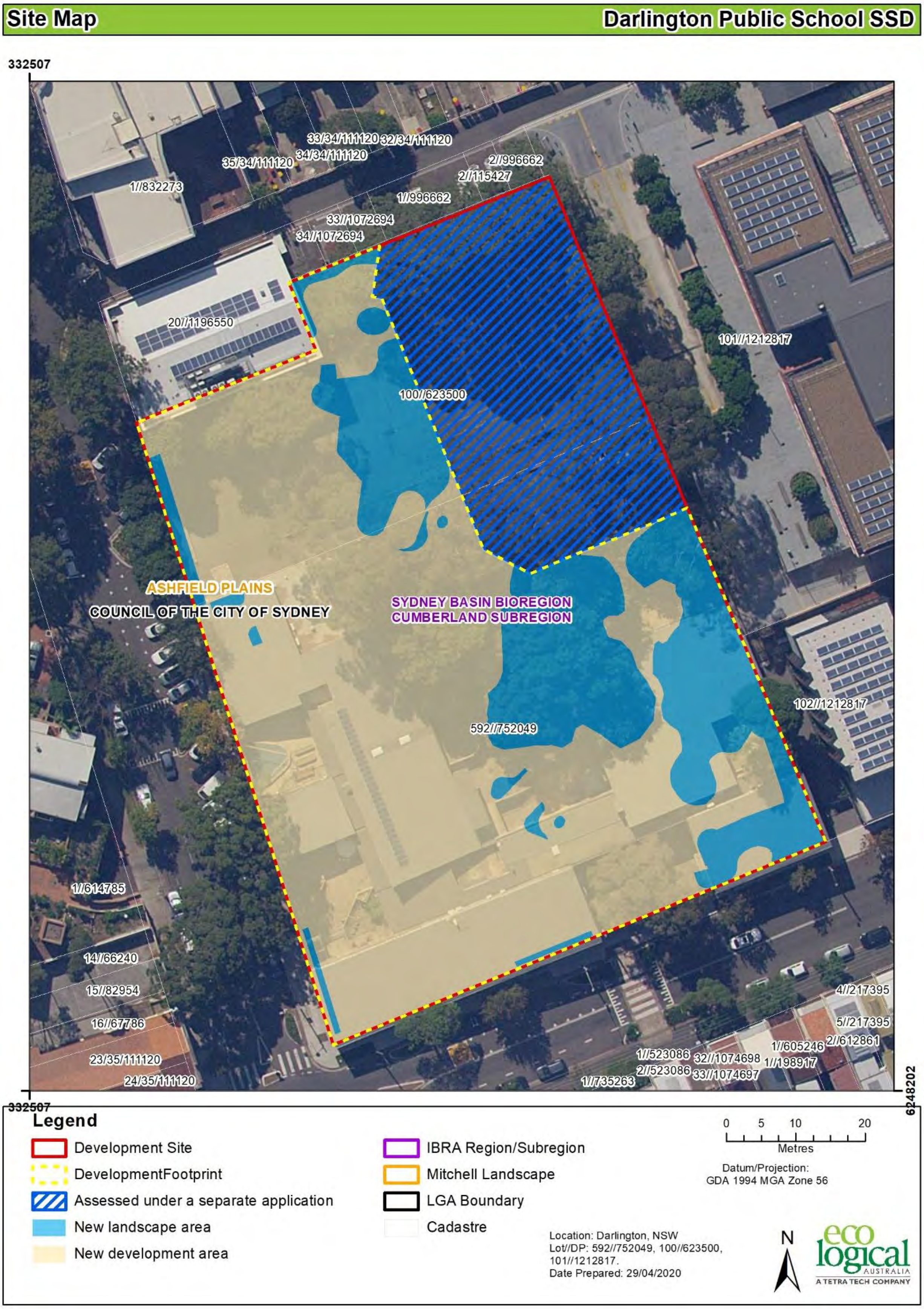

Figure 1: Site Map

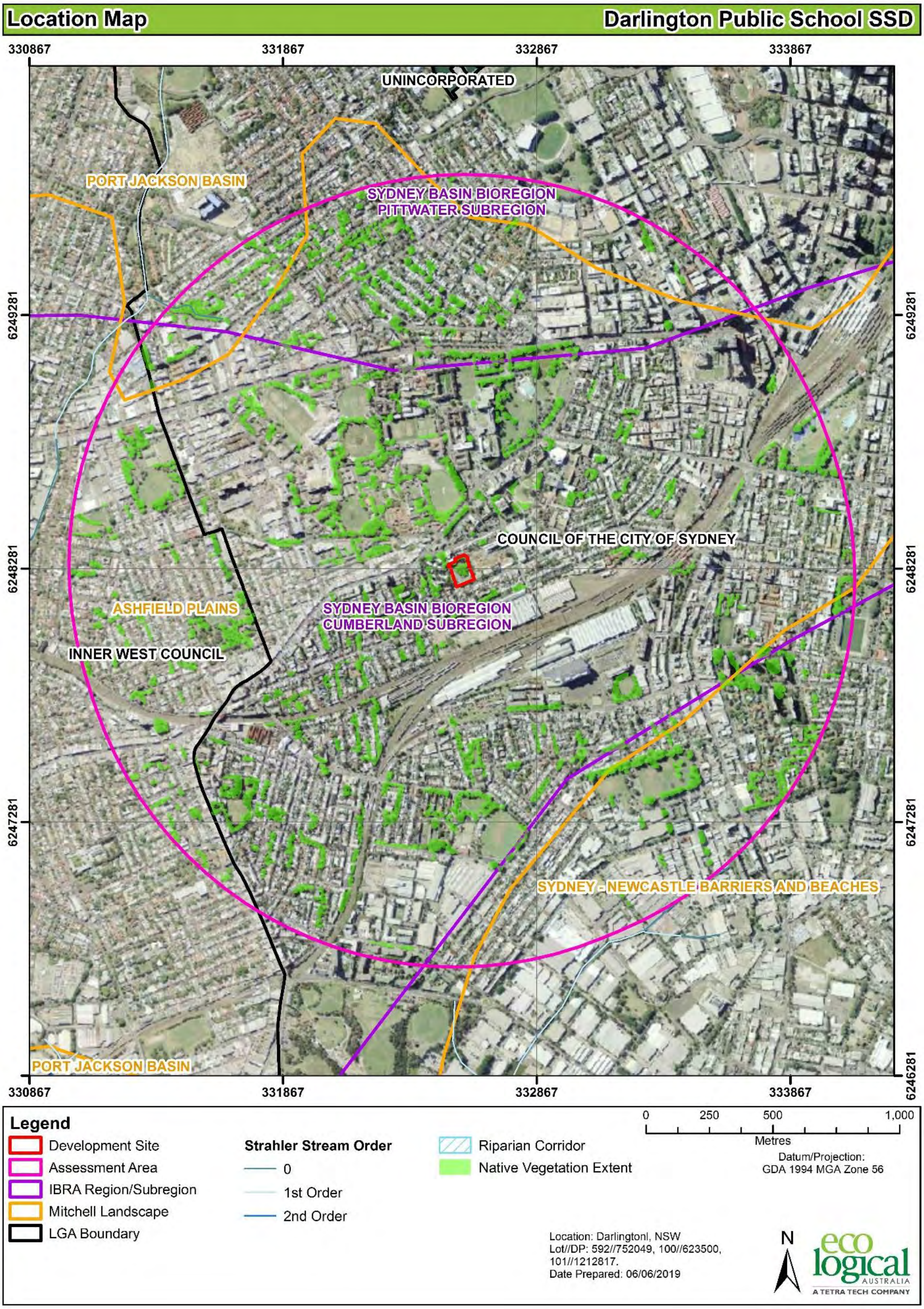

Figure 2: Location Map

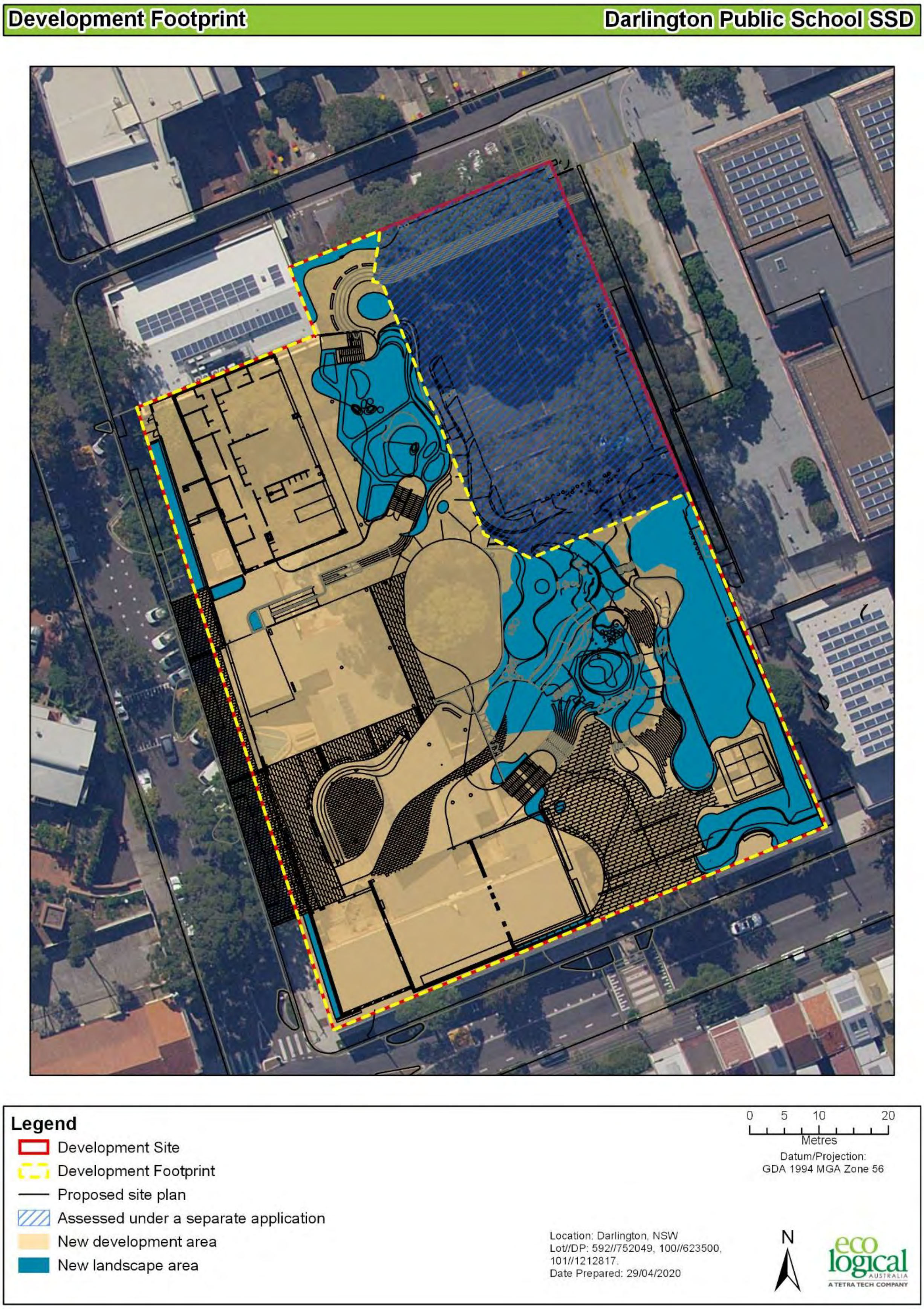

Figure 3: Final project footprint including construction and operation

1.2 Legislative context

Table 2: Legislative context

Name	Relevance to the project	Report Section
Commonwealth		
Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Matters of National Environmental Significance (MNES) have been identified within the development site. This report assessed impacts to MNES and concludes that the development is unlikely to have a significance impact on MNES.	2.6.1
State		
Biodiversity Conservation Act 2016 (BC Act)	The proposed development requires submission of a BDAR (i.e. this report) under the BC Act.	All
Environmental Planning and Assessment Act 1979 (EP&A Act)	The proposed development requires consent under the EP&A Act.	N/A
Fisheries Management Act 1994 (FM Act)	The development does not involve impacts to Key Fish Habitat, does not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. A permit or consultation under the FM Act is not required.	N/A
Local Land Services Amendment Act 2016 (LLS Act)	The LLS Act does not apply to areas of the state to which the Vegetation SEPP applies. The Vegetation SEPP applies to the City of Sydney LGA.	N/A
Water Management Act 2000 (WM Act)	The project does not involve works on waterfront land. A Controlled Activity Approval under s91 of the WM Act is not required.	N/A
Planning Instruments		
State Environmental Planning Policy (SEPP) – Coastal Management 2018	The proposed development is not located on land subject to SEPP coastal management.	N/A
SEPP (Koala Habitat Protection) 2019	The proposed development is not located within a LGA to which SEPP (Koala Habitat Protection) 2019 applies.	N/A
SEPP (Vegetation in Non-Rural Areas) 2017	This SEPP applies to development that does not require development consent. As this project requires consent under the EP&A Act, the Vegetation SEPP is not relevant.	N/A
Sydney Local Environmental Plan 2012 (LEP)	The development site is zoned SP2 under the Sydney LEP. The proposed works require development consent for the educational facilities.	2.6.2
Sydney Development Control Plan (DCP) 2012	The Sydney DCP has been reviewed for additional biodiversity provisions that may relate to the development site. Section 3.5.1 Urban Ecology of the DCP relates to the: • Protection of existing habitat features within and adjacent to development sites • Improve the diversity and abundance of locally indigenous flora and fauna species across the LGA. Under the DCP, development is to be consistent with the Street Tree Master Plan, Park Tree Management Plans and the Landscape Code. These matters have been addressed in this report.	2.6.3

1.3 Landscape features

1.3.1 IBRA regions and subregions

The development site falls within the Sydney Basin IBRA region and Cumberland subregion.

1.3.2 Mitchell Landscapes

The development site falls within the Ashfield Plains Mitchell Landscapes as outlined in Table 2 (DECC 2002) (Figure 2).

Table 3: Mitchell Landscapes

Mitchell Landscape	Description	Area within development site (ha)
Ashfield Plains	Undulating hills and valleys on horizontal Triassic shale and siltstone, occasional quartz sandstones especially near the margin of the Port Jackson landscape. General elevation 0 to 45m. Coastal extension of the Cumberland Plain landscape (DECC 2002). Vegetation is typically open forest of *Eucalyptus fibrosa* Broad-leaved Ironbark, *Eucalyptus moluccana* (Grey Box), with *Leptospermum* sp (tea-tree) along creeks and forests of *Syncarpia glomulifera* (Turpentine), *Eucalyptus resinifera* (Red Mahogany), *Eucalyptus punctata* (Grey Gum), *Eucalyptus saligna* (Sydney Blue Gum) and *Eucalyptus pilularis* (Blackbutt) with a grassy understorey of *Themeda triandra* (Kangaroo Grass) on moister sites (DECC 2002).	0.75

1.3.3 Rivers and streams

The development site does not contain any rivers and streams.

1.3.4 Wetlands

The development site does not contain any wetlands.

1.3.5 Connectivity features

The development site does not contain connectivity features with other vegetation patches in the adjoining land. Additionally, there are no native vegetation patches identified in adjoining lands.

1.3.6 Areas of geological significance and soil hazard features

The development site does not contain areas of geological significance and soil hazard features.

1.3.7 Site context

1.3.7.1 Method applied

The site based method has been applied to this development.

1.3.7.2 Percent native vegetation cover in the landscape

The current percent native vegetation cover in the landscape was assessed in a Geographic Information System (GIS) using aerial imagery sourced from SIX Maps using increments of 5%. The percent native vegetation cover within the 1,500 m buffer area is 9% (70 ha).

1.3.7.3 Patch size

Patch size was calculated using available vegetation mapping for all patches of intact native vegetation on and adjoining the development site. The patch size class is 25-100 ha (patch size area is 59 ha), this includes patches of Urban Exotic /Native vegetation as mapped by Office of Environment and Heritage (OEH 2013) vegetation mapping.

1.4 Native vegetation

1.4.1 Survey effort

The vegetation assessment was conducted on 21 May 2019 to identify the vegetation type and condition of the vegetation community within the development site. One full-floristic and vegetation integrity plot was undertaken in accordance with the BAM (Table 4). A summary table of the extent of each Plant Community Type (PCT) recorded within the development site and the amount of each PCT impacted is provided in Table 5 below.

The site visit also involved an assessment of habitat features, including hollow-bearing trees (HBTs), threatened species foraging resources and gaps in roof cavities suitable for threatened microchiropteran (microbat) species.

All field data collected in the full-floristic and vegetation integrity plot is included in Appendix B.

Table 4: Full floristic and vegetation integrity plots

Veg Zone	PCT ID	PCT Name	Ancillary code	Condition	Area impacted (ha)	Plots required	Plots surveyed
1	1281	Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	Planted	Low	0.16	1	1

Table 5: Summary of the PCTs in the development site and the extent of impacts and vegetation to be retained.

PCT and Veg Zone	Impacted development area (ha)	Impacted landscaping (ha)	TOTAL (ha)
PCT1281 Zone 1	0.12	0.04	**0.16**
Exotic	0.008	0.002	**0.010**
Cleared*	0.30	0.14	**0.44**
TOTAL	**0.43**	**0.18**	**0.608****

* CLEARED INCLUDES EXISTING BUILDING AND INFRASTRUCTURE
** NOTE, DEVELOPMENT FOOTPRINT EXCLUDES THE DA AREA (0.12 HA)

1.4.2 Plant Community Types present

The development site contains planted native canopy, shrubs and occasionally ground cover species which are native to NSW, however, not considered locally indigenous to the area. Under the BAM all vegetation native to NSW requires consideration as to the 'best fit' PCT. Therefore, it was determined that the best fit PCT for the native vegetation represented in the development site was PCT *1281 Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion* (Table 6, Figure 4, Photo 1). Justification regarding the selection of this PCT is provided below.

Some components of this PCT are listed as a threatened ecological community (TEC) under the BC and EPBC Act. However, the vegetation within the development site has been planted and does not represent a TEC (Table 7). Information regarding why the PCT mapped in the development site does not satisfy listing as a TEC is provided in Section 1.4.2 below.

Table 6: Plant Community Types within the development site

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area (ha)	Percent cleared
1281	Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	Northern Hinterland Wet Sclerophyll Forests	Wet Sclerophyll Forests (Grassy sub-formation)	0.16	90%

Table 7: Threatened Ecological Communities within the development site

PCT ID	BC Act			EPBC Act		
	Listing status*	Name	Area (ha)	Listing status*	Name	Area (ha)
1281	CEEC	Sydney Turpentine Ironbark Forest	0**	CEEC	Turpentine Ironbark-Forest	0**

* CEEC – Critically endangered ecological community

**The planted vegetation within the development site has been mapped as PCT 1281, however, the vegetation within the development site does not represent the TEC (see justifications below).

Photo 1: Vegetation zone 2 – PCT 1281_planted (non-TEC)

1.4.2.1 PCT selection justification

Only one PCT was recorded within the development site, PCT 1281 *Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion*. The desktop database assessment and site inspection did not record remnant vegetation within the development site or within the broader locality of the development site. The absence of remnant vegetation makes the selection of an appropriate PCT problematic. Additionally, the BAM vegetation integrity data and floristic data could not be used to quantitatively determine the appropriate PCT as the vegetation within the development site has been planted and does not represent a local vegetation community.

The development site currently contains two mature *Eucalyptus saligna* (Sydney Blue Gum). Aerial photography interpretation of 1943 historical imagery of the development site identified that the development site in 1943 was already highly urbanised and lacked vegetation. Therefore, although these two trees are mature, they are considered planted. The 1943 imagery also indicates that the surrounding lands lacks vegetation which may be considered remnant.

A review of available vegetation database mapping within the broader landscape of the development site recorded only one remaining patch of native vegetation which corresponds to a PCT. *PCT 1647 Red Bloodwood – Smooth – barked Apple heathy woodland on the Central and lower North Coast south-east* has been mapped 3.5 km to the south-east of the development site (SMCMA - OEH 2013). There is no connectivity with the site and this patch of vegetation. A description of this vegetation community indicates that this PCT occurs on sandy soils near coastal environments.

In the absence of suitable pre-European vegetation data, a description of the Mitchell Landscape was used as an indicator of the historical soil landscape and potential characteristic species represented within the development site. A description of the Mitchell Landscape within the development site is found in Table 3. In summary, the Ashfield Plains Mitchell Landscape may have contained open forest vegetation represented by; *Eucalyptus fibrosa*, *Eucalyptus moluccana* and *Syncarpia glomulifera*, *Eucalyptus resinifera*, *Eucalyptus punctata*, *Eucalyptus saligna* and *Eucalyptus pilularis* along creeks and forests. These dominant species were compared with vegetation descriptions present in the VIS online excel spreadsheet. Additionally, the VIS online database was filtered using a search of the IBRA-subregion and Mitchell Landscapes to determine an appropriate PCT. The results of these comparisons are provided in Table 8.

Table 8: PCT selection justification

PCT ID	PCT Name	Selection criteria	Justification
1281	**Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion**	**IBRA region, subregion, Mitchell landscape and planting of canopy species *Syncarpia glomulifera* and *Eucalyptus saligna*.**	**This PCT has been accepted as the best fit PCT for planted native vegetation located in the development site based on the comparison of dominant canopy species between the VIS description and Mitchell Landscape description.**
1647	Red Bloodwood – Smooth – barked Apple heathy woodland on the Central and lower North Coast south-east	A description of dominant species listed from the Mitchell landscape was compared within the VIS excel spreadsheet of dominant species within the IBRA subregion	This PCT has been mapped 3.5 km from the development site (SMCMA - OEH 2013). However, PCT 1647 represents sandstone heath vegetation which does not fit the development sites Mitchell Landscape description which indicates that the original soil landscape contained forest on clay soils.
725	Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	A description of dominant species listed from the Mitchell landscape was	This PCT was not chosen as this PCT is distributed within the Hornsby and Gosford

PCT ID	PCT Name	Selection criteria	Justification
		compared within the VIS excel spreadsheet of dominant species within the IBRA subregion	areas and does not include the development site location.
830	Forest Red Gum - Grey Box shrubby woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	A description of dominant species listed from the Mitchell landscape was compared within the VIS excel spreadsheet of dominant species within the IBRA subregion	This PCT was not chosen based on the description of characteristic species did not represent species within the development site.

1.4.2.2 Threatened Ecological Communities Justification

The BioNet Vegetation Classification lists PCT 1281 as a component of Sydney Turpentine Ironbark Forest which is listed as a critically endangered ecological community (CEEC) under the BC Act and EPBC Act (Table 7).

