HANSENYUNCKEN

Construction Environmental Management Plan (CEMP)

Project: East Leppington Public School

Job No: SC126

Rev: 5 | May 2021

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Contents

1 Document Information

1.1 Review & Approval

Review			
Position	**Name**	**Sign**	**Date**
Contracts Authorised Person	Dean Marcon		08/06/2021
Snr Contracts Administrator	Ronaldo Bermudez		20/5/21
Services Engineer	Nicholas Ko		20/5/21
(EL) Project Manager	Zac Casimatis		20/5/21
(EL) Contracts Administrator	Kirsty Allen		20/5/21
(EL) Site Manager	Ross Pearson		20/05/21
(EL) Site Safety Officer	Andrew Wackwitz		20/05/2021
(EL) Site Engineer	Jorge Vecchionacce		20-05-21
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(EL) Foreman	Frank Sultana		26-05-21
(EL) Foreman	Simon Hindmarch		26/05/21
Approval			
State HSE Manager	Peter Fay	P F	09/06/2021
Construction Manager	Dean Marcon		08/06/2021

1.2 Change Information

Change Information			
Revision	**Description**	**Issued by**	**Issue date**
1	Preliminary		22-10-2019
2	Final for SSDA Main Works	MB	11-09-2020
3	Update following client audit	MB	04-01-2021
4	Reviewed for Kiss & Drop Works	MB	17-03-2021
5	Updated to accommodate changed site conditions	MB	19-05-2021

2 Definitions

The following definitions and abbreviations have been used in this Environmental Management Plan. Further definitions and abbreviations are provided in referenced procedures and plans.

BIM360 Field	Cloud based QHSE field management software application designed specifically for the construction industry.
EMP	Environmental Management Plan (this document)
EPA	State Environment Protection Authority
ESD	Ecologically Sustainable Development
HSE	Health, Safety & Environment
HY	Hansen Yuncken Pty Ltd
HYWAY	An information management platform developed by HY utilising Microsoft SharePoint
NC	Non-Conformance
NGER	National Greenhouse and Energy Reporting
EL	East Leppington Public School
NVMP	Noise and Vibration Management Plan
OEH	Office of Environment and Heritage
PLN	HY Plan
PMP	Project Management Plan
POEO	The Protection of the Environment Operations Act
PROJ	Project Management
REO	Regional Environmental Officer
RMS	Roads and Maritime Services
S/C	Subcontract(s) or Subcontractor(s) as the context requires
Site Safety Supervisor	Site Manager
SSC	Site Safety Coordinator
SSO	Site Safety Advisor
SWMS	Safe Work Method Statement
TMP	Traffic Management Plan

3 Commitment & Policy

3.1 Scope & Application

The Construction Management Plan (CMP) has been developed to demonstrate that the proposed Works will be executed in accordance with legislated safety and environmental requirements with minimal inconvenience to stakeholders including neighbours and the general public.

Hansen Yuncken, appointed as Principal Contractor in accordance with NSW WHS legislation, complies with the requirements detailed in this Construction Management Plan, as well as the requirements of any other legislation or statutory bodies.

The proposed development includes the design and construction of a Core 35 Public School inclusive of; teaching spaces, ancillary & sport spaces, hall, library, administration spaces, canteen, special programs spaces and unique areas.

A combination of offsite and onsite construction techniques will be used to deliver a high quality, future focused innovative, state of the art school. Meeting the current and future school and community needs whilst complying with the requirements as detailed in the Educational Facilities Standards and Guidelines (EFSG) and providing a high level of end user satisfaction.

This EMP has been generated to satisfy the requirements of “ISO 14001:2015, Environmental management systems – Requirements with guidance for use” and the “NSW Government Environmental Management System Guidelines – 3rd edition”. It establishes guidelines and controls for all HY activities that may impact the surrounding environment for the duration of the works, including but not limited to; air, water, land, natural resource use & waste, flora & fauna, and their respective interrelationship. Furthermore, it has been designed to embrace the environmental management requirements, both in terms of the Contract and generally, to demonstrate HY as an environmentally responsible organisation to the broader community.

3.1.1 Hours of Work

The proposed hours of work for the project are as follows:

- Monday–Friday – 7am – 6pm
- Saturday – 8am – 1pm
- Sunday – Nil

The proposed hours align to Condition C3 of SSD 9476. Works are permissible in the following hours provided the noise levels do not exceed the existing background noise level plus 5db, in accordance with Condition C4 of SSD 9476.

- Monday–Friday – 6pm – 7pm
- Saturday – 1pm – 4pm

Extended construction hours under the COVID-19 Recovery Act are in place, allowing construction hours to be extended to 7am-6pm, 7 days a week.

3.1.2 24 Hour Contact Details

The 24-hour contact details for the project are as follows:

Ross Pearson

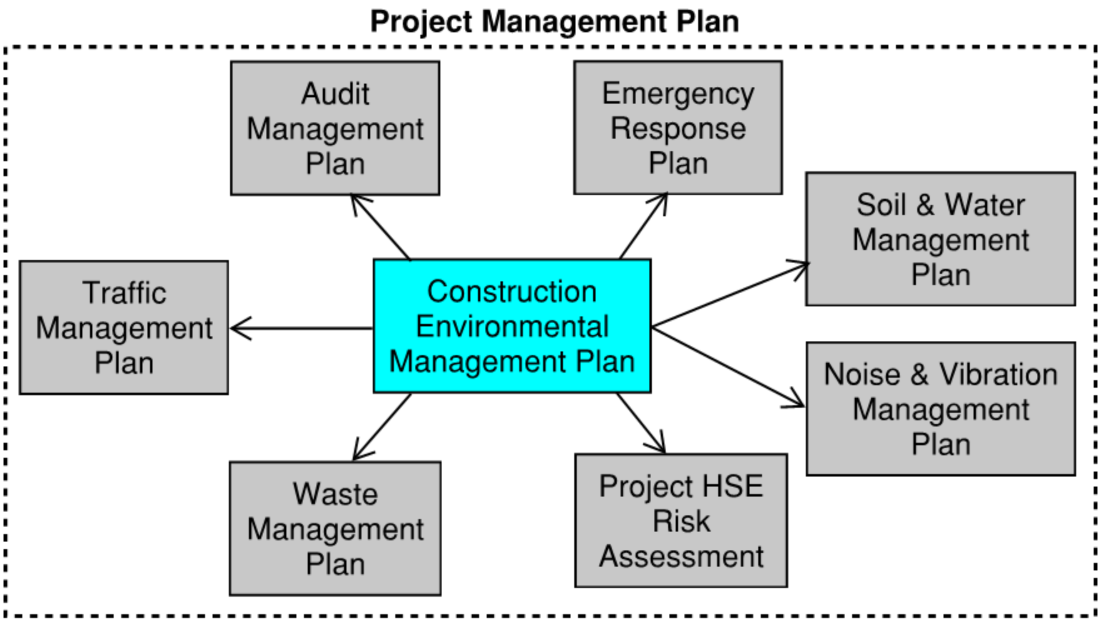
M: 0438 675 748

rpearson@hansenyuncken.com.au

3.2 EMP Interrelationship with PMP

This EMP forms part of Hansen Yuncken's Environmental Management and interfaces with the company's Quality & WHS Management Systems. Furthermore, this EPM is an integral part of East Leppington Public School PMP. The following plans referenced within this EMP form part of the overall PMP for the project and contribute to the environmental management procedures:

- **Project Site Induction** – Ensures all workers onsite are aware of the Environmental Management Plan & also trains all workers onsite on the requirements for controlling: dust & windblown debris, dirt & debris on public roads, protection of stormwater drains, tool & equipment washout, chemical spills, noise disturbance, waste collection & disposal, rubbish & food scraps & excess concrete.
- **Project HSE Risk Assessment** – Identifies what subcontractor onsite are impacted by or the risk of; air quality/dust, archaeology & cultural heritage, chemical spill, flora & fauna, littering, noise disturbance, stormwater contamination & watercourse pollution each month. This will be monitored through task observations scheduled for each month.
- **Noise & Vibration Management Plan** – Identifies mitigation methods to minimise the risk of noise & vibration to the workers onsite and the surrounding properties.
- **Traffic & Pedestrian Management Plan** – Summarises how construction and pedestrian traffic will be managed on the project to minimise the impact on the existing facility and the neighbours surrounding to the project.
- **Site Layout Plan** – Identifies the location of sediment controls, access routes, truck washout, location of site bins, spill kits, concrete washout.
- **Emergency Response Plan** – Outlines the process to manage the following environmental emergencies; asbestos exposure, water pollution, fire, major fuel spill & chemical spill
- **Audit Management Plan** – Describes the frequency of internal and external environmental audits and the process for closing out any non-conformances raised.



3.3 Policy & Objectives

The HY Environmental Policy Statement provides the framework for the development of this EMP (refer Appendix A.1), and details the company's commitment to "*providing a high quality environment, which meets the requirements and expectations of; Clients, Statutory Authorities, Employees and Community Groups*", through the application of "*sustainable development principles, to continually improve environmental performance in minimising impact on, and pollution of, the environment during the construction process*".

The objective of the Environmental Management Plan is to:

- Satisfy Client requirements related to environmental performance, set out in the Specification for the Works.
- Incorporate and provide mitigation strategies for environmental issues arising from site activities and as detailed in the East Leppington Public School Environmental impact assessment document (Environmental Impact Statement SSD 9476 by RPS)
- Encourage best practice environmental management through planning, commitment and continuous improvement;
- Prevent and minimize adverse impacts on the environment;
- Identify the potential for, and respond to, environmental incidents and emergency situations and take corrective actions;
- Identify and control possible environmental hazards with the works and HY activities;
- Identify and protect any special environmental characteristics of the site including cultural heritage significance;
- Define roles and responsibilities and allocate the necessary resources
- Ensure environmental training and awareness programmes are provided to employees and subcontractors;
- Establish mechanisms to monitor, evaluate and report progress.

The HY Environment Policy commits the company to achieve the following goals:

- Develop and promote a culture of environmental leadership, responsibility and continual improvement across the HY business;
- Audit, monitor and ensure compliance with environmental legislative and regulatory obligations and other environmental commitments;
- Utilise the resources of HY to lead the way in defining and achieving best environmental practice; and
- Advance and disseminate environmental knowledge and applied environmental management through training, research and engagement with the wider community

A copy of the Environment Policy is contained within the PMP and displayed at the project / site office and induction sheds. HY recognises this implementation will involve effective training of personnel to ensure they fully understand their responsibilities to comply with and monitor the management system. In addition, all site workers are consulted on HY environmental policies & procedures through the following mechanisms; site induction, notice board, site inspections, prestart meetings, subcontractor meetings, team meetings, toolbox talks.

3.4 Targets

3.4.1 Objective: Comply with all environmental legislation

KPI: Number of identified breaches of State or Commonwealth Environmental legislation

Target: Nil for duration of project.

Responsibility: HY & Subcontractors

3.4.2 Objective: Minimise impacts on the environment

KPI: Number of significant environmental incidents causing serious harm to the environment

Target: Nil for duration of project.

Responsibility: HY & Subcontractors

3.4.3 Objective: Conduct environmental site inspections to validate environmental conformance

KPI: Schedule and undertake regular site inspections

Target: > 90% of scheduled HSE inspections

Responsibility: HY Site Manager

3.4.4 Objective: Minimise and manage environmental complaints

KPI: Consult with impacted neighbours and promptly address all complaints

Target: ≤ 1 complaint per significant construction milestone

Responsibility: TSA

3.5 ESD Vision & Principles

The project provides an opportunity for HY to expand its practical and theoretical knowledge of ESD to a level that is considered ‘best practice’ status.

As such, the ESD vision and principles for HY involves:

- Identification and prioritisation of environmental risk based on AS/NZS ISO 31000:2009 and Guidelines HB158:2010, using qualitative likelihood vs. consequence methods.
- Development of management systems which build knowledge and capacity on environmental issues, principles and sustainable behaviours including training and communication.
- Reduced energy and water consumption as well as waste minimisation during the construction process.
- Environmental training and management of trade contractor’s activities to ensure that the project ESD objectives are obtained.
- Efficient and effective use of natural resources in a way that maintains the ecological processes on which life depends
- Sustainable use of renewable energy resources.

3.6 Environmental Planning

In accordance with the contractual requirements, applicable legislation, and in keeping with proper environmental practices, Hansen Yuncken has instituted a methodology which is reflective of observes the requirement, as set out in ISO 14001:2015.

3.6.1 Environmental Aspects & Impact

All activities related to the East Leppington Public School, which are enacted by or on behalf of Hansen Yuncken, are identified in the "Project HSE Risk Assessment" (refer Appendix A.4). For each activity the environmental aspects and associated actual and potential impacts are identified as they relate to the following environmental elements:

- Location and Land Use;
- Noise & Vibration;
- Traffic and Access;
- Air Quality;
- Soils, Erosion and Water Quality;
- Terrestrial Flora and Fauna;
- Cultural Heritage;
- Site Contamination; and
- Waste Management.

Environmental impacts are detailed in the "**Project HSE Risk Assessment**" and assessed for significance by using the Risk Matrix. Each identified potential impact is rated (Risk rating) in relation to its predicted likelihood and consequence. Environmental Impacts as applicable to the East Leppington Public School are summarised in the "Environmental Risk Register" contained within this CEMP (Section 4.3).

3.6.2 Work Method Statements

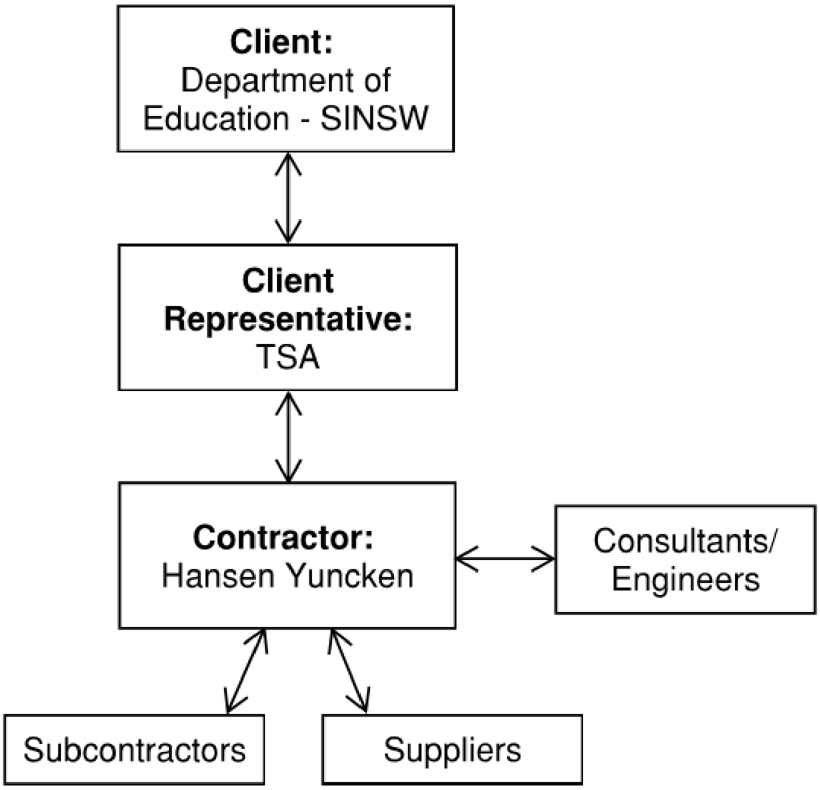
For each activity rated as a significant risk (i.e. Risk class >M/Medium) to the environment, a further Risk assessment is undertaken with the additional controls identified and contained within a Work Method Statement. This document details the; steps involved, hazards, control measures and persons responsible associated with the higher risk activity. A Tool Box talk is then completed with the relevant workers that will be completing the task to ensure that they comply with the Work Method Statement.

3.6.3 Legal Compliance and Other Requirements

Hansen Yuncken has developed a procedure ("Legislation Standards and Codes of Practice"), available on HYWAY to identify legal and other requirements that are applicable to the East Leppington Public School and to ensure the accessibility of the information. The procedure shall be referenced and is applicable to those activities and functions that have the potential to interact with the environment.
Furthermore (URL) links are supplied on HYWAY to regulatory body websites and relevant NSW legislation relevant to environmental Aspects and management of the same.

3.7 Roles and Responsibilities

The below flow chart summarises the organisation structure for communication and reporting between Hansen Yuncken, it's suppliers/subcontractors and the principal.



Hansen Yuncken will collaborate with the project team to provide the following in ensuring we are achieving sustainable environmental management for the duration of the project:

- Engagement with project stakeholders including consultants and contractors
- Notifications and communications with adjacent property occupants and owners advising of the Works;
- Formal notices of road closures and related matters;
- Conveying enquiries and complaints regarding the works (including but not limited to traffic, dust and noise) to the client;
- Liaising with key stakeholders and local authorities regarding the works; and
- Environmental issues related to the works.

A summary of the roles and responsibility of each stakeholder with regards to environmental management for the project is summarised below:

- Client Representative – provides a medium of communication between the client and the contractor and is responsible for all community consultation and communication
- Contractor – responsible for delivering the project in accordance with the relevant legislation, including the enforcement of the CEMP for it's subcontractors and suppliers.
- Consultants/Engineers – provide expert knowledge into the generation of aspects of the CEMP in line with industry standards and the relevant legislations.
- Subcontractor/Suppliers – responsible to abiding by the requirements of the CEMP when carrying out their contract works.

4 Implementation

4.1 Environmental Awareness

All HY and S/C employees shall receive an induction into the project in accordance with the Site Induction procedure including completing the Site Induction Record Form (FM-CORP-HSE-001).

The induction shall include the requirements for the conduct of activities which have the potential for significant environmental impacts on the project which shall be outlined in the project specific Site Induction Handbook.

This document applies to all HY and S/C employees, environmental awareness is the responsibility of every person working on and associated with the project.

4.2 Environmental Impacts of Subcontractor Activities

The environmental impacts of subcontractor activities shall be assessed during the S/C pre-award meeting in accordance with pre-award meeting procedure and the project HSE risk assessment. The general structure of the environmental management of the following risks is contained within this section of the report under the following structure:

- Likely Impacts – outlines the impacts of the environmental issues that have been assessed in the environmental risk register
- Mitigation Strategies – outline the procedures/actions that will be taken to minimise the possibility of the impacts outlined above from occurring.

4.3 Environmental Risk Register

Environmental Risk Register Summary & Responsibilities		
Environmental Issue	Risk to Project	Responsible Personnel
Location & Land use Residential and other properties may be impacted with construction works due to construction noise and dust	Low	PM
Noise & Vibration Construction of the development may result in short term impacts during the project due to the use of heavy machinery, drilling and plant as well as construction personnel and vehicle movements.	Low	PM / SM
Traffic & Access During construction there will be impacts to traffic on public roads surrounding the project from construction vehicles and deliveries for site.	Medium	PM / SM

Environmental Risk Register Summary & Responsibilities		
Air Quality During the earthworks stage of the project, there is a risk of poor air quality generated by the constructions works.	Low	SM
Soils, Erosion, & Water Quality There is a risk of soil leaving the site and potentially contaminating the stormwater system in the short-term during the earthworks stage of the project.	Low	SM
Terrestrial Flora & Fauna The removal of trees during construction works poses minimal risk to landscaped species throughout the area. The preliminary site investigation concluded that there were no ‘native trees’ that were present on the site.	Low	PM / SM
Cultural Heritage It is unlikely that construction works will impact any undisturbed aboriginal artefacts given that Biosis has completed an archaeological survey report, which concluded the area possesses low archaeological potential. The Upper Canal corridor has been identified as requiring preventative measures to minimise the impact that vibration, soil and water has on it during construction.	Medium	PM / SM

PM - Project Manager, SM - Site Manager, FM - Foreman, S/C – Subcontractor, PCA - Private Certifier

4.4 Location and Land Use

4.4.1 Site Location

The site is located at the corner of Commissioners Drive and Elkhorn Street within the Campbelltown Local Government Area (LGA). The site is located approximately 45lm southwest of the Sydney Central Business District (CBD), 30km southwest of Parramatta CBD and 13km south of the proposed Western Sydney Airport. The total site area is approx. 30,000m^2.

4.4.2 Likely Impacts

The construction works would be short term in nature and would not interfere with the current use of the site. All construction activities would be carried out with due diligence, duty of care and best management practices. Given the location of residential and other properties in close proximity to the works area, some impacts associated with construction traffic, noise/vibration and dust are likely to affect adjacent residents. These likely impacts will be addressed below.

4.4.3 Mitigation Strategies

- The neighbouring landowners are to be consulted in regard to the construction works, predicted program and any access requirements.
- Land disturbance during construction is to be limited to that required to undertake the construction works
- Construction works to be undertaken in consideration of adjacent vegetation
- Areas disturbed during construction to be returned to the pre-construction condition
- The consent approval stipulates working times to minimise the impact on the community being generally Monday to Friday 7am-6pm, Saturday 8am-1pm, no work on Sundays or public holidays. The COVID-19 Recovery Act has allowed construction hours to extend to 7am-6pm, 7 days a week.

4.5 Noise and Vibration

4.5.1 Likely Impacts

Construction of the proposed development will result in short term noise impacts during the construction period. The predicted noise levels during the construction phase have been identified in the project Construction Noise & Vibration Management Plan along with associated mitigation strategies that are to be adopted to minimise these impacts (refer Appendix A.6 for the Construction Noise & Vibration Management Plan).

4.5.2 Mitigation Strategies

The following mitigation strategies listed have been developed to control the level of noise and vibration that affect the relevant stakeholders:

- Site construction noise will be managed in accordance Construction Noise and Vibration Management Plan (CNVMP) developed for this project. The CNVMP is based on the proposed construction methodology, activities, durations and equipment type and numbers.
- Keep the community informed in relation to noise intensive activities in the immediate area.
- Provide consultation where prolonged or consecutive periods of construction works are planned.
- Construction activities shall be restricted to the hours dictated in the consent SSD 9476.
    - The consent approval stipulates working times to minimise the impact on the community being generally Monday to Friday 7am-6pm, Saturday 8am-1pm, no work on Sundays or public holidays.
    - The COVID-19 Recovery Act has allowed construction hours to extend to 7am-6pm, 7 days a week
- Any noise complaint received will be investigated as soon as practicable. Any practicable and feasible measures to minimise noise will be identified and implemented if required.
- Optimum siting of work areas, vehicle and plant parking areas, materials stockpiles and equipment storage areas in locations where potential acoustical impacts will be minimised.
- All plant and machinery used for the project shall be well maintained.
- Ensure workers and contractors are regularly trained (such as toolbox talks) to use equipment in ways to minimise noise

- "Quacker" reversing alarms to be used for all plant on site where practicable and without compromising the safety of construction staff or members of the public

For more detailed mitigation strategies related to specific work phases and the relevant mitigation strategies to be adopted, refer to the CNVMP (Appendix A.6).

4.6 Traffic & Access

4.6.1 Likely Impacts

Construction of the new site facilities shall see some increase in traffic in the local area. The increased traffic is not predicted to have an impact on local traffic flow and only a minor inconvenience to local road users is expected. Construction vehicle routes have been developed with the intention of minimising the impact of construction traffic on the local streets in the immediate vicinity. Access to site is currently via Elkhorn Street. The management of construction traffic developed as a result of these works in summarised in the Construction Traffic Management Plan (refer Appendix A.5). Access from Willowdale Drive will temporarily be lost once the Kiss & Drop works commence, from which access to site will be from Elkhorn Street.

4.6.2 Mitigation Strategies

Follow the Construction Traffic Management Plan (TMP) based on the detailed construction methodology and use of specific heavy vehicles and construction plant. The Traffic Management

- Plan is to include measures to minimise traffic impacts ensure public safety and is to be prepared in accordance with:
- Traffic Control at Work Sites Manual (RTA, 2010)
- Australian Standard 1742.3 - 2002 Traffic Control Devices for Works on Roads.

- The TMP will be developed in consultation with Campbelltown Council.
- The TMP will detail hours of operation, heavy vehicle volumes (numbers) and routes, construction staff parking, loading / unloading areas and site access arrangements, all temporary warning, guidance and information signage, and appropriate traffic control devices
- Notify surrounding landowners at least one week in advance of the works
- All vehicles accessing the sites will use the designated access roads
- All roads will be kept clean and free of dust and mud. Where material is tracked onto sealed road, it will be removed so that road pavements are kept safe and trafficable
- All vehicles transporting spoil onsite will be covered and filled to maximum capacity to minimise vehicle movements as required
- All roads, kerbs, gutters and footpaths damaged as a result of construction are to be restored to their pre-construction condition. A dilapidation report has been carried prior to construction
- All traffic shall comply with all applicable traffic laws and regulations including speed limits. All construction vehicles shall comply with the speed limits set for the roads accessing the site
- Construction activities shall be restricted to the hours dictated in the consent SSD 9476.
- The consent approval stipulates working times to minimise the impact on the community being generally Monday to Friday 7am-6pm, Saturday 8am-1pm, no work on Sundays or public holidays. The COVID-19 Recovery Act has allowed construction hours to extend to 7am-6pm, 7 days a week

4.7 Air Quality & Dust Control

In accordance with condition B15a (iii) of SSD 9476, repeated in part as follows; the Construction Environmental Management Plan (CEMP) which must include, but is not limited to, the following; (iii) management of dust and odour to protect the amenity of the neighbourhood. This section of the CEMP addresses this condition, outlining the likely impacts of air quality and dust control for the various aspect of the construction works, along with the mitigation strategies that will be implemented to minimise these impacts on the neighbourhood.

4.7.1 Likely Impacts

The main impact of air quality during construction is expected to arise from the generation of airborne localised dust associated with earthworks. Given the proximity to of neighbouring properties and existing buildings, there is the potential for impact by dust, particularly during windy conditions.

4.7.2 Mitigation Strategies

- Construction vehicles and equipment to be suitably serviced prior to commencement of construction activities and all necessary maintenance to be undertaken during the construction period to meet EPA air quality requirements.
- Excessive use of vehicles and powered construction equipment will be minimised where possible
- All construction machinery will be turned off when not in use to minimise emissions where possible.
- Construction contractors to monitor dust generation progressively.
- Dust suppression methods will be adopted where required (i.e. on windy days when earthworks and vehicle movements are generating dust). Examples of dust suppression methods include:
  - Water carts
  - Localised use of water to supress excavation activities as they are occurring to suppress dust
  - Covering stockpiles
- Any stockpiled spoil/fill will be protected to minimise dust generation to avoid sediment moving offsite.
- Vehicles transporting spoil from the site to be covered where required.
- The burning of waste materials will not be permitted on site

4.8 Soil, Erosion & Water Quality

In accordance with condition B15a (iv) & (v) of SSD 9476, repeated in part as follows; the Construction Environmental Management Plan (CEMP) which must include, but is not limited to, the following; (iv) stormwater control and discharge & (v) measured to ensure sediment and other materials are not tracked onto the roadway by vehicles leaving the site. This section of the CEMP addresses these conditions, outlining the likely impacts associated with stormwater runoff and the mitigation strategies that will be implemented to ensure that these impacts are minimised. Further to this, in accordance with condition B13e, refer to Appendix A.7 for the Soil and Water Management Sub-Plan.

4.8.1 Likely Impacts

Earthworks and general ground disturbances associated with the site works may result in sediment and other materials leaving the site via wind or water movement. This may have the potential to result in the water pollution such as turbidity and nutrient inputs, should sediment wash into stormwater or natural drainage lines.

Aspects of the site identified as potentially impacting on water quality includes:

- Excavation for foundations and site levelling;
- Stockpiling and transportation of excess spoil; and
- General construction waste entering drainage lines

4.8.2 Mitigation Strategies

- Construction is to be undertaken in accordance with the Erosion and Sediment Control Plan.
- All erosion and sediment control devices shall be properly maintained for the duration of the work. All structures are to be inspected after rain events and sediment to be removed
- Any temporary stockpiles should be stabilised using sediment fencing or similar.
- All fuels and other hazardous liquids shall be stored at designated construction compounds
- All chemicals used for construction shall be stored and used in accordance with the relevant Safety Data Sheets.
- An emergency spill kit shall be kept at the construction compound.
- Workers are to be made aware of the provisions of Section 120 of the POEO Act with regards to water pollution
- Notification to the EPA in accordance with Part 5.7 of the POEO Act is to be undertaken where a pollution incident occurs
- All construction vehicles and equipment are to be maintained in designated areas away from watercourses
- Construction vehicles shall be appropriately cleaned of any soil or mud prior to leaving each works site at dedicated wash down bays
- “Clean” stormwater shall be diverted around the site where possible
- All existing stormwater pits and drains subject to HY construction works will be silt protected with geo-fabric and/or granular socks. Drains will be monitored and maintained by HY
- Stockpiles to be established at HY approved locations
- Sediment fences shall be installed at required locations at the perimeter of the site
- Stormwater shall be diverted to retention basins
- The location and details of permanent controls shall be included on the Site Layout Plan
- Erosion and sediment controls shall be inspected as part of the Site HSE Inspection

4.9 Terrestrial Flora and Fauna

4.9.1 Likely Impacts

The construction of the New East Leppington Primary School is occurring on a greenfield site, with a small number of existing flora and fauna present. The preliminary site investigations have concluded that there are no native trees that need to be removed as part of the development. There is a total of 14 flora species across the site which are common groundcovers that are typical of derived pasture. The mitigation strategies outlined in the subsequent section will be adopted during construction to minimise the impact that the construction has on the local flora and fauna.

4.9.2 Mitigation Strategies

- No vegetation removal or modification is to occur beyond the proposed works areas shown on the plans.
- Any identified noxious weeds should be removed as part of the works if encountered
- Carry out landscaping in accordance with the landscape design
- Any areas of significant flora and fauna value which have been identified on the construction site will remain bunted/ flagged during construction
- If any additional species are encountered the Site Manager shall arrange for works to be ceased in the area and contact the Superintendent for further directions.

4.10 Archaeology & Cultural Heritage

4.10.1 Likely Impacts

An Aboriginal Archaeological Assessment has been completed for the area by Biosis, which has deducted that the area possesses low archaeological potential. While it is unlikely that the proposed works would disturb any undisturbed Aboriginal objects or sites of historical relics, the following mitigation strategies will be adopted.

4.10.2 Mitigation Strategies

- All workers (including contractors) should be made aware that it is illegal to harm an Aboriginal object or historic relics, and if a potential Aboriginal object or historic relic is encountered during activities, then all work at the site will cease and the OEH will be contacted to advise on the appropriate course of action to allow the Wiradjuri People to record and collect the identified item(s).
- All workers (including contractors) should be inducted concerning Aboriginal cultural heritage values
- In the event that known or suspected Aboriginal skeletal remains are encountered during the activity, the following procedure will be followed:
  a. All work in the immediate vicinity will cease;
  b. The find will be immediately reported to the work supervisor who will immediately advise the environment manager or other nominated senior staff member;
  c. The environment manager or other nominated senior staff member will promptly notify the police and the state coroner (as required for all human remains discoveries);
  d. The environment manager or other nominated senior staff member will contact the OEH for advice on identification of the skeletal material as aboriginal and management of the material; and
  e. If the skeletal material is of aboriginal ancestral remains, the local aboriginal land council will be contacted and consultative arrangements will be made to discuss ongoing care of the remains.
  f. The project team will take all necessary measures to protect the artefacts from being damaged or destroyed.
  g. Works will not re-commence in the area until a written instruction from the superintendent is received.

4.11 Site Contamination

4.11.1 Contaminated Soil Risk Assessment

A preliminary contamination investigation has been conducted by Environmental Investigation Services (EIS) which has concluded that there is a relatively low potential for contamination-related unexpected finds to occur at the site during the proposed development works (refer Appendix A.11 for Executive Summary). Prior to the commencement of bulk earthworks and in line with the risk assessment generated for the project, an assessment of actual or potential soil contamination and it's impacts will be undertaken using the Soil Contamination Assessment on BIM360 Field. The purpose of this assessment was to provoke whether HY should have an independent third party to provide recommendations or seek wider advice within the company so that the additional knowledge can reduce the risk profile of contaminated soil. The findings of this assessment concluded that there is no contaminated soil present on the site. There are no existing adjacent buildings to the site. Despite this, Section 4.11.7 of this management plan contains the unexpected finds protocol that is to be adopted in the event that unexpected contaminated material is encountered.

4.11.2 Identification of Contaminated Soil

During construction, it shall be necessary to monitor soil contamination levels (if any), dust levels and water runoff quality, to ensure that health and environmental standards are not compromised. This is especially important as contaminated soil may be excavated and transported around the site.

Upon discovery of contaminated soil, the HY Site Manager shall arrange for works to be ceased immediately in the area and contact the Superintendent for further directions.

Contaminated waste shall be collected, contained, stored, handled and disposed of in accordance with relevant legislation and codes of practice.

4.11.3 Risk of Exposure

It is important to minimise the risk of exposure of construction personnel to soil contaminants by adopting appropriate site controls and industrial hygiene practices. Site controls may include:

- Defining certain areas as contaminated and restricting access to them;
- Appropriate signage;
- Training construction employees in industrial hygiene procedures;
- Keeping non-essential motor vehicles such as personal cars out of contaminated areas;
- Regular medical checks of construction personnel who are exposed to contaminated soils;
- Keeping stockpiles of contaminated material watered down to minimise dust generation in accordance with any water restriction requirements and ensure that runoff is not generated from excessive watering;
- Covering truck loads with tarpaulins and watering material when loading and unloading;
- Wheel washes for trucks and vehicle leaving the contaminated areas;
- Regular road sweeping and cleaning;
- Dust monitoring and adjustment of construction programs to accommodate high risk periods when conditions are windy or very dry; and

- Monitoring of concentrations of volatiles.

Industrial hygiene practices may include:

- Wearing long sleeved shirts and trousers or overalls to minimise dermal exposure;
- Wearing gloves when handling soils;
- Washing hands and faces before eating, drinking or smoking;
- Leaving overalls at site for laundering;
- Showering and washing facilities; and
- Wearing respiratory equipment during times of high dust or volatile emissions.

4.11.4 Groundwater Management

In accordance with condition B15a (vi) of SSD 9476, repeated in part as follows; the Construction Environmental Management Plan (CEMP) which must include, but is not limited to, the following; (iv) groundwater management plan including measures to prevent groundwater contamination. The contamination investigation conducted by EIS concluded that groundwater is not considered to pose a risk to the site (refer Appendix A.11 for the Executive summary). This was based on boreholes that were completed in the investigation that did not encounter any groundwater on the site, and the laboratory testing of groundwater samples obtained was below the Site Assessment Criteria. Despite this, the measures outlined in Section 4.11.5 will be adopted to mitigate the potential contamination of groundwater. Furthermore, the unexpected finds protocols outlined in Section 4.11.7 & Section 4.11.8 will be adopted in the event that groundwater is encountered on site.

4.11.5 Release of Contaminants to Soil and Groundwater

Water spraying of stockpiles and of soils being loaded and unloaded from trucks, covering of truck loads with tarpaulins and other measures described in the previous section would minimise the potential for dust to be generated.

If heavily contaminated soil is placed in contact with clean soils, contaminants could be mobilized by rainwater or chemical / physical reactions and affect the clean soils to a limited extent.

Similarly, there is a risk that contaminated soil is not clearly differentiated from clean soil and that mistakes could occur which cause the materials to be mixed or wrongly handled or disposed of.

This shall be overcome by implementing a material tracking system for all contaminated soils and ensuring that construction staff are trained how to use the system.

This shall involve documenting areas containing contaminated soil and putting signage near stockpiles that indicated the type of material present and its contamination status.

It shall also require supervision and documentation of all movements of contaminated materials around the site.

Avoiding contact between stormwater and contaminated soils is difficult to achieve if larger areas of a site are being exposed within a short period, because it does not allow for minimizing the amount of soil that is uncovered or placed in temporary stockpiles.

Therefore, it is necessary to manage stormwater in such a way that it does not mobilize contaminants and transfer them to clean areas.

This may be achieved by:

- Covering stockpiles of contaminated soil;
- Placing stockpiles of contaminated soil on bitumen or other sealed areas;
- Installation of adequate bunding or other approved method to contain runoff;
- Collecting stormwater run-off from stockpile areas; and
- Analytical testing of collected stormwater prior to its release.

Erosion and sediment control procedures in accordance with the relevant Code of Practice may also be applied, but with the additional objective of keeping water that is exposed to contaminated soils separate from water that has only come into contact with clean soils.

Groundwater could potentially be impacted by contaminants mobilized from stockpiled contaminated soil or by buried material.

Minimising runoff from stockpiles, as outlined above would reduce the risk to groundwater.

Land filling of contaminated material which is below the relevant criteria for soil contamination above the water table and capping the landfill area with low permeability material would minimise the risk of groundwater contamination from infiltration of stormwater into buried soils.

4.11.6 Heavy Metal Contamination

Any suspicious industrial wastes encountered will be immediately isolated to enable these assumptions to be confirmed by analytical testing.

4.11.7 Mitigation Strategies

In the event that unexpected conditions are encountered during development work or between sampling locations which may pose a contamination risk, all works should stop and an environmental consultant shall be engaged to inspect the site and address the issue.

4.11.8 Unexpected Finds

In accordance with Condition B15f and B15g of SSD 9476, unexpected finds protocols must be included within the CEMP to outline the process to be followed in the event that unexpected contamination and/or Aboriginal/non-Aboriginal heritage is found through the duration of the project. Unexpected Find shall be addressed in compliance with the Hansen Yuncken’s Unexpected Finds protocol listed below:

Unexpected Finds Protocols – General including aboriginal and non-aboriginal items

1. Immediately cease work and contact site foreman
2. Site Foreman to construct temporary barricading to prevent worker access to the unexpected substance(s) and install appropriate stormwater/sediment controls
3. Site foreman to contact Client and arrange inspection by environmental consultant
4. Environmental consultant to undertake detailed inspection and sampling & analysis as per the documented sampling procedures outlined in the RAP analytical results against documented site assessment criteria in the RAP
5. If substance assessed as presenting an unacceptable risk to human health
6. If substance assessed as not presenting an unacceptable risk to human health Site foreman to remove safety barricades and environmental controls and continue work
7. Environmental consultant to supervise remediation and undertake validation/clearance as per the remediation/validation/clearance plan
8. Site Foreman to remove barricades and environmental controls and continue work.
9. Environmental consultant to submit assessment/validation/clearance to site foreman for distribution to Client and appropriate regulatory authorities.

Unexpected Finds Protocol – Asbestos and contamination

If asbestos is detected in unexpected areas prior to, or during, site development works the following 'Unexpected Finds Protocol' will apply:

a. Upon discovery of suspected asbestos containing material, the site manager is to be notified and the affected area closed off by the use of barrier tape and warning signs. Warning signs shall be specific to Asbestos Hazards and shall comply with the AS1319-1994 – Safety Signs for the Occupational Environment.

b. An Occupational Hygienist is to be notified to inspect the area and confirm the presence of asbestos and to determine the extent of remediation works to be undertaken. A report detailing this information would be compiled by the Occupational Hygienist and provided to the Principal (or their representative) and the site manager.

c. The location of the identified asbestos material would be surveyed using sub-meter Differential Global Positioning System (DGPS).

d. If the impacted soil is to be disposed off site, it should be classified in accordance with the DECCW's Waste Classification Guidelines (2008) and disposed of, as a minimum, as asbestos contaminated waste to a suitably licensed landfill. In dry and windy conditions the stockpile would be lightly wetted and covered with plastic sheet whilst awaiting disposal.

e. All work associated with asbestos in soil would be undertaken by a contractor holding a class ASA Licence. WorkCover must be notified 7 days in advance of any asbestos works.

f. Monitoring for airborne asbestos fibres is to be carried out during the soil excavation in asbestos contaminated materials.

g. Documentary evidence (weighbridge dockets) of correct disposal is to be provided to the Principal (or their representative).

h. At the completion of the excavation, a clearance inspection is to be carried out and written certification is to be provided by an Occupational Hygienist that the area is safe to be accessed and worked. If required, the filling material remaining in the inspected area can be covered/sealed by an appropriate physical barrier layer of non-asbestos containing material prior to sign–off.

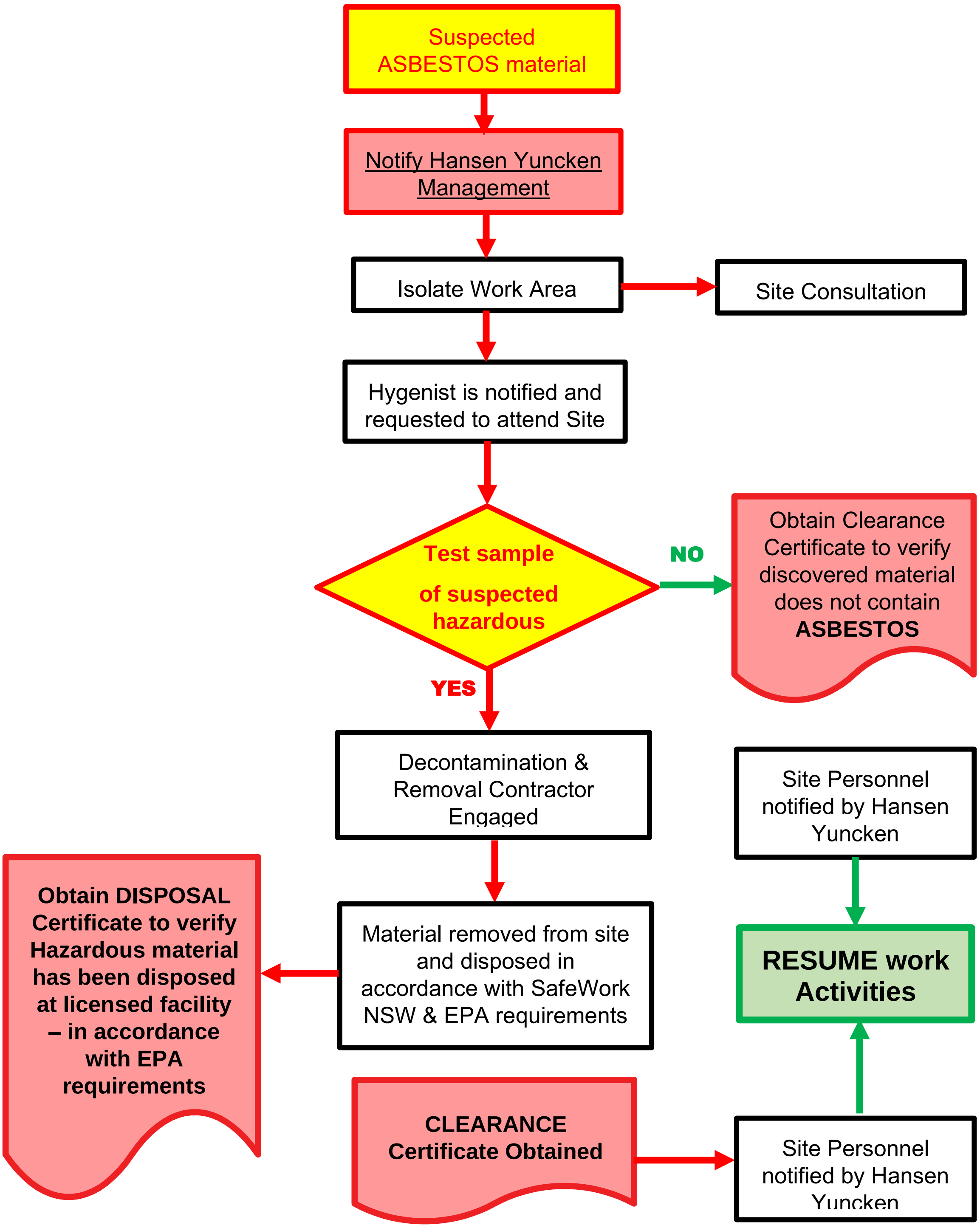
i. Validation samples would be collected from the remedial excavation to confirm the complete removal of the asbestos containing materials. If the asbestos pipes/conduits are uncovered, then sampling density would typically comprise one sample per 10-20 linear meter (depending on the length of the pipe). If asbestos debris are found, then the sampling density would typically comprise 1 sample per 5 metre x 5 metre grid.

j. The sampling locations should be surveyed using a sub-meter DGPS.

k. Details are to be recorded in the site record system.

l. Following clearance by an Occupational Hygienist, the area may be reopened for further excavation or construction work.

Unexpected Finds Protocol - ASBESTOS



Unexpected Finds Protocol - Buried Structures

In the unlikely event that buried structures such as Underground Storage Tanks (USTs) are encountered during site works, the structure(s) and any associated pipe-work should be managed /removed as follows:

a. Upon discovery of structure, the site foreman is to be notified and the area barricaded;

b. Visual identification of the tank and associated pipe-work;

c. Remove and dispose of the structure and associated pipe-work by a qualified contractor. In the case of an UST, the tank must be removed in accordance with Australian Institute of Petroleum (AIP) Code of Practice and Australian standards;

d. Excavate and stockpile impacted materials (based on field observations) for classification;

e. Validation of the remedial pit by a qualified environmental consultant for the contaminants of concern at the following sampling density:

    i) Base of tank pit excavation - 1 sample per 25 m^2 (i.e. 5m x 5 m grid);

    ii) Side of tank pit excavation - 1 sample per 10 linear metre (minimum of 1 sample per side) and 1 sample per 2m – 3m depth interval;

    iii) Fuel feed lines/pipe-work - 1 sample per 10 linear metre and 2 - 3 depth interval; and

f. If required, “chase out’ all of materials in the remediation pit identified to be impacted by petroleum/hydrocarbons and further validation sampling and analysis as required to assess appropriate removal of impacted materials;

g. Waste classification and off-site disposal of impacted materials in accordance with Section 4.12 of this plan on Waste Management and

h. Inclusion of validation, waste classification and disposal documents (including landfill dockets and, in the case of USTs, tank and pipe work destruction certificates) in the validation report.

4.12 Waste Management

In accordance with Condition B15 d), the Construction Waste Management Plan (CWMP) has been completed for the project and is contained within (Appendix A.8). The CWMP contains detailed information regarding the types and disposal of different waste types throughout the project. In particular, section 5 of the Waste Management Plan addresses the way that waste will be addressed throughout the construction process with reference to the unexpected finds protocols that are to be adopted in the event that an unexpected find is encountered.

In accordance with Condition B13 h), the waste classification for the project is contained within Appendix A.9. Detailed information regarding the treatment and allocation of waste for the duration of the project is contained within the CWMP.

4.12.1 Waste Reduction

It is likely that some excess building materials will be produced due to the construction work such as miscellaneous waste associated with packaging and transport of plant and equipment and various other manufactured items forming part of the augmentation works. Waste generated as a result of construction will be minimised, recycled, reused or recovered, where practical.

HY has accepted the challenge to reduce waste on construction projects, particularly in materials transferred to landfill.

The strategy for reducing the waste on the project will be made up of three strategies as detailed below in order of priority. The prime objective is to keep the amount of materials transferred to landfill from this project to the minimum possible amount.

1. Reduce the amount of waste material produced on the project by ensuring that only enough materials required to perform the works are ordered.
2. Any excess materials from particular work areas are to be retained and incorporated into other work areas where practical.
3. Encourage “just in time” delivery of construction materials (minimum storage on site) to reduce the potential of loss / waste due to damage prior to usage.

4.12.2 Waste Generation – Fill Material

The site is expected to have site-won material only.

4.12.3 Non-Recyclable Waste

Non-recyclable waste will be disposed of at an EPA approved landfill or transfer station.

4.12.4 Waste Collection & Disposal

Appropriate waste bins are to be provided by HY and made available to all S/C

All S/C shall be directed to place waste in the bins provided. This shall be included in the Site Induction.

Waste collection points are nominated on the Site Layout Plan.

4.12.5 Waste Reporting

Waste generation is monitored by HY on monthly basis to ensure that the company’s waste reduction objectives are achieved. Waste disposal quantities are monitored monthly by HY to ensure compliance.

The Project Administrator shall record waste disposal data on BIM360 Field using the waste record checklist.

Waste quantities from the PMR shall be entered into the State HSE Database for analysis and reporting against HY Waste reduction targets.

4.12.6 Concrete Waste & Washout

Concrete trucks and pumps shall be washed out at designated locations as shown on the site layout plan. Washout of concrete pumps and AGI’s in other areas will not be permitted.

Washout shall be captured using membranes or other suitable means and allowed to set.

Waste shall be placed in bins for disposal with site waste.

Excess concrete shall be returned to the concrete plant for disposal or re-use.

4.12.7 Mitigation Strategies

- Accurate written records are to be kept such as:

  - Who transported the waste (company name, ABN, vehicle registration and driver details, date and time of transport, description of waste)
  - Copies of waste dockets/receipts for the waste facility (date and time of delivery, name and address of the facility, it's ABN, contact person).
- The construction contractor to ensure that waste generated by the works is transported to a place that can lawfully accept it as per Section 143 of the *Protection of the Environment Operations Act* 1997.
- The removal of any asbestos containing material if found is only to undertaken by an appropriately licenced contractor as per WorkCover NSW requirements and current guidelines.
- All waste, including excess spoil be recycled where practicable
- Trucks transporting spoil off site to be covered.
- The EPA is to be notified immediately of any pollution incidents or harm to the environment (as defined under Part 5.7 of the POEO Act).

4.13 Visual

4.13.1 Likely Impacts

The project has minimal visual impact to neighbouring properties. The visual impact has been assessed through the SSDA within the Environmental Impact Statement (EIS).

4.13.2 Mitigation Strategies

- Construct landscaping in accordance with the design documentation will reduce visual impacts of the new development.

4.14 Environmental Complaints

Complaints received regarding HY's Environmental Impacts or performance shall be recorded as Complaint in accordance with Hansen Yuncken's HSE Incident Procedure. Actions to be taken to address the complaint.

4.15 Fuel & Chemical Spills

Response to major fuel spills shall be implemented in accordance with the fuel spill procedure in the Emergency Response Plan. The requirements for storage of large fuel and chemical quantities are not expected for this project.

A spill kit shall be located adjacent to fuel and chemical storage and dispensing areas.

4.16 Hazardous Materials

Hazardous materials shall be controlled in accordance with Hazardous Materials procedure.

4.17 External Lighting

In accordance with condition B13 & B15a (vii) of SSD 9476, the external lighting to the proposed East Leppington Public School complies with AS1158.3.1:2005 – Pedestrian area (Category P) lighting – Performance and Design Requirements and AS4282-2019 – Control of the Obstructive Effects of

Outdoor Lighting. Please refer to Appendix A.10 for the certificate verifying the compliance with these Australian Standards.

4.18 Community Consultation and Complaints Handling

In accordance with condition B15a (viii) of SSD 9476, community consultation and complaints handling is primarily the responsibility of the Client. Hansen Yuncken will provide assistance where possible to ensure that the client is complying with the requirements of Community Communication Strategy, developed for the New Primary School in East Leppington.

4.18.1 Community Consultation

Community consultation is primarily the responsibility of the client. Hansen Yuncken will ensure that the relevant strategies/outcomes are incorporated within the relevant management plans and construction process where possible. The main channels that the client is planning on conducting consultation is through the following:

- Community information phone line
- Community contact cards
- Door knocks
- Face-to-face meetings/briefings
- Fact sheets
- Information Booths
- Project updates
- Project Reference Group
- Website
- Works notifications
- Letterbox drops

The above have been extracted from Table 3 of the Community Communication Strategy.

4.18.2 Complaints Handling

The primary form of assistance that Hansen Yuncken will provide is through the complaints handling process. During the project delivery phase, a complaint defined as in regards to construction impacts – *such as* – safety, dust, noise, traffic, congestion, loss of parking, contamination, loss of amenity, hours of work, property damage, property access, service disruption, conduct or behaviour of construction workers or other environmental impacts. If a complaint is made directly to Hansen Yuncken, it will be redirected to the following SINSW communication channels through the provision of business cards containing the following information:

- Phone: 1300 482 651
- Email: schoolinfrastructure@det.nsw.edu.au

Upon receipt of the complaint from the Project Director, Hansen Yuncken will endeavour to close out the complaint in a timely manner. The complaint will be logged to ensure that the impact of future construction works that may impact the community in a similar manner are minimised.

5 Measurement & Evaluation

5.1 Environmental Incidents & Emergencies

5.1.1 Environmental Incidents

Incidents resulting in potential or actual environmental damage shall be reported and investigated in accordance with the Hansen Yuncken's HSE Incident Procedure and recorded on BIM360 using the HSE incident report

5.1.2 Environmental Emergencies

Preparation for and response to the environmental impacts of emergency events shall be conducted in accordance with Hansen Yuncken's project Emergency Response Plan. The environmental impacts controlled in ERP are;

Asbestos Exposure

In the event that during works, personnel become accidentally exposed to asbestos, the following procedures shall be followed:

1. Personnel in the immediate affected area shall cease work and immediately go to the emergency showers on site.
2. All contaminated clothing is to be removed and placed into a thick plastic bag. The plastic bag must then be tightly sealed and labelled as "Asbestos Contaminated Clothing".
3. Personnel are to immediately decontaminate themselves in a shower and a clean set of clothes to be re-issued.
4. Asbestos contaminated clothing is to be industrially cleaned or disposed of appropriately

Water Pollution

An incident involving actual or potential harm to human or environmental health must be reported immediately to the EPA.

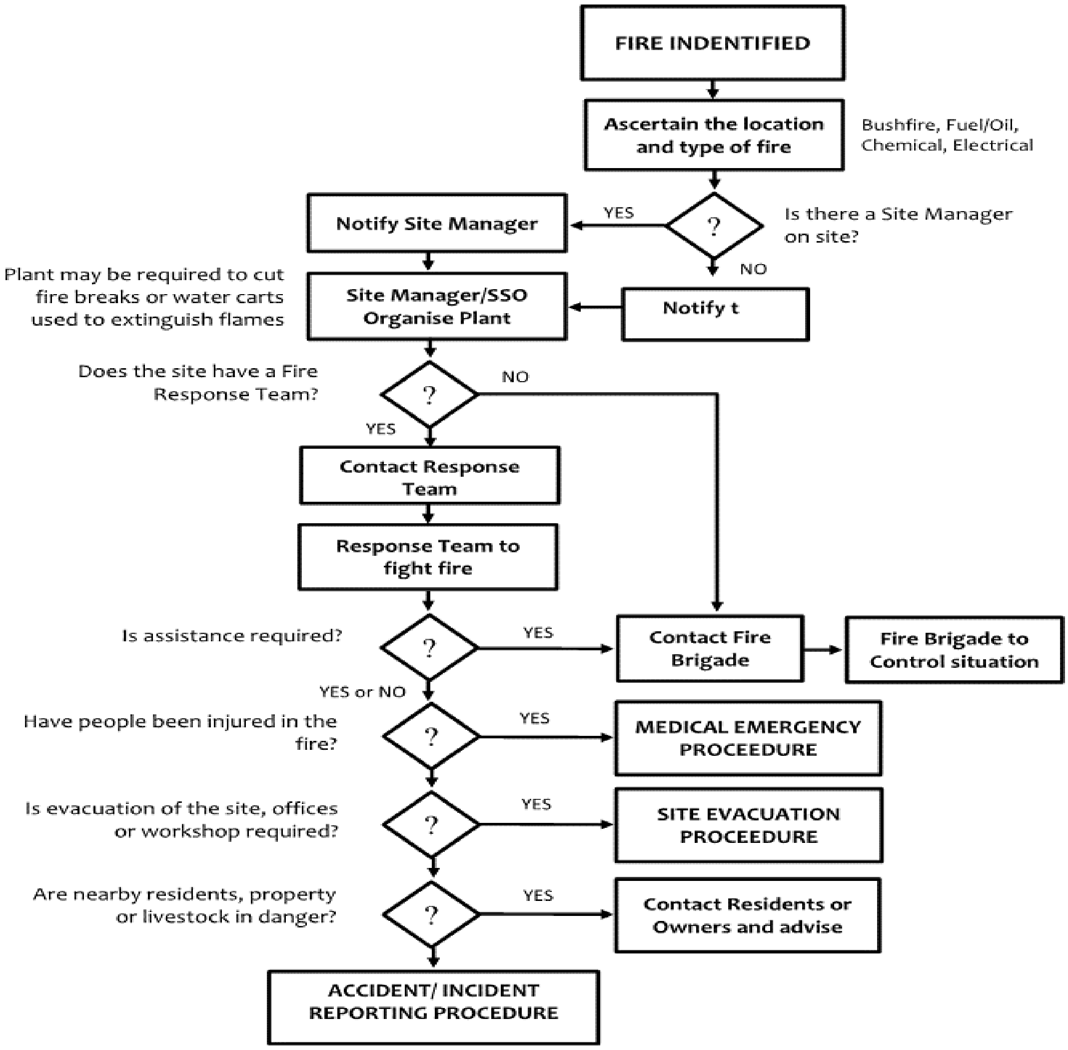
Firstly, call 000 if the incident presents an immediate threat to human health or property. Fire and Rescue NSW, the NSW Police and the NSW Ambulance Service are the first responders, as they are responsible for controlling and containing incidents.

