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Long Term Environmental Management Plan

Wentworth Point High School, 7 Burroway Road, Wentworth Point, NSW 2127

RobertsCo
12 June 2024

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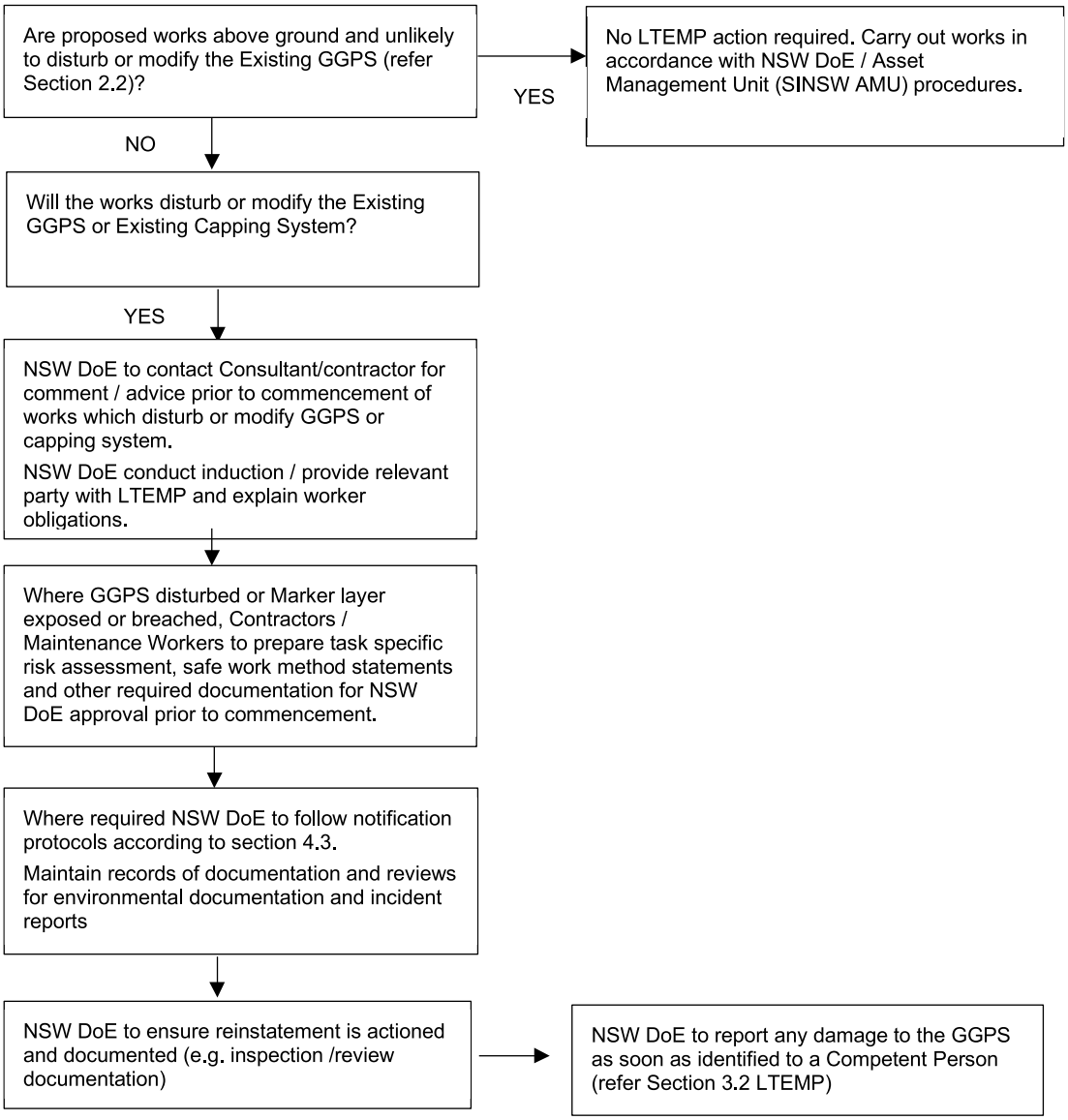
Executive Summary of Environmental Management Controls

This Long-Term Environmental Management Plan (LTEMP) applies to the Wentworth Point High School located at 7Burroway Road, Wentworth Point, NSW (the site). The site is legally identified as Lot 1 in DP1276305 and occupies an area of approximately 0.95 ha. The site location and site layout plan are presented in Figures 1 and 2, Appendix A respectively.

To ensure that site buildings, below ground utilities (i.e. electrical / communications / stormwater / sewer pits) and site users (e.g. staff, children, parents, visitors, maintenance staff) are protected from potential hazards associated with landfill gas (e.g. explosion or asphyxiation) and contaminated material underlying capping layers, it is imperative that the requirements of this LTEMP are understood and strictly adhered to by relevant personnel as a requirement of continued site suitability. It is the responsibility of Department of Education (NSW DoE) and Infrastructure Assets Branch (IAB) to ensure that all relevant parties are aware of the existence of this LTEMP and comply with its requirements. The nature and extent of the installed GGPS and capping layer are presented in Figure 3 Appendix A. Chart E1 provides the decision matrix for any works that may breach the capping layer (in the western portion of the site) or the ground gas protection system (GGPS) installed under the site structures.

Chart E1: General LTEMP process Flow Chart and Actions



Additional actions to be implemented:

Monitoring

- Geosyntec for 12 months on behalf of NSW DoE
- Based on findings review whether ongoing monitoring is required in consultation a NSW EPA accredited Site Auditor.

NSW DoE Administrative processes

- Annual LTEMP review for compliance with fire safety schedule.
- Ensure LTEMP is incorporated into Facilities Management System

A summary of LTEMP requirements and corresponding control measures are presented in Table E1.

Table E1: Summary of activities that trigger LTEMP control measures, and associated responsibilities and record keeping

LTEMP Requirement	LTEMP Control Measures (corresponding Report Sections)
Future Building, Landscaping or Services Modification / Construction Works	
Modification or installation of service entries to the buildings that could provide a preferential pathway of landfill gas migration. This relates to modification of existing services and installation of additional service entries.	Section 3.2: Appoint an appropriately qualified environmental consultant with experience in landfill gas protection design (e.g. suitably qualified environmental consultant) to provide advice prior to conducting such works.
Modification or installation of below ground utilities that could provide a preferential pathway for landfill gas migration from the site	
Erection of enclosed external structures (around existing buildings) or enclosed temporary structures where landfill gases could accumulate.	Any intentional disturbance by penetration / excavation within the building footprint may damage the existing GGPS or excavation breaching the capping layer in the western portion of the site. These activities need to be managed in accordance with Section 6.0. As built drawings, technical specifications and warranty information are provided in Appendix B. Refer to section 2.2.2 for detail on GGPS. Refer to Section 4, Table 4.1 for detail on monitoring program.
Disturbance to the site surface which is significant enough to reduce the capping layer thickness or for the marker layer to be exposed/breached	Section 3.2: Contact an Environmental Consultant to ensure that proposed works are acceptable and obtain guidance for compliance / procedures required to maintain the integrity of capping. Consult with other LTEMP Stakeholders, as required.
Ongoing Responsibilities, Notification Triggers and Contractor Management	
NSW DoE to conduct LTEMP inductions	Section 3.1 and Appendix D
NSW DoE to incorporate the LTEMP into the facilities asset management system for the site (e.g. Asbestos register)	Section 3.2
Responsibilities under LTEMP for: • NSW DoE Facilities Operations Manager (or delegation to Head Contractor) • Contractors and Maintenance Workers • Environmental Consultant	Section 3
Notification event / triggers and corresponding NSW DoE actions, with guidance from suitably qualified Environmental Consultant	Section 4.3 / Table 4.3
Implementation of a verification inspection and monitoring programme for 12 months from LTEMP finalisation by suitably qualified Environmental Consultant on behalf of NSW DoE	Section 4
NSW DoE to ensure that Contractors / Maintenance Workers have prepared task specific risk assessment, safe work method statements and appropriate control measures prior to conducting any works below the existing site surface	Section 5 and 6
NSW DoE to ensure that Contractors / Maintenance Workers have established appropriate environmental controls where residual contaminated materials are to be excavated and reinstated	Section 5 and 6
NSW DoE to ensure that any proposed disturbance or damage to the Existing GGPS is notified immediately to suitably qualified Environmental Consultant to ensure that repairs meet the original design intent / current best practice	Section 6, Appendix B
Record Keeping	
NSW DoE to maintain the following records to demonstrate compliance with the LTEMP:	Section 7

LTEMP Requirement	LTEMP Control Measures (corresponding Report Sections)
• Contractor / Maintenance Worker competencies • Reviews of safety documentation • Reviews of environmental documentation • Reviews of reinstatement documentation • Review of incident reports • Annual compliance reviews	

Table of Contents

Appendices

Tables

List of Acronyms

DoE: Department of Education
GGPS: Ground Gas Protection System
LTEMP: Long-Term Environmental Management Plan
SINSW AMU: School Infrastructure NSW Asset Management Unit

1 Introduction

Geosyntec Consultants Pty Limited (Geosyntec) was requested by Roberts Co (NSW) Pty Ltd (Roberts Co), on behalf of Department of Education (School Infrastructure NSW) (NSW DoE) to prepare this Long-Term Environmental Management Plan (EMP) for the Wentworth Park High School located at 7Burroway Road, Wentworth Point, NSW (the "site"). The site boundary and layout are shown in Figures 1 and 2, Appendix A respectively.

The site comprises approximately 0.95 hectares and is legally known as legally identified as Lot 1 in DP1276305.

Important Note

To ensure that the school infrastructure and human health are protected from potential hazards associated with ground gas (e.g. explosion or asphyxiation), it is imperative that the requirements of this EMP are understood and strictly adhered to by relevant personnel (Refer to Section 3 for responsibilities).

The site is considered suitable for –High School use subject to the implementation of this LTEMP.

Normal day to day use of the site as a high school can be undertaken without restrictions. However, ongoing management of the site through the implementation of this LTEMP is required to maintain the cap and to provide management measures during any future sub-surface works that may breach or interfere with the capping and the ground gas protection system that have been installed at the site

To maintain the integrity of the ground gas protection system (GGPS) installed under buildings, NSW DoE must ensure that relevant personnel working at the site are aware of the existence of this LTEMP and any modifications to the current school buildings and its immediate vicinity are assessed by a Competent Person (e.g. an appropriately qualified Environmental Consultant with experience in gas protection design) for the potential to create additional risks from hazardous ground gas. For example:

- Damage to any of the GGPS Components or Monitoring Points;
- Interference or blockage of GGPS vents and inlets;
- Modification or installation of additional cable conduits to the building that could provide a preferential pathway for hazardous ground gas migration;
- Modification or installation of below ground utilities that could provide a preferential pathway for landfill gas migration from the site; and / or
- Erection of enclosed external structures or enclosed temporary structures where hazardous ground gas could accumulate.

NSW DoE must ensure that a review of compliance with this LTEMP is conducted as a component of the NSW DoE Periodic Maintenance Programme for the School buildings, as discussed in Sections 1.2, 3 and 7.

1.1 Background

The site is located within the Wentworth Point peninsula that was historically filled as part of land reclamation and used for light industrial purposes. The peninsula is progressively being remediated and redeveloped for mixed uses.

The soil within the high school site is contaminated with a combination of petroleum hydrocarbons, heavy metals, PAHs, asbestos (bonded and friable), hazardous ground gases and the presence of potential or actual acid sulfate soils which were remediated by capping strategy and ground gas protection system. Further detail is provided in Section 2.2 on remediation works completed at the site including the installation of a capping layer over impacted fill material remaining at depth, and the ground gas protection system installed under the buildings.

1.2 Objectives of the EMP

The LTEMP has the following objectives:

- Document the nature and extent of known contamination remaining at the site that requires ongoing environmental management;
- Outline controls to be implemented during any future development and/or maintenance works at the site; and
- Document required monitoring to confirm that landfill gas is not present at concentrations which have the potential to cause harm.
- Outline corrective measures to restore the site should the cap or the GGPS be breached, to maintain the site suitability for continued high school activities.

From a landfill gas perspective, this LTEMP (or subsequently approved amended versions) will be implemented for the life of the development or until such time as it is determined that landfill gas concentrations at the site are no longer deemed to pose a risk when assessed in accordance with legislation or applicable guidelines.

Management of the capping layer in accordance with this LTEMP (or subsequently approved amended versions) will be required for the life of the development to manage ongoing risks associated with buried soil contaminated with a combination of petroleum hydrocarbons, heavy metals, PAHs, asbestos (bonded and friable), hazardous ground gases and the presence of potential or actual acid sulfate soils.

1.3 LTEMP Public Notifications and Enforcement Mechanism

The LTEMP will be required to be publicly notified on the section 10.7 planning certificate for the site. The mechanism to make the LTEMP legally enforceable is via SSD-11802230 consent condition E6 for the development.

1.3.1 Legal Requirements

Given the presence of asbestos impacted fill materials beneath the capping layer, and the site will be occupied by workers, tenants and visitors, the legal requirements of *Work Health and Safety Regulation 2017* are triggered with respect to asbestos. To comply with WHS regulations, an asbestos register is required for the residual asbestos impacted fill below the cap. The *Work Health and Safety Regulation 2017* are legally enforceable via the provisions within the legislation. Further requirements on management of residual asbestos are stated in Section 6.2.2.

Work which involves removal of asbestos containing material will require the presence of a licenced asbestos removalist in accordance with Clause 458 of *Work Health and Safety Regulation 2017*. Works should be undertaken in accordance with the Safe Work Australia (2020) *Code of Practice How to Manage and Control Asbestos in the Workplace* and Safe Work Australia (2020) *Code of Practice How to Safely Remove Asbestos*.

1.4 Current Stakeholders

The following is a list of relevant stakeholders during the operation of the site:

- NSW DoE and SINSW AMU – Asset holder, and key stakeholder(s) for the implementation of the LTEMP;
- Suitably Qualified Environmental Consultant – Environmental Consultant and GGPS Independent Verifier;
- NSW EPA Accredited Site Auditor – as required
- NSW EPA – Environmental Regulator; and
- City of Parramatta Council.

2 Site Identification

Site details are provided below in Table 2.1. The location and layout of the site are shown on Figures 1 and 2, Appendix A respectively. The site identification and land use details include:

Table 2.1: Site Identification.

Title	Details
Street Address:	7 Burroway Road, Wentworth Point, NSW 2127 Boundary Coordinates: Easting: Northing: 322369 6255632 322294 6255683 322298 6255684 322358 6255771 322430 6255721
Property Description:	Lot 1 in DP1276305
Current Site Ownership:	NSW Department of Education
Geographical Coordinates:	Lat: -33.823734° Long: 151.080786°
Property Size:	Approximately 0.95 hectares
Local Government Area:	City of Parramatta Council (formerly Auburn City Council)
Zoning – Existing:	B1 Neighbourhood Centre, R4 High Density Residential and RE1 Public Recreation (Auburn Local Environmental Plan (ALEP) 2010 and Draft Parramatta Local Environmental Plan 2020)

2.1 Surrounding Land Use

Land use immediately adjoining the site, at the time of preparing this LTEMP, is described as follows:

Table 2.2: Immediate Site Surrounds.

Title	Details
North:	Vacant land comprising part of the proposed Wentworth Point Peninsula Park redevelopment area followed by Parramatta River.
East:	Vacant land comprising part of the Wentworth Point Marina and Rowing Club redevelopment area followed by Homebush Bay.
South:	Burroway Road followed by a construction site.
West:	Wentworth Point Public School followed by Marina Square Shopping Mall.

2.2 Current Site Condition

The EMP is to be applied to the entire site and consists of management of the capping system extending across the site and GGPS within the building footprint as discussed in the following sections.