However, the vegetation present in the development site has been established through plantings and does not satisfy the listing criteria under the BC and EPBC Acts. The vegetation exists as a mix of planted eucalypt and exotic canopy species and horticultural varieties of native ground cover or shrubs. There is no evidence of remnant vegetation within the development site or broader landscape. Additionally, the soil profile has been substantially modified and does not represent original profile. Therefore, the vegetation within the development site does not form part of the Sydney Turpentine Ironbark Forest TEC listings under the BC or EPBC Acts.

1.4.3 Vegetation integrity assessment

A vegetation integrity assessment using the Credit Calculator (BAMC) was undertaken and the results are outlined in Table 9.

Table 9: Vegetation integrity

Veg Zone	PCT ID	Ancillary code	Condition	Impact area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	1281	Planted (non TEC)	Low	0.16	11.6	12.6	45.3	17.1

Figure 4 Plant Community Types and native vegetation extent

Figure 5 Plot location

1.5 Threatened species

1.5.1 Ecosystem credit species

Ecosystem credit species predicted to occur at the development site, their associated habitat constraints, geographic limitations and sensitivity to gain class are included in Table 10.

Table 10: Predicted ecosystem credit species

Species	**Common Name**	**Habitat constraints/ Geographic limitations**	**Sensitivity to gain class**	**NSW listing status**	**EPBC Listing status**	**Justification if species excluded**
Anthochaera phrygia	Regent Honeyeater (Foraging)	N/A	High	CE	CE	Excluded Habitat features for this species are not present at this site. The development site does not comprise of key plant species required for foraging.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	N/A	Moderate	V	Not listed	Excluded No suitable vegetation to provide foraging/shelter/breeding habitat within the development site.
Calyptorhynchus lathami	Glossy Black-Cockatoo (Foraging)	Other Presence of *Allocasuarina* and *Casuarina* species	High	V	Not Listed	Excluded Habitat features for this species are not present at this site. The development site does not comprise of key plant species required for foraging.
Chthonicola sagittata	Speckled Warbler	N/A	High	V	Lot Listed	Excluded Habitat present does not contain suitable habitat features for this species such as abundance of fallen logs. The vegetation within the development site is substantially modified and urbanised.
Dasyurus maculatus	Spotted-tailed Quoll	N/A	High	V	E	Excluded Habitat features for this species are not present at this site. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in (DECC 2007).

Species	**Common Name**	**Habitat constraints/ Geographic limitations**	**Sensitivity to gain class**	**NSW listing status**	**EPBC Listing status**	**Justification if species excluded**
Glossopsitta pusilla	Little Lorikeet	N/A	High	V	Not Listed	**Included** There is only one BioNet record for this species and this record is recent (2015). Seasonal foraging habitat was identified in this assessment.
Lathamus discolor	Swift Parrot (Foraging)	N/A	Moderate	E	CE	Excluded Habitat features associated with this species are not present on the development site. There are no habitat features required for this species such as the favoured feed trees or lerp infestations.
Melanodryas cucullata	Hooded Robin (south-eastern form)	N/A	Moderate	V	Not Listed	Excluded Habitat features associated with this species are not present on the development site. This species requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses which the development site does not contain. No individuals have been recorded within 5 km of the development site.
Micronomus norfolkensis	Eastern Freetail-bat	N/A	High	V	Not Listed	Included There are 10 BioNet records for this species within a 5 km radius of the development site. Seasonal foraging habitat was identified in this assessment.
Miniopterus australis	Little Bent-winged Bat (Foraging)	N/A	High	V	Not Listed	Included There is only one BioNet record for this species within a 5 km radius of the development site. Seasonal foraging habitat was identified in this assessment.
Miniopterus orianae oceanensis	Large Bent-winged Bat (Foraging)	N/A	High	V	Not Listed	Included There are 42 BioNet records for this species within a 5 km radius of the development site. Seasonal foraging habitat was identified in this assessment.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Petroica boodang	Scarlet Robin	N/A	Moderate	V	Not Listed	Excluded Habitat features associated with this species includes an abundance of logs and fallen timber, these features were not present in the development site.
Petroica phoenicea	Flame Robin	N/A	Moderate	V	Not Listed	Excluded Habitat features associated with this species are not present in the development site. This species requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses which the development site does not contain. No individuals have been recorded within 5 km of the development site.
Phascolarctos cinereus	Koala (Foraging)	N/A	High	V	V	Excluded Habitat present is highly urbanised landscape which is substantially degraded such that this species is unlikely to utilise the development site. Habitat was not considered suitable due to the high disturbance and limited feed trees.
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	N/A	High	V	V	Included There are 1161 BioNet records for this species within a 5 km radius of the development site. Seasonal foraging habitat was identified in this assessment.

1.5.2 Species credit species

Species credit species predicted to occur at the development site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class are shown in Table 11. Habitat assessments were undertaken during the field survey on 21 May 2019 to determine the likelihood of threatened species occurring within the development site on an intermittent or permanent basis.

It should be noted that two flora species listed under the BC Act and EPBC Act, which have been planted as horticultural varieties were present within the development site.

Eucalyptus nicholii (Narrow-leaved Black Peppermint) is listed as vulnerable under the BC Act and EPBC Act was recorded within development site. *Eucalyptus nicholii'*s natural distribution is restricted to the New England Tablelands which is over 400 km from the development site. This species occurs in dry grassy woodlands on ridges. The development site does not contain dry grassy woodlands and is not located on a ridgetop. The Threatened Species Profile for *Eucalyptus nicholii* states that this species is often planted as an urban street tree (DPIE 2020).

Eucalyptus scoparia (Wallangarra White Gum) is listed as endangered under the BC Act and vulnerable under the EPBC Act. This species has been planted as landscaping trees and was not recorded within remnant or part of a native vegetation patch. This threatened species is known from only three locations in NSW near Tenterfield, which is more than 640 km from the development site. The development site is not connected to the known geographic distribution of this species. *Eucalyptus scoparia* occurs in open eucalypt forests and heath, typically at high altitudes. The development site does not represent suitable habitat for this species.

One *Eucalyptus nicholii* was located near the southern boundary (identified as Tree 3 in the arborist report, Moore Trees 2020). One *Eucalyptus scoparia* was identified in a cluster of trees along the northern boundary (identified as Tree 31 in the arborist report, Moore Trees 2020). Both trees will be removed for the proposed development.

Although *Eucalyptus nicholii* and *E. scoparia* are listed as threatened species under the BC Act, these specimens are considered planted for the following reasons:

- The specimens were located within a horticultural garden which contains a highly modified soil profile
- The vegetation with the development site has been planted and does not contain remnant vegetation.
- The development site is located outside of the natural distribution for these species.
- The genetic origins for planted threatened species are of unknown source and therefore, do not contribute to the genetic pool for these species.

Given that these species are located outside of their natural range of distribution and/or outside their natural habitat, and the fact these species have clearly been planted due to the landscaped setting, these species were not considered candidate species credit species and do not require additional assessment under the BAM. Impacts to these species in accordance with the EPBC Act have been assessed in accordance with the Significance Impact Criteria and are provided in Section 2.6.1.

Habitat assessments involved searches of all possible hollow-bearing trees within the development site, on ground inspection using binoculars of roof cavities for possible entrance for microbats, indirect evidence of fauna use within the development site.

Two hollow-bearing trees (HBT) were recorded within the development site. No evidence of microbat occupation, in the form of scats, markings, were observed around the entrances. A range of peri-urban bird species were observed foraging in the development site during site inspection, of which only one species (Rainbow Lorikeet (*Trichoglossus haematodus*)) are known to utilise HBTs for nesting. This species is not listed as a threatened species under the BC or EPBC Acts.

Additionally, two small ventilation vents were observed with nesting material within the University of Sydney Regiment building along the northern boundary of the development site. The vents were located within the exposed brick wall and currently contain nesting material (sticks) possibly from peri-urban birds. It is unlikely that these vents will provide suitable habitat for microbats due to the obstruction of the nesting material and the lack of depth of the vents. Furthermore, this building is located outside of the development site and will be retained under the proposed works. An inspection of the remaining buildings within the development site did not identify possible openings within the roof cavities which indicate habitat for microbats.

The vegetation within the development site contains occasional foraging habitat for urbanised fauna species (birds and arboreal mammals). The vegetation within the development site lacks important habitat features. Additionally, the vegetation patch is small in size and lacks connectivity (i.e. via watercourse or vegetative corridors) to other patches of habitat (including core bushland). Therefore, fauna species utilising the vegetation on site is restricted to highly mobile species which may utilise urban landscape environments.

Table 11: Candidate species credit species

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Acacia bynoeana	Bynoe's Wattle	N/A	High	E	V	Excluded The presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the development site.
Acacia prominens – endangered population	Gosford Wattle Endangered population, Hurstville and Kogarah LGAs	N/A	High	E	Not Listed	Excluded The development site is not located within the Gosford, Hurstville or Kogarah LGAs. This species is not considered a candidate species for this assessment.
Acacia pubescens	Downy Wattle	N/A	High	V	V	Excluded The presence of this species was not identified (conspicuous species) and it was determined that the habitat features associated with this species are not present within the development site.
Anthochaera phrygia	Regent Honeyeater (Breeding)	N/A	High	CE	CE	Excluded The development site is not located within any of the four known NSW breeding areas. It is

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						not recorded within the mapped Important Areas in the BOAMS (dated 24/04/2020). Specific habitat features for this species were not recorded within the development site.
Caladenia tessellata	Thick Lip Spider Orchid	N/A	Moderate	E	V	Excluded Habitat for this species was not considered suitable in the development site. The site is substantially degraded, and this species occurs in grassy sclerophyll woodlands which were not recorded within the development site. Furthermore, this species is only known from old records in Sydney area.
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	Hollow bearing trees Living or dead tree with hollows > 15cm diameter and > 5 m above ground	High	V	Not Listed	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain larger patches of intact vegetation or trees with large hollows that are suitable for the species to utilise the site.
Camarophyllopsis kearneyi	*Camarophyllopsis kearneyi*	Lane Cove Bushland Park	High	E	Not Listed	Excluded The development site is not in within Lane Cove Bushland Park (it is located 13 km away to the north of the Development Site). This species is unlikely to occur within the development site.
Epacris purpurascens var. purpurascens	*Epacris purpurascens var. purpurascens*	N/A	Moderate	V	Not Listed	Excluded The presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the development site.
Eucalyptus nicholii	Narrow-leaved Black Peppermint	N/A	High	V	V	Excluded This species was identified within the development site. This species has been planted. However, in accordance with the BAM

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						threatened species should be considered in this assessment. This species is not associated with PCT 1281 and was added as a candidate species within the BAMC. The BioNet Atlas notes that this species is frequently planted well outside of its natural range. Based on the rational provided in the section above, it was determined that this species is not a candidate species credit species.
Eucalyptus scoparia	Wallangarra White Gum	Cliffs or within 100 m/ Rocky areas or within 100 m	Very High	E	V	Excluded This species was identified within the development site. This species has been planted. However, in accordance with the BAM threatened species should be considered in this assessment. This species is not associated with PCT 1281 and was added into the BAMC. The BioNet Atlas notes that this species is frequently planted well outside of its natural range. Based on the rational provided in the section above, it was determined that this species is not a candidate species credit species.
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	N/A	High	V	V	Excluded The presence of this species was not identified (conspicuous species) and it was determined that the habitat features associated with this species are not present within the development site and the habitat is highly urbanises such that this species is unlikely to occur in the development site.
Grevillea parviflora subsp. supplicans	Grevillea parviflora subsp. supplicans	N/A	High	E	Not Listed	Excluded The presence of this species was not identified (conspicuous species) and it was determined that the habitat features associated with this species are not present within the

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						development site and the habitat is highly urbanises such that this species is unlikely to occur in the development site.
Gyrostemon thesioides	*Gyrostemon thesioides*	N/A	High	E	Not Listed	Excluded The presence of this species was not identified (conspicuous species) and it was determined that the habitat features associated with this species are not present within the development site and the habitat is highly urbanises such that this species is unlikely to occur in the development site.
Hibbertia puberula	*Hibbertia puberula*	N/A	High	E	Not Listed	Excluded The presence of this species was not identified, and it was determined that the habitat features associated with this species are not present within the development site. The site is substantially degraded such that this species is unlikely to utilise the development site.
Hibbertia superans	Hibbertia superans	Other Ridgetops	High	E	Not Listed	Excluded The presence of this species was not identified, and it was determined that the habitat features associated with this species are not present within the development site. The site is substantially degraded such that this species is unlikely to utilise the development site.
Hygrocybe anomala var. *ianthinomarginata*	-	Lane Cove Bushland Reserve	High	V	Not Listed	Excluded The development site is not in within Lane Cove Bushland Reserve (it is located approximately 13 km away to the north of the development site). This species is unlikely to occur within the development site.
Hygrocybe aurantipes	-	Lane Cove Bushland Reserve	High	V	Not Listed	Excluded The development site is not in within Lane Cove Bushland Reserve (it is located

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						approximately 13 km away to the north of the development site). This species is unlikely to occur within the development site.
Hygrocybe austropratensis	-	Lane Cove Bushland Reserve	High	E	Not Listed	Excluded The development site is not in within Lane Cove Bushland Reserve (it is located approximately 13 km away to the north of the development site). This species is unlikely to occur within the development site.
Hygrocybe collucera		Lane Cove Bushland Reserve	High	E	Not Listed	Excluded The development site is not in within Lane Cove Bushland Reserve (it is located approximately 13 km away to the north of the development site). This species is unlikely to occur within the development site.
Hygrocybe griseoramosa		Lane Cove Bushland Reserve	High	E	Not Listed	Excluded The development site is not in within Lane Cove Bushland Reserve (it is located approximately 13 km away to the north of the development site). This species is unlikely to occur within the development site.
Hygrocybe lanecovensis		Lane Cove Bushland Reserve	High	E	Not Listed	Excluded The development site is not in within Lane Cove Bushland Reserve (it is located approximately 13 km away to the north of the development site). This species is unlikely to occur within the development site.
Hygrocybe reesiae		Lane Cove Bushland Reserve	High	V	Not Listed	Excluded The development site is not in within Lane Cove Bushland Reserve (it is located approximately 13 km away to the north of the development site). This species is unlikely to occur within the development site.
Lathamus discolor	Swift Parrot (Breeding)	Other As per mapped areas	Moderate	E	CE	Excluded BCT have confirmed that the development site does not occur

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						within mapped important areas for this species (June 2019). Habitat features associated with this species are not present on the development site. The development site does not contain habitat features required for this species. There are none of the favoured feed trees or lerp infestations.
Litoria aurea	Green and Golden Bell Frog	Semi-permanent/ephemeral wet areas Within 1km of wet areas, Swamps Within 1km of swamps Waterbodies Within 1km of waterbody	High	E	V	Excluded Habitat features associated with this species are not present on the development site. The development site does not contain suitable waterbodies for this species to utilise the site for breeding, wintering, foraging or sheltering. There are no BioNet records for this species within 5 km of the development site.
Meridolum corneovirens	Cumberland Plain Land Snail	N/A	High	E	Not Listed	Excluded Habitat features associated with this species are not present in the development site. This species occurs within Cumberland Plain Woodland and associated shale vegetation communities. The development site does not support these habitat features.
Miniopterus australis	Little Bent-winged Bat (Breeding)	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species recorded in BioNet with microhabitat code 'IC -in cave' Observation type code 'E nest roost' With numbers of individuals >500 Or from the scientific literature	Very High	V	Not Listed	Excluded Habitat features for this species are not present within the development site. Exiting buildings within the site do not contain suitable breeding habitat for this species.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species recorded in BioNet with microhabitat code 'IC -in cave' Observation type code 'E nest roost' With numbers of individuals >500 Or from the scientific literature	Very High	V	Not Listed	Excluded Habitat features for this species are not present within the development site. Exiting buildings within the site do not contain suitable breeding habitat for this species.
Myotis macropus	Southern Myotis	Hollow bearing trees Within 200 m of riparian zone Other Bridges, caves or artificial structures within 200 m of riparian zone This includes rivers, creeks, billabongs, dams and other waterbodies on or within 200m of the site	High	V	Not Listed	Excluded Habitat features associated with this species are not present on the development site. There are no suitable waterbodies, creeks or dams within the development site which may contain suitable habitat for this species.
Persoonia hirsuta	Hairy Geebung	N/A	High	E	E	Excluded The presence of this species was not identified (conspicuous species) and it was determined that the habitat features associated with this species are not present within the development site and the habitat is highly urbanises such that this species is unlikely to occur in the development site.
Petaurus norfolcensis	Squirrel Glider	N/A	High	V	Not Listed	Excluded Habitat present is substantially urbanised and degraded such that this species is unlikely to utilise the development site. Habitat in the development site is isolated and

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
						disturbed. Additionally, this species has a strong preference for old growth forests which does not include the development site. Additionally, there are no BioNet records for this species within a 5 km radius of the development site.
Phascolarctos cinereus	Koala (Breeding)	Other Areas identified via survey as important habitat	High	V	V	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. Habitat present is substantially urbanised and degraded such that this species is unlikely to utilise the site for breeding.
Pimelea curviflora var. *curviflora*	Pimelea curviflora var. curviflora	N/A	High	V	V	Excluded The presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the development site.
Pomaderris prunifolia – endangered population	Endangered population in Parramatta, Auburn, Strathfield and Bankstown LGA	N/A	High	E2	V	Excluded The development site is not located within the LGA for this endangered population. Furthermore, the presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the development site.
Pommerhelix duralensis	Dural Woodland Snail	Other Leaf litter and shed bark or within 50m of litter or bare ground Rocky areas Rocks or within 50m of rocks Fallen/standing dead timber including logs Including logs and bark or within 50m of logs or bark	High	E	E	Excluded Habitat present is substantially degraded such that this species is unlikely to utilise the development site. Habitat is isolated and disturbed. There are no BioNet records for this species within a 5 km radius of the development site.

Species	Common Name	Habitat constraints/ Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification if species excluded
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Other Breeding camps	High	V	V	Excluded This is a dual credit species, and only a species credit species when specific habitat constraints are present for breeding. The development site does not contain any breeding sites (i.e. riparian corridors) that are suitable for the species to utilise.
Rhodamnia rubescens	Scrub Turpentine	N/A	High	CE	Not Listed	Excluded The presence of this species was not identified (conspicuous species) and it was determined that the habitat features associated with this species are not present within the development site and the habitat is highly urbanises such that this species is unlikely to occur in the development site.
Syzygium paniculatum	Magenta Lily Pilly	N/A	Moderate	E	V	Excluded The presence of this species was not identified (conspicuous species) and it was determined that the habitat features associated with this species are not present within the development site and the habitat is highly urbanises such that this species is unlikely to occur in the development site.
Tetratheca glandulosa	Tetratheca glandulosa	N/A	High	V	Not Listed	Excluded Habitat features (i.e. sandstone ridgetops) associated with this species are not present on the development site.
Wahlenbergia multicaulis – endangered population	Tadgell's Bluebell in the LGAs of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	Other Land situated in damp, disturbed sites	High	E	Not Listed	Excluded The development site does not occur within the LGA distribution of this species.

CE = Critically Endangered; E = Endangered; E2 = Endangered Population; V = Vulnerable

1.5.3 Targeted surveys

Due to the high level of modification of vegetation within the development site and lack of potential habitat, targeted surveys were not conducted for species credit species.

Justification for the exclusion of species credit species is provided Table 11.

1.5.4 Use of local data

The use of local data is not proposed.

1.5.5 Expert reports

Expert reports have not been used as part of this BDAR.

2. Stage 2: Impact assessment (biodiversity values)

2.1 Avoiding impacts

2.1.1 Locating a project to avoid and minimise impacts on vegetation and habitat

The development has been located in a way which avoids and minimises impacts as outlined in Table 12.

Table 12: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
Locating the project in areas where there are no biodiversity values	The project (i.e. the proposed development footprint) has utilised existing development areas, cleared lands and planted gardens to minimise impacts on areas with the highest biodiversity values.	The project has utilised areas with existing development in the development footprint to reduce impacts to areas of biodiversity values. Native planted canopy species have been retained within the development site where possible and the loss of canopy species will be replaced through revegetation works which includes native planted canopy species.
Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition	The project has been located to limit the impacts to planted native vegetation and reduce the extent of clearing of potential foraging habitat for threatened fauna species (i.e. canopy species).	The project has utilised area of existing buildings or paved areas to reduce the extent of native vegetation removal. Where native vegetation will be removed, landscaping will incorporate additional native canopy species to replace vegetation loss.
Locating the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species	The project has been located to avoid removal of vegetation in high threat categories. The project has been located to minimise the removal of habitat for species in high threat categories.	The development site does not contain any vegetation in high threat categories (EEC or TEC).
Locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	The project has been located to retain canopy species which provides connectivity across the local area.	The project has been located to maintain scattered canopy trees across the centre of the development site and along the perimeter. This will enable continued connectivity across the landscape for mobile fauna species and movement of genetic material.

2.1.2 Designing a project to avoid and minimise impacts on vegetation and habitat

The development has been designed in a way which avoids and minimises impacts as outlined in Table 13.

Table 13: Designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
Reducing the clearing footprint of the project	The project has been designed to reduce the clearing footprint of the project.	The placement of the development site footprint has been strategically designed to avoid complete removal of native planted vegetation within the development site. Clusters of native canopy trees will be retained within the development site where possible. Landscaping plans have incorporated planting with native canopy trees to increase the biodiversity values within the development site.
Locating ancillary facilities in areas where there are no biodiversity values	Ancillary features have been located in areas where there are no biodiversity values.	Ancillary features will be located in built and paved areas to reduce impacts to planted native vegetation. Some removal of planted native vegetation is required for the development footprint; however, these impacts will be kept to a minimum by retaining as much planted native vegetation within the development site as possible and reinstating the loss of canopy species through landscaping following construction works.
Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)	Ancillary features have been located in areas where native vegetation is in the poorest condition.	Ancillary features will be located along the northern section of the development site where native planted vegetation is currently in poor condition (see Arborist report). Some removal of native vegetation is required for the works; however, effort has been to retain a high portion of the native planted vegetation and landscaping works will reinstate the loss of native canopy species.
Locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)	Ancillary features have been located in areas that avoid habitat for species and vegetation in high threat categories.	The majority of the development site contains mixed exotic and planted native vegetation which does not support vegetation in high threat categories (e.g. EEC or CEEC). The development site contains substantial amount of cleared lands which will be utilised for ancillary facilities and will not impact upon any high threat category vegetation.
Providing structures to enable species and genetic material to move across barriers or hostile gaps	The development has been designed to maintain a vegetated corridor enabling movement of species and genetic material.	The project has been designed to retain native planted vegetation within the development site. The development site has been designed so that it does not impact on potential stepping stone

Approach	How addressed	Justification
		corridors. Existing vegetated corridors will be maintained with connectivity in all directions, allowing for the continued movement of species and genetic material across the landscape. Given that no corridors will be impacted, additional structures are not necessary.
Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.	Vegetation in the middle of the development site will be retained. Additional species will be planted to enhance the canopy cover within the development site following construction.	Vegetation to be retained in the development site. Additional species will be planted to enhance the canopy cover within the development site following construction.
Efforts to avoid and minimise impacts through design must be documented and justified	The project has been designed to reduce the clearing footprint of the project.	The placement of the development footprint has been strategically designed to retain native planted vegetation where possible. Effort has been made to reinstate the loss of native canopy species into the new landscape design.