If the incident does not require an initial combat agency, or once the 000 call has been made, notify the HY Site Manager who will notify the relevant authorities in the following order. The 24-hour hotline for each authority is given when available:

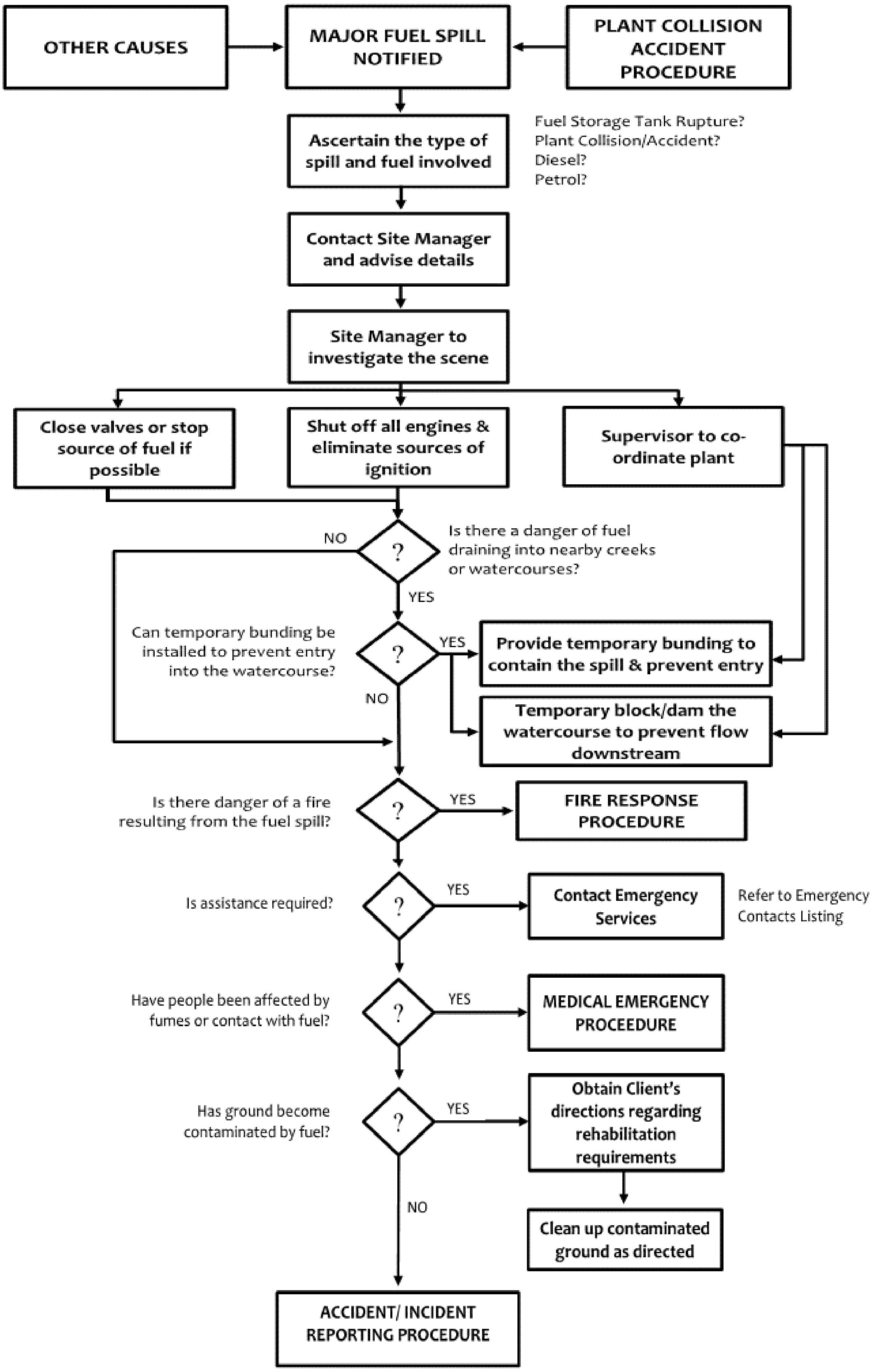
EPA Environment Line on 131 555

Safework NSW Authority – phone 13 10 50 (Where appropriate)

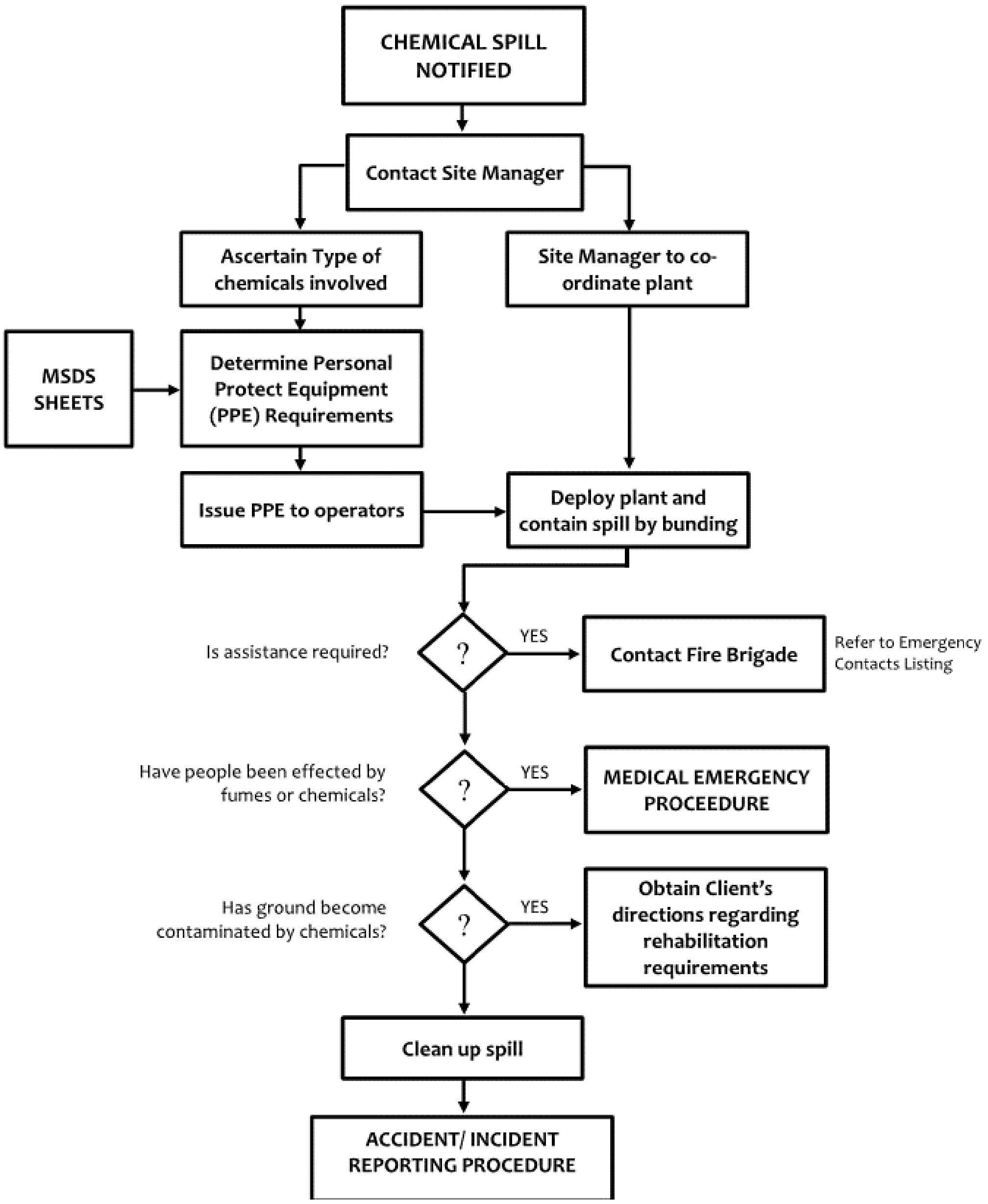
Fire


FIRE INDENTIFIED
Ascertain the location and type of fire
Bushfire, Fuel/Oil, Chemical, Electrical
Is there a Site Manager on site?
?
YES
NO
Notify Site Manager
Notify t
Plant may be required to cut fire breaks or water carts used to extinguish flames
Site Manager/SSO Organise Plant
Does the site have a Fire Response Team?
?
NO
YES
Contact Response Team
Response Team to fight fire
Is assistance required?
?
YES
Contact Fire Brigade
Fire Brigade to Control situation
YES or NO
Have people been injured in the fire?
?
YES
MEDICAL EMERGENCY PROCEDURE
Is evacuation of the site, offices or workshop required?
?
YES
SITE EVACUATION PROCEDURE
Are nearby residents, property or livestock in danger?
?
YES
Contact Residents or Owners and advise
ACCIDENT/ INCIDENT REPORTING PROCEDURE

Major Fuel Spill



Chemical Spill



5.2 Environmental Inspections & Audits

Inspections & audits of the site including environmental controls shall be conducted in accordance with the procedure for Site HSE Inspections & the project Audit Management Plan. The following inspections will be conducted onsite throughout the time on the project:

- Fortnightly site inspections,
- Monthly task observations,
- 6 monthly internal audits,
- Monthly external audits in line with the contract requirements &,
- Bi-Monthly external audits in line with the contract requirements.

5.2.1 Non-Conformances

Where an item has been assessed as Non-Conformance (NC) during any internal inspection an issue shall be raised in BIM360 Field to bring the activity or process into compliance with requirements. The issue(s) shall be recorded in BIM360 Field and allocated to the relevant contractor/subcontractor.

The independent consultant in writing shall raise all items assessed as non-conformance during external audits and HY will address all issues and close out within the time frame advised.

HY shall ensure that product/ works which does not conform to specified requirements are identified and controlled to prevent its unintended use or delivery. A nonconformance shall be raised when:

- Works/products not meeting specified requirements are identified; and/or
- Works have not been inspected or tested in accordance with specified requirements (frequency, method, authority); and/or
- A systematic and/or repeated omission/error that may result in a time or cost implication to the project.

5.2.2 Reporting & Corrective Actions

All nonconformities will result in corrective action being undertaken. The significance of nonconformities shall be evaluated in terms of their impact on:

- operating costs,
- cost of nonconformity and its correction,
- product performance,
- regulatory requirements,
- client satisfaction, and
- any other risks

HY project management shall undertake the following actions to investigate the causes of nonconformities specific to the project in order to prevent recurrence.

- identify nonconformities that relate to: products; QMS processes; resources; subcontractors and outsourced work; client complaints;
- review and determine the causes of nonconformities using problem solving tools such as the root cause analysis process - Process Workflow flowchart - to determine the underlying root cause(s) of the nonconformity;
- evaluate the need for corrective action to minimise the occurrence of identified nonconformities;
- determine and implement the corrective action needed; and
- monitor the corrective actions taken and record the results to determine if further improvement is necessary to get it right.
- Actions taken to eliminate the cause of nonconformity must flow from the root cause analysis and may involve changes to product, process, resources, methods, equipment, etc. or any combination of these.

Records of the actions taken and follow-up activities shall be monitored and maintained by the project Ensure timely completion of any open corrective action. Monitor corrective action records on an ongoing basis, for any recurrence of the nonconformity where corrective action was taken.

6 References

Environmental Planning and Assessment Act 1979 No 203

Environmental Planning and Assessment Regulation 2000

Protection of the Environment Operations Act 1997 (NSW)

Protection of the Environment Operations (General) Regulation 2009

ISO 14001; 2015 Environmental management systems - Requirements with guidance for use

AS/NZS ISO 31000:2009 Risk management – Principles and guidelines

HB158:2010 Delivering assurance based on ISO 31000:2009 – Risk management – Principles and guidelines

NSW Government Environmental Management System Guidelines (edition 3 - August 2013)

7 Appendices

A.1 Hansen Yuncken Environmental Policy Statement

HANSENYUNCKEN

ENVIRONMENT POLICY

Hansen Yuncken Pty Ltd is committed to providing a high quality environment in the building and construction industry, which meets the requirements and expectations of Clients, Statutory Authorities, Employees and Community Groups.

Hansen Yuncken recognises that impacts on the environment in the building and construction industry relate not only to the process of construction but also to the design and subsequent use of the buildings constructed. Hansen Yuncken affirms its commitment to applying sustainable development principles to all facets of the building and construction process and to continually improve our performance in minimising the impact on, and pollution of, the environment during the construction process.

In achieving this Hansen Yuncken is committed to the implementation, maintenance and improvement of a Management System meeting the requirements of Australian and International Standard AS/NZS ISO 14001.

The National Executive Committee shall review Environmental objectives and set performance targets each year. State Managers, through their line management structure, are accountable for ensuring all employees and subcontractors achieve these objectives and targets.

The Company's Environmental performance shall be monitored against established performance targets and the results reported to the Board of Directors on the regular basis.

Hansen Yuncken affirm that they have a legal obligation to comply with relevant Environmental legislation, standards and codes of practice as the minimum level of performance and a professional obligation to acknowledge the views of Environmental and Community Groups.

Hansen Yuncken acknowledges that environmental excellence can only be achieved and maintained by a clear unequivocal direction of all levels of management, stimulating a participative atmosphere and sense of pride in our environmental achievements by all employees and trade contractors, and through recognition by concerned groups in obtaining this.

Peter Salveson
Chief Executive Officer
May 2018

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A.2 Environmental Management Accreditation - ISO14001

CERTIFICATE OF REGISTRATION

Hansen Yuncken Pty Ltd

SCP, Building 1, Level 3, 75-85 O'Riordan Street, Alexandria NSW 2015 Australia
Suite 12, 125 Bull Street, Newcastle West NSW 2302 Australia
and transient sites
ABN 38 063 384 056

complies with the requirements of

ISO 9001:2015
Quality Management Systems – Requirements

and

ISO 14001:2015
Environmental Management Systems – Requirements with guidance for use

for the following capability:

This registration covers the Quality and Environmental Management Systems for the provision of project management and the design and construction of commercial, industrial and institutional buildings and civil engineering works.

Registered by:
Quality Control Services (Environmental) Pty Ltd
ABN 85 102 935 195
10 Rosina Street Woodcroft South Australia 5162 Australia

This certificate is subject to the Terms and Conditions for Certification, and relevant program rules. Currency of certification can be validated at www.qcse.com.au/certified-register, and www.jas-anz.org/our-directory/certified-organisations; it remains the property of QCSE Pty Ltd and must be returned upon request.

Certificate Number: 160052022
Issue Date: 26 February 2019

Original Certification: 23 February 2010
Expiry Date: 22 February 2022

CAStone

Cheryl Stone
Certification Manager

QCSE
QMS/EMS Certified Company
Licence Number: Q0160

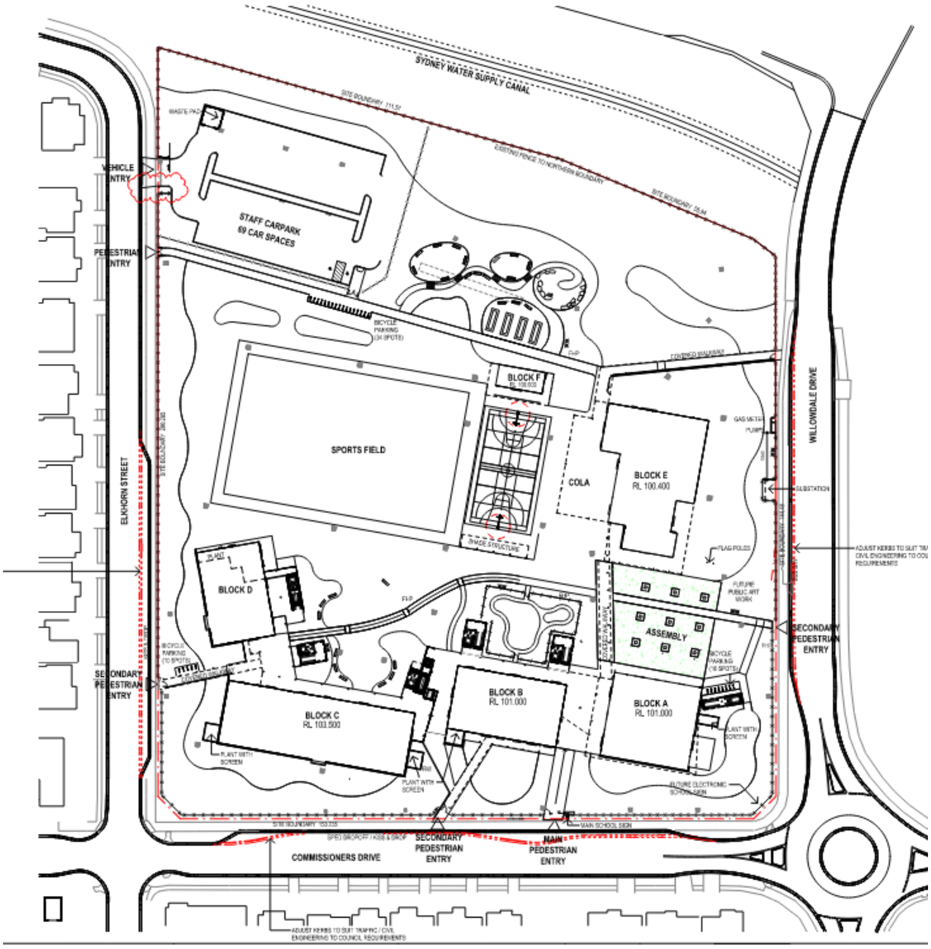
IAF
QMS 010

Quality Control Services
QCS
ENVIRONMENTAL

JAS-ANZ
www.jas-anz.org/register

A.3 Site Description and Location

(extracted from RPS Environmental Impact Statement SSD 9476 – East Leppington Primary School)



A.4 HSE Project Risk Assessment

HANSENYUNCKEN

PROJECT HSE RISK ASSESSMENT

This Project HSE Risk Assessment is to beused as aguide when completing the monthly Project High Risk Identification assessment on HYWAY Site Management Dashboard in accordance with the Project HSE Risk Assessment procedure and should be conducted at the time of Construction programme statusing to assess hazards and risks for next month. Hazards with residual risk from the Design WHS Risk Assessment (if applicable) are also to be considered.

RELEVANT PROCEDURE:	Project HSE Risk Assessment
PROJECT:	New High Quality Schools
JOB NO:	SC 126 (Catherine Field and East Leppington)
ASSESSED BY:	Paul Todhunter
ASSESSMENT DATE:	26-May-20

RISK ASSESSMENT TABLE		**Consequence**				
		1	2	3	4	5
Likelihood		Significant	Major	Moderate	Minor	Insignificant
A	Very Likely	High	High	High	Medium	Medium
B	Likely	High	High	Medium	Medium	Medium
C	Possible	High	Medium	Medium	Medium	Low
D	Remotely Possible	Medium	Medium	Medium	Low	Low
E	Very Unlikely	Medium	Medium	Low	Low	Low
NA	Not applicable	NA	NA	NA	NA	NA

	RISK ASSESSMENT			**CONTROLS (to be established in the following order of priority 1st=High Level Risks; 2nd = Medium Level Risks; 3rd = Low Level Risks)**	
HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Amenities					
Access	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	Gravel, all weather footpaths have been installed for safe access to all amenities in the compound area. The compound area is fenced off to protect workers from moving plant, trucks and vehicles
Location and nature of workplace	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	All amenities are set up in a compound area at the main entry to site making it easy for access and egress in emergency situations
Housekeeping	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	A cleaner is engaged twice a week to manage and maintain all amenities.
Seating	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	Sufficient seating is in place for all workers to rest, take breaks and eat lunch
Lighting (Poor)	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	Lighting is setup in all amentities for safe access
Air Quality	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	Windows, fans and airconditioning are installed to all site sheds
Hot and Cold Environment	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	Air conditioning installed to all lunch sheds
Drinking water	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	Bubbler set up at lunch sheds and varoius locations throughout site
Dining Facilities	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	Clean and tidy tables are available in all lunch sheds. There is sufficient space for all workers to site down and have lunch
Hand washing	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	Warm water, soap and hand dryers are available in the toilets
Shower Facilities	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	Hot showers are provided on site
Change Room	A	4	Medium	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	Change rooms with benching and coat hooks are proivded on site for workers to change clothes
Air Quality					
Dust from plant & truck movements	C	4	Medium	WHS Plan	Water cart to conduct regular laps of the site spraying water on the ground to keep dust settled particularly where there is high plant and truck movements. Temporary water has been installed at several locations around site.
Refuelling of plant and equipment	B	4	Medium	AS/NZS 1715 Selection, use and maintenance of respiratory protective devices AS/NZS 1716 Respiratory protection devices	All refuelling is to be conducted in well ventilated areas only. Refuelling to be conducted clear of any hot works on site such as grinding, welding etc
Concrete cutting / coring	E	5	Low	NSW Cutting & Drilling Concrete & Other Masonry Products 1996	Water must be used to minimise dust. Demolition saws take preference over dry cutting with a masonry blade on an angle grinder. Rubble to cleaned up immediately. Slurry to be cleaned up immediately
Access/ Egress and movements around site					
Workers entering site without Hansen Yuncken permission would be unaware of any specific site hazards eg, asbestos, gas lines, high risk construction work etc	A	2	High	SafeWork NSW Code Of Practice: WHS Consultation, coordination and cooperation	All workers must be site inducted by Hansen Yuncken prior to entering site. This is clearly marked on the contact details sign at the main entry to site. Subcontractors must give Hansen Yuncken site staff sufficient notice prior to workers attending site to be site inducted. All workers on site to display a HY photo ID at all times and sign into the site attendance register on a Daily Basis after they have been Inducted.
Unauthorised access to Site	B	3	Medium	SafeWork NSW Code Of Practice: WHS Consultation, coordination and cooperation HY procedure - Site Establishment Hansen Yuncken HYer Standard 09 Site Establishment	Install safety/warning signage e.g. Construction Site Authorised Persons Only, All visitors report to site office Where a security fence is used to control unauthorised entry onto a construction site, they should: • be constructed from suitable, dedicated materials with no holes or gaps; • be a suitable height to deter entry (for example, at least 1.8 metres high) • be soundly constructed (for example, gates and joints) • be secure and not present a weak point for entry • be stable and able to withstand anticipated loads or forces (for example, strong winds, persons attempting to climb the fence) • be difficult to gain access under the fence and to scale the fence Where a fence is comprised of discrete panels, the joints should not weaken it and should provide the same level of security as the panels Sheets of reinforcing mesh should not be used as site fencing because it may allow adequate hand and foot hold for children to climb over the protruding ends Fencing with signage and shade cloth type coverings may require additional support to resist wind loadings. Gates should not represent a weak point and the closed gate should provide the same level of security Gates to have locks and chains fitted Gates to be kept locked where required, e.g. vehicle access points, or traffic controllers in place Undertake regular inspections to ensure integrity of fences and gates After Hours Security on Site
Unauthorised access to work areas / Work areas not secured	B	4	Medium	SafeWork NSW Code Of Practice: WHS Consultation, coordination and cooperation HY Procedures - Work Permits, Excavations and Trenches, Working at Heights, Inexperienced workers	Barricading of excavations and trenches Signage in place (danger/caution/mandatory) Work Permit systems Exclusion zones Lock access to roof areas HRCW SWMS Safe access to work areas Communication of work areas/exclusion zones at daily prestart meetings Site specific induction
Visitors entering site without Hansen Yuncken permission would be unaware of site hazards eg, asbestos, gas lines etc	C	5	Low	SafeWork NSW Code Of Practice: WHS Consultation, coordination and cooperation	All visitors must sign in at the site office prior to entering site. Signs have been erected clearly stating this. Visitors must display a ID card and be escorted by an inducted guide at all times. Visitors entering site must have approval from the Site Manager.

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PROJECT HSE RISK ASSESSMENT

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PROJECT:	New High Quality Schools
JOB NO:	SC 126 (Catherine Field and East Leppington)
ASSESSED BY:	Paul Todhunter
ASSESSMENT DATE:	26-May-20

RISK ASSESSMENT TABLE		**Consequence**				
		1	2	3	4	5
Likelihood		Significant	Major	Moderate	Minor	Insignificant
A	Very Likely	**High**	**High**	**High**	**Medium**	**Medium**
B	Likely	**High**	**High**	**Medium**	**Medium**	**Medium**
C	Possible	**High**	**Medium**	**Medium**	**Medium**	Low
D	Remotely Possible	**Medium**	**Medium**	**Medium**	Low	Low
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NA	Not applicable	NA	NA	NA	NA	NA

	RISK ASSESSMENT			**CONTROLS (to be established in the following order of priority 1st=High Level Risks; 2nd = Medium Level Risks; 3rd = Low Level Risks)**	
HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Pedestrians/ workers walking around site being struck by vehicles/trucks/ plant moving around site	D	1	**Medium**	SafeWork NSW Code of Practice: Managing the risks of plant in the workplace SafeWork NSW Code of Practice - Moving Plant on Construction Sites	Bunted/fenced off pedestrian pathways have been erected on site to keep pedestrians clear of areas where there are high movements of vehicles/ trucks and plant. All subcontractors using moving plant must have a HRCW SWMS which details how to protect other workers in the area from being struck by the plant. All plant must have a flashing light, horn and reversing beeper. Vehicles/ trucks must turn their flashing lights on. There is a 10km/h speed limit on site. All workers have been told at the site induction to be aware of moving plant on site and keep clear whenever possible. Only workers who are involved with the task are to be in the vicinity of the plant. HY have instructed all subcontractors to train their workers through pre-start meetings on how to approach moving plant and equipment. Haul roads for plant and vehicles are to be maintained. Pedestrians are to avoid walking on haul road whenever possible. Plant operators are to keep reversing to a minimum. Pedestrians that need to approach moving plant are to do so from the front of the machine and are to gain the operators attention by waving arms and yelling out to the operator. No person is to approach the machine until the operator has stopped moving the machine and signalled that it is safe to approach. Spotters working with machines must always stand in an area where they are visible to the operator. A site spotter/ delineation plan has been proposed to and approved by the site safety committee. This plan states areas where a spotter is mandatory for all plant and vehicle movements. This plan is posted on the site notice board.
Public being struck by trucks entering and exiting site	D	3	**Medium**	SafeWork NSW Code Of Practice: How to manage work health and safety risks	Gate keeper is in place managing vehicle and pedestrian movements at main entry to site
Subcontractors bringing vehicles onto site without Hansen Yuncken permission	B	4	**Medium**	**Ford Civil/** Traffic Construction Traffic Management Plan	All subcontractors must seek approval from the Hansen Yuncken Site Manager prior to bringing vehicles/ trucks onto site.
Workers slipping/ tripping over on muddy/ uneven ground	c	3	**Medium**	WHS Management Pan	Pedestrian pathways have been constructed to minimise slip and trip hazards. Wheel ruts, eroded ground, muddy haul roads and pathways are to be bladed back to solid ground as required. On rain days the foreman & safety committee (when established) is to walk the site prior to work commencing and determine which areas are safe for work and which areas are no go zones.
Vehicles becoming bogged or losing traction whilst entering/ exiting and driving around site	E	4	**Low**		Vehicles to be driven on solid ground only. No vehicles will be allowed to drive on muddy terrain
Collisions between plant on site	E	3	**Low**		Sufficient distance to be kept between all plant on site. Flashing light, horn and reversing beeper must be working. Plant and vehicles to stay on haul roads whenever possible. Site speed limit is 10km/h
Too many vehicles parked on site creating restricted access around site	NA	4	NA		A Parking area on site has been established. Vehicles are not permitted to park outside of the car park area.

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HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Asbestos					
Workers being exposed to the asbestos contaminated soil (ACM) at various locations around site	NA	3	NA	Working with asbestos guide 2008	A contamination report for the sites has been produced and has not identified any ACM. An unexpected finds protocol is to be implemented
Unidentified finds of asbestos	B	3	Medium	HY Procedure SafeWork NSW Code of Practice: How to manage and control asbestos in the workplace SafeWork NSW Code of Practice: How to safely remove asbestos	If asbestos is found stop work immediately and notify HY site staff immediately whom will arrange for a hyienist to assess the area. Area to be closed off with bunting/ red white tape and warning signage. Air monitors to be installed and all workers in the area must wear appropriate PPE as defined in SWMS.
Atmosphere - Contaminated/ Flammable					
Flammable fumes from fuel containers	A	4	Medium	SafeWork NSW NSW Code of Practice: Managing risks of hazardous chemicals in the workplace	Fuel to be stored in fuel storage areas only. Fuel drums are to be placed back in the fuel storage area after refuelling has been completed. No refuelling near any hot works being undertaken. All subcontractors must have a 'refuelling SWMS'
Unsafe storage of fuel	C	4	Medium	AS/NZS 2430 Classification of hazardous areas	Fuel must be stored in ventilated cages. No fuel to be stored in shipping containers
Fumes from spray selear application to carpark slab	D	4	Low	AS1318 Use of colour for the marking of physical hazards and the identification of certain equipment in industry	Applicators must wear mask whilst spray painting. Warning signage to be erected and all other personnel not involved with the task are to be clear of the area
Biological Hazards					
Disease from unhygienic facilities and amenities	E	4	Low	SafeWork NSW Code Of Practice: Control of work related exposure to Hepatitis and HIV (blood borne) viruses WHS Management Plan SafeWork NSW: Code Of Practice: Managing the work Environment and Facilities	A cleaner has been engaged by Hansen Yuncken to clean amenities on a bi-weekly basis. Amenities to be kept clean and tidy at all times
Bomb Threat					
Persons unaware of what to do in the event of an emergency	E	5	Low	HY Emergency Response Plan AS 2293 Emergency escape lighting and exit signs for buildings AS 3745: 2002 Emergency Control Organisation and Procedures For Buildings, Structures and Workplaces	Emergency response procedure is explained to all workers at the site induction. HY to practice emergency drills every 6 months to ensure the system is working.
Changes in design					
Changes in design could result in new hazards not being identified	D	4	Low	WHS Management Plan	All design changes must be risk assessed by HY and Consultants. Subcontractor SWMS will be reviewed by HY as required
Craning & Hoisting Operations					
Persons/ other trades on site walking into the crane slew area may be struck by crane or load	B	1	High	AS 2550: Cranes, hoists & winches - Safe Use WHS Plan	The work area around all cranes must be fully barricaded eg bunting and signposted to keep other workers clear.
Slings or chains failing resulting in loss of load	A	1	High	AS 1418.1: Cranes, hoists and winches – General Requirements AS 4991 Lifting Devices WHS Plan	Subcontractors must keep an up to date register of all chains and slings. All equipment must be visually checked daily prior to use.
Crane out riggers sinking in ground resulting in crane rolling over	A	1	High	NWHSC 1010: National Standard for Plant WHS Plan	Subcontractor SWMS to detail craning and hoisting operations. Subcontractor to communicate with HY staff and obtain a plant setup permit prior to setting up cranes to ensure outriggers are not set up over underground services or in unstable ground conditions.
Crane striking structures whilst slewing	A	2	High	AS 1418.10(Int): Cranes, hoists and winches - Elevating work platforms WHS Plan	Dogman and crane operator to constantly communicate with each other. Crane operator to take directions from dogman only.

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HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Concrete					
Concrete Pumping - overload formwork structure	A	2	High	WHS Plan	Spotter to be used when positioning boom over formwork
Trip hazard after excess concrete has cured	A	4	Medium	Environmental Protection Act 1994	Back to plant policy for large amounts of excess concrete
Slip hazard from excess water and slurry on the ground/ concrete washout	A	4	Medium	WHS Plan	Concrete washout to be set up in area where water will not run over pedestrian pathways. Generally plastic is rolled out on the ground. The hopper is washed out onto the plastic, the concrete cures then is placed in a skip bin the following day
Slurry and wet concrete entering stormwater drains	B	5	Medium	WHS Plan	The concrete washout area will constantly move on site to suite site conditions. The HY site foreman will determine where the wash out area will be on the day of any concrete pours.
No designated washout area could result in truck drivers washing out wherever they please leaving the site messy and untidy	D	4	Low	WHS Plan	Excess concrete from washing out the pump is to be placed onto plastic, allowed to set then placed into the skip bin with a telehandler
Concrete cutting / coring - dust	B	4	Medium	WHS Plan	Water must be used to minimise dust. Demolition saws take preference over dry cutting with a masonry blade on an angle grinder. Rubble to cleaned up immediately. Slurry to be cleaned up immediately
Strike PT cables whilst cutting concrete	B	4	Medium	WHS Plan	Review As Constructed Drawings, consult Structrular engineer and obtain permission to proceed. Enact Cutting and Coring Permit prior to any works commencing
Confined Space					
Poor ventilation inside in-ground pits	C	4	Medium	NWHSC 1009: Safe Working in a Confined Space AS 2865: Confined Spaces SafeWork NSW Code of Practice: Confined spaces	No chemicals are to be used inside in-ground pits. Close supervision of all men working inside pits at all times. Lid to be kept open at all times. Sparging up of pits is to be conducted as pit risers are installed to minimise the need to enter the pit afterwards
Workers unable to easily enter and exit trenches	D	3	Medium	WHS Plan	All trenches over 1.5m must be benched at 1:1 at a maximum of 1.5m or battered at 45 degrees. A ramp or steps must be cut into the trench for easy pedestrian access.
Workers being overcome by fumes building up in open trenches	D	3	Medium	NSW WHS Regulation 2017: Part 4.3 Confined spaces	All open trenching has good ventilation. Refuelling does not occur inside open trenches. Oxy acetylene equipment is kept clear of open trenching.
Contaminated Soil					
Exposure to contaminated soil which has not been identified	C	3	Medium	AS 4482: Guide to the investigation & sampling of sites with potentially contaminated soil NSW Environment Operations Act 1997	All subcontractors that will excavate onsite to have a SWMS for 'unexpected finds'. All workers have been instructed at the site induction to stop work immediately and notify Hansen Yunken site staff whom will take action to make the area safe.
Exposure to contaminated soil which has not been identified	C	3	Medium	WHS Plan	Unexpected finds protocal
Deliveries To Site					
Delivery vehicle drivers unaware of site hazards	A	4	Medium	SafeWork NSW Code of Practice: Moving Plant On Construction Sites: 2004	All delivery drivers must complete a 'delivery driver induction' prior to entering site.
Delivery vehicle unloading in an unsafe area eg. in an area where there is mobile plant or pedestrians frequently moving past	C	2	Medium	WHS Plan	The subcontractor supervisor must have good communication with the delivery driver and escort him to the work area where the delivery is to be unloaded. The s/c supervisor must take charge and assist the driver to unload materials from the truck. Exclusion zones to keep people clear of loading/unloading areas will consist of flagging on bollards with Danger Loading/unloading area – no go zone signage Delivery Driver Safe Zone Three pedestrian control barriers will be installed off the exclusion zone “bollards and flagging” where the delivery driver will remain during loading/unloading activities. This driver safe zone must be on the same side of the vehicle where mobile plant is operating so the operator has line of sight with the delivery driver at all times. A “driver safe zone” sign will be attached to the barriers.
Pedestrians/ other workers in the area being struck by materials as they are being unloaded from the truck	A	4	Medium	WHS Plan	All delivery drivers are told at the 'delivery driver induction' to be aware of any pedestrians/ other workers in the area. Delivery drivers must ensure they have enough space to unload/ load materials from trucks safely. If they have any problems they must notify HY staff immediately whom will assist the driver to undertake their task safely. Subcontractors must manage and supervise their deliveries on site. Subcontractors must spot the driver whilst materials are being unloaded and warn other workers in the area to keep well clear.
Untrained delivery drivers using plant to unload goods	E	3	Low	WHS Plan	SWMS must be in place for subcontractors using plant to unload their delivery
Drugs & Alcohol					
Persons under the influence of drugs or alcohol are at high risk of injuring themselves or others	E	4	Low	Alcohol and other drugs in the workplace guide - 2006 Drug and Alcohol Management Plan	Persons assumed to be under the influence of drugs or alcohol will be stopped from working immediately. Their employer will be notified who will investigate and take appropriate action as per their drug and alcohol policy.

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	RISK ASSESSMENT			**CONTROLS (to be established in the following order of priority 1st=High Level Risks; 2nd = Medium Level Risks; 3rd = Low Level Risks)**	
HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Dust					
Disruption/ nuisance to neighbours and client	D	5	**Low**	SafeWork NSW Code of Practice: Managing the risks of hazardous chemicals in the workplace Environmental Engagement Plan Zoic Construction Soil and Water Management Plan	Shade cloth installation to site perimeter fence to contain all dust within the construction site.
Eye injuries and respirable damage to workers	D	4	**Low**	AS/NZS 1336 Recommended practices for occupational eye protection	Water carts and hoses used to keep dust to a minimum. Plant and trucks to move at low speeds to keep dust settled. Eye protection to be worn for any task that creates large amounts of dust
Dust from wall chasing	NA	4	NA	AS/NZS 1715 Selection, use and maintenance of respiratory protective devices	Dust must be minimised whilst wall chasing by way of vacuum system. Workers must wear dust mask whilst wall chasing. Rooms are to be swept frequently to minimise dust
Concrete cutting / coring	E	4	**Low**	AS/NZS 1716 Respiratory protection devices NSW Cutting & Drilling Concrete & Other Masonry Products 1996 WHS Plan	Water must be used to minimise dust. Demolition saws take preference over dry cutting with a masonry blade on an angle grinder. Rubble to cleaned up immediately. Slurry to be cleaned up immediately . HY Cutting amnd Coring permit in place.
Electricity					
Electrocution from faulty/ damaged electrical equipment	D	1	**Medium**	AS/NZS 3017: Electrical installations - Testing & inspection guidelines SafeWork NSW: Code Of Practice: Managing Electrical Risks	All power tools/ leads must be visually checked daily and tested and tagged monthly. Damaged leads and power tools are not to be used on site. Lead are to be elevated off the ground to minimise risk of electrical leads being damaged.
Electrocution from faulty/ damaged Distribution boards	NA	1	NA	WHS Plan SafeWork NSW: Code Of Practice: Managing Electrical Risks	HY DB Board checklist to be completed for all DB boards. All temporary distribution boards will be inspected, tested and tagged monthly. All RCD's to be padlocked and only reset by a qualified electrician.
Workers tripping on leads	C	4	**Medium**	AS/NZS 3199 Approval & test specification for cord extension sets SafeWork NSW: Code Of Practice: Managing Electrical Risks	All power leads must be elevated off the ground. A maximum of 5m may be on the ground for general movements in the area whilst using the power tool.
Electrocution from temporary construction wiring being damaged	B	1	**High**	SafeWork NSW: Code Of Practice: Managing Electrical Risks	All temporary construction must be labelled with 'yellow temporary construction wiring tape'. All temporary construction wiring will be inspected and recorded on the site HSE inspection report weekly.
Working around energised live Substation	B	2	**High**	AS/NZS 3000: Electrical Installations SafeWork NSW: Code Of Practice: Managing Electrical Risks	All subcontractors conducting excavation works must obtain a ground works permit from HY site staff. A plan with existing underground services must be attached to the permit to dig.
Workers piggy backing leads	C	3	**Medium**	AS 3012: Electrical Installations - Construction & Demolition Sites SafeWork NSW: Code Of Practice: Managing Electrical Risks	Portable generators must be used if electrical leads cant reach from the DB board to the work area so a power source is close to the work area.
				AS 3190: Approval & test specification - Residual current devices	
				AS/NZS 3001 Electrical installations - Relocatable premises and their site installations	
				SafeWork NSW: Code Of Practice: Managing Electrical Risks	
				AS3760: 2010 In-service safety inspection and testing of electrical equipment	
				NSW Code Of Practice: Electrical Practices for Construction Work 2007	
Emergency Services Unavailability					
Injured person may not receive first aid treatment in a sufficient amount of time	E	3	**Low**	WHS Act 2011 SafeWork NSW Code of Practice: First Aid in the Workplace HY emergency response plan	Emergency contact details are displayed on the site safety notice board in the lunch shed and in the first aid room. HY site staff have senior first aid training. There are first aid kits in the site office. The first aid facilities have been setup in accordance with SafeWork NSW Code Of Practice: First Aid in the Workplace taking into account the number of workers on site, response times and types of injuries which may occur on site.
Site Emergencies	B	3	**Medium**	WHS Regulation 2017	HY emergency response plan details actions to be taken for different types of emergencies
Erosion/ Loss of Topsoil					
Sediment entering stormwater systems	E	4	**Low**	Environmental Protection Act 1994 Northrop Water Stormwater Managemetn Plan	All stormwater pits to be covered with sediment control fabric. Sediment barrier to be erected around the low perimeter of site perimeter fencing in accordance with the site sediment control plan. Sediment control to be inspected weekly and recorded on the site HSE inspection report. All de-watering of site must be discharged in accordance with the stormwater management plan. The water must be flocked, tested and approved by HY prior to being pumped into the existing stormwater system.
Erosion causing perimeter scaffolding to become unstable	NA	3	NA	Environmental Management Plan	All perimeter scaffolding to be checked following significant rainfall and rectified by scaffolder as required.

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Existing services					
Damage to existing services could cause major disruption to the client eg. live power, security cables etc.	D	3	Medium	SafeWork NSW Code Of Practice: Excavation Work WHS Plan	Subcontractors are available to repair services in the event they are damaged
PLANT OPERATORS STRIKING UNDERGROUND SERVICES WHILST UNDERTAKING TRENCHING/ EXCAVATION WORKS	C	1	High	Ausgrid National Standard NS 156 - Working near or around underground cables WHS Plan	A ground works permit system is in place on this site. All known existing services have been marked up on the site plans. Pot holing and hand digging must occur when working around existing services. Striking existing underground services has been listed as a hazard on all subcontractor SWMS involving excavation works
Excavators digging trenches accidently striking recently installed and charged up hydrant lines throughout the site	E	2	Medium	Jemena Guidelines Construction Activities Near & Over Jemena Gas Networks Assets A WHS Plan	A plan has been issued to all subcontractors notifying them of existing services
Explosive Powered Tools					
Eye and hearing damage	E	4	Low	WHS Plan	Eye and hearing protection must be worn. Workers must be closely supervised by their supervisor
Excavations					
Excavation over 1.5m	C	3	Medium	SafeWork NSW Code Of Practice: Excavation Work	All trenches over 1.5m must be benched at 1:1 at a maximum of 1.5m or battered at 45 degrees unless stated otherwise by a geotechnical engineers report. A ramp or steps must be cut into the trench for easy pedestrian access.Shoring boxes to be used for trenches greater than 1.5 m deep if benching is not possible
Large stockpiles of spoil creating blind spots for plant operators and truck drivers	E	3	Low	NSW Code Of Practice: Moving Plant On Construction Sites 2004	Plant operators must neatly stockpile all spoil and limit the height of the stockpile to maintain good vision. Plant operators are to avoid stockpiling spoil next to bends on haul roads.
Trench collapse trapping workers	C	1	High	AS 2763 Vibration and shock - hand transmitted vibration - guidelines for measurement and assessment of human exposure	Any trenching in unstable ground is to be benched/ battered. If the excavation reaches rock or shale and benching/ battering is not practical geotechnical engineers signoff is required. A ramp must also be cut into the end of trench for emergency access/ egress.
Plant eg. mobile crane set up too close to a trench could result in trench collapse and plant roll over	C	2	Medium	WHS Management Plan	All plant must be set up clear of the zone of influence
Plant outriggers sinking into ground resulting in plant roll over.	C	1	High	AS 3798 Guidelines on earthworks for commercial & residential developments	Plant must only be set up on solid ground and sufficient pig sty packing/ sole plates placed underneath out riggers. Sole plates are to be used underneath EWP stabilizers if the ground is soft. Ground conditions to be constantly checked during and after rain fall.
Open trenches restricting access for vehicles and pedestrians around site	C	4	Medium	NSW Dial Before U Dig Legislation	Pedestrian / vehicle/ plant access must be kept clear at all times around site. Alternative access routes are to be set up prior to trenching across pathways and roadways.
Building materials/ stockpiles stored near trench could result in trench collapse	C	3	Medium		Materials and equipment must not be stored within the 'zone of influence'
Different trades working in the same area at the same time could strike each other with mobile plant	A	2	High		Daily pre-starts and SWMS detail how to work around moving plant on site including plant used by other trades eg. spotters, barricade the work area, signage etc
Damage to existing buildings from vibrations caused by machinery	NA	4	NA		Vibration from earthworks to be monitored by HY and subcontractors
Formwork					
Formwork collapse	B	1	High	SafeWork NSW Code of Practice: Formwork	Formwork must be certified by a qualified engineer that it is structurally sound and able to safely support loads that may be applied by the concrete pour, workers, reinforcement & crane lifted loads. Once engineer's inspection complete ensure any additional back propping is installed if required. Place plant and materials on formwork and falsework only where allowed for by the design and when the structure or deck is sufficiently constructed so it is able to bear the load
Fall from heights	A	1	High	SafeWork NSW Code of Practice:Managing the risks of falls at the workplace	Spread first section of joist on beam from intermediate work platform and only access the deck to start laying ply once the joist are down and handrail is in place. Use scaffold to gain access to deck to start laying plywood When you sheet up to 1.8m from end of joist lay next section of joist NEVER sheet to the end of the joist even if there is a catch deck in place Lay joist across bearers fixed at a spacing of 450 maximum to prevent any possibility of falls while construction of the deck. Establish working areas for steelfixers & other trades. A 'formwork only' zone should be maintained behind the leading edge. This zone should be clearly demarcated by signage and a barrier. Protect open penetrations with edge protection (e.g. handrails) or cover securely. Cast5in metal mesh with a small aperture (e.g. 50 x 50 mm mesh size or smaller) for small penetrations. Paint ply covers with appropriate warnings (e.g. "PENO" or similar) and fasten securely.
Cuts/ impalement on starter bars	B	3	Medium		Safety caps to be fitted to all starter bars wherever there is a risk that a person may fall on one.
Fall prevention/ arrest equipment					
Failure of fall arrest equipment	B	1	High	HY emergency response plan AS/NZS 1891: Industrial fall arrest systems and devices	All safety harnesses and lanyards must be visually checked daily. Safety harness is the last form of control and other forms of fall protection should be used such as perimeter scaffolding, EWP, handrails etc Maintenance and inspection records in subcontractor safety management plans to be kept up to date Roof anchor points must be certified prior to use Rescue procedure for rescuing persons in fall arrest must be developed prior to persons using safety harnesses

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PROJECT HSE RISK ASSESSMENT

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JOB NO:	SC 126 (Catherine Field and East Leppington)
ASSESSED BY:	Paul Todhunter
ASSESSMENT DATE:	26-May-20

RISK ASSESSMENT TABLE		**Consequence**				
		1	2	3	4	5
Likelihood		Significant	Major	Moderate	Minor	Insignificant
A	Very Likely	High	High	High	Medium	Medium
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	RISK ASSESSMENT			**CONTROLS (to be established in the following order of priority 1st=High Level Risks; 2nd = Medium Level Risks; 3rd = Low Level Risks)**	
HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Fall from heights					
Workers falling into open trenches	C	3	Medium	AS 1418.1: Cranes, hoists and winches – General Requirements	All open trenches must be bunted off at least 1m from the edge of the trench. Where there are high movements of pedestrians an plant then a solid barrier such as a temporary mesh
Workers falling into open penetrations (eg in-ground pits)	C	3	Medium	WHS Regulation 2017 Part 4.4 Falls	All penetrations to be covered and secured and the wording "peno" or "do not remove" sprayed onto the plywood/metal plate.
Workers falling from ladders	C	3	Medium	SafeWork NSW Code Of Practice: Managing the risk of falls at workplaces	Ladders are to used in accordance with the HY ladder policy. Ladders are the last resort for height access and other means of height access should be used eg EWP's, mobile scaffolding, platform ladders etc. Standard A frame ladders can be used but only for short duration works or tight restricted spaces such as small rooms where a scissor lift will not fit. Ladders with 4 steps or less are not permitted on site
Bricklayers falling from trestle scaffold	C	1	High	AS 4576: Guidelines for scaffolding	Bricklayers must install a handrail to the scaffold and a ladder for safe access/egress. Trestle scaffold must be set up correctly on solid ground
Fall from scaffold	E	3	Low	AS 1576: Scaffold general requirements	Modular stairs to be installed at the same time as decks are installed for safe access to each deck. Handrails must be installed from deck below prior to accessing the deck above. Ends must be closed off with trannys. Scaffolder will erect 'danger scaffold incomplete' signage until the scaffold is ready for use and a handover certificate has been issued to HY. All trades have been made aware not to alter the scaffold under any circumstance.
Personnel falling into open trenches or off the edges of batters and excavations	D	3	Medium	Emergency Response Plan	All open trenches and along the top edge of batters must be bunted off at least 1m from the edge of the trench. Deep trenching must be benched every 1.5m so that a person can only fall a maximum of 1.5m.
Fall from mobile scaffold	B	3	Medium	Scaffold erection guide (comes with scaffold)	All mobile scaffolding must be built as per the manufacturers instructions. Handrails and midrails must be in place. Any scaffold where a person can fall more than 4m must be erected by a licenced scaffolder.
Workers falling from heights	C	2	Medium	WHS Plan	Roof access permit must be obtained by the roofer prior to accessing the roof. Perimeter scaffold or handrail must be in place for fall protection. Safety mesh must be installed correctly as per Code Of Practice: Safe Work On Roofs: Part 1
Falls into bored piers	B	2	High	AS/NZS 1892 Portable Ladders	Bored piers must be fully covered with plywood or mesh to eliminate risk of workers falling into the hole. Deep excavation signs are to be erected and the are fully bunted off. Best practice is to fill the hole with concrete as soon as possible.
Falling objects					
Pallets of blocks stacked too high could tip over and injure a person	A	4	Medium	Workcover Bricklayers guide	Pallets of blocks must be stacked on level ground no more than 2 pallets high
Scaffold parts could fall/ be knocked off the deck and injure workers below	NA	2	NA	AS 1576: Scaffold general requirements	All excess scaffold material must remain on the ground. No excess scaffold material is to be left lying on scaffold decks
Formwork and reo materials falling from deck onto persons below	B	2	High		All materials must be stacked neatly clear from edge of deck and kick boards must be put in place
Building material and tools falling from scaffold decks	NA	2	NA	WHS Plan	Edge boards to be fitted to all scaffold decks. Materials stored on scaffolding is to be kept to a minimum and removed from decks daily. If possible do not store materials on scaffold at all.
Falling materials from EWP's	A	1	High	AS/NZS 2210 Occupational protective footwear	No worker is to walk underneath an elevated EWP. All EWP operation must have a spotter or the area must be fully barricaded off with red/white tape, bunting or flagging or signage in place
Loose materials and rocks from walls of trenches falling onto workers within the trench	D	3	Medium	AS/NZS 1800 Occupational protective helmets - Selection, care & use	No access to any open trenches for workers unless the walls of the trench are stable. Geotech sign off required for trenching over 1.5m
Materials left behind after works finish eg. loose bolts, off cuts etc	B	1	High	AS/NZS 1801 Occupational protective helmets	Work areas at heights must be checked daily and loose items brought down to ground level.
Fauna (protected or endangered species)					
Snakes and insects in long grass	B	3	Medium	Environmental Protection Act Environmental Management Plan	Weeds and long grass alongside pedestrian pathways around the site are to be cut back with a whipper snipper
Fire					
Chemical and fuel spills may cause a fire	E	1	Medium	Emergency Response Plan	A;BE Powder type fire extinguishers are installed at several locations strategically placed around the site
Sparks from hot works eg welding, grinding may cause a fire	D	3	Medium	AS 2444: Portable fire extinguishers & fire blankets - selection and location AS/NZS 1850 Portable fire extinguishers - Classification, rating and performance testing	All subcontractors must obtain a hot works permit from HY staff. The permit will detail any controls required for undertaking the task
Flammable materials stored on site may ignite from hot works in the area	D	2	Medium	SafeWork NSW Code of Practice: Managing the risks of hazardous chemicals in the workplace	Hazardous materials must be stored in cool, dry areas away from ignition sources and flammable material signage installed.
Fuel drums could catch on fire from sources of ignition	B	4	Medium	AS 3745 Emergency control organisation and procedures for buildings, structures and workplaces	Fuel drums are to be put away when not in use in a storage cage in a well ventilated area
Workers could be seriously injured whilst attempting to extinguish fire	E	1	Medium	AS 2444 Portable fire extinguishers and blankets - Selection & location	All workers are told at site induction not to place themselves at risk and not to try and fight the fire
Time taken to obtain fire extinguisher in the event of an emergency	D	1	Medium	AS/NZS 1841 Portable fire extinguishers	Fire extinguishers are places strategically around site for easy/ fast access. Locations of fire extinguishers are on the site layout plan
Poor maintenance of fire extinguishers	E	1	Medium	AS 2375 Guide to the selection, care & use of clothing for protection against heat & fire	Fire extinguishers are to be tagged every 6 months by a competent person

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HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
First aid					
Persons unaware of what to do if an individual requires first aid	E	5	Low	WHS Regulation 2017	Emergency response plan posted on site notice board. All workers explained of the location of the first aid room and contact details for site first aiders.
Injured person not receiving first aid treatment quickly enough due to the site being so large	D	3	Medium	Work injury management and workers compensation act 1988	Site staff to communicate by way of mobile phones and 2 way radios. A first aid room is set up in the HY amenities. Within the first aid room is a fixed type A kit and portable type A kit for rapid response.
It may not be possible to take the injured person to the first aid room because of the seriousness of their injuries	E	4	Low	SafeWork NSW Code of Practice: First aid in the workplace:	Access routes to be kept clear around site for emergency vehicles
Inadequate first aid supply's	E	3	Low	WHS Plan	First aid room to be set up with portable and fixed first type A first aid kits, stretcher, defibrillator, ice packs, sun cream, eye wash and examination couch as per SafeWork NSW Code of Practice: First aid in the workplace
Inadequately trained first aiders/ insufficient number of first aiders	E	3	Low	Emergency Response Plan	HY Site Foreman must have Apply First Aid type certification. HY Safety Officer must have Occupational First aid certificate
Persons working alone unable to raise the alarm	E	3	Low	Emergency Response Plan	No person is to work alone. There must be another person in the area at all times. This is told to all workers at site induction
Heart attack/ stroke	E	1	Medium	Emergency Response Plan	Defibrillator to be kept in first aid room
Number of buildings	E	5	Low	Emergency Response Plan	5 - all easily accessible for pedestrians or vehicles
Maximum Number of levels on each building	E	5	Low	Emergency Response Plan	3 - All have internal stair access
Time taken to walk to furthest point on site	D	4	Low	Emergency Response Plan	5 minutes - from first aid room to furthest point on site
Nearest Hospital	D	4	Low	Emergency Response Plan	Camden Hospital Sydney
Nearest Medical centre	D	4	Low	Emergency Response Plan	Gregory Hills Medical centre
Maximum time to medical service	D	4	Low	Emergency Response Plan	10 min
Maximum number of workers	D	4	Low	Emergency Response Plan	>100
Site hours	E	5	Low	Emergency Response Plan	7:00am - 6:00pm Monday - Friday 8:00am - 2:00pm Saturday. No Works on Sundays or Public Holidays. A first aid qualified person from Hansen Yuncken is on site at all times
Average hours worked by a worker	E	5	Low	Emergency Response Plan	Workers generally work 8-9 hours per day
Remote or isolated works	E	4	Low	Emergency Response Plan	Workers are not permitted to work alone. There must be atleast 2 workers in the same area at all times. Due to the nature of the site it is unlikely any worker will be isolated or work alone
Types of injuries over the last 12 months	E	4	Low	Emergency Response Plan	Majority of types of injuries include: cuts and abrasions, minor eye injuries, insect bites, sprains and strains, back injuries and dislocations
Incidents not resulting in injury	E	5	Low	Emergency Response Plan	Incidents have occurred where excavator operators have struck existing live underground electrical cables - defibrillator will be required in the event persons are electrocuted
Cuts and abrasions	C	4	Medium	Emergency Response Plan	Type A first aid kit has contents for treating these types of injuries
Sprains and strains	D	4	Low	Emergency Response Plan	Ice packs and instant cold packs to be available
Eye injuries	D	3	Medium	Emergency Response Plan	Eye wash facilities will be made available
Burns	E	4	Low	Emergency Response Plan	Burn cream and non adherent wound dressings
Fractures	D	4	Low	Emergency Response Plan	Type A first kit and a stretcher for moving injured workers
Dislocations	D	4	Low	Emergency Response Plan	Type A first aid kit has triangle slings
Poisoning and toxic effect of substances	E	5	Low	Emergency Response Plan	Safety data sheets available for all substances used.
Heat stroke	D	4	Low	Emergency Response Plan	Ice packs and cold water on standby. Subcontractors have been addressed at side induction to take breaks, work in shade wherever possible., job rotation etc