2.2.1 Capping System

The adopted remedial strategy included cap and contain with the intention of enabling the redevelopment of the site without extensive generation of waste material requiring off-site disposal. Specifically, capping of the entire site with a minimum 500 mm of validated clean fill VENM or excavated natural material (ENM) which occurred over two phases of civil works.

Between 2019-2020 the western portion of the site was capped with imported VENM at least 500 mm thick. Early works program by Roberts Co between November-December 2021 included removal of concrete slab and levelling of the site, the installation of a geotextile marker and interim capping across the area not previously capped during the 2019-2020 works.

The final finished levels and thickness of the VENM were confirmed with survey information, following completion of the remedial works (included in Appendix E).

In summary, the **Capping System** installed at the site comprises the following:

- Beneath buildings, hardstanding, or walkway slabs:
  - Geotextile Marker Layer (TerraStop HVL Geotextile - Orange);
  - 500mm of validated clean fill VENM and/or excavated natural material (ENM).
  - A reduction in capping thickness to 300mm was endorsed by the Auditor (email dated 24 February 2023,) for all vertical walls requiring backfilling (i.e. retaining walls), with a marker layer placed above the fill, and the capping layer consisting of 100 mm of hazardous ground gas protection system, and 300 mm concrete slab.
- Areas of landscaping (western portion of the site) underlain by the following (bottom up):
  - Geotextile Marker Layer (TerraStop HVL Geotextile - Orange);
  - 300 mm of validated clean fill VENM and/or excavated natural material (ENM).
  - 200mm of imported Growth Medium (locally thinning to 100mm at hardstanding interfaces to achieve site grading requirements); and
  - 50mm of Turf.

During the development phase, various pits and trenches were excavated to facilitate piling, services and a lift pit. A marker layer was placed at the bottom of these pits/trenches and backfilled with clean VENM material.

2.2.2 Localised Thinning of Cap

Following a request from RobertsCo to Geosyntec, Auditor approval was obtained for reducing the capping thickness to 400mm, where retaining walls and pits were backfilled with material sourced from piling spoil (including contaminated material below the marker layer).

The minimum capping thickness requirements was achieved across the site with the following minor exceptions:

- Turfed area in the southwestern corner of the site (insert approximate area e.g. 4 x 10 m) – This area has a minimum capping thickness of approximately 0.25m (refer to Appendix A, Figure 4) to facilitate site drainage. This deviation from the original requirement of 0.5m is not considered to affect the validation outcomes for the following reasons:

- This thinning is very localised, occupying a relatively small area of the total turf play area (refer to Figure 4, Appendix A)
- The minimum thickness of approx. 0.25m still provides a physical barrier between the contaminated soils beneath the marker layer and any potential receptor.
- The marker layer remains the trigger for the management actions. If surface inspections as required under LTEMP identify damage to the capping system, including exposure of the marker layer, corrective actions will be required.
- The area of localised thinning will be documented in the LTEMP.
- The average capping thickness of the turf area capping layer exceeds the minimum requirement.
- Based on the above, the capping system in the turfed area as a whole is considered to provide a sufficient barrier to underlying site soils, noting that the area of localised thinning will be recorded in the LTEMP. This deviation is not considered to affect the validation outcomes or the suitability of the site for the proposed use as a High School.
- Building footprint - It was noted that some locations beneath the building hardstand had capping thickness below the 0.5m requirement (minimum thickness 0.23m). The presence of hazardous ground gas protection system (100mm) and structural slab (300mm) are considered to provide a sufficient barrier, restricting access to these areas. Nonetheless, for completeness, these areas have also been shown on Figure 4, Appendix A and will be documented in the LTEMP.

Figure 5, Appendix A provides a profile for each of the capping layers installed at the site.

2.2.3 Inert Foreign Materials in Shallow Capping Layer

Inert construction materials (a brick fragment, occasional asphalt fragments, shells and a plastic lid) were observed in two shallow (<0.3m deep) trenches in the north-western portion of the site.

These two trenches were adjacent to each other in a series of seven trenches excavated for drainage purposes across the western portion of the site (refer to Figure 7, Appendix A). These trenches were installed within the previously installed VENM capping layer, above the original marker layer previously installed by Ford Civil.

The shallow find was within re-worked VENM which was excavated from the original placement to facilitate installation of services, and then reinstated.

Observed inert construction material was inconsistent with previous observations during Geosyntec site works.

To address the anomaly in the capping profile, nine test pits were excavated in the vicinity of the affected drainage trenches to observe the nature of the material (shown in Figure 7), and delineate it's extent. It is noted that the original marker layer was not breached. Within these test pits, similar inert materials were sporadically observed (including occasional brick, concrete, shells and occasional asphalt inclusions) in six of the nine test pits. The soil matrix was observed to be consistent with the various VENM materials previously validated as part of early works.

The test pits and shallow trench excavations were visually inspected, with no potential ACM, staining or potential indicators of contamination noted.

As presented in Figure 7 Appendix A, the occurrence of the observed foreign materials was delineated by a combination of test pits and adjoining drainage piping trenches based on visual observations, specifically:

- No observations of such materials within adjoining drainage trench to the north.
- No observations of such materials within adjoining drainage trench to the south, as well as TP8 and TP9.
- No observations of such materials within adjoining drainage trench to the east, as well as TP6 and TP9.
- Presence of site boundary to the west.
- Based on the above, the occurrence of anthropogenic materials is considered to be localised.

On the basis of the above findings, the presence of inert construction materials was not considered to affect the suitability of the capping layer in performing its function as a barrier to underlying impacted fill, beneath the original marker layer installed by Ford Civil.

The Auditor concurred with Geosyntec's evaluation via email correspondence dated 14 May 2024.

2.2.4 Ground Gas Protection System (GGPS)

The GGPS Components and Monitoring Points are presented within the as-built drawings (Liquid Boot Hybrid & Ventcell 90 System Cross Section) presented in Appendix B. The components of the system are summarised as follows (described from the base to the top):

- Formation Protection Layer: Terrastop A1 to prevent silting of the overlying void former;
- Ventilated Void: VentCell 90;
- Lower Protection Layer: Terrastop C1 X geotextile to protect the membrane;
- Gas Membrane: Liquid Boot Plus Membrane (minimum 1.0mm Liquid Boot applied to a VI-20 membrane) beneath floors and Liquid Boot direct application to basement walls (minimum 1.5mm thickness);
- Upper Protection Layer: Terrastop C1 X geotextile to protect the membrane;
- Floor Slab: Any joints or penetrations were filled to prevent gas ingress using a suitable sealant;

Inlet, outlets, and subfloor monitoring point details are presented Tables 2.3-2.5:

Table 2.3: Inlet Vent Details

Area	Location IDs (Appendix B)	Pipe Size (mm)	Minimum Clear Venting Area (mm^2)
Sports Hall	IB6-1	225 Bollard	39,760
	IB6-2	225 Bollard	at approximately 9m spacing located along the western face of the building
	IB6-3	225 Bollard	
	IB6-4	225 Bollard	
	IB6-5	225 Bollard	
School Building East (Northern Portion)	IG1-1	150 Grate	17,670
	IG1-2	150 Grate	at approximately 9m spacing located along the northern face of the building
	IG1-3	150 Grate	

School Building East (Central Portion)	IB1-1	150 Bollard	17,670
	IB1-2	150 Bollard	at approximately 9m spacing located along the eastern and western faces of the building
	IB2-1	150 Bollard	
	IB2-2	150 Bollard	
	IB2-3	150 Bollard	
	IB2-4	150 Bollard	
	IB2-5	150 Bollard	
	IG1-4	150 Grate	
	IG2-1	150 Grate	
	IG2-2	150 Grate	
	IG2-3	150 Grate	
	IG2-4	150 Grate	
	IG2-5	150 Grate	
School Building East (Southern Portion)	IG3-1	150 Grate	17,670
	IG3-2	150 Grate	at approximately 9m spacing located along the eastern and western / southwestern faces of the building
	IG3-3	150 Grate	
	IG3-4	150 Grate	
	IG3-5	150 Grate	
	IG3-6	150 Grate	
	IG3-7	150 Grate	
	IG3-8	150 Grate	
	IG3-9	150 Grate	
School Building Southwestern	IG4-1	150 Grate	17,670
	IG4-2	150 Grate	at approximately 6m spacing located along the southwestern, southern and southeastern faces of the building
	IG4-3	150 Grate	
	IG4-4	150 Grate	
	IG4-5	150 Grate	
	IG4-6	150 Grate	

Table 2.4: Outlet Vent Details

Area	Location IDs (Appendix B)	Pipe Size (mm)	Minimum Clear Venting Area (mm^2)
Sports Hall	O5-1	225 Outlet	39,760
	O5-2	225 Outlet	at approximately 9m spacing located within the riser cupboards along the eastern side of the building. Below slabs solid piping is installed to achieve equidistant vent spacing within this portion.
	O5-3	225 Outlet	
	O5-4	225 Outlet	
	O5-5	225 Outlet	
School Building East (Northern Portion)	O1-1	150 Outlet	17,670
	O1-2	150 Outlet	Below slabs solid piping is installed to achieve equidistant vent spacing within this portion.
	O1-3	150 Outlet	
	O1-4	150 Outlet	
School Building East (Central Portion)	O2-1	150 Outlet	17,670
	O2-2	150 Outlet	Below slabs solid piping is installed to achieve equidistant vent spacing within this portion.
	O2-3	150 Outlet	
	O2-4	150 Outlet	

School Building East (Southern Portion)	O3-1 O3-2 O3-3 O3-4	150 Outlet 150 Outlet 150 Outlet 150 Outlet	17,670 Below slabs solid piping is installed to achieve equidistant vent spacing within this portion.
School Building Southwestern	O4-1 O4-2 O4-3	150 Outlet 225 Outlet 225 Outlet	17,670 in the riser cupboards along the northern face of the building. Below slab solid piping is installed to achieve equidistant vent spacing within this portion.

Table 2.5: Subfloor Monitoring Points Locations

Area	Location IDs (Appendix B)	Pipe Size (mm)
Sports Hall	SF6-1 SF6-2 SF6-3	¼" LLDPE Tube
School Building East (Northern Portion)	SF1-1 SF1-2 SF1-3	¼" LLDPE Tube ¼" LLDPE Tube ¼" LLDPE Tube
School Building East (Central Portion)	SF2-1 SF2-2 SF2-3	¼" LLDPE Tube ¼" LLDPE Tube ¼" LLDPE Tube
School Building East (Southern Portion)	SF3-1 SF3-2 SF3-3	¼" LLDPE Tube ¼" LLDPE Tube ¼" LLDPE Tube
School Building Southwestern	SF4-1 SF4-2	¼" LLDPE Tube ¼" LLDPE Tube

Table 2.6: Clay Plug Locations

Location (Appendix B)	Location IDs (Appendix B)	Location
0	Stormwater Pit	Southern Site Boundary
1	Stormwater Pit	Southern Site Boundary
2	Pressurised Sewer Line	Southern Site Boundary
3	NBN Conduits	Southern Site Boundary
4	Water Main	Southern Site Boundary
5	Gas Main	Southern Site Boundary

- All the services enter or exit a site, and the gas source is considered likely to track along penetrations, utility excavations sympathetically designed using clay plug (approved by the Auditor) to ensure that they do not provide a preferential conduit for gas migration (Appendix B).
- No pits have been identified within the enclosed GGPS extent.

Maintenance works on the GGPS Components and Monitoring Points described above should be conducted by suitably experienced persons only. Management of future below ground works or maintenance of the GGPS components and monitoring points described above (and the associated health & safety risks) must include consideration of the information presented in Section 6 of this EMP.

2.2.5 Residual Contamination

Whilst the site has been demonstrated as being suitable for use, contaminants are present in various media beneath the capping system will need to be managed accordingly depending on future activities.

During monitoring, contract and / or maintenance activities which involve excavation below the current site's surface (i.e. concrete slab / hardstanding or geotextile marker layer), it is possible that workers may come into contact with contaminated material or locations with potential presence of hazardous ground gas.

In the site, potential contaminants of concern in fill include petroleum hydrocarbons, heavy metals, PAHs, asbestos (bonded and friable), hazardous ground gases and the presence of potential or actual acid sulfate soils.

Potential contaminants in groundwater may include any of the above, excluding asbestos. Based on information presented in historical investigation reports conducted between 2015 and 2018, the depth to groundwater was between 2 to 3m below ground level.

Potential gaseous contaminants may include methane, carbon dioxide, carbon monoxide. hydrogen sulfide and volatile organic compounds (VOCs). However, based on the pre-occupation monitoring results, the key gaseous contaminants include methane and carbon dioxide.

Management of future below ground works or maintenance of the Existing GGPS (and the associated health & safety risks) must include consideration of the information presented in Section 6 of this LTEMP.

2.3 Active or Passive EMP

Section 5.2.1 of the NSW EPA (2020) Hazardous Ground Gas Guidelines states that passive EMPs do not require intervention other than inspection or maintenance once installed (e.g. membrane and natural venting). Active EMPs are defined as forced ventilation systems. Consequently, this EMP is passive in nature.

3 Responsibilities

This section summarises the responsibilities of relevant parties under this LTEMP. The responsibilities have been allocated according to the party best placed to manage the requirements.

The responsibilities may be delegated where appropriate, however this must be done in writing and notified to all affected parties.

NOTE: The ultimate responsibility for compliance with the LTEMP cannot be delegated and must be retained by a NSW DoE representative.

3.1 LTEMP Induction

All personnel proposing to conduct any task that involves disturbance of the site surface, GGPS components or monitoring points must complete an environmental awareness induction prior to their commencement of works on the site. The awareness induction will include:

- An outline of intended works including methodology and extent; and
- Contents of the LTEMP and individual's responsibilities.

The delivery of the induction will be conducted by NSW DoE or a delegated party / appointed site environmental manager. All personnel must adhere to the requirements of this LTEMP.

Furthermore, Contractors / Maintenance Workers who are proposing to conduct any task that involves site surface disturbance which is significant enough for the marker layer to be exposed/breached, and/or modify/disturb the GGPS or monitoring points (section 2.2.2) must prepare their own task specific environmental and safety documentation, which must be prepared in accordance with the control measures required by this LTEMP (Section 5.6, Table 5.1) and will be adhered to for the duration of their works.

3.2 Responsibilities

This EMP sets out NSW DoE responsibilities as site owner. NSW DoE will manage these responsibilities by including the EMP and its requirements in the facilities management system (FMS) or similar for the site. School Infrastructure NSW Asset Management Unit (SINSW AMU) / NSW DoE will register the LTEMP in their current management system for regular asset maintenance and scheduled works.

In the event of failure to sign off the tasks as complete, the tasks are escalated from the NSW DoE Facilities Manager (from AMU) – higher levels of management until completed. NSW DoE must be prepared to demonstrate this tool and its functionality in relation to the EMP to any key stakeholders listed in Section 1.4 above, if requested.

Table 3.1: Responsibilities.