2.1.3 Prescribed biodiversity impacts

The list of potential prescribed biodiversity impacts as per the BAM is provided below:

- Occurrences of karst, caves, crevices and cliffs - none occur within the development site
- Occurrences of rock - no rock outcrops or scattered rocks occur within the development site
- Occurrences of human made structures and non-native vegetation – **Yes, see below**.
- Hydrological processes that sustain and interact with the rivers, streams and wetlands - none occur within the development site.
- Proposed development for a wind farm and use by species as a flyway or migration route - the project does not involve any wind farm development.

The development site contains both human made structures and vegetation (native and non-native). Additional information regarding consideration of human made structures are provided below. Non-native vegetation was identified and assessed for any potential to provide habitat for threatened flora and fauna species, including presence of HBTs.

As the development site is located in a heavily urbanised area, almost the entire development site contains human made structures. Consideration was given during the literature review to buildings or structures that could potentially be utilised as a roosting resource by microbats. Visual surveys were conducted during the field survey to visually determine if the buildings within the development site contain potential openings, possibly utilised by microbats.

Potential threatened microbats surveyed include:

- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)

- *Miniopterus australis* (Little Bentwing-bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat).

Existing buildings within the development site did not contain any visible small gaps which may contain potential roost sites for microbats. Additionally, most of the buildings are multi-storey with a corrugated iron flat roof which are not particularly suitable for microbats. However, the presence of roof-roosting microbats within the development footprint cannot be completely disregarded.

Non-native vegetation within the development site did not contain potential habitat for roosting or foraging habitat for microbats. However, the development site contains a small number of exotic palms and *Harpephyllum caffrum* (Kaffar Plum) and nectar producing species which may be utilised on occasion by one threatened fauna species, *Pteropus* poliocephalus (Grey-headed Flying Fox).

The development site has the prescribed biodiversity impacts as outlined in Table 14.

Table 14: Prescribed biodiversity impacts

Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities effected
Impacts of development on the habitat of threatened species or ecological communities associated with: • **karst, caves, crevices, cliffs and other geological features of significance, or** • **rocks, or** • **human made structures, or** • **non-native vegetation**	The development site contains a number of existing buildings and a small amount of exotic vegetation. The buildings were inspected during field surveys and do not provide potential microbat roosts. The vegetation within the development site contains fruit bearing and nectar producing non-native vegetation canopy, in landscaped areas which will be removed as part of the project. The project will result in a reduction in the extent of foraging habitat and reduction in availability of their prey items. Roosting habitat for microbats in not native vegetation is considered to be negligible.	Potential roosting habitat for threatened microbat *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail Bat), (Eastern False Pipistrelle), *Miniopterus australis* (Little Bentwing-bat) and *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat). Potential foraging habitat for other threatened microbat species above non-native vegetation canopy. Potential foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying Fox).
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	The proposed development will require the removal of non-native vegetation from within the development site. The development will result in a minor reduction in the extent of existing non-native vegetation within the development site which provides stepping stone habitat between urban fragmented patches of vegetation	Reduction in extent of potential foraging habitat for Grey-headed Flying Fox. Reduction in extent of foraging habitat for other threatened microbats.
Impacts of development on movement of threatened species that maintains their lifecycle	The proposed development will result in reduction of vegetation within the development site and marginal loss of connectivity for mobile threatened species.	Grey-headed Flying Fox and microbat species.

2.1.3.1 Locating a project to avoid and minimise prescribed biodiversity impacts

The development has been located in a way which avoids and minimises prescribed biodiversity impacts as outlined in Table 15.

Table 15: Locating a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed	Justification
Locating the envelope of surface works to avoid direct impacts on habitat features	Habitat features including HBTs, foraging habitat for GHFF and threatened microbats within the development site will be removed.	The development has avoided complete removal of vegetation by designing the new development to retain as much vegetation within the development site as possible. Some areas of non-native vegetation, two HBTs and all existing buildings will be removed over a two staged process.
Locating the envelope of sub-surface works, both in the horizontal and vertical plane, to avoid and minimise operations beneath the habitat features, e.g. locating long wall panels away from geographical features of significance or water dependent plant communities and their supporting aquifers.	The development will involve minor excavation works. However, the works will not impact upon water dependent plant communities or their supporting aquifers.	There are no geographic features of significance of water dependent plant communities recorded within or adjacent to the development site.
Locating the project to avoid severing or interfering with corridors connecting different areas of habitat, migratory flight paths to important habitat or preferred local movement pathways	The vegetation with the development site has been planted and located within a highly urbanised and fragmented environment. Some of the vegetation within the development site will be retained so the stepping stone corridors may be retained across the development site.	Although the development will result in the removal of some native and exotic vegetation within the development site, the connectivity will be retained through vegetation along the perimeter and scattered throughout the development site.
Optimising project layout to minimise interactions with threatened and protected species and ecological communities, e.g. designing turbine layout to allow buffers around features that attract and support aerial species, such as forest edges, riparian corridors and wetlands, ridgetops and gullies	The planning proposal has been located in an area which avoids impacts to areas of high biodiversity value in the locality.	The development site does not contain areas of high biodiversity values. The project layout has utilised existing buildings and paved areas where possible for the development footprint. Some removal of native and exotic vegetation is required; however, these are limited to low biodiversity values vegetation.

2.1.3.2 Designing a project to avoid and minimise prescribed biodiversity impacts

The development has been designed in a way which avoids and minimises prescribed biodiversity impacts as outlined in Table 16.

Table 16: Designing a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed	Justification
Engineering solutions, e.g. proven techniques to minimise fracturing of bedrock underlying features of geological significance, water dependent communities and their supporting aquifers; proven engineering solutions to restore connectivity and favoured movement pathways	The development design has utilised the existing cleared, urban and disturbed areas and the works will not involve deep excavations into the bedrock.	The development design has utilised the zoning which allows multi-storey buildings and therefore reduces the need to conduct deep excavation works. There are no known ground water or water dependent communities within the development site.
Design of project elements to minimise interactions with threatened and protected species and ecological communities, e.g. designing turbines to dissuade perching and minimise the diameter of the rotor swept area, Designing fencing to prevent animal entry to transport corridors	The development design has utilised areas with minimal impacts to biodiversity values.	The development design has utilised existing disturbed areas to minimise interactions with threatened species habitat.
Design of the project to maintain environmental processes critical to the formation and persistence of habitat features not associated with native vegetation	The formation of habitat features such as canopy species has been retained within the development site.	Potential foraging habitat for Grey-headed Flying Fox will be retained within the development site. Additional resources will be planted following landscaping works.
Design of the project to maintain hydrological processes that sustain threatened species and TECs	There are no threatened species or TECs which are depend upon hydrological processes recorded within the development site.	There are no threatened species or TECs which are dependent upon hydrological processes identified within the subject site or development site.
Design of the project to avoid and minimise downstream impacts on rivers, wetlands and estuaries by control of the quality of water released from the site.	There are no waterbodies recorded within the development site or in adjoining lands.	There are no waterbodies recorded within the development site or in adjoining lands.

2.2 Assessment of Impacts

2.2.1 Direct impacts

The direct impacts of the development are provided below:

- native vegetation - Table 17
- threatened species and threatened species habitat - Table 18
- prescribed biodiversity impacts are outlined in Section 2.2.2

Direct impacts including the final project footprint (construction and operation) are shown on Figure 6.

The direct impacts of the development footprint includes the demolition and construction works and short-term impacts associated with landscaping. Landscaping works includes the removal of groundcover and potential pruning of canopy during construction. Landscaping works will retain the canopy structure.

A separate management zone has been included for 0.12 ha of direct removal of PCT 1281 and 0.04 ha disturbance for landscaping impacts to PCT 1281.

Table 17: Direct impacts to 'native vegetation' as defined under the BAM

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Total clearing (ha)
1281	*Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion*	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	0.16*

* IMPACTED PCT 1281 INCLUDES 0.12 HA FOR DIRECT REMOVAL AND 0.04 HA FOR LANDSCAPING.

2.2.2 Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 18.

Two management zones were added for PCT 1281 to account for different impacts on the vegetation. This includes removal of PCT 1281 vegetation for construction works and impacts to PCT 1281 during landscaping works. These two management zones were entered into the BAMC as separate zones as some of the characteristics of the landscaping vegetation zone will remain (i.e. the canopy structure). The future integrity score assumes that the canopy will remain in this zone. Therefore ,the species diversity and percent cover will remain, however, the ground cover and midstorey will be reduced (see Table 30 in Appendix B). The combined change to the vegetation integrity score is -17.1.

Table 18: Change in vegetation integrity

Veg Zone	PCT ID	Management zone	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity	Total change in VI score
1	1281	Direct	0.12	18.8	0	-18.8	-17.1
1	1281	Landscaping	0.04	18.8	6.6	-12.1	

2.2.3 Indirect impacts

The indirect impacts of the development are outlined in Table 19.

Table 19: Indirect impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
Sedimentation and contaminated and/or nutrient rich run-off	Construction	Runoff during construction works	Confined to development site with sediment fencing	During heavy rainfall or storm events	During rainfall events	Short-term impacts
Noise, dust or light spill	Construction	Noise and dust created from machinery (no night works proposed therefore no light spill)	Noise and dust likely to carry beyond development site boundary	Daily, during construction works	Sporadic throughout construction period	Short-term impacts
Inadvertent impacts on adjacent habitat or vegetation	Construction	Damage to adjacent habitat or vegetation	Adjacent vegetation	Daily, during construction works	Throughout construction period	Short-term impacts
Transport of weeds and pathogens from the site to adjacent vegetation	Construction	Spread of weed seed or pathogens	Potential for spread into adjacent habitat	Daily, during construction works	Sporadic throughout construction period	Potentially long-term impacts
Vehicle strike	Construction / operation	Potential for native fauna to be struck by working machinery and moving vehicles	Within access road and development site	Daily, during both construction and operational phases.	Throughout life of project	Short-term impacts
Rubbish dumping	Construction / operation	Illegal dumping by local residents/ construction crews	Potential for rubbish to spread via wind into adjacent vegetation	Potential to occur at any time throughout construction or operational phases	Throughout life of project	Short-term impacts
Increase in pest animal populations	Construction / operation	Potential to increase if introduced	In vegetation in the southern portion of the development site	Potential to occur at any time throughout construction or operational phases	Throughout life of project	Short-term impacts
Increased risk of fire	Construction / operation	Potential due to presence of vegetation retained in the south of the development site	In vegetation in the southern portion of the development site	Potential to occur at any time, although, more likely during dry, windy conditions	Throughout life of project	Short-term and long-term impacts

2.2.4 Prescribed biodiversity impacts

An assessment of impacts of the development on prescribed biodiversity impacts is outlined in Table 20 in accordance with Section 9.2.1of the BAM.

Table 20: Direct impacts on prescribed biodiversity impacts

BAM Criteria	Justification
9.2.1.3 The assessment of the impacts of the development on the habitat of threatened species or ecological communities associated with human made structures	
a) identify the human made structures with potential to be habitat for threatened species or ecological communities	The development site is located within a highly urbanised area. The proposed development will involve the removal of a number of existing educational building for redevelopment. A ground inspection of the buildings did not detect potential gaps suitable for microbat access into the roof cavities. No other human made structures with potential habitat for threatened species or ecological communities were identified in the development site.
b) identify the species and ecological communities likely to use the habitat	The following threatened microbat species may utilise buildings as occasional roosting habitat: *Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat) *Miniopterus australis* (Little Bentwing-bat) and *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat). There are BioNet records for these species within a 5 km radius for these species.
c) describe the nature, extent and duration of short and long-term impacts	The impact involves the permanent removal of several multistorey education facilities. This is considered a long-term impact. Construction of new building may result in the production of noise and vibration which is considered a short-term impact. These impacts are likely to be minor considering alternative roost locations which may occur within the development site are likely to be are used by microbats under these circumstances.
d) describe, with reference to relevant literature the importance within the bioregion of the habitat of these species or ecological communities	According to literature documented in Australian Bat (Churchill 2009) the preferred roosting habitat of the following species includes: • Yellow-bellied Sheathtail Bat – this species will utilise tree hollows or buildings in small groups. There is potential that this species may utilise the buildings and tree hollows recorded within the development site. • Little Bentwing-bat – this species forms specific maternity roosts in caves. They occasionally utilise buildings in the absence of other alternative roost locations (such as mines, culverts). There is potential that this species may on occasion utilise buildings as an alternative roost location. • Eastern Bentwing-bat – this species primarily roosts in caves, however, it occasionally roosts in human made structures such as buildings. There is potential that this species may on occasion utilise buildings as an alternative roost location.

BAM Criteria	Justification
e) predict the consequences of the impacts for the local and bioregional persistence of the suite of threatened species and communities likely to use these areas as habitat, with reference to relevant literature and other published sources of information.	While these species of microbats have been known to utilise human structures for roosting, preferred roosting habitat for these species are non-human made structures (tree hollows or caves). Additionally, only one of the species is likely to utilise buildings more regularly including breeding times, this species is the Yellow-bellied Sheathtail Bat. The other species of microbats may utilise the buildings on occasion while traversing through the landscape or if other alternative roosting resources are not present. It should be noted that the development site provides marginal foraging and alternative roosting habitat in the form of buildings for a number of microbat species. The development site does not contain important habitat for these species. There is potential that the removal of the buildings may impact upon the number of available roosting resources (if the buildings actually contain suitable gaps in the roof cavity) for microbats migrating to breeding or non-breeding habitats such as the two Bentwing species. There is no available literature which has considered the impacts of removal of human made structures on microbat species. The Priority Action Statement for the Yellow-bellied Sheathtail-bat lists several recommended actions for help in the recovery of this species, those pertaining to retention of roosting habitat focus on the retention of large hollow-bearing trees and retention of vegetated areas. The Priority Action Statement for the Little Bentwing Bat and Eastern Bentwing Bat include further investigation of the wintering roosts for these species which includes tree hollows and undertaking restoration activities to create habitat and connectivity in the landscape. There is no mention of the use of buildings for Bentwing Bat species. The habitat within the development site is unlikely to be important for any of these microbat species.
9.2.1.4 The assessment of the impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation	
a) identify the species and ecological communities likely to use the habitat	Several non-native tree species are present in the development site which have been planted within residential gardens or are invasive weeds. Non-native species which have been identified as potential foraging species for Grey-headed Flying fox include Kaffir Plum and Palm species.
(b) describe the nature, extent and duration of short and long-term impact	The proposed development will result in the permanent removal of a small number of non-native trees (listed above) which provide potential foraging habitat for Grey-headed Flying-fox.
(c) describe, with reference to relevant literature and other reliable published sources of information, the importance within the bioregion of the habitat to these species or ecological communities	These non-native foraging species are in relatively low abundance within the development site and most species would provide only small amounts of secondary foraging habitat. Flowering resources in the form of native planted *Eucalyptus, Melaleuca* and *Callistemon* sp. would more likely be utilised for foraging resources by Grey-headed Flying-fox.
(d) predict the consequences of the impacts for the local and bioregional persistence of the suite of threatened species and communities likely to use	The consequences of the permanent removal of those species listed above for the local and bioregional persistence of the Grey-headed Flying-fox is predicted to be negligible.

BAM Criteria	Justification
these areas as habitat, with reference to relevant literature and other published sources of information.	
9.2.1.5 The assessment of the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range must:	
(a) identify the area/s of connectivity joining different areas of habitat that intersect with the subject land and the areas of habitat that are connected according to Paragraph 4.2.1.3	The development site includes predominately disturbed and non-native species. The vegetation within the development site is relatively small and disconnected from areas of high biodiversity value. Connectivity across the subject lands is limited to scattered street plantings. Due to the presence of major roads and urbanised landscape only highly mobile species are likely to utilise the vegetation within the development site.
(b) identify the species and ecological communities likely to benefit from the connectivity	The species most likely to utilise the connectivity would be Grey-headed Flying-fox, microbat species, and Little Lorikeet.
(c) describe the nature, extent and duration of short and long-term impacts	The proposed development will result in the permanent removal of 0.16 ha of native and 0.010 ha of exotic vegetation which forms a stepping stone corridor for highly mobile species. As some vegetation will be retained, some connectivity will be retained within the development site and in the adjacent broader locality.
(d) describe, with reference to relevant literature and other reliable published sources of information, the importance of the area of connectivity within the bioregion	The connectivity is considered limited except for highly mobile species which easily move across disturbed landscapes. The connecting habitat provides potential foraging habitat for the above listed species, which is part of a fragmented network of urban vegetation within the eastern suburbs. Within the Sydney Basin Bioregion, the removal of 0.16 ha native planted and 0.010 ha of exotic vegetation is considered to provide negligible connectivity on a landscape scale. The removal of connecting habitat would not prevent the highly mobile Grey-headed Flying-fox, Little Lorikeet or microbats from moving across the landscape in search of foraging resources. The removal of a small amount of connecting habitat from the development site is unlikely to be of importance to any threatened species within the bioregion considering the availability of connectivity retained within the subject site and immediately adjacent to the subject site.
(e) predict the consequences of the impacts for the bioregional persistence of the suite of threatened species and communities currently benefitting from the connectivity with reference to relevant literature and other published sources of information and taking into consideration mobility, abundance, range and other relevant life history factors.	The habitat to be removed forms part of a network or stepping stone habitat in the form of canopy and ground layer garden plantings. Only highly mobile species are likely to utilise the stepping stone vegetation from the development site. Under the proposal, canopy species will be retained within the development site to provide additional connectivity. The proposed development will not result in a loss of connectivity for the highly mobile species likely to utilise it.

2.2.5 Mitigating and managing impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 22.

Table 21: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Moderate	Minor	Pre-clearance survey of trees to be removed and identification/location of habitat trees by a suitably qualified ecologist. Trees identified for retention should be clearly delineated as a 'No Go' zone with high visibility bunting. Any tree removal is to be undertaken by a suitably qualified and insured arborist.	Any fauna utilising habitat within the development site will be identified and managed to ensure clearing works minimise the likelihood of injuring resident fauna	During clearing works	Project Manager / Ecologist
Protection or displacement of resident fauna	Minor	Negligible	Supervision by a qualified ecologist / licensed wildlife handler during habitat tree removal (i.e. trees which contains hollows or nests) in accordance with best practice methods.	Relocation of fauna in a sensitive manner	Prior to and during clearing works	Project Manager /ecologist
Installing artificial habitats for fauna in adjacent retained vegetation and habitat or human made structures to replace the habitat resources lost and encourage animals to move from the impacted site, e.g. nest boxes	Minor	Negligible	Any trees removed that have hollows/hollow trunks/fissures should be used as replacement hollows and attached to trees within the within the development site/subject site. If it is impractical to use salvaged hollows as replacement tree hollows, compensatory nest boxes should be installed within vegetation to be retained. Nest boxes should be installed at a ratio of 1 nest box per hollow removed. There are two tree hollows (shown in Figure 5). Recommended installation of two nest boxes with entrance diameter of approximately 10 cm.	Replacement of habitat features removed.	Prior to and during clearing works	Project Manager/ Ecologist
Programming construction activities to avoid impacts; for example, timing construction activities for when migratory species are absent	Minor	Negligible	Where possible the removal of hollow-bearing trees (shown in Figure 5) to occur outside of spring breeding season.	impacts to fauna during nesting/nursing avoided	During clearing works	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
from the site, or when particular species known to or likely to use the habitat on the site are not breeding or nesting						
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance	Moderate	Minor	Install tree protection fencing around trees proposed for retention.	Trees to be retained not disturbed/impacted	Tree protection fencing to be set up prior to any works occurring on site and to remain throughout duration of construction works	Project Manager
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	Construction staff to be briefed prior to work commencing to be made aware of sensitive biodiversity values present and environmental procedures such as: • Importance of retained vegetation areas and 'No Go' zones • Site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and noxious weeds) • What to do in case of environmental emergency (chemical spills, fire, injured fauna) • Key contacts in case of environmental emergency	All staff entering the Development Site are fully aware of all the ecological values present within the Lot and environmental aspects relating to the development and know what to do in case of any environmental emergencies	To occur for all staff entering/working at the development site. Site briefings should be updated based on phase of the work and when environmental issues become apparent.	Project Manager
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Minor	Negligible	Sediment control works to be done in accordance with Sediment, Erosion and Dust Control plans (prepared by Bonacci). Soil and erosion measures such as sediment fencing, clean water diversion must be in place prior the commencement of the construction work.	Erosion and sedimentation will be controlled	For the duration of construction works	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Minor	Negligible	Considering the highly urbanised nature of the development site, the project is unlikely to result in impacts on wildlife resulting from noise. Daily timing of construction activities is recommended in accordance with Table 1 of Interim Noise Guidelines (2009)	Noise impacts associated with the development will be managed in accordance with guidelines	For the duration of construction works	Project Manager
Adaptive dust monitoring programs to control air quality	Minor	Negligible	Dust suppression measures to be done in accordance with Sediment, Erosion and Dust Control plans (prepared by Bonacci) and implemented during construction works to limit dust on site.	Mitigate dust created during construction activities	For the duration of construction works	Project Manager
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Minor	Priority weeds present within the development site listed under the NSW *Biosecurity Act 2015* for the Greater Sydney Region will be removed. Priority weeds located within the development site includes *Asparagus aethiopicus* and *Celtis sinensis.*	Prevent spread of weeds or pathogens	For the duration of construction works	Project Manager
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Minor	Vehicles, machinery and building refuse should remain only within the development site and not impinge on the areas of retained native planted vegetation to be retained in the development site.	Spread of weeds prevented	Post-construction	Project Manager
Use of indigenous species from locally occurring plant community for landscape plantings in the development site	Minor	Negligible	No remnant native vegetation is present within the site. Native vegetation present consists of street trees and garden plantings and is in general not representative of an indigenous PCT. It is recommended that landscape plantings be undertaken as part of the development in accordance with City of Sydney DCP (Clause 3.5) increasing the presence of locally indigenous species.	Areas within the development site will be landscaped using appropriate species	Throughout construction and following completion of construction activities	Project Manager
Development control measures to regulate activity in vegetation and habitat adjacent to residential development including controls on rubbish disposal, wood collection,	Minor	Negligible	Strategy to be developed and implemented as part of the residential development may include: • Signage to indicate areas not to be disturbed i.e. No Go zones • Rubbish disposal guidance • Prohibition of wood collection (if appropriate)	Strategy to protect vegetation and habitat adjacent to development	To be developed to provide awareness to residents of housing development.	Client

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
fire management and disturbance to nests and other niche habitats			• Prohibition of bush rock removal (if appropriate) • Controls on pet ownership such as prohibitions on allowing pets to roam beyond fenced areas			
Making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site	Minor	Negligible	Where possible, landscaping in the development site should consider the use of locality derived native species and those found within the PCT historically represented in the development site. Suggested canopy species include *Eucalyptus saligna, Syncarpia glomulifera, E. punctata* and *E. paniculata* and shrubs such as *Pittosporum undulatum, Polyscias sambucifolia, Acacia falcata, Allocasuarina torulosa, Elaeocarpus reticulatus, Exocarpos cupressiformis* and *Melaleuca decora*.	Areas within the development site will be landscaped using appropriate species	Throughout construction and following completion of construction activities.	Project Manager

2.2.6 Serious and Irreversible Impacts (SAII)

The vegetation within the development site (PCT 1281) is not part of the Sydney Turpentine Ironbark Forest TEC and therefore, is not considered a candidate for Serious and Irreversible Impacts (SAII).