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HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Ground Collapse/poor ground					
Plant roll over from sinking in unstable ground conditions	C	3	Medium	WHS Plan	Subcontractors to complete a plant risk assessment prior to operating plant. Plant will not be operated in unstable ground conditions. If the ground is too soft or uneven then the ground will be bladed back to solid ground prior to plant operating on it. All subcontractors must obtain a HY plant setup permit prior to operating plant with outriggers. Concrete boom pumps and mobile cranes must obtain a geotechnical engineers report stating the ground is stable and able to take the weight of the crane and load being lifted. Site to be inspected by the Site Manager and subcontractor WHS representatives following heavy rain prior to work commencing the next day
Vehicles/ plant could become bogged in soft muddy ground	D	4	Low	National Standard For Plant: 10:10 (1994)	Temporary roadways have been rolled and compacted to keep ground stable, No plant to work on unstable ground accessed in wet weather prestart to be conducted after each inclement weather event
Pedestrian slip and trip hazards from muddy/ uneven ground	E	3	Low	WHS Plan	Crusher dust has been spread over pedestrian pathways to minimise slip and trip hazards. Plant is to be used to blade back ruts and muddy ground to minimise slip and trip hazards for workers in the area particularly on rain days
Trucks and vehicles tracking mud and dirt onto road from muddy tyres	E	3	Low	WHS Plan Environmental Management Plan	Shaker grid installed at site entrance. High pressure water blaster to be used to wash tyres if required
Pedestrians/ workers tripping over in deep wheel ruts left by plant movements	E	3	Low	WHS Plan	Wheel ruts are to be bladed/ levelled out to minimise trip hazards around site
Hazardous Chemicals					
Spillage of fuels and chemicals	C	3	Medium	AS 1940: The storage and handling of flammable and combustible liquids Environmental Management Plan	A spill kit is kept in the site office. Any drums of fuel larger than 20 litres must be bunded. All trades are to set up a hazardous substance storage are next to their site containers with signage erected 'no smoking', 'Danger Fuel Storage area' etc
Unsafe storage of oxy acetylene equipment	C	3	Medium	AS 4332 The storage and handling of gases in cylinders Environmental Management Plan	Oxygen and acetylene bottles are to be stored in separate ventilated cages 3m apart at the end of each day and appropriate warning signage erected.
Mix matched storage of hazardous substances could cause a chemical reaction	C	3	Medium	NWHSC 2017 - 2001 Storage & Handling of Dangerous Goods	Only substances of the same class can be stored together as per the Safety Data sheet for the products
				AS 3780: The storage & handling of corrosive substances	
				NWHSC 2011: Preparation of Material Safety Data Sheets	
				WHS Plan	
				SafeWork NSW Code of Practice: Manging risks of hazardous chemicals in the workpace	
				NWHSC 1015 - 2001 Storage & Handling of Dangerous Goods	
				NWHSC 2011 - 2003 Preparation of Material Safety Data Sheets	
				NWHSC 2007 - 1994 Control of Workplace Hazardous Substances	
				NWHSC 2012 - 1994 Labelling of Workplace Hazardous Substances	
				NWHSC 2014 - 1995 Carcinogenic Substances	
Heat stress					
Sun burn	D	4	Low	SafeWork NSW Code Of Practice: How to manage work health and safety risks	Sun cream is available in the site office. Singlets are banned. Workers are encouraged at the site induction to wear long sleeve pants and shirts.
Hot temperatures may cause persons to become dehydrated resulting in illness, headaches, fainting etc	E	4	Low	NSW Hot & Cold Environments 2001	Air conditioned lunch sheds. Subcontractors to work in shaded area wherever possible.
				NSW Code Of Practice: Managing the work Environment and Facilities	
				WHS Plan	
Heavy lifting (over normal crane operation)					

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HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Manual handling injuries	E	4	**Low**	WHS Regulation 2017 Part 4.2 Hazardous Manual Tasks	Team lifts for heavy items. Mechanical lifts wherever possible
Back injuries	E	3	**Low**	WHS Plan	Bend knees, keep a straight back, don't twist
Block and tackle use	NA	4	NA	NCOP for Manual Tasks 2007 National Standard for Manual Tasks - 2007 NCOP for the Prevention of Musculoskeletal Disorders Caused From Performing Manual Tasks	Use of block, tackle and slings is to be used in accordance with SWMS. Slings are to wrapped around a solid structure only. Slings to be wrapped by dogman and riggers only
				NSW Manual Handling Resource 2004	
				SafeWork Code of Practice: Hazardous Manual Tasks	
Hot Works					
Sparks from welding, grinding or using oxy acetylene may cause a fire if flammable materials are in the area	C	4	**Medium**	AS 1674: Safety in welding and allied processes	A hot works permit must be obtained by the subcontractor.. All sources of ignition to be removed from the area prior to hot works occurring
Fire and injury to others from persons using angle grinders	A	4	**Medium**	hot works permit	Conduct all grinding away from flammable materials and other workers I the area. Be ware of direction of flying sparks
Welders flash to other trades	B	4	**Medium**	WHS Plan	Welding screens and warning signage must be erected to protect other trades from welders flash if others are within a 10m radius of the work area
				SafeWork NSW Code Of Practice: Welding Processes	
Hygiene (poor)					
Unhygienic facilities could result in workers becoming ill and contracting diseases	D	4	**Low**	SafeWork NSW Code Of Practice: Managing the work environment and facilities	A cleaner has been engaged by Hansen Yuncken to clean amenities on a bi-weekly basis. All amenities to be kept clean and rubbish bins emptied daily
Trades not putting rubbish and off cuts in bins provided creating trip hazards	D	4	**Low**	SafeWork NSW Code Of Practice: Managing the work environment and facilities	Improvement notices to be issued to subcontractors who do not keep the site neat and tidy
Inadequate facilities for general site rubbish	D	4	**Low**	WHS Plan	Skip bins to be placed on site at various locations and changed over regularly
Lifting Over Public/outside site					
Injury to pedestrians/ public	NA	4	NA	AS 1742.3-2009: Manual of uniform traffic control devices - Traffic control for works on roads WHS Plan Trafficl Management Plan Road Management Act 2004	No lifting of building materials outside of the construction fence unless traffic control and diversions are in place and the subcontractor has seeked approval from the HY Site Manager.
Manual Handling					
Back injuries/sprains and strains	C	3	**Medium**	HY Glove and clip policy	Team lifts for heavy items. Mechanical aids eg. telehandler to be used wherever possible. Building material to be dropped off as close to the work area as possible to minimise carrying distance.
Cuts to hands	C	4	**Medium**	WHS Regulation 2017 Part 4.2 Hazardous Manual Tasks	Gloves to be worn for manual handling tasks as per Hansen Yuncken glove & clip policy
				SafeWork NSW Code Of Practice: Hazardous Manual Tasks	
				AS/NZS 2161 Occupational protective gloves	
				WHS Plan	

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Mobile Plant					
Mobile plant could strike a pedestrian worker on site	C	1	**High**	NWHSC 1010: National Standard for Plant	All trades are warned of moving plant at the site induction. High vis vests are to be worn at all times. All workers on site must keep well clear of plant on site and gain the operators attention prior to approaching any plant. Only workers involved with the task are to be with in the work areas of plant. People working within the work area of plant must be visible to the operator at all times.
Mobile plant could crash into a structure or open trench	D	3	**Medium**	WHS Plan	Trained, experienced, qualified workers to operate plant only. Plant operator competency statement to be issued to HY for any plant which does not require a legislated ticket.
Pedestrians/ workers being struck by mobile plant	C	1	**High**	AS 2294 Earth moving machinery - Protective Structures AS 4602 High Visibility Safety Garments	A combination of controls must be put into place and detailed in sub contractors SWMS eg. barricade the area, erect signage, use a spotter etc. Bunted off pedestrian pathways have been erected on site to keep pedestrians clear of areas where there are high movements of vehicles/ trucks and plant. All subcontractors using moving plant must have a SWMS which details how to protect other workers in the area from being struck by the plant. All plant must have a flashing light, horn and reversing beeper. Vehicles/ trucks must turn their flashing lights on. There is a 10km/h speed limit on site. All workers have been told at the site induction to be aware of moving plant on site and keep clear whenever possible. Only workers who are involved with the task are to be in the vicinity of the plant. HY have instructed all subcontractors to train their workers through pre-start meetings on how to approach moving plant and equipment. Access routes for plant and vehicles are to be maintained. Pedestrians are to walk along the side of access routes whenever possible. Plant operators are to keep reversing to a minimum. Pedestrians that need to approach moving plant are to do so from the front of the machine and are to gain the operators attention by making verbal conatct and eye contact with the operator. No person is to approach the machine until the operator has stopped moving the machine and signalled that it is safe to approach. Spotters working with machines must always stand in an area where they are visible to the operator.
Plant roll over on unstable ground	E	3	**Low**	SafeWork NSW Code of Practice - Managing the Risks of Plant in the Workplace	Plant operator and HY site staff must assess conditions and determine if the ground is stable for plant. If the plant has out riggers then they must be fully extended. Subcontractors must obtain a 'plant setup permit' from Hansen Yuncken prior to setting up any plant with outriggers eg. concrete boom pumps, cranes, frannas etc
Possibility of scissor lift being driven off edge of concrete slab resulting in scissor lift tipping over	NA	2	NA	SafeWork NSW Code of Practice - Managing the Risks of Plant in the Workplace	A timber bump stop must be installed to the edge of the slab whenever EWP's are used close to the edge of a slab
Crushing Injury from scissor or boom lift	NA	1	**High**	SafeWork NSW Code of Practice - Managing the Risks of Plant in the Workplace	Provide onsite training, Instruction and supervision Pre starts and Toolbox talks to be done as consultation with person's affected by the controls outlined. Only person's with EWP ticket to operate Scissor Lift No Person to work isolated or alone on an EWP 2 person team as a minimum , whilst using a EWP, 1 person to spot and also assist with task All Personnel to be trained by a qualified person from the hire company on the specific EWP, as not all EWP's are the same. Prior to use, completion of a logbook check is to be done All faults are to be immediately reported to supervisor and machine is to be tagged out Personnel using EWP must be aware of the emergency response protocol of that specific EWP Person operating scissor lift must be able to communicate clearly to spotter/work partner(team)
Needle stick Injury					
Injured person could contract a disease	E	2	**Medium**	SafeWork NSW Code Of Practice: Control of work related exposure to Hepatitis and HIV (blood borne) viruses	Workers injured by needle stick to be sent to the nearest medical centre
Workers unaware of what to if a needle is found	E	4	**Low**	WHS Plan	Workers to be told at site induction that if they find a needle on site they are not to touch it and report it to HY staff immediately
Inadequate disposal facilities for needles found on site	E	4	**Low**	SafeWork NSW NSW: Code Of Practice: Managing the work environment and facilities	Sharps clean up kit to be kept in site office at all times
Noise					
Hearing damage from general construction noise eg. power tool usage, jack hammering etc.	B	3	**Medium**	AS/ANZ 1269: Occupational Noise Management Acoustic Dynamics Construction Noise and Virbation Management Plan	Hearing protection to be worn when using power tools or loud equipment. Signage to be erected to warn other trades of excessive noise. A noise monitor is available in the site office. The noise monitor is available for use on site safety walks
Disruption to client and neighbours	D	5	**Low**	NWHSC 1007 - 2000 National Standard for Occupational Noise NWHSC 2009 - 2004 Noise Mgt & Protection of Hearing at Work	Notice of disruption to be issued to client if required. Work to be conducted within approved hours of DA contract only
				AS/NZS 1269 Occupational noise management AS/NZS 1270 Acoustics - hearing protectors AS 2436 Guide to noise control on construction, maintenance & demolition sites	
				NSW Noise Management & Protection of Hearing at Work 1996	
				AS 2436: Guide to noise control on construction, maintenance & demolition sites	
				AS 2012: Acoustics – Measurement of Airborne Noise Emitted by Earthmoving Machinery & Agricultural Tractors	
				WHS Plan	
				AS/NZS 1270: Acoustics - hearing protectors	
Overhead Power lines					
Power lines over Chalmers St Construction zone	A	1	**High**	WHS Plan	All plant and workers must keep clear of overhead power lines as per SafeWork NSW Code Of Practice: Work near overhead power lines
				SafeWork NSW Code of Practice: Work near overhead power lines 2006	Tiger Tails to be installed prior to and hoarding installation and cranage

HANSENYUNCKEN

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RELEVANT PROCEDURE: Project HSE Risk Assessment

PROJECT: New High Quality Schools

JOB NO: SC 126 (Catherine Field and East Leppington)

ASSESSED BY: Paul Todhunter

ASSESSMENT DATE: 26-May-20

RISK ASSESSMENT TABLE		Consequence				
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NA	Not applicable	NA	NA	NA	NA	NA

	RISK ASSESSMENT			CONTROLS (to be established in the following order of priority 1st=High Level Risks; 2nd = Medium Level Risks; 3rd = Low Level Risks)	
HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Plant & Equipment					
Plant failure may cause serious injury to workers	D	3	Medium	NWHSC 1010: National Standard for Plant	HY plant verification reports to be completed for all plant. Maintenance records to be submitted to HY as evidence machine is safe for operation. Plant risk assessments to be conducted for all high risk work. Plant operators must conduct pre-start safety inspections of their machine daily and report faults to their supervisors
Poorly maintained ladders and scaffolding failing/ collapsing	D	3	Medium	AS/NZS 1892: Portable Ladders	No timber ladder on HY sites. Ladders must be in good condition. Electricians must use fibre glass ladders. All workers are aware of the HY ladder policy posted on the wall in the lunch shed. Extension ladders must be tied off at the top landing. Scaffolding to be visually checked daily and full inspection monthly or after adverse weather
Use of damaged ladders	D	3	Medium	AS 4576: Guidelines for scaffolding	Ladders to be checked for damage weekly on the site safety walk
Lifting gear failure	D	1	Medium	AS/NZS 4994: Temporary edge protection	All lifting gear: soft slings, lifting chains must be visually checked daily prior to use for damage. Damaged lifting gear is to be withdrawn from service. Lifting gear register to be supplied to Hansne Yuncken. Hansne Yuncken Sling verification checklist to be completed for soft slings if not captured on lifting register.
Scaffold collapse/ fall from scaffold	NA	1	NA	AS/NZS 1891.1 2007 Industrial fall arrest systems - harnesses and ancillary equipment	Scaffold handover certificate to be issued to HY prior to anyone accessing the scaffold. Scaffold to be inspected minimum monthly and after heavy rain. Scaffold will also be inspected on weekly safety walks. Mobile scaffolds to be built as per manufacturers instructions. Scaffold where a person can fall more than 4m must be erected by a licenced scaffolder. No person is to alter the scaffold what so ever. Any issues with scaffold is to be reported to the Site Manager immediately.
Multiple mobile plant interaction/ contact	D	1	Medium	WHS Plan	Plant operators must communicate by way of 2 way radios, eye contact and spotters
Vehicle and plant exhaust fumes	D	4	Low	HY ladder policy	Use of electric scissor lifts inside buildings only. All other diesel powered machines are used in open well ventilated areas
Post Tensioning					
Accidental drilling or cutting into PT cable	D	2	Medium		All subcontractors to obtain permit to cut concrete/ core. This permit will detail location of PT cables if applicable
Plant & Equipment Washout					
Water from cleaning plant and equipment creating a muddy/ slippery surface	D	4	Low	Environmental Protection Act 1994	Washout area to be determined on a daily basis as the site changes. The wash out area must not allow water to flow over pedestrian foot paths
Muddy and contaminated water entering stormwater system	D	4	Low	HY environmental management plan	Sediment control to be placed around the washout area
Pressurised Gas Mains					
Excavator buckets striking UNDERGROUND GAS LINES	E	1	Medium	SafeWork NSW Code Of Practice: Excavation Work	A permit to dig system is in place on this site. All known existing services have been marked up on the site plans. Pot holing must occur when working around existing services. Only toothless buckets are to be used when digging in the vicinity of gas lines. Striking existing underground services has been listed as a hazard on all subcontractor SWMS involving excavation works
				WHS Plan	
				Jemena guidelines construction activities near and over Jemena has network assets	
Scaffold					
Fall from heights over 2m	C	2	Medium	WHS Regulation 2017: Part 3.1 Managing risks to health and safety	
Fall from heights whilst forming up and pouring concrete	C	2	Medium	AS4576: Guidelines for scaffolding	
Insufficient egress from building in the event of an emergency	B	5	Medium	WHS Plan	
Inadequate development of scaffold plan	D	5	Low		
Possible scaffold overload resulting in scaffold collapse - materials and workers	C	4	Medium		
Scaffold sinking into soft ground compromising structural integrity	D	3	Medium		
Sediment and erosion control					
Mud, dirt and sediment polluting stormwater systems	C	4	Medium	Environmental Protection Act 1994	Northrop sediment and erosion control plans
Mud, dirt and sediment polluting stormwater systems	C	4	Medium	Environmental Management Plan	Silt barriers to be installed around low areas of site to catch all rain fall. All stormwater pits to be covered in silt control. All vehicles tyres must be washed clean of mud prior to leaving site. Silt socks to be placed in front of stormwater drains in gutters. Inspections to be carried out weekly by HY using the Site HSE inspection report

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	RISK ASSESSMENT			**CONTROLS (to be established in the following order of priority 1st=High Level Risks; 2nd = Medium Level Risks; 3rd = Low Level Risks)**	
HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Site Lighting					
Sun glare restricting plant operators visibility	C	4	Medium	WHS Regulation 2017	Sunglasses to be worn by plant operators as required. Certain tasks may also be conducted at different times of the day to stop the sun becoming an issue.
Lighting (Poor)	NA	5	NA	SafeWork NSW Code Of Practice: Managing the work Environment and Facilities	Ensure that task area has adequate natural light and if natural light is not adequate provide artificial lighting
Slips/Trips					
Workers slipping or tripping on rough/ uneven/ muddy/ slippery ground	C	3	Medium	AS/NZS 2210 Occupational protective footwear WHS Plan	Pedestrian pathways to be kept clear of rubbish and material. Safe access around site to be maintained at all times. Gravel/ crusher dust to be placed on slippery/ muddy surfaces. Blading back of ruts and muddy ground conditions to be conducted as required. Bunted off pedestrian pathways are installed around main access routes throughout site for safe pedestrian access, this way people can use the pathway then branch out to their specific work area with minimal risk of slipping over in muddy conditions
Structural Support					
Masonry walls collapsing in high winds	D	1	Medium	National Code of Practice for Precast, Tilt Up and Concrete Elements in Building Construction 2008	Masonry walls must be adequately braced with timbers every 2m until core filled
Formwork collapse	D	1	Medium	AS 3850:Tilt Up Concrete Construction	Engineers sign off required to pouring of any concrete
Precast concrete panel collapse if structural steel is inadequately braced	D	1	Medium	NSW Code of Practice: Formwork 1998	Structural steel must be signed off by engineer prior to installation of precast concrete panels
Structural steel collapse	D	1	Medium	AS 4991: Lifting devices	Structural steel must be erected by qualified dogmen and riggers. Subcontractor must submit ITP's to Hansen Yuncken. Hansen Yuncken to complete QC Compliance audit report: Structural Steel checklist
Synthetic fibres					
Unsafe handling of roof insulation	D	4	Low	SafeWork NSW Code of Practice: Safe use of synthetic mineral fibres	Install roof insulation as per Safety Data Sheet and SWMS
Temperature Extremes					
Dehydration	E	3	Low		Workers are encouraged to drink plenty of water. Water bubbler available at site lunch sheds
Sunburn	C	3	Medium		Workers must wear are shirt on site. Singlets are not allowed. Sun cream is available to everyone and is kept in the site office
Heat stress	E	3	Low		Workers are encouraged to work in the shade wherever possible and take regular breaks whenever required.
Tilt –up or Precast Concrete Work					
Structural steel support collapse	C	1	High	AS 3850:Tilt Up Concrete Construction	HY precast panel installation checklist must be completed and all relevant documentation submitted, reviewed and approved by HY prior to installation of precast panels
Injury to other workers/ trades	B	1	High	AS 4991: Lifting devices	Precast panel installation must be closely monitored by HY Management and conducted in accordance with SWMS . The work area around the crane must be clearly closed off to other trades with bunting, flagging or red/white tape. Spotters must be used to
Plant failure	C	1	High	National Code of Practice for Precast, Tilt Up and Concrete Elements in Building Construction 2008	All maintenance records and plant safety verification reports must maintained and kept up to date
Failure of lifting points on precast panels	C	1	High	AS 2550: Cranes, hoists & winches - Safe Use	Subcontractor ITP's must be submitted and reviewed by HY prior to erection of precast panels , engineered lifting points used to install precast. Lifting gear register in place
Concrete may not have cured to specified strength	C	2	Medium		HY precast panel installation checklist must be completed and all relevant documentation submitted, reviewed and approved by HY prior to installation of precast panels
Crane roll over on unstable ground	B	1	High	AS 1418.1: Cranes, hoists and winches – General Requirements	Plant setup permit must be obtained by subcontractor prior to standing crane
Exceed SWL of crane	B	2	High	AS 2321: Short link chain for lifting purposes	Work to SWL chart for crane at all times
Lifting gear failure	A	3	High	National Code of Practice for Precast, Tilt Up and Concrete Elements in Building Construction 2008	Riggers must inspect all lifting gear prior to use. Damaged lifting equipment must not be used. Lifting gear registers and certificates must be issued to HY prior to use.
Poor communication between crane operator and dogmen	C	3	Medium		Dogman and crane operator to constantly communicate with each other. Crane operator to take directions from dogman only.

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	RISK ASSESSMENT			**CONTROLS (to be established in the following order of priority 1st=High Level Risks; 2nd = Medium Level Risks; 3rd = Low Level Risks)**	
HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Traffic Management					
Vehicles/ trucks speeding on site	B	3	Medium	AS 1742.3-2009: Manual of uniform traffic control devices - Traffic control for works on roads	10km/h speed limits signs are erected around site. Drivers must give way to pedestrians. Delivery driver inductions for all drivers entering site. Hazard or flashing lights must be turned on
Vehicles parking and blocking access roads	B	4	Medium		Vehicles to be used for loading/unloading purposes only and are to be parked off site if not required for work purposes
Blind spots creating collisions between vehicles	E	3	Low		Warning signs to be erected at blind spots
Pedestrians entering site being struck by trucks and vehicles	A	2	High		A fenced off pathway with signage has been installed along the driveway from the street to the site office to keep all pedestrians off the road used by plant and trucks. Pedestrians and vehicles have been seperated theough entry/ exit by way of concrete jersy kerbs
Tree lopping					
Tree lopping	A	4	Medium		Area to be delimeated and HRCW for falling from heights and Plant and Equipment
Vehicle & plant exhaust fumes					
Workers overcome by exhaust fumes from plant	E	1	Medium	SafeWork NSW Code of Practice: Managing risks of hazardous chemicals in the workplace	Plant to be operated in open areas with good ventilation only. Electric scissor lifts to be used inside buildings only. No petrol/ diesel powered equipment used inside buildings
Ventilation (poor)					
Workers overcome by fumes when using chemicals	E	1	Medium	SafeWork NSW Code of Practice: Managing risks of hazardous chemicals in the workplace AS/NZS 1715 Selection, use and maintenance of respiratory protective devices AS/NZS 1716 Respiratory protective devices	MSDS to be read and understood by all workers prior to work commencing
Violence					
Workers arguing and fighting	D	4	Low	Violence in the workplace guide 2002	Zero tolerance for fighting on site - instant dismissal
Waste Management/ Littering					
Inadequate bins on site to dispose of rubbish	E	3	Low	WHS Act/ Regulation 2017 Zoic Construction Waste management Plan	Skip bins to be placed at various locations around site which are easy to access. Bins for food scraps are to be placed at the front of all lunch sheds
Bins attracting rodents	D	4	Low		Food scrap bins to be bagged and changed regularly
Having to walk long distances to dispose of rubbish	D	4	Low		Numerous skip bins to be on site close to all work areas
Workers littering the site with rubbish and off cuts instead of disposing of rubbish in bins provided	D	4	Low		Suspension/ improvement notices to be issued to subcontractors who leave the site untidy
Water Contaminants					
Clean water around site becoming contaminated with mud	E	4	Low		Clean rain water is diverted around site by way of swales and sediment control
Working at Height above 2m					
Workers dropping tools and material onto persons below	C	1	High	SafeWork NSW Code of Practice; Managing the risk of falls in the workplace NSW Code of practice: Safe work on roofs part 1	"Danger workers above" signage to be erected. If there are other trades in the immediate area then red/white tape will be erected to create an exclusion zone.
Scaffolders falling from heights during erection process	B	1	High	WHS Regulation 2017 Part 4.4 Falls	Install handrail, mid-rails and toe-boards where scaffolders are working from deck below while building using the approved control methods such as the 1m rule or Advanced guardrail systems
Perimeter scaffold collapse	E	1	Medium	AS 4576: 1995 Guidelines for scaffolding	Check and confirm the suitability of the subgrade prior to basing out the scaffolding Confirm areas where trenches have been laid Visually check ground for stability, use sole boards where required or get others to compact areas Do not allow scaffold to exceed 4.0 m in height without being tied to the structure and braced or stabilised to an approved design Do not allow standards to be erected and left unsupported Each standard will be braced in a minimum of two directions. A brace is defined as a ledger or transom Scaffolds from which a person can fall more than 4 metres must be constructed and certified by a licensed scaffolder. Secure materials at height & isolate area below where there is risk of falling objects causing injury to persons below. No scaffold alterations are to be undertaken except by licensed scaffolder. Close off access to incomplete scaffolds, for example, install tube barricades and warning signs “Scaffold Incomplete” Ensure all scaffold is checked and secure before issuing handover docket and attaching Scafftag.
Workers falling from roof	A	1	High	HY HSE procedure 9.46 Working at height	Roof access permit must be obtained by the workers prior to accessing the roof. Perimeter scaffold or handrail must be in place for fall protection. Safety mesh must be installed correctly as per SafeWork NSW Code Of Practice: Safe Work On Roofs: Part 1
Mobile scaffold collapse	B	1	High	SafeWork NSW Code of Practice: Managing the risk of falls at workplaces	
Workers falling from perimeter scaffold	NA	1	NA	AS 1577 Scaffold Planks	Perimeter scaffolds to be inspected weekly using the site HSE inspection report. All workers are advised at site induction strictly not to alter any scaffolding
Fall from ladder	C	3	Medium	AS/NZS 4488 Industrial rope access systems - Selection, use & maintenance	Ladders must be used in accordance with HY ladder policy. An Aconex has been issued on ladder use to all subcontractors. EWP's, mobile scaffold and platform ladders take first preference over standard A frame ladders.
Fall from EWP/ boom lift	B	1	High	AS/NZS 1891 Industrial fall arrest systems & devices AS/NZS 4994 Temporary edge protection	WP ticket required to operate boom lift >11m . EWPAA yellow car required for EWP <11m. Ground conditions to be checked prior to operation. Harnesses and lanyards must be maintained and kept in good condition
Fall from scissor lift	B	1	High	NWHSC - Prevention of Falls in General Construction 2008	Timber or angle to be installed to the edge of concrete slabs to stop scissor lifts accidently being driven off edge of slab. Scissor lift operators must have a EWPAA yellow card or WP type ticket. Stabilizers and sole plates must be used for rough terrain scissors used on soft ground
Inadequately installed roof perimeter handrail	B	1	High	NSW Identification Tool for Aluminium Mobile Scaffolds 2008	Installation certificate must be issued to HY prior to any worker accessing roof. Installation manual to be available on site so it can be confirmed the handrail has been installed as per the manufacturers specifications.

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HAZARD (Include additional project specific hazards as required)	**L**	**C**	**Class**	**Legislation, Standards & Codes of Practice**	**Enter Details of Specific Controls Required**
Potential Emergencies - preparation for and response to potential emergency events assessed high or medium risk to be defined in the Emergency Response Plan					
Arrested fall in a harness	B	2	High	HY Procedure for Emergency Response	All subcontractors using harnesses in boom lifts must have a rescue procedure as part of their SWMS. Generally rescue will be by using the ground controls at the base of the machine or by using a second boom lift to retrieve the suspended casualty.
Bomb threat	E	4	Low	HY Procedure for Emergency Response	Procedure for bomb threats is part of the HY Emergency Response Plan
Confined Space Rescue	E	3	Low	HY Procedure for Emergency Response	Procedure for confined space rescue is part of the HY Emergency Response Plan
Cyclone	NA			HY Procedure for Emergency Response	N/A
Drowning	E	5	Low	HY Procedure for Emergency Response	Trenches are to be de-watered prior to any person working in around the area.
Electric shock	D	1	Medium	HY Procedure for Defibrillators	Electric shock procedure detailed in the HY Emergency response plan
Emergency services unavailability				HY Procedure for Emergency Response	N/A
Fire	D	2	Medium	AS 3745 Emergency control organisation and procedures for buildings, structures and workplaces AS/NZS 1221 Fire hose reels AS/NZS 1841 Portable fire extinguishers AS/NZS 1850 Portable fire extinguishers - Classification, rating and performance testing AS 1851 Maintenance of fire protection systems & equipment AS 2375 Guide to the selection, care & use of clothing for protection against heat & fire AS 2444 Portable fire extinguishers and blankets - Selection & location	Fire procedure detailed in the HY emergency response plan
First Aid (inadequate resources)	E	3	Low	HY Procedure for Emergency Response	First aid room to be set up with portable and fixed first type A first aid kits, stretcher, defibrillator, ice packs, sun cream, eye wash and examination couch as per Code of Practice: First Aid . (Refer to first aid assessment)
Gas line contact or damage	D	2	Medium	HY Procedure for Emergency Response	Jemena contact details are part of the HY Emergency response plan
Major rock fall/landslip	E	4	Low	HY Procedure for Emergency Response	Rockall procedure detailed in the HY Emergency response plan
Major Fuel/Chemical Spill	E	3	Low	HY Procedure for Emergency Response	Fuel/ Chemical spill is part of the HY emergency response plan
Medical Emergency	D	3	Medium	HY Procedure for Emergency Response	Medical emergency is part of the HY emergency response plan
Overhead power line contact or arcing	B	3	Medium	HY Procedure for Emergency Response	Contact with overhead power lines is part of the HY emergency response plan
Precast Panel Collapse	D	1	Medium	HY Procedure for Emergency Response	Precast panel collapse is part of the HY emergency response plan
Structural failure/collapse	D	1	Medium	HY Procedure for Emergency Response	Structural collapse is part of the HY emergency response plan
Trench collapse	D	1	Medium	HY Procedure for Emergency Response	Trench collapse is part of the HY emergency response plan

A.5 Construction Traffic and Pedestrian Management Sub-plan

Construction Traffic and Pedestrian Management Plan

Main Works Development Application

Lot 9001, DP 1206596
Commissioners Drive, Denham Court

Ref: 1048r02v07
19/05/2021

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Document Control

Project No: P1048

Project: New East Leppington Public Schools

Client: Hansen Yuncken

File Reference: P1048r02v07 CTPMP New East Leppington School

Revision History

Revision	Date	Details	Author	Approved by
-	29/07/2019	Draft	A. Reisch J. Laidler	A. Reisch
1	5/09/2019	Issue I	A. Reisch J. Laidler	D. Budai
2	20/11/2019	Issue II	J. Laidler	D. Budai
3	01/09/2020	Issue III	J. Laidler	D. Budai
4	01/09/2020	Issue IV	J. Laidler	D. Budai
5	13/11/2020	Issue V	J. Laidler	J. Laidler
6	18/03/2021	Issue VI	W. Zheng	W. Zheng
7	19/05/2021	Issue VII	W. Zheng	W. Zheng

party. This document has been prepared based on the Client’s description of its requirements, information provided by the Client and other third parties.

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Appendices

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Figures

1 Introduction

1.1 Overview

Ason Group has been engaged by Hansen Yuncken (HY) to prepare a Construction Traffic and Pedestrian Management Plan (CTPMP) for the proposed East Leppington Public School development at Commissioner Drive, Denham Court (the Site). This CTPMP has been prepared to support a development application for the main works works associated with construction for use as an educational establishment in accordance with the zoning of the land.

The main works development application is in relation to the State Significant Development and, as such, relevant conditions of consent have not yet been provided. Notwithstanding, as is standard practice, it is expected that the final CTPMP shall demonstrate the proposed management of the impact in relation to construction traffic addressing the following:

a) assessment of cumulative impacts associated with other construction activities (if any)

b) an assessment of road safety at key intersection and locations subject to heavy vehicle construction traffic movements and high pedestrian activity

c) details of construction program detailing the anticipated construction duration and highlighting significant and milestone stages and events during the construction process

d) details of anticipated peak hour and daily construction vehicle movements to and from the site

e) details of on-site car parking and access arrangements of construction vehicles, construction workers to and from the site, emergency vehicles and service vehicle and

f) details of temporary cycling and pedestrian access during construction

Having regard for the above, the purpose of this report is to establish the broad traffic principles for construction that would minimise traffic impacts on the surrounding road network, ensure safety and efficiency for workers, pedestrians and road users, and provide information regarding construction vehicle access routes and any changed road conditions (if applicable).

It is expected that this plan will be updated should any necessary changes to the currently proposed arrangements arise in the future. Any special events (if required) would be subject to a separate request for a specific permit not covered by this report.

Please note, Ason Group is responsible for the preparation of this CTPMP only and not for its implementation, which is the responsibility of the Contractor.

1.2 Statutory Requirements

The following conditions have been imposed with respect to construction traffic management and this CTPMSP has been updated to incorporate the requirements of the conditions identified.

Table 1: Condition Requirements

Condition	Condition Requirement	Document Reference
B16	A Construction Traffic and Pedestrian Management Sub-Plan (CTPMSP) must be prepared to achieve the objective of ensuring safety and efficiency of the road network and address, but not limited to, the following;	
	a) be prepared by a suitably qualified and experienced person(s);	Appendix D
	b) be prepared in consultation with Council and TfNSW;	Section **Error! Reference source not found.**
	c) detail the measures that are to be implemented to ensure road safety and network efficiency during construction in consideration of potential impacts on general traffic, cyclists and pedestrians and bus services;	Section **Error! Reference source not found.**
	d) detail heavy vehicle routes;	Section 2.4
	e) include location of all proposed work zones;	N/A
	f) details of the haulage routes and the construction hours;	Section 2.2 Section 2.4
	g) details of estimated number and type of construction vehicle movements including morning and afternoon peak and off-peak movements for each stage of construction; and	Section 3.1
	h) details of the construction program highlighting details of peak construction activities and proposed construction staging.	Section 2.1 Section 3.1
B20	A Driver Code of Conduct must be prepared and communicated by the Applicant to heavy vehicle drivers and must address the following:	Section **Error! Reference source not found.** Appendix A
	a) minimise the impacts of earthworks and construction on the local and regional road network;	
	b) minimise conflicts with other road users;	
	c) minimise road traffic noise; and	
	d) ensure truck drivers use specified routes.	
B21	Prior to the commencement of construction, compliance with the following requirements must be submitted to the Certifier:	
	a) all vehicles must be able to enter and leave the Site in a forward direction;	Section 2.4
	c) the swept path analysis of the longest construction vehicle entering and exiting the site in association with the new work, as well as manoeuvrability through the Site, must be in accordance with the latest version of AS2890.2; and	Appendix C
	d) the safety of vehicles and pedestrians accessing adjoining properties.	Section **Error! Reference source not found.**

1.3 Consultation

In preparing this report, Ason Group has had the opportunity to discuss key local and sub-regional transport issues with officers of Council and RMS, as shown in **Appendix D**. Ason Group acknowledges the insights in regard to existing and future local traffic and transport conditions provided by these officers.

1.4 Site Location

At a regional level, the Site is located approximately 15 kilometres east of Camden and 55 kilometres south-west of the Sydney CBD. It is within the Local Government Area (LGA) of Campbelltown City Council; however, it is also located within the South West Growth Area (SWGA). The site is to be located within a greenfield site with frontages to Willowdale Drive, Commissioner Drive and Elkhorn Street, Denham Court (the School).

1.5 Road Hierarchy

Key roads surrounding the Site are as shown in Figure 1 and are described as the following:

- **Camden Valley Way:** Camden Valley Way performs a regional classified road under the care and control of Campbelltown City Council. It generally northeast/southwest in its alignment, providing a link between Bringelly Road in the north and The Northern Road in the south. Camden Valley Way is a 4 lane divided carriageway with 2 lanes in each direction, and a posted speed limit of 80km/hr, and no provision of footpath on either side of the road.
- **Willowdale Drive:** Willowdale Drive performs a collector road function under the care and control of Campbelltown City Council. It has a northwest/southeast alignment, providing a link between Camden Valley Way in the northwest and Greenhood Crescent in the southeast. Willowdale Drive intersects with Commissioners Drive under a single lane roundabout, immediately adjacent to the north-eastern corner of the site.

  Willowdale Drive along the norther site frontage provides an 11m wide carriageway, within a road reservation width of 20m. A shared path provided along both sides of the road for pedestrian and cycle use.
- **Commissioner Drive:** Commissioners Drive performs a local road access function between Willowdale Drive in the northeast and Fanflower Avenue in the southwest. It intersects with Elkhorn Street at the south-eastern corner of the site under major/minor priority control with Commissioner Drive forming the priority route.

  Being local roads have been constructed to provide a 9m wide pavement within a 16m wide road reserve. A 1.5m wide footpath is provided along one (western) side of Commissioners Drive. It is further noted that an indented parking zone is currently provided along the western side of the Commissioners Drive.

- **Elkhorn Street:** Elkhorn Street is also defined as a local road under DCP 2016. It primarily forms east/west alignment, connecting Commissioners Drive in the east and Sawsedge Avenue in the west. Being local roads have been constructed to provide a 9m wide pavement within a 16m wide road reserve. A 1.5m wide footpath is provided along both sides of Elkhorn Street.

With regard for the above, the site is ideally located to disperse construction traffic onto the arterial road network and direct access can be achieved via Willowdale Drive and Camden Valley Way.

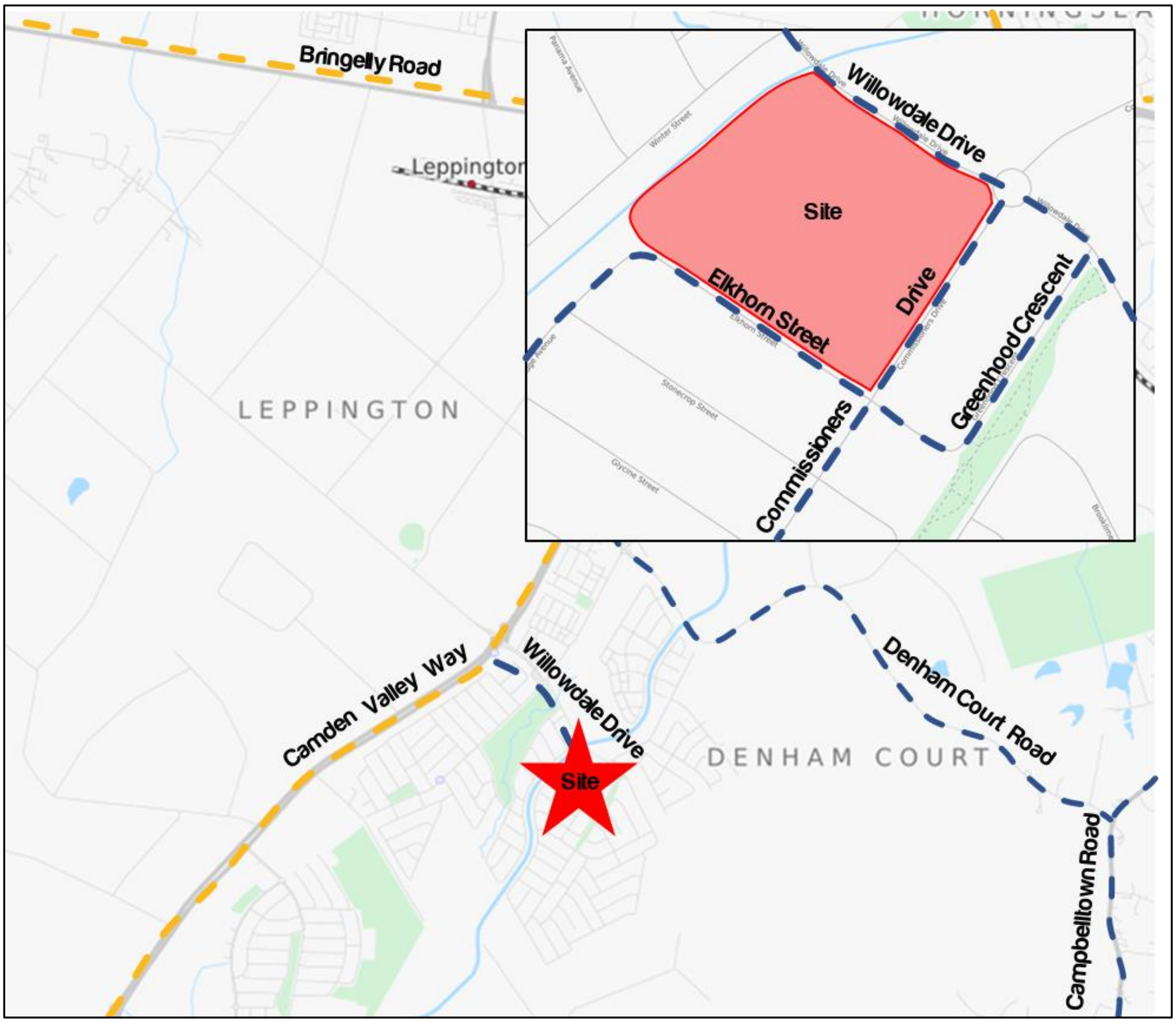


Figure 1: Location Plan

2 Overview of Works

2.1 Staging and Duration of Works

Recognising that this CTPMP has been prepared to support a development application for main works associated with construction for use as an educational establishment in accordance with the zoning of the land, the following summarises the main stages:

- Stage 1: General earthworks, excavation for footings and the maintenance of the temporary access, constructed as part of the early works DA. Three temporary accesses are proposed—two on Elkhorn Street and one on Willowdale Drive—as shown in **Figure 2**.
- Stage 2: Construction of buildings, retaining walls and associated infrastructure.
- Stage 3: Landscaping and reinstatement in preparation for school opening.

2.2 Hours of Operation

The type of work being undertaken may vary depending on the phase of construction and associated activities and includes both construction and design personnel. However, all works will be in accordance with standard construction working hours, which are likely to be as follows:

Monday to Friday (other than Public Holidays):	7:00AM – 6:00PM.
Saturday:	8:00AM – 1:00PM.
Sunday & Public Holidays:	No works to be undertaken.

2.3 Proposed Site Access

All access to the site by construction personnel is proposed via accesses in the location of future connections to Willowdale Drive and Elkhorn Street.

To separate trucks and cars, it is proposed that Heavy Vehicles access the site via the Willowdale Drive access. Contractor and Light Vehicles would be directed to use the Elkhorn Street access to a temporary car park at the north-west corner of the site.

During public domain works on Willowdale Drive Heavy Vehicles will be temporarily directed to use the access on Elkhorn Street. This will result in both Heavy Vehicle & Light Vehicle Access being directed to the site access point on Elkhorn Street.

Site management will schedule the arrival / departure times of Light Vehicles and Heavy Vehicles so to reduce the risk of collision.

Emergency vehicle access to and from the Site will be available at all times while the site is occupied by construction workers. This process would be implemented through emergency protocols on the site which will be developed by the Contractor.

2.4 Construction Vehicle Access Routes

It is proposed that all construction vehicles shall enter and exit the site via the routes shown in Figure 2. The routes shown are to be utilised by all construction vehicles travelling to and from the site and represents the shortest route between the local and regional road network - hence minimising the impacts of the construction process. An on-site turning area shall be provided within the future car park area so that access site access is undertaken in a forward direction, at all times.

It is expected that a copy of the approved routes will be distributed by the Lead Contractor to all drivers by before their arrival to site. All vehicles shall enter and leave the site in a forward direction.

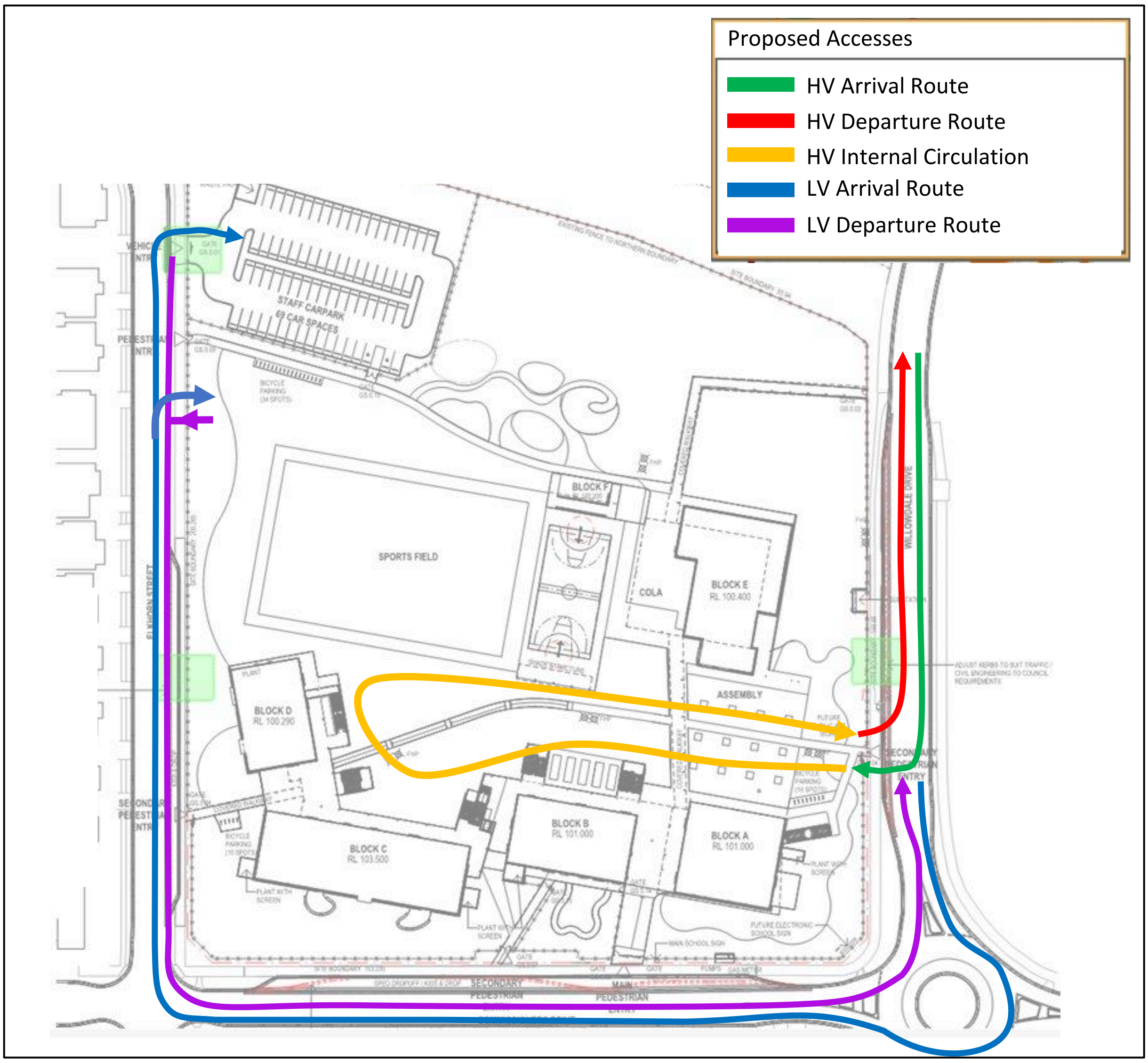


Figure 2: Construction Vehicle Route
(Note: HV vehicle route will be the same as the LV routes once the site access from Willowdale Drive is removed)

2.5 Fencing Requirements

Temporary exclusion fencing will be erected along the entire boundary of the site and will be maintained for the duration of the construction program. The fencing is to ensure unauthorised persons are kept out of the Site. Site access gates would be provided within Willowdale Drive and will be closed at all times outside of the permitted construction hours.

During the public domain works road barriers will be used (per the TCPs in Appendix B) to separate the construction from live traffic. Delineation as detailed in TCP 202259 will be installed to create separation between the work zone and pedestrian on the footpath.

2.6 Materials Handling

Handling of all materials throughout the construction shall adhere to the following;

- It is proposed that all material loading will occur within the construction site boundary.
- No loading is proposed to occur outside of the provisioned areas.
- Equipment, materials and waste will be kept within the construction site boundary.

During latter stages of construction, tie in works will be required within the kerbside of the Site’s 3 surrounding roads. All materials handling shall be undertaken off public roadways, however in the event materials handling is required from a public roadway, then prior approval shall be sought and obtained from the relevant Authorities.

3 Assessment of Traffic & Transport Impacts

3.1 Construction Vehicle Traffic Generation & Impacts

Light Vehicle traffic generation would be generally associated with construction staff movements to and from the Site. Staff would be comprised of project managers, various trades and general construction employees. Over the full period, the peak workforce represents the worst-case scenario for vehicle movements during the morning or evening road network peak hour. The workforce arrival and departure periods (6:30-7:00AM and 6:00-6:30PM) represent the peak construction traffic periods.

It is expected that the Heavy Vehicles would generally arrive outside of peak periods, therefore not contribute to the estimated peak hour volumes. For the purpose of this report, the following construction traffic volumes expected during peak periods:

- AM Peak: Concrete pump, Semi trailer (every 2hr), and concrete deliveries every 15 minutes
- PM Peak: Small Rigid Vehicles (SRV's) or smaller spaced at approximately 2hr intervals

Additionally, it is noted that the school when operational, is expected to generate far less traffic. Accordingly, the estimated construction traffic flows for the proposed construction activities would not result in any adverse impact on the operational capacity of the surrounding road network. It is proposed that Heavy Vehicles access the site via Willowdale Drive to minimised, as far as possible, impacts on surrounding residents.

3.2 Vehicle Management – Principles

All vehicles transporting loose materials will have the entire load covered and/or secured to prevent any large items, excess dust or dirt particles depositing onto the roadway during travel to and from the site. Drivers are to be familiar with the Driver Code of Conduct before attending the Site — a copy of the Code is included in **Appendix CTPMP-A**.

All subcontractors must be inducted by the Contractor to ensure that the procedures are met for all vehicles entering and exiting the construction site. The Head Contractor will monitor the roads leading to and from the site and take all necessary steps to rectify any road deposits caused by site vehicles.

Vehicle movements to, from and within the site shall do so in a manner, which does not create unreasonable or unnecessary noise or vibration.

No tracked vehicles will be permitted or required on any paved roads. Public roads and access points shall not be obstructed by any materials, vehicles, refuse skips or the like, under any circumstances.

A review of the road network surrounding the site indicates that there is no crash history.

3.3 Employee Parking

It is intended that all contractor and construction light vehicle parking utilise the designated construction access gate. During the latter stages of construction, the site compound is expected to be relocated to the permanent car park, which will minimise the amount of parking permitted on site. Given the project will be nearing completion, the expected impact of this change to the neighbouring streets is expected to be minimal.

3.4 Pedestrian and Cyclist Access

All external construction activities will occur on each of the three roads at some point during the build. Accordingly, all pedestrian footpaths shall be managed by an accredited Traffic Controller during crossover works and deliveries to site.

During construction of the temporary and final driveway crossovers, pedestrians will be directed around the construction site by the installation of temporary fencing and management of an accredited Traffic Controller.

The existing footpaths shall remain open at all times to ensure that the construction site does not interfere with pedestrians or cyclists, with efforts to minimise impacts, where possible. This may include staged construction of driveway crossovers such that a suitable pedestrian connection shall be available.

Public domain works will take place on the Willowdale Drive, Commissioners Drive and Elkhorn Street in two phases. One phase will involve works occupying the entire width of the footpaths on the school side for all three frontage roads where pedestrians will be directed across the road using a combination of signage and traffic controllers when necessary (see TCP 202258 in Appendix B). It is expected that the impact on pedestrian usage of the frontage roads will be low as there is no desire line on the school side of these roads.

The other phase of the public domain works is the construction of kerb extensions on Willowdale Drive and Commissioners Drive. Footpath access will not be affected during this phase and the work zone on street will have delineation installed to create safe separation between the footpath and the work zone (as detailed in TCP 202259 in Appendix B).

3.5 Public Transport

There is minimal public transport on surrounding roads. A single service travels directly adjacent to the Site which is the 841-bus route, connecting Narellan to Leppington, via Gregory Hills, Gledswood Hills, and the Willowdale Estate. This service operates every 30 minutes during morning and evening periods, Monday to Friday. Approximately 800m from the site, Camden Valley Way provides a further 2 services;

- Bus Service 857 which runs between Narellan to Liverpool, via Leppington. This service operates every 45 minutes during morning and evening periods, Monday to Friday.
- Bus Service 858 which runs between Oran Park Town Centre to Leppington via Gledswood. This service operates approximately every 30 minutes during morning and evening periods, Monday to Friday.

The construction activities will have no impact on the existing public transport services with all bus services to continue as is.

4 Traffic Control

4.1 Traffic Control

The RMS guide “Traffic Control at Worksites” (TCAW) manual contains standard traffic control plans (TCPs) for a range or work activities with the objective to maximise safety by ensuring traffic control at worksites complies with best practice.

The RMS TCAW outlines the requirement for a Vehicle Movement Plan (VMP), where Heavy Vehicles movements exceed 20 in a single shift (or day), or 10 trucks per day (1 truck = 2 movements) A VMP is a diagram showing the preferred travel paths for vehicles associated with a work site entering, leaving or crossing the through traffic stream. A VMP should also show travel paths for trucks at key points on routes remote from the work site such as places to turn around, accesses, ramps and side roads.

4.2 Authorised Traffic Controller

Although not required at this stage, in the event an authorised Traffic Controller is to be present on-site, their responsibilities include:

- Supervision of all construction vehicle movements into and out of site at all times,
- Supervision of all loading and unloading of construction materials during the deliveries in the construction phase of the project, and
- Pedestrian management, to ensure that any conflicts between vehicle movements and pedestrians do not occur, while maintaining radio communication with construction vehicles at all times.

The Contractor shall make clear to Traffic Controllers that pedestrian and cyclists have right of way on footpaths. Where interfaces of pedestrian and cyclists need to be managed, accredited Traffic Controllers will be in place to ensure the safety of member of the public and workers. Once the heavy vehicles are clear, the pedestrians and cyclists will be able continue along their journey.

5 Monitoring and Communication Strategies

5.1 Development of Monitoring Program

The development of a program to monitor the effectiveness of this CTPMP shall be established by the lead contractor. It is not anticipated that the monitoring of the processes will have any material cost implications.

This CTPMP shall be subject to ongoing review and will be updated accordingly. Regular reviews will be undertaken by the on-site coordinator. As a minimum, a review will occur within a week of changes to works characteristics (e.g. implementation of a new TCP, changes in truck volumes and / or contractor numbers).

All and any reviews undertaken should be documented, however key considerations regarding the review of the CTPMP shall be:

- Tracking deliveries against the estimated volumes.
- To identify any shortfalls and develop an updated action plan to address issues that may arise during construction (Parking and access issues)
- To ensure TCP's are updated (if necessary) by "Prepare a Work Zone Traffic Management Plan" card holders to ensure they remain consistent with the set-up on-site.
- Regular checks undertaken to ensure all loads are leaving site covered as outlined within this CTPMP.

5.2 Communications Strategy

A communications strategy shall be prepared by the Head Contactor and will outline the most effective communication methods to ensure adequate information within the community and assist the project team to deliver the traffic changes with minimal disruption to the road network.

Surrounding residents and landowners shall be notified of any work that is deemed disruptive to the surrounding network prior to commencement. Ongoing communication is also proposed so that all key stakeholders are kept up to date of works and potential impacts.

Nearby property owners that may be affected directly by the construction works shall be included within the communications strategy.

6 Recommended Mitigation Measures

Referencing the above information, it is proposed that the following mitigation measures be undertaken in order to offset any construction impacts:

- Construction:
  - Planning of all appropriate routes to travel to and from site,
  - Discussions with Council, and RMS will be undertaken to identify all (if any) roads of interest to be assessed in order to quantifiably measure the condition of the road before and after construction.
  - Providing options for workers to carpool to and from site,
  - Ensuring that gates to and from site are locked at all times outside of construction hours.
  - Continual review of the CTPMP to identify any shortfalls and develop an updated action plan to address said issues.
- Road occupancy:
  - In order to reduce the impact on any and all roads, it is proposed to complete the work in the shortest reasonable duration,
  - To improve road safety, TCPs are to be prepared for all works to be undertaken,
  - Prior to travel, drivers must be aware of the Driver Code of Conduct, which is to be handed to all construction employees,
  - Public roads and access points will not be obstructed by any materials, vehicles, skips or the like, under any circumstance,
  - All loads travelling to and from the site shall be covered at all times,
- Notification processes:
  - Notification of any adjoining residents or businesses will be undertaken prior to construction. It is proposed that all affected properties will be notified at least 14 days in advance of any impacts (including road closures),
  - Appropriate approvals must be obtained prior to construction in the relevant area from private residences, road authorities, utility providers and any other stakeholder requiring preapproved access.

7 Conclusions

Ason Group has been engaged by Hansen Yuncken (HY) to examine the access, traffic and parking characteristics for the main works DA associated with the proposed East Leppington Public School development at Commissioner Drive, Denham Court (the Site). Further to our assessment Ason Group has concluded that:

- The construction staff arrival and departure periods (6:30-7:00AM and 6:00-6:30PM) represent the peak construction traffic periods and it is expected that the Heavy Vehicles would also generally arrive outside of peak periods, therefore not contribute to the estimated peak hour volumes.
- All construction vehicles will use dedicated construction routes between the site and the regional road network.
- With reference to all applicable road capacity guidelines, the introduction of the site construction traffic will have no significant impact on the operation or capacity of key regional, urban, local or unsealed roads and intersections providing access to the site.
- Appropriate mechanisms – including site-specific TCPs – can be established to monitor the condition of the roads providing access to the construction site such that access is maintained (for public and construction vehicles) at all times.
- During public domain works site specific TCPs have been created to ensure pedestrian safety and access when works take place on the footpaths.
- All light and heavy vehicle parking throughout the construction phase will be provided on-site to minimise the impact to on-street parking.
- Appropriate management conditions can be introduced to ensure that all roads are maintained to an appropriate standard throughout and after construction.

A detailed Construction Traffic Management Plan will be formalised prior to the commencement of the pipeline development construction for approval by the relevant Local and State Government authorities.