Party	Responsibility of Party
NSW DoE	• Maintain ultimate responsibility for implementation of the EMP. • Ensure that compliance with this EMP is enforced as part of the NSW DoE Periodic Maintenance Programme for the school. • Review the effectiveness of the EMP as part of the NSW DoE Periodic Maintenance Programme and following any incident or other event that suggests the EMP is ineffective. • Record any review of the EMP undertaken and ensure that any improvements deemed necessary are implemented and communicated to relevant parties. • Ensure that enough resources are allocated to comply with the requirements of this EMP. • Ensure that relevant parties working at the site are aware of the existence of this EMP and any modifications to the current buildings and its immediate vicinity are assessed by a Competent Person (e.g. an appropriately qualified Environmental Consultant with experience in gas protection design) for the potential to create additional risks from hazardous ground gas. For example: - Damage to any GGPS components or monitoring points; - Modification or installation of additional cable conduits to the buildings that could provide a preferential pathway for hazardous ground gas migration; - Erection of enclosed external structures or enclosed temporary structures where hazardous ground gases could accumulate; and / or - The external staircases (if applicable) must not be enclosed. • Where responsibility for ownership / management changes, ensure that new parties are aware of remediation works that have been undertaken and the need to review their own management measures to ensure that they are in line with the requirements of this EMP to ensure that the integrity of the GGPS components and monitoring points is not compromised and that there is no unacceptable risk to human health or the school buildings as a result of hazardous ground gas.
Wentworth Point High School Facilities Manager or similar.	• Communicate between the onsite Contractors / Maintenance Workers and the NSW DoE Facilities Manager, as required. • Ensure that the EMP is reviewed and updated if the school land use configuration is to be changed. • Ensure that contractors or maintenance workers engaged to undertake any works on site are suitably trained, qualified and experienced; notified of the existence of the EMP; and their required compliance with its content as relevant to their scope of works. • Ensure that contractors or maintenance workers are inducted into the site by a NSW DoE representative. • Arrange with a Competent Person (e.g. Environmental Consultant) for monitoring hazardous ground gas; the integrity of the GGPS components and monitoring points in accordance with Sections 4 and 5 of the EMP; and ensure remedial measures are implemented where problems are identified. • Report results to the EPA as required where hazardous ground gas concentrations are recorded above specified concentrations within this EMP. • Ensure that any issues that suggest that the EMP is ineffective are reported to the NSW DoE Facilities Manager. • Act as the contact point for any incident reporting. • Report any incidents to NSW DoE Facilities Manager.
Contractors and Maintenance Workers	• Appoint a suitably qualified, trained, and experienced Contractor Works Manager. • Ensure that risks have been assessed and suitable control measures implemented where the site surface will be disturbed. • Ensure that they are briefed on the presence of contamination below the site surface. • Ensure that they have been inducted into the site by a NSW DoE representative. • Develop task specific work health and safety (WHS) plan including safe work method statements, EMP or Construction Management Plan (CMP) for any proposed intrusive work. • Ensure that the GGPS components and monitoring points (refer to Section 2.2.2) are protected during future works. Any damage will need to be repaired by a suitably qualified and experienced contractor in accordance with the original specifications (refer to Appendix B).

Party	Responsibility of Party
	• Ensure that all workers are briefed on the presence of contaminated material below the site surface, the potential for hazardous gas in trenches, excavations, enclosed voids or within the GGPS components and monitoring point infrastructure. • Promptly notify any concerns regarding the implementation of this EMP to the Wentworth Point High School Manager.
Environmental Consultant	• Develop EMP • Provide support for implementation of EMP, as requested by the Wentworth Point High School Manager. • Conduct environmental inspections and monitoring, as requested by the Wentworth Point High School Manager. • If required, provide recommendations for changes to the EMP or additional works that may be necessary based on findings of environmental inspections and / or monitoring.

NSW DoE to ensure that maintenance works on the existing GGPS are conducted by suitably experienced persons only. Potential gaseous contaminants may include VOC's, methane, carbon dioxide, carbon monoxide and hydrogen sulfide. These contaminants may give rise to potentially harmful or explosive working atmospheres and Contractors will be required to demonstrate that they are taking appropriate steps to ensure that their works are conducted in a manner which does not endanger themselves, others and / or the development.

An example of an **EVENT / TRIGGER** and corresponding **ACTION** to be taken by NSW DoE is as follows:

- EVENT / TRIGGER: An acute or explosive risk from ground gases is known (e.g. as a result of monitoring conducted by a Contractor) or suspected.
- ACTION: Notify the emergency services and evacuate the Blocks using established fire safety procedures.

Further detail regarding potential events / triggers and corresponding actions to be taken by NSW DoE to ensure that the safety of the development and occupants is not compromised in the future is provided in Section 4.3 / Table 4.3.

NSW DoE is responsible for ensuring that the GGPS components and monitoring points are protected and maintained for the life of the school.

4 Monitoring Program

4.1 Introduction

The locations to be monitored are shown on As Built Drawings in Appendix B and are discussed in detail in the following Sections. Regular inspections and monitoring will be conducted by a suitably qualified Environmental Consultant, on behalf of NSW DoE, to ensure that the hazardous ground gas associated with contaminated fill not pose an unacceptable risk to human health, the existing development and / or the environment. Any damage to components or monitoring points referenced below will be reported to the NSW DoE Facilities Manager or similar so that prompt rectification can be organised. Table 4.1 outlines the methodology to be adopted for implementation of the monitoring programme.

Table 4.1: Monitoring Program for the Site (Initial 12 Months)

Area Description	Responsibility	Frequency	Purpose	Monitoring to be Undertaken
Existing Capping System and GGPS	NSW DoE	Quarterly for 12 months	To confirm that the integrity of the Capping System and Existing GGPS is not damaged / compromised by future site activities. The extent of the existing capping system can be found in Appendix A, Figure 2.	A visual inspection of the key components of the Capping System and Existing GGPS with findings reported in a proforma presented in Appendix C.
Inlet bollards and grills	NSW DoE	Quarterly for 12 months	To confirm that all the inlets are in an acceptable condition and free of debris, and any potential blockage. Examples of inlet terminations can be found in Appendix B, Figure B4.	A visual inspection of the inlets with findings reported in a proforma presented in Appendix C.
Temporary sealed conduits	NSW DoE	Quarterly for 12 months	To confirm that the integrity of the temporary sealing is not damaged. Locations of the temporary sealed conduits can be found in Appendix B, Figure B3.	A visual inspection of the seal on and a gas monitoring with findings reported in a proforma presented in Appendix C.
Service Pits 0 and 1 (sealed by clay plug)	NSW DoE	Quarterly for 12 months	To confirm that the integrity of the seal is not damaged. Location of the service pits can be found in Appendix B, Drawing 0000003	A visual inspection of the pits and a surface monitoring with findings reported in a proforma presented in Appendix C.
Outlet Vent Pipes and Whirly Birds	NSW DoE	Quarterly for 12 months	To confirm that the passive ventilation to the subfloor void is operating efficiently. Examples of outlet terminations can be found in Appendix B, Figure B2.	Monitoring of Outlet Vent Pipes for air flow and hazardous ground gases as detailed in Table 4.2.

Following the completion of the initial 12 months of monitoring, the requirement for monitoring will be evaluated subject to review based on the findings of the quarterly monitoring.
The recommended hazardous ground gas monitoring instruments: Huberg - Laser One Portable Gas Detector or similar unit: (CH_4: ppm), GA5000 Landfill Gas Analyser 1 or similar unit: (CH_4 %, CO_2 %, O_2 %, H_2S ppm, CO ppm), TSI anemometer or similar unit: flow rate (m/s)

In addition, Geosyntec do not consider ongoing inspection or monitoring of construction joints is warranted or practical for the following reasons (This was approved by the SIte Auditor):

- Suspended floor slabs (post tension slabs) are supported on piles and have been designed to span across large areas to accommodate risks of settlement. This is the design implemented at WPHS.
- Cold pour joints in building slabs and penetrations are accommodated waterbars.
- It was identified that below slab service cable hangers clash at several locations along the temporary movement joints (TMJ) preventing the installation of PVC water bars targeted at sealing joints in concrete floor slabs to prevent hazardous ground gas ingress. A tooled rebate was created at the TMJ atop the proposed grout using a timber formwork filet during concrete pours to facilitate the subsequent application of a bead of caulking to seal breaches in the concrete slab. The installation of caulking was verified by BGL and inspected by Geosyntec during floor slab inspections. This was approved by the Site Auditor prior to implementation.
- The method for managing discontinuity of water bars was considered satisfactory by the Site Auditor on 10 May 2023.

However, the Auditor required further inspections and monitoring to be included in the LTEMP if the degree of settlement of the slab or width of the bead is not known.

Geosyntec was advised by Colin Chu (Senior Design Engineer) on 19 June 2023 that, "*Construction joints are only temporary joints between two pours. Once both pours on either side is cast, it is considered structurally a continuous slab. The slab deflects as a whole, and there are no differential deflection expected locally at the joint between 2 pours, unless there is a serious construction and/or formwork defect".*

In addition, it is important to note that to address potential shrinkage in construction joints, a continuous gas membrane was installed beneath all joints to mitigate any potential HGG migration concerns.

Given the above points, settlement has been appropriately addressed as part of both the structural and GGPS components.

Given the justification above, the gas protection has been shown to perform as designed, and additional installation measures provide sufficient contingencies. On this basis the construction joints between Pour1-2 and Pour1-5 are not require inspection nor monitoring during operations.

4.2 Procedures

4.2.1 Visual Inspections

The visual inspection conducted by the Environmental Consultant will also include a review of any excavations and maintenance activity reports prepared by the NSW DoE Facilities Operations Manager to assess whether the works were undertaken in accordance with LTEMP requirements.

4.2.2 Outlet Vent Pipe Monitoring

Where possible monitoring should be conducted early in the day and at times of low and falling pressure. Monitoring should aim to capture at least two periods of likely worst case atmospheric conditions defined in NSW EPA (2020) as *"…fifth percentile three-hour pressure decrease rate for the site, based on a two-year data set for the nearest Bureau of Meteorology site with continuous pressure recording."*

Gas monitoring in the outlet vent pipes will be conducted using an Infra-Red Gas Analyser (e.g. GA5000 or similar). The instrument will be certified as being intrinsically safe. Air flow monitoring in the outlet vent pipes will be conducted using an anemometer (TSI or similar) so that performance of venting in m/s can be determined.

Monitoring will be conducted by connecting the gas analyser to a purpose-built monitoring port constructed above ground within or adjacent to each selected vent stack pipe. Monitoring will be recorded using the proforma presented in Appendix C. Once concentrations have been recorded in outlet vent pipes, the anemometer will be placed into the air stream in the centre of the outlet.

Table 4.2: Guideline Values for Monitoring Works

Monitoring Task	Location (No. of Location)	Contaminant of Concern	Guideline	Comment
Outlet Monitoring Points	See table 2.3	Methane	<1.0%v/v	Concentration at 0.3m/s wind speed (NSW EPA (2020) Very Good Performance)
		Methane	<2.5%v/v	NSW EPA (2020) Good Performance (NSW EPA (2020) Good Performance)
		Methane	5.0%v/v	Lower Explosive Limit
		Carbon Dioxide	<1.5%v/v	Concentration at 0.3m/s wind speed (DETR (1997) Partners in Technology Passive Gas Venting of Soil Gases Beneath Buildings Research Report – Target Equilibrium Design Concentration for passive ventilation measures)
Enclosed Ground Floor (sealed conduits)	See Appendix B, Figure B1 and B3	Methane	500ppm	CRC Care (2013) Immediate Action Level
		Methane	1.0%v/v	NSW EPA (2016) Notification Level
		Carbon Dioxide	5000ppm	SafeWork NSW Exposure Standard
		Carbon Dioxide	1000ppm[2]	ABCB/AIRAH (2018) Indoor Air Quality[3] SafeWork
		Oxygen	>19.5%v/v	NSW Exposure Standard[4]
		H2S	10ppm	SafeWork NSW Exposure Standard
		H2S	1ppm[5]	WHO (2000) Air Quality Guideline[5]
		Carbon Monoxide	30ppm	SafeWork NSW Exposure Standard
		Carbon Monoxide	6ppm	WHO (2010) Guidelines for Indoor Air[6]
Surface Monitoring (services)	See Appendix B, Drawing0000003	Methane	500ppm	NSW EPA (2016) Further Investigation Level
		Methane	2500ppm	SafeWork NSW Exposure Standard[1]
		Methane	1.25%v/v	NEPM (2013) Immediate Action Level

WHS Regulation (2017) Chapter 4, Part 4.3, Division 3, Clause 72: A person conducting a business or undertaking must ensure, so far as is reasonably practicable, that while work is being carried out in a confined space, the concentration of any flammable gas, vapour or mist in the atmosphere of the space is less than 5% of its LEL

These concentrations are equal to the typical detection limit of instruments commonly used for gas detection works. Concentrations above these criteria but close to the detection limit may be attributable to instrument sensor drift rather than the presence of contaminants, particularly where their detection is sporadic and / or localised.

Australian Building Code Board (2018) Handbook: Indoor Air Quality – ASHRAE 62.1 recommendation for occupant comfort.

SafeWork Australia states that air normally contains 21%v/v air by volume but oxygen levels between 19.5 and 23.5%v/v are considered to be safe.

World Health Organisation (2000) Air Quality Guidelines (24hr exposure) occupants. “Most probably, at concentrations below 1.5 mg/m3 (1 ppm), even with exposure for longer periods, there are very few detectable health hazards in the toxicological sense.”

World Health Organisation (2010) Guidelines for Indoor Air Quality – Selected Pollutants (24hr) exposure for occupants.

[1] WHS Regulation (2017) Chapter 4, Part 4.3, Division 3, Clause 72: A person conducting a business or undertaking must ensure, so far as is reasonably practicable, that while work is being carried out in a confined space, the concentration of any flammable gas, vapour or mist in the atmosphere of the space is less than 5% of its LEL

4.3 Corrective Actions / Contingency Plan

The Environmental Consultant will suggest corrective actions / contingency plans to address detections of landfill gases above the adopted guidelines. Some examples of such actions are summarised in Table 4.3. A comprehensive record of any actions must be kept.

Table 4.3: Examples of Corrective Actions/Contingency Plans.

Event / Trigger	Corrective Action / Contingency Plan
Outlet Vent Pipes and Subfloor Void Monitoring	
Methane (>1%v/v) or carbon dioxide (>1.5%%v/v) recorded in vent pipes above respective design thresholds at nominated wind speeds (<=0.3m/s)	Inspection to confirm no defect with infrastructure or instrument has occurred. If defect identified, rectify and reassess. An increased frequency of monitoring (e.g. weekly or monthly) will be conducted to determine that the results are reliable. No notification of external stakeholders required.
Methane (>1 and <5%v/v) or carbon dioxide (>5%v/v) recorded in vent pipes	Inspection to confirm no defect with infrastructure or instrument has occurred. If defect identified, rectify and reassess. NSW EPA (2015) Guidelines on the Duty to Report Contamination under the CLM Act 1997 states that *"Notification is not required if approved management measures are in place to control gas entry into buildings or underground services."* An increased frequency of monitoring (e.g. weekly or monthly) will be conducted to determine that the results are reliable. No notification of external stakeholders required.
Methane detected above a concentration of 5% v/v in vent pipes	Access to these areas would be restricted. An increased frequency (e.g. daily or weekly) of all monitoring locations listed in Table 4.1 above would be conducted to ensure that no immediate risk was being posed to the occupants of the building. Advise NSW DoE that EPA and Fire & Rescue NSW should be notified immediately and informed of subsequent developments in writing within 14 days. Dependent on the location of elevated methane concentrations additional ventilation would be introduced. Initially, gas can be vented to atmosphere by use of passive ventilation or intrinsically safe blowers and flexible conduit. Given the existing nature of the gas protection measures, for an integrated long term solution additional venting could only be provided by active means.
Landfill gas concentrations above adopted guidelines are recorded within a building	If landfill gas concentrations within the building exceed the guideline values but do not pose an acute or explosive risk, then access to those areas of the building would be controlled and / or temporarily evacuated in accordance with the Wentworth Point High School Fire Evacuation procedure.
Methane concentrations above explosive levels are recorded within a building	If landfill gas concentrations within a building are considered likely to exceed (i.e. increasing gas readings) or exceed the explosive value presented in Table 4.2, then Fire & Rescue NSW will be notified immediately by NSW DoE and the building evacuated in accordance with the Wentworth Point High School Fire Evacuation procedure.
Surface Monitoring	
Integrity of the seal is damaged; or Methane detected above 500ppm within the immediate vicinity of the sealed conduits	If defect identified, rectify, and reassess. An increased frequency of monitoring (e.g. weekly or monthly) will be conducted to determine that the results are reliable. No notification of external stakeholders required.
Methane detected above 1.25%v/v within the immediate vicinity of the sealed conduits	An increased frequency of monitoring (e.g. weekly or monthly) of the surface in the vicinity of the exceedances would be conducted whilst ventilation or other measures to address the landfill gas emissions in these areas was implemented. Advise NSW DoE that EPA and Fire & Rescue NSW should be notified immediately and informed of subsequent developments in writing within 14 days. A copy of the correspondence should also be sent to Parramatta City Council and any affected service providers.