Additionally, *Eucalyptus scoparia* is listed as candidate species for SAII. There are no naturally occurring populations for this species within the locality of the development site. This species has been established through cultivation of unknown genetic material. This specimen is not considered important to the overall population of this species. Planted individuals are not considered to hold conservation value and therefore, a detailed SAII assessment has not been conducted for this planted species.

As the development footprint does not impact upon SAII consideration of SAII is not required for this report.

2.3 Risk assessment

A risk assessment has been undertaken for any residual impacts likely to remain after the mitigation measures (Section Table 21) have been applied. Likelihood criteria, consequence criteria and the risk matrix are provided in Table 22, Table 23 and Table 24 respectively.

Table 22: Likelihood criteria

Likelihood criteria	Description
Almost certain **(Common)**	Will occur, or is of a continuous nature, or the likelihood is unknown. There is likely to be an event at least once a year or greater (up to ten times per year). It often occurs in similar environments. The event is expected to occur in most circumstances.
Likely **(Has occurred in recent history)**	There is likely to be an event on average every one to five years. Likely to have been a similar incident occurring in similar environments. The event will probably occur in most circumstances.
Possible **(Could happen, has occurred in the past, but not common)**	The event could occur. There is likely to be an event on average every five to twenty years.
Unlikely **(Not likely or uncommon)**	The event could occur but is not expected. A rare occurrence (once per one hundred years).
Remote **(Rare or practically impossible)**	The event may occur only in exceptional circumstances. Very rare occurrence (once per one thousand years). Unlikely that it has occurred elsewhere; and, if it has occurred, it is regarded as unique.

Table 23: Consequence criteria

Consequence category	Description
Critical **(Severe, widespread long-term effect)**	Destruction of sensitive environmental features. Severe impact on ecosystem. Impacts are irreversible and/or widespread. Regulatory and high-level government intervention/action. Community outrage expected. Prosecution likely.
Major	Long-term impact of regional significance on sensitive environmental features (e.g. wetlands). Likely to result in regulatory intervention/action. Environmental harm either temporary or permanent, requiring immediate attention. Community outrage possible. Prosecution possible.

Consequence category	Description
(Wider spread, moderate to long term effect)	
Moderate **(Localised, short-term to moderate effect)**	Short term impact on sensitive environmental features. Triggers regulatory investigation. Significant changes that may be rehabilitated with difficulty. Repeated public concern.
Minor **(Localised short-term effect)**	Impact on fauna, flora and/or habitat but no negative effects on ecosystem. Easily rehabilitated. Requires immediate regulator notification.
Negligible **(Minimal impact or no lasting effect)**	Negligible impact on fauna/flora, habitat, aquatic ecosystem or water resources. Impacts are local, temporary and reversible. Incident reporting according to routine protocols.

Table 24: Risk matrix

Consequence	Likelihood				
	Almost certain	Likely	Possible	Unlikely	Remote
Critical	Very High	Very High	High	High	Medium
Major	Very High	High	High	Medium	Medium
Moderate	High	Medium	Medium	Medium	Low
Minor	Medium	Medium	Low	Low	Very Low
Negligible	Medium	Low	Low	Very Low	Very Low

Table 25: Risk assessment

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
Vegetation clearing	Construction / operation	Medium	Low
Sedimentation and contaminated and/or nutrient rich run-off	Construction	Medium	Low
Noise, dust or light spill	Construction	Low	Very Low
Inadvertent impacts on adjacent habitat or vegetation	Construction	Medium	Low
Transport of weeds and pathogens from the site to adjacent vegetation	Construction	Medium	Low
Vehicle strike	Construction / operation	Low	Very Low
Rubbish dumping	Construction / operation	Low	Very Low

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
Increase in predatory species populations	Construction / operation	Low	Very Low
Increase in pest animal populations	Construction / operation	Low	Very low
Increased risk of fire	Construction /operation	Medium	Low
Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	Construction / operation	Medium	Low
Sedimentation and contaminated and/or nutrient rich run-off	Construction	Low	Very Low

2.4 Adaptive management strategy

This section is required for those impacts that are infrequent, cumulative or difficult to predict. Impacts associated with the proposed development have been considered and addressed in Section 2.5 and no further impacts are required to be addressed. For major projects: details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain.

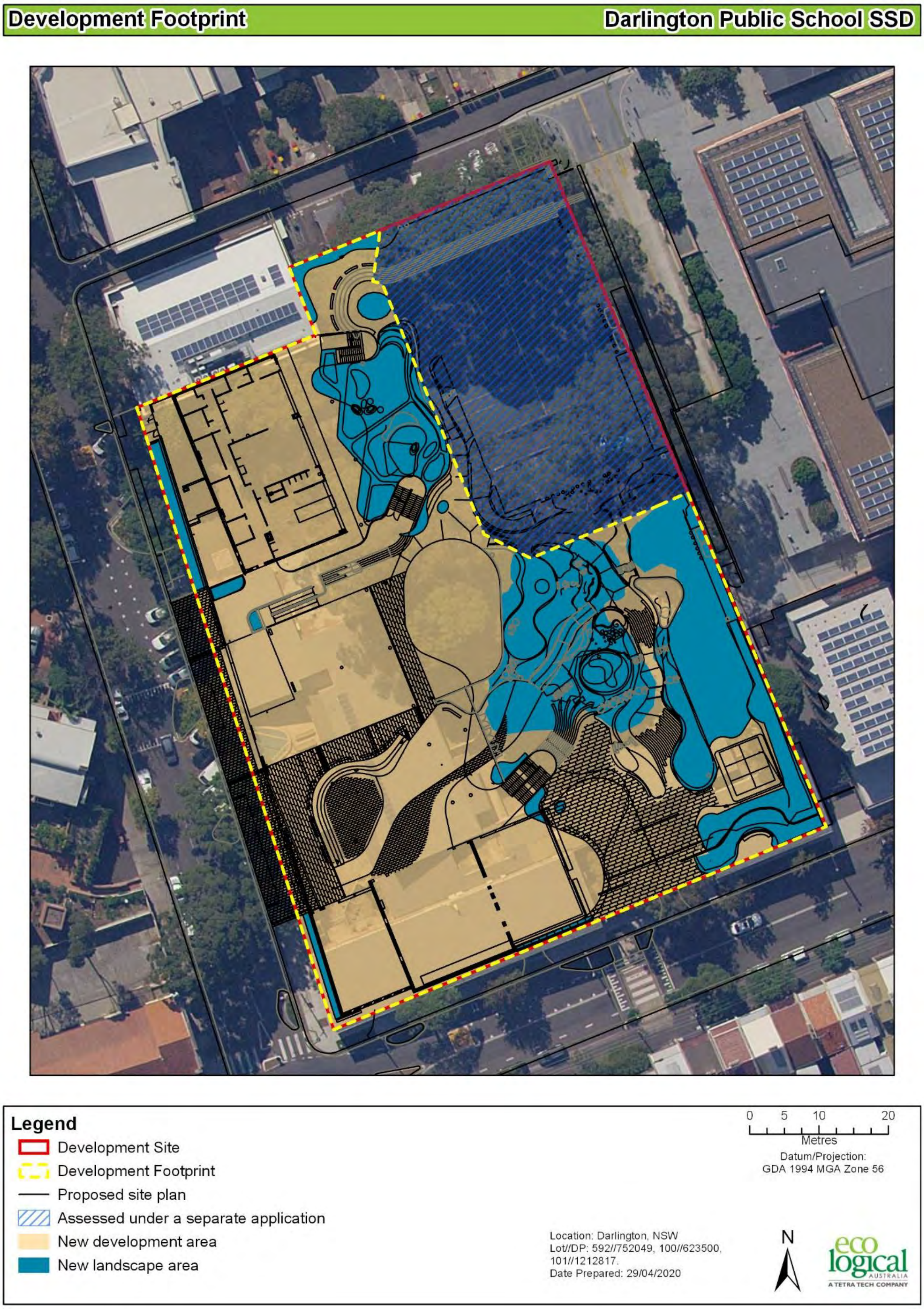

Figure 6: Final project footprint including construction and operation

2.5 Impact summary

Following implementation of the BAM and the BAMC, the following impacts have been determined.

2.5.1 Serious and Irreversible Impacts (SAII)

As discussed in Section 2.2.6, no candidate entities for SAII are present in the development site or are likely to be impacted by the development. Therefore, it is unlikely that the development would result in a SAII.

2.5.2 Impacts requiring offsets

The impacts of the development requiring offsets for native vegetation are outlined in Table 26 and shown in Figure 7.

Table 26: Impacts to native vegetation requiring offsets

Veg zone	PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
1	1281 planted (non TEC)	Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	Northern Hinterland Wet Sclerophyll Forests	Wet Sclerophyll Forests (Grassy sub-formation)	0.16

2.5.3 Impacts not requiring offsets

All native vegetation within the development site which will be removed requires offsets.

2.5.4 Areas not requiring assessment

Areas not requiring assessment include existing buildings, paved playing areas, paths and exotic vegetation. The development site contained exotic vegetation (0.010 ha) which was classified as shown in Figure 4. These areas were not consistent with any listed PCT, nor did they contain any threatened species, hence further assessment under the BAM was not required. Areas not requiring assessment are shown on Figure 8.

2.5.5 Credit summary

The number of ecosystem credits required for the development are outlined in Table 27. A total of (two) ecosystem credits are required for impacts to PCT 1281_planted. The like-for-like options and trading group is provided in Table 27. No candidate species credit species or likely habitat was recorded within the development site; hence no species credits are required to offset the development. The biodiversity credit report is included in Appendix C.

Table 27: Ecosystem credits required

PCT ID	PCT Name	Credit class	Trading group	Total impacts (ha)	Credits required
1281	Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	Northern Hinterland Wet Sclerophyll Forests this includes PCTs 1281, 1845	Northern Hinterland Wet Sclerophyll Forests > 90% cleared group	0.16	2

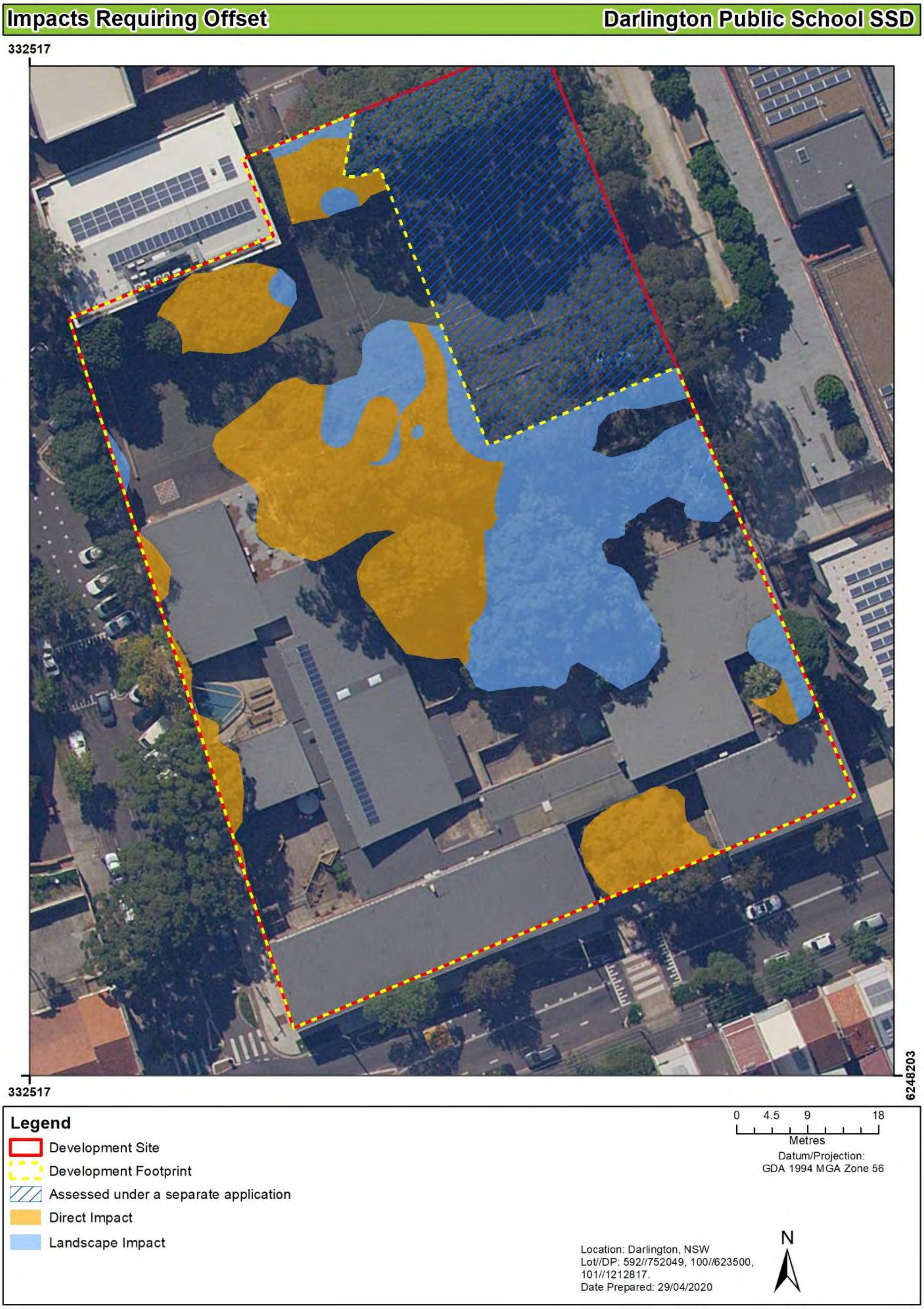

Figure 7 Impacts requiring offset

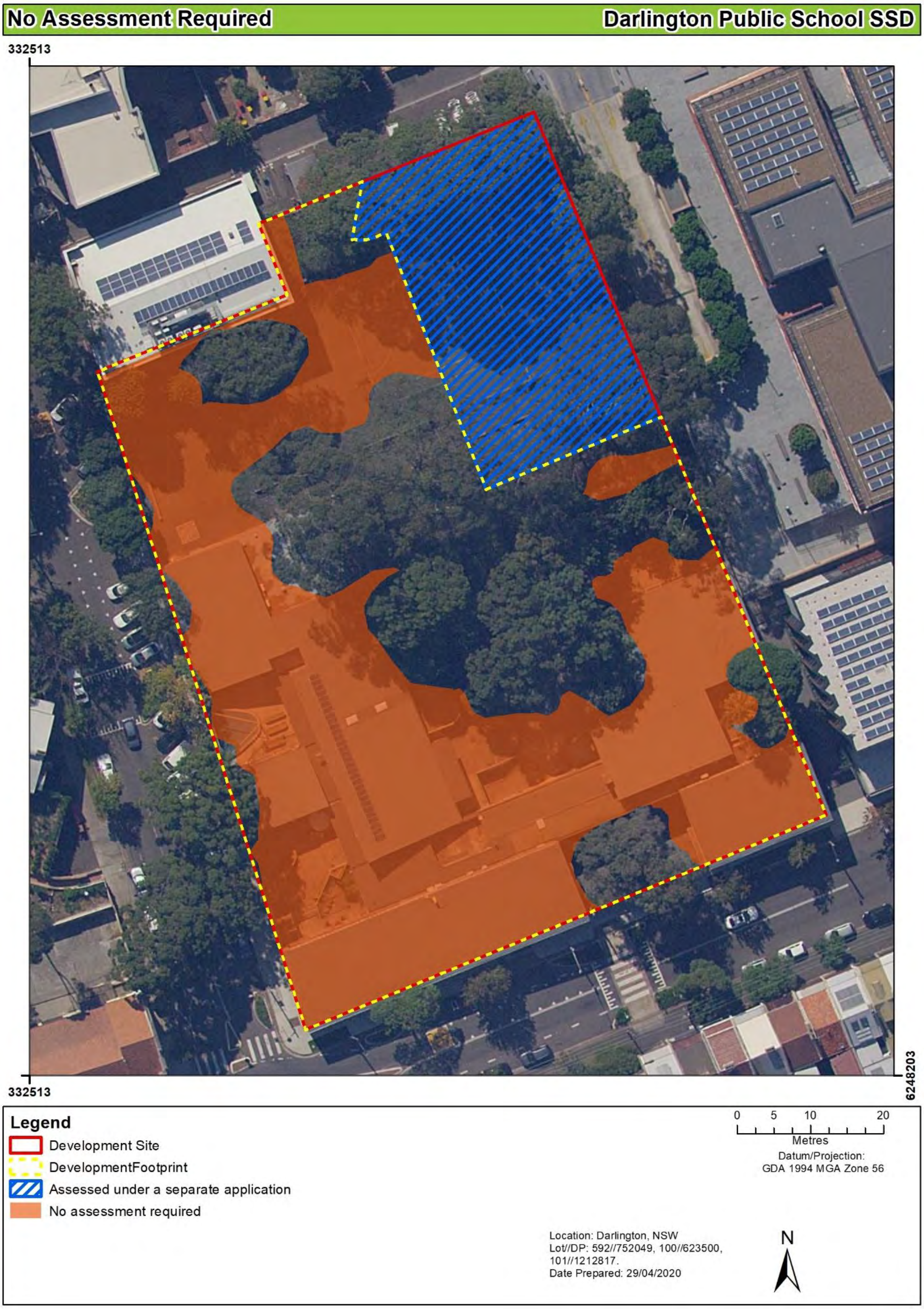

Figure 8 Areas not requiring assessment

2.6 Consistency with legislation and policy

Additional matters relating to impacts on flora and fauna which are not covered by the BC Act must also be addressed for the proposed development. Potential "Matters of National Environmental Significance" (MNES) in accordance with the EPBC Act have been addressed in Section 2.6.1. Matters relating to City of Sydney Council planning instruments have been addressed in Section 2.6.3.

2.6.1 *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where "Matters of National Environmental Significance‟ (MNES) may be affected. Under the Act, any action which "has, will have, or is likely to have a significant impact on a matter of MNES" is defined as a "controlled action", and requires approval from the Commonwealth Agriculture, Water and the Environment (DAW&E), which is responsible for administering the EPBC Act.

A habitat assessment and Likelihood of Occurrence was completed and one MNES *Pteropus poliocephalus* (Grey-headed Flying-fox) was assessed under the act as there are 1161 BioNet records for this species within the broader landscape (5 km radius) of the development site.

Additionally, two planted threatened species were also recorded within the development site and require assessment under the EPBC Act, *Eucalyptus nicholii* and *E. scoparia*.

The following assessments have been prepared in accordance with the EPBC Act Matters of National Environmental Significance: Significant Impact Guidelines 1.1. These guidelines have been established to assist proponents to determine whether a proposed action is likely to result in a significant impact on a matter of national environmental significance.

2.6.1.1 Pteropus poliocephalus (Grey-headed Flying-fox)

The Grey-headed Flying-fox is listed as a vulnerable species under the EPBC Act. This species utilises a wide variety of habitats (including disturbed areas) for foraging and have been recorded travelling long distances on feeding forays. Fruits and flowering plants of a wide variety of species are the main food source. The species roosts in large 'camps' of up to 200 000 individuals. Camps are usually formed close to water and along gullies, however, the species has been known to form camps in urban areas (DECCW 2009).

The Centennial Park Grey-headed Flying-fox (GHFF) camp is known from the locality to be within 5 km of the development site (DAW&E 2020b). The vegetation within the development site provides potential foraging habitat. It is considered likely that this species would use the site on occasion for foraging purposes. According to the National Flying-fox Monitoring Program, no GHFF camps currently occur or have been recorded within the development site (DAW&E 2020b). The distribution and habitat associations for this threatened species are presented in Appendix D.