Appendix A

Driver Code of Conduct

- Driver Code of Conduct -

Drivers Code of Conduct

Safe Driving Policy for East Leppington Public School

Objectives of the Drivers Code of conduct

- To minimise the impact of earthworks and construction on the local and regional road network;
- Minimise conflict with other road users;
- Minimise road traffic noise; and
- Ensure truck drivers use specified routes

Code of Conduct

All vehicle operators accessing the site must:

- Take reasonable care for his or her own personal health and safety.
- Not adversely, by way of actions or otherwise, impact on the health and safety of other persons.
- Notify their employer if they are not fit for duty prior to commencing their shift.
- Obey all applicable road rules and laws at all times.
- In the event an emergency vehicle behind your vehicle, pull over and allow the emergency vehicle to pass immediately.
- Obey the applicable driving hours in accordance with legislation and take all reasonable steps to manage their fatigue and not drive with high levels of drowsiness.
- Obey all on-site signposted speed limits and comply with directions of traffic control supervisors in relation to movements in and around temporary or fixed work areas.
- Ensure all loads are safely restrained, as necessary.
- Drive over cattle grids – located at the Site’s access – to vibrate off any loose material attached to construction vehicles.
- Operate their vehicles in a safe and professional manner, with consideration for all other road users.
- Hold a current Australian State or Territory issued driver’s licence.

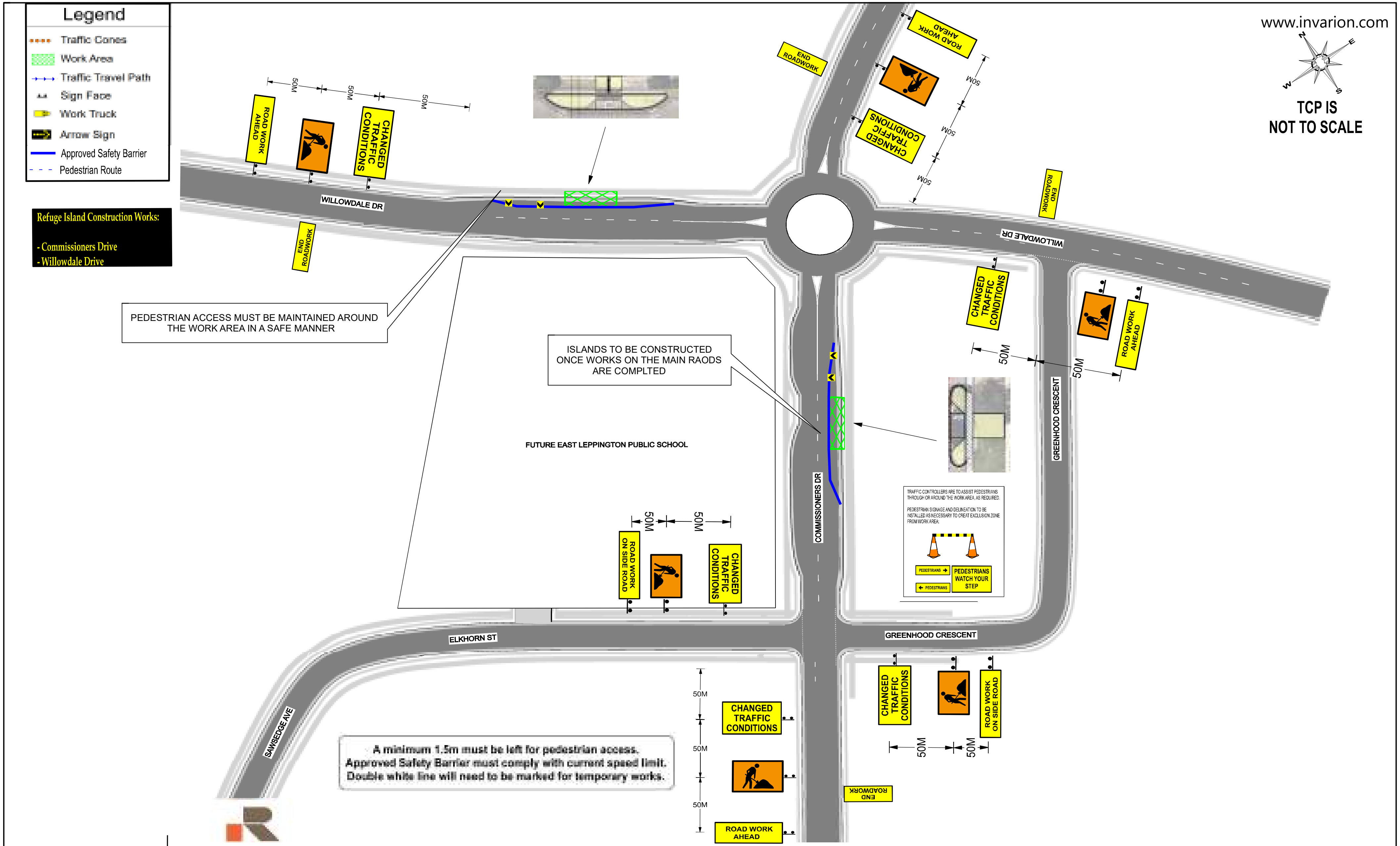
- Notify their employer or operator immediately should the status or conditions of their driver's license change in any way.
- Comply with other applicable workplace policies, including a zero tolerance of driving while under the influence of alcohol and/or illicit drugs.
- Not use mobile phones when driving a vehicle or operating equipment. If the use of a mobile device is required, the driver shall pull over in a safe and legal location prior to the use of any mobile device.
- Advise management of any situations in which you know, or think may, present a threat to workplace health and safety.
- Drive according to prevailing conditions (such as during inclement weather) and reduce speed, if necessary.
- Have necessary identification documentation at hand and ready to present to security staff on entry and departure from the site, as necessary, to avoid unnecessary delays to other vehicles.

Crash or incident Procedure

- Stop your vehicle as close to it as possible to the scene, making sure you are not hindering traffic. Ensure your own safety first, then help any injured people and seek assistance immediately if required.
- Ensure the following information is noted:
  - Details of the other vehicles and registration numbers
  - Names and addresses of the other vehicle drivers
  - Names and addresses of witnesses
  - Insurers details
- Give the following information to the involved parties:
  - Name, address and company details
- If the damaged vehicle is not occupied, provide a note with your contact details for the owner to contact the company.
- Ensure that the police are contacted should the following circumstances occur:
  - If there is a disagreement over the cause of the crash.
  - If there are injuries.
  - If you damage property other than your own.
- As soon as reasonably practical, report all details gathered to your manager

Appendix B

Traffic Control Plans



Refuge Island Construction Works:

- Commissioners Drive
- Willowdale Drive

PEDESTRIAN ACCESS MUST BE MAINTAINED AROUND THE WORK AREA IN A SAFE MANNER

ISLANDS TO BE CONSTRUCTED ONCE WORKS ON THE MAIN RAODS ARE COMPLTED

TCP IS NOT TO SCALE

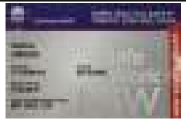
TRAFFIC CONTROLLERS ARE TO ASSIST PEDESTRIANS THROUGH OR AROUND THE WORK AREA, AS REQUIRED.

PEDESTRIAN SIGNAGE AND DELINEATION TO BE INSTALLED AS NECESSARY TO CREAT EXCLUSION ZONE FROM WORK AREA:

A minimum 1.5m must be left for pedestrian access.
Approved Safety Barrier must comply with current speed limit.
Double white line will need to be marked for temporary works.

RAINBOW

Client's Name:	
Location Of Work	124 WILLOWDALE RD, DENHAM COURT
On Site Contact Name:	JAMES PARK
On Site Contact Number:	0419 021 832
Plan No:	202259
Type Of Closure:	SHOULDER WORKS PEDESTRIAN MANAGEMENT

Date	Plan Drawn By	Orange Ticket Number	
11/03/2021	Marissa Arraiza	TCT0046191	
UBD REF	*This plan remains the property of Kontro Services. *This Plan Is Not to Scale. *This TCP complys with Aust Standard 1742.3 and RTA TCWSM Version 4.	Date of Issue	
11/03/2021		17/03/2017	

Traffic Cones		Taper Lenghts		Signs	
Spacing (60-80km/h)	12m	Merger Taper	2Dm	Size	"A" , "B" or "C"
Spacing (Over 80km/h)	15m	Lateral Shift Taper	Dm	Spacing	Dm
Merge Taper (60-80km/h)	9m	Attended STOP/SLOW	30m	Advance Warning Area To Transition Area.	2Dm
Lateral Shift (60-80km/h)	12m	Dm = SPEED LIMIT		Use class 2 reflective signs for day work & class 1 reflective signs for night work	

Speed of traffic km/h	TC at beginning of taper	Lateral Shift Taper	Merge Taper
45	15	0	15
46-55	15	15	30
56-65	30	30	60
66-75	N/A	70	115
76-85	N/A	60	130
86-105	N/A	90	145
Greater 105	N/A	100	160
	N/A	110	180

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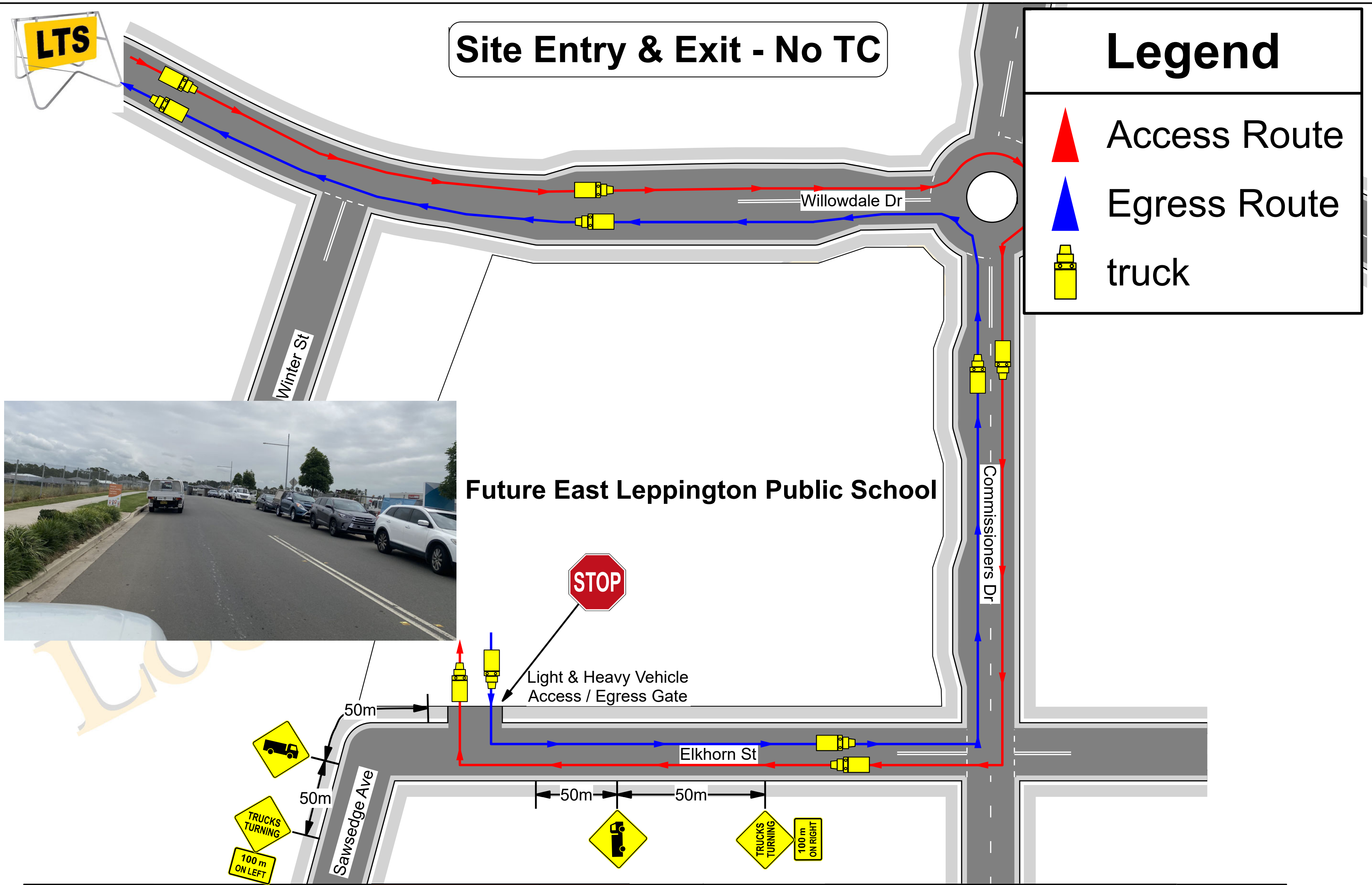
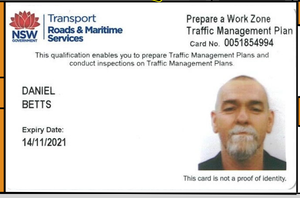
Site Entry & Exit - No TC



Local Traffic Services

Plan Drawn By

Danny Betts
0402 746 408
9603 8886



Transport
Roads & Maritime Services

Prepare a Work Zone
Traffic Management Plan
Card No. 0051854994

This qualification enables you to prepare Traffic Management Plans and conduct inspections on Traffic Management Plans.

DANIEL
BETTS

Expiry Date:
14/11/2021

This card is not a proof of identity.

Client	Date
HANSENYUNCKEN	24/03/21
Location Of Work	**UBD REF**
Willowdale Dr DENHAM COURT	286 K14

Plan No:	3062-6
Type Of Closure	Site Entry & Exit
On Site Contact	Marco Beretta 0439 850 357

Speed of traffic Km/h	Traffic controller at beginning of taper	Lateral Shift Taper	Merge Taper
45	15	0	15
46-55	15	15	30
56-65	30	30	60
66-75	N/A	70	115
76-85	N/A	60	130
86-105	N/A	90	145
Greater 105	N/A	100	160
	N/A	110	180

N

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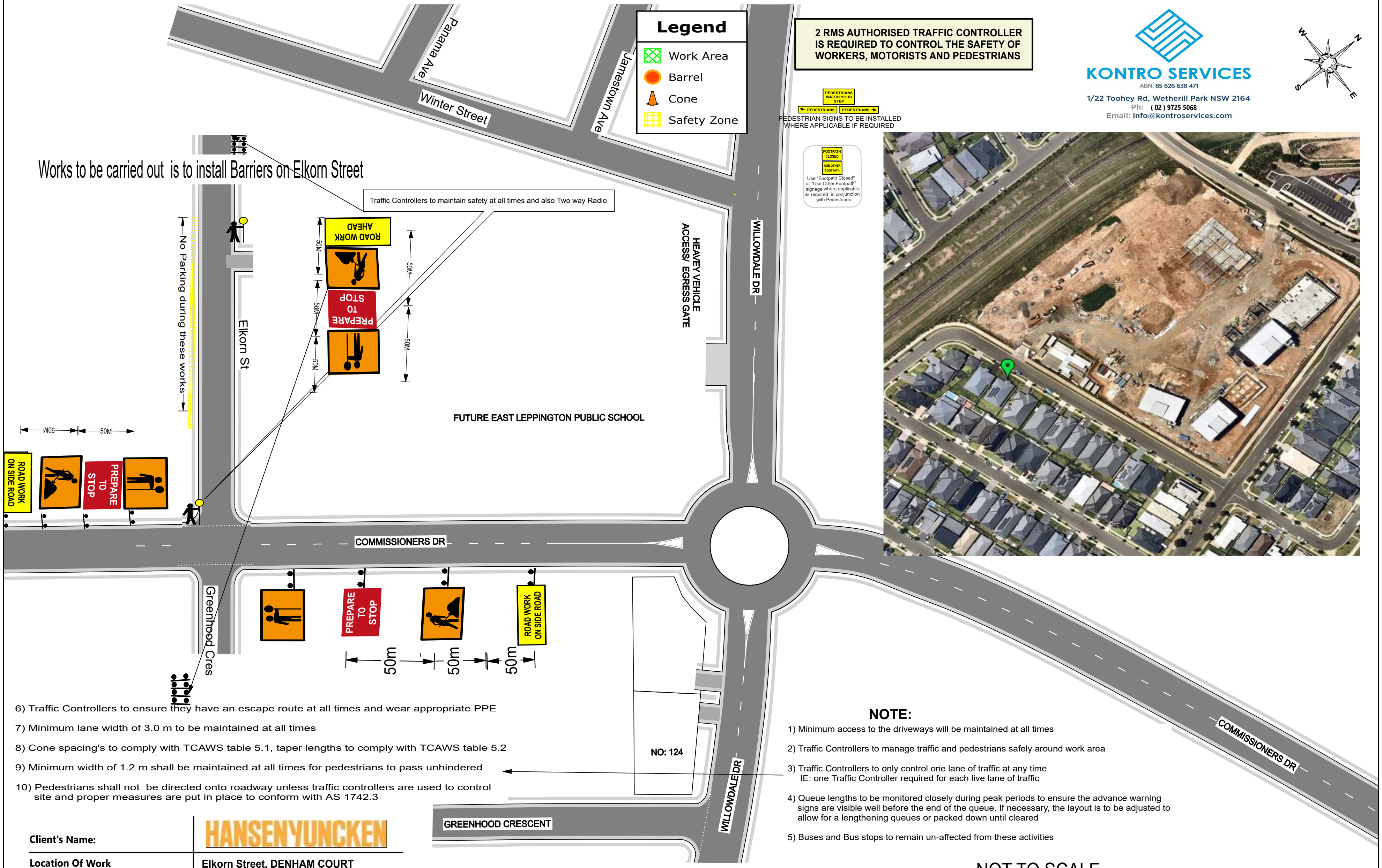
KONTRO SERVICES
ABN. 85 626 638 471
1/22 Toohey Rd, Wetherill Park NSW 2164
Ph: (02) 9725 5068
Email: info@kontroservices.com

Works to be carried out is to install Barriers on Elkorn Street

2 RMS AUTHORISED TRAFFIC CONTROLLER IS REQUIRED TO CONTROL THE SAFETY OF WORKERS, MOTORISTS AND PEDESTRIANS

Legend

- 🟩 Work Area
- ● Barrel
- ▲ Cone
- ▨ Safety Zone



PEDESTRIAN SIGNS TO BE INSTALLED WHERE APPLICABLE IF REQUIRED

Use "Footpath Closed" or "Use Other Footpath" signage where applicable, as required, in conjunction with Pedestrians

6) Traffic Controllers to ensure they have an escape route at all times and wear appropriate PPE

7) Minimum lane width of 3.0 m to be maintained at all times

8) Cone spacing's to comply with TCAWS table 5.1, taper lengths to comply with TCAWS table 5.2

9) Minimum width of 1.2 m shall be maintained at all times for pedestrians to pass unhindered

10) Pedestrians shall not be directed onto roadway unless traffic controllers are used to control site and proper measures are put in place to conform with AS 1742.3

NOTE:

1) Minimum access to the driveways will be maintained at all times

2) Traffic Controllers to manage traffic and pedestrians safely around work area

3) Traffic Controllers to only control one lane of traffic at any time
IE: one Traffic Controller required for each live lane of traffic

4) Queue lengths to be monitored closely during peak periods to ensure the advance warning signs are visible well before the end of the queue. If necessary, the layout is to be adjusted to allow for a lengthening queues or packed down until cleared

5) Buses and Bus stops to remain un-affected from these activities

Client's Name:	HANSENYUNCKEN
Location Of Work	Elkorn Street, DENHAM COURT
On Site Contact Name:	Ross Pearson
On Site Contact Number:	0438 675 748
Plan No:	202270
Type Of Closure:	Stop/ Go Pedestrian Watch

NOT TO SCALE

Date	Plan Drawn By	Orange Ticket Number
24/03/2021	Marissa Arraiza	TCT0046191
UBD REF	*This plan remains the property of Kontro Services. *This Plan Is Not to Scale. *This TCP complys with Aust Standard 1742.3 and RTA TCWSM Version 6.	Date of Issue
		17/03/2017

NSW SafeWork NSW WORK HEALTH & SAFETY TRAFFIC CONTROL WORK
Marissa
ARRAIZA
Card No: TCT0046191
D.O.B: 03/12/1963
Date of Issue: 17/03/2017
Type of traffic control work: IMP PWZ TCR
Safe Work NSW
NEW SOUTH WALES

Traffic Cones		Taper Lenghts		Signs	
Spacing (60-80km/h)	12m	Merger Taper	2Dm	Size	"A" , "B" or "C"
Spacing (Over 80km/h)	15m	Lateral Shift Taper	Dm	Spacing	Dm
Merge Taper (60-80km/h)	9m	Attended STOP/SLOW	30m	Advance Warning Area To Transition Area.	2Dm
Lateral Shift (60-80km/h)	12m	Dm = SPEED LIMIT		Use class 2 reflective signs for day work & class 1 reflective signs for night work	

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56-65	30	30	60
66-75	N/A	70	115
76-85	N/A	60	130
86-105	N/A	90	145
Greater 105	N/A	100	160
	N/A	110	180

Legend

- 🟩 Work Area
- ● Barrel
- ▲ Cone

NOTE:

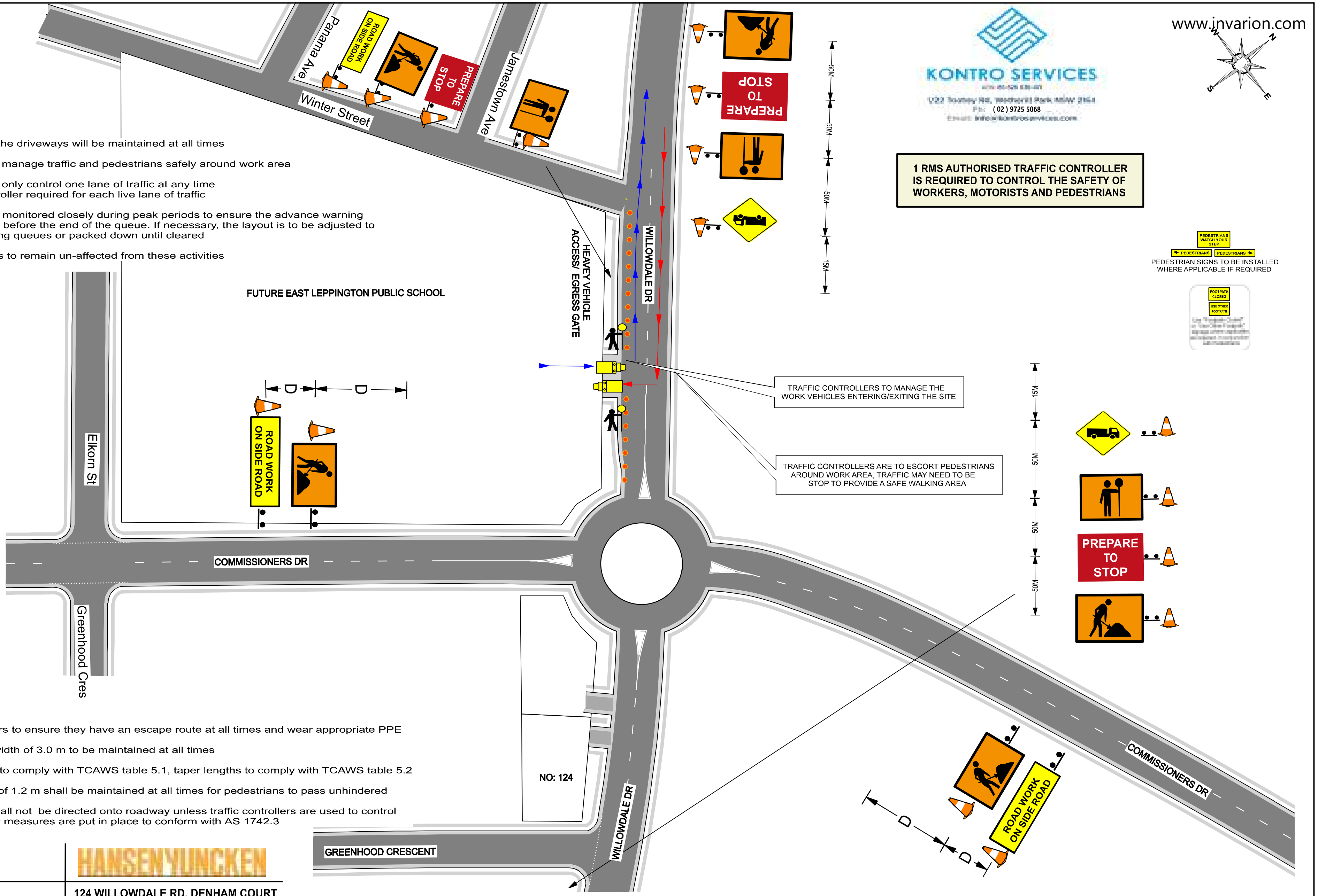
1) Minimum access to the driveways will be maintained at all times

2) Traffic Controllers to manage traffic and pedestrians safely around work area

3) Traffic Controllers to only control one lane of traffic at any time
IE: one Traffic Controller required for each live lane of traffic

4) Queue lengths to be monitored closely during peak periods to ensure the advance warning signs are visible well before the end of the queue. If necessary, the layout is to be adjusted to allow for a lengthening queues or packed down until cleared

5) Buses and Bus stops to remain un-affected from these activities



TRAFFIC CONTROLLERS TO MANAGE THE WORK VEHICLES ENTERING/EXITING THE SITE

TRAFFIC CONTROLLERS ARE TO ESCORT PEDESTRIANS AROUND WORK AREA, TRAFFIC MAY NEED TO BE STOP TO PROVIDE A SAFE WALKING AREA

PEDESTRIAN SIGNS TO BE INSTALLED WHERE APPLICABLE IF REQUIRED

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KONTRO SERVICES
Ph: (02) 9725 5068

1 RMS AUTHORISED TRAFFIC CONTROLLER IS REQUIRED TO CONTROL THE SAFETY OF WORKERS, MOTORISTS AND PEDESTRIANS

6) Traffic Controllers to ensure they have an escape route at all times and wear appropriate PPE

7) Minimum lane width of 3.0 m to be maintained at all times

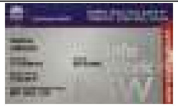
8) Cone spacing's to comply with TCAWS table 5.1, taper lengths to comply with TCAWS table 5.2

9) Minimum width of 1.2 m shall be maintained at all times for pedestrians to pass unhindered

10) Pedestrians shall not be directed onto roadway unless traffic controllers are used to control site and proper measures are put in place to conform with AS 1742.3

Client's Name:	HANSENYUNCKEN
Location Of Work	**124 WILLOWDALE RD, DENHAM COURT**
On Site Contact Name:	Ross Pearson
On Site Contact Number:	0438 675 748
Plan No:	202270
Type Of Closure:	GATE MANAGEMENT PEDESTRIAN MANAGEMENT

Date	Plan Drawn By	Orange Ticket Number
23/11/2020	**Marissa Arraiza**	**TCT0046191**
UBD REF	*This plan remains the property of Kontro Services. *This Plan Is Not to Scale. *This TCP complys with Aust Standard 1742.3 and RTA TCWSM Version 4.	Date of Issue
		17/03/2017



Traffic Cones		Taper Lenghts		Signs	
Spacing (60-80km/h)	12m	Merger Taper	2Dm	Size	"A" , "B" or "C"
Spacing (Over 80km/h)	15m	Lateral Shift Taper	Dm	Spacing	Dm
Merge Taper (60-80km/h)	9m	Attended STOP/SLOW	30m	Advance Warning Area To Transition Area.	2Dm
Lateral Shift (60-80km/h)	12m	Dm = SPEED LIMIT		Use class 2 reflective signs for day work & class 1 reflective signs for night work	

Speed of traffic km/h	TC at beginning of taper	Lateral Shift Taper	Merge Taper
45	15	0	15
46-55	15	15	30
56-65	30	30	60
66-75	N/A	70	115
76-85	N/A	60	130
86-105	N/A	90	145
Greater 105	N/A	100	160
	N/A	110	180

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Legend

- 🟩 Work Area
- ● Barrel
- ▲ Cone
- ▬ Barrier

NOTE:

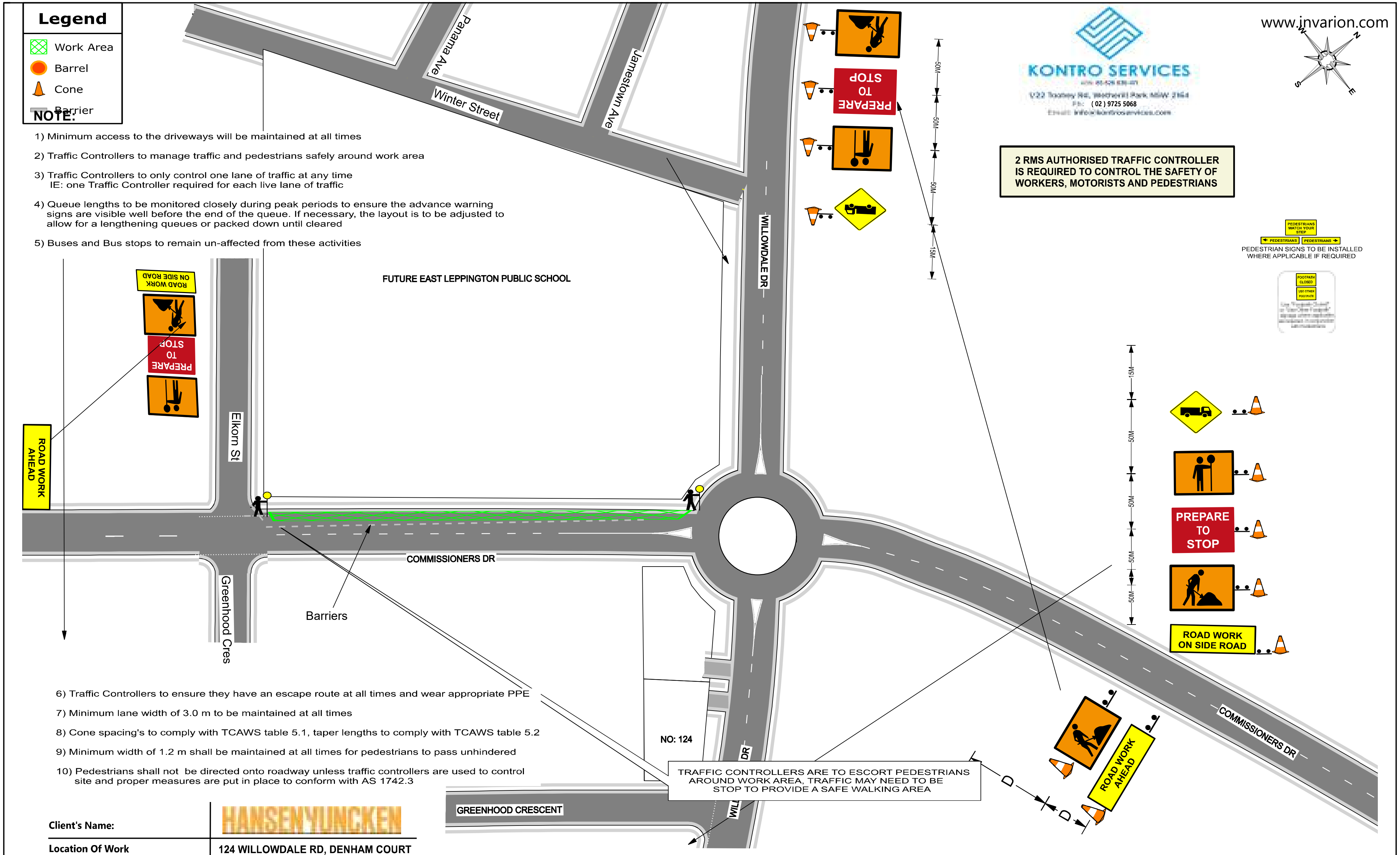
1) Minimum access to the driveways will be maintained at all times

2) Traffic Controllers to manage traffic and pedestrians safely around work area

3) Traffic Controllers to only control one lane of traffic at any time
IE: one Traffic Controller required for each live lane of traffic

4) Queue lengths to be monitored closely during peak periods to ensure the advance warning signs are visible well before the end of the queue. If necessary, the layout is to be adjusted to allow for a lengthening queues or packed down until cleared

5) Buses and Bus stops to remain un-affected from these activities



KONTRO SERVICES
1/22 Tooley Rd, Wetherill Park NSW 2164
Ph: (02) 9725 5068
Email: info@kontroservices.com

2 RMS AUTHORISED TRAFFIC CONTROLLER IS REQUIRED TO CONTROL THE SAFETY OF WORKERS, MOTORISTS AND PEDESTRIANS

PEDESTRIAN SIGNS TO BE INSTALLED WHERE APPLICABLE IF REQUIRED

TRAFFIC CONTROLLERS ARE TO ESCORT PEDESTRIANS AROUND WORK AREA, TRAFFIC MAY NEED TO BE STOP TO PROVIDE A SAFE WALKING AREA

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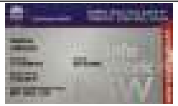
9) Minimum width of 1.2 m shall be maintained at all times for pedestrians to pass unhindered

10) Pedestrians shall not be directed onto roadway unless traffic controllers are used to control site and proper measures are put in place to conform with AS 1742.3

Client's Name:	HANSENYUNCKEN
Location Of Work	**124 WILLOWDALE RD, DENHAM COURT**
On Site Contact Name:	Ross Pearson
On Site Contact Number:	0438 675 748
Plan No:	202270a
Type Of Closure:	Stop Slow Pedestrian Control

Date	Plan Drawn By	Orange Ticket Number	
23/11/2020	Marissa Arraiza	TCT0046191	
UBD REF	*This plan remains the property of Kontro Services. *This Plan Is Not to Scale. *This TCP complys with Aust Standard 1742.3 and RTA TCWSM Version 4.	Date of Issue	
		17/03/2017	

Traffic Cones		Taper Lenghts		Signs	
Spacing (60-80km/h)	12m	Merger Taper	2Dm	Size	"A" , "B" or "C"
Spacing (Over 80km/h)	15m	Lateral Shift Taper	Dm	Spacing	Dm
Merge Taper (60-80km/h)	9m	Attended STOP/SLOW	30m	Advance Warning Area To Transition Area.	2Dm
Lateral Shift (60-80km/h)	12m	Dm = SPEED LIMIT		Use class 2 reflective signs for day work & class 1 reflective signs for night work	

Speed of traffic km/h	TC at beginning of taper	Lateral Shift Taper	Merge Taper
45	15	0	15
46-55	15	15	30
56-65	30	30	60
66-75	N/A	70	115
76-85	N/A	60	130
86-105	N/A	90	145
Greater 105	N/A	100	160
	N/A	110	180

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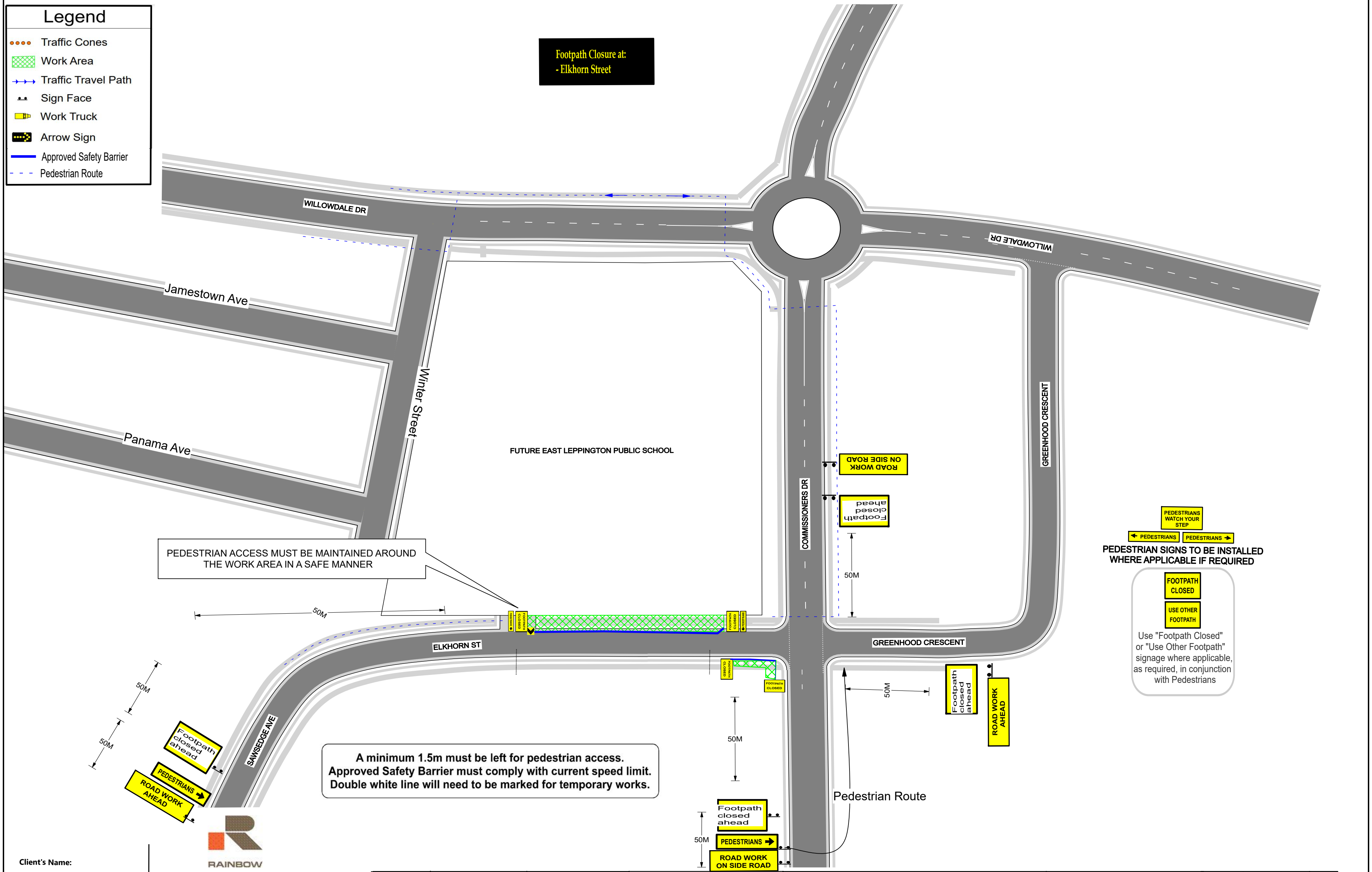

PEDESTRIAN ACCESS MUST BE MAINTAINED AROUND THE WORK AREA IN A SAFE MANNER

PEDESTRIAN SIGNS TO BE INSTALLED WHERE APPLICABLE IF REQUIRED

Use "Footpath Closed" or "Use Other Footpath" signage where applicable, as required, in conjunction with Pedestrians

A minimum 1.5m must be left for pedestrian access.
Approved Safety Barrier must comply with current speed limit.
Double white line will need to be marked for temporary works.

RAINBOW

Client's Name:	
Location Of Work	**124 WILLOWDALE RD, DENHAM COURT**
On Site Contact Name:	JAMES PARK
On Site Contact Number:	0419 021 832
Plan No:	202273
Type Of Closure:	GATE MANAGEMENT PEDESTRIAN MANAGEMENT

Date	Plan Drawn By	Orange Ticket Number
5/5/2021	Marissa Arraiza	TCT0046191
UBD REF	*This plan remains the property of Kontro Services. *This Plan Is Not to Scale. *This TCP complys with Aust Standard 1742.3 and RTA TCWSM Version 6.	Date of Issue
		17/03/2017


NSW SafeWork NSW
WORK HEALTH & SAFETY TRAFFIC CONTROL WORK
Marissa
ARRAIZA
Card No: TCT0046191
D.O.B: 03/12/1963
Date of Issue: 17/03/2017
Type of traffic control work: IMP PWZ TCR
Safe Work NSW
NEW SOUTH WALES

Traffic Cones		Taper Lenghts		Signs	
Spacing (60-80km/h)	12m	Merger Taper	2Dm	Size	"A" , "B" or "C"
Spacing (Over 80km/h)	15m	Lateral Shift Taper	Dm	Spacing	Dm
Merge Taper (60-80km/h)	9m	Attended STOP/SLOW	30m	Advance Warning Area To Transition Area.	2Dm
Lateral Shift (60-80km/h)	12m	Dm = SPEED LIMIT		Use class 2 reflective signs for day work & class 1 reflective signs for night work	

Speed of traffic km/h	TC at beginning of taper	Lateral Shift Taper	Merge Taper
45	15	0	15
46-55	15	15	30
56-65	30	30	60
66-75	N/A	70	115
76-85	N/A	60	130
86-105	N/A	90	145
Greater 105	N/A	100 110	160 180

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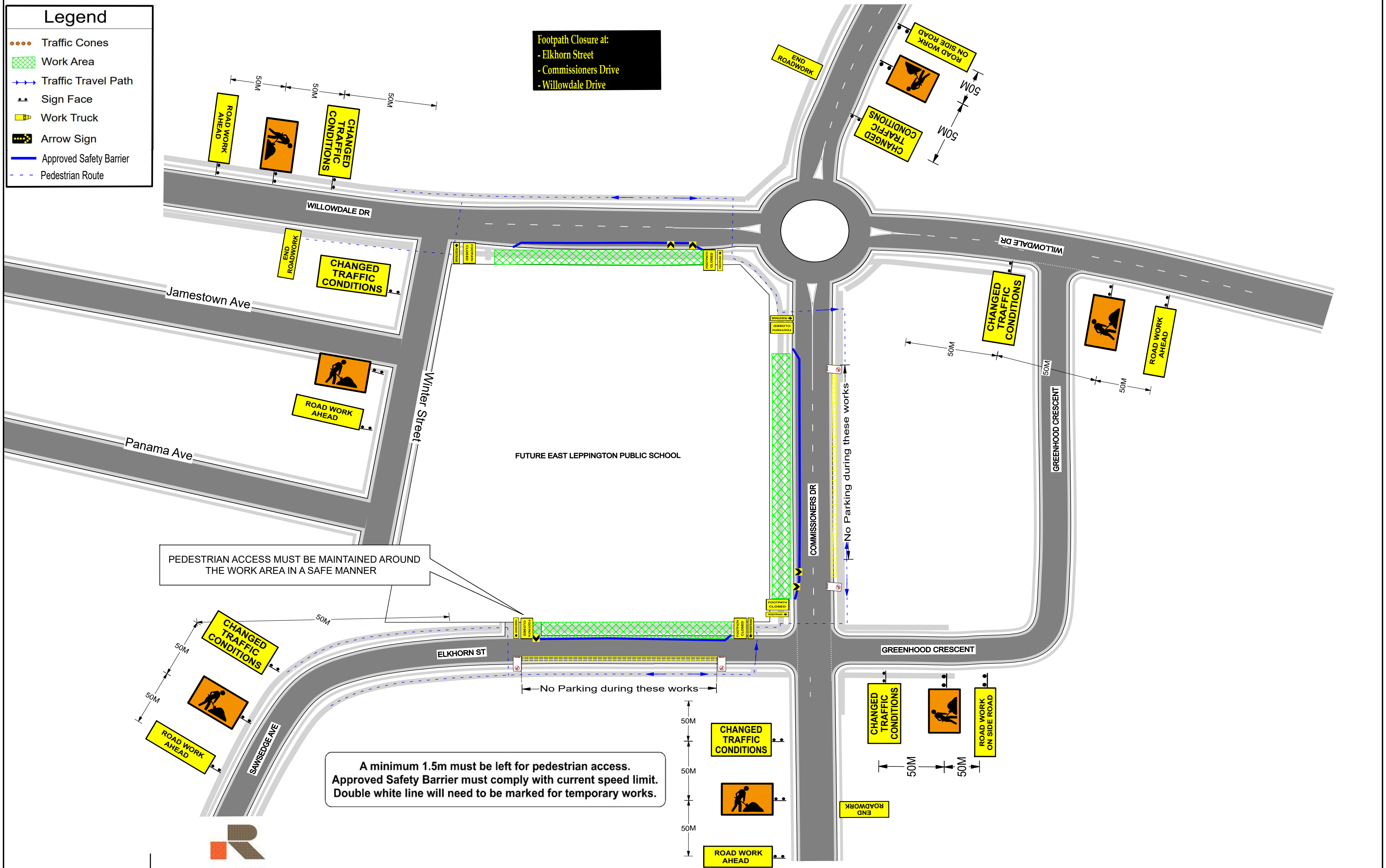

Legend

●●●●	Traffic Cones
▨	Work Area
→→→	Traffic Travel Path
••	Sign Face
▭	Work Truck
■	Arrow Sign
▬	Approved Safety Barrier
- - -	Pedestrian Route

Footpath Closure at:
- Elkhorn Street
- Commissioners Drive
- Willowdale Drive

PEDESTRIAN ACCESS MUST BE MAINTAINED AROUND THE WORK AREA IN A SAFE MANNER

A minimum 1.5m must be left for pedestrian access.
Approved Safety Barrier must comply with current speed limit.
Double white line will need to be marked for temporary works.

RAINBOW

Client's Name:	
Location Of Work	**124 WILLOWDALE RD, DENHAM COURT**
On Site Contact Name:	JAMES PARK
On Site Contact Number:	0419 021 832
Plan No:	202258
Type Of Closure:	GATE MANAGEMENT PEDESTRIAN MANAGEMENT

Date	Plan Drawn By	Orange Ticket Number
11/03/2021	Marissa Arraiza	TCT0046191
UBD REF	*This plan remains the property of Kontro Services. *This Plan Is Not to Scale. *This TCP complys with Aust Standard 1742.3 and RTA TCWSM Version 6.	Date of Issue
11/03/2021		17/03/2017


NSW SafeWork NSW
WORK HEALTH & SAFETY
TRAFFIC CONTROL WORK
Marissa
ARRAIZA
Card No:
TCT0046191
D.O.B:
03/12/1963
Date of Issue:
17/03/2017
Type of traffic control work:
IMP PWZ TCR
NEW SOUTH WALES
Safe Work NSW

Traffic Cones		Taper Lenghts		Signs	
Spacing (60-80km/h)	12m	Merger Taper	2Dm	Size	"A" , "B" or "C"
Spacing (Over 80km/h)	15m	Lateral Shift Taper	Dm	Spacing	Dm
Merge Taper (60-80km/h)	9m	Attended STOP/SLOW	30m	Advance Warning Area To Transition Area.	2Dm
Lateral Shift (60-80km/h)	12m	Dm = SPEED LIMIT		Use class 2 reflective signs for day work & class 1 reflective signs for night work	

Speed of traffic km/h	TC at beginning of taper	Lateral Shift Taper	Merge Taper
45	15	0	15
46-55	15	15	30
56-65	30	30	60
66-75	N/A	70	115
76-85	N/A	60	130
86-105	N/A	90	145
Greater 105	N/A	100	160
	N/A	110	180

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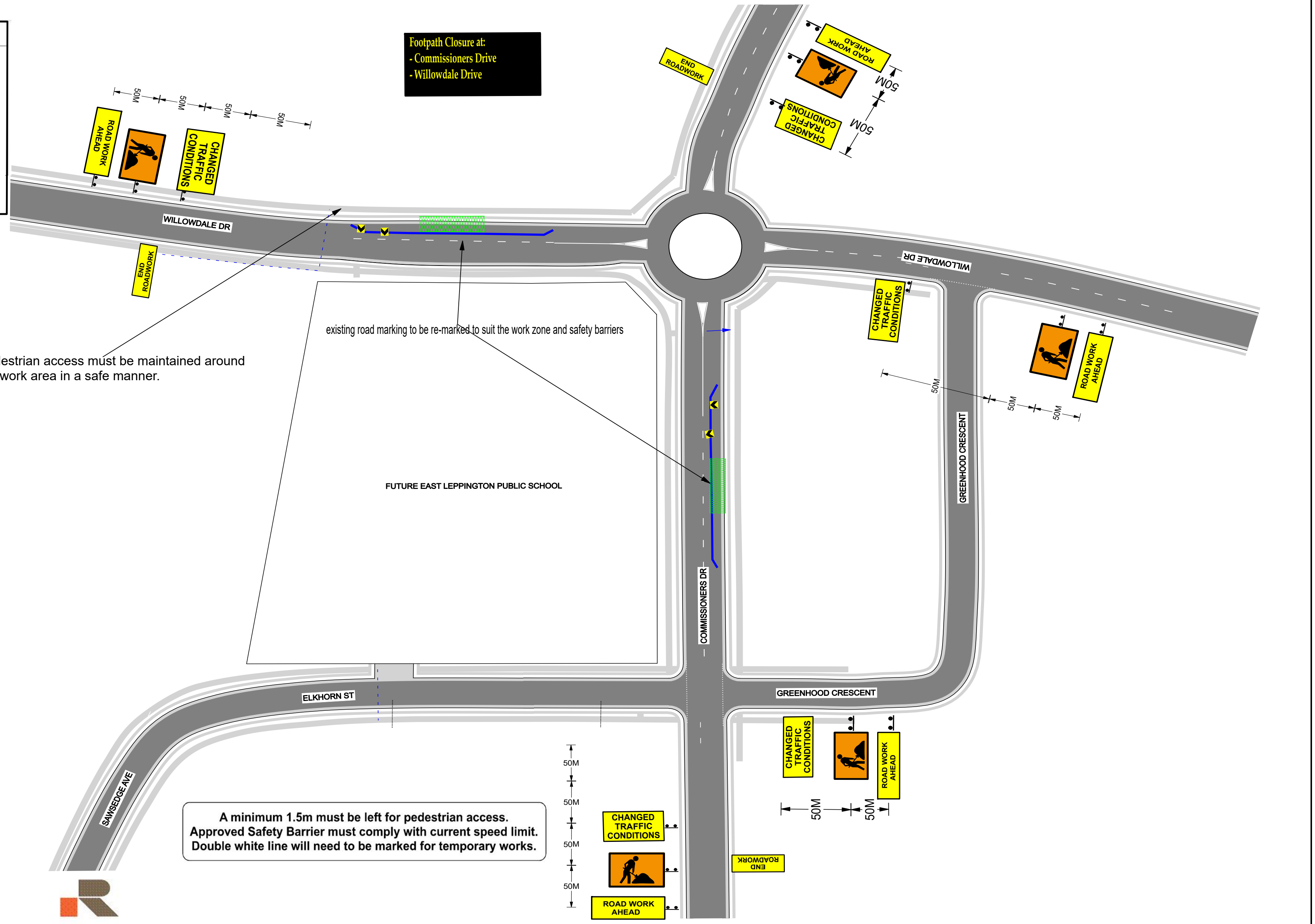
Legend

●●●●	Traffic Cones
▨	Work Area
→→→	Traffic Travel Path
••	Sign Face
▭	Work Truck
▶	Arrow Sign
▬	Approved Safety Barrier
- -	Pedestrian Route



Footpath Closure at:
- Commissioners Drive
- Willowdale Drive

existing road marking to be re-marked to suit the work zone and safety barriers

Pedestrian access must be maintained around the work area in a safe manner.

A minimum 1.5m must be left for pedestrian access.
Approved Safety Barrier must comply with current speed limit.
Double white line will need to be marked for temporary works.

RAINBOW

Client's Name:	
Location Of Work	124 WILLOWDALE RD, DENHAM COURT
On Site Contact Name:	JAMES PARK
On Site Contact Number:	0419 021 832
Plan No:	202259
Type Of Closure:	GATE MANAGEMENT PEDESTRIAN MANAGEMENT

Date	Plan Drawn By	Orange Ticket Number
11/03/2021	Marissa Arraiza	TCT0046191
UBD REF	*This plan remains the property of Kontro Services. *This Plan Is Not to Scale. *This TCP complys with Aust Standard 1742.3 and RTA TCWSM Version 4.	Date of Issue
11/03/2021		17/03/2017

NSW SafeWork NSW WORK HEALTH & SAFETY TRAFFIC CONTROL WORK

Marissa
ARRAIZA

Card No: TCT0046191
D.O.B: 03/12/1963

Date of Issue: 17/03/2017

Type of traffic control work: IMP PWZ TCR

NEW SOUTH WALES

Traffic Cones		Taper Lenghts		Signs	
Spacing (60-80km/h)	12m	Merger Taper	2Dm	Size	"A" , "B" or "C"
Spacing (Over 80km/h)	15m	Lateral Shift Taper	Dm	Spacing	Dm
Merge Taper (60-80km/h)	9m	Attended STOP/SLOW	30m	Advance Warning Area To Transition Area.	2Dm
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46-55	15	15	30
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86-105	N/A	90	145
Greater 105	N/A	100	160
	N/A	110	180

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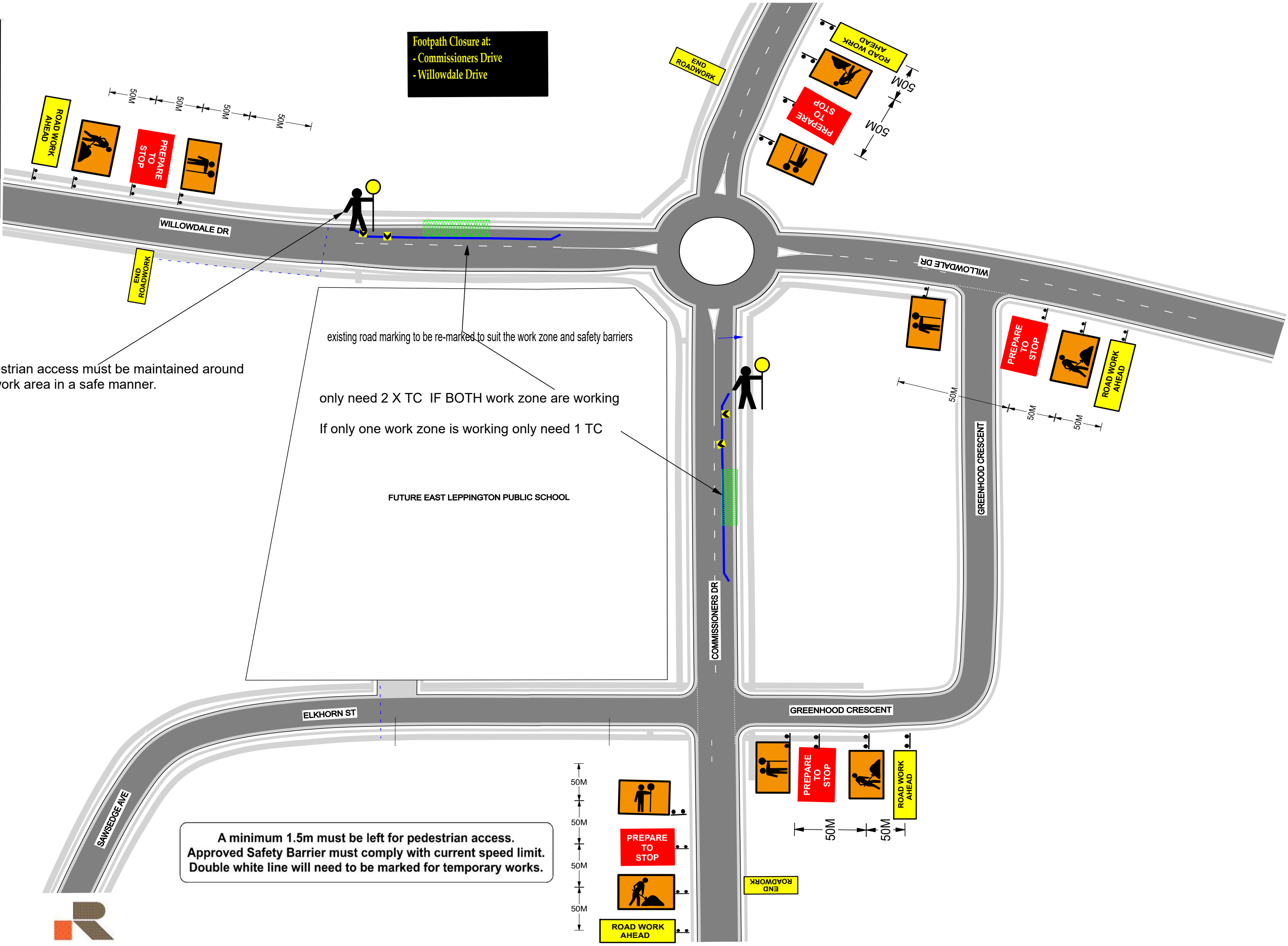
Legend

- •••• Traffic Cones
- ▨ Work Area
- →→→ Traffic Travel Path
- •• Sign Face
- Work Truck
- Arrow Sign
- ━ Approved Safety Barrier
- - - Pedestrian Route



Footpath Closure at:
- Commissioners Drive
- Willowdale Drive

existing road marking to be re-marked to suit the work zone and safety barriers

Pedestrian access must be maintained around the work area in a safe manner.

only need 2 X TC IF BOTH work zone are working

If only one work zone is working only need 1 TC

A minimum 1.5m must be left for pedestrian access.
Approved Safety Barrier must comply with current speed limit.
Double white line will need to be marked for temporary works.