Event / Trigger	Corrective Action / Contingency Plan
Methane detected above 5%v/v within the immediate vicinity of the sealed conduits	Access to these areas would be restricted. An increased frequency (e.g. daily or weekly) of all monitoring locations for the building of concern would be conducted to ensure that no immediate risk was being posed to the occupants of the building. Advise NSW DoE that EPA and Fire & Rescue NSW should be notified immediately and informed of subsequent developments in writing within 14 days. Dependent on the location of elevated methane concentrations additional ventilation would be introduced. Landfill gas can be vented to atmosphere by use of passive ventilation or intrinsically safe blowers and flexible conduit.

Where a pollution incident occurs that may cause material harm to the environment as defined in Sections 147 and 148 of POEO Act 1997, immediate verbal notification to the NSW EPA (and others, as required by the Protection of the Environment Legislation Amendment Act, 2011) must take place using the following contact numbers, as appropriate:

- NSW EPA Pollution Reporting – 13 15 55
- SafeWork NSW – 13 10 50
- Fire & Rescue NSW – 000
- Parramatta City Council – 1300 617 058
- Department of Health – 1800 020 103

4.4 Reporting Requirements

Gas monitoring will be conducted quarterly for 12 months. The requirement for on-going gas monitoring can be reviewed after this period has expired. An annual report for the first year of LTEMP implementation will be compiled by the Environmental Consultant and provided to the appointed NSW EPA Accredited Auditor for review and evaluation of the need for on-going monitoring. If any exceedances of the guideline concentrations presented in Table 4.2 are recorded during the monitoring visits, these must be verbally reported immediately to the NSW DoE and then Council, Fire & Rescue NSW and / or NSW EPA as appropriate in consultation with NSW DoE.

A written report together with suggested corrective actions (refer Table 4.3), as deemed necessary or as stipulated in the guidelines, will be provided within 14 days.

4.5 Warranty Information and GGPS Component Replacement

The following information related to GGPS warranty has been provided by BGL (GGPS contractor / installer):

- *'The Warranty being provided by BGL for the GGPS components is as required by [BGL's] contract agreement: 10 years (Note: typical construction industry warranty is 7 years)*
- *The design life of the GGPS elements is as follows:*
  - *Nero Void 90mm (90% recycled polypropylene and 10% virgin polymer): 50 years + based on long term creep testing as stated on data sheet*
  - *Edmonds Hurricane H100 to H400: 15 year warranty as stated on data sheet*
  - *Gas Membrane: 50 years + anticipated by BGL noting that Section 7.3.8 of Wilson, Card and Haines (2009) Ground Gas Handbook states that "Membranes will degenerate over time due to processes such as oxidation, biological degradation, chemical attack and*

degradation caused by UV light… As a general rule membranes used in gas protection are not exposed to UV light after installation… membranes usually have UV stabilisers added to protect against attack by UV… Gas-resistant membranes should in most cases have a very long service life (at least 100 years or more) at an ambient temperature of about 20oC… The service life will be reduced as temperature increases and where membranes are subject to long-term stress"

- *Non woven Silting, Cushion and Protection Geotextiles: Geofirma products used by BGL are made from highly durable virgin polyester fibres and manufactured to the highest standards. The product is wrapped in a highly UV stable outer wrap such that it is only exposed during the installation process. BGL consider that the geotextiles used will have a similar design life to that outlined above for gas membranes (i.e. 50 years +)*
- *PVC Inlet and Outlet Pipes: From a sustainability perspective, the Vinidex website states that "By convention, plastics pipe systems are often designed to Australian Standards on the basis of 50 year extrapolated test data. This is established international practice but is not intended to imply the service life of pipe is limited to 50 years. For correctly manufactured and installed systems, the actual life cannot be predicted, but can logically be expected to be well in excess of 100 years before major rehabilitation is required."*
- *25mm Monitoring Pipe Conduit: is also made from PVC and would be expected to have a similar design life to that outlined above for Inlet and Outlet Pipes (i.e. 50 years +)*
- *John Guest High Pressure LLDPE ¼" Blue Monitoring Tubes: It is a robust product made from non-contaminating FDA-compliant materials supporting a wide range of temperatures, pressures and chemicals. It is NSF International-certified LLDPE tubing and provides excellent resistance to environmental stress cracking as measured by ASTM D-1693. Given that this material is robust in its own right and is contained within the aforementioned conduit, BGL consider that its design life would be similar (i.e. 50 years +)*

- *Bearing the above in mind, BGL concludes that the design life of the GGPS is likely to be 50 years +, with the notable exception of the wind driven ventilator which has a design life of 15 years. This component is covered under regular inspections as part of the LTEMP for the site and will be replaced when it ceases to function as intended or every 15 years whichever comes sooner.'*

Based on the above warranty information, wind driven ventilators are required to be replaced if they cease to function as intended (e.g., if identified as part of routine inspections or ad-hoc observations) or every 15 years, whichever comes sooner.'

5 Work, Health, Safety and Environment (WHSE)

5.1 Introduction

The following WHSE requirements are presented for guidance only. It is essential that a risk assessment and safe work method statement (SWMS) are prepared and reviewed to assess the specific risks associated with proposed works conducted at the site.

All parties conducting work at the site must be inducted into this LTEMP by NSW DoE and appropriate records kept demonstrating compliance in the future (refer to example proforma in Appendix C).

5.2 Site Hazards

Potential hazards exist through dermal contact, ingestion or inhalation of soil, groundwater or soil gas / vapours that may contain contamination (as detailed in Section 2.2.3 above). During future excavation activities, it is possible that workers may come into contact with contaminated media.

Hazards associated with landfill gas include explosive atmospheres or asphyxiation due to gas displacing oxygen within confined spaces such as trenches, service pits and existing GGPS. Therefore, a calibrated gas monitoring instrument should be used by a suitably qualified and experienced person prior to entry and during works in locations where landfill gas may accumulate. The gas monitoring instrument should be capable of providing alarms for explosive / harmful atmospheres and be appropriate for the gases / vapours likely to be encountered.

Personal protective equipment (PPE) may include disposable coveralls, gloves and suitably rated dust masks / respirators. Safety glasses may be required if there is a risk of soil or groundwater contact with the eyes. It is noted that site-specific PPE may also be specified by NSW DoE or appointed Contractors / Maintenance Workers depending on their proposed activities.

It is essential that the NSW DoE Facilities Operations Manager reviews a SWMS prepared by the Contractor / Maintenance Workers to ensure that the specific risks associated with the proposed works have been appropriately assessed before any intrusive activities are conducted on site.

5.3 Competence, Training and Awareness

Prior to commencing works at the site, NSW DoE must ensure that all tenants, employees, Contractors, Maintenance Workers, and Consultants have received the appropriate level of environmental training to achieve the standard of awareness and competence appropriate to their assigned activities.

For any proposed excavation works, the Contractor Works Manager will be on-site at all times to conduct and/or supervise the works. The Contractor Works Manager will engage with Contractors / Maintenance Workers by means of a daily toolbox talk before the start of site works to ensure all environmental and WHS controls are implemented, and any new hazards are identified, assessed and controlled.

All persons involved in any works at the site will:

- Become fully briefed and aware of the work they are required to carry out;
- Possess the necessary qualifications, training and experience to carry out the work and appropriately manage any associated environmental and WHS risks; and
- Have appropriate verbal language and literacy skills.

5.4 Site Control

For the purpose of containing and controlling the potential transfer of landfill / contaminated soil the following zones are to be set up and maintained:

- Work Zone: This is the area in which excavations will be carried out. This area is to be fenced off and only those persons who are necessary for undertaking the works should enter this zone.
- Decontamination Zone: At the completion of the work, all equipment used for excavation, storage and transfer of contaminated soil is to be cleaned within the work zone. Decontamination of equipment shall comprise physical removal using scraping or brushing of all soil adhering to excavation machinery and implements on to the piles of soil which are scheduled for off-site disposal at a suitably licensed facility.

5.5 Safe Work Practices

The requirement for the following safe work practices should be incorporated into SWMS for excavation works which are likely to remove the Capping System described in Section 2.2.1 and especially where fill materials may be encountered:

- All work areas must be appropriately fenced, and signage displayed prior to commencement of any excavation works.
- Personnel and equipment decontamination areas must be established within the defined work area.
- The excavation and reinstatement process must be managed and controlled by procedures developed by a NSW Licensed Asbestos Assessor in accordance with prevailing legislation and guidelines.
- The excavation must be monitored by a suitably qualified, trained and experienced operator using appropriately calibrated and intrinsically safe instrumentation to ensure potential risks from landfill gas are appropriately managed.
- Eating, drinking, chewing gum or tobacco, smoking or any practice that involves hand to mouth transfer increases the probability of ingestion of foreign matter into the body should only be undertaken in a dedicated area away from the work area. Personnel should ensure that hands are thoroughly washed before eating, drinking, or smoking.
- Any clothing that becomes dirty from on-site work should be removed within a dedicated decontamination area and either disposed of or secured in an appropriate container before being washed separately from other clothes.

5.6 Contingency Plan

It is important that the Contractor establishes contingency plans should environmental issues arise during the works. Potential issues and control measures are provided in Table 5.1:

Table 5.1: Site Contingency Plan.

Environmental Consideration	Issue	Possible Control Measures
Discovery of Unknown Materials	Exposing potentially contaminated soil and / or material of unknown origin and composition to the surface	If potentially contaminated material is encountered during excavation (e.g. drums, petroleum or other strong odours, etc), cease work, secure the area and immediately notify the NSW DoE Facilities Operations Manager. Advice should be sought from a suitably qualified environmental consultant as to the nature and origin of the material and associated potential health hazards.
Air Quality	Excessive dust generated during excavation	Keep loose surfaces, stockpiles moist or covered. Monitor dust levels visually. Cease dust generating activities if excessive dust is being generated and during periods of high wind.
	Odours developed during penetration of the cap	If odours are encountered, work will temporarily be ceased while the odour dissipates to acceptable levels. If the odour continues to be present during excavation works, the work is to be stopped and the source and nature of the odour investigated by a suitably qualified Environmental Consultant.
Waste	Potentially contaminated excess soil generated	Avoid over excavation and reuse / retain soil within site where appropriate. If offsite disposal is required, classify the waste in accordance with Section 5.6.
	Potentially contaminated groundwater generated	Where practicable, avoid excavations below the groundwater table and avoid dewatering. If offsite disposal is required, the water should be tested and disposed of appropriately to a licensed waste facility in accordance with relevant NSW EPA guidelines. Alternatively, a trade waste permit can be obtained through Sydney Water.
Spillages and Leakages	Spillages of oils and lubricants from machinery contaminating the cap	Refuel plant and equipment in a designated area away from landscaped areas, excavation or 'open cap' areas or near joins in the concrete pavement. Make available 'spill kits' on site. Clean up spillage as soon as practicable using spill kits.
Spillages and Leaks	Tracking of dirt from site onto public roads	Check vehicle tyres and clean off excess mud / soil and install a grate at entrance / exit. Install a wheel wash bay at entrance / exit, if necessary.
Soil and Water	Erosion of disturbed capped areas, loose soils, stockpiles	Contractor to prepare a Soil & Water Management Plan prior to commencement of works to details site specific soil and water control measures and provide this to the NSW DoE Facilities Operations Manager for approval. Install sediment trenching downgradient of the excavation / construction areas. Install silt traps or straw bales around stormwater drains / grates. Excavated materials resulting from small-scaled short-term excavations should be temporarily placed adjacent to the excavations where appropriate. Where excavated materials cannot be backfilled within one day, the excavated materials should be placed in designated stockpiles and controlled accordingly.

6 Management of Future Works

6.1 Overview

Any intentional disturbance by penetration / excavation within the building footprint may damage the Existing GGPS. In addition any excavation breaching the capping layer may pose a risk to Contractors / Maintenance Workers and / or buildings and their occupants.

Whilst the site has been demonstrated as being suitable for high school use, potential contaminants of concern are present in various media beneath the capping layer and will need to be managed accordingly depending on future activities.

During monitoring, contract and / or maintenance activities which involve excavation below the current site's surface (i.e. concrete slab / hardstanding or geotextile marker layer), it is possible that workers may come into contact with contaminated material or locations with potential presence of hazardous ground gas.

The facilities manager must review and approve the specific job risk assessment (JRA) and safe work method statements (SWMS) for any intrusive works which penetrates the capping layer and significant enough for the marker layer to be exposed/breached. The purpose of this review is to ensure that site personnel and/or contractors who will undertake the works are inducted into the EMP.

In the site, potential contaminants of concern in soils include petroleum hydrocarbons, heavy metals, PAHs, asbestos (bonded and friable), hazardous ground gases and the presence of potential or actual acid sulfate soils.

Maintenance works on the Existing GGPS should be conducted by suitably experienced persons only. Potential gaseous contaminants may include volatile organic compounds, methane, carbon dioxide, carbon monoxide and hydrogen sulfide.

An appropriate person appointed by DoE / Wentworth Point High School facility manager must inspect the integrity of the capping layers periodically on an annual basis and following weather events with potential to damage site capping at the discretion of the facility manager (e.g. 1:100yr rain events or severe storms) to ensure that the integrity of the surface/capping layers are maintained. A proforma has been included in Appendix C which may be used to document the site inspections.

6.2 Capping System

6.2.1 General

Excavation in external areas beneath Building Slabs, Hardstanding or Geotextile Marker Layer at the site (see Figures 3 and 4 Appendix A) may encounter contaminated or asbestos containing materials and should be avoided wherever possible.

The exact locations of underground services (electrical, communications, stormwater, sewer, gas, fire hydrant and water) should be confirmed on site by a Competent Person before commencing any excavation works.

Any contaminated material exposed by excavation during Contractor and / or Maintenance activities must be properly managed during the works to prevent:

- Contamination of the site surface (use plastic sheeting or similar as a separation layer);
- Dispersion by wind-blown dust (use covers or maintain the material in a damp condition);
- Dispersion by stormwater run-off (implement proper management of stormwater);
- Tracking of material offsite by vehicles (cleaning of vehicles before leaving work area); and
- Release of contaminated groundwater to the environment (control of pumping and drainage routes and disposal via licensed means).

Any excavated contaminated material will be managed and disposed offsite in accordance with the Waste Classification Guidelines, Part 1: Classifying Waste. (NSW EPA 2014). Documentation will be provided by the Contractor to the NSW DoE Facilities Operations Manager in relation to material testing, waste tracking (i.e. consignment authorisation and waste transport certificate) and disposal (i.e. weighbridge receipts).