Table 28: EPBC Act of Significance for *Pteropus poliocephalus* (Grey-headed Flying-fox)

Criterion	Assessment
Criterion a: lead to a long-term decrease in the size of an important population of a species	The Matters of National Environmental Significance Impact Guidelines 1.1 (Commonwealth of Australia, 2013) defines an important population as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

Criterion	Assessment
	• Key source populations either for breeding or dispersal • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range No important populations have been recorded within the development site, however, the development site provided potential foraging resource for an important population. The site does not support key source populations for breeding or dispersal, populations necessary for maintaining genetic diversity, or populations near the limit of the species range. According to the National Flying-fox Monitoring Program, no Grey-headed Flying Fox camps currently occur or have ever been recorded within the development site (DoEE 2019). The nearest active GHFF camp occurs approximately 5 km to the south-east of the development site, within Centennial Park (DAW&E 2020b).
Criterion b: reduce the area of occupancy of an important population	No important populations have been recorded within the development site, however, the vegetation within the development site may contain potential foraging resources for an important population. As the extent of vegetation removal is only minor and foraging resources will be retained in the development site, therefore, the proposed works would not reduce the area of occupancy of an important population.
Criterion c: fragment an existing important population into two or more populations	No important populations have been recorded within the development site. The potential foraging habitat to be removed is marginal relative to adjacent potential habitat within the region. Whilst the potential foraging habitat may contribute as a ‘stepping stone’ for this highly mobile species to other more substantial foraging habitat sites, this function is unlikely to be significantly inhibited by the proposed works. Furthermore, this species has been recorded in urban environments and is likely to continue to forage adjacent to the development site and across the broader locality.
Criterion d: adversely affect habitat critical to the survival of a species	Approximately half of the potential foraging habitat in canopy trees within the development site will be removed by the proposal. These individual trees represent a negligible amount of potential foraging resources in the locality. Potential foraging habitat in the form of street trees will persist in close proximity to the development site. Given that this species is highly mobile (traveling up to 50 km to forage), it is considered unlikely that the works would adversely affect habitat critical to the survival of this species
e: disrupt the breeding cycle of an important population	According to the National Flying-fox Monitoring Program, no Grey-headed Flying Fox camps currently occur or have ever been recorded within the development site (DPIE 2020a). The nearest active Grey-headed Flying Fox camp occurs approximately 5 km to the south-east of the development site, within Centennial Park (DAW&E 2020b). Thus, no important population of Grey-headed Flying Fox occurs within the development site, and the proposed works are unlikely to disrupt the breeding cycle of an important population.
Criterion f: Adversely affect habitat critical to the survival of a species; modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The potential foraging habitat to be removed is marginal and of low quality. Given the small amount of potential foraging habitat to be removed, that potential foraging habitat will persist adjacent to the development site and across the locality, and that this species is highly mobile, it is unlikely that the habitat to be removed would cause the species to decline. Furthermore, according to the National Flying-fox Monitoring Program, no Grey-headed Flying Fox camps currently occur or have ever been recorded within the development site (DPIE 2020b). The nearest active Grey-headed Flying Fox camp occurs approximately 5 km to the south-east of the development site, within Centennial Park (DAW&E 2020b). Therefore, no known Grey-headed Flying Fox roosting camps for this species will be impacted by the proposed works.
Criterion g: Result in invasive species that are harmful to a vulnerable species becoming	The proposed works will not result in the establishment of an invasive species that is harmful to Grey-headed Flying Fox.

Criterion	Assessment
established in the vulnerable species' habitat	
Criterion h: Introduce disease that may cause the species to decline	The proposed works will not result in the introduction of a disease that is harmful to the Grey-headed Flying Fox.
Criterion i: Interfere substantially with the recovery of the species	Considering the above factors, the proposed works will not interfere substantially with the recovery of the species.
Conclusion	In consideration of the above, the proposed works are considered unlikely to have a significant impact on the Grey-headed Flying Fox.

2.6.1.2 Eucalyptus nicholii (Narrow-leaved Black Peppermint)

Eucalyptus nicholii (Narrow-leaved Black Peppermint) is listed as vulnerable under the EPBC Act. The distribution and habitat associations for this threatened species are presented in Appendix D. One individual was identified within the development site. Within NSW, the species is known from New England Tablelands, located over 400 km north of the development site. Thus, it is likely that this species has been planted on the development site. The proposed development will remove the individual.

Criterion	Question	Response
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
1)	lead to a long-term decrease in the size of an important population of a species	An important population is defined as a population that is necessary for a species' long-term survival and recovery. The *Eucalyptus nicholii* proposed to be removed was likely planted, and therefore does not form part of an important population. Consequently, it is considered that the proposed development will not lead to a long-term decrease in the size of an important population of the species.
2)	reduce the area of occupancy of an important population	This species typically grows in the far north of NSW. The *Eucalyptus nicholii* proposed to be removed was outside of its natural range and likely planted. Therefore, it is unlikely to form part of an important population. Consequently, it is considered that the proposed development will not reduce the area of occupancy of an important population of the species.
3)	fragment an existing important population into two or more populations	The *Eucalyptus nicholii* proposed to be removed was identified outside of the known habitat for the species in a disturbed site and is therefore does not form part of an important population. Consequently, it is considered that the proposed development will not fragment an existing important population.
4)	adversely affect habitat critical to the survival of a species	The *Eucalyptus nicholii* proposed to be removed was identified outside of the known habitat for the species in a disturbed site and is therefore it is not considered to be important or critical to the survival of the species. Consequently, it is considered that the proposed

Criterion	Question	Response
		development will not adversely affect habitat critical to the survival of the species.
5)	disrupt the breeding cycle of an important population	Not applicable.
6)	modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The *Eucalyptus nicholii* proposed to be removed was identified outside of the known habitat for the species in a disturbed site. It is considered unlikely that the development site will modify, destroy, remove or isolate or decease the availability or quality of habitat to the extent that the species is likely to decline.
7)	result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The study area is currently in a disturbed and modified condition and does not represent known habitat for this threatened species. Consequently, the proposed development is unlikely to result in the establishment of an invasive species that is harmful to the species.
8)	introduce disease that may cause the species to decline, or	It is considered unlikely that the proposed action would introduce disease that may cause the decline of *Eucalyptus nicholii.*
9)	interfere substantially with the recovery of the species.	There is no National Recovery Plan for this species at present. The Approved Conservation Advice under the EPBC Act for this species lists the following threats: seed collectors, inappropriate grazing, fire management, road construction and road reserve management activities. The proposed action does not include nor is likely to exacerbate these threats. Therefore, the proposed removal of the single planted *Eucalyptus nicholii* specimen would not interfere substantially with the recovery of this species.
Conclusion	Is there likely to be a significant impact?	No. The proposed action is unlikely to have a significant impact on the *Eucalyptus nicholii* for the following reasons: • The individual to be removed was planted and does not form part of an important population • The development site is located outside of the known distribution and habitat for this species. • Only one individual of this planted threatened species is proposed for removal.

2.6.1.3 *Eucalyptus scoparia* (Wallangarra White Gum)

Eucalyptus scoparia (Wallangarra White Gum) is listed as vulnerable under the EPBC Act. The distribution and habitat associations for this threatened species are presented in Appendix D. One individual was identified within the development site. Within NSW, the species is known from Tenterfield, located over 600 km north of the development site. Thus, it is likely that this species has been planted on the development site. The proposed development will remove one individual.

Criterion	Question	Response
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		

Criterion	Question	Response
1)	lead to a long-term decrease in the size of an important population of a species	An important population is defined as a population that is necessary for a species' long-term survival and recovery. The *Eucalyptus scoparia* proposed to be removed was likely planted, and therefore does not form part of an important population. Consequently, it is considered that the proposed development will not lead to a long-term decrease in the size of an important population of the species.
2)	reduce the area of occupancy of an important population	This species typically grows in the far north of NSW. The *Eucalyptus scoparia* proposed to be removed was outside of its natural range and likely planted. Therefore, it is unlikely to form part of an important population. Consequently, it is considered that the proposed development will not reduce the area of occupancy of an important population of the species.
3)	fragment an existing important population into two or more populations	The *Eucalyptus scoparia* proposed to be removed was identified outside of the known habitat for the species in a disturbed site and is therefore does not form part of an important population. Consequently, it is considered that the proposed development will not fragment an existing important population.
4)	adversely affect habitat critical to the survival of a species	The *Eucalyptus scoparia* proposed to be removed was identified outside of the known habitat for the species in a disturbed site and is therefore it is not considered to be important or critical to the survival of the species. Consequently, it is considered that the proposed development will not adversely affect habitat critical to the survival of the species.
5)	disrupt the breeding cycle of an important population	Not applicable.
6)	modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The *Eucalyptus scoparia* proposed to be removed was identified outside of the known habitat for the species in a disturbed site. It is considered unlikely that the development site will modify, destroy, remove or isolate or decease the availability or quality of habitat to the extent that the species is likely to decline.
7)	result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The study area is currently in a disturbed and modified condition and does not represent known habitat for this threatened species. Consequently, the proposed development is unlikely to result in the establishment of an invasive species that is harmful to the species.
8)	introduce disease that may cause the species to decline, or	It is considered unlikely that the proposed action would introduce disease that may cause the decline of *Eucalyptus scoparia.*
9)	interfere substantially with the recovery of the species.	There is no National Recovery Plan for this species at present. The Approved Conservation Advice under the EPBC Act for this species lists the following threats: clearing and fragmentation of habitat, timber collection, damage to juvenile plants by bushwalkers, illegal seed collection, and

Criterion	Question	Response
		a limited gene pool. The proposed action does not include nor is likely to exacerbate these threats. Therefore, the proposed removal of the single planted *Eucalyptus scoparia* specimen would not interfere substantially with the recovery of this species.
Conclusion	Is there likely to be a significant impact?	No. The proposed action is unlikely to have a significant impact on the Wallangarra White Gum for the following reasons: • The individual to be removed was planted and does not form part of an important population • The development site is located outside of the known distribution and habitat for this species. • Only one individual of this planted threatened species is proposed for removal.

2.6.2 Sydney Local Environmental Plan 2012 (LEP)

The development site is currently zone SP2 Educational Establishment which allows for proposed the redevelopment with consent approval.

Clause 5.9 Preservation of Trees or vegetation has been repealed under the LEP. There are no additional clauses which relates to this development.

2.6.3 Sydney Development Control Plan 2012 (DCP)

Clause 3.5 Urban Ecology of the DCP objectives are as follows:

- Protect existing habitat features within and adjacent to development sites.
- Improve the diversity and abundance of locally indigenous flora and fauna species across the LGA.

The provisions of the clause are as follows:

- Development is to be consistent with the Street Tree Master Plan, Park Tree Management Plans and the Landscape Code.
- Existing habitat features including cliff lines, rocky outcrops, waterbodies, trees, shrubs and groundcover vegetation are to be retained.
- New habitat features including trees, shrubs and groundcover vegetation, waterbodies, rockeries and green roofs and walls are to be included, wherever possible.
- Link and enhance existing and potential biodiversity corridors wherever possible.
- Landscaping is to comprise a mix of locally indigenous tree, shrub and groundcover species as outlined in City's Landscape Code. Where this is not possible it is preferred that plants native to Australia are used.
- Shrubs are to be densely planted and trees are to be well-spaced, as outlined in the City's Landscape Code.

The proposed development has, as much as possible, aimed to conserve the majority of the native planted vegetation within the development site and minimise unnecessary damage or removal of trees. Landscaping will be conducted in accordance with the above clause and include revegetation using locally indigenous native flora species.

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Appendix A Definitions

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

Terminology	Definition
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines
Operational Manual	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site...
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5 cm within a vegetation zone.
Remaining impact	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	A development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land? It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.

Terminology	Definition
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

Appendix B Vegetation plot data

Table 29: Vegetation integrity data (Composition, Structure and function)

Plot location data							
Plot no.	PCT	Vegetation Zone	Condition	Zone	Eastings	Northings	Bearing
2	1281	1	Planted	56	332597	6248291	235

Composition (number of species)						
Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
2	3	1	3	2	0	0

Structure (Total cover %)						
Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
2	21	0.1	0.7	0.2	0	0

Function											
Plot no.	Large Trees	Hollow trees	Litter Cover	Length Fallen Logs	Tree Stem 5-9	Tree Stem 10-1 9	Tree Stem 20-2 9	Tree Stem 30-49	Tree Stem 50-79	Tree Regen	High Threat Weed Cover
2	1	1	13	0	0	1	0	0	1	0	6.5

Table 30: Change in vegetation integrity scores for each management zone

Veg zone	Management zone	Area ha	Composition	Structure	Function	Vegetation integrity score	Change in score	Total Change in integrity score
1	Direct	0.07	11.6	12.6	45.3	18.8	-18.8	--17.1
2	Landscaping	0.01	5.5	6	8.9	6.6	-12.1	-17.1

Table 31: Species matrix (species recorded by plot)

Stratum	Form	Species name	Exotic (*)	High Threat Weed (*)	Cover (%) Plot 1
U	TG	*Casuarina glauca*			1
U	TG	*Corymbia maculata*			10
G	GG	*Cyperus eragrostis*	*		0.5
G	F	*Dianella caerulea var. caerulea*			0.1

Stratum	Form	Species name	Exotic (*)	High Threat Weed (*)	Cover (%) Plot 1
G	GG	*Eleusine indica*	*	*	0.5
U	TG	*Eucalyptus saligna*			10
M	SG	*Grevillea sp.*			0.1
G	GG	*Lomandra longifolia*			0.1
G	GG	*Lomandra sp.*			0.1
G	GG	*Pennisetum sp.*	*	*	0.5
U	TG	*Pinus radiata*	*	*	1
G	GG	*Poa annua*	*		0.1
G	F	*Sonchus sp.*			0.1
G	GG	*Stenotaphrum secundatum*	*	*	5
G	GG	*Trifolium sp.*	*		0.1

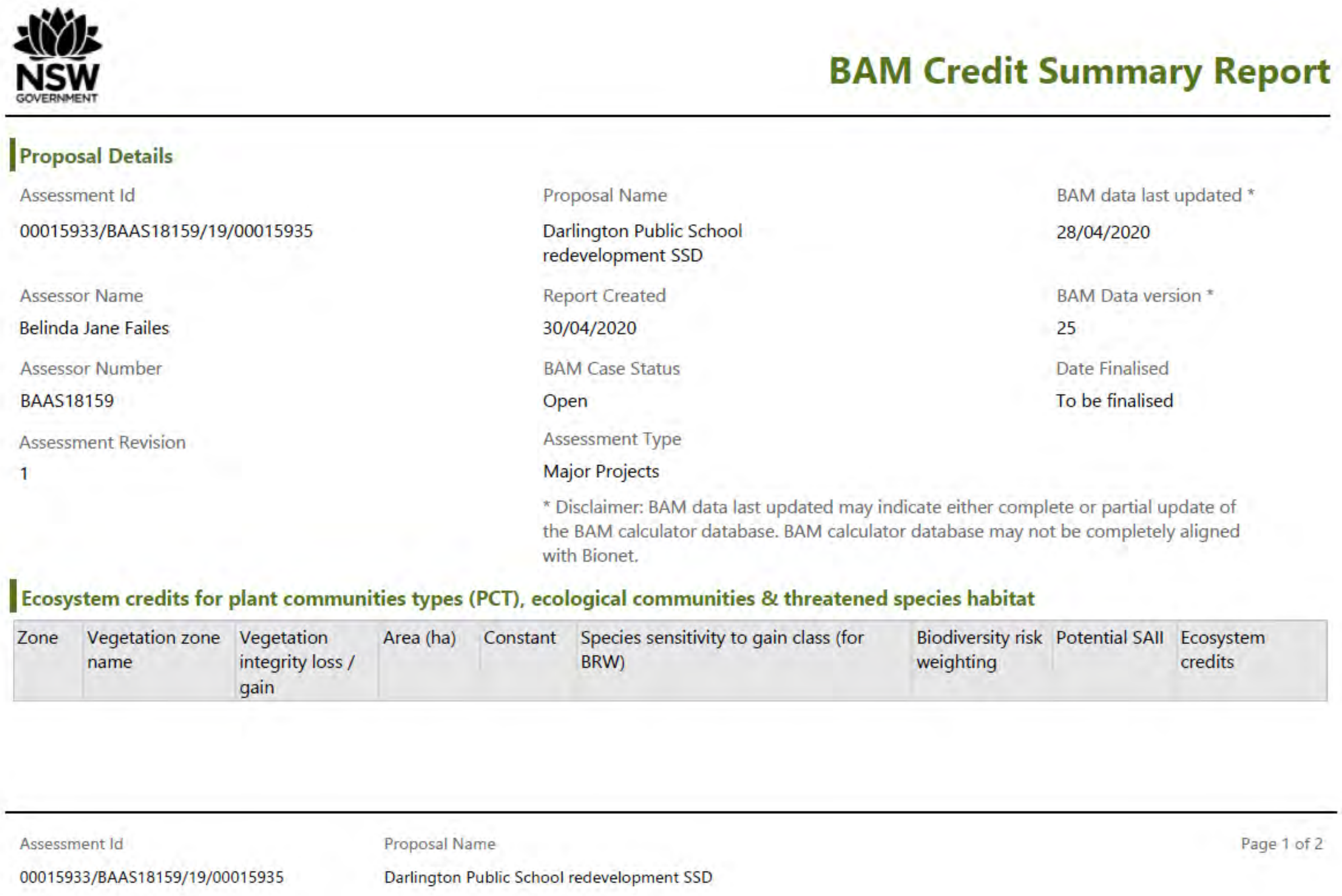
Table 32: Other species recorded

Botanic Name	Common Name	Exotic/ Native*
Agapanthus sp.	Agapanthus	E
Brachychiton acerifolius	Illawarra Flame Tree	N
Callistemon salignus	Willow Bottlebrush	N
Celtis sinensis	Celtis	E
Chlorophytum sp.		E
Doryanthes excelsa	Gymea Lily	N
Elaeocarpus reticulatus	Blueberry Ash	N
Eucalyptus microcorys	Tallowwood	N
Eucalyptus scoparia		N
Grevillea sp.		N
Hymenosporum flavum		E
Liquidambar sp.		E
Melaleuca quinquenervia	Broad-leaf Melaleuca	N
Murraya sp.		E
Nandina domestica		E
Prunus sp.		E
Syzygium sp.		N

Botanic Name	Common Name	Exotic/ Native*
Yucca sp.		E

* ALL NATIVE SPECIES HAVE BEEN PLANTED

Appendix C Biodiversity credit report



NSW GOVERNMENT

BAM Credit Summary Report

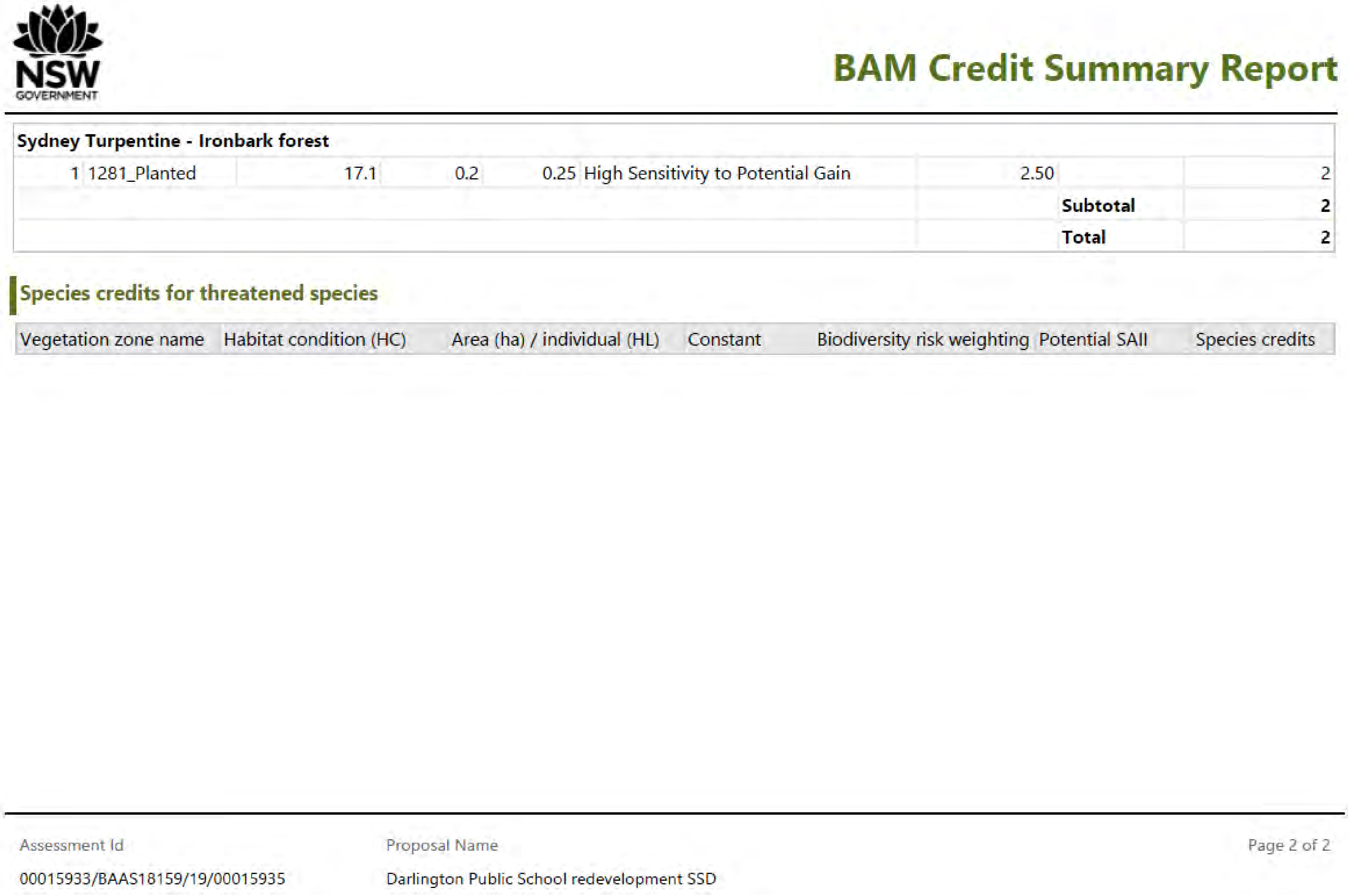
Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00015933/BAAS18159/19/00015935	Darlington Public School redevelopment SSD	28/04/2020
Assessor Name	Report Created	BAM Data version *
Belinda Jane Failes	30/04/2020	25
Assessor Number	BAM Case Status	Date Finalised
BAAS18159	Open	To be finalised
Assessment Revision	Assessment Type	
1	Major Projects	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits



NSW GOVERNMENT

BAM Credit Summary Report

Sydney Turpentine - Ironbark forest

1	1281_Planted	17.1	0.2	0.25	High Sensitivity to Potential Gain	2.50		2
							Subtotal	**2**
							Total	**2**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits

Assessment Id

00015933/BAAS18159/19/00015935

Proposal Name

Darlington Public School redevelopment SSD

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Appendix D EPBC Act Likelihood of Occurrence

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the Protected Matters Search Tool. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the site inspection and professional judgement. Some Migratory or Marine species identified from the Commonwealth database search have been excluded from the assessment, due to lack of habitat. The terms for likelihood of occurrence are defined below:

- ‘known’ = the species was or has been observed on the site
- ‘likely’ = a medium to high probability that a species uses the site
- ‘potential’ = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- ‘unlikely’ = a very low to low probability that a species uses the site
- ‘no’ = habitat within the study area and in the vicinity is unsuitable for the species.