RAINBOW

Client's Name:	
Location Of Work	**124 WILLOWDALE RD, DENHAM COURT**
On Site Contact Name:	JAMES PARK
On Site Contact Number:	0419 021 832
Plan No:	202260
Type Of Closure:	GATE MANAGEMENT PEDESTRIAN MANAGEMENT

Date	Plan Drawn By	Orange Ticket Number
11/03/2021	Marissa Arraiza	TCT0046191
UBD REF	*This plan remains the property of Kontro Services. *This Plan Is Not to Scale. *This TCP complys with Aust Standard 1742.3 and RTA TCWSM Version 4.	Date of Issue
11/03/2021		17/03/2017


NSW SafeWork NSW
WORK HEALTH & SAFETY TRAFFIC CONTROL WORK
Marissa
ARRAIZA
Card No: TCT0046191
D.O.B: 03/12/1963
Date of Issue: 17/03/2017
Type of traffic control work: IMP PWZ TCR
Safe Work NSW
NEW SOUTH WALES

Traffic Cones		Taper Lenghts		Signs	
Spacing (60-80km/h)	12m	Merger Taper	2Dm	Size	"A" , "B" or "C"
Spacing (Over 80km/h)	15m	Lateral Shift Taper	Dm	Spacing	Dm
Merge Taper (60-80km/h)	9m	Attended STOP/SLOW	30m	Advance Warning Area To Transition Area.	2Dm
Lateral Shift (60-80km/h)	12m	Dm = SPEED LIMIT		Use class 2 reflective signs for day work & class 1 reflective signs for night work	

Speed of traffic km/h	TC at beginning of taper	Lateral Shift Taper	Merge Taper
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46-55	15	15	30
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66-75	N/A	70	115
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Greater 105	N/A	100 110	160 180

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Legend

▨	Work Area
●	Barrel
▲	Cone
▬	Barrier

NOTE:

1) Minimum access to the driveways will be maintained at all times

2) Traffic Controllers to manage traffic and pedestrians safely around work area

3) Traffic Controllers to only control one lane of traffic at any time
IE: one Traffic Controller required for each live lane of traffic

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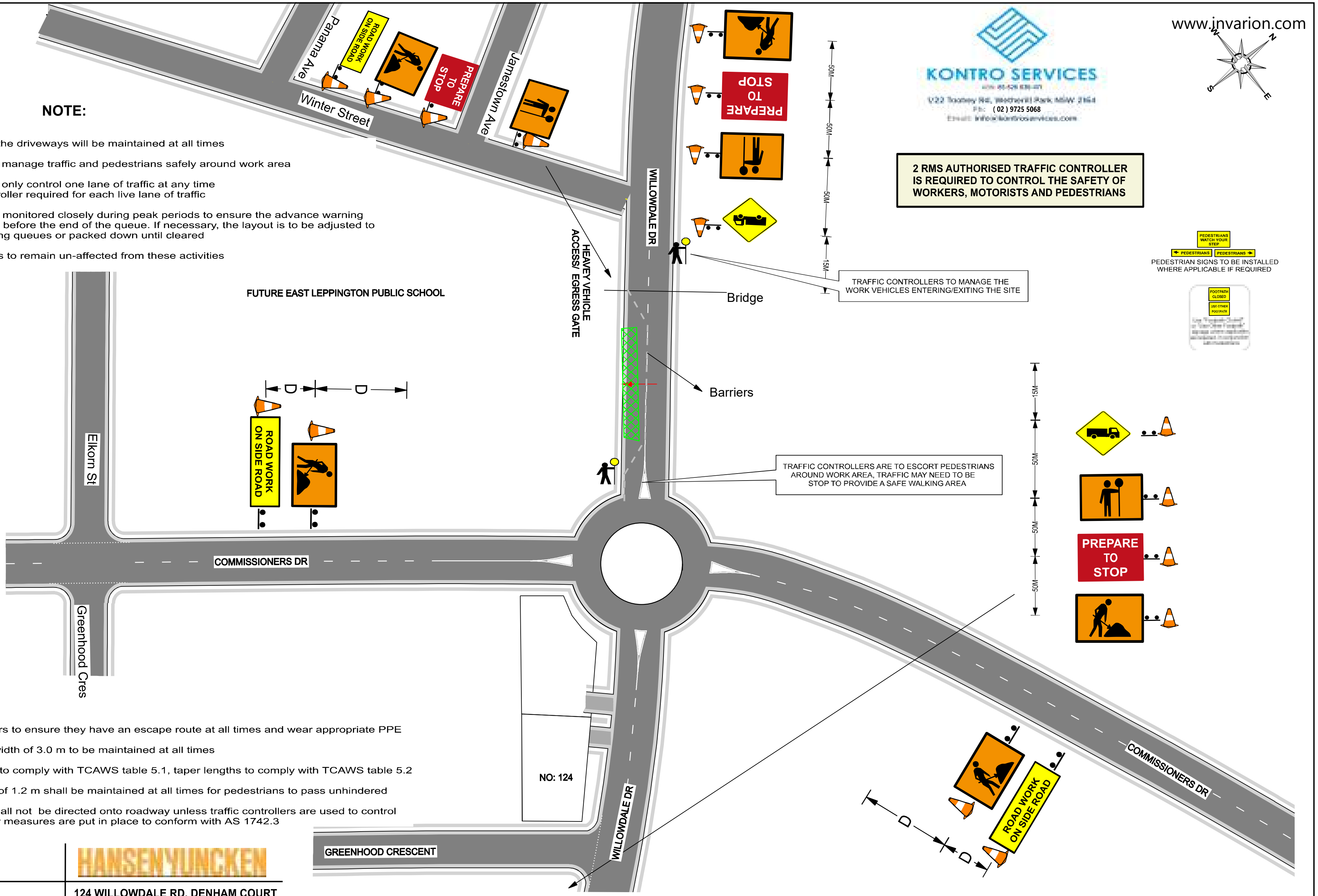


TRAFFIC CONTROLLERS TO MANAGE THE WORK VEHICLES ENTERING/EXITING THE SITE

TRAFFIC CONTROLLERS ARE TO ESCORT PEDESTRIANS AROUND WORK AREA, TRAFFIC MAY NEED TO BE STOP TO PROVIDE A SAFE WALKING AREA

KONTRO SERVICES

Ph: (02) 9725 5068

2 RMS AUTHORISED TRAFFIC CONTROLLER IS REQUIRED TO CONTROL THE SAFETY OF WORKERS, MOTORISTS AND PEDESTRIANS

PEDESTRIANS WATCH YOUR STEP

← PEDESTRIANS | PEDESTRIANS →

PEDESTRIAN SIGNS TO BE INSTALLED WHERE APPLICABLE IF REQUIRED

FOOTPATH CLOSED

USE OTHER FOOTPATH

6) Traffic Controllers to ensure they have an escape route at all times and wear appropriate PPE

7) Minimum lane width of 3.0 m to be maintained at all times

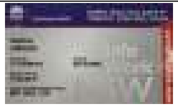
8) Cone spacing's to comply with TCAWS table 5.1, taper lengths to comply with TCAWS table 5.2

9) Minimum width of 1.2 m shall be maintained at all times for pedestrians to pass unhindered

10) Pedestrians shall not be directed onto roadway unless traffic controllers are used to control site and proper measures are put in place to conform with AS 1742.3

Client's Name:	HANSENYUNCKEN
Location Of Work	**124 WILLOWDALE RD, DENHAM COURT**
On Site Contact Name:	Ross Pearson
On Site Contact Number:	0438 675 748
Plan No:	202270
Type Of Closure:	GATE MANAGEMENT Stop Slow Pedestrian Control

Date	Plan Drawn By	Orange Ticket Number
23/4/21	Marissa Arraiza	TCT0046191
UBD REF	*This plan remains the property of Kontro Services. *This Plan Is Not to Scale. *This TCP complys with Aust Standard 1742.3 and RTA TCWSM Version 6.	Date of Issue
		17/03/2017



Traffic Cones		Taper Lenghts		Signs	
Spacing (60-80km/h)	12m	Merger Taper	2Dm	Size	"A" , "B" or "C"
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Lateral Shift (60-80km/h)	12m	Dm = SPEED LIMIT		Use class 2 reflective signs for day work & class 1 reflective signs for night work	

Speed of traffic km/h	TC at beginning of taper	Lateral Shift Taper	Merge Taper
45	15	0	15
46-55	15	15	30
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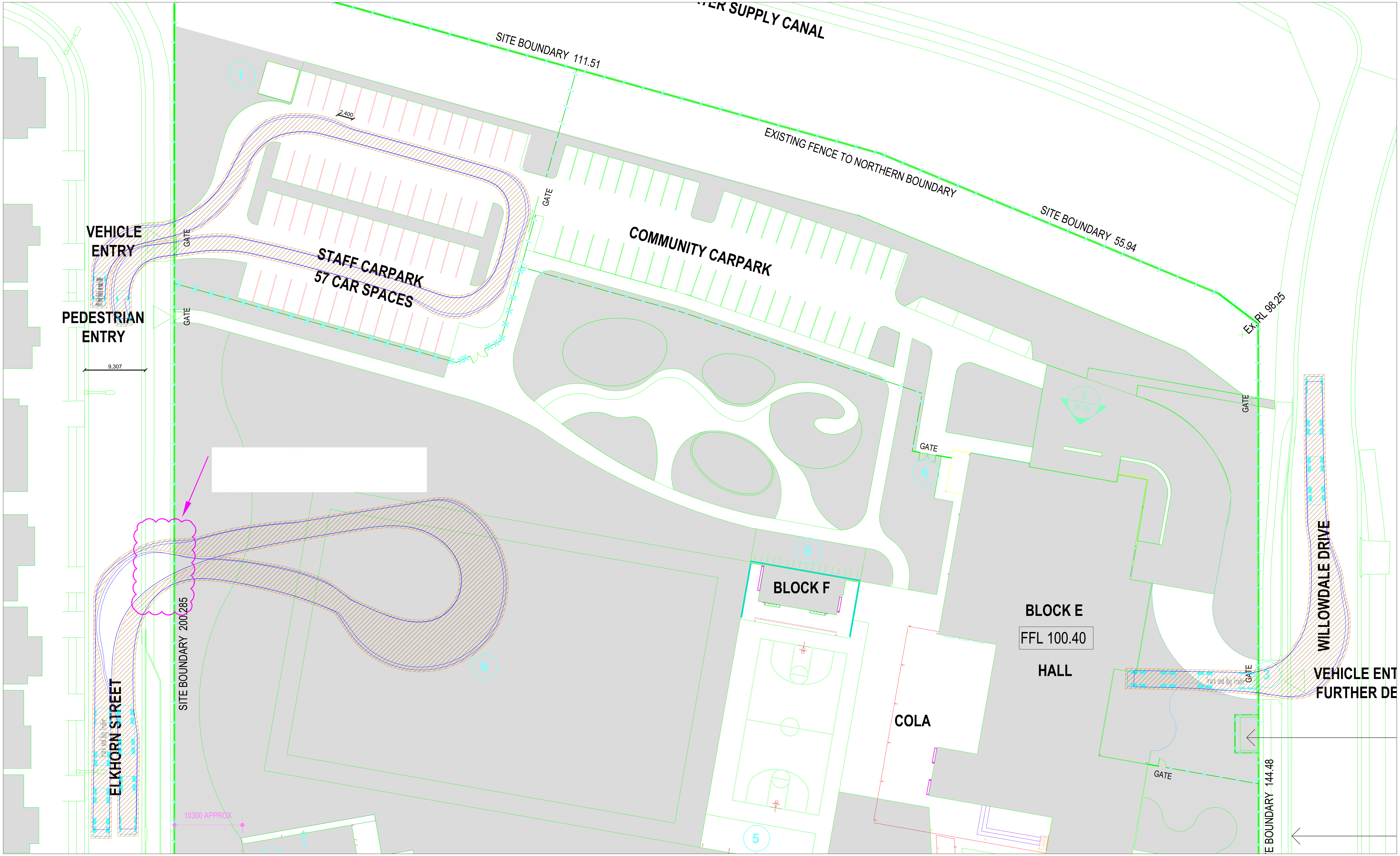
66-75	N/A	70	115
76-85	N/A	60	130
86-105	N/A	90	145
Greater 105	N/A	100	160
	N/A	110	180

Appendix C

Swept Paths



Notes:	This drawing is provided for information purposes only and should not be used for construction.

Document Info:
Drawn by: JamesLaidler
File name: 1048d03 CTPMSP Access.dwg

Client:
Hansen Yucken

Project:
1048
East Leppington Public School

Drawing Title:
Truckand Dog Access

Date:
27/06/2019

Scale @ A3:
N.T.S

Drawing Number:
AG 01

asongroup
Suite 5.02, Level 5, 1 Castlereagh Street
Sydney NSW 2000
info@asongroup.com.au

Appendix D

Council / TfNSW Correspondence

Appendix D

Council / TfNSW Correspondence

Post Approval Consultation Record

Identified Party to Consult:	Campbelltown City Council
Consultation type:	Email correspondence
When is consultation required?	Prior to commencement
Why	B16. A Construction Traffic and Pedestrian Management Sub-Plan (CTPMSP) must be prepared to achieve the objective of ensuring safety and efficiency of the road network and address, but not be limited to, the following: (b) be prepared in consultation with Council and TfNSW;
When was consultation scheduled/held	16 January 2020, 17 February 2020, 02 September 2020, 07 September 2020
When was consultation held	16 January 2020, 17 February 2020, 02 September 2020, 07 September 2020
Identify persons and positions who were involved	Sean Wilson, Development Assessment Planner Harvinder Singh, Council Development Engineer
Provide the details of the consultation	16 January 2020 - Campbelltown City Council submitted comments on the SSD application. The comments that were raised were all regarding the access to the site, the adjoining roads/footpaths and the use of roads once the project is complete and the facility is operational 17 February 2020 - Ason issued a technical note on 17 February 2020 addressing each of the items raised through the early phases of the project 02 September 2020 - CTPMSP was submitted for review to council for them to confirm acceptance that the submitted plan satisfied the council requirements. 07 September 2020 - Response received from council regarding the submitted plan. The only comment that was raised was on one of the TCP appendices regarding additional signage inside the site. Council confirmed that they had no further comments with any other aspect of the plan. - The revised TCP was provided back to council incorporating their comments.
What specific matters were discussed?	The email correspondences referenced in this consultation record outlined the submission of the sub-plan in accordance with the relevant development consent condition and provided the opportunity for council to make comments on the plans. Council confirmed that the plan was satisfactory, with the comment they

	raised regarding the TCP amended and incorporated within the final revision of the plan.
What matters were resolved?	Council has been consulted during the development of the CTPMSP in line with condition B16. The signage for the site entrance from Willowdale Drive was resolved as part of the consultation.
What matters are unresolved?	Not applicable
Any remaining points of disagreement?	No
How will SINSW address matters not resolved?	Not applicable

David Way

From:	Belinda Borg <Belinda.Borg@campbelltown.nsw.gov.au>
Sent:	Thursday, 16 January 2020 6:19 PM
To:	David Way
Cc:	Fletcher Rayner; Andrew MacGee
Subject:	RE: HPE CM: Notice of Exhibition - East Leppington Public School (SSD 9476)

Dear David,

Apologies for the delayed response from Council in relation to the proposed East Leppington School. We are excited that the school is progressing to delivery and the opportunity to review the documentation publicly exhibited.

A review of the information has raised the following concerns for Council:

- **Community Facility - It is noted that an agreement has not been reached between Campbelltown Council and the Department of Education regarding the delivery of the community facility. This area would be the subject of a separate Development Application.**
- **Student Numbers - It is noted that the submitted traffic study has been based on estimated School capacity of 1012 students. It is not clear how the student count was derived. Council is concerned that should the student number increase; it has the potential to negatively impact on the safety of traffic circulation in the vicinity of the school. In this regard, Council needs assurance that the student number will not increase.**
- **Traffic and Parking Management Plan - It is noted that the report recommends preparation of Traffic and Parking Management Plan prior to the opening of the school to provide safe and efficient operations on and off-site. Council believes that this is not satisfactory as there are numerous road safety matters as listed below. Such plan needs to be prepared now during the DA stage demonstrating how the on-site design elements will complement with on-street traffic facilities so that an effective and safe traffic solutions can be achieved. Such plan must include consideration of the interaction between the school and the childcare centre on the opposite side of Willowdale Drive as many parents will access both facilities. In this regard, the applicant shall submit a revised engineering drawings supported by robust Traffic and Management Plan for the review and approval of Council's Executive Manager Infrastructure addressing the following concerns.**
- **Site Access - The development includes a significant number of access points – controlling access to the site would be difficult and a reduction in the number of access points should be considered.**
- **Equitable Access - The provision of one lift and its location within the school is not considered to deliver equitable access. The inability to move within the administration/ library level of the building is of greatest concern in this area.**
- **Equitable Access throughout site – the applicant should review the plans to ensure the paths of travel provided appropriate linkages within the site/ connectivity to fields and court.**
- **Willowdale Drive Public Verge Area - It is noted that the footpath area will be reduced in width due to the installation of kiss & ride and bus bay on all road frontages. The applicant shall dedicate land to reinstate the public verge area to the current width. Footpaths of appropriate width are to be reconstructed where moved or modified to ensure that the students/ passengers using the bus bay have sufficient space to wait while allowing pedestrian movements within the locality.**
- **Willowdale Drive & Children's Crossing - A children's crossing will be needed to provide a safe crossing points for walking students and parents who park at the childcare (on the opposite side of the road) to drop their children and then walk to school to drop school kids.**

Such path may be located where the existing off-road cycleway cross the road if this can be demonstrated not to conflict with other operational aspects of this frontage (e.g. buses).

- **<u>Bus Bay Length</u> - The applicant needs to justify how the how the proposed length of bus bay was derived as it seems a bit lengthy. The applicant needs to consider the number of students who will be dropped off at this primary school (with their younger siblings) to be collected and transported to their high school by bus. A shortening of the bus bay would enable the provision of a children's crossing within Willowdale Drive.**
- **<u>Access to the Community Hall</u> - The proposed vehicular access for the future community hall needs to be located outside the bus bay as the current location would restrict access to outside school peak times. Given the intended shared use nature of this facility and expected hours of operation, this need to be addressed as a part of this application, rather than the future DA for the Community Facility.**
- **<u>Willowdale Drive & Pedestrian Access to future Community Facility</u> - The proposed pedestrian access to the future community hall needs to be relocated to the east of the vehicular access so that there is no conflict between the pedestrians and vehicles.**
- **<u>Commissioners Drive Children's Crossing</u> - A children's crossing is needed outside kiss & drive bay to provide safe crossing point. At the time of subdivision Council had designed the road to enable the installation of such crossing through the provision of the blisters in the kerb area. The proposal includes the removal of such blisters.**
- **<u>Elkhorn Street</u> – The traffic report details that there will be an estimated queue of 200m on this road to access the kiss and drive bay. The road is only 8.0 m wide and will not be able to accommodate on-street parking (on residential side) and two through lane. This matter must be addressed as the community impact is unacceptable. It is recommended that the pedestrian access pint from Elkhorn Street is removed.**
- **<u>Linkage to Town Centre/ Sports Fields and Riparian Corridor</u> - Pedestrian access and linkages with town centre need to be considered in relation to the delivery of pedestrian crossings.**
- **<u>Safety and Security Plan</u> – this is required to address the significant number of access points to the school, treatment to streets/fencing/lighting throughout site, etc.**
- **<u>Contamination</u> - What does Low Contamination on site mean and does this require additional assessment under SEPP 55?**
- **<u>Sydney Water Supply Canal</u> – A Management Plan is required to protect this critical infrastructure it short term during construction and long term (rubbish from the playground)**
- **<u>Signage Illumination</u> - The illumination levels of the signage should be limited to protect the amenity of the adjoining residents - no flashing sign boards would be appropriate.**
- **<u>Separate DA for Bulk Earthworks</u> – Please note that Council is in receipt of a Development Application for Bulk earthworks associated with this site. Reference 3870/2019/DA-CW, received on 6 December 2019.**

Matters that can be conditioned as part of the determination:

- **The community carpark shall be solely preserved for community use and shall not be used for staff carpark.**
- **The staff carpark shall be available for community use when it is not being used by the school.**
- **It is noted that the existing stormwater pits on all school frontages will be impacted by the proposed bus and kiss & ride bays. In this regard, each affected pit shall be replaced with two butterfly pits (two pits to compensate for the reduced intake capacity of an individual butterfly pit).**
- **The applicant shall submit a DRAINS model to ensure that any flood water is contained in the swale located on the site adjacent to Sydney Water Canal. It is noted that an imperviousness of 50% was considered for the school in earlier stormwater analysis which showed flood water being contained in the swale.**

Council would be happy to meet with the Department of Planning in the event that you would like to further understand Council's comments.

Regards,

CAMPBELLTOWN
CITY COUNCIL
Belinda Borg
Coordinator Urban Release

P: +61 2 4645 4608
E: belinda.borg@campbelltown.nsw.gov.au

www.campbelltown.nsw.gov.au

Find us on

From: David Way <David.Way@planning.nsw.gov.au>
Sent: Thursday, 16 January 2020 3:37 PM
To: Belinda Borg <Belinda.Borg@campbelltown.nsw.gov.au>
Subject: RE: HPE CM: Notice of Exhibition - East Leppington Public School (SSD 9476)

Hi Belinda

Great to hear.

Regards,

David

David Way
Senior Planning Officer, School Infrastructure Assessments

Social and Infrastructure Assessments | Planning and Assessment
T 02 8275 1324| **E** david.way@planning.nsw.gov.au
320 Pitt Street Sydney NSW 2000
www.dpie.nsw.gov.au

NSW GOVERNMENT | Planning, Industry & Environment

From: Belinda Borg <Belinda.Borg@campbelltown.nsw.gov.au>
Sent: Thursday, 16 January 2020 3:18 PM
To: David Way <David.Way@planning.nsw.gov.au>
Subject: RE: HPE CM: Notice of Exhibition - East Leppington Public School (SSD 9476)

Hi David,

Yes we will be and I will have this done by the end of the week.

Regards,

Belinda Borg
Coordinator Urban Release

From: David Way <David.Way@planning.nsw.gov.au>
Sent: Thursday, 16 January 2020 2:15 PM
To: Belinda Borg <Belinda.Borg@campbelltown.nsw.gov.au>
Subject: RE: HPE CM: Notice of Exhibition - East Leppington Public School (SSD 9476)

Hi Belinda

I just wanted to quickly touch base regarding the East Leppington Public School (SSD 9476) which finished its exhibition period last year.

I wanted to check whether Campbelltown was likely to provide a late submission for this project?

Happy to discuss,

David

David Way
Senior Planning Officer, School Infrastructure Assessments

Social and Infrastructure Assessments | Planning and Assessment
T 02 8275 1324| **E** **david.way@planning.nsw.gov.au**
320 Pitt Street Sydney NSW 2000
www.dpie.nsw.gov.au

NSW GOVERNMENT | Planning, Industry & Environment

From: Andrew MacGee <Andrew.Macgee@campbelltown.nsw.gov.au>
Sent: Thursday, 16 January 2020 11:24 AM
To: David Way <David.Way@planning.nsw.gov.au>
Subject: RE: HPE CM: Notice of Exhibition - East Leppington Public School (SSD 9476)

Hi David, I am away at the moment but have forwarded your message to Belinda Borg, who is the area coordinator for the team that looks after the east Leppington area. I understand they were definitely intending on making a submission as there is a plan to collocate some Council/community facilities on the site as well.

From: David Way <David.Way@planning.nsw.gov.au>
Sent: Wednesday, 15 January 2020 16:15
To: Andrew MacGee <Andrew.Macgee@campbelltown.nsw.gov.au>
Subject: FW: HPE CM: Notice of Exhibition - East Leppington Public School (SSD 9476)

Hi Andrew

I hope you nice Christmas / New Years.

After our talk last year regarding Warakirra College, I thought you might be a good starting point for a question regarding an exhibition which the Department of Planning undertook last year (see below).

In the end Campbelltown didn't provide a submission on this project. I was just wondering if there was some way I could check if Campbelltown Council was intending to provide a late submission or if they were not intending to provide one?

Happy to discuss,

David

David Way
Senior Planning Officer, School Infrastructure Assessments

Social and Infrastructure Assessments | Planning and Assessment
T 02 8275 1324| **E** **david.way@planning.nsw.gov.au**
320 Pitt Street Sydney NSW 2000
www.dpie.nsw.gov.au

NSW GOVERNMENT | Planning, Industry & Environment

From: David Way
Sent: Friday, 8 November 2019 10:05 AM
To: OLG - Campbelltown City Council <council@campbelltown.nsw.gov.au>
Subject: HPE CM: Notice of Exhibition - East Leppington Public School (SSD 9476)

NSW GOVERNMENT | Planning, Industry & Environment

Attention: Mrs Lindy Deitz
General Manager
Campbelltown City Council
PO Box 57
Campbelltown NSW 2560

-via email-
council@campbelltown.nsw.gov.au

Dear Mrs Deitz

The Department of Planning, Industry and Environment has received an Environmental Impact Statement (EIS) for the New East Leppington Primary School (SSD-9476).

The EIS will be publicly exhibited from **Thursday 14 November 2019 to Wednesday 11 December 2019**. All relevant documents may be viewed on the Department's website at: https://www.planningportal.nsw.gov.au/major-projects/project/9686.

The Applicant has arranged to deliver two hard copies and one electronic copy of the EIS to you directly. You are requested to make a copy of the DA and EIS available at Campbelltown City Council Offices for the duration of the public exhibition period, accompanied by a copy of the attached exhibition notice.

The Department invites you to advise on the proposal, including advice on recommended conditions by **Wednesday 11 December 2019**.

If you have any enquiries, please contact David Way on (02) 8275 1324 or via email at David.Way@planning.nsw.gov.au.

Kind regards

David Way
Senior Planning Officer, School Infrastructure Assessments

Social and Infrastructure Assessments | Planning and Assessment
T 02 8275 1324| **E** **david.way@planning.nsw.gov.au**
320 Pitt Street Sydney NSW 2000
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info@asongroup.com.au
+61 2 9083 6601
Suite 5.02, Level 5, 1 Castlereagh Street
Sydney, NSW 2000
www.asongroup.com.au

TECHNICAL NOTE

Reference: P1048t02v02

17 February 2020

Hansen Yuncken
Bldg 1, L3, 75-85 O'Riordan Street
Alexandria NSW 2015

Response to Submissions

New East Leppington Public School, Commissioners Drive, Denham Court (SSD 9476)

Dear Paul,

I refer to recent correspondence in regard to the issues raised in the submissions received in relation to the proposed New Public School, Commissioners Drive, Denham Court SSD-9476 (the Proposal), and specifically the following submissions prepared by the public and government agencies following exhibition of the Proposal:

- Heidi Pearse, Denham Court, *Submission for: New East Leppington Primary School*, (Ms Pearse Submission)
- Jason Maslen, Department of Planning Industry & Environment (DPIE), *New East Leppington Primary School (SSD-9476)*, 17 December 2019 (DPIE RTS)
- Belinda Borg, Campbelltown City Council, *New East Leppington Primary School (SSD 9476)* (Council Submission).

The sections below provide a summary of the relevant issues raised in each of the responses to the submission and the Ason Group response to each issue. In preparing these responses, Ason Group has referenced the following documents:

- Ason Group, *Transport Impact Assessment, New East Leppington Public School, Commissioners Drive, Denham Court* (AGTIA); and

- Ason Group, *Construction Traffic Management Plan, New East Leppington Public School, Commissioners Drive, Denham Court* (AGCTMP)

Issues have also been labelled with the appropriate Ethos Urban reference number (EU) for ease of cross referencing.

Heidi Pearse

EU 2a, 2b

With regard to the staff car park entrance on Elkhorn St, I propose that the entrance to the car park be moved a few meters up from the current proposed location for 2 reasons:

1. the car park is too close to the bend on, many cars come screaming around that corner and I fear there will be an accident at some stage. The traffic impact assessment is incorrect as far as it stating that there are around 10 cars passing through in hour. This is a thoroughfare for the residents who reside in the streets behind Elkhorn St and many cars pass through in an hour.

2. My house is next door to the house on the bend on Elkhorn St, the entrance to the car park is directly opposite my driveway which will make it difficult for myself and visitors etc to come in and out of my property as I already have to constantly check who might be screaming around the corner bend when leaving my drive way, having the entrance directly across from my driveway would make it more difficult to leave my property safely. My suggestion is to move the staff car park up a few meters away from the bend and make the entrance between 17 & 19 Elkhorn St where it will not impact peoples driveways and also make it safer for staff to turn into and from the car park. Your consideration with my submission would be greatly appreciated.

Ason Group Response (EU 2a, 2b)

The geometry of the roadway (radius) is such that self-enforcement is required to safely negotiate the curve. Therefore, if excessive speed is indeed an issue currently, then it would be one for local enforcement. However, it is also expected that activation of the site would further reduce speed in the area.

In accordance with Section 3 of AS 2890.1, the access to the proposed off-street car park on Elkhorn Street has been formed in such a way as to be clearly recognised by road users as an access driveway. Additionally, the appearance and character of the driveway is such that it will be clear to vehicle drivers that pedestrians and frontage road traffic have priority of movement.

The Category 2 access is not located in a prohibited location in accordance with AS2890.1, has satisfactory entering sight distance and clear sight lines for pedestrians for the design speed. Further, the no stopping rule applying across the driveway effectively provides more manoeuvring area for the opposite property.

NSW Department of Planning Industry & Environment

EU 11e

Traffic assessment and management

Provide clarification and refinements, as required, to the traffic impact assessment in relation to drop-off and pick-off demand and impact management for the site and a sweep path analysis of the largest vehicles entering and exiting the site.

Ason Group Response (EU 11e)

A swept path analysis is provided in Attachment A.

Council

EU 12a

Student Numbers - It is noted that the submitted traffic study has been based on estimated School capacity of 1012 students. It is not clear how the student count was derived. Council is concerned that should the student number increase; it has the potential to negatively impact on the safety of traffic circulation in the vicinity of the school. In this regard, Council needs assurance that the student number will not increase.

Ason Group Response (EU 12a)

This figure was provided by SINSW at project inception.

EU 12b

Traffic and Parking Management Plan - It is noted that the report recommends preparation of Traffic and Parking Management Plan prior to the opening of the school to provide safe and efficient operations on and off-site. Council believes that this is not satisfactory as there are numerous road safety matters as listed below. Such plan needs to be prepared now during the DA stage demonstrating how the on-site design elements will complement with on-street traffic facilities so that an effective and safe traffic solutions can be achieved. Such plan must include consideration of the interaction between the school and the childcare centre on the opposite side of Willowdale Drive as many parents will access both facilities. In this regard, the applicant shall submit a revised engineering drawings supported by robust Traffic and Management Plan for the review and approval of Council's Executive Manager Infrastructure addressing the following concerns.

Ason Group Response (EU 12b)

Development of an Operational Traffic and Parking Management Plan at this stage of the planning pathway could only be high level without many specific details such as:

- student class numbers, residing addresses within the catchment relevant to start/finish times;
- which classrooms the students are coming from or going to;
- number of staff available for management of students, parents and teachers;
- whether or not a Drop Off / Pick Up Zone (DOPUZ) has been approved and implemented by TfNSW;
- operational characteristics of the community hall.

Accordingly, it is expected that the development of this plan would form a Condition of Consent and be implemented post school opening and reviewed on a regular basis.

EU 12f

Willowdale Drive & Children's Crossing - A children's crossing will be needed to provide a safe crossing points for walking students and parents who park at the childcare (on the opposite side of the road) to drop their children and then walk to school to drop school kids. Such path may be located where the existing off-

road cycleway cross the road if this can be demonstrated not to conflict with other operational aspects of this frontage (e.g. buses).

Ason Group Response (EU 12f)

TfNSW has a reduced warrant for sites used predominantly by children and by aged or impaired pedestrians. If the crossing is used predominantly by school children, is not a suitable site for a children's crossing and in two counts of one hour duration immediately before and after school hours:

> *(a) the pedestrian flow per hour (P) crossing the road is greater than or equal to 30*
>
> *AND*
>
> *(b) the vehicular flow per hour (V) through the site is greater than or equal to 200*
>
> *a pedestrian (zebra) crossing may be installed. If at least 50% of pedestrians using the crossing are aged or impaired and for each three one hour periods in a typical day*
>
> *(a)* $P \geq 30$
>
> *AND*
>
> *(b)* $V \geq 200$
>
> *AND*
>
> *(c)* $PV \geq 60{,}000$

a pedestrian (zebra) crossing may be installed.

The above criteria are not known for the school when it will be operational and, whilst the vehicle volumes can be forecast with relative accuracy and may exceed the requirement, the pedestrian volumes and desire lines may not. This is particularly relevant given that the number of possible directions and access desire lines—depending on specific enrolment locations within the catchment—are likely to significantly spread the concentration of pedestrians and therefore reduce the effectiveness and efficiency of a crossing.

Notwithstanding, indicative locations have been shown in **Figure 1** to demonstrate appropriate and likely locations should the warrants be met once the school is operational. The ultimate crossing location should be based on an assessment of enrolment spatial data with consideration of desire lines. It is important to note that warrants at the four locations may not be met and in that situation it may be prudent to install lower order crossing facilities such as pedestrian refuges at some locations.

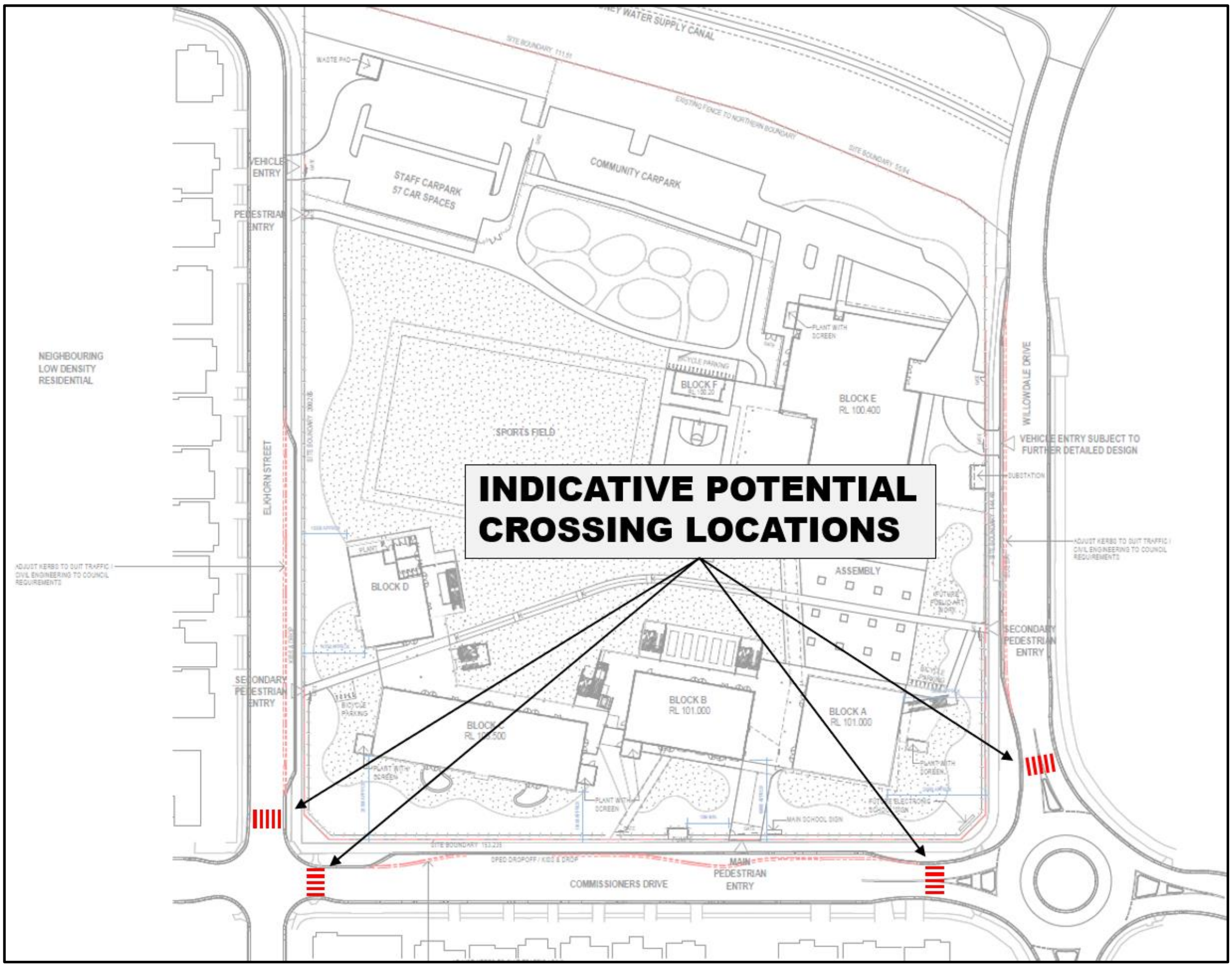


Figure 1: Indicative Potential Crossing Locations

EU 12g

Bus Bay Length - The applicant needs to justify how the how the proposed length of bus bay was derived as it seems a bit lengthy. The applicant needs to consider the number of students who will be dropped off at this primary school (with their younger siblings) to be collected and transported to their high school by bus. A shortening of the bus bay would enable the provision of a children's crossing within Willowdale Drive.

Ason Group Response (EU 12g)

Provision for two buses, including 15 metre tapers at both ends, has been estimated based on the 273 students expected to catch public transport after the estimated 638 vehicle trips and 102 active transport mode splits have been subtracted. Using the combined seating/standing capacity of 70 for NSW school buses, there is a need for a minimum of four full buses to service this requirement. Therefore, the proposed provision is considered satisfactory and the bus bay is not "a bit lengthy".

Whilst there is an expectation that the local and district bus services will provide the coverage and capacity required to accommodate student travel to and from the School, dedicated school bus services could be introduced should demand exceed public bus capacity. However, in general students would be encouraged to travel on scheduled public transport routes.

Willowdale Drive has been designated as a bus route corridor and as such has been designed in accordance with the appropriate bus standards, including the provision of minimum 3.5m travel lanes and an indented bus bay in the vicinity of the Site.

EU 12h

Access to the Community Hall - The proposed vehicular access for the future community hall needs to be located outside the bus bay as the current location would restrict access to outside school peak times. Given the intended shared use nature of this facility and expected hours of operation, this need to be addressed as a part of this application, rather than the future DA for the Community Facility.

Ason Group Response (EU 12h)

SINSW has advised that gates will be used to control access at this location and it is expected that, once the hours of operation for the school, bus bay and community hall are known, this area would be considered in and incorporated into the school's Operational Transport Management Plan.

EU 12i

Willowdale Drive & Pedestrian Access to future Community Facility - The proposed pedestrian access to the future community hall needs to be relocated to the east of the vehicular access so that there is no conflict between the pedestrians and vehicles.

Ason Group Response (EU 12i)

The area to the north of the hall entry/exit will be a designated a shared zone with fences and gates controlling access as required.

EU 12j

Commissioners Drive Children's Crossing - A children's crossing is needed outside kiss & drive bay to provide safe crossing point. At the time of subdivision Council had designed the road to enable the installation of such crossing through the provision of the blisters in the kerb area. The proposal includes the removal of such blisters..

Ason Group Response 12j

Refer to 12f and Figure 1 above. The criteria required for the warrant are not known for the school when it will be operational.

EU 12k

Elkhorn Street – The traffic report details that there will be an estimated queue of 200m on this road to access the kiss and drive bay. The road is only 8.0 m wide and will not be able to accommodate on-street parking (on residential side) and two through lane. This matter must be addressed as the community impact is unacceptable. It is recommended that the pedestrian access pint from Elkhorn Street is removed..

Ason Group Response (EU 7a)

Elkhorn Street is 8.8 metres wide for the entire school frontage and the Austroads Guide to Road Design road profile requirement is:

Parking	Traffic	Traffic
2.4m	3.0-3.4m	3.0-3.4m

Therefore, with consideration of the proposed indentation of the DOPUZ bay plus no parking on the school side, the 8.8 metre provision on Elkhorn Street is deemed acceptable and in accordance with the Guidelines.

EU 12l

Linkage to Town Centre/ Sports Fields and Riparian Corridor - Pedestrian access and linkages with town centre need to be considered in relation to the delivery of pedestrian crossings.

Ason Group Response 12l

Refer to 12f and Figure 1 above. The criteria required for the warrant are not known for the school when it will be operational.

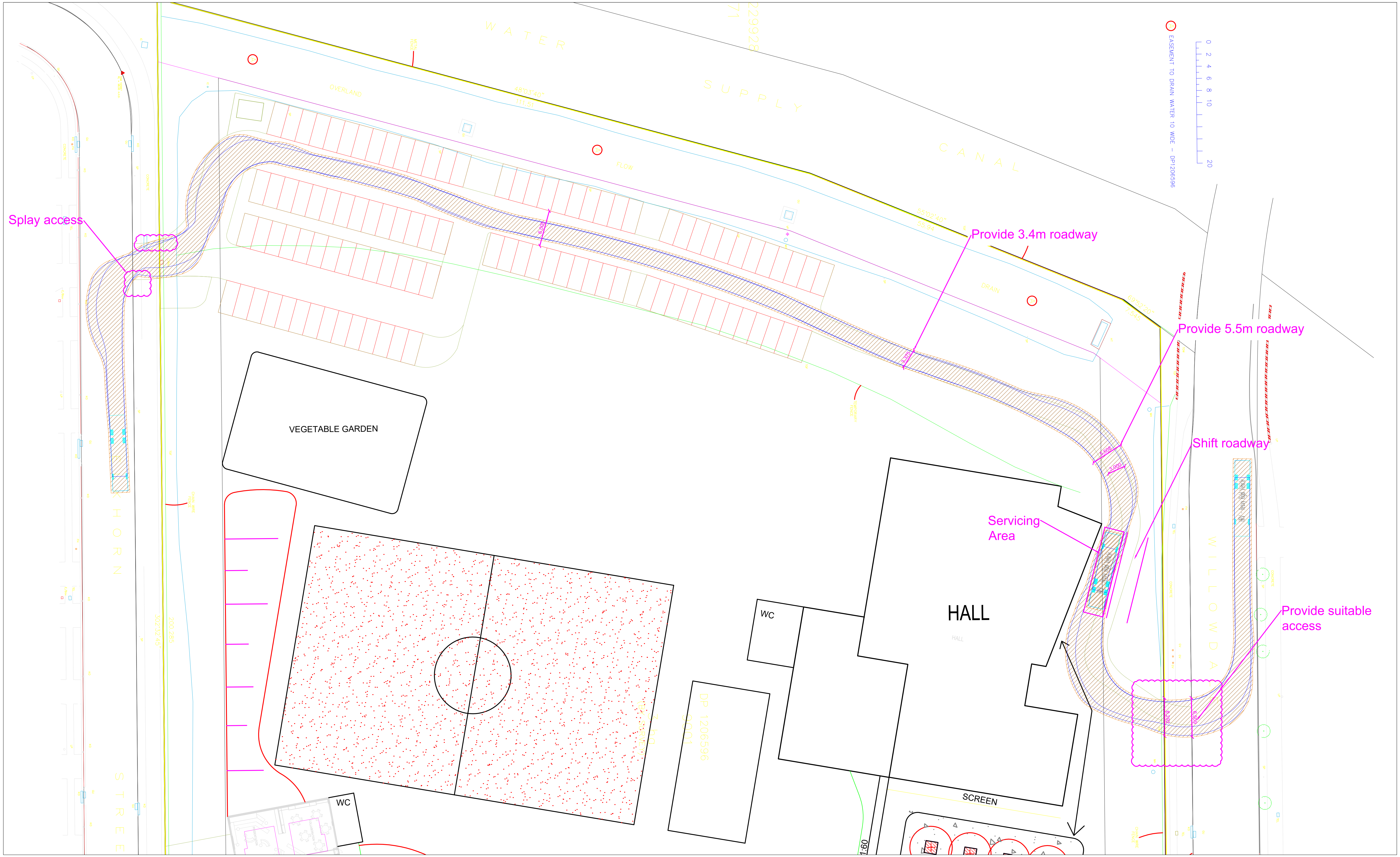
Finally, we trust the above information provides clarification and a greater appreciation of the issues identified in each of the submissions/responses. As always, please do not hesitate to contact the undersigned should you require any further information.

Yours sincerely,

Dan Budai
Senior Traffic Engineer – Ason Group
Email: dan.budai@asongroup.com.au

Attachment A

Swept Path Analysis

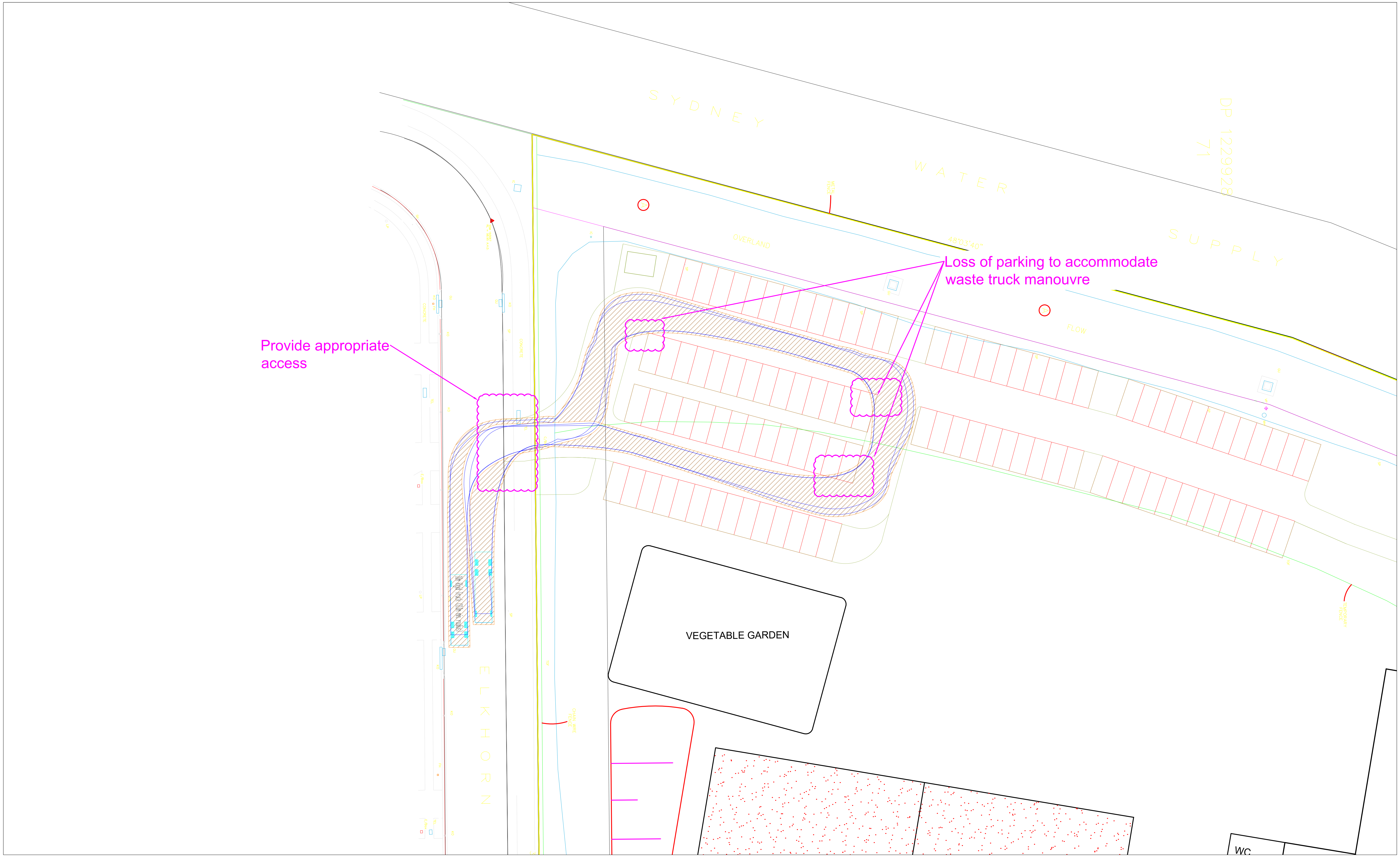


Notes:

This drawing is provided for information purposes only and should not be used for construction.

Document Info: Drawn by: Rebecca BMadden File name: 1048d01 Servicing Access.dwg	**Client:** Hansen Yucken
Project: 1048 East Leppington Public School	**Drawing Title:** 12.5m HRV Servcing Access
Date: 27/06/2019	**Scale @ A3:** N.T.S
Drawing Number: AG 01	

asongroup
Suite 5.02, Level 5, 1 Castlereagh Street
Sydney NSW 2000
info@asongroup.com.au



Provide appropriate access

Loss of parking to accommodate waste truck manouvre

Notes:

This drawing is provided for information purposes only and should not be used for construction.

Document Info:

Drawn by: Rebecca BMadden

File name: 1048d01 Servicing Access.dwg

Client:

Hansen Yucken

Project:

1048

East Leppington Public School

Drawing Title:

12.5m HRV Servcing Access

Date:

27/06/2019

Scale @ A3:

N.T.S

Drawing Number:

AG 02

Suite 5.02, Level 5, 1 Castlereagh Street
Sydney NSW 2000
info@asongroup.com.au

Post Approval Consultation Record

Identified Party to Consult:	TfNSW
Consultation type:	Email correspondence
When is consultation required?	Prior to commencement
Why	B16 - A Construction Traffic and Pedestrian Management Sub-Plan (CTPMSP) must be prepared to achieve the objective of ensuring safety and efficiency of the road network and address, but not be limited to, the following: (b) be prepared in consultation with Council and TfNSW;
When was consultation scheduled/held	13th December 2019, 28th February 2020
When was consultation held	13th December 2019, 28th February 2020
Identify persons and positions who were involved	Mark Ozinga, Principal Manager, Land Use Planning & Development
Provide the details of the consultation	Email correspondences, response to SSD lodgement submissions
What specific matters were discussed?	9th December 2019 - TfNSW recommended that swept path analysis' be undertaken and included within the CTMP - Comment was made that the plan should include details of vehicle routes, hours of operation, access arrangements, traffic control, etc. - To close out the above comments, the recommendation was that the plan be submitted to council for approval 28th February 2020 - Ason issued a technical note addressing the comments made by TfNSW. - It was noted that the CTMP would be developed in consultation with council to addressed the comments made by TfNSW
What matters were resolved?	Swept path analysis was completed for both operation and construction and other comments regarding the application were addressed
What matters are unresolved?	Submission of a CTMP to council
Any remaining points of disagreement?	Nil
How will SINSW address matters not resolved?	HY has consulted with council regarding the development of the CTMP for the SSD main works (refer separate consultation form and correspondence for reference).

David Way
Department of Planning, Industry and Environment
GPO Box 39
SYDNEY NSW 2001

Dear Mr. Way,

New East Leppington Primary School (SSD 9476)

Thank you for your correspondence via Major Projects Planning portal (ref: PAE-1101) on 8 November 2019, requesting Transport for NSW (TfNSW) to review and comment on the subject State Significant Development (SSD) Application. Legislation came into effect on the 1 December 2019 that brings Roads & Maritime Services and Transport for NSW together into one organisation. It is noted that a submission had been provided by the former Roads & Maritime Services and this letter represents the additional response of the new organisation.

The Transport Impact Assessment in support of the subject SSD has been reviewed and the comments are outlined as follows:

- Proposed drop off and pick up (DOPU) facilities on O'Keefe Drive should give consideration to the role and function of O'Keefe Drive as identified in the DCP of Catherine Fields (Part) Precinct.
- Advice to be considered informing the final Green Travel Plan that is recommended to be in place prior to the issue of an Occupation Certificate.

These comments have been expanded upon and are provided in **TAB A**. Suggested draft conditions are provided in **TAB B**.

Thank you again for the opportunity of providing advice for the above development application. If you require any further information, please don't hesitate to contact Billy Yung, Senior Transport Planner, via email at billy.yung@transport.nsw.gov.au. I hope this has been of assistance.

Yours sincerely

13/12/2019
Mark Ozinga
Principal Manager, Land Use Planning & Development
Customer Strategy and Technology

CD19/09036

TAB A – Detailed comments on SSD 9476

DOPU demand

Comment

The TIA report suggests that the proposed DOPU zone will be managed and time restricted to maximum 2 minutes. The report also acknowledges that a longer average standing time is required in the PM school peak as parents/carers would normally arrive prior to the end of school to wait for the students. It is evident that the analysis of DOPU movements is based on a 2-minute usage time over a 45 minute period without considering the demand of parents/carers waiting prior to end of school. It is also commonly observed at primary schools that some short-term parking demand would be generated by parents/carers of younger students who would stay till start of school in the AM school peak.

Recommendation

Further analysis should be provided in assessing the drop-off/pick-up demand, including short-term parking demand, around the school site and identify practical measures to alleviate the impact if necessary.

Construction traffic impact

Comment

A high-level Construction Traffic Management Plan (CTMP) has been provided. Details in relation to swept path of the largest vehicles entering and exiting the site (in a forward direction) should be included.

Recommendation

Swept path analysis detailing the above comment should be included in the Response to Submissions.

Bicycle Parking

Comment

There is no indication of how many bicycle parking spaces will be provided for the proposed development.

Recommendation

The provision of bicycle parking rates should be considered in line with those outlined in the Cycling Aspects to Austroads Guidelines Appendix I. In addition, the proposed future use of the school hall and construction of a supporting car park to cater for over 450 visitors should include the provision of additional bicycle parking to further encourage residents/visitors to walk and cycle to the facility.

Green Travel Plan

Comment

A framework Green Travel Plan (GTP) has been prepared in associated with the transport assessment. The following items should be further considered:

- include a Transport Access Guide to staff, students and parent/carers about the range of travel modes, access arrangements and supporting facilities that service the site;
- identify which party is responsible for the delivery of each action in the GTP and advise when each action will be delivered;

- analyse the likely travel origins and modes of travel based on the school catchment and aggregate residential post code analysis of enrolled students, once known;
- liaise with TfNSW about any proposed transport service improvements in the area and/or the need for any additional services that may be required, based on the projected demand identified above.

Recommendation

Prior to the issue of an Occupation Certificate, the applicant prepare a comprehensive Travel Plan (or amend and expand the existing framework GTP) in consultation with TfNSW to address the above.

School Zone signs and associated markings

The applicant must obtain written authorisation from Transport for NSW (TfNSW) to install School Zone signs and associated pavement markings, and/or remove/relocate any existing Speed Limit signs. To obtain authorisation, the applicant must submit the following for review and approval by TfNSW, at least eight (8) weeks prior to student occupation of the site:

a. A copy of development Conditions of Consent
b. The proposed school commencement/opening date
c. Two (2) sets of detailed design plans showing the following:
    i. School property boundaries
    ii. All adjacent road carriageways to the school property
    iii. All proposed school access points to the public road network and any conditions imposed/proposed on their use
    iv. All existing and proposed pedestrian crossing facilities on the adjacent road network
    v. All existing and proposed traffic control devices and pavement markings on the adjacent road network (including School Zone signs and pavement markings).
    vi. All existing and proposed street furniture and street trees.

School Zone signs and pavement marking patches must be removed and installed in accordance with TfNSW approval/authorisation, guidelines and specifications. All School Zone signs and pavement markings must be installed prior to student occupation of the site. The applicant must maintain records of all dates in relation to installing, altering, removing traffic control devices related to speed.

Following installation of all School Zone signs and pavement markings the applicant must arrange an inspection with TfNSW for formal handover of the assets to TfNSW. The installation date information must also be provided to Transport for NSW at the same time.

Note: Until the assets are formally handed-over and accepted by TfNSW, TfNSW takes no responsibility for the School Zones/assets.

Reason for condition

A significant number of vehicles and pedestrians will access the site at the start and end of the school day. School Zones must be installed along all roads with a direct access point (either pedestrian or vehicular) from the school. School Zones must not to be provided along roads adjacent to the school without a direct access point. Road Safety precautions and parking zones should be incorporated into the neighbouring local road network and 40km/hr School Zones are to be installed in accordance with the conditions above. The consent authority should ensure that parking, drop-off and pick-up zones and bus zones are incorporated in accordance with TfNSW standards. TfNSW is responsible for speed management along all public roads within the state of New South Wales. That is, TfNSW is the only authorised organisation that can approve speed zoning changes and authorise installation of speed zoning traffic control devices on the road network within New South Wales.

Car Parking

The layout of the proposed car parking areas associated with the subject development (including, driveways, grades, turn paths, sight distance requirements in relation to landscaping and/or fencing, aisle widths, aisle lengths, and parking bay dimensions) should be in accordance with AS 2890.1- 2004, AS2890.6-2009 and AS 2890.2 – 2002 for heavy vehicle usage.

Construction Traffic Management Plan

A Construction Traffic Management Plan detailing construction vehicle routes, number of trucks, hours of operation, access arrangements and traffic control should be submitted to the relevant consent authority for approval prior to the issue of a Construction Certificate.

Swept path of the longest vehicle (including garbage trucks, building maintenance vehicles and removalists) entering and exiting the subject site, as well as manoeuvrability through the site, shall be in accordance with AUSTROADS. In this regard, a plan shall be submitted to Council for approval, which shows that the proposed development complies with this requirement.

TECHNICAL NOTE

Reference: P1048t03v01

28 February 2020

Hansen Yuncken
Bldg 1, L3, 75-85 O'Riordan Street
Alexandria NSW 2015

Attention: Paul Nelson

Response to Submissions

New East Leppington Public School, Commissioners Drive, Denham Court (SSD 9476)

Dear Paul,

I refer to recent correspondence in regard to the issues raised in the submissions received in relation to the proposed New Public School, Commissioners Drive, Denham Court SSD-9476 (the Proposal and specifically the recent submission prepared Mark Ozinger, Transport for NSW (TfNSW RTS).

The sections below provide a summary of the relevant issues raised in each of the responses to the submission and the Ason Group response to each issue. In preparing these responses, Ason Group has referenced the following documents:

- Ason Group, *Transport Impact Assessment, New East Leppington Public School, Commissioners Drive, Denham Court* (AGTIA); and
- Ason Group, *Green Travel Plan, New East Leppington Public School, Commissioners Drive, Denham Court* (AGGTP)

Issues have also been labelled with the appropriate Ethos Urban reference number (EU) for ease of cross referencing.