6.2.2 Asbestos Containing Materials

If excavation in external areas beneath the Hardstanding or Geotextile Marker Layer at the site (see Figures 3 and 4 in Appendix A) cannot be avoided, then the Contractor will be required to implement a procedure for management and off-site disposal of asbestos materials and any associated fibres. When preparing such a procedure, the Contractor must ensure that the works are conducted in accordance with all relevant guidance including, but not limited to, the following:

- Safe Work Australia (2020) Code of Practice How to Safely Remove Asbestos;
- Safe Work Australia (2020) Code of Practice How to Manage and Control Asbestos in the Workplace;
- WA Department of Health (2009) Guidelines for Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

Key considerations arising from the above documents regarding the management of asbestos containing materials and associated fibres includes the following:

- The Contractor must hold a relevant license and be appropriately trained to conduct any work involving asbestos;
- The Contractor must prepare a removal control plan for any licensed asbestos removal work;
- The Contractor must notify the regulator at least 5 days before the commencement of licensed asbestos removal work;
- The Contractor must erect signage and barricades for asbestos removal work to inform and limit access to the work area;

- The Contractor must ensure that facilities are available to decontaminate the work area, any plant used during the works and any workers associated with the asbestos removal works;
- The Contractor must ensure that air monitoring is conducted at the work site in accordance with NOHSC:3003 (2005) and that, where required, appropriate action is taken as defined in NSW WHS Regulations 2017;
- The Contractor must ensure that asbestos waste and personal protective equipment is sealed in a container and disposed of at a suitably licensed facility; and
- The Contractor must ensure that an appropriate person conducts a clearance inspection of the work area and issues a clearance certificate.

6.3 Reinstatement of Existing GGPS/Capping

In the event where conditions of the existing GGPS and capping have been altered potentially resulting in increased exposure to contaminated soil or disturbance of the Existing GGPS, corrective action will be undertaken to restore the area to its former state.

The responsibility for implementing corrective actions will rest with the NSW DoE Facilities Manager or similar.

6.3.1 Capping System Reinstatement

Where maintenance contractors or other workers observe that the grass has died; capping layer is thinning; and / or, the marker layer is exposed, the following contingency and corrective action should be carried out:

- Temporarily fence of the affected area to prevent further erosion from occurring;
- Where the marker layer is damaged, place a temporary geotextile with appropriate sandbags / weighting to prevent exposure to the underlying soils;
- Organise repair of high visibility marker layer, growth medium and turf to reinstate to the original condition; and
- Document the process in accordance with the inspection proforma in Appendix C and ensure supporting documentation (including photographs and material records) are kept for annual reporting purposes.

With respect to works that may penetrate the capping, each contractor working on site who damages the cap (either intentionally or accidentally) will be responsible for its repair before they leave the site. Two principal ways that the NSW DoE Facilities Manager and Contractor could control potential damage to the cap during works is by specification (i.e. the addition of a clause relating to the repair of the Capping / Existing GGPS in contracts) and through monitoring of the work as it progresses and after it is complete.

Upon completion of the works, the cap must be reinstated with either building slab / hardstanding of similar thickness and composition to that removed or topsoil provided by a reputable supplier that does not contain recycled components (i.e. blended excavated natural materials) of at least the same thickness and compaction level used for the original capping. A registered surveyor must be appointed to provide documentation to demonstrate that reinstated capping thicknesses are consistent with those installed originally.

Alternatively, a similar capping design that is equally acceptable to the LTEMP Stakeholders referred to in Section 1.4 may be proposed by NSW DoE for reinstatement. Source documentation for the topsoil material must be provided to the NSW DoE Facilities Manager including assessment by a suitably qualified Environmental Consultant that the material can be legally imported to the site and is suitable for the intended purpose. Topsoil source documentation must be supported by

representative NATA accredited analytical laboratory data for a broad suite of contaminants of potential concern.

The material will also need to be inspected at point of delivery for any signs of contamination such as odours, staining, presence of rubbish etc. The consultant shall provide the NSW DoE Facilities Manager with final documentation demonstrating that building slab / hardstanding or topsoil material has been emplaced as per the agreed capping specification.

6.3.2 GGPS reinstatement

Should damage or disturbance to the Existing GGPS occur this must be repaired. Accordingly, advice must be sought from a Competent Person (e.g. an appropriately qualified Environmental Consultant/ Contractor with experience in landfill gas protection design) prior to commencement of works to ensure that the proposed repair meets the original design intent / current best practice and to facilitate independent QA/QC checks to be conducted.

The findings of the reinstatement inspections must be thoroughly documented by the NSW DoE Facilities Manager.

7 Periodic Review

The NSW DoE will review the effectiveness of the LTEMP on an annual basis and following any incident, other event that suggests the LTEMP is ineffective and updates to any guidelines or publications referenced in this plan. Furthermore, the NSW DoE will record any review of the LTEMP undertaken and ensure that any improvements deemed necessary are implemented and communicated to relevant parties. The findings of this review must also be used to inform the Fire Safety Schedule for the site.

Following completion of the quarterly monitoring events over the specified 12-month period, the Environmental Consultant will provide recommendations for any amendments that may be required to the LTEMP and whether monitoring should continue. Upon receipt of instructions from NSW DoE regarding the acceptance of the recommendations, the Environmental Consultant will provide an updated draft LTEMP for review and approval by key stakeholders prior to implementation. This LTEMP would then be superseded.

8 References

- NSW Environment Protection Authority, 2022, Sampling design part 1 – application Contaminated Land Guidelines
- National Occupational Health and Safety Commission (NOHSC), 1995, Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment (Ref: NOHSC:1003(1995)).
- Standards Australia, 1995, Safe Working in a Confined Space (Ref: AS2865 – 1995).
- ANZECC & ARMCANZ, 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
- World Health Organisation, 2000, Air Quality Guidelines.
- NSW Department of Environment and Conservation, 2006, Contaminated Sites: Guidelines for the Site Auditor Scheme, Second Edition Department of Environment and Conservation.
- CIRIA, 2007, Assessing Risks Posed by Hazardous Gases to Buildings (Ref: CIRIA C665).
- Steve Wilson, Geoff Card & Sarah Haines, 2009, Ground Gas Handbook.
- World Health Organisation, 2010 Guidelines for Indoor Air Quality – Selected Pollutants.
- NSW Office Environment and Heritage, 2011, Guidelines for Consultants Reporting on Contaminated Sites.
- CRC Care (July 2013) Technical Report 23 Petroleum hydrocarbon vapour intrusion assessment: Australian guidance.
- National Environment Protection Council, 2013, National Environment Protection Measure (NEPM) 1999 – Assessment of Site Contamination, Schedule B (1) and B (2).
- NSW Environment Protection Authority, 2014, Waste Classification Guidelines Part 1: Classifying Waste.
- NSW Environment Protection Authority, 2016 Environmental Guidelines: Solid Waste Landfills (second edition).
- NSW Work Health and Safety (WHS) Regulations 2017
- SafeWork Australia, 1 July 2020, Workplace Exposure Standard for Airborne Contaminants
- Australian Building Code Board, 2018, Handbook: Indoor Air Quality – ASHRAE 62.1 recommendation for occupant comfort.
- NSW Environment Protection Authority, 2020, Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases.

9 Limitations

This report has been prepared by Geosyntec Consultants Pty Ltd ("Geosyntec") for use by the Client who 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 findings of this report are based on the scope of work outlined in Section 1. The report has been prepared specifically for the Client for the purposes of the commission, and use by any explicitly nominated third party in the agreement between Geosyntec and the Client. No warranties, express or implied, are offered to any third parties and no liability will be accepted for use or interpretation of this report by any third party (other than where specifically nominated in an agreement with the Client).

This report relates to only 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. This report should not be reproduced without prior approval by the Client, or amended in any way without prior written approval by Geosyntec.

Geosyntec's assessment was limited strictly to identifying environmental conditions associated with the subject property area as identified in the scope of work and does not include evaluation of any other issues.

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 investigation.

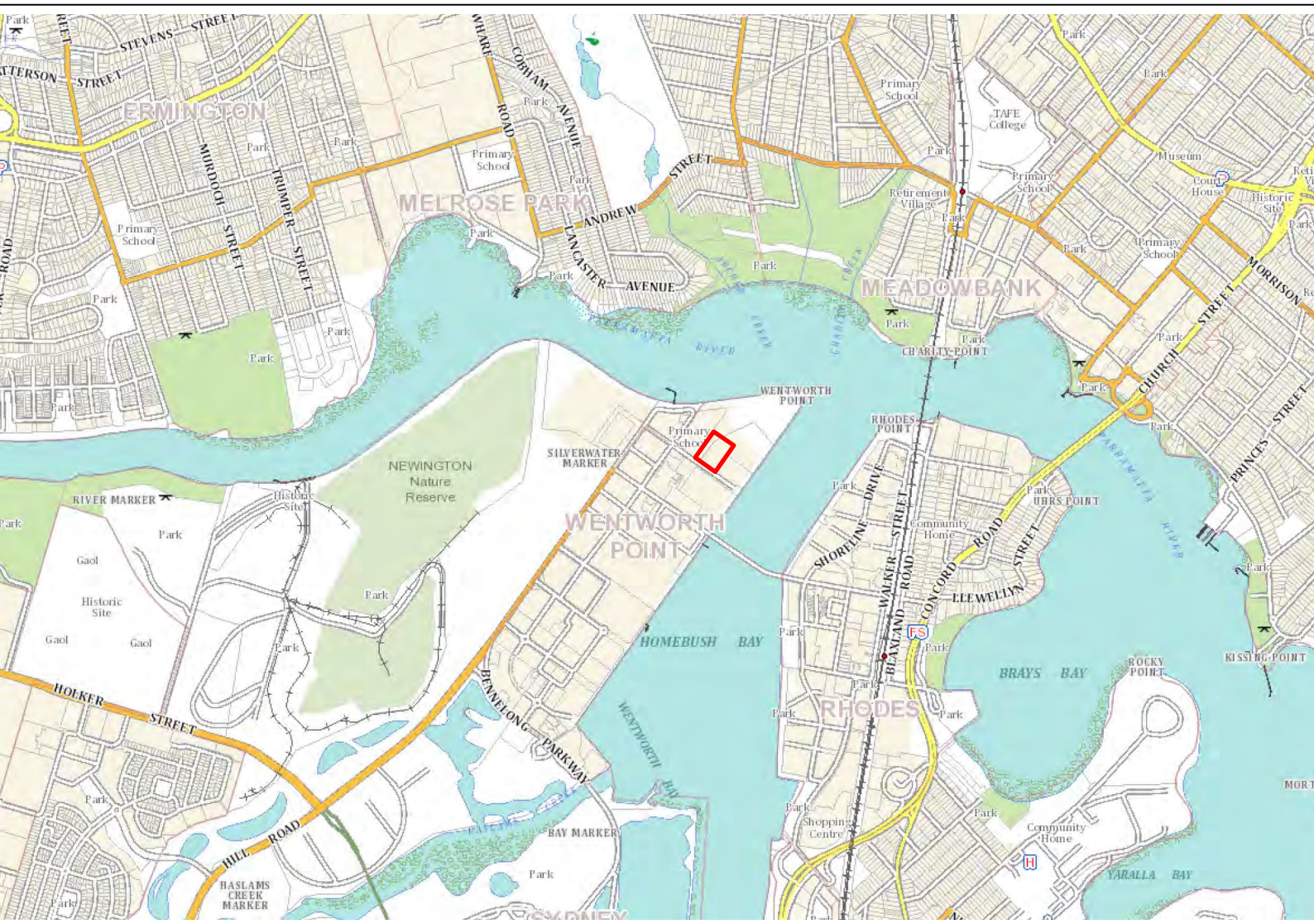
This report does not comment on any regulatory obligations based on the findings. This report relates only to the objectives stated and does not relate to any other work conducted for the Client.

The absence of any identified hazardous or toxic materials on the site should not be interpreted as a guarantee that such materials do not exist on the site.

All conclusions regarding the site are the professional opinions of the Geosyntec personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Geosyntec has not independently verified and assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Geosyntec, or developments resulting from situations outside the scope of this project.

Geosyntec is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The Client acknowledges that this report is for its exclusive use.

Appendix A Figures



e Boundary

ed to support the main report and is not suitable for other
Six Maps.

Approx. 200 m

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 1: Site Location

Site Address: 7 Burroway Road, Went

Client: RobertsCo Pty Ltd

Job Number: AU122229

Date:

e Boundary

previously validated and
the wider Zoic (2019)
works

Portion of the site capped as part of the 2021 early works (Geosyntec, March 2022 validation) prior to commencement of the current, main remediation works

ed to support the main report and is not suitable for other
Nearmap, 2 August 2022.

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 2: Site Layout (and pre
from Zoic (2019) works)

Site Address: 7 Burroway Road, Went

Client: RobertsCo Pty Ltd

Job Number: AU122229 | Date:

Boundary – Covered by LTEMP

surface areas

play area

ootprints, different pours refer to GGPS footprint – membrane installation

Figure 3: Capping Type a

Site Address: 7 Burroway Road, Went

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 – AHD

Client: RobertsCo Pty Ltd

Job Number: AU122229 | Date:

to support the main report and is not suitable for other
earmap 25 Feb 2024.

surface areas

lt play area

t / GGPS Areas

ed to support the main report and is not suitable for other
Nearmap 25 Feb 2024.

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 – AHD

Figure 4: Capping Thickness

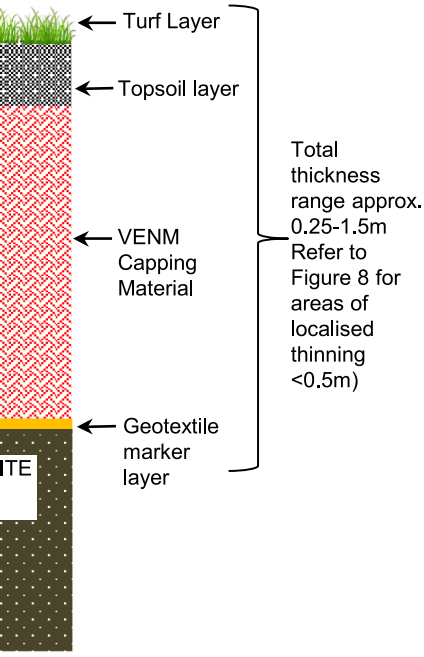
Site Address: 7 Burroway Road, Went

Client: RobertsCo Pty Ltd

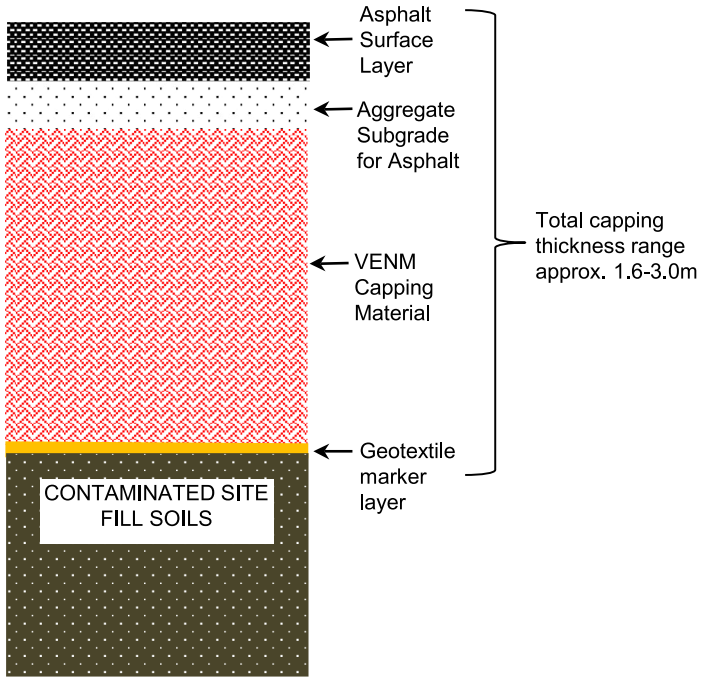
Job Number: AU122229

Date:

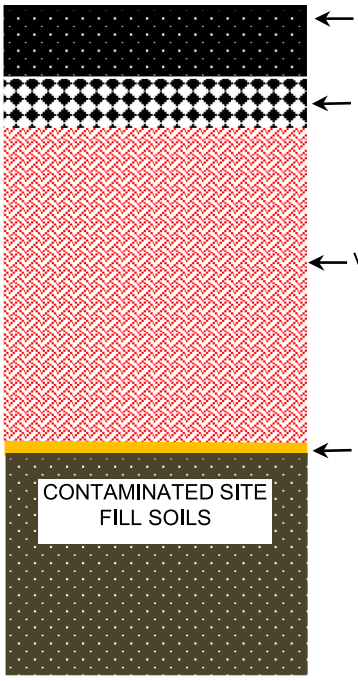
Areas



2. Asphalt Play Area



3. Building Footprint / GGPS



ed to support the main report and is not suitable for other
Nearmap 25 Feb 2024.