A test of significance was conducted for threatened species or ecological communities that were recorded within the study area or had a higher likelihood of occurring and were not recorded during the site visit. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the study area intermittently for foraging. For these fauna species, the habitat present and likely to be impacted is not considered to be important to the threatened species, particularly in relation to the amount of similar habitat remaining in the surrounding landscape. As such, a test of significance in reference to Commonwealth legislation was not considered necessary.

Information provided in the habitat associations’ column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database and the NSW Threatened Species Data Collection.

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			FAUNA			
Anthochaera phrygia	Regent Honeyeater	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions. Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana* (River Oak).	Potential - occasional seasonal foraging habitat features associated with this species were identified within the development site. The development site is not within an important breeding area for the species.	Yes (minor foraging only)	No – the species is highly mobile and preferable foraging habitat is available within the broader locality.
Apus pacificus	Fork-tailed Swift	M	Recorded in all regions of NSW. Riparian woodland., swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	Unlikely - suitable habitat not identified within the site.	N/A	No
Ardea ibis	Cattle Egret	Mar	Widespread and common across NSW. Grasslands, wooded lands and terrestrial wetlands.	Unlikely - suitable habitat not identified within the site.	N/A	No
Botaurus poiciloptilus	Australasian Bittern	E	Found over most of NSW except for the far north-west. Permanent freshwater wetlands with tall, dense vegetation, particularly *Typha* spp. (bullrushes) and *Eleocharis* spp. (spikerushes).	Unlikely - suitable habitat not identified within the site.	N/A	No
Calidris acuminata	Sharp-tailed Sandpiper	M	Summer migrant. Widespread in most regions of NSW, especially in coastal areas, but sparse in the south-central Western Plain and east Lower Western Regions. Shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Calidris canutus	Red Knot	E	Red Knots are widespread around the Australian coast, less in the south and with few inland records. Small numbers visit Tasmania and off-shore islands. It is widespread but scattered in New Zealand. They breed in North America, Russia, Greenland and Spitsbergen. Red Knots are a non-breeding visitor to most continents.	Unlikely - suitable habitat not identified within the site.	N/A	No
Calidris ferruginea	Curlew Sandpiper	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin. Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Unlikely - suitable habitat not identified within the site.	N/A	No
Calidris tenuirostris	Great Knot	CE	Sheltered coastal habitats containing large intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and inlets, or exposed reefs or rock platforms.	Unlikely - suitable habitat not identified within the site.	N/A	No
Charadrius leschenaultii	Greater Sand Plover	V	Entirely coastal in NSW, foraging on intertidal sand and mudflats in estuaries, roosting during high tide on sandy beaches or rocky shores.	Unlikely - suitable habitat not identified within the site.	N/A	No
Charadrius mongolus	Lesser Sand Plover	E	Favours coastal areas including beaches, mudflats and mangroves where they forage. They may be seen roosting during high tide on sandy beaches or rocky shores.	Unlikely - suitable habitat not identified within the site.	N/A	No
Chalinolobus dwyeri	Large-eared Pied Bat	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes. Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Unlikely - there is no suitable breeding habitat such as caves, overhangs, mines or culverts present for the species to utilise the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Dasyornis brachypterus	Eastern Bristlebird	E	There are three main populations: Northern - southern Qld/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass understorey.	Unlikely - suitable habitat not identified within the site.	N/A	No
Dasyurus maculatus maculatus	Spotted-tailed Quoll	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld. Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Unlikely – suitable habitat, in the form of maternal den sites or large areas of relatively intact vegetation, were not identified within the site.	N/A	No
Diomedea antipodensis	Antipodean Albatross	V	The Antipodean Albatross is marine, pelagic and aerial. It is endemic to New Zealand, however forages on cephalopods, fish and crustaceans in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea, notably off the coast of NSW.	Unlikely - suitable habitat not identified within the site.	N/A	No
Dimedea antipodensis gibsoni	Gibson's Albatross	V	The Gibson's Albatross is marine, pelagic and aerial. It is endemic to New Zealand, however forages on cephalopods, fish and crustaceans in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea, notably off the coast of NSW.	Unlikely - suitable habitat not identified within the site.	N/A	No
Diomedea epomophora	Southern Royal Albatross	V	The Southern Royal Albatross is marine and pelagic. During the non-breeding season it has a wide and possibly circumpolar distribution, ranging north to about 35°S. It is moderately common throughout the year in offshore waters of southern Australia, mostly off southeastern NSW, Victoria and Tasmania. It has been observed where the water surface temperature is 6 to 20°C.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Diomedea exulans	Wandering Albatross	V	The Wandering Albatross is marine, pelagic and aerial. It occurs where water surface temperatures range from -2° to 24°C. In the Australasian region, it occurs inshore, offshore and in pelagic waters.	Unlikely - suitable habitat not identified within the site.	N/A	No
Diomedea sanfordi	Northern Royal Albatross	E	This species breeds on Chatham Island and Taiaroa Head on the South Island of New Zealand. It can be found in open waters off SE Australia.	Unlikely - suitable habitat not identified within the site.	N/A	No
Epinephelus daemelii	Black Rockcod	V	This species is a marine species.	Unlikely - suitable habitat not identified within the site.	N/A	No
Fregetta grallaria grallaria	White-bellied Storm Petrel		The White-bellied Storm-Petrel breeds on small offshore islets and rocks in the Lord Howe Island group, including Roach Island and Balls Pyramid. In the non-breeding season, it reaches and forages over near-shore waters along the continental shelf of mainland Australia.	Unlikely - suitable habitat not identified within the site.	N/A	No
Gallinago hardwickii	Latham's Snipe	M	Migrant to east coast of Australia, extending inland west of the Great Dividing Range in NSW. Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	Unlikely - suitable habitat not identified within the site.	N/A	No
Grantiella picta	Painted Honeyeater	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas. Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Unlikely - suitable habitat not identified within the site.	N/A	No
Heleioporus australiacus	Giant Burrowing Frog	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Hirundapus caudacutus	White-throated Needletail	M	All coastal regions of NSW, inland to the western slopes and inland plains of the Great Divide. Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	Unlikely - suitable habitat not identified within the site.	N/A	No
Hoplocephalus bungaroides	Broad-headed Snake	V	Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney. Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	Unlikely - suitable habitat not identified within the site.	N/A	No
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	Found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River. Heath or open forest with a heathy understorey on sandy or friable soils.	Unlikely - suitable habitat not identified within the site.	N/A	No
Lathamus discolor	Swift Parrot	CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes. Box-ironbark forests and woodlands.	Potential – foraging habitat features associated with this species were identified within the development site.	Yes (minor foraging only)	No – the species is highly mobile and more foraging habitat is available within the broader locality.
Limosa lapponica	Bar-tailed Godwit	M	Summer migrant to Australia. Widespread along the coast of NSW, including the offshore islands. Also numerous scattered inland records. Intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	CE	Mainly coastal, usually sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats. This species has been recorded across coastal Australia during non-breeding seasons.	Unlikely - suitable habitat not identified within the site.	N/A	No
Litoria aurea	Green and Golden Bell Frog	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region. Marshes, dams and stream-sides, particularly those containing *Typha* spp. (bullrushes) or *Eleocharis* spp. (spikerushes). Some populations occur in highly disturbed areas.	Unlikely - suitable habitat not identified within the site.	N/A	No
Macronectes giganteus	Southern Giant-Petrel	E	The Southern Giant-Petrel is marine bird that occurs in Antarctic to subtropical waters. It possibly concentrates north of 50° S in winter, as it is rare in waters of the southern Indian Ocean, but common off South America, South Africa, Australia and New Zealand. It occurs in both pelagic and inshore waters.	Unlikely - suitable habitat not identified within the site.	N/A	No
Macronectes giganteus	Northern Giant-Petrel	V	The Northern Giant-Petrel is marine and oceanic. Visits areas off the Australian mainland mainly during the winter months (May-October). Immature and some adult birds are commonly seen during this period in offshore and inshore waters from around Frenamtle (WA) to around Sydney (NSW).	Unlikely - suitable habitat not identified within the site.	N/A	No
Macquaria australasica	Macquarie Perch	E	Habitat for the Macquarie perch is on the bottom or mid-water in slow-flowing rivers with deep holes, typically in the upper reaches of forested catchments with intact riparian vegetation. Macquarie perch also do well in some upper catchment lakes. In some parts of its range, the species is reduced to taking refuge in small pools which persist in midland–upland areas through the drier summer periods.	Unlikely - suitable habitat not identified within the site.	N/A	No
Monarcha melanopsis	Black-faced Monarch	M	In NSW, occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi	Unlikely - habitat present is substantially degraded	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			National Park and Wombeyan Caves. It is rarely recorded farther inland. Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	such that this species is unlikely to utilise the site for foraging or breeding.		
Motacilla flava	Yellow Wagtail	M	Regular summer migrant to mostly coastal Australia. In NSW recorded Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA. Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	Unlikely - suitable habitat not identified within the site.	N/A	No
Myiagra cyanoleuca	Satin Flycatcher	M	In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains. Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	Unlikely - suitable habitat not identified within the site.	N/A	No
Neophema chrysogaster	Orange-bellied Parrot	CE	Breeds only in coastal south-west Tasmania and spends the winter in coastal Victoria and South Australia (March/April - October/November), mostly within 3 km of the coast. It nests in hollows in eucalypt trees which grow adjacent to its feeding plains.	Unlikely - suitable habitat not identified within the site.	N/A	No
Numenius madagascariensis	Eastern Curlew	CE	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records. Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	Unlikely - suitable habitat not identified within the site.	N/A	No
Pachyptila turtur subantarctica	Fairy Prion	V	Breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. Some individuals may migrate towards New Zealand and southern Australia in winter.	Unlikely - suitable habitat not identified within the site.	N/A	No
Petauroides volans	Greater Glider	V	This population on the south coast of NSW is bounded by the Moruya River to the north, Coila Lake to the south and the Princes Highway	Unlikely - habitat present is substantially degraded such that this species is	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			and cleared land exceeding 700 m in width to the west. Eucalypt forests and woodlands.	unlikely to utilise the site for foraging or breeding.		
Petrogale penicillata	Brush-tailed Rock-wallaby	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	Unlikely - suitable habitat not identified within the site.	N/A	No
Phascolarctos cinereus	Koala	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands. Eucalypt woodlands and forests.	Unlikely - Habitat present is substantially degraded such that this species is unlikely to utilise the site for foraging or breeding.	N/A	No
Prototroctes macraena	Australian Grayling	V	The historic distribution of the Australian Grayling included coastal streams from the Grose River southwards through NSW, Vic. and Tas. On mainland Australia, this species has been recorded from rivers flowing east and south of the main dividing ranges. This species spends only part of its lifecycle in freshwater, mainly inhabiting clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops but has also been found in muddy-bottomed, heavily silted habitat.	Unlikely - Habitat present is substantially degraded such that this species is unlikely to utilise the site for foraging or breeding.	N/A	No
Pseudomys novaehollandiae	New Holland Mouse	V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	Unlikely - suitable habitat not identified within the site.	N/A	No
Pterodroma leucoptera leucoptera	Gould's Petrel	E	The Australian subspecies of the Gould's Petrel breeds only on Cabbage Tree Island and on nearby Boondelbah Island, near Port Stephens, in NSW. Gould's Petrel is a pelagic marine species, spending much of its time foraging at sea and coming ashore only to breed.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Pterodroma neglecta neglecta	Kermadec Petrel	V	The Kermadec Petrel (western) is a pelagic seabird that occurs in tropical, subtropical and temperate waters of the Pacific Ocean. In Australia, the Kermadec Petrel (western) breeds on Balls Pyramid, which lies to the south of Lord Howe Island, and on Phillip Island, in the Norfolk Island group. It occasionally reaches the eastern coast of mainland Australia.	Unlikely - suitable habitat not identified within the site.	N/A	No
Pteropus poliocephalus	**Grey-headed Flying-fox**	**V**	**Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria. Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.**	**Likely – seasonal foraging habitat available within the study area. No camps identified within study area.**	**Yes (foraging only)**	**Yes**
Rhipidura rufifrons	Rufous Fantail	M	Coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW. Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	Unlikely - suitable habitat not identified within the site.	N/A	No
Rostratula australis	Australian Painted Snipe	E	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Swamps, dams and nearby marshy areas.	Unlikely - suitable habitat not identified within the site.	N/A	No
Sternula nereis nereis	Australian Fairy Tern	V	The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline.	Unlikely - suitable habitat not identified within the site.	N/A	No
Synemon plana	Golden Sun Moth	CE	It is found in native open temperate grasslands and open grassy woodlands dominated by *Austrodanthonia* spp.	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Thalassarche bulleri	Buller's Albatross	V	This species breeds in New Zealand but regularly visits Australian marine waters.	Unlikely - suitable habitat not identified within the site.	N/A	No
Thalassarche bulleri platei	Northern Buller's Albatross	V	This species is a non-breeding visitor to Australian waters. This species is mostly limited to the Pacific Ocean and Tasman Sea and not the east coast of Australia mainland.	Unlikely - suitable habitat not identified within the site.	N/A	No
Thalassarche cauta cauta	Shy Albatross	V	Most common distribution occurs below 25o S in southeastern and Tasmanian shelf waters. During non-breeding seasons the Shy Albatross extends across the continental shelf in subantarctic and subtropical waters including NZ. It spends most of it's life out to sea coming to shore to breed in September at Stradbroke Island in Qld and south to Tasmania.	Unlikely - suitable habitat not identified within the site.	N/A	No
Thalassarche cauta steadi	White-capped Albatross	V	This species breeds predominately in New Zealand. It may forage in marine waters off eastern mainland Australia.	Unlikely - suitable habitat not identified within the site.	N/A	No
Thalassarche eremita	Chatham Albatross	E	The Chatham Albatross is a marine species that breeds on Pyramid Rock, Chatham Islands, off the coast of New Zealand. It occurs in subantarctic and subtropical waters and has been noted in shelf-waters around breeding islands, over continental shelves during the non-breeding season, and occurs inshore and offshore.	Unlikely - suitable habitat not identified within the site.	N/A	No
Thalassarche impavida	Campbell Albatross	V	This species is a non-breeding migrant to Australian waters. Forages in temperate waters.	Unlikely - suitable habitat not identified within the site.	N/A	No
Thalassarche melanophris	Black-browed Albatross	V	Commonly occuring in southern Australian waters in winter. Breeds on offshore Islands off southern Australia including Heard Is, Macquarie Is and McDonald Is, to name a few. It is a marine specialist	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			foraging for fish, crustaceans and squid in Antarctic, subantarctic and temperate waters.			
Thalassarche salvini	Salvin's Albatross	V	The Salvin's Albatross is a non-breeding visitor to Australian waters.	Unlikely - suitable habitat not identified within the site.	N/A	No
Thinornis rubricollis rubricollis	Hooded Plover (eastern)	V	This species utilises sandy beaches along south-eastern Australia.	Unlikely - suitable habitat not identified within the site.	N/A	No
Tringa nebularia	Common Greenshank	M	Summer migrant to Australia. Recorded in most coastal regions of NSW; also widespread west of the Great Dividing Range. Terrestrial wetlands and sheltered coastal habitats.	Unlikely - suitable habitat not identified within the site.	N/A	No
			FLORA			
Acacia bynoeana	Bynoe's Wattle	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Heath or dry sclerophyll forest on sandy soils.	Unlikely - the presence of this species was not identified (conspicuous species) and suitable habitat was not identified within the site.	N/A	No
Acacia pubescens	Downy Wattle	V	Restricted to the Sydney region around the Bankstown-Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	Unlikely - the presence of this species was not identified (conspicuous species) and suitable habitat was not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Acacia terminalis subsp. *terminalis*	Sunshine Wattle	E	Limited mainly to near-coastal areas from the northern shores of Sydney Harbour south to Botany Bay. Coastal scrub and dry sclerophyll woodland on sandy soils.	Unlikely - the presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially disturbed such that this species is unlikely to utilise the development site.	N/A	No
Allocasuarina glareicola	-	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Castlereagh woodland on lateritic soil. Found in open woodland with *Eucalyptus parramattensis*, *Eucalyptus fibrosa*, *Angophora bakeri*, *Eucalyptus sclerophylla* and *Melaleuca decora*.	Unlikely - the presence of this species was not identified (conspicuous species) and suitable habitat was not identified within the site.	N/A	No
Asterolasia elegans	-	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Likely to occur in the western part of Gosford local government area. Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys.	Unlikely – the development site is not within the seven recognised populations of the species.	N/A	No
Caladenia tessellata	Thick Lip Spider Orchid	V	Currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast. Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	Unlikely –the development site is not within the recognised populations of the species.	N/A	No
Cryptostylis hunteriana	Leafless Tongue Orchid	V	in NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton. Coastal heathlands, margins of coastal	Unlikely - suitable habitat not identified within the site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			swamps and sedgelands, coastal forest, dry woodland, and lowland forest.			
Eucalyptus camfieldii	Camfield's Stringybark	V	Narrow band from the Raymond Terrace area south to Waterfall. Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges.	Unlikely - the presence of this species was not identified (conspicuous species) and suitable habitat was not identified within the site.	N/A	No
Eucalyptus nicholii	**Narrow-leaved Black Peppermint**	**V**	**In NSW it is known from Walcha-Niangala region (east of Tamworth) to just north of Glen Innes in NSW. This species is sparsely distributed but most commonly occurs in the central portions of its range.**	**Known – one individual of this species was identified within the development site. The development site is located outside of the geographic distribution for this species. This species is considered a planted specimen of unknown genetic source material.**	**Yes**	**Yes**
Eucalyptus scoparia	**Wallangarra White Gum**	**V**	**In NSW it is known from only three locations near Tenterfield. Open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes.**	**Known – one individual of this species was identified within the development site. The development site is located outside of the geographic distribution for this species. This species is considered a planted specimen of unknown genetic source material.**	**Yes**	**Yes**

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
Genoplesium baueri	Bauer's Midge Orchid	E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. Dry sclerophyll forest and moss gardens over sandstone.	Unlikely - suitable habitat not identified within the site.	N/A	No
Melaleuca biconvexa	Biconvex Paperbark	V	Only found in NSW, populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Damp places, often near streams or low-lying areas on alluvial soils.	Unlikely - the presence of this species was not identified (conspicuous species) and suitable habitat was not identified within the site.	N/A	No
Persicaria elatior	Tall Knotweed	V	In south-eastern NSW recorded from Mt Dromedary, Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). Beside streams and lakes, swamp forest or disturbed areas.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the site.	N/A	No
Persoonia hirsuta	Hairy Geebung	E	Scattered distribution around Sydney, from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Unlikely - suitable habitat not identified within the site.	N/A	No
Pimelea curviflora var. *curviflora*	-	V	Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south. Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	Unlikely - The presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially degraded such that this	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
				species is unlikely to utilise the development site.		
Pimelea spicata	Spiked Rice-flower	E	Two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). Well-structured clay soils. Eucalyptus moluccana (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra.	Unlikely - suitable habitat not identified within the site.	N/A	No
Syzygium paniculatum	Magenta Lilly Pilly	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Subtropical and littoral rainforest on gravels, sands, silts and clays.	Unlikely - The presence of this species was not identified (conspicuous species) and it was determined that the habitat is substantially disturbed such that this species is unlikely to utilise the development site.	N/A	No
Thesium australe	Austral Toadflax	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands. Grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely - suitable habitat not identified within the site.	N/A	No

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bsi. AS/NZS 4801 Occupational Health and Safety Management

bsi. ISO 14001 Environmental Management

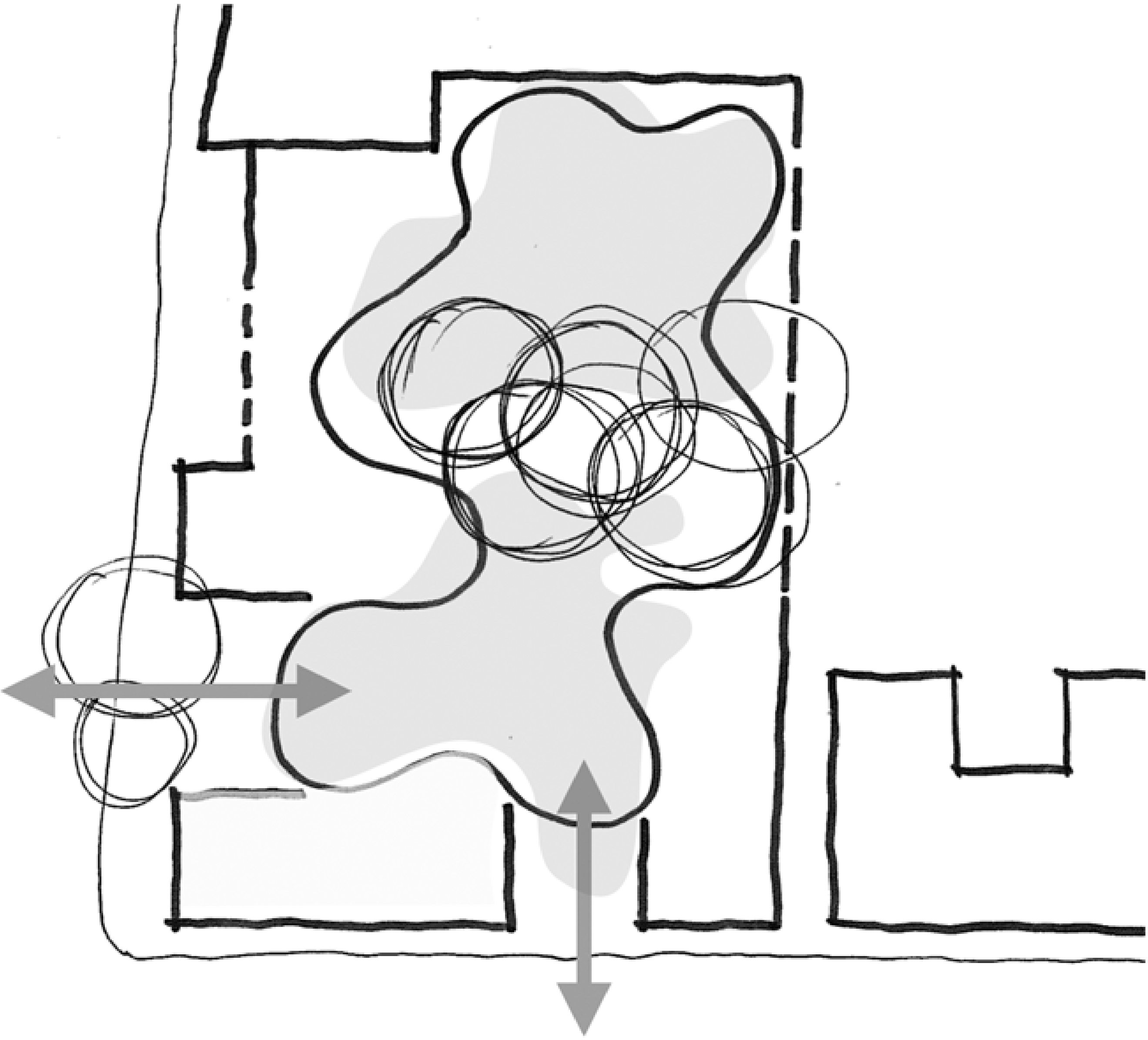
DARLINGTON PUBLIC SCHOOL REDEVELOPMENT

Appendix V — Construction Waste Management Plan

SSD-9914

Prepared by JBS&G

For NSW Department of Education



School Infrastructure NSW

Construction Waste Management Plan

Darlington Public School
Golden Grove Street, Darlington, NSW

27 April 2020

56243/129063 (Rev 1)

JBS&G Australia Pty Ltd

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JBS&G Australia Pty Ltd

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1. Introduction

JBS&G Pty Ltd (JBS&G) has been engaged on behalf of School Infrastructure NSW (SINSW, the client) to prepare a Construction Waste Management Plan (CWMP) for the redevelopment of the Darlington Public School (the site). Darlington Public School is located on the corner of Golden Grove Street and Abercrombie Street, Darlington, within the City of Sydney Local Government Area. The school is adjacent to the University of Sydney Darlington Campus and within walking distance to Redfern and Macdonaldtown train stations. The site is legally described as Lot 100 in DP 623500 and Lot 592 in DP 7523049 (**Figure 1**).