EU 5

The Transport Impact Assessment in support of the subject SSD has been reviewed and the comments are outlined as follows:

- *Proposed drop off and pick up (DOPU) facilities should give consideration to short term parking demand that would be generated by parents/carers of younger students.*

- *Advice to be considered informing the final Green Travel Plan that is recommended to be in place prior to the issue of an Occupation Certificate.*

Ason Group Response (EU 5)

Student DOPU trips are expected to be concentrated over 30 – 45 minutes rather than a full hour in each School peak periods.

With reference to our past assessment of primary schools, schools are required to use DOPU areas under the same conditions as No Parking zones, i.e. a maximum stay of 2 minutes, remaining in or within 3 metres of the vehicle. As such, an individual DOPU space could effectively serve approximately 15 - 20 vehicles across a 30 – 45 minute period.

In addition, it is important to consider the different characteristics of the drop-off trip against the pick-up trip. In the AM school peak, the drop-off trip generally takes less time, as the students are in the car and simply need to be dropped-off. Conversely, in the PM school peak parents / carers must wait for the students, which can increase the average standing time. In addition, many parents / carers will arrive prior to the end of school, and as such queues can form behind the vehicles waiting in the pick-up area.

The arrival and departure times of students (through the broader AM and PM school peaks) utilising the DOPU facilities has been surveyed and observed by Ason Group over many years, with almost all primary schools having a similar build-up of trips prior to school finishing, with the peak DOPU demand occurring approximately 10 minutes prior to the commencement of school. These observed profiles have been assigned to the School demand for the PM school peak pick-up period, as shown in **Figure 1**.

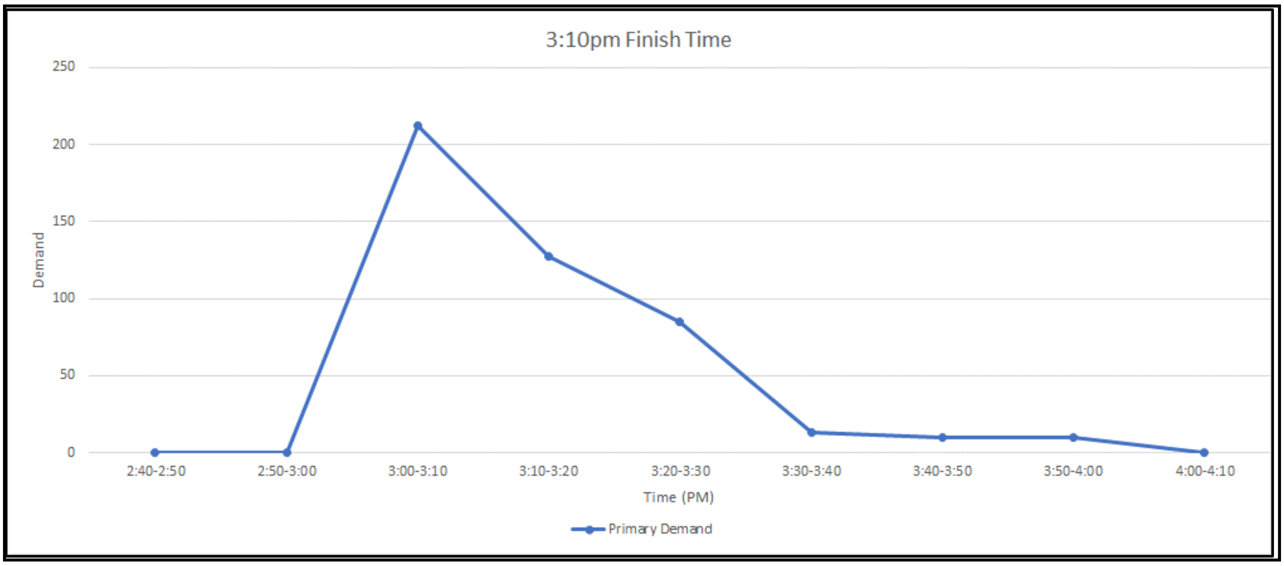


Figure 1: PM School Peak Pick-Up Peak Demand

Further to the above, the provision of DOPU spaces in both Commissioners Drive and Elkhorn Street could provide the capacity required to accommodate this peak demand, with an estimated peak queue of some 33 vehicles, or a length of approximately 200m. This queue could be accommodated in Elkhorn Street adjacent to the School, feeding DOPU spaces in the southern end of Elkhorn Street and/or in Commissioners Drive adjacent to the School.

It is recommended that a Traffic and Pedestrian Management Plan (TPM Plan) be developed by the DoE and the School, which would be reviewed on an annual basis to establish inefficiencies and areas for improvement, particularly in regard to the operation of the DOPU areas. Implementation of new strategies as required would then ensure that the demand for DOPU is accommodated while reducing impacts on the local road network. These future strategies may include staggering starting / finishing times to allow reduce the demand.

In addition, investigations into public transport provision and modal splits of students will also provide insight into potential methods at accommodating the DOPU demand.

Regarding the Green Travel Plan (GTP), it is assumed that a reasonable condition of consent would be to update the GTP once more details relating to the operation of the school are known—such as the Principal—and prior to occupation and opening.

As recommended in the AGGTP, the establishment of a centralised Travel Plan Coordinator who is to take responsibility for the ongoing review and monitoring of the GTP and provide direction to staff / parents in relation to specific requirements arising from the GTP, is likely to be appointed during the recruitment process for school staff.

Finally, we trust the above information provides clarification and a greater appreciation of the issues identified in each of the submissions/responses. As always, please do not hesitate to contact the undersigned should you require any further information.

Yours sincerely,

Dan Budai

Dan Budai
Senior Traffic Engineer – Ason Group
Email: dan.budai@asongroup.com.au

Appendix E

CV

Dan Budai

Senior Traffic Engineer – Ason Group

Email: dan.budai@asongroup.com.au
Phone: +61 2 9083 6601

Dan is an efficient and resourceful professional engineer with extensive experience in public sector traffic and transport planning. He has demonstrated expertise in the coordination and delivery of strategic advice and reporting in transport fields and for major infrastructure. He has delivered reliable operational assessments for major road projects in NSW that were capable of being used for major NSW Government investment decisions in a 16 year career with Roads and Maritime Services.

Past projects involved leading teams to ensure the planning, development, enhancement, delivery and support of Roads and Maritime's Intelligent Transport Systems, technologies and applications to improve the customer journey experience. At the local level, Dan has also made significant contributions to the development and implementation of Local Government delivery programs for traffic and transport infrastructure.

Dan has been trained in and worked with numerous transport planning models and this experience allows him to provide strategic and specialist advice on transport planning issues.

QUALIFICATIONS & EDUCATION

- Bachelor of Engineering (Civil)
- Associate Diploma in Civil Engineering
- Member AITPM

PROFESSIONAL BACKGROUND

- 2017-Current: Ason – Senior Traffic Engineer
- 2014 – 2017: CoN – Senior Traffic Engineer
- 2010 – 2014: RMS – Mgr Journey Information
- 2006 – 2010: RMS – Major Projects Liaison
- 1999 – 2006: RMS – Snr Transport Planner
- 1993 – 1999: GCC – Investigation and Planning

KEY SKILLS

- Traffic & Transport Planning
- Master Planning / Structure Planning
- Project Management
- Transport Modelling

KEY PROJECTS & EXPERIENCE

Residential, Commercial & Mixed Use Developments

- *Ivanhoe Estate, Macquarie Park* – Developed a Transport Management and Accessibility Plan to support a Concept DA for the Ivanhoe Estate Masterplan, a State Significant Development.

State Government

- *Journey Information Framework* – Utilised ITS and planning knowledge, skills and experience to design the journey information quality framework, resulting in the development of reliable, accurate data for stakeholders to make informed business decisions.
- *Major Projects Liaison* – Delivered reliable operational assessments for major road projects in NSW that were capable of being used for major NSW Government investment decisions.

Local Government

- *Newcastle Transport Strategy* – guide Council's transport-related decisions and actions to contribute, within the limits of its roles and responsibilities, to achieving the objectives of the Newcastle Community Strategic Plan.
- *LATMS* – Investigated and resolved road safety, traffic and parking issues and provide traffic facilities and guidance signage. Developed concept designs, undertook public consultation and provided detailed reports to Traffic Committee and Council.

James Laidler

Traffic Engineer – Ason Group

Email: james.laidler@asongroup.com.au
Phone: +61 2 9083 6601

James has a Bachelor of Civil Engineering and has been working in traffic engineering in the transport planning and transport construction industries for over eight years.

During this time, James has been involved in numerous projects for both private organisations and government agencies, including CPB Samsung John Holland Joint Venture (WestConnex M4 Extension project) and The Hills Shire Council.

James has demonstrated his ability across numerous areas of traffic engineering, transport construction, and transport planning and has been involved in many significant studies.

Past projects have ranged in size from detailed design advice in relation to intersection upgrades, the preparation of reviews and due diligence advice, to the preparation of Traffic Management Plans, Traffic Control Plans, and Traffic Impact Assessments for a large forward planning municipality infrastructure upgrade strategy for Council. While at The Hills Shire Council, James worked closely with Endeavour Energy for streetlighting feasibility and assessment studies and worked on the implementation of the Western Sydney Energy Efficient Streetlighting Program. James has undertaken internal road safety inspections post major road works, and has experience dealing with the Transport Management Centre to obtain Road Occupancy Licenses.

James has been trained in and worked with transport planning models and control plans, and this experience allows him to give specialist advice on transport planning and construction issues. These models and programs include AutoCAD Vehicle Tracking, SIDRA and Rapid plan.

QUALIFICATIONS & EDUCATION

- BE Civil Engineering (University of Technology, Sydney)
- Diploma in Engineering Practice (University of Technology, Sydney)
- RMS Prepare a Work Zone Traffic Management Plan Card (Combined orange and red card)
- WorkCover Occupational Health and Safety Construction Induction Card.
- Conduct Road Safety Audits

PROFESSIONAL BACKGROUND

2017 – Current:	Ason Group Traffic Engineer
2016 – 2017:	CPB Samsung John Holland Joint Venture (WestConnex M4 East) Traffic Engineer
2012 – 2016	The Hills Shire Council Trainee, Graduate, and Acting Traffic Engineer

KEY SKILLS

- Traffic Impact Assessments
- Master Planning & Feasibility Studies
- Sustainable Transport Planning
  (Green Travel Plans & Transport Access Guides)
- Transportation Modelling Analysis (SIDRA)
- Australian Standards (AS2890 & AS 1158) Compliance
- Construction Traffic Management Plans
- Traffic Control Plans (Rapid Plan)
- Streetlighting assessment and feasibility studies.

KEY PROJECTS & EXPERIENCE

Residential, Commercial & Mixed-Use Developments

- *Round Corner Dural – The Master Plan*
  Traffic Impact Assessment providing recommendations to improve traffic management measures resulting from the revitalisation and renewal of the Round Corner Town Centre.
- *Bondi Junction RSL redevelopment*
  Traffic Impact Assessment to provide guidance on the design of the internal parking scheme and loading dock design for the redevelopment of the Bondi Junction RSL. The TIA also identified and provided mitigating strategies to minimise impacts to the road network as a result of the redevelopment.

Transport Construction.

- *Closure of Concord Road Westbound on-ramp to the M4*
  Transport Management Plan with accompanying Traffic Control Plans to support the permanent closure of the Westbound M4 on-ramp at Concord Road to facilitate the construction of the Upgrade to the M4.
- *Long term closure of Powell St, North Strathfield.*
  Transport Management Plans with accompanying Traffic Control Plans to accommodate mass services relocation for the construction of WestConnex M4 East tunnels.
- *Oakdale South Masterplan S96.*
  Development of a Construction Traffic Management Plan to support the use of out-of-hours construction vehicles.

Tim Lewis

Principal Traffic Engineer – Ason Group
Email: tim.lewis@asongroup.com.au
Phone: +61 2 9083 6601

Tim has been working in the traffic engineering and transport planning industry for over 13years. During this time, Tim has undertaken numerous projects for both private developers and Government Agencies, including Councils and Transport for NSW across a range of industry sectors.

Tim has demonstrated ability in all areas of traffic engineering and transport planning, and has been involved in many significant studies. Tim is also an accredited Road Safety Auditor (Level 2) with the Register of Road Safety Auditors; and has represented on numerous occasions to the NSW Land & Environment Court as an Expert Witness.

Tim's projects have ranged in size from detailed design advice in relation to small residential developments with highly constrained access opportunities; to the preparation of Traffic Impact Assessment (TIA) and Transport Management and Accessibility Plans (TMAPs) for large Planning Proposal submissions.

Tim has been trained in and worked with numerous transport planning models and this experience allows him to provide strategic and specialist advice on transport planning issues. These models and programs include AutoCAD, AutoTrack, SIDRA, Quadstone Paramics and LinSig.

QUALIFICATIONS & EDUCATION

- BE Civil (Sydney University)
- Level 2 Road Safety Auditor
- Member AITPM
- Member Engineers Australia (incl. Transport Society)

PROFESSIONAL BACKGROUND

2016 - Present	Ason Group Principal Traffic Engineer
2006 – 2015	TRAFFIX Associate / Senior Engineer

KEY SKILLS

- Traffic Impact Assessments
- Master Planning & Feasibility Studies
- Sustainable Transport Planning
- Green Travel Plans & Transport Access Guides
- Local Area Traffic Management (LATM) Plans
- Transportation Modelling Analysis
- Car Park & Loading Dock Design & Assessment
- Construction & Occupancy Certification
- Construction Traffic Management Plans
- Project Management

KEY PROJECTS

Residential, Commercial & Mixed-Use

Caerleon Residential Rezoning, Mudgee

Tim prepared a Traffic Impact Assessment in support of a Planning Proposal providing for some 2,200 dwellings across the rezoned site.

The assessment required an assessment of the internal and local road network, including detailed trip generation and distribution analysis, and the modelling of key intersections and roads to ensure they would accommodate future traffic volumes.

Edmondson Park Frasers Town Centre

The project required the delivery of the Edmondson Park Town Centre to provide for up to 3,500 dwellings and 40,000m^2 of commercial and retail floor space to the immediate south of Edmondson Park Railway Station.

As part of the Project Team, Tim prepared the relevant technical assessments and approval proves through the Planning and Assessment Commission.

This included Aimsun and Vissum modelling of the Town Centre; the design of both the road network and internal configuration of future buildings; and the management of integrated transport solutions to cater for the high pedestrian and non-car transport demands expected.

97 Waterloo Road, Macquarie Park

A commercial development comprising 120,000m^2 of Commercial GFA developed across up to six individual buildings, Ason Group was engaged to assist in the development of the master plan and manage the transport related issues through the approval process. The project is located within a highly congested network, subject to considerable change through new infrastructure.

As Project Manager, Tim oversaw the significant modelling of both vehicle and pedestrian impacts associated with the masterplan application using micro-simulation traffic and transport modelling for both the current and future horizon years.

Due to the complexity of the location of this Site, this also required significant engagement with RMS, TfNSW, the Sydney Coordination Office, the Department of Planning and Property NSW.

Mixed Use Development, Botany Road, Rosebery

To reduce traffic generation to a sustainable and acceptable (to Council) level, Tim prepared a detailed Green Travel Plan, including preparation of a Transport Access Guide, to be implemented at the Site. This included detailed public and active transport information and the provision of end of journey facilities.

Parramatta Square

Tim prepared the Traffic Impact Assessment for Stages 1 & 3 of the overall Parramatta Square precinct, in addition to preliminary traffic modelling to determine the most appropriate access sites for construction and operation. This focused not only on reducing general road network traffic impacts, but al minimising impacts on local business and general activity in the area.

North Belmont Supermarket

This project provided for the development of a new supermarket with access to be provided via the Pacific Highway, an already congested road with significant growth forecast for the future. At the same time, the trip generation of the supermarket itself needed to be assessed with regard to its location (as a stand alone store) and parking, given that the proposed supply of parking exceeded general DCP conventions.

Tim's management of the project required consultation with RMS and Council to ensure that the future base conditions were appropriately modelled such that the additional generation of the supermarket was not considered in and of itself the key driver for upgrades.

Industrial

Light Horse Interchange Industrial Hub

Tim has managed the traffic assessment process for the development of the Light Horse Interchange Business Hub on behalf of Western Sydney Property Trust.

A somewhat complicated project, requiring careful consideration of future network conditions while correctly apportioning the future Site traffic for potential contribution purposes; and juggling the difference access demands for the Site with the expectation of RMS.

Bungarribee Industrial Estate

Tim has prepared numerous Traffic Impact Assessment in support of site specific DAs within the Bungarribee Industrial Estate, as well as liaising with RMS in relation to B-Double route approvals to and through the Estate.

Road Safety Audits

Austral and Riverstone RSAs

Detailed design (pre-construction) audits of residential subdivision road works plans in Austral and Riverstone.

Woolworths Shopping Centre

Detailed design audits (pre-construction) of a proposed Woolworths shopping centre, including separate audits for internal car park and external road works.

A.6 Construction Noise and Vibration Management Sub-plan

CONSTRUCTION NOISE & VIBRATION MANAGEMENT PLAN

East Leppington Public School

Corner Commissioners Drive & Elkhorn Street, Denham Court NSW 2565

PREPARED FOR
Hansen Yuncken
Building 1, Level 3, 75-85 O'Riordan Street
Alexandria NSW 2015

Tel: 02 9770 7600

Ref: SY190518-01-AUR04
Rev: D
Date: 8.09.2020

Construction Noise & Vibration Management Plan

Revision Schedule

Date	Revision	Issue	Prepared By	Approved By
8.04.2020	A	Preliminary	I. Adlington	
26.08.2020	B	Draft - for review	I. Adlington	J. Ameli
4.09.2020	C	Updated for review	I. Adlington	
8.09.2020	D	Updated for review	I. Adlington	

Northrop Consulting Engineers Pty Ltd

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Table of Contents

1. Executive Summary

Northrop Consulting Engineers Pty Ltd (Northrop) Acoustics have been engaged by Hansen Yuncken to provide a construction noise management plan for East Leppington Public School to be located at Corner Commissioners Drive & Elkhorn Street, Denham Court NSW 2565 (the Site).

A construction noise and vibration management plan is a site specific plan developed to ensure that appropriate work practices are implemented during the demolition, excavation and construction to minimise noise and vibration impact. This document provides a construction noise and vibration management plan so as to comply with the NSW Interim Construction Noise Guideline.

The Plan considers possible Noise and Vibration impacts upon the nearest sensitive receivers. Procedures for neighbouring community engagement and keeping noise and vibration affected neighbouring community informed are addressed in this plan. Procedures on dealing with community complaints are also outlined in this construction noise management plan.

2. Referenced Documents

This assessment has been prepared considering the following documentation:

Consent authority, design guidelines and standards:

- NSW Critical State Significant Infrastructure Standard Secretary's Environmental Assessment Requirements (SEARs) 2015
- *NSW Noise Policy for Industry* (NPfI), 2017, issued by NSW Environmental Protection Authority
- *Noise Guide for Local Government*, 2013, issued by NSW Environmental Protection Authority
- *NSW Interim Construction Noise Guideline* (ICNG), 2009, issued by NSW Department of Environment, Climate Change and Water
- AS 2436:2010: Guide to Noise and vibration control on construction demolition sites, 2010, issued by Standards Australia
- AS 2670:2001: Vibration and shock – Guide to the evaluation of human exposure to whole body vibration, 2001, issued by Standards Australia
- Update of Noise Data Base for the Prediction of Noise on Construction Sites, 2005, issued by UK Department for Environment Food and Rural Affairs
- *Environmental Management Plan Guideline 2020 – Guideline for Infrastructure Projects April 2020,* issued by NSW Government Department of Planning, Industry and Environment

Project documents:

- *SY190518-01-AUR01-D East Leppington Public School Acoustic Report for School Buildings,* issued by Northrop

3. Site Description

The Site (shown in red) in Figure 1 is located at Willowdale Drive and Commissioners Drive, Denham Court NSW 2565. The nearest affected residential receivers are located on Elkhorn Street and Commissioners Drive, shown outlined in orange in Figure 1. Figure 1 also shows the locations of the long-term noise monitor, and the locations of the operator attended measurements.

Figure 1: *Aerial view of site with nearest affected recievers and measurement locations*

4. Construction Noise and Vibration Criteria

Construction site operators must comply with construction noise and vibration control requirements of the NSW statutory requirements and the conditions set out in the NSW Critical State Significant Infrastructure Standard Secretary's Environmental Assessment Requirements (SEARs) 2015.

The Protection of the Environment Operations Act 1997 (NSW) Act is the key piece of environment protection legislation, and the Protection of the Environment Operations (Noise Control) Regulation 2008 (NSW) provides for inspection and testing of noise emissions.

The "Interim Construction Noise Guidelines" (2009) published by the NSW Environment Protection Authority (EPA), deals with the assessment of noise from construction activities and advises on best practice approaches to minimise noise impacts. It is aimed at managing noise from construction works regulated by Office of Environment and Heritage, and is used to set statutory conditions in licences or other regulatory instruments.

The "Assessing vibration: A Technical Guideline" (2006) published by the NSW EPA, is based on guidelines contained in BS 6472-1992, and presents preferred and maximum vibration values for use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques. It does not address motion sickness, occupational vibration, blasting vibration effects or vibration-induced damage to buildings or structures.

4.1 NSW EPA Interim Construction Noise Guideline

Construction noise is a major environmental noise issue in NSW and it is well accepted that this activity can adversely affect, sleep, concentration and learning performance and mental and physical health. While construction noise is temporary in nature, its impacts need to be controlled.

The NSW Interim Construction Noise Guideline (ICNG) is specifically aimed at managing noise from construction works. From a regulatory perspective, the local Council is the appropriate regulatory authority for non-scheduled construction activities.

Table 1: *GCN noise criteria at residences, using quantitative assessment, L_{Aeq}*

Time of Day	**Management Level – $L_{Aeq\ (15min)}$**	**How to apply**
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining, regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) If the community is prepared to accept longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for work outside the recommended standard hours The proponent should apply all feasible and reasonable work practices to meet the noise affected level Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community For guidance on negotiating agreements see Section 7.2.2 (NSW Interim Construction Noise Guideline)

4.2 Construction Vibration Limits

The following criteria are considered applicable when assessing vibration emission levels from the construction works.

The effects of ground vibration on buildings near construction sites may be broadly defined by the following three categories:

1. Disturbance to building occupants - Vibration in which the occupants or users of the building are inconvenienced or possibly disturbed,
2. Effects on building contents - Vibration where the building contents may be affected, and,
3. Effects on building structures - Vibration in which the integrity of the building or structure itself may be prejudiced.

In general, vibration criteria for human disturbance (1) are more stringent than vibration criteria for effects on building contents (2) and building structural damage (3). Hence, compliance with the more stringent limits dictated by Category 1, would allow for compliance to be achieved for the other two categories.

4.2.1 Category 1 – Disturbance to Buildings Occupants

For disturbance to human occupants of buildings, we refer to the EPA's *'Assessing Vibration; a technical guideline'*, published in February 2006. This document provides criteria which are based on the British Standard BS 6472-1992, *'Evaluation of human exposure to vibration in buildings (1-80Hz)'*.

Vibration sources are defined as C*ontinuous, Impulsive or Intermittent.* Section 2 of the technical guideline defines each type of vibration as follows:

> ***'Continuous*** *vibration continues uninterrupted for a defined period (usually throughout the day-time and/or night-time).*
>
> ***Impulsive*** *vibration is a rapid build-up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds.*
>
> ***Intermittent*** *vibration can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude'.*

The criteria are to be applied to a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

> *'Evidence from research suggests that there are summation effects for vibrations at different frequencies. Therefore, for evaluation of vibration in relation to annoyance and comfort, overall weighted rms acceleration values of the vibration in each orthogonal axis are preferred (BS 6472).'*

Preferred and maximum values for continuous and impulsive vibration are defined in below in Table 2 extracted from "Table 2.2 of the guideline" and the values for residential type buildings are reproduced below.

Table 2: *Preferred and Maximum Weighted RMS Values for Continuous and Impulsive Vibration Acceleration (m/s^2) 180Hz*

Location	**Assessment period**	**Preferred values**		**Maximum values**	
		z axis	**x & y axis**	**z axis**	**x & y axis**
Continuous vibration					
Residences	Daytime (7am-10pm)	0.010	0.0071	0.020	0.014
Impulsive vibration					
Residences	Daytime (7am-10pm)	0.30	0.21	0.60	0.42

Intermittent vibration is to be assessed using vibration dose values (VDVs). The VDV method is a fourth power approach which is more sensitive to peaks in the acceleration waveform and makes corrections to the criteria based on the duration of the source’s operation.

The VDV can be calculated using the overall weighted rms acceleration of the vibrating source in each orthogonal axis and the total period during which the vibration may occur. Weighting curves are provided in each orthogonal axis in the guideline.

Preferred and maximum VDV values are defined in Table 3 below extracted from “Table 2.4 of the guideline” and VDV values for residential type buildings are reproduced below.

Table 3: *Preferred and Maximum VDV Values*

Location	**Daytime (7am-10pm)**		**Night-time (10pm-7am)**	
	Preferred values	**Maximum values**	**Preferred values**	**Maximum values**
Residences	0.20	0.40	0.13	0.26

4.3 Vibration Impact to the Upper Canal

Water NSW has advised that the upper canal to the north-east of the Site is over 130 years and potentially susceptible to damage from vibration from excavation and construction works. The canal is located approximately 30m from the closest points in the Site being excavated. Water NSW accepts Line 3 of Table 3 from DIN 4150-3 Structural Vibration: Effects of Vibration on Structures as the maximum allowable limit of vibration acceptable at Water NSW assets. Maximum peak vibration velocity values are shown in Table 4 below.

Table 4: *Guideline values for vibration velocity to be used when evaluating the effects of long term vibration on structures*

Line	**Type of structure**	**Guideline values for velocity in mm/s of vibration in horizontal plane of highest floor at all frequencies**
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design	10
2	Dwellings and buildings of similar design and/or occupancy	5
3	Structures that, because of their particular sensitivity to vibration, cannot be classifies under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	2.5

4.4 Site Measurements and Background Noise Criteria

Measurements were undertaken as to determine the noise criteria as per the Noise Policy for Industry for the boundary of the nearest affected receiver. Details of the measurement results can be found in the Acoustic Report for State Significant Development Application prepared by Northrop entitled "*SY190518-01-AUR01-D East Leppington Public School Acoustic Report for School Buildings*". Based on the measurements and assessment undertaken in accordance with NSW Industrial Noise Policy the project construction noise criteria at the boundary of the nearest affected residences at Elkhorn Street and Commissioners Drive are shown in Table 5 below.

Table 5: *Noise Criteria at boundary of nearest affected residences*

Location	**Period**	**Rating Background Noise Level (RBL) – $L_{Aeq,15min}$, dB(A)**	**Construction Noise Criteria (RBL + 10) – $L_{Aeq,15min}$, dB(A)**
L1	Day	48	58
L2	Day	43	53

5. Acoustic Assessment

At this stage, the proposed nature of construction works and activity has not been finalised and will be subject to final input by the construction contractor. We have assumed typical plant and activity will entail the following stages and typical plant items as follows:

- Site establishment and excavation works – bump in, truck deliveries, site excavation works, spoil removal, screw piling;
- Structural works – main structural works, crane hoists, concrete pumps, concrete saws, grinding hammering;
- Fit out works – mainly enclosed finishing works. For the purposes of this assessment we have assumed a typical shielding loss of 20 dB.

The Interim Construction Noise Guideline proposes that noise levels not exceeding measured background noise levels (RBL for day – see Table 5) by 10 dB are considered acceptable for construction works.

Representative plant and associated noise power levels have been derived from the Australian Standard AS 2436 "Guide to noise and vibration control on construction, demolition and maintenance sites". The following Table 6 presents a summary of equipment noise levels.

Table 1: *AS2436 - Predicted construction noise from various works phases,* $L_{Aeq\ (15min)}$

Item	Plant Description	Sound Power Level (average), dBA	Sound Pressure Level at 10 m, dBA
1	Excavator	107	79
2	Jack hammer	121	93
3	Backhoe	104	76
4	Small compactor	113	85
5	Crane(mobile)	104	76
6	Compressor	101	73
7	Generator	99	71
8	Hand tools (Jack hammer)	121	93
9	Concrete pump truck	108	80
10	Welder	105	77
11	Angle grinder/ drill	108 / 105	80 / 77
12	Loader	113	85
13	Circular Saw (3 KW, petrol, cutting concrete)	107	79
14	Truck (20 T)	107	79

***Table 7:** Predicted construction noise levels, $L_{Aeq\ 15minute}$ dB(A) during standard hours*

Noise receiver	**Worst-case distance (m)**	**Noise Level $L_{Aeq\ (15\ min)}$ dB(A)**		
		Site establishment and excavation works	**Structural works**	**Fit-out works**
Residential receivers	21	73 (excavator)	74 (concrete truck & pump)	73 (loader & truck)
		87 (jack hammer)	54 (grinder & drill, inside)	54 (grinder & drill, inside)
		70 (backhoe)	70 (mobile crane)	
		73 (loader & truck)	73 (loader & truck)	

The above noise levels were assessed against the criteria. A summary of results is presented in Table 8.

***Table 2:** Noise levels and compliance status*

Noise receiver	**Phase**	**Noise level at receiver, dB(A)**	**Criteria**		**Does it comply with?**	
			Noise Affected Level – dB(A)	**Highly Noise Affected Level – dB(A)**	**Noise Affected Level – dB(A)**	**Highly Noise Affected Level – dB(A)**
Residential receivers	Site establishment and excavation works	73-87	58	75	No	No
	Structural works	54-74	58	75	No	Yes
	Fit-out works	54-73	58	75	No	Yes

The above summary results indicate that for residential receivers, noise emissions from most activities, demolition, excavation and construction exceed the Noise Affected Level criteria and in some cases comply with Highly Noise affected Level. Due to the close proximity of the residential buildings and high level of equipment noise, exceedances are likely to occur and at times the Highly Noise Affected Criteria will also be exceeded. At times when two or three pieces of equipment work simultaneously (e.g. excavator and loader could be working simultaneously) the accumulated noise will be even higher; hence the exceedances will be higher.

For exceedances above the Noise Affected Level, ICNG requires reduction of the noise to meet the level as follows (see Table 1):

The noise affected level represents the point above which there may be some community reaction to noise.

Where the predicted or measured $L_{Aeq\ (15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.

The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration as well as contact details.

For exceedances above the Highly Noise Affected Level of 75 dBA, there will be a strong community reaction. In such cases, to reduce the noise impact and its effects the following recommendations are given (See Table 1).

The highly noise affected level represents the point above which there may be strong community reaction to noise.

Where noise is above this level, the relevant authority (consent, determining, regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:

- *Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences)*
- *If the community is prepared to accept longer period of construction in exchange for restrictions on construction times.*

6. Construction Noise Mitigation Recommendations

Information in Table 8 referenced from AS 2436:2010 details the potential noise reduction of standard engineering mitigation measures, typically utilised on construction and demolition sites.

***Table 8:** AS 2436:2010 – Construction noise mitigation measures*

Noise mitigation measure	**Typical noise reduction, L_p – dB(A)**
Distance attenuation	6 dB per doubling of distance
Screening and barriers	Typically, 5 to 10 dB(A) maximum 15 dB(A)
Enclosure	Typically, 15 to 25 dB(A) maximum 50 dB(A)
Silencing	Typically, 5 to 10 dB(A) maximum 20 dB(A)

As per consent condition B17(i) an acoustic monitoring program is recommended, detailed in Section 7.7 of this plan.

7. Construction Noise Management Recommendations

The highly noise affected level represents the point above which there may be strong community reaction to noise. The construction noise mitigation measures detailed in Section 5 and 6 above do not provide sufficient attenuation to achieve construction noise levels compliant with the ICNG criteria, therefore, noise from construction activity must be managed to minimise the temporary loss of acoustic amenity on the nearest affected receivers and surrounding community. Noise management can be achieved through scheduling, community engagement and operational practices to minimise noise impact.

The Interim Construction Noise Guideline (2009) notes that there may be some community reaction to noise from major construction projects where this is more than 10 decibels above the background noise level for work during the daytime. This recognises that construction noise is generally temporary with the community having a slightly higher tolerance for it.

The best management practices involve adopting particular operational procedures that minimise noise while retaining production efficiency. Some common noise reduction strategies include:

- Changing the activity to reduce the noise impact or disturbance (e.g. reorganising the way the activity is carried out).
- Choosing a suitable time — schedule noisy activity to less sensitive times of the day. There are sensitive times of the day for different people, for example, residences during evenings, night and weekends. Where several noisy pieces of equipment are used, their operation should be scheduled to minimise impacts.
- Keeping neighbours informed of a planned noisy activity, its duration and the reasons for the activity. Neighbours may be more accepting of temporary noise if they know when and why the noise is happening, and how long it will last.
- Educating staff and contractors about noise and quiet work practices. This could include signage, for example, some construction sites have signs reminding contractors to consider neighbours and be quiet, and to not start noisy work too early (e.g. before 7.00 am).

Noise can be controlled in the transmission path by using separation distances, barriers and sound absorptive materials.

- Increasing the separation distance (distance attenuation) between the noise source and receiver reduces the noise level. As a rule of thumb, each doubling of the distance from a noise source equates to a reduction of sound pressure level of 6 dB (the inverse square law). This does not apply close to a loud noise source.
- Careful site selection for a new noisy activity can help minimise noise impacts where it is possible to provide adequate separation distances.
- Barriers are most effective when they are located close to the noise source and block the line of sight between the source and receiver. The amount of noise reduction achieved depends on the height and mass of the barrier and the frequency of the noise (barriers are less effective for low-frequency noise). Noise barriers should have no gaps. Use of absorptive material on the side of the barrier facing the noise source can also help to reduce noise levels by reducing noise reflections. Trees or other vegetation do not provide an effective noise barrier. Some limited attenuation may be gained where trees are densely planted but little attenuation is achieved for low frequencies.
- Sound-absorptive materials reduce the level of reflected sound. They are porous materials such as glass fibre, wool and mineral wool. Thin layers are capable of absorbing only high frequencies, whereas thicker layers can absorb a wider frequency range.

7.1 Standard Hours for Construction Work

The following are the permitted construction hours as recommended in the new East Leppington Public School Development. Council will be advised and letters to affected residential receivers will be issued for any works occurring or trucks arriving outside of standard construction hours. The community will be consulted before and during the construction phase, and a dedicated phone line will be implemented for the handling of complaints.

The following hours for construction works as permitted under conditions C3, C4, C5, C6 and C7 are as follows:

C3. Construction, including the delivery of materials to and from the Site, may only be carried out between the following hours:

(a) between 7am and 6pm, Mondays to Fridays inclusive; and
(b) between 8am and 1pm, Saturdays.
(c) No work may be carried out on Sundays or public holidays.

C4. Notwithstanding condition C3, provided noise levels do not exceed the existing background noise level plus 5dB, works may also be undertaken during the following hours:

(a) between 6pm and 7pm, Mondays to Fridays inclusive; and
(b) between 1pm and 4pm, Saturdays.

C5. Construction activities may be undertaken outside of the hours in condition C3 if required:

(a) by the Police or a public authority for the delivery of vehicles, plant or materials; or
(b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm;
(c) where the works are inaudible at the nearest sensitive receivers; and
(d) where a variation is approved in advance in writing by the Planning Secretary or his nominee if appropriate justification is provided for the works.

C6. Notification of such construction activities as referenced in condition C4 must be given to affected residents before undertaking the activities or as soon as is practical afterwards.

C7. Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours:

(e) 9am to 12pm, Monday to Friday;
(f) 2pm to 5pm Monday to Friday; and
(g) 9am to 12pm, Saturday.

Blasting during the construction work is not permitted for this project due to the proximity of residences and heritage buildings.

7.2 Construction Work Schedule and Traffic Management

The builder will be required to provide a construction programme for the works, from site establishment and site works to practical completion. The noisy phases will be monitored so as to avoid and minimise potential complaints from neighbouring and other affected properties. The builder will be required to provide construction traffic routes, proposed frequency of vehicular movements and the estimated total gross weights of the vehicles to assess the traffic generated noise in the vicinity of the development. Traffic noise will be monitored where potentially noisy construction traffic movement periods could cause complaints to arise from the affected residential properties.

As per condition C14 it is recommended where practicable and without compromising the safety of construction staff or members of the public, the use of ‘quacker’ reverse alarms are used to ensure noise impacts on surrounding noise sensitive receivers are minimised.

7.3 Respite Periods

The following construction-related noise-generating activities have been identified by the ICNG as having particularly annoying or intrusive characteristics

- Use of power saws, such as used for cutting timber, rail lines, masonry, road pavement or
- Steel work
- Grinding metal, concrete or masonry
- Rock drilling
- Line drilling
- Vibratory rolling
- Jackhammering, rock hammering or rock breaking
- Impact piling

It is recommended that respite periods are exercised for the above activities such that:

- They are only undertaken after 8.00 am,
- They are only undertaken over continuous periods not exceeding 3 hours with at least a 1 hour respite every three hours ('Continuous' means any period during which there is less than an uninterrupted 60 minute respite between temporarily halting and recommencing any of the intrusive and annoying work referred to in section 4.5 of ICNG.)

7.4 Community Engagement

The most impacted community during the construction phase of the new East Leppington Public School Development are the residents on Elkhorn Street facing the proposed construction site.

From a community point of view, there is a need for a range of actions and processes which are required by the guidelines of the Secretary's Environmental Assessment Requirements (SEARs) guidelines for the construction works that aim to reduce noise and vibration impacts from the construction activities while encouraging community involvement.

As a project moves towards the construction phase, further details normally become available on the planned work methods, scheduling, location of plant and equipment.

For the new East Leppington Public School Development construction works, contact with the nearest affected community is desirable once approval has been given to commence works and should be undertaken prior to any work beginning. The type of community engagement should relate to the likelihood and extent of noise and vibration impacts from the construction works.

The aim of community engagement is to:

- Establish good working relationships between the development owner, builder, the community and other stakeholders in relation to the construction project
- Receive feedback on the project's environmental performance, discuss community concerns and identify opportunities for the resolution of community complaints and concerns
- Gain advice on how best to communicate relevant information on the project and its environmental performance to the broader community
- Work cooperatively towards outcomes of benefit to the project, immediate neighbours and the local and regional community.

The new East Leppington Public School Development Project Manager shall nominate the construction site manager as a community liaison officer for the project as a point of contact for the community regarding issues related to the construction of the development, including issues relating to noise and vibration. Any formal complaints received regarding noise and vibration matters at the construction site shall be passed on to the Project Manager for the complaints to be addressed and resolved.

The following community consultation and management strategies shall be implemented in order to manage the construction noise impacts upon the nearest affected residences.

7.4.1 Dealing with Community and Public Complaints during Construction

Complaints from the community and public can arise when accidental or unintentional noise and/or vibration are generated due to unforeseen circumstances or error of judgement made by the construction team. The community and public generally understand when this happen once or not too often. The complaints must be handled in a serious and respectful way. The complaints are to be recorded and logged in a noise and vibration complaints log book and followed up by the construction site manager. Following resolution of the noise or vibration problem, the complainant are to be informed of the remedial actions taken before the complaint can be recorded as being resolved.

7.4.2 Community Consultation

Community consultation has been undertaken by Schools Infrastructure, details provided below and in Appendix 2:

Community Consultation has been undertaken with an online focus, due to the restrictions associated with the legislated restrictions around social distancing. An information package outlining the construction activities, and what mitigation measures have been implemented to reduce noise and vibration levels propagating beyond the site boundaries, has been provided to the community via the following mediums, with examples included in Appendix 2:

- *Project Update distributed via letterbox drop*
- *Information pack via SI website*
- *Information board via SI website*

Consultation has been undertaken by providing the community the abovementioned information and providing FAQs. SINSW has sought feedback from the community via email or phone on the mitigation strategies proposed by the contractor, in line with the consent requirements. The Community was provided 7 days to comment.

Feedback received at the end of the 7 days has been incorporated in the CNVMSP and CEMP where practical and appropriate. The community was also be updated on how feedback has been received by the project team.

7.4.3 Training

The site manager shall implement appropriate training and induction in the requirements of this construction noise management plan. All employees, contractors and utility staff working on site will undergo site induction training which includes Environmental Due Diligence Training. The induction will address:

- This Construction Noise & Vibration Management Plan
- The existence of noise legislation and what this means for the project, i.e. OEH and Noise Management Levels
- Delivery hours and locations.
- Reporting and recording environmental incidents related to noise and vibration.
- Noise and vibration minimisation measures.
- The importance of regular maintenance noise and vibration generating plant.

Records will be kept of all personnel undertaking the site induction and training, including the contents of the training, date and name of trainer/s. Key staff will undertake more comprehensive training relevant to their position and/or responsibility. This training may be provided as “toolbox” talk training.

7.5 Operational Practices to Minimise Construction Noise Impacts

The best management practices involve adopting particular operational procedures that minimise noise while retaining production efficiency. Some common noise reduction strategies include:

- Changing the activity to reduce the noise impact or disturbance (e.g. reorganising the way the activity is carried out).
- Choosing a suitable time — schedule noisy activity to less sensitive times of the day. There are sensitive times of the day for different people, for example, schools during the day, times of religious services, and residences during evenings and night. Where several noisy pieces of equipment are used, their operation should be scheduled to minimise impacts.
- Keeping neighbours informed of a planned noisy activity, its duration and the reasons for the activity. Neighbours may be more accepting of temporary noise if they know when and why the noise is happening, and how long it will last.
- Educating staff and contractors about noise and quiet work practices. This could include signage, for example, some construction sites have signs reminding contractors to consider neighbours and be quiet, and to not start noisy work too early (e.g. before 7.30 am).

7.6 Vibration Management

The management objective for the site is to limit vibration from construction activities so as to avoid building damage and human discomfort associated with the construction works. It is noted that buildings in the vicinity of development are residential. Vibration impacts on the buildings and their occupants should be considered for the assessment of structural damage and human annoyance, respectively.

Typical vibration levels from construction plant equipment most likely to cause significant vibration are summarised in Table 9 below.

Table 9: *Typical ground vibration generated by construction plant*

Activity	Typical ground vibration
Bulldozers/ Excavators	Typical ground vibration from bulldozers range from 1mm/s to 2mm/s at distances of approximately 5m and at distances greater than 20m, vibration levels are usually below 0.2mm/s.
Jack Hammers	Typical ground vibrations from jack hammers are generally greater than 5mm/s at distances of 1m and no more than 2mm/s for distances of 5m or more.
Truck traffic	Typical vibration from heavy trucks passing over normal (smooth) road surfaces generate relatively low vibration in the range 0.01-0.2mm/s at the footings of buildings located 10-20m from a roadway. In general ground vibration from trucks is usually imperceptible in nearby buildings.

Therefore, vibration management strategies implemented on site shall consider these items of plant and construction activities involving these items of plant.

7.6.1 Buffer Distances for Vibration Control

The relationship between vibration and the probability of causing human annoyance or damage to structures is complex. This complexity is mostly due to the magnitude of the vibration source, the particular ground conditions between the source and receiver, the foundation-to-footing interaction and the large range of structures that exist in terms of design (i.e. dimensions, materials, type and quality of construction and footing conditions).

The intensity, duration, frequency content and number of occurrences of a vibration, all play an important role in both the annoyance caused and the strains induced in structures.

As the pattern of vibration radiation is very different to the pattern of airborne noise radiation, and is very site specific, below are some indicative minimum ‘buffer’ distances determined for some common construction plant with data available from recent projects, which assist to avoid human discomfort in terms of perceptible (or tactile) vibration during daytime construction hours:

Table 10: *Recommended Minimum Buffer Distances for Construction Plant*

Plant Item	Recommended Minimum Buffer Distance (m)
CFA (Continuous Flight Auger) Piling rig	10
Excavators	10
Jack hammers	5

For this project, nearest affected receivers are located more than 10m from the Site so no vibration assessment is required. If any resident complains of excessive construction vibration at their residence, it is recommended that vibration measurements are undertaken in response to the complaint, to quantify the impact so alternative construction methods to ensure lower vibration impact can be implemented. Details of vibration monitoring program are included in Section 7.7 of this plan.

7.6.2 Vibration Management Measures – Residences

Further to buffer distances, to ensure vibration impacts are minimised during the construction period, the following vibration management control measures are provided:

1. The proper implementation of this management plan is required to avoid adverse vibration disturbance to affected occupancies. Consultation with occupants and property owners is

recommended and should be aimed at providing a communication path directly to the Project Manager.

2. A management procedure will be implemented to deal with vibration complaints. Each complaint will be investigated and where vibration levels are established as exceeding the set limits, appropriate amelioration measures shall be put in place to mitigate future occurrences
3. Where vibration is found to be excessive, management measures shall be implemented to ensure vibration compliance is achieved. Management measures may include modification of construction methods such as using smaller units, establishment of safe buffer zones and if necessary, time restrictions for the most excessive vibration activities. Time restrictions are to be negotiated with affected receivers.

7.6.3 Vibration Management Measures – Upper Canal

Water NSW has advised that the upper canal to the north-east of the Site is over 130 years old and potentially susceptible to damage from vibration from excavation and construction works. The canal is located approximately 30m from the closest points in the Site (proposed car park). Water NSW accepts Line 3 of Table 3 from DIN 4150-3 Structural Vibration: Effects of Vibration on Structures as the maximum allowable limit of vibration acceptable at Water NSW assets. Maximum peak vibration velocity values for various structures are shown in Table 4 in Section 4.3. Maximum peak vibration velocity criteria to be applied to the upper canal is 2.5 mm/s.

It is recommended that vibration measurements are undertaken at the commencement of the civil works on Site to determine the worst-case vibration impact upon the canal. A vibration monitor (capable of measuring vibration velocity in mm/s) is to be installed at canal and measurements taken of the vibration velocity for various vibration generating equipment (to be determined when the civil contractor is engaged) tested at the closest point on the Site to the canal. If measurements show the criteria is exceeded, or close to being exceed the following is recommended:

- Measure vibration velocity at varying distances to determine the minimum safe distance at which risk to damage of the canal is minimized
- Recommend alternative construction methods to reduce vibration impact upon canal
- Vibration monitoring to be undertaken at the upper canal during excavation, earthworks and construction phases to monitor vibration levels. It is recommended that an automatic, visual or audible alarm is sent to the operator to alert when vibration criteria is close to being exceeded

Vibration monitoring shall be undertaken by a suitably qualified acoustic consultant.

7.7 Monitoring Program

As per consent conditions B14 and B17(i) and Section 3.5.8 of the Environmental Management Plan Guideline, where noise or vibration impacts are likely to occur (i.e. vibration generating equipment working within the buffer distance), it is recommended that regular noise or vibration checks, monitoring or inspections are undertaken during the construction period. Where monitoring indicates that measured noise levels consistently exceed the predicted noise level by more than 3dB, additional mitigation measures will be implemented to reduce the noise levels.

Noise and vibration monitoring shall be undertaken by a suitably qualified acoustic consultant in accordance with Table 10. Reports shall be provided stating the measurement methodology and results of monitoring, and any recommendations for mitigation such as:

a) Recommending alternative construction methods with lower noise emissions

b) Installing screens and acoustic rated hoardings with a minimum transmission loss of >R_w 25 around the site to minimize noise impacts from the site to residential receivers

c) Implementing further respite periods and consultation for any noisy activity if a) and b) can not be reasonably implemented

Long term noise monitoring data shall be acquired over a period of minimum 10 days, excluding rain and excessive wind events using 15-minute A frequency weighted measurements and broadband levels for L_{Aeq}, L_{A10}, L_{A90}, L_{Amax} and L_{Amin} shall be recorded.

Spot checks using a hand-held Type 1 integrating sound level meter with octave band filters may be undertaken to check equipment noise levels against manufacturers specifications and to check worst-case noise impacts at the commencement of high noise generating activities. Operator attended measurements shall be 15-minute A frequency weighted measurements and record octave band levels for L_{Aeq}, L_{A10}, L_{A90}, L_{Amax} and L_{Amin}. Reports shall be provided stating the measurement methodology and results.

Table 10: *Recommended noise and vibration monitoring program*

Monitoring condition		**Frequency**	**Monitoring Location**
Noise monitoring	During high noise construction activities	Monthly	Nearest affected receiver
	Where a compliant has been received and monitoring is considered an appropriate response to determine whether noise levels are consistently exceeding predicted noise level by more than 3dB	As required	At address of complainant
Vibration monitoring	Vibration generating works undertaken at distances less than the buffer distances presented in Table 9	As required	At address of complainant
	Where a compliant has been received and monitoring is considered an appropriate response to determine whether noise levels are consistently exceeding vibration criteria shown in Tables 2 and 3	As required	At address of complainant
	Test of various vibration generating equipment to determine vibration impact upon the upper canal (see Section 4.6.3)	At commencement of civil works	At the closest point at the upper canal to the Site
	If results of the test above show that maximum vibration criteria is exceeded (see Section 4.6.3)	As required	At the closest point at the upper canal to the Site

8. Conclusion

This report forms part of the SSDA submission for the proposed development of East Leppington Public School at Corner Commissioners Drive & Elkhorn Street, Denham Court NSW 2565. Construction noise and vibration criteria were established, and construction noise predictions found that the criteria at the nearest affected receiver are likely to be exceeded. Noise mitigation and management strategies have been recommended for the excavation and construction phases of the project.

9. Appendix 1 – Author and Verifier CVs

Isabella Adlington

Acoustics Consultant

MArchSc (Acoustics) BSc (Physics) AAS (Grad.)

Isabella contributes her skills in architectural and building acoustics to the Northrop team. Isabella takes an analytical approach to projects, with a focus on finding the best design solutions and outcomes that are both practical and cost-effective for the client's needs. Isabella seeks to combine both aesthetic and functional considerations in designs and enjoys the challenges of combining acoustical aspects with architectural vision, and integration with other building services and engineering disciplines.

Project Experience

Community

- USYD Chau Chak Wing Museum
- Sydney Dance Company
- Cooke Park Multipurpose Pavillion
- Darling Exchange Library
- Bowral Memorial Hall
- Granville Park Stadium
- Liverpool Baptist Church
- Senses Child Care Centre, Milson's Point
- Moree Civic Precinct

Commercial

- PTW Architects Office fit-out, Aurora Place Sydney
- Sydney Trains Central Hub fit-out, Clyde
- Sussex Street Hotel, Sydney
- Arthur J. Gallagher office fit-out, North Sydney
- Arthur J. Gallagher Melbourne
- Four Seasons Hotel, Sydney
- Instructure office fit-out, One Wharf Road, Sydney
- George Weston Foods office fit-out, North Ryde
- Plus Fitness Jordan Springs
- Langham Hotel Miller's Point
- The Highline – Bankstown
- Doltone House – Milperra
- Sutton's Motors Homebush

Residential

- St. Andrews College, University of Sydney
- 68A Queenscliff Road, Queenscliff
- 38 Stewart Street Wollongong
- 23-27 Harold Street North Parramatta
- Top Spring St. Leonards

Education

- St. Rita's College Performing Art's Building
- St. Mark's College Performing Arts Building
- Wagga Wagga, Catherine Fields and East Leppington Schools Package
- Western Sydney and Wollongong Schools Package
- Macquarie University Central Courtyard
- UTS Proto Space
- UTS Touring Hall, Powerhouse Museum
- WSU MARCS Institute BabyLab, Westmead
- WSU Chancellery Fit Out
- ACU North Sydney Campus Physio Laboratory
- UTS Graduate Research School
- TAFE Meadowbank
- Richmond High School Gymnasium and Hall
- Brigidine College, Randwick
- Loreto Normanhurst Library
- Lucas Gardens School
- Eileen O'Connor Catholic College, Lewisham
- UNSW Cliffbrook Campus, Coogee

Aged Care and Health

- RFBI Hawkins Village
- Minchinbury Manor Aged Care Facility, Rooty Hill
- Anglicare Nowra
- Casula Residential Aged Care Facility
- Uniting Aged Care Yamba
- Nepean Private Hospital
- Coffs Harbour Health Campus Upgrade

Jamshid Ameli

Senior Acoustics Consultant

BSc (Mech Eng) MSc (Noise & Vibrations) MAAS

Jamshid has a wealth of experience and has been in acoustic consulting for more than 10 years handling projects in environmental noise, transportation noise, mechanical noise and building acoustics. Jamshid enjoys working collaboratively with clients and his colleagues. He is focused on understanding the client needs for a project and delivering results, on time and on budget.

Jamshid has also worked as a noise and vibration engineer in the automotive industry and has skills in design and development. With a mechanical engineering background, he can extend his acoustic skills to integrate with other building services and engineering disciplines.

Project Experience

Community

- Community Centre, Jordan Springs
- West Sports Club, Croydon
- East Leagues Club, Bondi
- RSL Club, Parramatta
- RSL Club, North Ryde

Commercial

- WestPoint Shopping Centre, Blacktown
- ARB workshops, Wentworthville
- Barden Fresh Produce, Kemps Creek
- Kogarah golf club, Kogarah
- Gap Bluff Centre, Watson Bay
- Dan Murphy’s, Mosman
- Service Station, Bourke St, Waterloo
- Tesla Service Centre, Alexandria

Residential

- Parks Apartments, Oxford Street, Darlinghurst
- Poly Horizon Apartments, Epping
- Dougherty Apartments, Chatswood
- Elaine estate, Point Piper
- Wrights Road Apartments, Drummoyne

Hospitality

- Karaoke bar, Church St, Parramatta
- Cake Wine bar, Redfern
- Huntsbury Hotel, Lewisham

Education

- Shirley St Childcare Centre, Wollstonecraft
- Little Giants Childcare centre, Oran Park
- Pymble Ladies College, Pymble
- Chabad North shore Childcare Centre, College Crescent, St Ives
- Fairfield Forum Childcare Centre, Fairfield

Aged Care and Health

- Presbyterian aged care, Thornleigh
- Prince Henry Hospital, Little Bay
- MRI rooms, Westmead Hospital
- Veterinary Hospital, Vineyard
- Nowra Regional Health, Nowra
- Twilight Glades Bay aged care, Gladesville

Infrastructure

- Wyong to Warnervale Pipeline, Warnervale
- Eastlakes shopping centre, Eastlakes
- Kangy Angy Rail Maintenance Facility

Industrial

- BOC gases, Lidcombe
- ACE cryogenic facility, Kings Park
- Joe White Malting, Minto
- Premier Mushrooms, Glossodia

10. Appendix 2 – Community Consultation Resources

New primary school for Leppington

A new primary school for Leppington is underway with early works and main construction works anticipated to commence mid-September 2020, pending planning approval. This will cater for projected enrolment growth and provide students in the area with new educational facilities.

Artist impression of new primary school for Leppington

Significant milestones timeline

We are here

Planning	Design	Development determination	Construction	Completion
Complete	Complete	Mid 2019	Late 2020	Late 2021

New primary school for Leppington

For more information phone: 1300 482 651
Email: schoolinfrastructure@det.nsw.edu.au

schoolinfrastructure.nsw.gov.au

New primary school for Leppington – facilities

School facilities include:

- **44 flexible learning spaces**
- **New staff and administration areas**
- **A new hall**
- **A library**
- **A canteen**
- **Covered outdoor learning area (COLA)**

Artist impression of new primary school for Leppington

New primary school for Leppington

For more information phone: 1300 482 651
Email: schoolinfrastructure@det.nsw.edu.au

schoolinfrastructure.nsw.gov.au

NSW GOVERNMENT

New primary school for Leppington – artist impressions

Artist impression of new primary school for Leppington

New primary school for Leppington

For more information phone: 1300 482 651
Email: schoolinfrastructure@det.nsw.edu.au

schoolinfrastructure.nsw.gov.au

NSW GOVERNMENT

Artist impression of the new primary school for Leppington

Changing the way we communicate

The health and safety of our students, staff and community is our priority. We are temporarily changing some of the ways we keep you informed about our project in your community to account for social distancing measures.

How we will keep you informed

Until further notice we will share information with our communities online instead of in person.

Our information hotline and email address will continue to operate as normal.

Next steps

Works are anticipated to start in mid September 2020, pending planning approval, starting with site establishment, bulk earthworks and building foundations.

We will continue to work with the contractor, Hansen Yuncken, to ensure any disruption to our neighbours is kept to a minimum.

Stay informed

Website
Stay up to date by visiting the School Infrastructure NSW website
schoolinfrastructure.nsw.gov.au

Email
Contact the Community Engagement team by emailing
schoolinfrastructure@det.nsw.edu.au

Phone
Contact us between 9:00am and 5:00pm, Monday to Friday on **1300 482 651**

New primary school for Leppington

Information pack

August 2020

Artist impression of the new primary school for Leppington

The NSW Government is investing $6.7 billion over four years to deliver more than 190 new and upgraded schools to support communities across NSW. In addition, a record $1.3 billion is being spent on school maintenance over five years. This is the largest investment in public education infrastructure in the history of NSW.

The NSW Department of Education is committed to delivering new and upgraded schools for communities across NSW. The delivery of these important projects is essential to the future learning needs of our students and supports growth in the local economy.

The new primary school for Leppington will include:

- **44 flexible learning spaces to facilitate new ways of teaching and learning**
- **Covered outdoor learning areas (COLA)**
- **A new hall**
- **A library**
- **A canteen**
- **Outdoor multipurpose activity areas**
- **Administration and staff facilities**

Progress Summary

The State Significant Development (SSD) application for this project is being fast tracked by the Department of Planning, Industry and Environment.

Once the SSD application is determined, the project can look at commencing construction shortly.