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 – AHD

Figure 5: Capping Cross Secti

Site Address: 7 Burroway Road, Went

Client: RobertsCo Pty Ltd

Job Number: AU122229 | Date:

used for storage of pallets and containers of construction materials

ion of Haulage Road

ion of Cattle Grid

ed to support the main report and is not suitable for other
Nearmap 25 Feb 2024.

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 – AHD

Figure 6: Additional Site Featu

Site Address: 7 Burroway Road, Went

Client: RobertsCo Pty Ltd

Job Number: AU122229

Date:

nt of inert material within shallow capping layer

nage trench with no observed inert materials

age trench with observed inert materials

ed to support the main report and is not suitable for other
Nearmap 25 Feb 2024.

1 Test pit with observed shallow inert materials

1 Test pit with no observed inert materials

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 – AHD

Figure 7: Area with Shallow, S
Material within Capping

Site Address: 7 Burroway Road, Went

Client: RobertsCo Pty Ltd

Job Number: AU122229

Date:

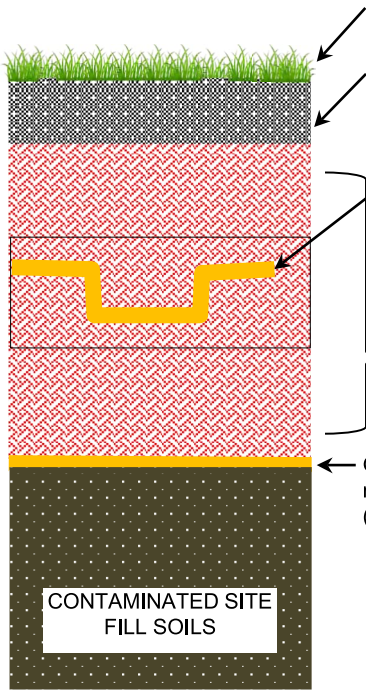


Figure 8: Footprint & Cross Se

Redundant Marker Layer

Site Address: 7 Burroway Road, Went

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 – AHD

Client: RobertsCo Pty Ltd

Job Number: AU122229

Date:

ed to support the main report and is not suitable for other
Nearmap 25 Feb 2024.

e Boundary

Figure 9: Site Structures and F

(04 / 06 / 2024)

Site Address: 7 Burroway Road, Went

ed to support the main report and is not suitable for other
Nearmap 04 June 2024.

Approx. 10 m

Datum: GDA 1994 MGA Zone 56 – AHD

Client: RobertsCo Pty Ltd

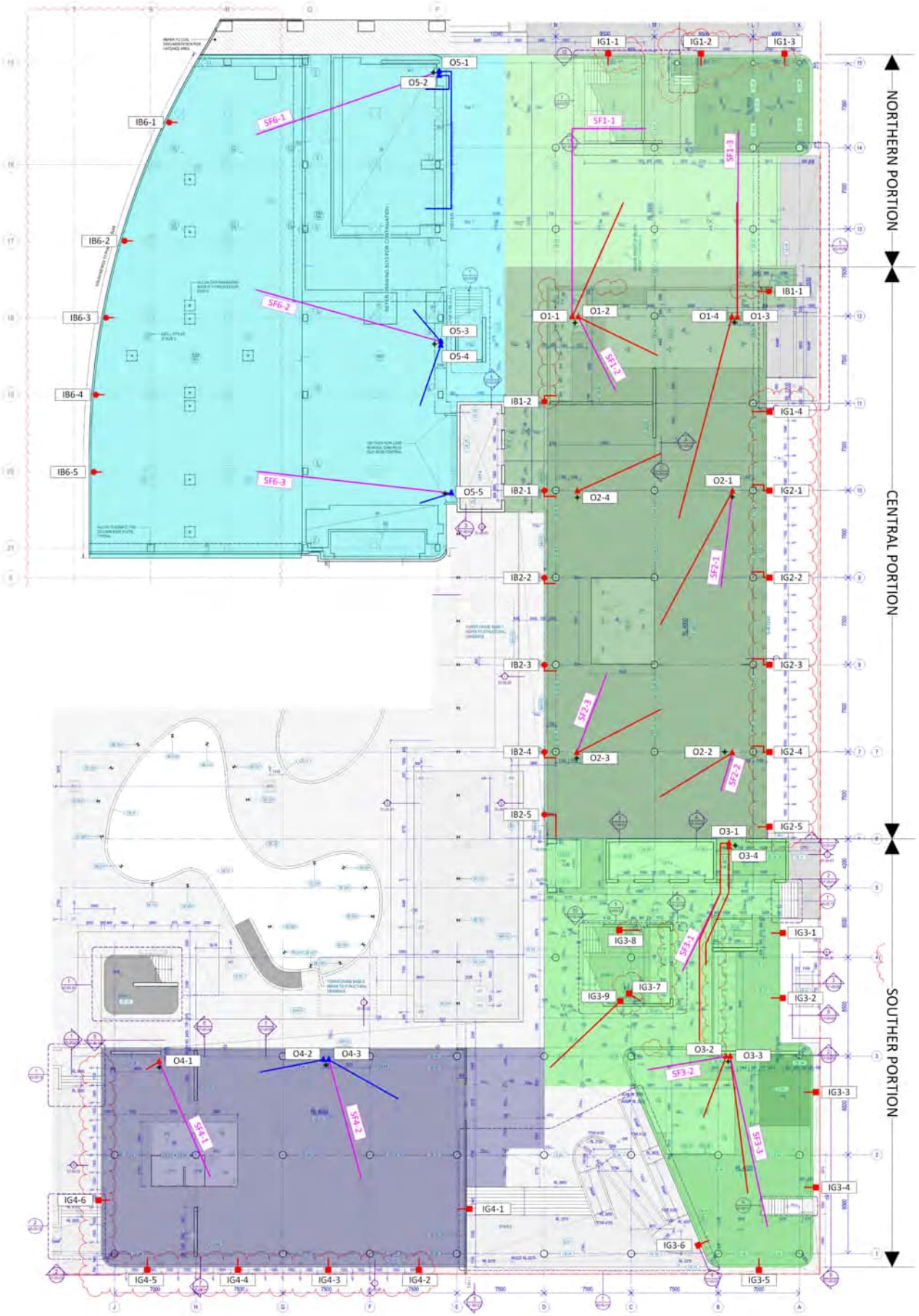
Job Number: AU122229

Date:

Appendix B As-Built GGPS Drawings

G

UILDING



SCALES		
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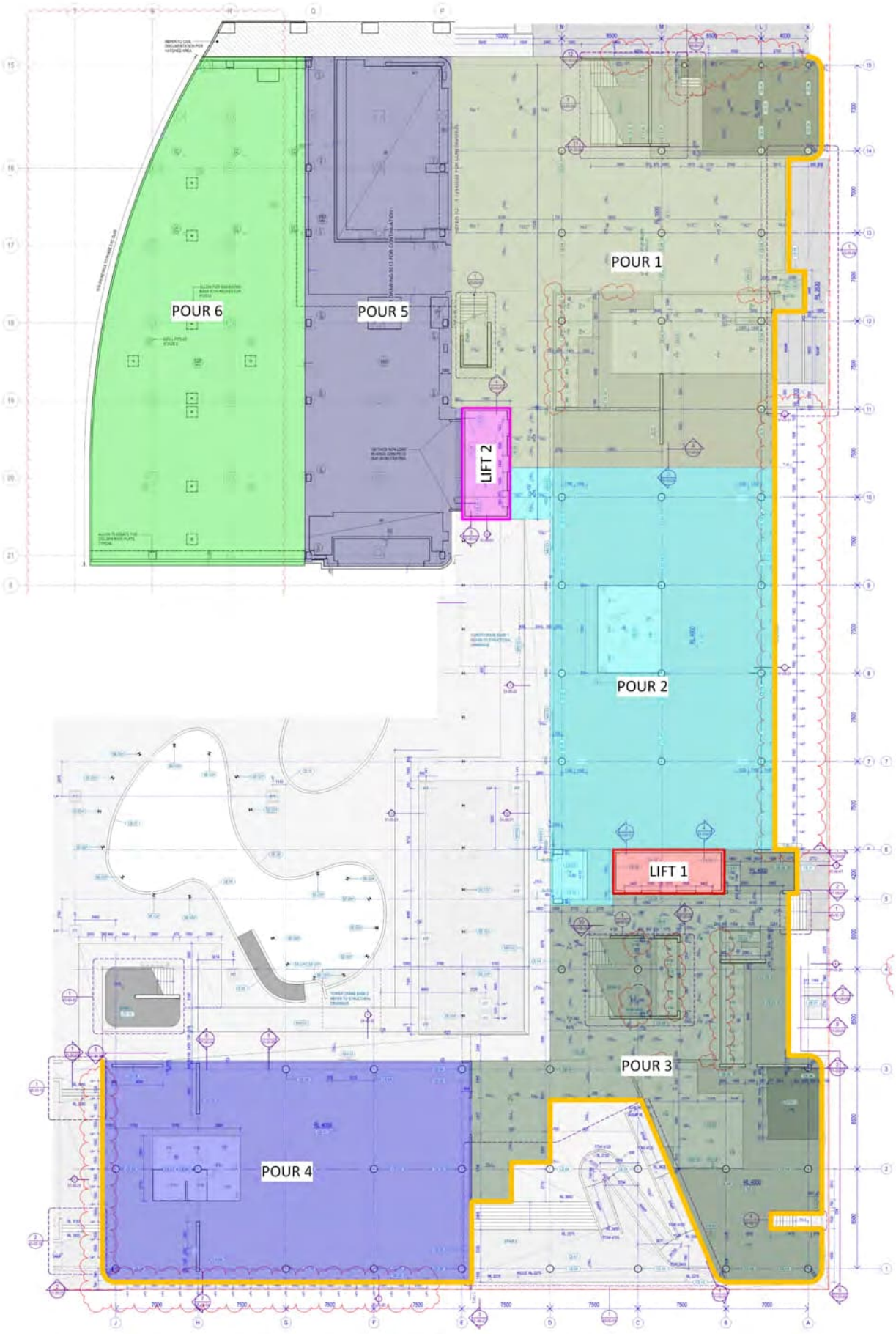
BELOW GRO



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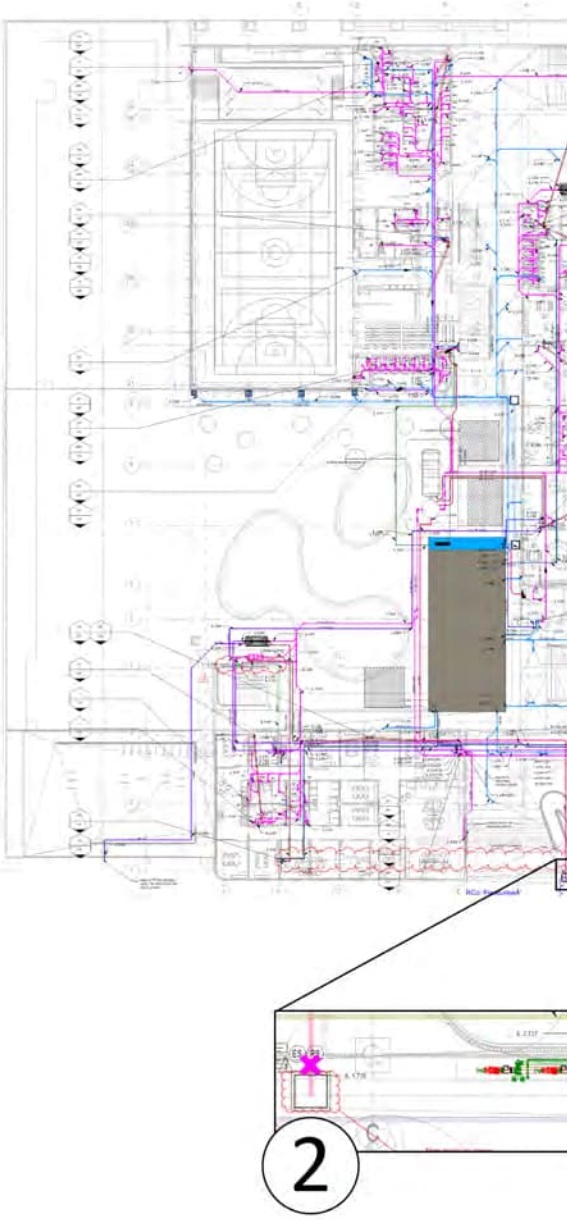

QUARE PIPE AT IL2.44 (<0.20m DEEP)

TER PIPE AT IL1.12 (1.2m DEEP)

WIDE TRENCH)

H (TRENCH WIDTH UNKNOWN)

CLED WATER CONNECTION 150mm DIAMETER (1200mm WIDE TRENCH)

NCH)

SCALES		
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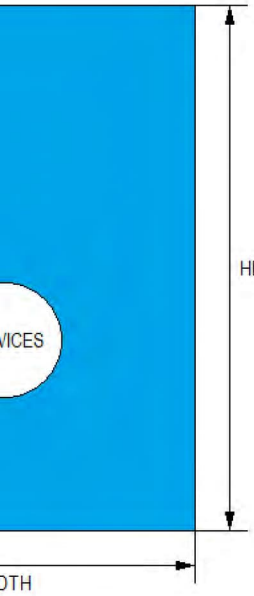
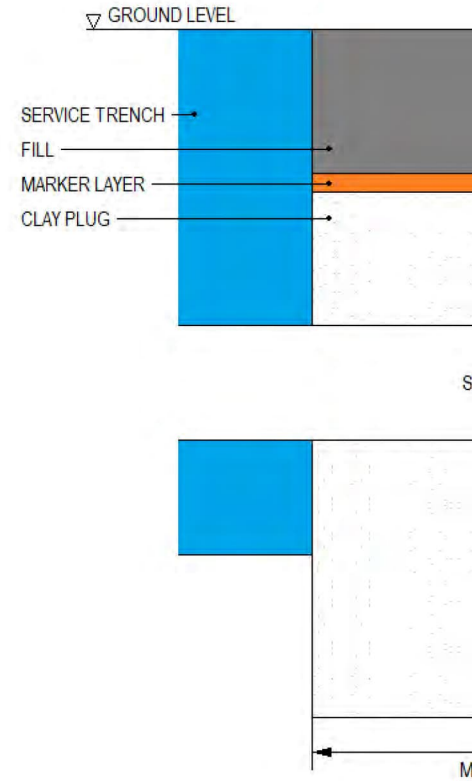
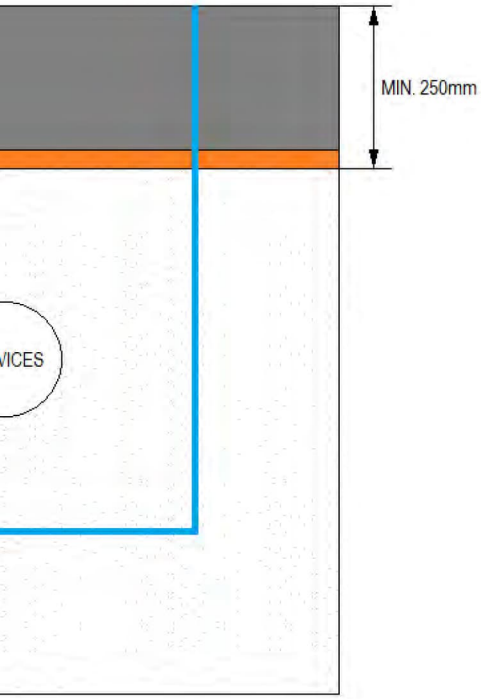