The State Significant Development (SSD) application seeks consent for demolition of existing school buildings and construction of a new part 2, part 3-storey building, increasing the school capacity from 230 to 437 students. The works also include replacement of the existing child-care facility (to the same capacity of 60 students), earthworks and landscaping. For a detailed project description refer to the Environmental Impact Statement (EIS) prepared by Ethos Urban.

1.1 Scope

This CWMP has been developed to address the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning and Environment for application SSD 19_9914[1], dated 19 March 2019. **Table 1.1** presents the SEARs required to be addressed to support the SSDA:

Table 1.1: SEARS Requirements

SEARS Requirements	Report Section
Identify, quantify and classify the likely waste streams to be generated during construction and operation and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.	Waste streams associated with the construction phase of the project are presented in **Section 4.**
Identify and detail how any asbestos waste, lead-based paint and Polychlorinated biphenyls (PCBs) that may be encountered will be handled, transported and disposed.	Hazardous material handling, transport and disposal requirements are detailed in **Section 5** and **Table 5.1**
Identify appropriate servicing arrangements (including but not limited to, waste management, loading zones, mechanical plant) for the site.	Servicing arrangements are presented in **Section 5**.
Assess, quantify and report on waste management in the context of the waste management hierarchy.	Waste Hierarchy is presented in **Section 3.3**. Waste Management is detailed in **Section 5**.

1.2 In accordance with the SEARs listed above, the scope of this CWMP is to address the likely waste streams generated during the works, provide indicative estimations of waste quantities, and propose management, reuse, recycling and disposal procedures during the demolition, excavation and construction works of the redevelopment works within the subject site. **Objectives**

The key objective of this CWMP is to support the client in the SSDA through identifying the types and quantities of potential waste streams and to establish management measures to prevent environmental harm, minimise waste and maximise resource preservation.

This CWMP specifically aims to:

- Address the SEARs for waste as per SSD 9344;

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[1] *Application Number SSD – 9914 Darlington Public School Redevelopment. Golden Grove Street, Darlington within City of Sydney. Department of Education.* Secretary's Environmental Assessment Requirements, Section 4.12(8) of the Environmental Planning and Assessment Act 1979 Schedule 2 of the Environmental Planning and Assessment Regulation 2000 dated 19 March 2019 (SSD 9914)

- Promote waste minimisation through avoiding and reducing waste generation;
- Promote the recycling of building and demolition materials;
- Comply with legislative criteria and adhere to waste minimisation guidance and standards;
- Apply the waste management hierarchy (**Section 3.3**) throughout construction; and
- Specify safe and appropriate management of potentially contaminated wastes.

2. Project Description

Darlington Road Public School provides education to preschool and primary school students for the local school catchment area, and NSW Government has recently provided funds to remove existing structures on site, undertake cut and fill activities to the site and construct new buildings to ensure it can accommodate increases in the surrounding population.

2.1 Location and Site Layout

Information relating to the site are provided in **Table 2.1** below. The site location is illustrated in **Figure 1.**

Table 2.1: Site Details

Site address	Golden Grove St, Darlington, NSW, 2008
Local Government	City of Sydney
Zoning	SP2 – Infrastructure (Education Establishment) Local Environmental Plan (LEP) 2014
Surrounding Land Use	North: Sydney University Regiment IXL Garage bordering the school, with terraced houses to the north across Darlington Ln. East: University of Sydney Business School Campus. South: Abercrombie St and terraced housing followed by railway line and Carriageworks and the main southern train line. West: Golden Grove St and medium to high density housing.

2.2 Project Scope of Works

It was understood from the client that the subject site will undergo the following redevelopment works including:

- Demolition of existing structures on site;
- Site preparation;
- Construction of one new part 2, part 3-storey building, increasing the school capacity from 230 to 437 students, containing:
    - Replacement of the existing child care facility (capacity of 60 students);
    - Several Outdoor play areas;
    - One outdoor, undercover play area;
    - Several collaborative learning areas;
    - Services and mechanical plant rooms;
    - Canteen;
    - Administration facilities;
    - Staff facilities;
    - Special program/counselling rooms;
    - A community clinic and waiting rooms;
- Construction of a new entry forecourt;
- Community Hall with stores and kitchenette;
- Landscaping and fencing; and

- Tree removal.

Details design drawings are included in **Appendix A**.

2.3 Existing Environment

2.3.1 Topography

A review of the regional topography (LPMA[2]) identified that there was a gentle gradient towards the south-east. The site has an elevation of between approximately 41 to 43 m Australian Height Datum (AHD).

2.3.2 Buildings, Structures and Roads

The entrance to Darlington Public School is located on Golden Grove St. The northern portion of the site is predominantly occupied by a bitumen basketball court surrounded by established trees. The southern portion of the site contains school buildings Block A, Block B and Block C surrounded by concrete and bitumen. A small area of lawn is present in the central eastern portion of site adjacent to the centrally located softball area.

2.3.3 Acid Sulfate Soils

Review of the 1:25 000 scale Prospect Paramatta Acid Sulfate Soil (ASS) Risk Map (DLWC 1997[3]) indicated that the site is located within an area of 'no known occurrence' of acid sulfate soil materials. Based on the site's elevation, the reported geology and the ASS Risk Map classification, no further consideration of requirements for the management of acid sulfate soil is required.

2.3.4 Vegetation

As mentioned above, the site is predominantly surfaced with concrete hardstand or bitumen with the exception of the lawn and softball area in the central portion of site. The central portion and northern boundary have established trees, most of which are proposed to be retained as part of the proposed works as shown in the Design Drawings (**Appendix A**).

2.3.5 Presence of Chemical Storage, Hazardous and Fill Material

No previous environmental reports or hazardous materials survey reports for existing site infrastructure have been provided by the client. However, it is anticipated that fill material may have been imported to create the existing site levels and therefore should any soil require disposal off-site as part of the scope of works, it will need to be classified as per the NSW EPA Waste Classification Guidelines (EPA 2014[4]) as discussed in **Section 4**.

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[2] Land and Property Information, Spatial Information Exchange website, http://maps.six.nsw.gov.au/ accessed 21 May 2019

[3] *Prospect Paramatta Acid Sulfate Soil Risk Map* (Edition 2), NSW Department of Land and Water Conservation (DLWC 1997)

[4] Waste Classification Guidelines. Part 1: Classifying Waste. NSW Environment Protection Authority (EPA 2014)

3. Legislative Requirements and Guidelines

3.1 Legislation

This CWMP has been prepared in accordance with the requirements of the *NSW Waste Avoidance and Resource Recovery Act 2001*, and the NSW *Protection of the Environment Operations Act 1997* (POEO Act). These and other key legislation relevant to waste management at the site are provided in **Table 3.1.**

Table 3.1: NSW Waste Legislation Summary

Legislation	Purpose
Protection of the Environment Operations Act 1997 *Protection of the Environment Operations (Waste) Regulation 2014* *Protection of the Environment Operations (General) Regulation 2009*	The Act is the key piece of environment protection legislation administered by the NSW Environment Protection Authority (EPA). The object of the Act is to achieve the protection, restoration and enhancement of the quality of the NSW environment. The Act enables the Government to establish policy instruments for setting environmental standards, goals, protocols and guidelines.
Waste Avoidance and Resource Recovery Act 2001	The WARR Act promotes waste avoidance and resource recovery to achieve a continual reduction in waste generation, provides for development of a state-wide Waste Strategy, and introduces a scheme to promote extended producer responsibility for the life-cycle of a product. Objectives of the Act include: • To encourage the most efficient use of resources and to reduce environmental harm; • To ensure that resource management options are considered against a hierarchy (see **Section 3.3**); • Provide for the continual reduction in waste generation; • To minimise the consumption of natural resources and the final disposal of waste; • To ensure that industry shares with the community the responsibility for reducing and dealing with waste; and • To assist in the achievement of the objectives of the *POEO Act.*
Environmental Planning and Assessment Act 1979 *Environmental Planning and Assessment Regulation 2000*	The Act and the Regulation provide the overarching structure for planning in NSW. They provide for a number of other statutory documents to support the planning structure, including State Environmental Planning Policies and Local Environmental Plans. The objectives include: • The proper management, development and conservation of natural and artificial resources; and • To encourage ecologically sustainable development.
Environmentally Hazardous Chemicals Act 1985 (NSW)	The Act provides for control of the effect on the environment of chemicals and chemical wastes. The EPA is responsible for administering this legislation, in partnership with other state government agencies. It is the primary legislation for specifically regulating environmentally hazardous chemicals throughout their life cycle. The Act sets out requirements for: • Chemical Control Orders (CCOs) which are used to manage specified hazardous chemicals and chemical wastes; • Technology assessments, which ensure that premises treating or destroying chemicals are safe and appropriate for their purpose; and • Licensing of individuals or industries who manage chemicals that are subject to a CCO.
Contaminated Land Management Act, 1997 and *Regulation 2013*	The Act establishes a process for investigating and (where appropriate) remediating land that the EPA considers to be contaminated significantly enough to require regulation.

3.2 Guidelines

Guidance documents and policies considered in the preparation of this CWMP are included in **Table 3.2.**

Table 3.2: NSW Guidance Summary

Guideline	Purpose
NSW Environment Protection Authority (EPA) Waste Classification Guidelines 2014 (EPA 2014)	The Waste Classification Guidelines have been established by the NSW EPA to assist waste generators to classify wastes. Wastes are classified into groups that pose similar risks to environment and human health. Waste classifications are discussed further in **Section 4.1**.
Building Code of Australia (BCA)	The BCA contains technical provisions for the design and construction of buildings and other structures, covering such matters as structure, fire resistance, access and egress, services and equipment, and energy efficiency as well as certain aspects of health and amenity.
NSW EPA's Waste Avoidance and Resource Recovery (WARR) Strategy 2014-21	The WARR strategy provides a framework for waste management for the state until 2021. Key targets include: • Avoid and reduce waste generation; • Increase recycling; • Divert more waste from landfill; • Manage problem wastes better; • Reduce litter; and • Reduce illegal dumping.
NSW EPA's Better Practice Guidelines for Waste Management and Recycling in Commercial and Industrial Facilities 2012	The guide provides advice to assist architects, developers, council staff and building managers to incorporate better waste management practice into the design, establishment, operation and ongoing management of waste services in commercial and industrial developments.
NSW Government Resource Efficiency Policy (GREP) 2019	The policy aims to reduce the NSW Government's operating costs and lead by example in increasing the efficiency of its resource use. The policy will continue to drive resource efficiency by NSW Government agencies in four main areas – energy, water, waste and air emissions from government operations. The GREP was introduced in 2014 and reviewed in 2018 to take into account implementation challenges, technology development and market trends. Local government, state-owned corporations, public trading enterprises and public financial enterprises are strongly encouraged to adopt this policy's approach.
How to manage and control asbestos in the workplace, SafeWork NSW Code of Practice, 2016 (NSW Government)	The Code of Practice is an approved code of practice under the *Work Health and Safety Act 2011*. The code provides guidance on how to manage risks associated with asbestos and asbestos containing material at the workplace and thereby minimise the incidence of asbestos-related diseases such as mesothelioma, asbestosis and lung cancer.
How to safely remove asbestos, SafeWork NSW Code of Practice, 2016 (NSW Government)	The Code of Practice is an approved code of practice under the *Work Health and Safety Act 2011*. The code provides practical guidance on how to safely remove asbestos from all workplaces including structures, plant and equipment and should be read in conjunction with *How to manage and control asbestos in the work place* Code of Practice.
Australian Government Construction and Demolition Waste Guide, 2011	The aim of the guide is to help develop effective markets for materials diverted or derived from the construction and demolition waste stream.
Australian Government Sustainable Procurement Guide, 2018.	The guide aims to reduce the adverse environmental, social and economic impacts of purchased products and services throughout their life through considerations such as waste disposal and the cost of operation and maintenance over the life of the goods. The guide was developed to assist Australian Government purchasers to include sustainability considerations in all stages of the procurement process, from identifying the business need to disposal of goods.
Sampling Design Guidelines – Contaminated Sites. NSW EPA, 1995	The Sampling Design Guidelines were established by the NSW EPA to: • Encourage the use of a statistically based approach to the design and sampling for contaminated sites and the interpretation of these samples for assessing and validating contaminated sites; and • Provide a convenient summary of statistical methods.

3.3 Waste Hierarchy

Waste management for the project will be undertaken in accordance with the waste hierarchy, which underpins the objectives of the *Waste Avoidance and Resource Recovery Act 2001*. The waste hierarchy shown in **Figure 3.1** demonstrates preferred approaches to waste management to ensure sustainable development and use of resources.

Figure 3.1: Waste Hierarchy

The hierarchy also aims to maximise efficiency and avoid unnecessary consumption of resources. This CWMP seeks to implement the waste hierarchy to minimise waste disposal and promote waste reduction in order of preference:

- Reduce or avoid waste through selection of items and design;
- Reuse materials without further processing;
- Recycle and process waste for reuse as a new product;
- Recover energy through combustion of materials where acceptable and in accordance EPA Regulations;
- Treat waste to stabilise the waste product for disposal or reuse; and
- Dispose of waste when no other management options are appropriate.

4. Waste Streams and Classification

4.1 EPA Waste Classification

The NSW EPA Waste Classification Guidelines (EPA 2014) provides for the classification of wastes into groups that pose similar risks to the environment and human health, which are defined in the POEO Act. Classes of waste described in the guideline are described in **Table 4.1.**

Table 4.1: Summary of NSW EPA Waste classifications

Waste Classification	Description
Special waste	Special wastes are wastes that pose specific regulatory requirements due to the risks of harm to the environment and human health. These wastes include clinical and related waste, asbestos waste, waste tyres, and anything classified as special waste under an EPA gazettal notice.
Liquid waste	Liquid waste is classified as any waste (other than special waste) that meets the following criteria: • Has an angle of repose of less than 5 degrees above horizontal; • Becomes free-flowing at or below 60 degrees Celsius or when it is transported; • Is generally not capable of being picked up by a spade or shovel; and/or • Is classified as liquid waste under an EPA gazettal notice.
Pre-classified waste: • Hazardous waste • Restricted solid waste • General solid waste (putrescible) • General solid waste (non-putrescible).	Where the waste is neither liquid nor special waste; the EPA has pre-classified other commonly generated waste types, as defined in Schedule 1 of the POEO Act. This includes hazardous waste, restricted solid waste, general solid (putrescible) and general solid (non-putrescible) waste. Putrescible waste is the component of the waste stream that is liable to become putrid, and usually refers to vegetative, food and animal products. A list of all currently gazetted waste classifications is provided on the EPA website at: www.epa.nsw.gov.au/waste/wastetypes.htm. Where material is classified as hazardous waste, it is noted that such materials cannot be directly disposed of and must be treated prior to disposal by an appropriately licensed facility/operator.
Wastes classified via chemical assessment: • Hazardous waste • Restricted solid waste • General solid waste (putrescible) • General solid waste (non-putrescible).	Where the waste does not fall into one of the above categories, chemical assessment of the material is required to finalise a waste classification as per the procedures outlined in detail in EPA (2014) and/or consideration of General or Specific Waste immobilisation approvals as approved under the *Protection of the Environmental Operations (Waste) Regulation* (2014).

4.2 Waste Streams and Classification

A variety of waste types are expected be generated during the site preparation and construction parts of the project. Potential waste types and corresponding EPA classifications for the Darlington Public School Redevelopment are summarised in **Table 4.2**.

Table 4.2: Potential Waste Types and Classification

Waste Type	EPA Classification	Generated	Project Phase
Excavated Soil	Subject to Waste Classification as per EPA 2014 following excavation	✓	Excavation, Construction
Rock and excavated stone	General solid waste (non-putrescible)	Potential	Excavation, Construction
Green waste (Garden Organics)	General solid waste (non-putrescible)	✓	Excavation (site preparation)
Metals (including roofing)	General solid waste (non-putrescible)	✓	Demolition, Excavation, Construction
Wood waste (including joinery offcuts)	General solid waste (non-putrescible)	✓	Demolition, Construction
Blockwork	General solid waste (non-putrescible)	✓	Demolition, Construction

Waste Type	EPA Classification	Generated	Project Phase
Glazed Bricks	General solid waste (non-putrescible)	✓	Demolition, Construction
Concrete (Building frames, cores & roof; external works; slab)	General solid waste (non-putrescible)	✓	Demolition, Excavation, Construction
Plasterboard	General solid waste (non-putrescible)	✓	Demolition, Construction
Glass	General solid waste (non-putrescible)	✓	Demolition, Construction
Carpet Tiles	General solid waste (non-putrescible)	✓	Demolition, Construction
Vinyl	General solid waste (non-putrescible)	✓	Demolition, Construction
Plastic (Artificial Turf and other durables (non-packing))	General solid waste (non-putrescible)	✓	Demolition, Construction
Plastic and foam packaging	General solid waste (non-putrescible)	✓	Construction
General refuse	General solid waste (putrescible), and General solid waste (non-putrescible)	✓	Excavation and Construction
Electrical (HV and LV)	General solid waste (non-putrescible)	✓	Demolition, Construction
Optic fibre wiring	General solid waste (non-putrescible)	Potential	Demolition, Construction
Light bulbs	Hazardous waste	Potential	Demolition, Construction
Batteries	Hazardous waste	Potential	Demolition, Construction
Empty drums (e.g. oil, fuel, chemicals, paint, spill clean-up)	Hazardous waste if the containers previously used to store Dangerous Goods (Class 1, 3, 4, 5 or 8) and from which residues have not been removed by washing or vacuuming. General solid (non-putrescible) waste if containers cleaned by washing or vacuuming.	Potential	Demolition, Excavation, Construction
PVC pipes (stormwater, electrical, optic fibre, sewer)	General solid waste (non-putrescible)	✓	Demolition, Construction
Site runoff (wastewater)	Liquid waste	Potential	Demolition, Construction
Sewage	Liquid waste	Potential	Demolition, Construction
Asbestos containing materials	Special waste	Potential	Demolition
Lead based paints	Hazardous waste	Potential	Demolition

4.3 Waste Quantities

4.3.1 Demolition

During the development of a detailed schedule of planned works, the quantity of waste generated, and the locations of temporary waste storage areas will be confirmed. Based on initial site inspections and appraisal by the demolition/construction contractor, waste quantities will be estimated.

The demolition schedule will be developed to ensure appropriate temporary waste storage areas are available for storage of demolition waste. If required, waste will be periodically removed from the site during the demolition works to ensure there is sufficient waste storage capacity available.

4.3.2 Construction

Indicative quantities of waste likely to be generated during construction (excluding excavation and other enabling works) will be determined when the detailed demolition schedule has been established. It is expected that actual waste quantities and composition will vary depending on outcomes of detailed design, materials specification and construction planning and methods.

Indicative waste volumes have been provided for context based on benchmark data developed by the UK Building Research Establishment Group (BRE 2012[5]), see **Table 4.4**), which is based on waste generation at various construction projects including healthcare, commercial, industrial and public buildings.

A value of 20.7 m^3 per 100 m^2 has been adopted to estimate waste generation for the construction phase of this project, for Education building waste. Indicative waste composition information shown in the tables below (derived from the Sustainability Victoria Waste Wise Tool Kit (2013 [6])) provides an estimate of quantities for each waste stream.

Strategies that will be implemented to minimise waste generation and maximise reuse and recycling are outlined in **Section 5.**

Table 4.4: Average Volumes of Waste Produced by Different Project Types

Project Type	Average volume (m^3) of waste per 100 m^2
Residential	18.1
Public buildings	20.9
Leisure	14.4
Industrial Buildings	13.0
Healthcare	19.1
Education	20.7
Commercial Other	17.4
Commercial Offices	19.8
Commercial Retail	20.9

Source: BRE (2012)

Table 4.5: Guide to Waste Composition and Volumes – Construction

Material	*Estimated Waste %*	Conversion Factor (Density) (Tonne per m^3)
Hard material	32%	1.2
Timber	24%	0.3
Plastics	15%	0.13
Cement sheet	9%	0.5
Gypsum material	6%	0.2
Metals	6%	0.9
Paper / card	4%	0.1
Vegetation	3%	0.15
Soil	1%	1.6
Other	0.3%	0.3

Source: Sustainability Victoria Waste Wise Tool Kit (2013)

Table 4.6: Approximate Quantities of Waste Generated During Construction Phase

Waste Type	Approximate quantity (m^3)
Hard Material	190.8
Timber	35.8
Plastics	9.7
Cement	22.4
Gypsum Material	6.0
Metals	26.8
Paper / card	2.0
Vegetation	2.2
Soil	7.9
Other	0.4

Source: Sustainability Victoria Waste Wise Tool Kit (2013)

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[5] Building Research Establishment Group. *Smartwaste - BRE Waste Benchmark Data* (BRE 2012)

[6] Sustainability Victoria Waste Wise Tool Kit (2013)

5. Waste Management

Site specific waste management measures have been developed in line with the waste hierarchy outlined in **Section 3.3** and in accordance with the relevant legislative requirements and guidelines. These measures are applicable to the demolition and construction phases of the project.