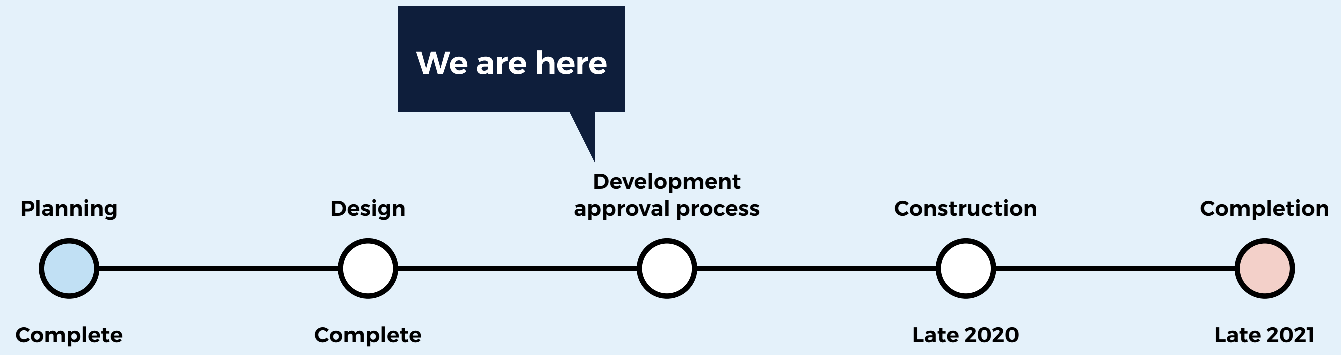
Message from the Principal

As the foundation Principal, I am looking forward to welcoming everyone to a learning space that references strong links to Aboriginal and Torres Strait Islander people in its design. The school will bring many cultural backgrounds together to create a positive learning community.

I am very excited to be a part of the future of Public Education and what this school can provide for our students. The open learning design will support strong collaboration skills and facilitate innovative teaching and learning that will prepare our students well for life-long learning.

Anna Butler

Timeline




Artist impression of the new primary school for Leppington

Catchment area

The NSW Department of Education has confirmed the school catchment area for the new primary school for Leppington.

The catchment for the new primary school has been informed by demographic advice about projected enrolments in the Leppington area and in consultation with local primary school Principals.

To check your catchment area, go to https://my.education.nsw.gov.au/school-finder.

Frequently asked questions

When will main works construction begin?

Main works construction will begin as soon as planning approval is received from Department of Planning, Industry and Environment.

Check the School Infrastructure project webpage at https://www.schoolinfrastructure.nsw.gov.au/ for future updates.

Will street parking be impacted during construction?

There will be minimal impacts to street parking as there will be parking available on site for workers. The impact of our project on the local community is considered in our planning. We work with councils and the community to identify issues and put in place mitigation measures.

When will the school be complete?

The school is forecast to be completed in late 2021.

How can I find out more information as the project progresses?

We are temporarily changing some of the ways that we keep you informed to account for social distancing measures. We will provide information through project updates and the project website.

Artist impression of the new primary school for Leppington

New primary school for Leppington

Project update

29 August 2020

Investing in our schools

The NSW Government is investing $6.7 billion over four years to deliver more than 190 new and upgraded schools to support communities across NSW. In addition, a record $1.3 billion is being spent on school maintenance over five years. This is the largest investment in public education infrastructure in the history of NSW.

The NSW Department of Education is committed to delivering new and upgraded schools for communities across NSW. The delivery of these important projects is essential to the future learning needs of our students and supports growth in the local economy.

Project overview

A project is underway to deliver a new primary school for Leppington on Commissioners Drive to support the growing community. The school will include:

- 44 new flexible learning spaces
- A library, hall, canteen and covered outdoor learning area (COLA)
- Administration and staff facilities.

Progress summary

The State Significant Development (SSD) application for this project has been fast tracked by the Department of Planning, Industry and Environment. If the SSD application is approved, the project can look at commencing construction. Design for Manufacture Assembly (DfMA) process will be used in the build, including constructing school buildings offsite. This reduces the impact to local residents and saves time when compared to traditional builds. The school is scheduled for completion in late 2021, pending the SSD application determination.

Keeping you updated

We are temporarily changing some of the ways that we keep you informed to account for social distancing measures.

Instead of community information sessions, we invite you to view more information about this project at www.schoolinfrastructure.nsw.gov.au/projects/l/leppington-new-primary-school.html

We will keep you updated and provide more information about the construction timetable in the coming months. You can contact us using the information below.

For more information contact:

School Infrastructure NSW
Email: schoolinfrastructure@det.nsw.edu.au
Phone: 1300 482 651
www.schoolinfrastructure.nsw.gov.au

Managing construction impacts

Once the SSD application is approved, the project can look at commencing construction. This is anticipated for mid September 2020, pending the SSD application determination, starting with site establishment, bulk earthworks and building foundations.

As part of the consent to carry out the work, the main contractor, Hansen Yuncken, is required to develop a Construction Environmental Management Plan to outline how it will manage construction impacts to nearby local residents. These impacts include noise, vibration and vehicle movements.

Your feedback

Let us know what you think about how we propose to manage construction activities listed in the table below.

Provide your feedback via email or phone by Saturday 5 September 2020.

- Email: schoolinfrastructure@det.nsw.edu.au
- Phone: 1300 482 651

Activity	Consent condition and proposed activities
General	**Proposed actions** ▪ Noise levels on site will not exceed the noise control guidelines that are outlined in the EPA Environmental Noise Control Manual for construction and demolition works. ▪ We will provide advance notice of work to the local community, particularly when we anticipate high noise generating works. ▪ Trucks will be well maintained and only use approved truck routes to and from the site. ▪ The majority of buildings that will be installed on site are being manufactured off site. Transporting them to site will require special wide load and length vehicles. We will provide advance notice of the proposed route and after hours timing of this to the local residents.
Construction	**Consent condition:** procedures for achieving the noise management levels in EPA's *Interim Construction Noise Guideline* (DECC, 2009). **Consent condition:** noise reducing work practices to be implemented. **Proposed actions:** ▪ Noise levels for general activities will only occur within approved standard work hours: a) Between 7:00am and 6:00pm Monday to Friday b) Between 8am and 1pm, Saturday c) No work may be carried out on Sundays or public holidays unless approved by the Department of Industry, Planning and Environment. ▪ Works may occur outside of these hours between: a) Between 6pm and 7pm Mondays to Fridays inclusive: and b) Between 1pm and 4pm, Saturdays These works are to be within existing background noise levels plus 5dB. ▪ All activities will occur within the approved standard work hours. ▪ Ensure that workers and contractors are regularly trained (via toolbox talks) to use equipment in ways to minimise noise. ▪ Avoiding the use of radios or stereos outdoors where neighbours can be affected. ▪ Avoid the overuse of public address systems.

Activity	Consent condition and proposed activities
	▪ Avoid shouting and minimise talking loudly or slamming vehicle doors. ▪ Develop a one-page summary of approval or consent conditions that relate to relevant workers to quickly reference this information.
Construction	**Consent condition:** measures to be implemented to manage high noise generating works such as piling, in close proximity to the closest homes. **Proposed actions:** ▪ If high noise generating works are planned, neighbours should be notified of this before work starts. ▪ If rock breaking activities are required, effective equipment should be chosen, and respite periods for local residents should be put in place. Rock breaking hours will be strictly limited to approved hours of: ▪ 9:00am to 12:00pm, Monday to Friday ▪ 2:00pm to 5:00pm, Monday to Friday ▪ 9:00am to 12:00pm, Saturday. ▪ For high noise generating works, if complaints are received, work will be managed to reduce the impact to local residents by implementing shorter time periods, or alternating with quieter work methods were practical

Artist impression of the new primary school for Leppington

Frequently asked questions

When will construction begin?

Main works construction will begin as soon as planning approval is received from Department of Planning, Industry and Environment.

Will street parking be impacted during construction?

There will be minimal impacts to street parking as there will be parking available on site for workers. The impact of our project on the local community is considered in our planning. We work with councils and the community to identify issues and put in place mitigation measures.

What steps will be taken to control noise and dust impacts?

Any activity that could exceed approved construction noise management levels is managed in strict accordance with the *Protection of the Environment Operations Act 1997*.

Dust is minimised with hoarding, shade cloth and spraying water.

How will traffic be managed?

Traffic management will be in place where required for the safety of the local community and workers. Traffic controllers will be used to manage entry and exit of vehicles to and from the construction site as necessary. Traffic Management Plans will be implemented when works are occurring on road frontages. Vehicles will give way to pedestrians at all times.

Why has the planning approval for this project been fast tracked?

Leppington new primary school is among the fifth wave of projects that will have their assessments fast tracked.

The Department of Planning, Industry and Environment (DPIE) will make decisions on the SSD application for this project by 11 September 2020. This will mean the project can get underway sooner if approved.

Does this mean the usual checks and community consultation will be waived to fast track the projects?

The assessment process is being accelerated, not changed. The usual planning rules and policies will apply, and all projects will be assessed under the *Environmental Planning and Assessment Act 1979*.

Will the community still get to have a say on projects that are being fast-tracked?

All of the projects being fast tracked have completed the substantive planning work and are post the exhibition and community consultation phase. We will continue to engage and inform the community during the project.

Due to the need to meet requirements under Public Health Orders, a range of digital engagement tools will be used to communicate with the community and stakeholders to seek any comment or feedback. This will include digital project updates, online sharing of information session material, the School Infrastructure NSW website, community information line and mailbox.

What is Design for Manufacture and Assembly (DfMA)?

DfMA is a design and construction process combining off-site and on-site assembly to deliver infrastructure. This process allows better use of limited land supply and minimises impact to schools and local communities, as new permanent buildings and upgrades are delivered in shorter timeframes.

What are the benefits of DfMA?

- Time savings
- Minimises impact on school operations
- Improved health, safety & productivity
- Upskills the workforce
- Improved sustainability
- Opportunity to reduce cost.

When will enrolments be accepted?

Information about enrolments for the new school will be available in the coming months. For general information on how to enrol in NSW public schools, please visit https://education.nsw.gov.au/public-schools/going-to-a-public-school/enrolment.

Will there be any changes to surrounding school enrolment boundaries?

If changes to school catchment boundaries / enrolment areas are needed, the Department of Education would work closely with school staff and communities to inform them and help them plan for any boundary realignments.

A.7 Construction Soil and Water Management Sub-plan

CIVIL ENGINEERING REPORT: SOIL & WATER MANAGEMENT PLAN

East Leppington Public School

Commissioners Drive, East Leppington NSW

PREPARED FOR
Hansen Yuncken
B1 L3 75-85 O'Riordan Street

Alexandria NSW 2015
Tel: (02) 9770 7691

Ref: 190518-LP-CR02
Rev: 6
Date: 01 June 2021

Civil Engineering Report: Soil & Water Management Plan

Revision Schedule

Date	Revision	Issue	Prepared By	Approved By
27.07.20	1	Preliminary	J. Gilligan	J. Gilligan
26.08.20	2	Preliminary	J. Gilligan	J. Gilligan
01.09.20	3	Preliminary	J. Gilligan	J. Gilligan
07.09.20	4	Preliminary	J. Gilligan	J. Gilligan
08.09.20	5	Final	J. Gilligan	J. Gilligan
01.06.21	6	Final	J. Gilligan	J. Gilligan

Northrop Consulting Engineers Pty Ltd

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Table of Contents

1. General

1.1 Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged by Hansen Yuncken to prepare the Civil Engineering design and documentation in support of a Construction Certificate for the proposed East Leppington Public School development at Commissioners Drive, East Leppington. A number of revisions have since been provided to update the sediment and erosion controls throughout the construction phase of the development.

This report covers the works shown as the Northrop Drawing Package required for the development of the site including:

- Erosion and Sediment control;

1.2 Related Reports and Documents

This report is to be read in conjunction with the following reports and documents:

1. Detailed Design Phase Civil Documentation prepared by Northrop for the Construction Certificate:
    - NHQC2-LP-CV-S-DDC101.11 Specification Notes – Sheet 01
    - NHQC2-LP-CV-S-DDC101.13 Specification Notes – Sheet 03
    - NHQC2-LP-CV-S-DDC102.01 Sediment and Soil Erosion Control Plan
    - NHQC2-LP-CV-S-DDC102.11 Sediment and Soil Erosion Control Details
    - Modified Civil Documentation prepared by Northrop throughout the construction phase of the project (Appendix A)
2. NSW Department of Housing Manual, “Managing Urban Stormwater Soil & Construction” 2004 (Blue Book)
3. Campbelltown Council Engineering Design Specifications

1.3 The Development

1.3.1 Precinct and Surrounds

The proposed East Leppington Primary School is currently a greenfield site located within the Campbelltown City Council Local Government Area. The site is approximately 3.0ha, which is bounded by Willowdale Drive to the north, Elkhorn Street to the south, Commissioners Drive to the east and Sydney Water Canal to the west. This greenfield site generally falls to the north western corner. The proposed East Leppington Primary School is proposed with module classrooms and buildings with associated carparking and playing fields.

2. Erosion and Sediment Control

The objectives of the erosion and sediment control for the development site are to ensure:

- Adequate erosion and sediment control measures are applied prior to the commencement of construction and are maintained throughout construction;
- Construction site runoff is appropriately treated in accordance with Campbelltown Council requirements; and
- Mitigate dust or polluted water entering the Upper Canal Corridor.

As part of the works, the erosion and sedimentation control will be constructed in accordance with Council requirements and the NSW Department of Housing Manual, "Managing Urban Stormwater Soil & Construction" 2004 (Blue Book) prior to any earthworks commencing on site. The Concept Sediment and erosion control measures are documented in Northrop's detailed design drawings NHQC2-LP-CV-S-101.11, 101.13, 102.01, 102.11 submitted as part of the Construction Certificate Application.

More recently drawings and associated sediment controls have been amended to suit the relevant construction phase of the project (Appendix A)

2.1 Sediment Basin

A temporary sediment basin has been designed to capture site runoff during construction and has been located towards the north eastern side of the site, in the lowest point. The construction of the basin will be undertaken in stages to enable maximum runoff capture assisted by diversion swales and direct runoff to the basin.

Calculations to determine the concept design basin size have been based on available geotechnical information regarding soil types and through the use of the Soils and Construction Volume 1 Manual.

To ensure the sediment basin is working effectively it will be maintained throughout the construction works. Maintenance includes ensuring adequate settlement times or flocculation and pumping of clean water to reach the minimum storage volume at the lower level of the settling zone. The settling zone will be identified by pegs to clearly show the level at which design storage capacity is available.

The pumped water from the sediment basin can be reused for dust control during construction.

Overflow weirs are to be provided to control overflows for rainfall events in excess of the design criteria which caters for a storm event up to and including the 1% AEP storm event.

The concept sediment basin sizing is summarised in the table below. Detailed sediment basin sizing, configuration and location shall form part of the Construction Certificate application.

The sediment basin has been located for future conversion into the permanent water quality basin.

More recently the stormwater network has been constructed connecting to Council's drainage network at the legal point of discharge. A significant area of the site has recently been landscaped reducing exposed surfaces. Construction activities have reshaped the site to fall locally towards stormwater pits no longer draining towards the sediment basin provided at the bulk earthworks stage of the project.

2.2 Sediment and Erosion Control Measures

Prior to any earthworks commencing on site, sediment and erosion control measure shall be implemented generally in accordance with the Construction Certificate drawings and the “Blue Book” to manage flows from the 1 in 5-year to the 1 in 100-year storm event where appropriate. The measures shown on the drawings are intended to be a minimum treatment only as the contractor will be required to modify and stage the erosion and sedimentation control measures to suit the construction program, sequencing and techniques. These measures will include:

- A temporary site security/safety fence is to be constructed around the site, the site office area and the proposed sediment basin;
- Sediment fencing provided downstream of disturbed areas, including any topsoil stockpiles;
- Dust control measures including covering stockpiles, installing fence hessian and watering exposed areas;
- Placement of hay bales or mesh and gravel inlet filters around and along proposed catch drains and around stormwater inlets pits; and
- The construction of a temporary sediment basin as noted above in Section 2.1;
- Stabilised site access at the construction vehicle entry/exits.

Any stockpiled material, including topsoil, shall be located as far away as possible from any associated natural watercourses or temporary overland flow paths. Sediment fences shall be installed to the downstream side of stockpiles and any embankment formation. All stockpiles and embankment formations shall be stabilised by hydroseeding or hydro mulching on formation.

These measures will be incorporated to also mitigate dust or polluted waters entering the Upper Canal Corridor.

2.3 Wet Weather Management

In circumstances of heavy rain sufficient to affect site access and ground conditions the Site Manager and Site HSE Committee representative should complete a site inspection before work commences. The inspection needs to focus on;

- The suitability of pedestrian access to the amenities and into the construction work areas
- The suitability of access for plant and equipment
- The suitability of ground conditions for plant and equipment to operate
- Nominate the construction zones suitable for work to commence
- Actions to remediate those areas not suitable for work to commence (de-water; prepare ground conditions and access ways etc.)

2.4 Salinity Management

Douglas Partners have undertaken a Salinity Investigation and prepared a Management Plan for Precinct 9 at East Leppington which includes the proposed development site. In this report several Management Strategies have been considered relative to those with a potential impact on the development. These are presented below for consideration on site where appropriate. The full report has been provided in Appendix C.

A. Management should focus on capping of the upper surface of the sodic soils, both exposed by excavation and placed as filling, with a more permeable material to prevent ponding, to reduce capillary rise, to act as a drainage layer and to reduce the potential for erosion.

B. With respect to any imported fill material, testing should be undertaken prior to importation, to determine the salinity characteristics of the material, which should be non-aggressive and non-saline where possible but in any case not more aggressive or more saline than the material on which it is to be placed.

C. Sodic soils can also be managed by maintaining vegetation where possible and planting new salt tolerant species. The addition of organic matter, gypsum and lime can also be considered where appropriate. After gypsum addition, reduction of sodicity levels may require some time for sufficient infiltration and leaching of sodium into the subsoils, however capping of exposed sodic material should remain the primary management method. Topsoil added at the completion of bulk earthworks is, in effect, also adding organic matter which may help infiltration and leaching of sodium.

D. Avoid water collecting in low lying areas, in depressions, or behind fill. This can lead to water logging of the soils, evaporative concentration of salts, and eventual breakdown in soil structure resulting in accelerated erosion.

E. Any pavements should be designed to be well drained of surface water. There should not be excessive concentrations of runoff or ponding that would lead to waterlogging of the pavement or additional recharge to the groundwater through any more permeable zones in the underlying filling material.

F. Surface drains should generally be provided along the top of batter slopes to reduce the potential for concentrated flows of water down slopes possibly causing scour. The following additional strategies are recommended for completion of service installation and for house construction. These strategies should be complementary to standard good building practices recommended within the Building Code of Australia, including cover to reinforcement within concrete and correct installation of a brick damp course, so that it cannot be bridged to allow moisture to move into brick work and up the wall.

G. Where soils are classified as non-aggressive to concrete (refer Drawing 3), piles should nevertheless have a minimum strength of 32 MPa and a minimum cover to reinforcement of 45 mm (as per AS2159).

H. Where soils are classified as mildly aggressive to concrete (refer Drawing 3 Appendix C), piles should have a minimum strength of 32 MPa and a minimum cover to reinforcement of 60 mm (as per AS2159) to limit the corrosive effects of the surrounding soils (in accordance with AS2159).

I. Where soils are classified as moderately aggressive to concrete (refer Drawing 3), piles should have a minimum strength of 40 MPa and a minimum cover to reinforcement of 65 mm (as per AS2159) to limit the corrosive effects of the surrounding soils (in accordance with AS2159).

J. With regard to concrete structures, for non-saline and slightly saline soils (with salinities less than 4 dS/m) (refer Drawing 5):

- Where soils are classified as non-aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 20 MPa, and should be allowed to cure for a minimum of three days (as per AS3600) to limit the corrosive effects of the surrounding soils; and
- Where soils are classified as mildly aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 25 MPa, and should be allowed to cure for a minimum of three days (as per AS3600) to limit the corrosive effects of the surrounding soils;
- Where soils are classified as moderately aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 32 MPa, and should be allowed to cure for a minimum of seven days (as per AS3600) to limit the corrosive effects of the surrounding soils.

K. With regard to concrete structures, for moderately saline soils with salinities of 4 – 8 dS/m (refer Drawing 5 Appendix C);

- Where soils are classified as non-aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 25 MPa, a minimum cover to reinforcement of 45 mm from unprotected ground and should be allowed to cure for a minimum of three days (as per AS3600) to limit the corrosive effects of the surrounding soils; and
- Where soils are classified as mildly aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 25 MPa, a minimum cover to reinforcement of 45 mm from unprotected ground and should be allowed to cure for a minimum of three days (as per AS3600) to limit the corrosive effects of the surrounding soils;
- Where soils are classified as moderately aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 32 MPa, a minimum cover to reinforcement of 45 mm from unprotected ground and should be allowed to cure for a minimum of seven days (as per AS3600) to limit the corrosive effects of the surrounding soils.

L. Any future installation of concrete pipes up to a maximum diameter of 750 mm, within the site, should employ fibre reinforced cement. Alternatively, concrete pipes in these areas should be encased in outer PVC conduits or should have a minimum equivalent strength as defined in I and J above.

M. Concrete pipes with a larger diameter than 750 mm should utilise sulphate resistant cement.

N. Resistivity results indicate the materials are mildly aggressive to moderately aggressive to steel. The following corrosion allowances (as per AS 2159 – 2009) should be taken into account:

- Mild: uniform corrosion allowance 0.01 – 0.02 mm/year.
- Moderate: uniform corrosion allowance 0.02 – 0.04 mm/year.

In instances where a coating is applied to the pile, if the design life of the pile is greater than the design life for the coating, consideration must be given to corrosion of the pile in accordance with the above list.

3. Further Commentary

3.1 SSD Conditions

The Minister for Planning and Open Spaces has provided Conditions of Consent for the proposed development at Commissioners Drive, East Leppington. Conditions associated with the Construction Soil and Water Management Plan have been provided below with further commentary for consideration by School Infrastructure NSW and the Certifying Authority.

B19. Construction Soil and Water Management Sub-Plan (CSWMSP)

The Applicant must prepare a Construction Soil and Water Management Sub-Plan (CSWMSP) and the plan must address, but not be limited to the following:

(a) be prepared by a suitably qualified expert, in consultation with Council;

(b) describe all erosion and sediment controls to be implemented during construction; as a minimum, measures in accordance with the publication Managing Urban Stormwater: Soils & Construction (4th edition, Landcom 2004) commonly referred to as the 'Blue Book'.

(c) Detail the measures to mitigate dust or polluted waters entering the Upper Canal Corridor;

(d) a Salinity Management protocol including the management strategies identified in the Salinity Management Plan submitted with RtS;

(e) provide a plan of how all construction works will be managed in a wet-weather events (i.e. storage of equipment, stabilisation of the Site);

(f) detail all off-Site flows from the Site; and

(g) describe the measures that must be implemented to manage stormwater and flood flows for small and large sized events, including, but not limited to, 1 in 5-year ARI and 1 in 100-year ARI.

Northrop Commentary

The following comments have been provided with respect to Condition B17 for consideration by School Infrastructure NSW and the Certifying Authority.

Northrop Commentary

(a) Please refer to the CV of the designer provided in Appendix B. Hansen Yuncken have approached Campbelltown City Council to initiate discussions regarding the proposed measures to control soil erosion and sedimentation during construction including proposed methods of discharging stormwater from the site.

(b) Please refer to Section 2 of this report and associated Civil Engineering drawings NHQC2-LP-CV-S-101.11, 101.13, 102.01, 102.11

(c) Please refer to Section 2 of this report and associated Civil Engineering drawings NHQC2-LP-CV-S-101.11, 101.13, 102.01, 102.11 which detail measures to mitigate dust or polluted waters entering the Upper Canal Corridor.

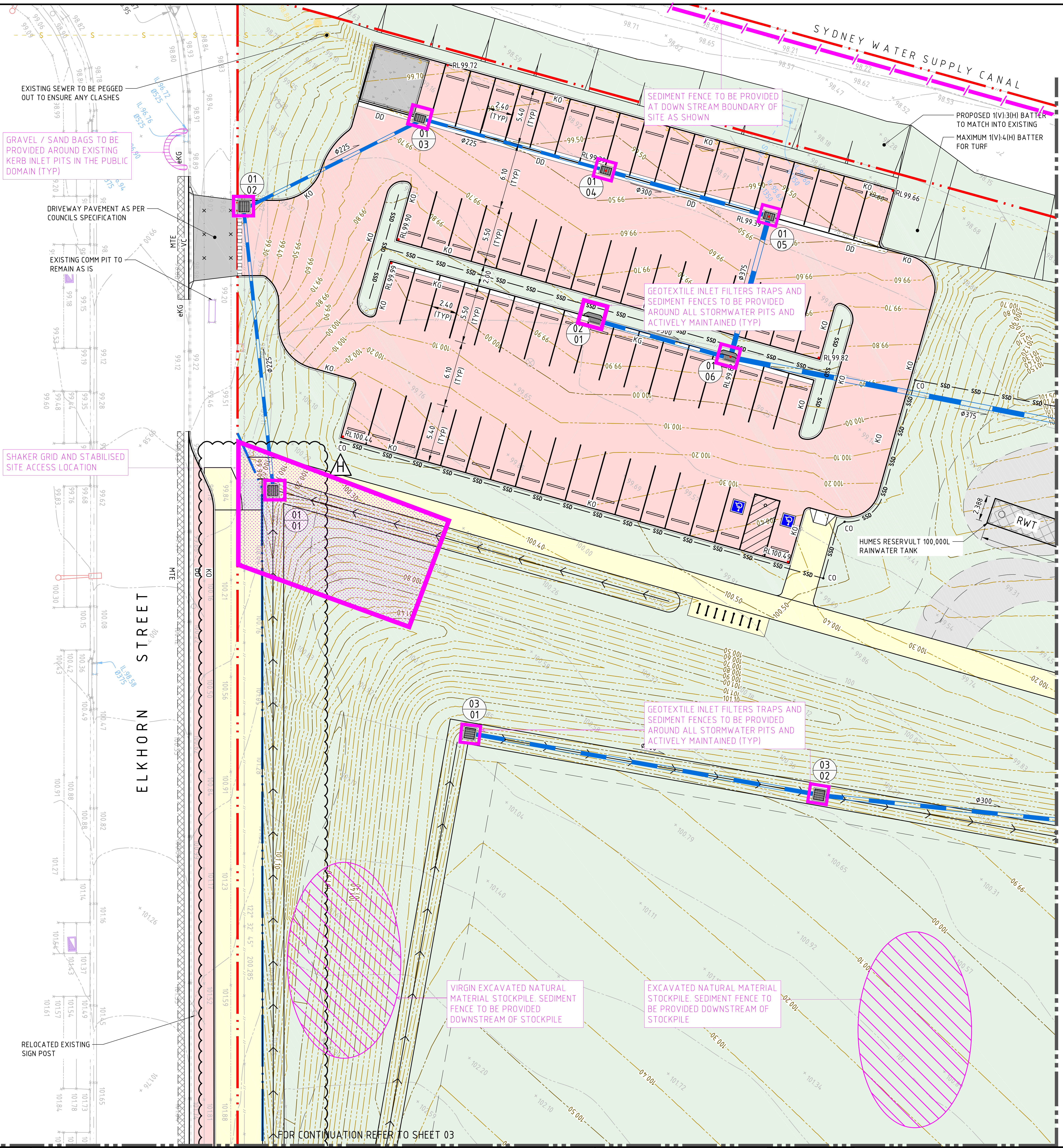
(d) Please refer to Section of this report and associated the Salinity Investigation and Management Plan prepared by Douglas Partners dated December 2014 Ref Project 76611.02-02 in Appendix C.

(e) Please refer to Civil Engineering drawing NHQC2-LP-CV-S-102.01 and Wet Weather Management Plan prepared by Hansen Yuncken.

(f) Water is directed to the constructed stormwater network of each sub-catchment before passing through filtration prior to discharge at the legal point of discharge into Council owned stormwater infrastructure away from the site.

(g) Please refer to Section 2 of this report and associated Civil Engineering drawings NHQC2-LP-CV-S-101.11, 101.13, 102.01, 102.11. The erosion and sediment control plans have been designed in accordance with the requirements of NSW Department of Housing Manual, “Managing Urban Stormwater Soil & Construction” 2004 (Blue Book) and Campbelltown City Council’s Engineering Design Specifications.

Appendix A – Soil & Water Management Plans



LEGEND

	PROPOSED BOUNDARY LINE
	EXISTING BOUNDARY LINE
S	EXISTING SEWER
	PROPOSED KERB
	EXISTING KERB
	SAWCUT AND PAVEMENT INFILL
KO	KERB ONLY
KG	KERB AND GUTTER
MTE	MATCH TO EXISTING
VC	VEHICULAR CROSSING
KR	KERB RAMP
× × ×	EXISTING TO BE REMOVED
FFLXX.XX	PROPOSED FINISHED FLOOR LEVEL
	BATTERS
XX.XX	CONTOURS
XX.XX	EXISTING CONTOURS
RW	RETAINING WALL
	DRAINAGE SWALE
	STORMWATER PIPE
SW	EXISTING STORMWATER PIPE
• DP	DOWNPIPE (REFER ARCHITECTS DRAWINGS)
	ROOF DRAINAGE
SSD	SUBSOIL DRAINAGE LINE
• CO	SUBSOIL DRAINAGE CLEAROUT
	DRAINAGE STRUCTURE WITH EXTENDED CHAMBER (NEW / EXTG)
	GRATED INLET PIT (NEW / EXTG)
	KERB INLET PIT (NEW / EXTG)
☒	JUNCTION PIT (NEW / EXTG)
GTD	GRATED TRENCH DRAIN
02 01	STORMWATER LINE ID / STRUCTURE PIT NO.
RWT	RAINWATER HARVESTING TANK
🟩	PROPOSED LANDSCAPING - REFER TO LANDSCAPE ARCHITECT'S FOR DETAIL
🟥	PROPOSED FLEXIBLE PAVEMENT
🟨	FOOTPATH PAVEMENT - TYPE 1
▨	FOOTPATH PAVEMENT - TYPE 2
⬜	PROPOSED RECREATIONAL AREAS - REFER TO LANDSCAPE ARCHITECT'S FOR DETAIL
⬛	DRIVEWAY PAVEMENT - REFER CAMDEN COUNCILS STANDARD DETAIL DRAWING No. DW01

GENERAL NOTES:

1. REFER SPECIFICATIONS NOTES FOR STORMWATER AND SITEWORKS GENERAL REQUIREMENTS.
2. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL / RELEVANT AUTHORITY SPECIFICATIONS AND DETAILS.
3. CAD FILES TO BE SUPPLIED IN AUTOCAD FORMAT FOR SETOUT PURPOSES (UPON REQUEST).
4. **PROVIDE 'OCEAN GUARD INSERTS' ON ALL GRATED INLET PITS**
5. SUBSOIL DRAINAGE TO RETAINING WALLS, KERBS AND SWALE DRAINS NOT SHOWN FOR CLARITY - REFER RELEVANT DETAILS.
6. BASED ON GEOTECHNICAL INVESTIGATIONS THE CBR = 1.5%. THEREFORE SUBGRADE TREATMENT IS REQUIRED. REFER DETAIL SHEET DAC112.01.
7. ALL ROOF DOWNPIPES TO BE DIRECTLY CONNECTED TO THE RAINWATER TANK SUBJECT TO CONFIRMATION FROM THE PROJECT HYDRAULIC ENGINEER.

FOR CONSTRUCTION

DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:

AMMENDMENTS

REV	BY	DATE	DESCRIPTION
A	JO	31.08.20	ISSUED FOR CONSTRUCTION
B	JO	25.09.20	RE-ISSUED FOR CONSTRUCTION
C	CP	02.11.20	RE-ISSUED FOR CONSTRUCTION
D	CP	03.12.20	RE-ISSUED FOR CONSTRUCTION
E	CP	17.12.20	RE-ISSUED FOR CONSTRUCTION
F	TB	17.02.21	RE-ISSUED FOR CONSTRUCTION
G	TB	08.03.21	RE-ISSUED FOR CONSTRUCTION
H	CP	12.03.21	RE-ISSUED FOR CONSTRUCTION

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Vince Pedavoli NSW reg No.5045

PERUMAL PEDAVOLI ARCHITECTS

EAST LEPPINGTON PS
NEW HIGH QUALITY CLASSROOMS

DRAWING NAME
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 01

PROJECT NORTH
NORTH

SCALE 1:200 @ A1
0 2 4 6 8 10m

DRAWN	CHECKED	VERIFIED	DATE
JO	NS	JG	08.03.21

DRAWING NUMBER
PROJECT CODE SCH.REF. DISC. TYPE SERIES#
NHQC2-LP-CV-S-DDC104.01

REVISION
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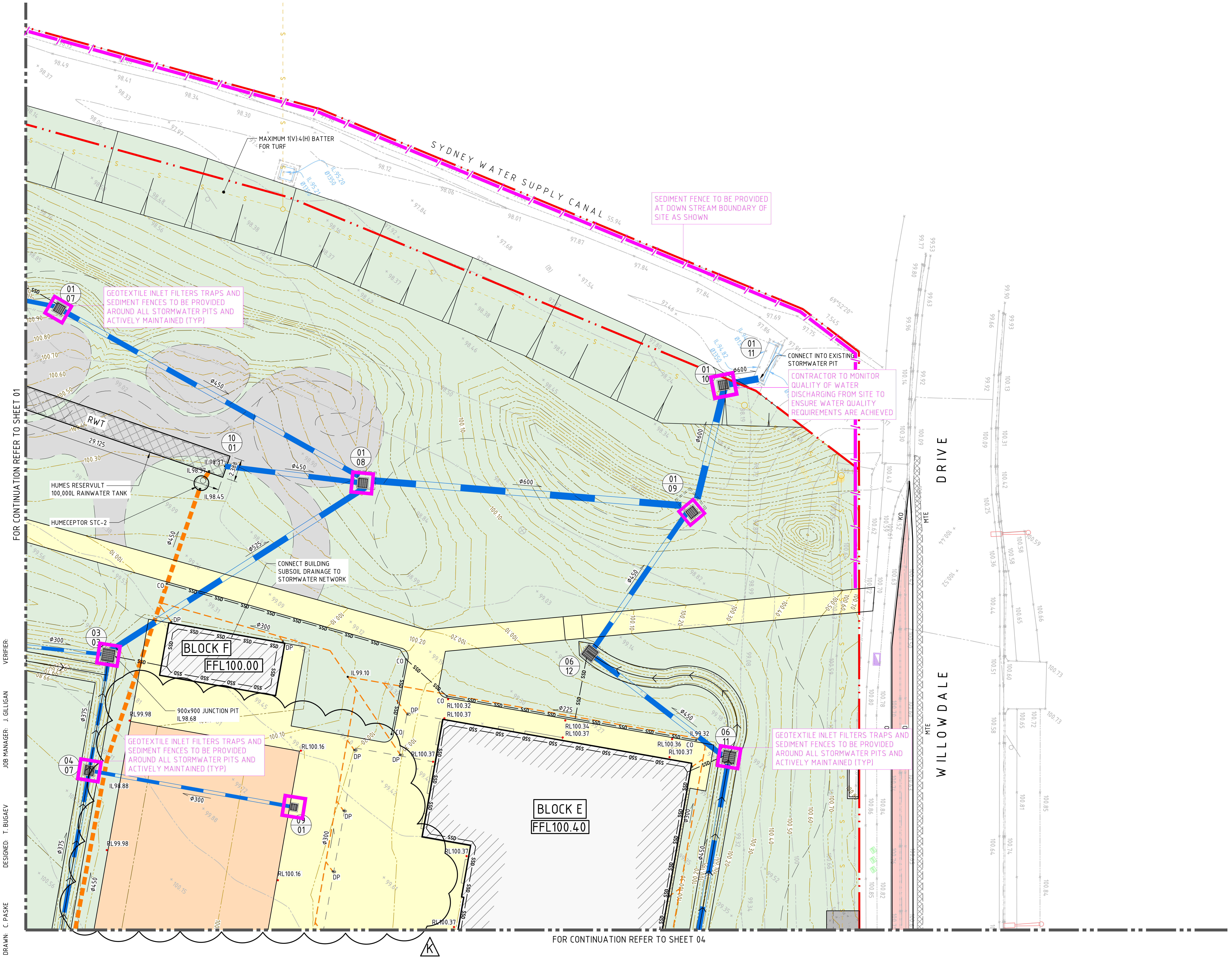

DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:

LEGEND

- PROPOSED BOUNDARY LINE
- EXISTING BOUNDARY LINE
- EXISTING SEWER
- PROPOSED KERB
- EXISTING KERB
- SAWCUT AND PAVEMENT INFILL
- KO — KERB ONLY
- KG — KERB AND GUTTER
- MTE — MATCH TO EXISTING
- VC — VEHICULAR CROSSING
- KR — KERB RAMP
- × × × — EXISTING TO BE REMOVED
- FFLXX.XX — PROPOSED FINISHED FLOOR LEVEL
- BATTERS
- XX.XX — CONTOURS
- XX.XX — EXISTING CONTOURS
- RW — RETAINING WALL
- DRAINAGE SWALE
- STORMWATER PIPE
- SW — EXISTING STORMWATER PIPE
- • DP — DOWNPIPE (REFER ARCHITECTS DRAWINGS)
- ROOF DRAINAGE
- SSD — SUBSOIL DRAINAGE LINE
- • CO — SUBSOIL DRAINAGE CLEAROUT
- DRAINAGE STRUCTURE WITH EXTENDED CHAMBER (NEW / EXTG)
- GRATED INLET PIT (NEW / EXTG)
- KERB INLET PIT (NEW / EXTG)
- ☒ JUNCTION PIT (NEW / EXTG)
- GTD — GRATED TRENCH DRAIN
- 02 / 01 — STORMWATER LINE ID / STRUCTURE PIT NO.
- RWT — RAINWATER HARVESTING TANK
- 🟩 PROPOSED LANDSCAPING - REFER TO LANDSCAPE ARCHITECT'S FOR DETAIL
- 🟥 PROPOSED FLEXIBLE PAVEMENT
- 🟨 FOOTPATH PAVEMENT - TYPE 1
- ▨ FOOTPATH PAVEMENT - TYPE 2
- ⬜ PROPOSED RECREATIONAL AREAS - REFER TO LANDSCAPE ARCHITECT'S FOR DETAIL
- ⬛ DRIVEWAY PAVEMENT - REFER CAMDEN COUNCILS STANDARD DETAIL DRAWING No. DW01

GENERAL NOTES:

1. REFER SPECIFICATIONS NOTES FOR STORMWATER AND SITEWORKS GENERAL REQUIREMENTS.
2. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL / RELEVANT AUTHORITY SPECIFICATIONS AND DETAILS.
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7. ALL ROOF DOWNPIPES TO BE DIRECTLY CONNECTED TO THE RAINWATER TANK SUBJECT TO CONFIRMATION FROM THE PROJECT HYDRAULIC ENGINEER.

FOR CONSTRUCTION

AMMENDMENTS

REV	BY	DATE	DESCRIPTION
B	JP	17.09.20	RE-ISSUED FOR CONSTRUCTION
C	TB	25.09.20	RE-ISSUED FOR CONSTRUCTION
D	CP	02.11.20	RE-ISSUED FOR CONSTRUCTION
E	CP	03.11.20	RE-ISSUED FOR CONSTRUCTION
F	CP	18.11.20	RE-ISSUED FOR CONSTRUCTION
G	CP	03.12.20	RE-ISSUED FOR CONSTRUCTION
H	CP	17.12.20	RE-ISSUED FOR CONSTRUCTION
J	TB	08.03.21	RE-ISSUED FOR CONSTRUCTION
K	MM	24.03.21	RE-ISSUED FOR CONSTRUCTION

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DRAWING NAME
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 02

PROJECT NORTH

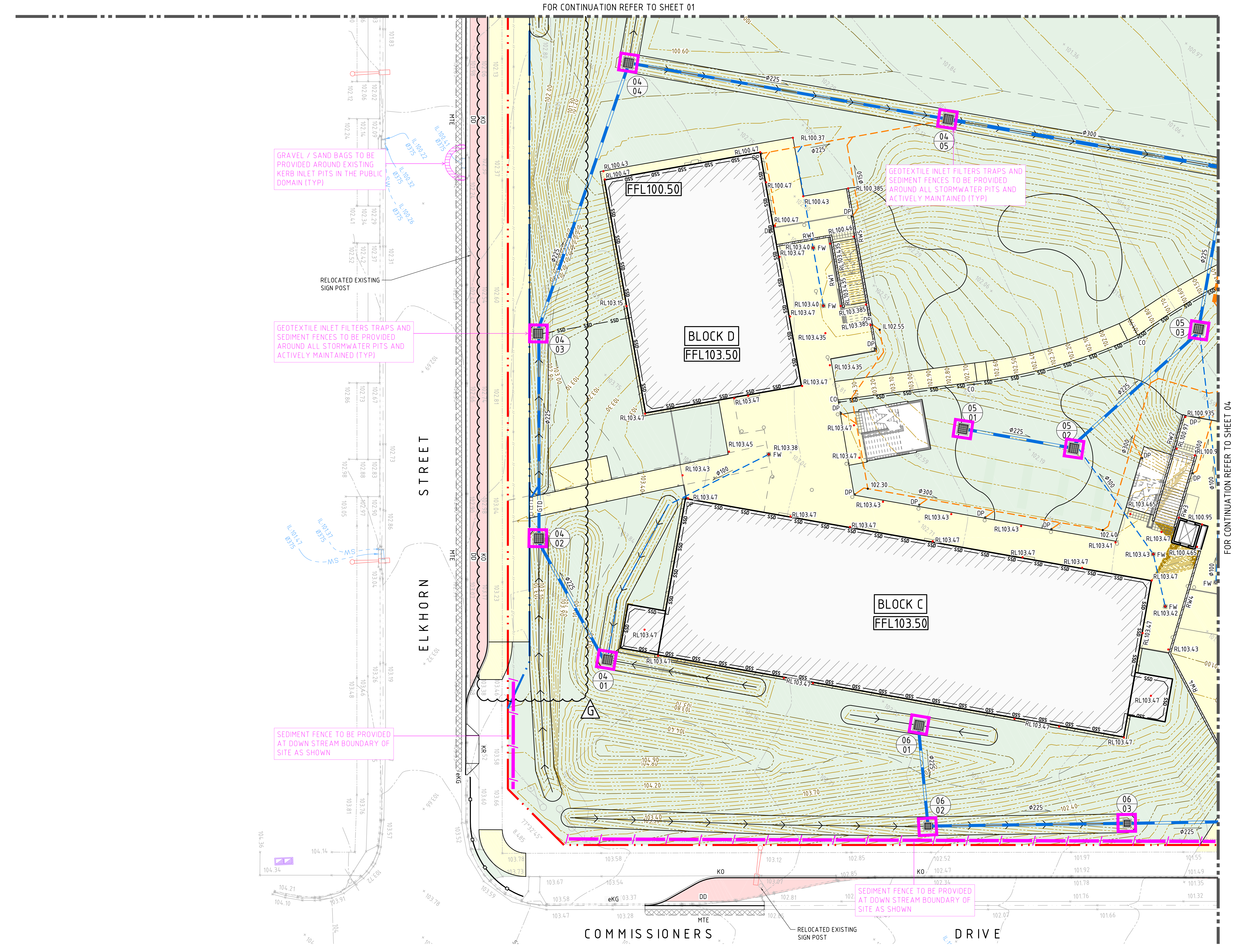
SCALE 1:200 @ A1 — 0 2 4 6 8 10m

DRAWN	CHECKED	VERIFIED	DATE
JO	NS	JG	24.03.21

DRAWING NUMBER
PROJECT CODE SCH.REF. DISC. TYPE SERIES#
NHQC2-LP-CV-S-DDC104.02

REVISION
K

DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:



GRAVEL / SAND BAGS TO BE PROVIDED AROUND EXISTING KERB INLET PITS IN THE PUBLIC DOMAIN (TYP)

GEOTEXTILE INLET FILTERS TRAPS AND SEDIMENT FENCES TO BE PROVIDED AROUND ALL STORMWATER PITS AND ACTIVELY MAINTAINED (TYP)

SEDIMENT FENCE TO BE PROVIDED AT DOWN STREAM BOUNDARY OF SITE AS SHOWN

LEGEND

	PROPOSED BOUNDARY LINE
	EXISTING BOUNDARY LINE
S	EXISTING SEWER
	PROPOSED KERB
	EXISTING KERB
	SAWCUT AND PAVEMENT INFILL
KO	KERB ONLY
KG	KERB AND GUTTER
MTE	MATCH TO EXISTING
VC	VEHICULAR CROSSING
KR	KERB RAMP
× × ×	EXISTING TO BE REMOVED
FFLXX.XX	PROPOSED FINISHED FLOOR LEVEL
	BATTERS
XX.XX	CONTOURS
XX.XX	EXISTING CONTOURS
RW	RETAINING WALL
	DRAINAGE SWALE
	STORMWATER PIPE
SW	EXISTING STORMWATER PIPE
• DP	DOWNPIPE (REFER ARCHITECTS DRAWINGS)
	ROOF DRAINAGE
SSD	SUBSOIL DRAINAGE LINE
• CO	SUBSOIL DRAINAGE CLEAROUT
	DRAINAGE STRUCTURE WITH EXTENDED CHAMBER (NEW / EXTG)
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	KERB INLET PIT (NEW / EXTG)
☒	JUNCTION PIT (NEW / EXTG)
GTD	GRATED TRENCH DRAIN
02 01	STORMWATER LINE ID / STRUCTURE PIT NO.
RWT	RAINWATER HARVESTING TANK
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🟥	PROPOSED FLEXIBLE PAVEMENT
🟨	FOOTPATH PAVEMENT - TYPE 1
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▨	DRIVEWAY PAVEMENT - REFER CAMDEN COUNCILS STANDARD DETAIL DRAWING No. DW01

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DRAWING NAME
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 03

PROJECT NORTH
NORTH

SCALE 1:200 @ A1
0 2 4 6 8 10m

DRAWN	CHECKED	VERIFIED	DATE
JO	NS	JG	08.03.21

DRAWING NUMBER
PROJECT CODE SCH.REF. DISC. TYPE SERIES#
NHQC2-LP-CV-S-DDC104.03

REVISION
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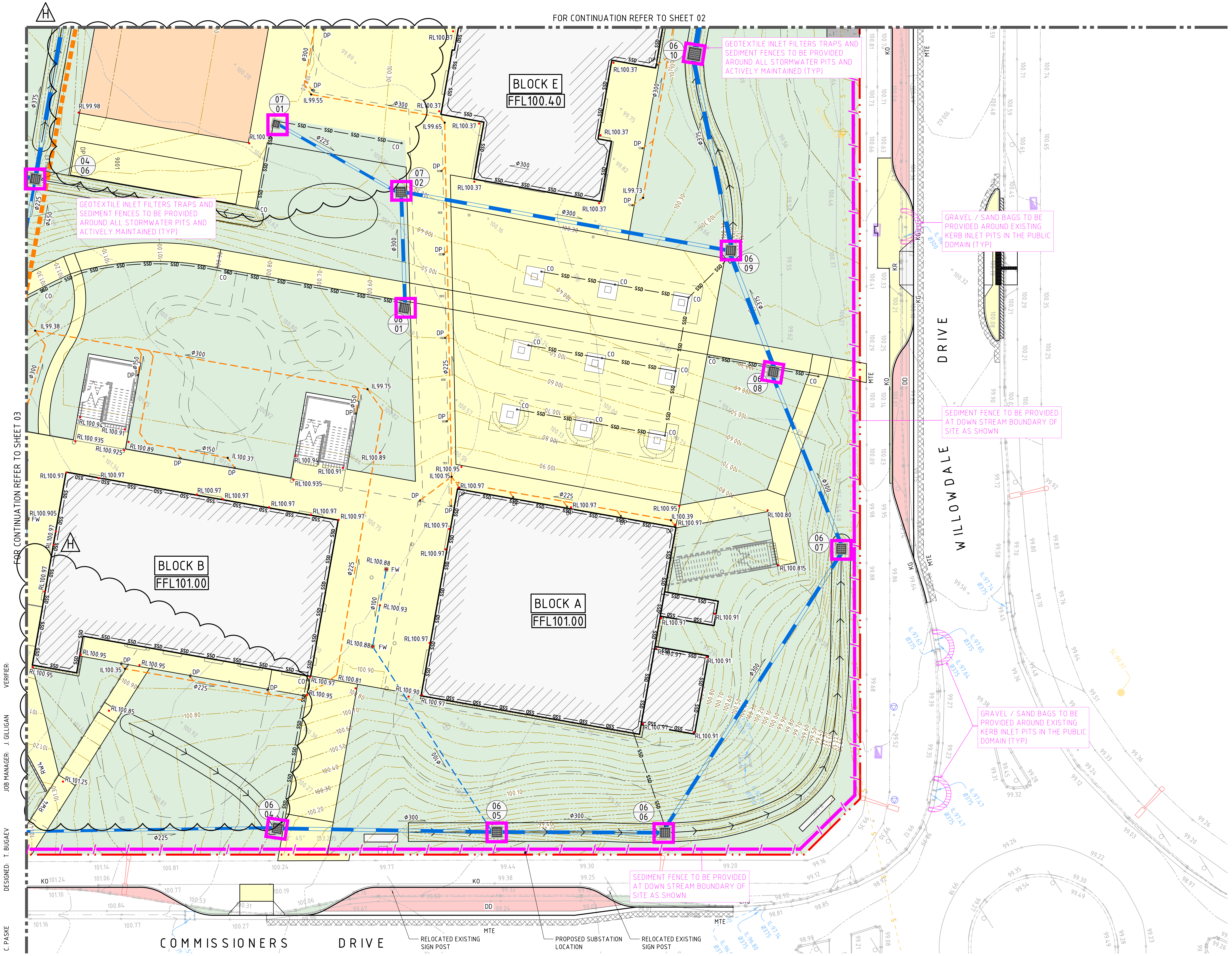

LEGEND

	PROPOSED BOUNDARY LINE
	EXISTING BOUNDARY LINE
S	EXISTING SEWER
	PROPOSED KERB
	EXISTING KERB
▨	SAWCUT AND PAVEMENT INFILL
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× × ×	EXISTING TO BE REMOVED
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	BATTERS
XX.XX	CONTOURS
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FOR CONSTRUCTION

DRAWN: C. PASKE
DESIGNED: T. BUGAEV
JOB MANAGER: J. GILLIGAN
VERIFIER:

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DRAWING NAME
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 04

PROJECT NORTH
NORTH

SCALE 1:200 @ A1
0 2 4 6 8 10m

DRAWN	CHECKED	VERIFIED	DATE
JO	NS	JG	24.03.21

DRAWING NUMBER
PROJECT CODE SCH.REF. DISC. TYPE SERIES#
NHQC2-LP-CV-S-DDC104.04

REVISION
H

Appendix B – CV

James Gilligan

Associate | Senior Civil Engineer

BE (Civil) MIEAust CPEng NER

James is a Senior Civil Engineer with over twelve years' experience managing and delivering buildings and complex civil infrastructure projects requiring design from the concept phase through to construction and post construction stages.

James also has particular experience in project management and contract administration. James' technical background includes civil design of utilities, earthworks, stormwater and roads for subdivision and buildings projects across all types of development including Education, Residential, Commercial & Industrial.

Project Experience

Urban Redevelopment

- Frasers Central Park, Broadway
- Tailors Walk, Pemberton Street, Botany
- 150 Epping Road, Lane Cove
- Glebe Affordable Housing Project, Glebe
- Altrove Stage 7 & 9, Schofields
- Airds Subdivision Works, Airds
- Pemulwuy Southern Lands, Pemulwuy
- Stellar Apartments, Ryde
- 10 Hall Street, Bondi
- McEvoy Street, Waterloo

Public Domain and Open Spaces

- Endeavour Energy Southern Carpark, Huntingwood
- Windsor Station Bus Interchange, Windsor
- Waterfall Station Easy Access Upgrade
- New Acton South Carpark, Canberra
- Elara Neighbourhood Centre, Elara
- Hurstville Bus Interchange, Hurstville
- Twin Creeks Golf Club, Luddenham
- Croom Regional Sporting Complex, Croom

Infrastructure / Utilities Coordination

- Southern Sydney Freight Line
- North West Rail Link
- Sydney International Airport – Stage 2B

Aged Care & Retirement Living

- St Mary's Aged Care Facility, St Mary's
- The Abbey Aged Care Facility, Mittagong
- Anglican Retirement Village, Glenhaven
- Oran Park Aged Care Facility, Oran Park
- Zhiva Living, Dural

Commercial / Industrial

- Ingram Micro Warehouse
- Goodyear Warehouse
- 1-5 Interchange Drive, Eastern Creek
- 2-4 Interchange Drive Eastern Creek
- 9-11 Interchange Drive, Eastern Creek
- 17-19 Interchange Drive, Eastern Creek
- 21-23 Interchange Drive, Eastern Creek
- Bunnings Distribution Centre, Eastern Creek
- Basalt Road, Greystanes
- Blum Australia Warehouse, Hoxton Park
- Masters Home Improvement, Penrith
- Masters Home Improvement Wagga Wagga
- AMP Shopping Centre, Glenmore Park
- Kingsford Smith Distribution Centre, Mascot
- Danks Hardware Distribution Centre

Health

- Manly AYAH
- Westmead Hospital
- Cumberland Hospital
- Bungarribee House Relocation, Blacktown

Education

- Passfield Park School
- Jordon Spring Public School
- Alex Avenue Public School
- Western Sydney University, Westmead
- Barker College Junior School and Early Learning Centre
- Westmead Catholic College
- Catherine Field Public School
- Wagga Wagga Public School
- East Leppington Public School
- Meadowbank TaFE

Appendix C – Douglas Partners Salinity Investigation and Management Plan

Douglas Partners
Geotechnics | Environment | Groundwater

Report on
Salinity Investigation and Management Plan

Precinct 9
East Leppington

Prepared for
Stockland Development Pty Limited

Project 76611.02-2
December 2014

Integrated Practical Solutions

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	76611.02-2	Document No.	2
Document title	Salinity Investigation and Management Plan		
Site address	Precinct 9, East Leppington		
Report prepared for	Stockland Development Pty Limited		
File name	P:\76611.02 EAST LEPPINGTON, Prec 9 Geotech, Salinity, Contam JRR\Phase 1 Salinity Contam\Report Salinity\76611.02 LEPPINGTON PRECINCT 9 SMP REV1.doc		

Document status and review

Revision	Prepared by	Reviewed by	Date issued
0	Bradley Harris	John Lean	27 November 2014
1	Bradley Harris	John Lean	11 December 2014

Distribution of copies

Revision	Electronic	Paper	Issued to
0	1	0	Stockland Development Pty Limited
1	1	0	Stockland Development Pty Limited

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

	Signature	Date
Author		11 December 2014
Reviewer	pp	11 December 2014

NCS INTERNATIONAL
CERTIFIED
QUALITY
MANAGEMENT SYSTEM

Table of Contents

Report on Salinity Investigation and Management Plan
Precinct 9, East Leppington

1. Introduction

This report describes the methodology and results of a salinity investigation conducted by Douglas Partners Pty Ltd (DP) and presents the associated Salinity Management Plan (SMP) for Precinct 9 which is located within Part Lot 6 in Deposited Plan 1193006, East Leppington (the site, as shown on Drawing 1, Appendix A). The work was commissioned by Stockland Development Pty Limited (Stockland).

Saline soils affect much of the Western Sydney Region. Buildings and infrastructure located on shales of the Wianamatta Group are particularly at risk. Salinity can affect urban structures in a number of ways, including corrosion of concrete, break down of bricks and mortar, corrosion of steel (including reinforcement), break up of roads, attack on buried infrastructure, reduced ability to grow vegetation and increased erosion potential.

It is understood that a residential subdivision is proposed and that an assessment of soil salinity is required for submission to Campbelltown Council with the subdivision application and to assist in conceptual planning of the development.

The investigation comprised excavation of test pits, followed by laboratory testing of selected samples, engineering analysis and reporting. Details of the work undertaken and the results obtained are given within this report, together with comments relating to design and construction practice.

The current assessment was undertaken concurrently with a geotechnical investigation (Project 76611.02-1) and a detailed contamination assessment (Project 76611.02-3) which are both reported under separate cover.

The proposed Precinct 9 encompasses part of the former Precinct 7 for which field work has already been completed for a Detailed Site Investigation, Salinity and Geotechnical Investigation. The current investigation utilises six test pits excavated within the former Precinct 7, which are now located within the current Precinct 9 Boundary.

2. Scope of Works

The current report includes two parts:

1. Salinity assessment of the site based upon:

- Collection of samples at regular depth intervals from 14 test pits to depths of 1.3 m to 3.2 m;
- Inspection of the site for signs of salinity;

- Analysis of electrical conductivity (EC1:5), pH and soil texture test results for 62 soil and weathered rock samples determined at a NATA accredited analytical laboratory, for classification of salinity and aggressivity;
- Laboratory analysis of additional salinity, aggressivity and erodibility indicators, including chloride and sulphate concentrations (8 samples) and sodicity testing (8 samples) at a NATA accredited analytical laboratory;
- Summary and review of results from samples collected within the former Precinct 7 boundary which encompasses the proposed Precinct 9 boundary, namely P7-16, P7-17, P7-18, P7-19, P7-21 and P7-23;
- Assessment of the results with respect to potential for salinity impacts on the development.