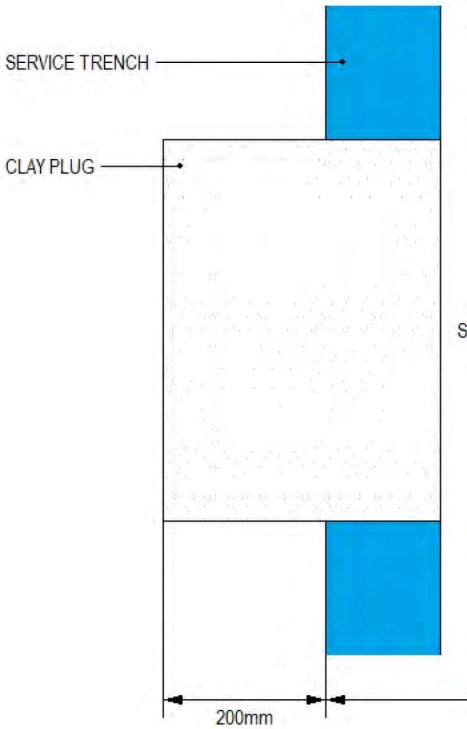
H - FRONT SECTION



CLAY PL



- FRONT VIEW



CLAY PL

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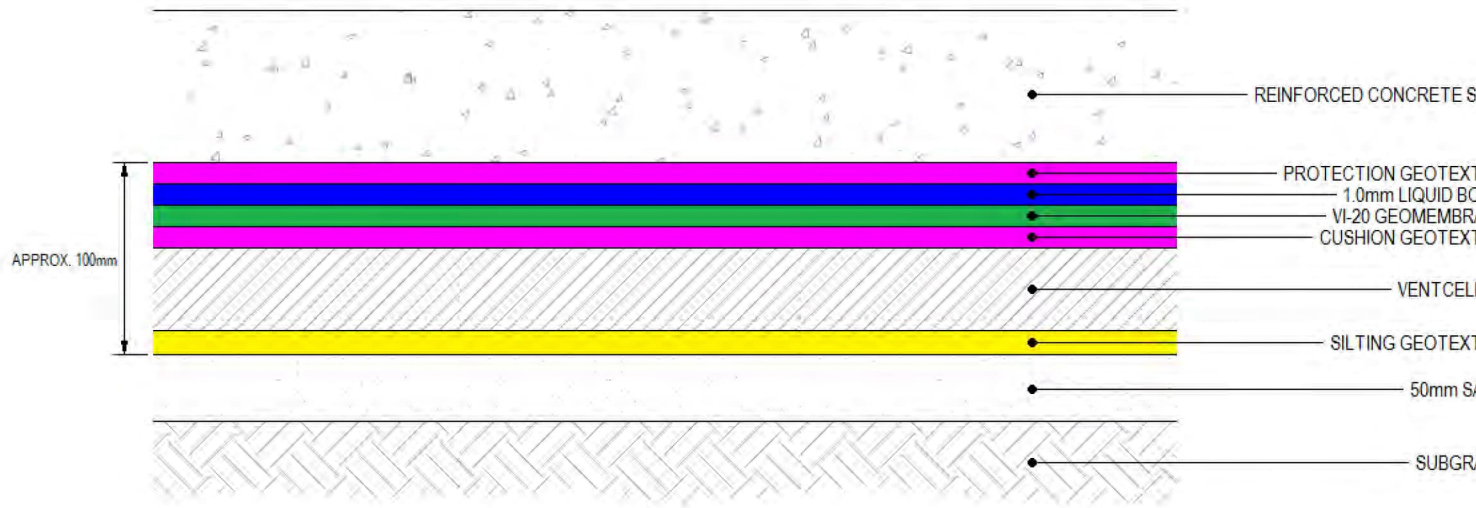

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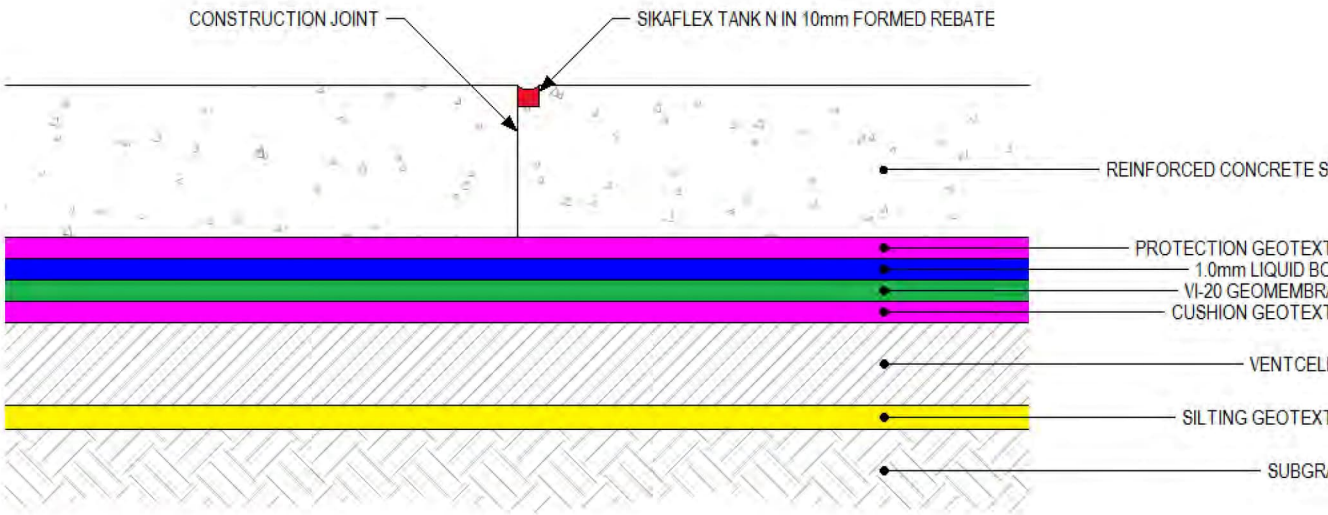

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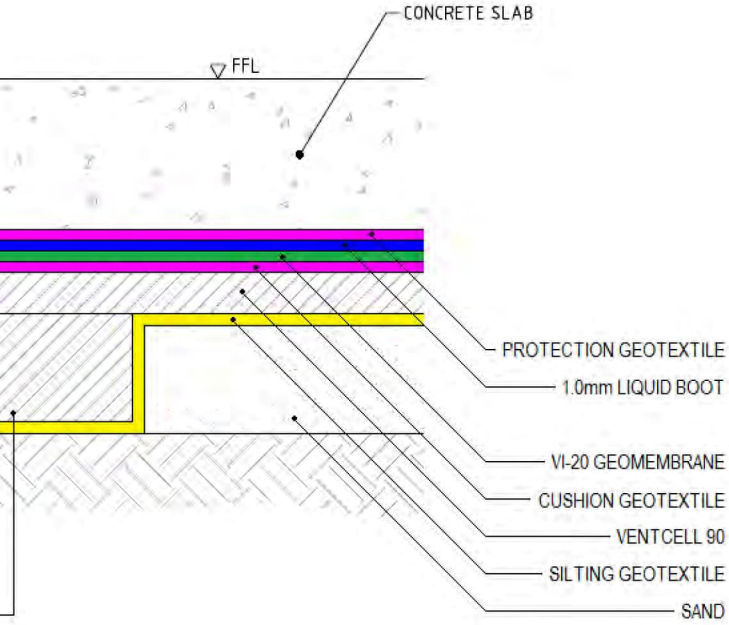

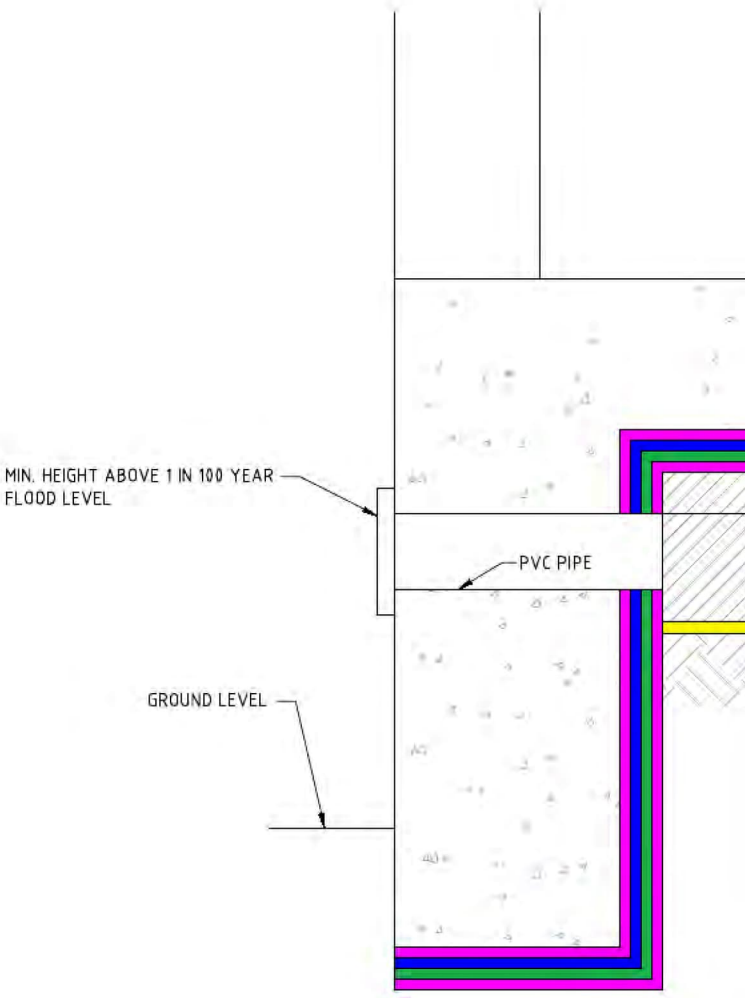

SCALES
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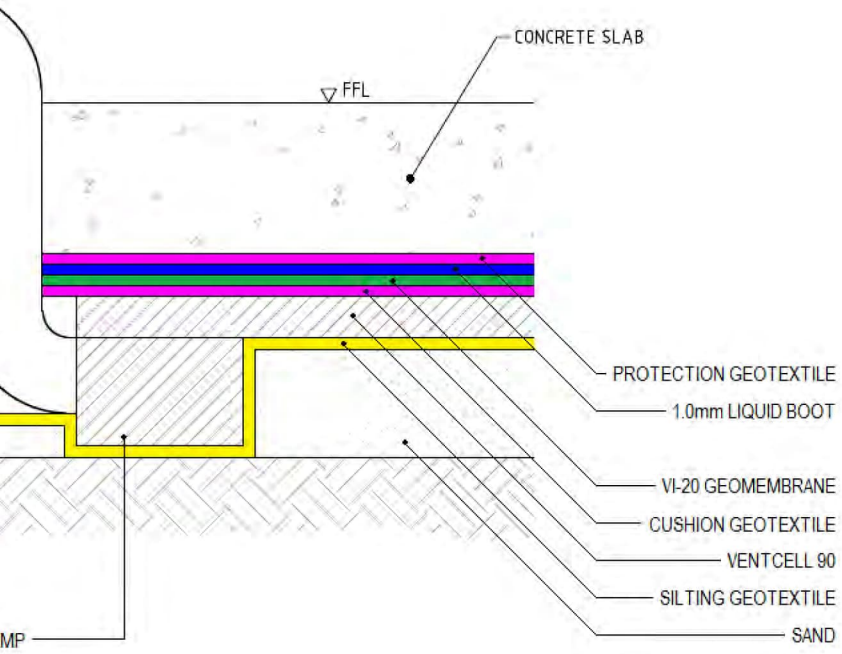
-PVC PIPE