5.1 Avoidance and Reduction of Waste

The demolition, excavation and construction contractor will be required to avoid waste generation, and endeavour to reuse materials where possible, thereby minimising waste generation.

During the construction phase, waste generation will be avoided through strategic selection of materials during design and purchasing, taking into account options to reduce waste generation for the project. This includes consideration of procurement of materials which are prefabricated, use minimal packaging, and are suitable for reuse across the site. Selection of construction materials will also consider the use of recycled items where practicable.

Opportunities to avoid wastes generated by construction include:

- Develop a procurement policy which considers waste avoidance measures such as:
    - Order site specific or prefabricated items where practicable to minimise surplus material;
    - Consider packaging material provided by suppliers during purchasing and reduce this requirement where possible, or consider returnable packaging;
    - Material selection to consider recycled items;
- Refine waste stream estimates to ensure adequate on-site storage and segregation; and
- Refine estimated volumes of materials for construction.

5.2 Reuse and Recycling

A 90% recycled or re-used target has been developed and noted on the Ecologically Sustainable Development report accompanying the SSDA for this project, as such majority of the excavated spoil will remain on site for site grading activities. While for other waste materials onsite, measures to separate waste streams will be implemented. This includes segregating wastes into appropriate dedicated bins or areas for reclamation on site or transportation to a designated recycling facility.

Concrete waste and waste rinse water are not to be disposed of at the site and rinse waters are required to be prevented from entering surface waters, including natural and artificial watercourses.

Should unexpected material containing asbestos be identified and cannot be safely removed/encapsulated, off-site disposal is the most appropriate option. The construction contractor will then liaise with a licensed asbestos removalist to determine a suitable disposal facility. Measures for dealing with hazardous waste (asbestos) are discussed in **Table 5.1.**

Procedures to manage the reuse and recycling of waste materials during construction include:

- Incorporation of waste management into development staging to promote reuse of materials across the site;
- Ensure areas for waste segregation are easily accessible and clearly defined;
- Ensure contractors are familiar with onsite waste storage areas for appropriate waste segregation;
- Determine suitability of materials generated during demolition for use in construction; and

- Consider opportunities for materials reuse in areas in proximity to the site or local construction activities where practicable.

5.3 Treatment and Disposal

Project wastes may require treatment to stabilise them for appropriate disposal to reduce the risk of harm to human health or the environment. These materials are not suitable for reuse or recycling and must be segregated and disposed of via a suitably qualified contractor.

Wastes will only be sent to landfill or disposal facilities where the prioritised management methods in the hierarchy cannot be effectively implemented. The construction contractor will liaise with the local council to determine appropriate disposal locations for potential waste streams.

Measures to manage the treatment and disposal of waste materials during construction include:

- Ensure wastes which cannot be reused or recycled and require disposal are clearly segregated from those which have the potential to be reused.
- Provide segregated bins for subcontractors to dispose of construction waste (i.e., metal, plastics and cardboard).
- Contractors and staff to be inducted into site waste management practices.
- Hazardous materials including asbestos (if identified) to be disposed of in accordance with the handling and disposal requirements of SafeWork NSW and NSW EPA.
- General wastes to be disposed of in accordance with NSW EPA/local council requirements.
- Toilet facilities must be regularly serviced and emptied by a licensed contractor.

It should be noted that concrete waste and waste rinse water are not to be disposed of at the site and rinse waters are required to be prevented from entering surface waters, including natural and artificial watercourses.

5.4 Waste Stream Management Options

The waste management measures outlined in **Table 5.1** will be implemented for each waste stream generated as part of the project. Key waste streams identified for this project have been discussed in more detail in this section to ensure appropriate waste handling for each type of waste.

Each waste stream will be separated and stored appropriately to ensure each type of waste is handled in the most appropriate and efficient way. The numbers and size of waste storage bins, containers, stockpile areas and loading zones on site will be determined by the demolition/excavation and construction contractor.

The Principal Contractor appointed by the client will implement its own waste management systems in accordance with this plan to ensure the schools existing waste management systems are not impacted by the redevelopment works.

5.5 Waste Disposal Hours

It is a requirement that waste collection services are not undertaken outside of the hours of 6.00 am and 10.00 pm, Monday to Saturday and 8.00 am to 10.00 pm on Sundays[7].

5.6 Other Considerations

To ensure waste is not unintentionally tracked off-site, the vehicles or trailers used to transport waste or excavated spoil from the site will be covered before leaving the subject site, to prevent

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[7] *Waste Policy: Managing Waste in Public Places information Fact Sheet.* City of Sydney, 2020. Found at: https://www.cityofsydney.nsw.gov.au/__data/assets/pdf_file/0007/194380/Waste-Policy-local-approvals-policy-for-managing-waste-in-public-places.pdf

spillage or escape of dust, waste or spoil from the vehicle or trailer. Any mud, splatter, dust and other material that is likely to be released from the wheels, underside or body of vehicles, or plant leaving the site will also be removed through a shaker bay or wash down area prior to leaving the subject site.

Table 5.1: Waste Stream Management

Waste Stream	Project Phase	Management
Concrete	Demolition and Construction	Concrete is likely to be generated during the demolition phase and the construction of the new school building and associated facilities. It is possible concrete may also be generated from kerbing and footpaths for external and landscaping works. There is also a possibility that concrete waste may be generated from excess concrete poured during construction, although this will be minimised wherever possible using the methods outlined in **Section 5.1**. Concrete can be reprocessed and may, in some instances, be reused across the subject site, however, the general practice is to break up/crush the concrete and arrange for disposal to a recycling facility or disposal offsite. Options may include disposal of excess concrete to a HDPE lined pit on site, to allow for regular reprocessing or disposal to a recycling facility. Wet supply may be placed back into supply trucks to return to the producer at the cost of an additional fee.
Soil	Demolition, Excavation and Construction	Soil is likely to be generated during establishment activities, removal of trees, excavation to establish required site levels, installation of infrastructure and other construction activities. Soil surplus to the site requirements will be sampled, analysed and classified in accordance with NSW EPA Waste Classification Guidelines (EPA 2014) prior to for offsite disposal at a facility that is licensed to accept that class of waste. As no previous environmental reports were provided by the client, whilst a 90% recycled and re-used target has been set for the project, it is anticipated that the excavated materials that meet the relevant site reuse criteria will, where possible be reused to establish the required site levels during construction works. A soil management plan (as part of a Construction Environmental Management Plan) will be developed to provide guidance for all soil testing, excavation, reuse and disposal works. In general, it is expected that assessment of relevant material will identify that undisturbed natural soil and bedrock at the site will meet the definition of VENM for off-site disposal or re-use purposes. VENM is considered suitable for re-use on-site, or alternatively, may be suitable for beneficial reuse at another site as fill material. In accordance with Part 1 of the Waste Classification Guidelines (EPA 2014), the VENM is pre-classified as general solid waste and may also be disposed of accordingly to a facility that is licensed to accept it. Where stockpiling is required prior to redistribution, control measures to avoid sediment and erosion will be implemented where appropriate. This may include establishing a bund or lining of the base with an impermeable HDPE plastic liner. Where excess soil cannot be redistributed or has been situated in proximity to asbestos containing materials (if present on site), the soil is required to be treated and/or disposed of, potentially as low level contaminated waste via a licensed removalist to a disposal facility.
Rock and excavated stone	Demolition, Excavation and Construction	Rock and excavated stone may be generated during excavation and construction of new buildings for footing and foundation construction. Depending upon the quantities and properties of the materials generated, materials may be used as aggregate or sub-base for other works across the site as described in the **Soil** section above.
Metals	Demolition and Construction	Metal wastes are likely to be generated during removal of roofing within the demolition/site establishment phase. There is also a possibility that metal waste may be generated from excess materials purchased for the site as part of construction work, although this will be minimised wherever possible using the methods outlined in **Section 5.1**.

Waste Stream	Project Phase	Management
		Principal Contractor appointed by the client will investigate and determine appropriate storage and recycling of metals to reduce waste, including location and signage of skip bins onsite. Where recycling of metal is not feasible, for example distribution to salvage yards for reuse, the contractor will organise disposal of the timber to a licensed waste facility.
Green Waste/ Wood Waste	Demolition, Excavation, Construction	Green/wood waste is likely to be generated during removal of trees and excavation of topsoil (mulch) for site grading purposes. It is likely that wood waste (timber) may be generated during the demolition phase as well as from excess materials purchased as part of building construction works, although this will be minimised wherever possible using the methods outlined in **Section 5.1**. Principal Contractor appointed by the client will investigate and determine appropriate storage and recycling of timber to reduce waste, including location and signage of skip bins onsite.
Plasterboard	Demolition, Construction	Plasterboard is likely to be generated during the demolition phase as well as the construction of new buildings, although this will be minimised wherever possible using the methods outlined in **Section 5.1**. Principal Contractor appointed by the client will investigate and determine appropriate storage and recycling of plasterboard to reduce waste, including location and signage of skip bins onsite. Uncontaminated plasterboard (e.g. offcuts) or material with low levels of contamination such as nails and screws is completely recyclable and can be recycled for use in new plasterboard or the gypsum used in agricultural soil conditioners.
Plastics	Construction	Plastic wastes associated with packaging for construction materials can be recycled or in some cases returned to the supplier of the materials for reuse. Where possible, plastic (non-durable) wastes will be reduced using the methods outlined in **Section 5.1**.
General Waste	Demolition, Excavation and Construction	Wastes such as food waste, organics and biodegradable material will be created as a result of worker activity on site. Non-putrescible wastes are generally inert, or solid, and are not able to be composted, recycled, reprocessed or reused. Principal Contractor appointed by the client will ensure adequate bins are provided on site for putrescible waste. This is particularly important around worker congregation areas, site office areas and toilet facilities. It is likely that general waste will increase at times of internal and service fit out during construction, primarily associated with excess packaging materials and workers on site. Principal Contractor will determine the location of skip bins and specify waste stream separation measures across the site. Where possible, co-mingled recycling bins will be provided in common areas at work sites for plastic and glass bottles, soft drink cans, aluminium and tin cans to avoid these items being disposed to landfill. Specialised bins for cigarette butts will also be provided in designated smoking areas.
Hazardous Waste – General	Demolition, Excavation and Construction	Small quantities of hazardous wastes may be uncovered during the demolition phase. Hazardous waste could also be generated during construction of new buildings (e.g. light bulbs, batteries, used drums from oil, fuel, chemicals or paint). Separate containers for the safe storage of these wastes will be provided where applicable, prior to removal offsite by an appropriately licensed contractor for recycling or disposal at a licensed facility.

Waste Stream	Project Phase	Management
Hazardous Waste – Asbestos (Unexpected Finds)	Demolition and Excavation	As discussed in **Section 2.2**, demolition works associated asbestos removal works do not form part of the SSDA (and this CWMP), however should unexpected asbestos containing materials be identified during demolition or excavation phases, appropriate measures and controls are required to be implemented. Asbestos poses a risk to human health through exposure of loose fibres when damaged or disturbed. As such, asbestos is classified as special waste under the POEO Act, and the EPA (2014) Waste Classification Guidelines. Special wastes pose unique regulatory requirements due to the management responsibilities to minimise risk of harm. Should unexpected asbestos containing materials be identified within work areas and required removal, a site and material specific asbestos removal control plan (ARCP) will be developed by a competent person or a licenced asbestos assessor or licensed asbestos removal contractor prior to the commencement of any asbestos removal works. The ARCP will be developed in accordance with the requirements of SafeWork NSW How to Safely Remove Asbestos, Code of Practice 2016. Controls may include: • Appropriate PPE including respiratory protective equipment • Air monitoring undertaken by an accredited expect • The asbestos work area and removal site will be clearly defined and restricted to unauthorised personnel All asbestos removal, transport and disposal must be performed in accordance with NSW legislative requirements including storing or wrapping in polythene bags. Any asbestos removed from site will be inspected by a competent person or licenced asbestos assessor prior to movement to the waste disposal facility.

6. Roles and Responsibilities

This CWMP forms the basis of waste management on site for the demolition/excavation and construction phase of the Darlington Public School redevelopment works.

It is expected that all demolition and construction personnel will commit to the CWMP and be responsible for their own actions in adhering the waste management objectives. Waste management criteria (such as those contained in this report) should be contractually binding for all contractors working on the site.

A Construction Site Manager will be the key person responsible for implementation of the CWMP and adherence to applicable legislation, guidelines, licensing and project conditions outlined herein.

Table 6.1 presents suggested responsibilities for waste management.

Table 6.1: Roles and Responsibilities

Role	Responsibility
Environmental Management Representative	• Compliance with applicable environmental licences, legislation and project conditions. Ensure environmental management plan(s) across the site are adhered to and accurate to site conditions. • Undertake inspections to ensure compliance.
Construction Site Manager	• Ensuring workers and subcontractors are inducted into the CWMP along with other applicable management plans. • Responsible for undertaking procurement of construction materials in accordance with the waste management hierarchy. • Segregation of waste streams where required to ensure appropriate use, treatment and/or disposal.
Health and Safety Manager	• Safety inductions for all staff, workers and visitors. • Work with Construction Site Manager to determine safe handling of asbestos waste in compliance with regulatory requirements.
Site Workers	• Responsible for acting in accordance with the CWMP and site inductions. • Informing the Construction Site Manager of any waste management incidences and Health and Safety Manager of any safety issues associated with on-site activities.

6.1 Training and Awareness

Staff present on site during the construction stage of the project will be required to undertake induction and awareness training inclusive of the CWMP and site-specific waste management. This includes:

- Induction to the waste management hierarchy and use across the site; and
- Details of responsibilities for waste management and key personnel;
- Site specific waste management practices relevant to the project stage such as:
  - Waste storage and stockpiling locations;
  - Waste disposal requirements;
  - Hazardous or special wastes;
  - Record of waste disposal details and receipts; and
- Knowledge of emergency response procedures and contacts; and
- Asbestos Awareness Training (if asbestos is identified on site).

Signage will be provided on site to ensure waste management measures are communicated across the subject site, particularly for contractors and visitors who are not regularly on site. Signage will highlight correct procedures for separating wastes where required, locations of bins and waste storage areas, labelling of designated bins, potential hazards associated with the waste streams and handling, and contact details should any issues be encountered.

Signage will be prepared and located on site in accordance with the Australian Standard (AS 1319) for safety signs, and the NSW EPA and Australian Standard for recycling signage.

7. Monitoring and Reporting

The following activities will be undertaken to inform future onsite waste management and to determine the success of the CWMP:

- Ensure waste quantities generated are recorded, including tracking of receipts from waste recycling or disposal via the appointed waste contractor;
- Record waste classification and testing results;
- Review the CWMP in light of any changes to construction activities or further information which may alter waste management practices;
- Undertake auditing of waste management across the site as a component of broader environmental site audits;
- Undertake visual inspections daily to ensure waste management controls are implemented and maintained across site; and
- Undertake final review of the CWMP upon project completion to ensure information accurately reflects site activities, and to assist future waste management.

Outcomes of audits and waste tracking will be reported to the client or the Principal Contractor, potentially through weekly or monthly reporting to ensure waste management objectives are adhered to.

7.1 Corrective Action

Where formal auditing, daily visual inspections or incident reporting identify incorrect storage or disposal procedures, or maintenance or waste management issues, observations will be promptly reported to the Construction Site Manager and recorded. The Construction Site Manager will determine appropriate measures to rectify the issues in a timely manner in consultation with the Environmental Management Representative and Health and Safety Manager where required.

8. Recommendations

This Construction Waste Management Plan will need to be updated once construction volumes have been finalised and temporary waste storage areas have been identified.

This CWMP must be in accordance with the sites SEARs application (SSD 9934) which requires the following waste management measures to be addressed:

'*Identify, quantify and classify the likely waste streams to be generated during construction and operation and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste. Identify appropriate servicing arrangements (including but not limited to, waste management, loading zones, mechanical plant) for the site.'*

Prior to commencement of construction, a Construction Environmental Management Plan (CEMP) will need to be developed. This CWMP will form a sub-plan of the CEMP for the redevelopment works. The CEMP should also include a soil management plan and an asbestos removal control plan (if asbestos is identified).

9. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquiries.

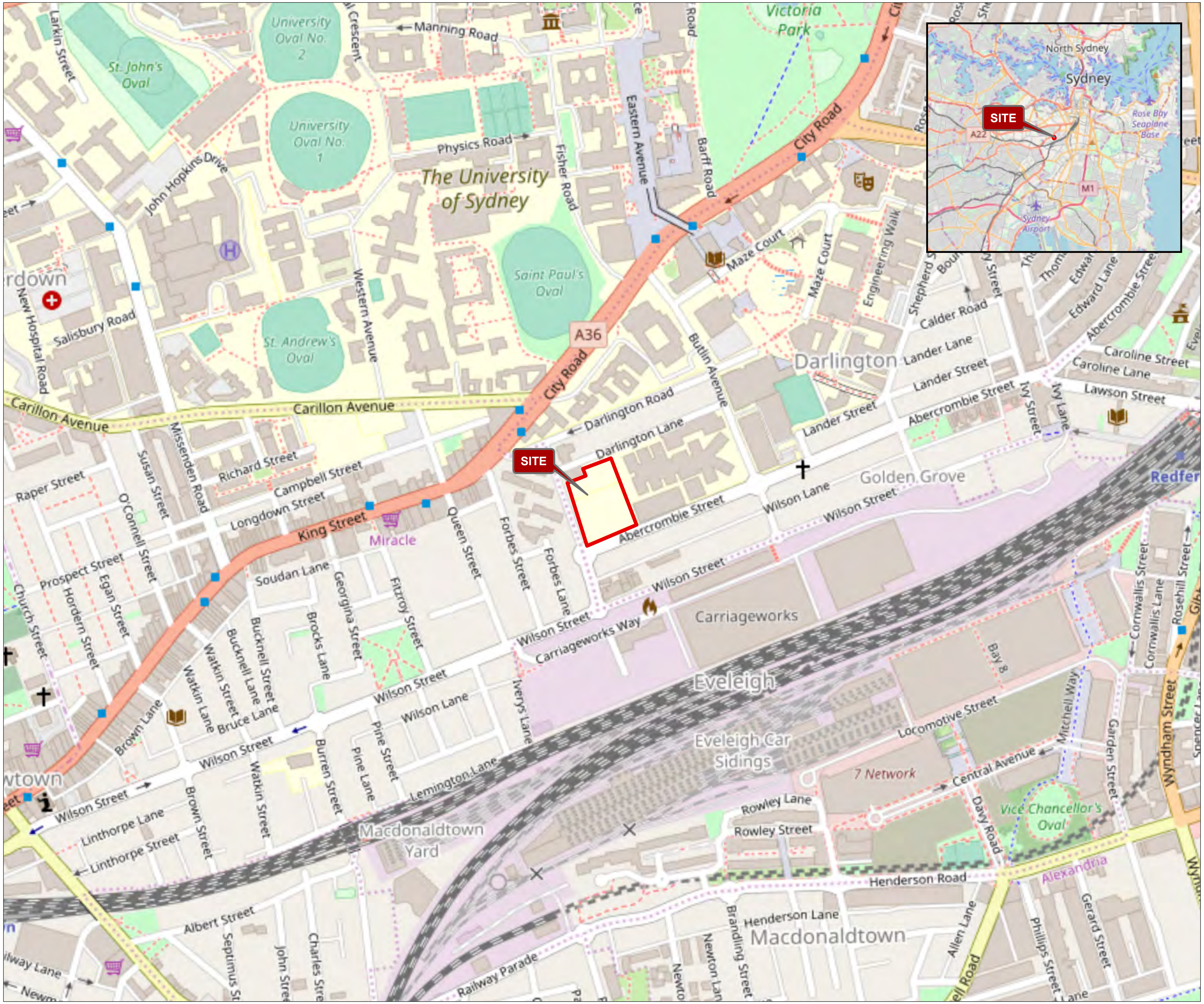
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Figures



Legend:
🟥 Approximate Site Boundary

JBS&G

Job Number: 58181	
Client: School Infrastructure	
Version: R01 Rev A	Date: 31/03/2020
Drawn By: AV	Checked By: RL
Scale 1:7,500	

0 70 140
metres

Coord. Sys.

417 – 445 Abercrombie Street
Darlington, NSW

SITE LOCATION

FIGURE 1

File Name: N:\Projects\School Infrastructure\56243 Darlington PS WMPs\GIS\56243.aprx
Reference: © OpenStreetMap (and) contributors, CC-BY-SA

Legend:

🟥 Approximate Site Boundary

JBS&G

Job Number: 58181

Client: School Infrastructure

Version: R01 Rev A	Date: 31/03/2020
Drawn By: AV	Checked By: RL

Scale 1:750

0 7 14

metres

Coord. Sys. GDA 1994 MGA Zone 56

417 – 445 Abercrombie Street
Darlington, NSW

SITE LAYOUT

FIGURE 2

File Name: N:\Projects\School Infrastructure\56243 Darlington PS WMPs\GIS\56243.aprx
Reference: Nearmap - www.nearmap.com - Imagery Date: 12-05-2019

Appendix A Design Drawings


NEIGHBOURING PROPERTY
UNIVERSITY OF SYDNEY
1
2
3
4
Bulk Waste Store
7.5 m2
CC.17
Comms
10.49 m2
EDB
CC.09
Laundry
5.2 m2
CC.04
Toilets
7.35 m2
CC.18
Indoor/Outdoor
Store
9.2 m2
35.600
FFL +36.830
CC.12
Cleaner
1.45 m2
CC.10
Staff WC
11.04 m2
PAA
3.14 m2
CC.01
Preschool 1
65.19 m2
Mech Plant
14.38 m2
CC.08
Staff Room
17.47 m2
CC.02
Preschool 2
75.19 m2
Cold
Water
Pump
10 m2
Circulation
PAA
3.12 m2
Water Meter
3.75 m2
PV
Inverters
CC.11
Kitchen
19.06 m2
MSB
CC.15
Store
2.61 m2
Circ
Riser
CC.14
Store
2.61 m2
CC.05
Toilets
12.53 m2
FFL +35.520
35.50
CC.07
Office
9.66 m2
CC.03
Preschool 3
75.5 m2
FFL 35.500
EMERGENCY PARKING
ONLY
Foyer
PAA
2.75 m2

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