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BELOW GRO

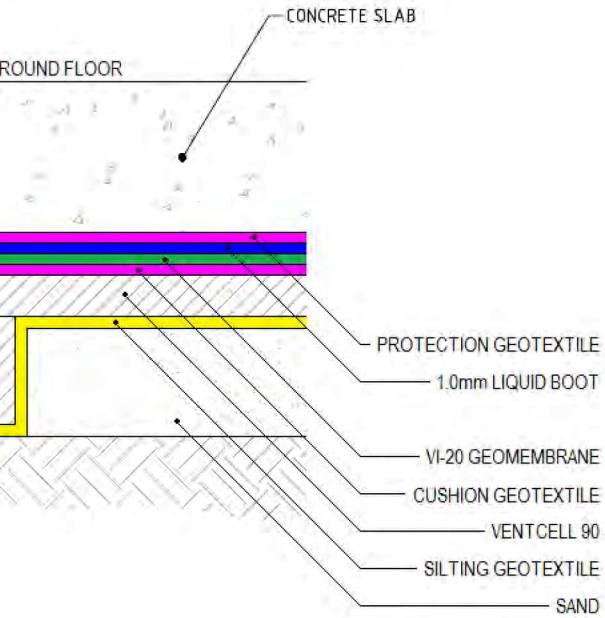
ATOR

OF ROOF
OTHER
CTIONS

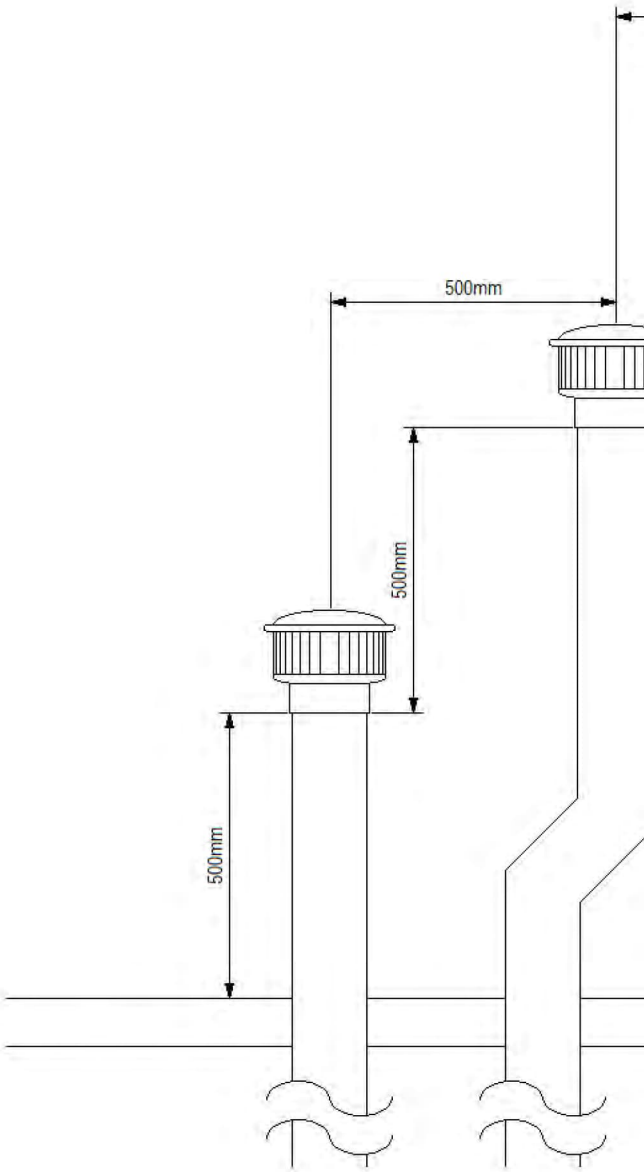
OOF LEVEL

WALL

EVEL ONE



DETAIL



ADJACENT OUTLETS
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SCALES
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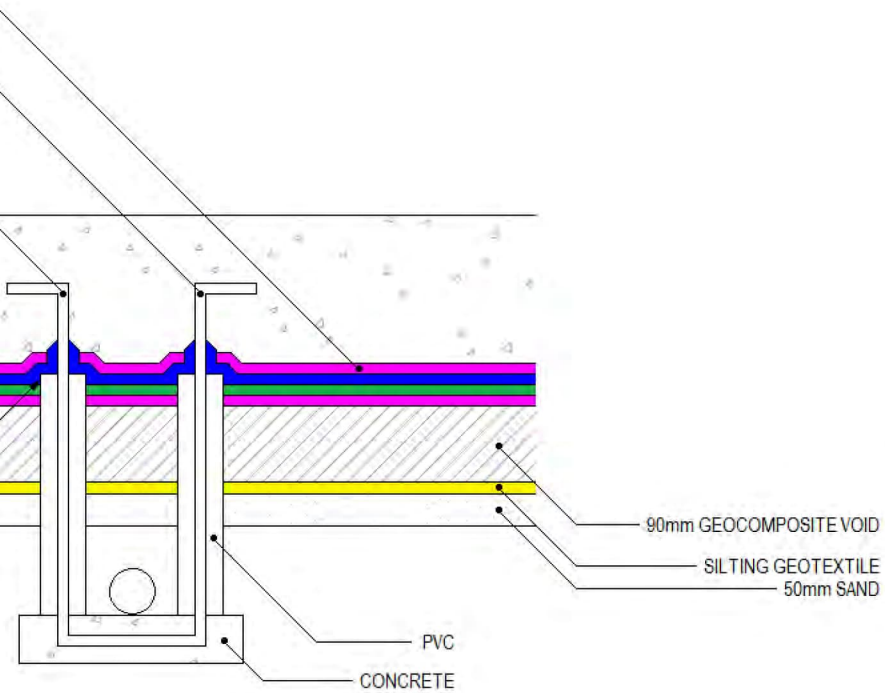
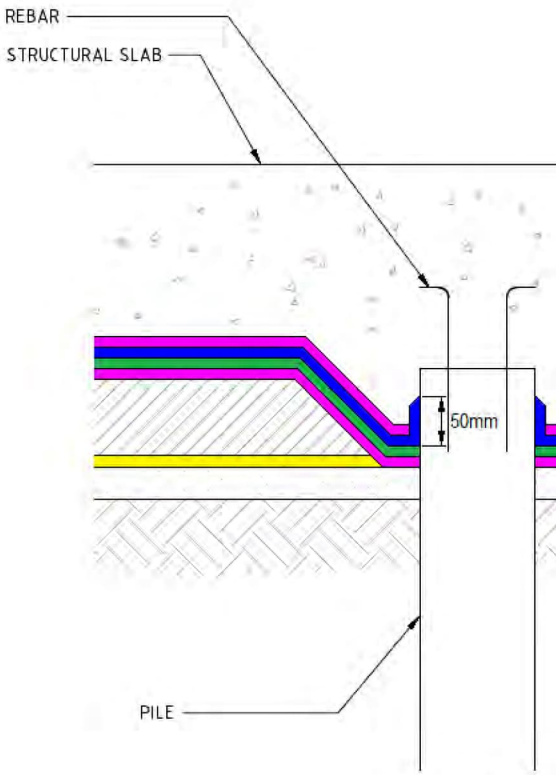


RVICES HANGER PENETRATION
N.T.S



GAS VAPOUR BARR
PILE TERMINATIO
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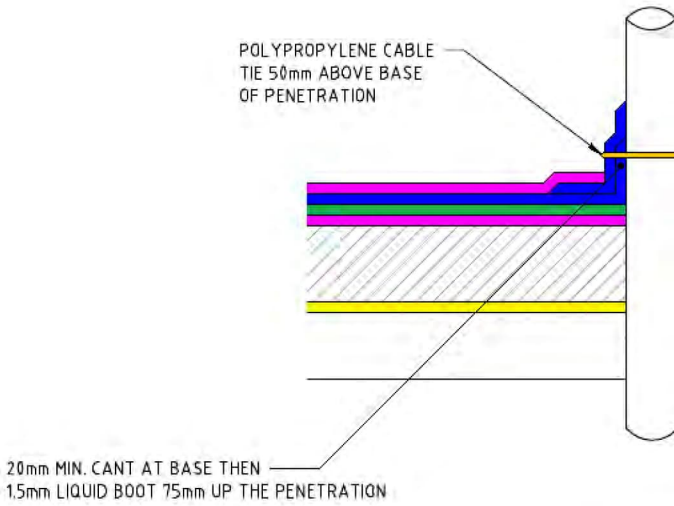
SCALES
N.T.S

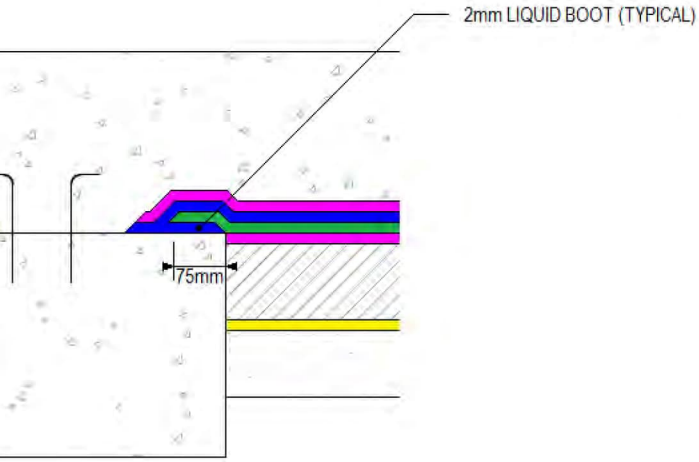
BELOW GRO

APOR BARRIER
AND GRADE BEAMS

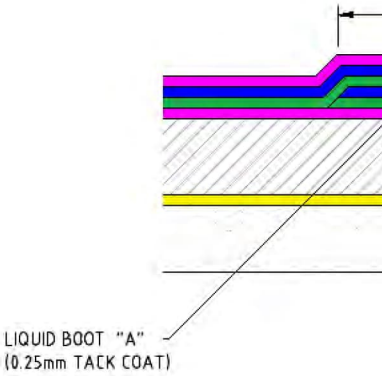


GAS VAPO
PENETRATIONS ON EART

NOTE:
ALL PENETRATIONS SHALL BE CLEANED BEFORE
LIQUID BOOT IS APPLIED.



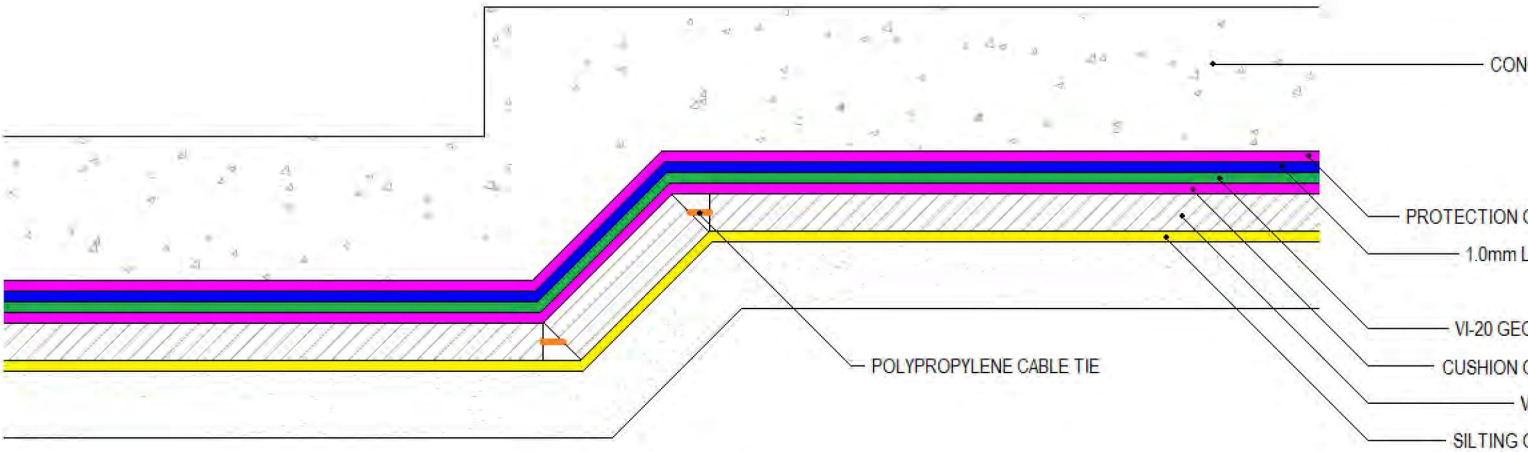
APOR BARRIER
GS AND PILE CAPS



GAS VAPO
MEMBRANE LAP JOI

SCALES
N.T.S

BC
BELOW GRO



AT RAMPS/SLOPES
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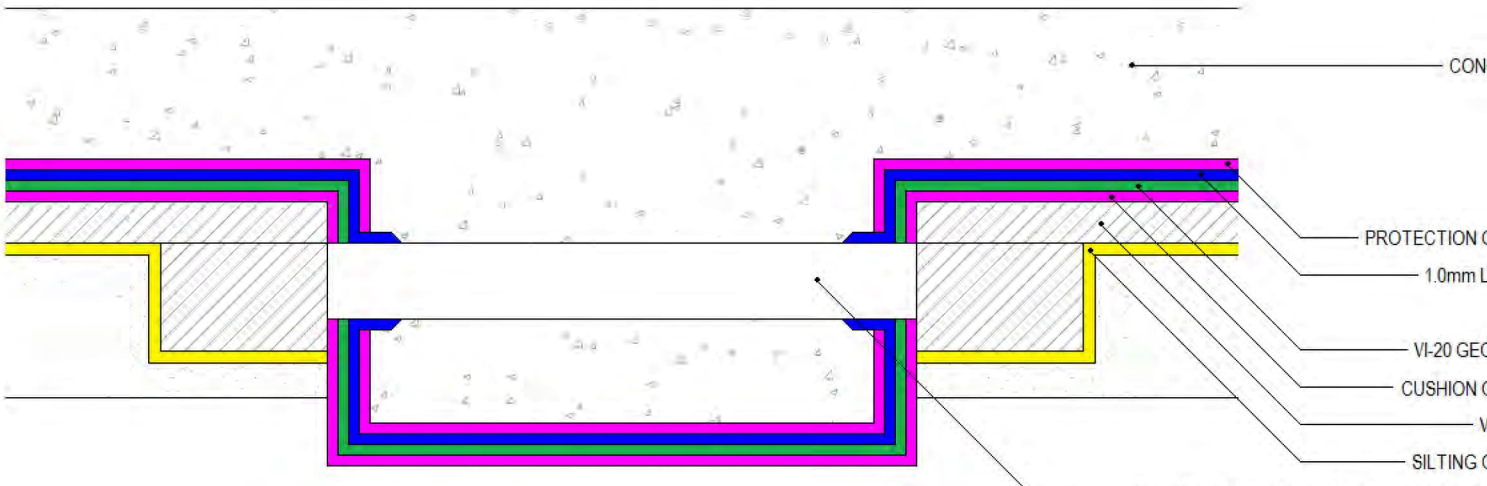
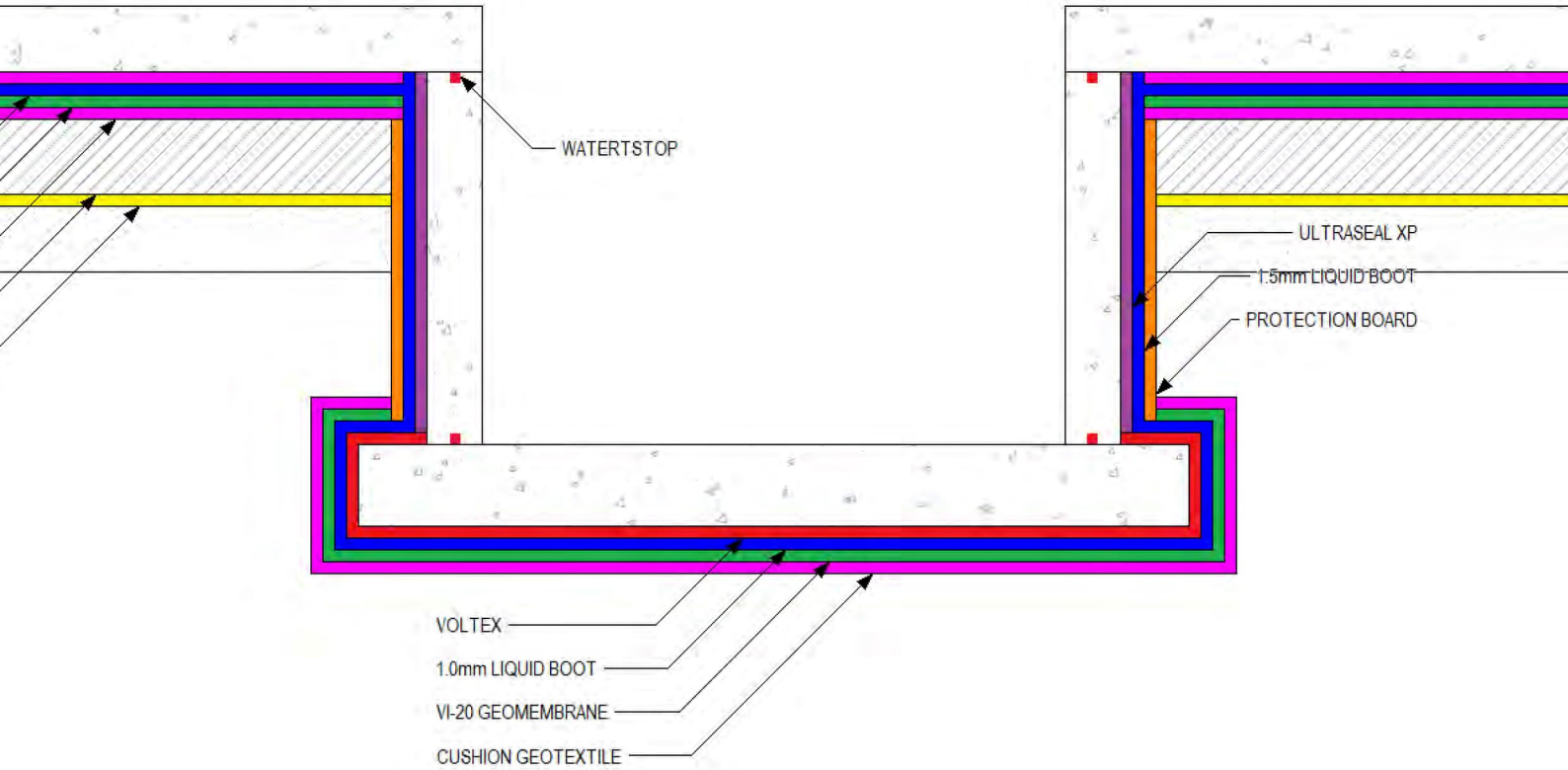


THROUGH SLAB/GROUND BEAMS
N.T.S

SCALES
N.T.S

BELOW GRO



SCALES
N.T.S

BELOW GRO