2. Preparation of a Salinity Management Plan (SMP) for the site providing guidance on development strategies to reduce the impact of saline materials (if and where found). The Plan was based upon:

- Review of the salinity investigation results;
- Review of the following documents:
    - 'Map of Salinity Potential in Western Sydney', DNR (2002);
    - 'Guidelines to Accompany Map of Salinity Potential in Western Sydney', DNR (2002);
    - 'Western Sydney Salinity Code of Practice' (amended January 2004), Rebecca Nicholson for WSROC, DNR and Natural Heritage Trust;
    - 'Guide to Residential Slabs and Footings in a Saline Environment', Cement, Concrete and Aggregates, Australia (2005);
    - 'Introduction to Urban Salinity', DNR (2003);
    - 'Building in a Saline Environment' DNR (2003);
    - 'Roads and Salinity', DNR (2003);
    - 'Indicators of Urban Salinity', DNR (2002);
    - 'Site Investigations for Urban Salinity', DNR (2002);
    - 'Urban Salinity Processes', DNR (2004);
    - 'Waterwise Parks and Gardens', DNR (2004); and
    - 'Broad Scale Resources for Urban Salinity Assessment' DNR (2002).

3. Previous Investigations and Results

A previous investigation within the subject site and its immediate surrounds was undertaken by Douglas Partners Pty Ltd in 2008 as part of the land capability assessment of the East Leppington Precinct. The results of the investigation were formalised in a report entitled *"Report on Salinity Investigation, Land Capability Assessment, East Leppington Precinct,* Project 40843 dated 23 June 2008 [DP 2008].

The investigation comprised site inspection, non-intrusive and intrusive site investigation, laboratory testing of selected samples, engineering analysis and reporting. An electromagnetic (EM) survey was undertaken, and results were assessed taking into account salinity analyses on 217 samples from 65 test pits throughout the East Leppington Precinct. Soils within the site were identified generally as non-saline to moderately saline.

Test locations that fall within the site boundary from the Land Capability Assessment (DP, 2008), namely TP33, TP34, TP40, TP41 and TP105, have been summarised and the results included in this Salinity Investigation.

4. Site Description

The site is currently registered as Part Lot 6 in Deposited Plan 1193006 and is located within the Campbelltown local government area (LGA). The site is irregularly shaped with an area of some 26 ha with maximum north-south and east-west dimensions of 930 m and 330 m respectively. The site is currently vacant and predominately cleared in the north with some areas of medium to dense vegetation in the central and southern portions of the site. There are three dams located within the boundary and several trails run east – west across the site. The site is fairly flat, however levels were observed to fall slightly towards the western and northern extents.

The site is bounded to the north, east and south by vacant agricultural land and to the west by the Sydney water supply canal. The site location and boundaries are shown on Drawing 1, Appendix A.

5. Geology and Hydrogeology

Reference to the Penrith 1:100 000 Geological Series Sheet indicates that the site is underlain by Bringelly Shale of the Wianamatta Group of Triassic age. This formation typically comprises shale, carbonaceous claystone, laminite, fine to medium grained lithic sandstone and some minor coal bands. The current round of test pits also confirmed the expected geology.

Reference to the 1:100 000 Soil Landscapes of the Wollongong – Port Hacking and Penrith Sheets indicates that the site includes only the Blacktown Soil Landscape which is characterised by topography of "*gently undulating rises on Wianamatta Group Shale, with local relief to 30 m and slopes usually less than 5%*". This is a residual landscape which the mapping indicates comprises up to four soil horizons that range from shallow, red-brown, hard-setting, sandy clay soils on crests and upper slopes to deep, brown to yellow sand and clay soils overlying grey, plastic, mottled clay on mid to lower slopes. These soils are typically of low fertility, are moderately reactive and have a generally low wet-bearing strength.

Additional reference to the Map of Salinity Potential in Western Sydney, indicates that the Site is predominantly located in an area of *"Moderate salinity potential"* where *"saline areas may occur .... which have not yet been identified or may occur if risk factors change adversely"*. The eastern boundary of the site is located in an area of "*High salinity potential"* where *"conditions are similar to areas of known salinity".* These classifications are based on the landform and geology and it is noted that due to the resolution at the scale of the mapping, it is not possible to delineate the zone boundaries with precision.

Several references (Old, 1942, Wooley, 1991, McNally, 2004; McNally, 2005; McNally, 2009; Russell, et al, 2009;) describe some general features of the hydrogeology of western Sydney which are relevant to this site. The shale terrain of much of western Sydney is known for saline groundwater, resulting either from the release of connate salt in shales of marine origin or from the accumulation of windblown sea salt. Seasonal groundwater level changes of 1.0 m to 2.0 m can occur in a shallow regolith aquifer or a deeper shale aquifer due to natural influences.

The unweathered shale rock unit is effectively impermeable and the few bores drilled into the unweathered shales in the Sydney area are generally dry or yielding small flows of saline groundwater, typically with total dissolved salts (TDS) contents of 10,000 mg/L to 30,000 mg/L (Old, 1942; McNally, 2004).

6. Field Work Methods

The current field work for this salinity investigation comprised the excavation of 14 test pits to depths of 3 m or prior refusal. In addition, 7 test pits initially excavated for Precinct 7 (TP7-14 to TP7-19, TP7-21 and TP7-23) have been included in this assessment, as a result of a precinct boundary change since the completion of the field work. All test pits were excavated using a JCB 4CX backhoe fitted with a 450 mm bucket.

The pits were logged on site by a geo-environmental engineer, who collected representative disturbed samples to assist in strata identification and for laboratory testing. After carefully backfilling each test pit, the surface was reinstated to its previous level.

The test pit locations were nominated by DP and are indicated on Drawings 2 to 5 (Appendix A). The test location co-ordinates (MGA94 Zone 56) and surface levels (to Australian Height Datum, AHD), shown on the logs, were determined using a differential GPS receiver.

7. Results

The test pit logs are included in Appendix B, and should be read in conjunction with the accompanying standard notes that define classification methods and descriptive terms. The succession of strata is broadly summarised below:

- TOPSOIL – silt with some clay and rootlets encountered to depths of 0.15 to 0.2 m in all test pits with the exception of P9-8 which encountered a layer of silt fill (stockpile / fill mound) to a depth of 0.4 m and P7-18 which encountered a layer of silt fill to a depth of 0.3 m;
- RESIDUAL SOIL – generally stiff to hard silt and silty clay to depths of between 0.9 m and 2.8 m bgl or to the limit of investigation in 9-8, 7-14 and 7-15;
- ROCK – shale was encountered in all test pits (with the exception of 9-8, 7-14 and 7-15) to the depth of test pit refusal at 1.3 m to 3.2 m bgl.

No free groundwater was observed in the pits during excavation for the short time that they were left open. It is noted, however, that the pits were immediately backfilled following excavation which precluded longer term monitoring of any groundwater levels that might be present. Groundwater levels are affected by factors such as soil permeability and weather conditions and will vary with time. No signs of efflorescence were noted during the inspection.

A Summary Table (Appendix C), presents the results of laboratory tests, assessments of aggressivity to concrete and steel, sodicity class, textural classification, calculated salinity ECe and salinity class inferred from ECe values using the method of Richards (1954). The Summary Table (Appendix C) also includes results of Emerson Crumb tests and derived Dispersion Potentials. The detailed laboratory test reports and chain of custody information are provided in Appendix D.

Laboratory data for TP7-14 to TP7-19, TP7-21, TP7-23, TP33, TP34, TP40, TP41 and TP105 have also been included in the Summary Table (Appendix C).

Drawing 3 (Appendix A) shows the areas of the Site which are proposed to be cut and filled and the Summary Table (Appendix D) presents approximate, interpolated cut and fill depths. The maximum proposed cut at a test pit location is to a depth of 2 m at TP9-3 and the maximum proposed fill is up to 3 m in the vicinity of TP9-13.

A “worst case” scenario was used to classify the extent of salinity and aggressivity within the Site. This was achieved by utilising a maxima/minima analysis within four area types defined by the cut-fill diagram provided for this assessment.

For foundation depths of up to 1.0 m below the proposed surface:

- Cut areas – relevant maximum or minimum values from the sample closest to the proposed surface level (after cutting) and from 0.5 m and 1.0 m below that sample (where available) were determined at individual locations and interpolated between locations to assess future foundation zone conditions in these sub-areas of the finished site;
- Fill areas – the most saline and most aggressive classifications of all the material to be excavated from above the proposed surface within the cut areas, were first used to classify the material to be used as filling. These classifications were then compared with those from shallow samples (up to 1.0 m bgl) at individual test locations within areas that are proposed to receive shallow fill (less than 1.0 m). The worst case results from the filling material as a whole and from the shallow samples at individual locations were used to classify the future foundation soils at the individual locations. These maxima or minima were interpolated between locations to assess future foundation zone conditions in these sub-areas into which filling materials are to be placed; and
- Undisturbed areas – relevant maximum or minimum values from depths of 0.5 m and 1.0 m below current surface levels were determined at individual locations and interpolated between locations where no cut or fill is required, to assess future foundation zone conditions in these sub-areas of the finished site.

For deep foundations (ie: piers):

- Finished surface area – This comprised the entire site area, where minimum pH and resistivity values at individual locations (from all investigated depths below the proposed surface level), were interpolated across the site to assess soil aggressivity to future concrete and steel piles.

These maximum or minimum values were used for spatial mapping of salinities and aggressivities throughout the investigation area (refer Drawings 3 – 5, Appendix A).

The total test sample numbers and the range of test results obtained are summarised in Table 1.

Table 1: Summary of Test Results

Parameter		Units	Samples	Minimum	Maximum
pH		pH units	106	4.4	9.1
Chlorides		(mg/kg)	27	92	1600
Sulphates		(mg/kg)	27	38	410
Aggressivity	to Concrete	[AS2159]	106	non-aggressive	moderate
	to Steel	[AS2159]	114	non-aggressive	moderate
Exchangeable Sodium (Na)		(meq/100g)	16	1.5	6.5
CEC (cation exchange capacity)		(meq/100g)	16	11	22
Sodicity [Na/CEC]		(ESP%)	16	8.2	36.8
Sodicity Class		[after DLWC]	16	sodic	highly sodic
EC1:5 [Lab.]		(mS/cm)	114	51	1200
Resistivity		Ω.cm	114	833	19607
ECe [M x EC1:5] [1]		(dS/m)	114	0.4	9.6
Salinity Class		[after Richards 1954]	114	non-saline	very saline

Note: 1 M is soil textural factor

7.1 Aggressivity

Figure 1 (below) presents variations of aggressivity with depth, based on pH profiles at all test pit locations, together with the aggressivity class ranges indicated in Australian Standard AS 2159 (2009). The absence of free groundwater from all test pits and the impermeability of the sampled clay-rich soils indicate that soils at all test pits are in Condition “B” as defined by AS 2159.

The pH profiles of Figure 1 indicate that the materials throughout the site, at all investigated depths, are non-aggressive to steel. The chloride concentration guidelines of AS 2159 support this non-aggressive classification. However, based on resistivity criteria (Appendix C), samples were classified as non-aggressive to moderately aggressive to steel.

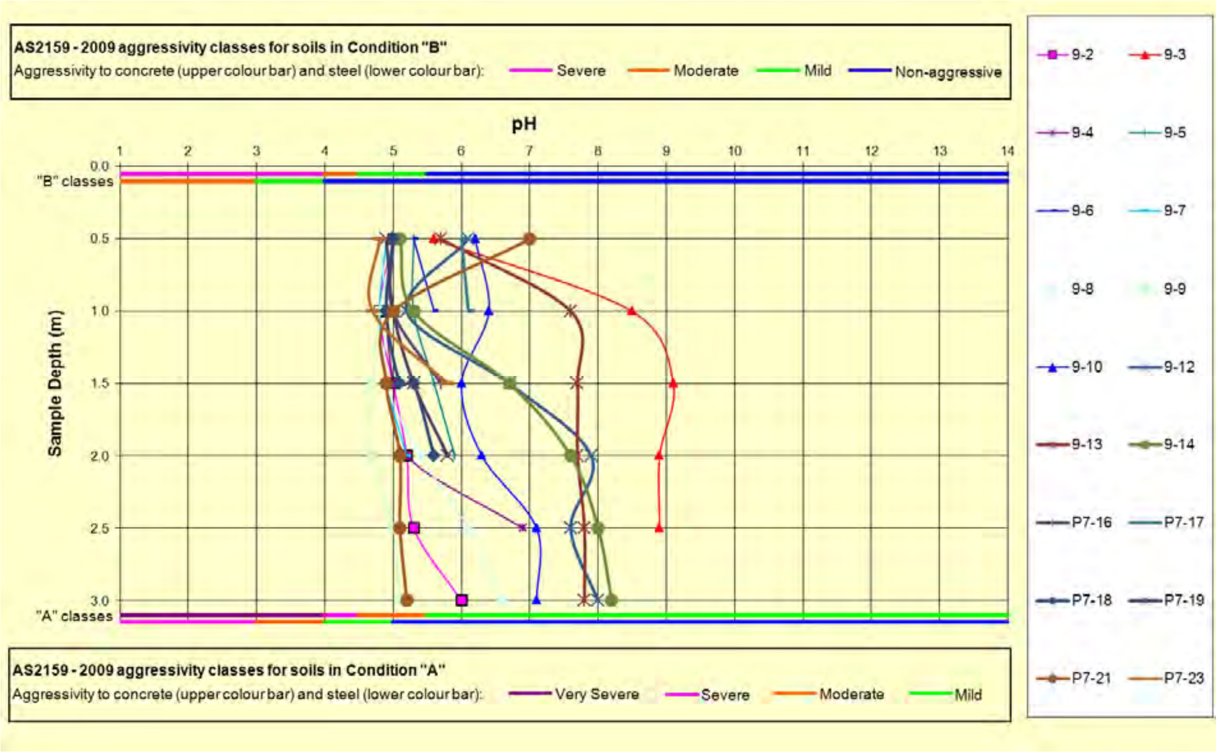

Figure 1: Vertical pH Profiles and Aggressivity Classes

The Summary Table also indicates that 48 % of all samples were non-aggressive to concrete, 51 % were mildly aggressive and 1 % (1 sample) were moderately aggressive.

The worst case results for each test pit were used to define approximate areas which are non-aggressive (pH > 5.5), mildly aggressive (pH 4.5 – 5.5) and moderately aggressive (pH 4.0 – 4.5) to concrete foundations and piles, represented by colour zones on Drawing 3 (Appendix A).

Calculated soil resistivities indicated higher aggressivities to steel than were indicated by pH measurements. The worst case results for each test pit were used to define approximate areas which are non-aggressive, mildly aggressive and moderately aggressive to steel piles, represented by colour zones on Drawing 4 (Appendix A).

7.2 Salinity

Figure 2 (below) presents the variations of salinity with depth, based on salinity (ECe) profiles at all test pit locations, together with the salinity classifications of Richards (1954).

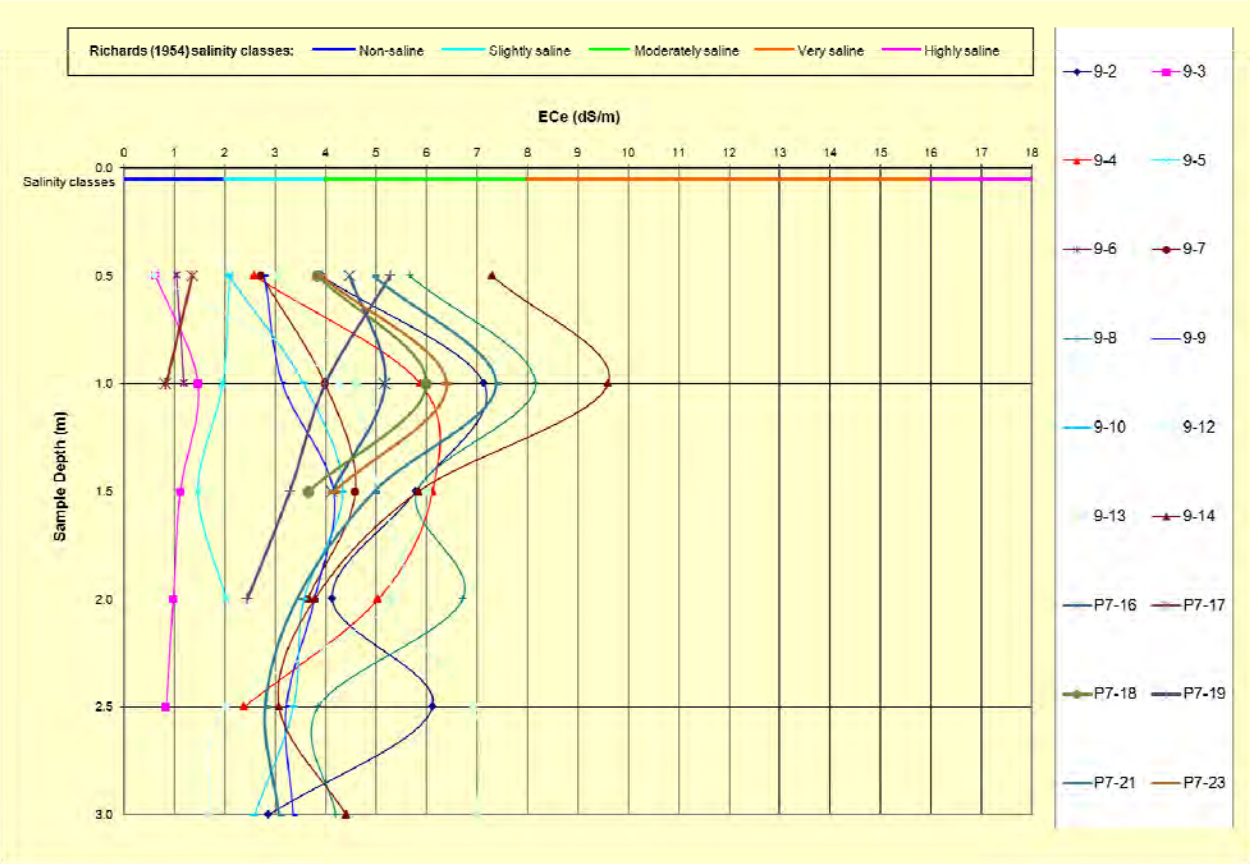

Figure 2: Vertical Salinity Profiles and Salinity Classes

The Summary Table (Appendix D) indicates that 14% of all soil samples were non-saline, 36% were slightly saline, 48% were moderately saline and 2% (2 samples) were very saline.

As for soil aggressivity, worst case ECe values were interpolated and contoured to define areas of non-saline (ECe < 2 dS/m), slightly saline (ECe 2 – 4 dS/m), and moderately saline (ECe 4 – 8 dS/m) soil (see Drawing 5, Appendix A). Note that the very saline soil samples were obtained at depths of 1.0 m below current ground level in areas that are proposed to be filled to depths in excess of 1.25 m. “Worst case” mapping does not lead to classification of these areas as very saline.

7.3 Sodicity

The sodicity test reported in the Summary Table shows sodic to highly sodic soils, indicating some potential for erodability of soils left exposed.

8. Impact of the Site Materials on the Proposed Development

The mild to moderate aggressivity to concrete and steel, the presence of moderately saline to very saline materials and the sodic to highly sodic soils are naturally occurring features of the local landscape and are not considered significant impediments to the proposed development, provided appropriate remediation or management techniques are employed.

Salinity and aggressivity affect the durability of concrete and steel by causing premature breakdown of concrete and corrosion of steel. This has impacts on the longevity of structures in contact with these materials. As a result management will be required (refer Section 9).

Sodic soils have low permeability due to infilling of interstices with fine clay particles during the weathering process, restricting infiltration of surface water and potentially creating perched water tables, seepage in cut faces or ponding of water in flat open areas. In addition, sodic soils tend to erode when exposed. Management of sodic soils is therefore required to prevent these adverse affects.

9. Salinity Management Plan

The current salinity investigation indicates that materials within the site are non-saline to moderately saline. Testing of other parameters associated with salinity indicates that the materials are mildly to moderately aggressive to concrete and steel within the site. In addition, shallow soils were sodic to highly sodic.

The following management strategies are confined to the management of those factors with a potential to impact on the development.

A. Management should focus on capping of the upper surface of the sodic soils, both exposed by excavation and placed as filling, with a more permeable material to prevent ponding, to reduce capillary rise, to act as a drainage layer and to reduce the potential for erosion.

B. With respect to any imported fill material, testing should be undertaken prior to importation, to determine the salinity characteristics of the material, which should be non-aggressive and non-saline where possible but in any case not more aggressive or more saline than the material on which it is to be placed.

C. Sodic soils can also be managed by maintaining vegetation where possible and planting new salt tolerant species. The addition of organic matter, gypsum and lime can also be considered where appropriate. After gypsum addition, reduction of sodicity levels may require some time for sufficient infiltration and leaching of sodium into the subsoils, however capping of exposed sodic material should remain the primary management method. Topsoil added at the completion of bulk earthworks is, in effect, also adding organic matter which may help infiltration and leaching of sodium.

D. Avoid water collecting in low lying areas, in depressions, or behind fill. This can lead to water logging of the soils, evaporative concentration of salts, and eventual breakdown in soil structure resulting in accelerated erosion.

E. Any pavements should be designed to be well drained of surface water. There should not be excessive concentrations of runoff or ponding that would lead to waterlogging of the pavement or additional recharge to the groundwater through any more permeable zones in the underlying filling material.

F. Surface drains should generally be provided along the top of batter slopes to reduce the potential for concentrated flows of water down slopes possibly causing scour.

The following additional strategies are recommended for completion of service installation and for house construction. These strategies should be complementary to standard good building practices recommended within the Building Code of Australia, including cover to reinforcement within concrete and correct installation of a brick damp course, so that it cannot be bridged to allow moisture to move into brick work and up the wall.

G. Where soils are classified as non-aggressive to concrete (refer Drawing 3), piles should nevertheless have a minimum strength of 32 MPa and a minimum cover to reinforcement of 45 mm (as per AS2159).

H. Where soils are classified as mildly aggressive to concrete (refer Drawing 3), piles should have a minimum strength of 32 MPa and a minimum cover to reinforcement of 60 mm (as per AS2159) to limit the corrosive effects of the surrounding soils (in accordance with AS2159).

I. Where soils are classified as moderately aggressive to concrete (refer Drawing 3), piles should have a minimum strength of 40 MPa and a minimum cover to reinforcement of 65 mm (as per AS2159) to limit the corrosive effects of the surrounding soils (in accordance with AS2159).

J. With regard to concrete structures, for non-saline and slightly saline soils (with salinities less than 4 dS/m) (refer Drawing 5):

    - Where soils are classified as non-aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 20 MPa, and should be allowed to cure for a minimum of three days (as per AS3600) to limit the corrosive effects of the surrounding soils; and
    - Where soils are classified as mildly aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 25 MPa, and should be allowed to cure for a minimum of three days (as per AS3600) to limit the corrosive effects of the surrounding soils;
    - Where soils are classified as moderately aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 32 MPa, and should be allowed to cure for a minimum of seven days (as per AS3600) to limit the corrosive effects of the surrounding soils.

K. With regard to concrete structures, for moderately saline soils with salinities of 4 – 8 dS/m (refer Drawing 5);

    - Where soils are classified as non-aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 25 MPa, a minimum cover to reinforcement of 45 mm from unprotected ground and should be allowed to cure for a minimum of three days (as per AS3600) to limit the corrosive effects of the surrounding soils; and
    - Where soils are classified as mildly aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 25 MPa, a minimum cover to reinforcement of 45 mm from unprotected ground and should be allowed to cure for a minimum of three days (as per AS3600) to limit the corrosive effects of the surrounding soils;

- Where soils are classified as moderately aggressive to concrete (refer Drawing 3), slabs and foundations should have a minimum strength of 32 MPa, a minimum cover to reinforcement of 45 mm from unprotected ground and should be allowed to cure for a minimum of seven days (as per AS3600) to limit the corrosive effects of the surrounding soils.

L. Any future installation of concrete pipes up to a maximum diameter of 750 mm, within the site, should employ fibre reinforced cement. Alternatively, concrete pipes in these areas should be encased in outer PVC conduits or should have a minimum equivalent strength as defined in I and J above.

M. Concrete pipes with a larger diameter than 750 mm should utilise sulphate resistant cement.

N. Resistivity results indicate the materials are mildly aggressive to moderately aggressive to steel. The following corrosion allowances (as per AS 2159 – 2009) should be taken into account by the designer:

- Mild: uniform corrosion allowance 0.01 – 0.02 mm/year.
- Moderate: uniform corrosion allowance 0.02 – 0.04 mm/year.

In instances where a coating is applied to the pile, if the design life of the pile is greater than the design life for the coating, consideration must be given to corrosion of the pile in accordance with the above list.

10. Additional Recommendations and Conclusion

Additional investigation should be undertaken in development areas which are to be excavated deeper than 3 m, where direct sampling and testing of salinity has not been carried out. Salinity management strategies herein may need to be modified or extended following additional investigations by deep test pitting and/or drilling, sampling and testing for soil and water pH, electrical conductivity, TDS, sodicity, sulphates and chlorides.

This SMP is based on the bulk earthworks plan supplied by Stockland (Cardno Drawing No. 600319-SK1372 Revision 1 dated 17 June 2014). Subsequent revisions to this plan must be reviewed by DP to assess the applicability of the SMP to the revised design. Such a review must be in writing and must be attached to copies of this report. Substantial changes to the proposed cut and fill on the Site are likely to require additional testing or alterations of the drawings.

It is considered that the management strategies described herein when incorporated into the design and construction works are appropriate to mitigate the levels of salinity, aggressivity and sodicity identified at the site.

11. References:

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- Cement, Concrete and Aggregates, Australia 2005, *Guide to Residential Slabs and Footings in a Saline Environment, Introduction to Urban Salinity*.
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- DNR 2002, *Site Investigations for Urban Salinity* (now managed by DPI).
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- DNR 2004, *Urban Salinity Processes* (now managed by DPI).
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- McNally, G. 2005, *Investigation of Urban Salinity – Case Studies from Western Sydney, Urban Salt 2005 Conference Paper*, Parramatta.
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- Spies, B. and Woodgate, P. 2004, *Technical Report Salinity Mapping Methods in the Australian Context*, Natural Resource Management Ministerial Council.
- Standards Australia 1995, AS 2159 – 2009 *Piling Design and Installation*.
- Standards Australia 1996, AS 2870 – 1996 *Residential Slabs and Footings*.

12. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at Precinct 9, East Leppington. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Stockland Development Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

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

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

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

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

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

Douglas Partners Pty Ltd

Appendix A

About this Report
Drawings 1 to 5

About this Report

Introduction

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

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

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

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

Sampling

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

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

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

Test Pits

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

Large Diameter Augers

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

Continuous Spiral Flight Augers

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

Non-core Rotary Drilling

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

Continuous Core Drilling

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

Standard Penetration Tests

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

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

The test results are reported in the following form.

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

  4,6,7
  N=13

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

  15, 30/40 mm

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

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

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

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

Symbols & Abbreviations

Douglas Partners

Introduction

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

Drilling or Excavation Methods

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

Water

▷	Water seep
▽	Water level

Sampling and Testing

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

Description of Defects in Rock

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

Defect Type

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

Orientation

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

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

Coating or Infilling Term

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

Coating Descriptor

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

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

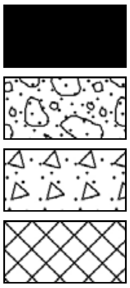
fg	fragmented
bnd	band
qtz	quartz

July 2010

Symbols & Abbreviations

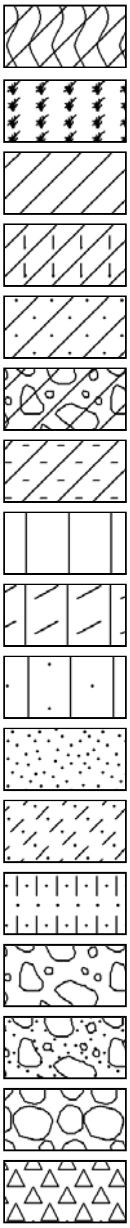
Graphic Symbols for Soil and Rock

General



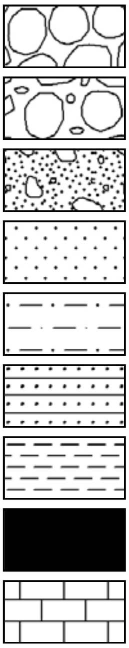
- Asphalt
- Road base
- Concrete
- Filling

Soils



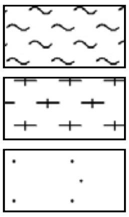
- Topsoil
- Peat
- Clay
- Silty clay
- Sandy clay
- Gravelly clay
- Shaly clay
- Silt
- Clayey silt
- Sandy silt
- Sand
- Clayey sand
- Silty sand
- Gravel
- Sandy gravel
- Cobbles, boulders
- Talus

Sedimentary Rocks



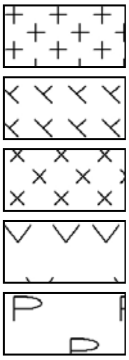
- Boulder conglomerate
- Conglomerate
- Conglomeratic sandstone
- Sandstone
- Siltstone
- Laminite
- Mudstone, claystone, shale
- Coal
- Limestone

Metamorphic Rocks



- Slate, phyllite, schist
- Gneiss
- Quartzite

Igneous Rocks



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

Soil Descriptions

Douglas Partners

Description and Classification Methods

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

Soil Types

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

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

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

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

The proportions of secondary constituents of soils are described as:

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

Definitions of grading terms used are:

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

Cohesive Soils

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

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

Cohesionless Soils

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

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

Soil Descriptions

Soil Origin

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

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

Transported soils may be further subdivided into:

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

Rock Descriptions

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 1993. The terms used to describe rock strength are as follows:

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

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$

Degree of Weathering

The degree of weathering of rock is classified as follows:

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

Degree of Fracturing

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

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

Rock Descriptions

Rock Quality Designation

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

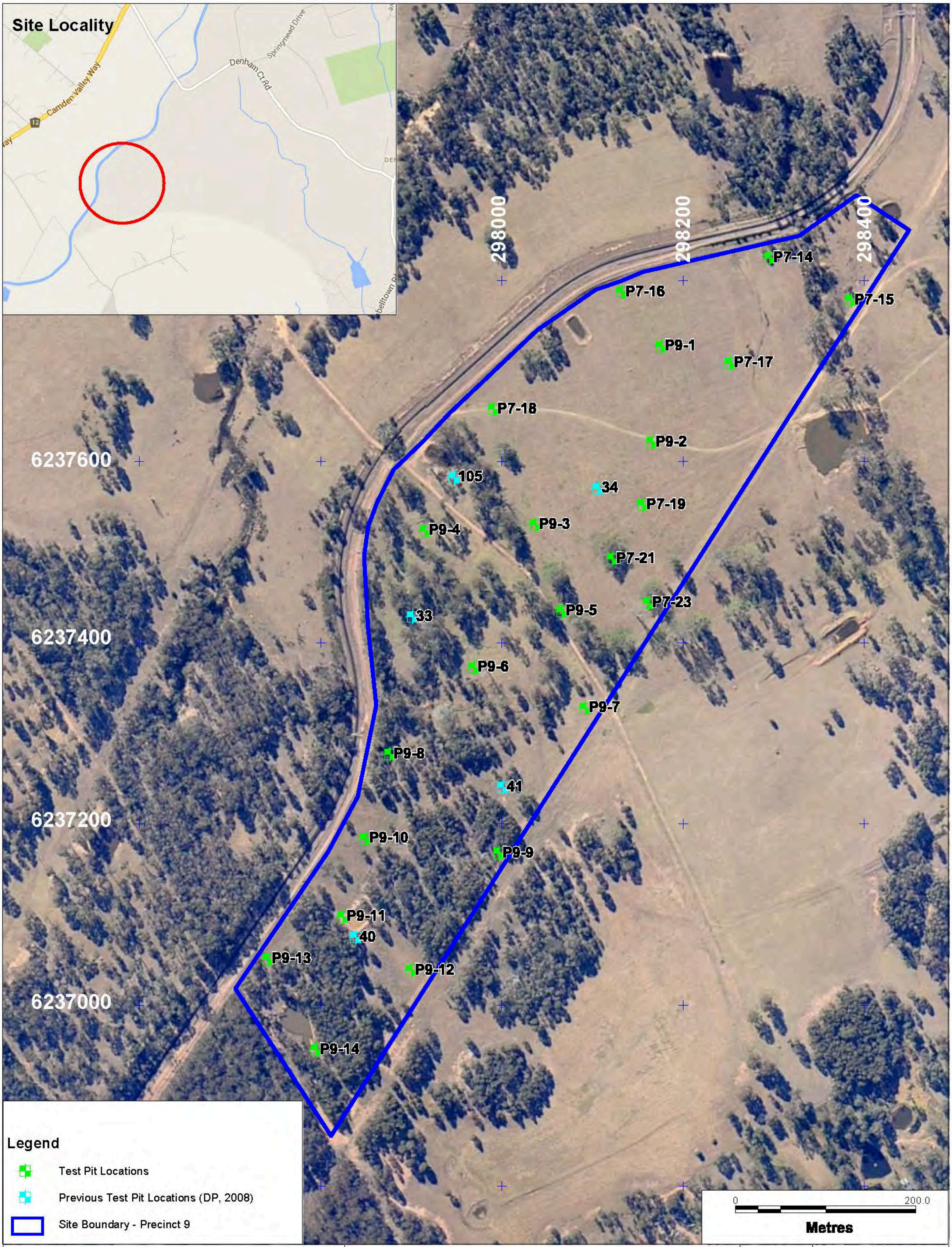
$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

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

Stratification Spacing

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

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



Legend

🟩	Test Pit Locations
🟦	Previous Test Pit Locations (DP, 2008)
▭	Site Boundary - Precinct 9

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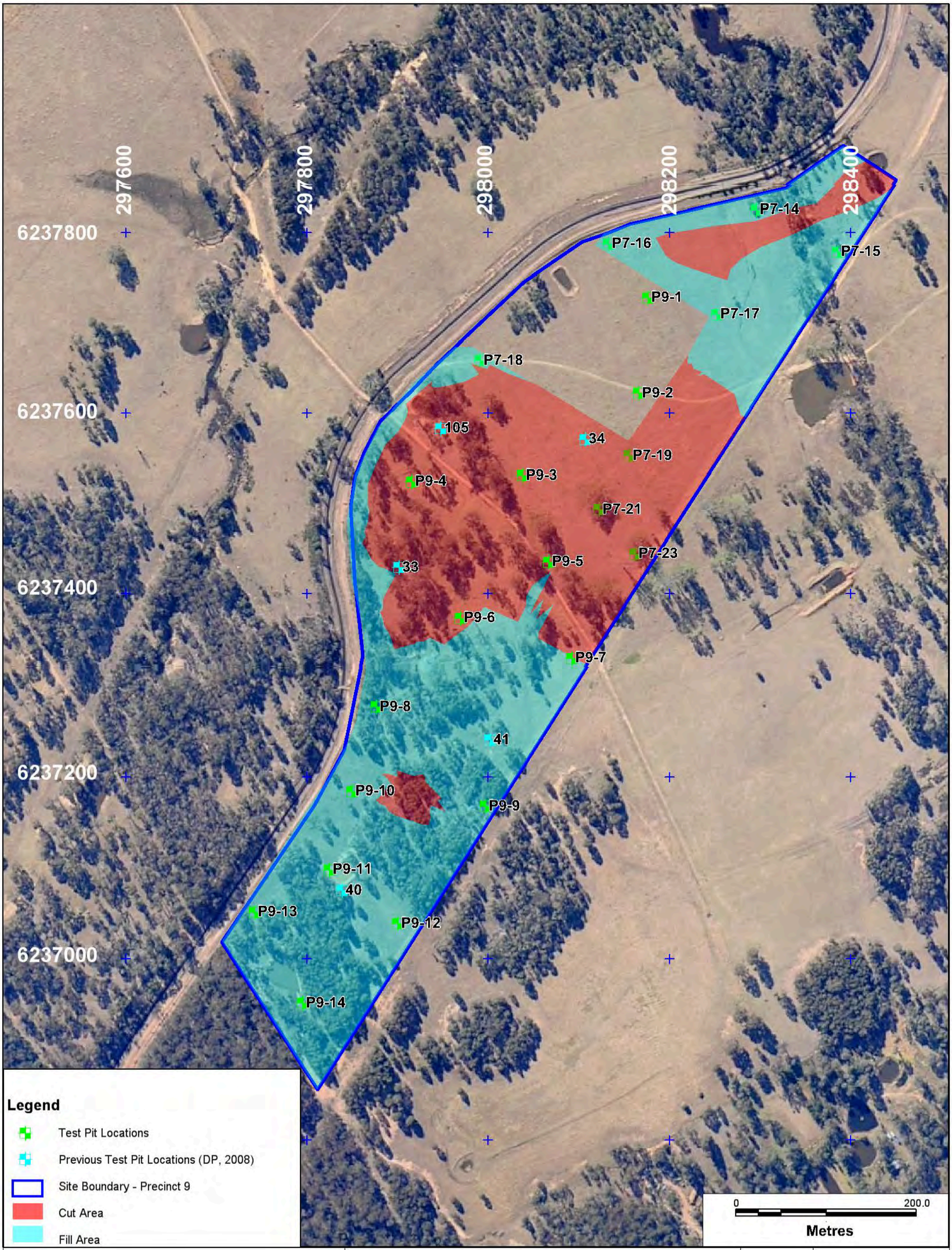
TITLE: Site Boundary and Test Pit Locations
Salinity Investigation and Management Plan
Precinct 9, East Leppington

N
MGA

OFFICE: Macarthur
DRAWN BY: MJC
DATE: 10.12.2014

CLIENT: Stockland Development Pty Ltd
PROJECT No: 76611.02
DRAWING No: 1
REVISION: B
SCALE: As shown



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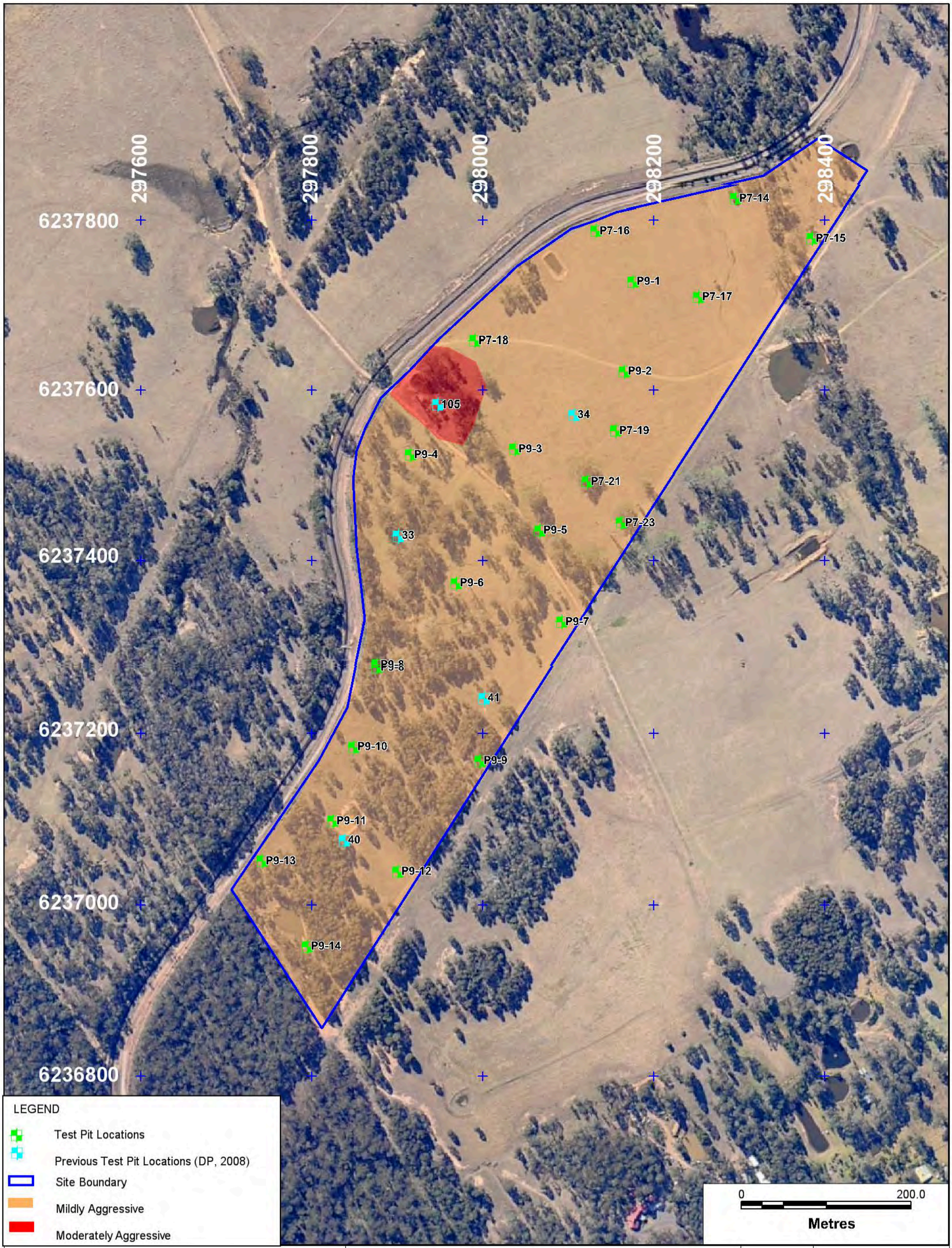
TITLE: Cut and Fill Areas
Salinity Investigation and Management Plan
Precinct 9, East Leppington

MGA

OFFICE: Macarthur
DRAWN BY: MJC
DATE: 10.12.2014

CLIENT: Stockland Development Pty Ltd
PROJECT No: 76611.02
DRAWING No: 2
REVISION: B
SCALE: As shown



Douglas Partners
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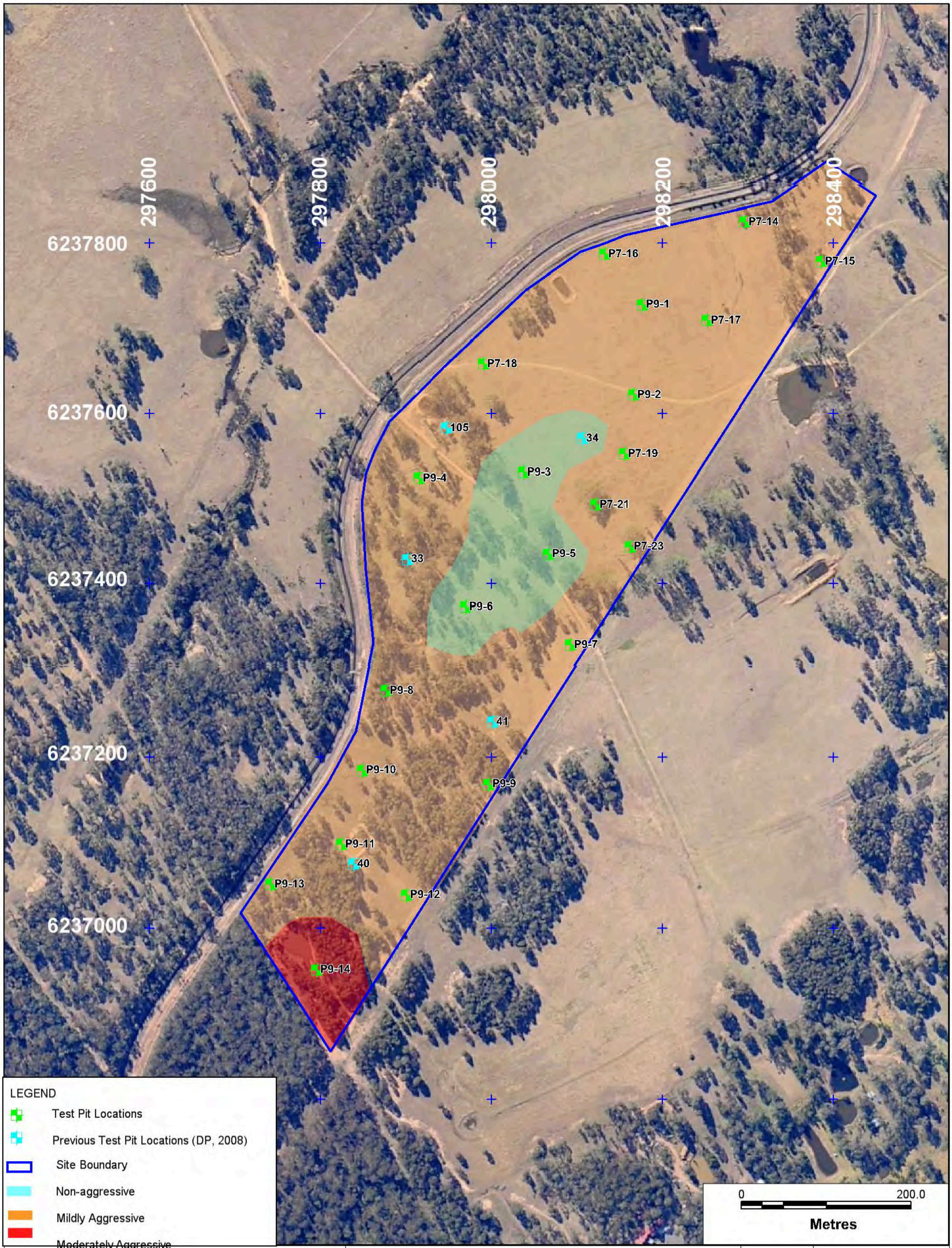
TITLE: Aggressivity to Concrete Foundations and Piles
Salinity Investigation and Management Plan
Precinct 9, East Leppington

OFFICE: Macarthur
DRAWN BY: MJC
DATE: 10.12.2014

CLIENT: Stockland Development Pty Ltd
PROJECT No: 76611.02
DRAWING No: 3
REVISION: B
SCALE: As shown

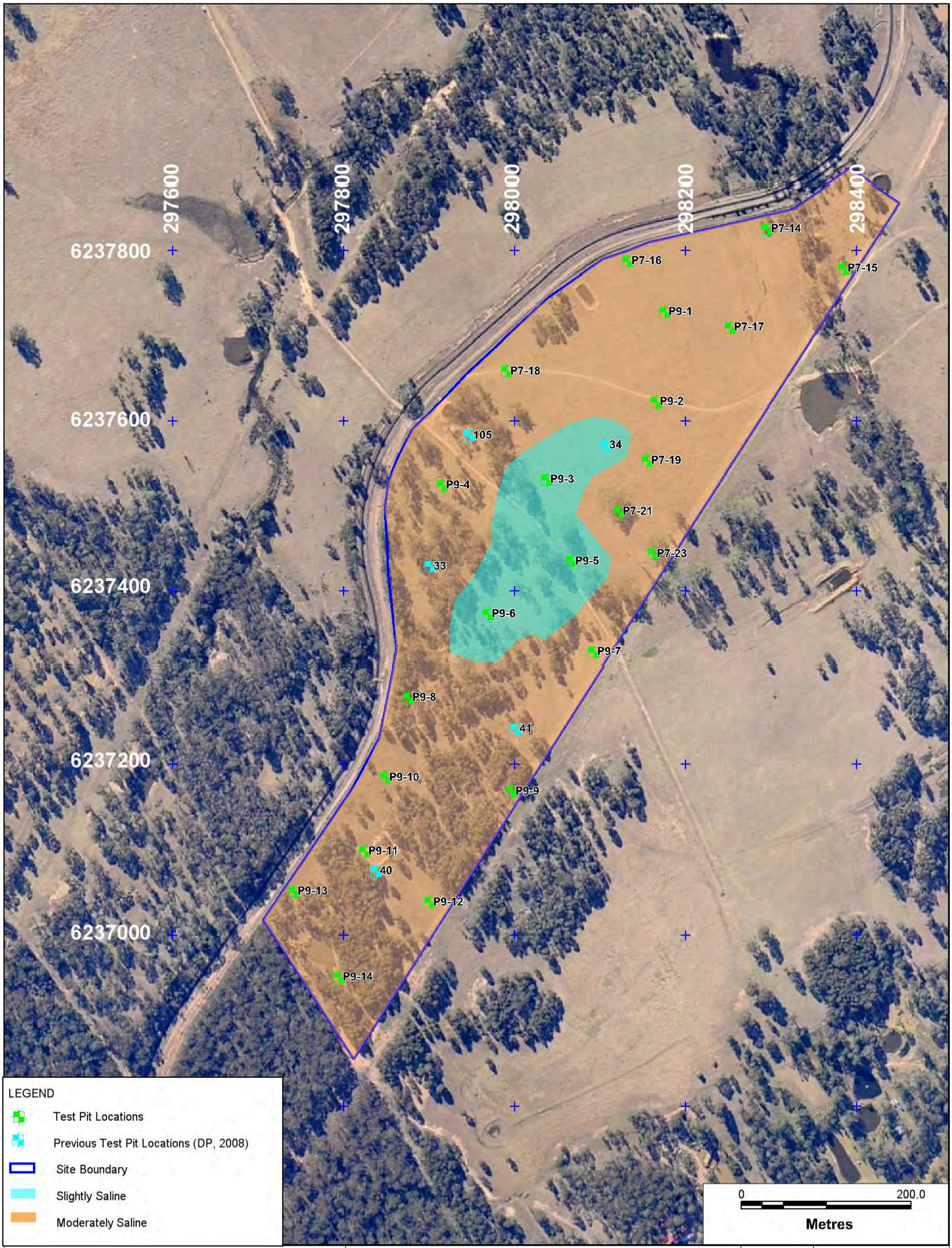


Douglas Partners
Geotechnics | Environment | Groundwater

TITLE: Aggressivity to Steel below Proposed Surface
Salinity Investigation and Management Plan
Precinct 9, East Leppington

OFFICE: Macarthur
DRAWN BY: MJC
DATE: 10.12.2014

CLIENT: Stockland Development Pty Ltd
PROJECT No: 76611.02
DRAWING No: 4
REVISION: B
SCALE: As shown



Douglas Partners
Geotechnics | Environment | Groundwater

TITLE: Salinity within Foundation Depths
Salinity Investigation and Management Plan
Precinct 9, East Leppington

N
MGA

OFFICE: Macarthur
DRAWN BY: MJC
DATE: 10.12.2014

CLIENT: Stockland Development Pty Ltd
PROJECT No: 76611.02
DRAWING No: 5
REVISION: B
SCALE: As shown

Appendix B

Test Pit Logs

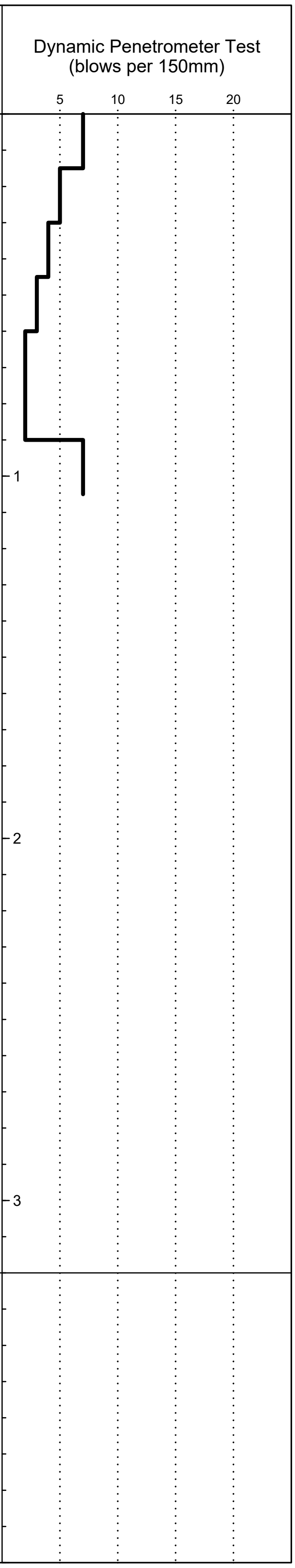
TEST PIT LOG

CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 99.5 mAHD
EASTING: 298175
NORTHING: 6237727

PIT No: 9-1
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		TOPSOIL - light brown silt with some clay and rootlets		D*	0.1 0.2			
	0.15	SILT - very stiff, light brown silt with trace rootlets						
	0.3	SILTY CLAY - stiff to very stiff, brown mottled orange silty clay with trace (ironstone) gravel, mc<pl		D D	0.4 0.5			
99								
	1	- becoming grey mottled red below 1.0m		D	1.0			
98				D	1.5			
		- becoming very stiff to hard with some very low strength red shale bands below 1.8m						
	2			D	2.0			
	2.2	SHALE - low strength, highly weathered, grey shale with trace silty clay banding						
97				D	2.5			
		- becoming low to medium strength, moderately weathered below 2.8m						
	3			D	3.0			
	3.2	Pit discontinued at 3.2m - limit of investigation						
96								



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD1/131014 collected

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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Geotechnics / Environment / Groundwater

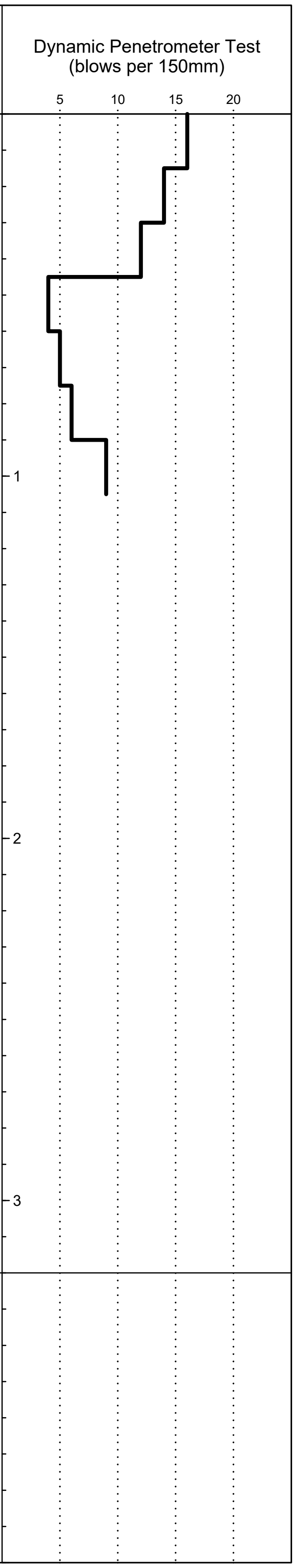
TEST PIT LOG

CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 102.3 mAHD
EASTING: 298166
NORTHING: 6237623

PIT No: 9-2
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

Depth (m)	Description of Strata	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
0.0–0.15	TOPSOIL - light brown silt with some clay and rootlets	D	0.1–0.2			
0.15–0.3	SILT - hard, light brown silt with trace rootlets					
0.3–2.6	SILTY CLAY - stiff to very stiff, red mottled grey silty clay, mc~pl	D D	0.4–0.5 0.5			
	- becoming very stiff to hard, grey mottled red with some fine grained (ironstone) gravel below 1.0m	D D D	1.0 1.5 2.0			
	- with some very low strength red shale bands below 2.4m	D	2.5			
2.6–3.2	SHALE - low to medium strength, moderately weathered, grey and brown shale	D	3.0			
3.2	Pit discontinued at 3.2m - limit of investigation					



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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TEST PIT LOG

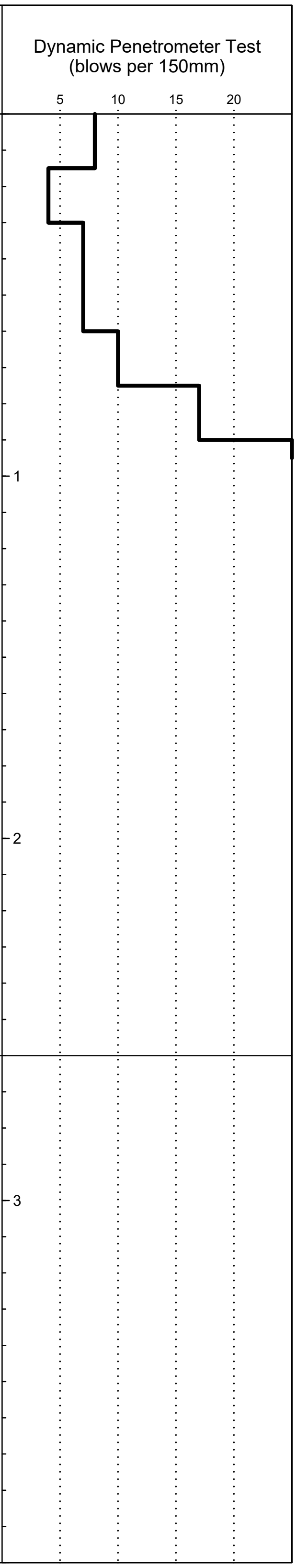
CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 105.3 mAHD
EASTING: 298039
NORTHING: 6237532

PIT No: 9-3
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		TOPSOIL - light brown and orange silt with some clay	D	0.1 0.2			
	0.15	SILT - very stiff, light brown and orange silt					
105	0.3	SILTY CLAY - very stiff to hard, red mottled orange silty clay, mc~pl	D D UU_{50}	0.4 0.5			
	0.9	SANDSTONE - extremely low to very low strength, extremely weathered, grey sandstone with some sandy clay banding	 D	0.9 1.0			
104			D	1.5			
	1.9	SHALE - low strength, highly weathered, dark grey shale with trace silty clay banding	D	2.0			
103		- becoming low to medium strength, moderately weathered below 2.4m	D	2.5			
	2.6	Pit discontinued at 2.6m - refusal in low to medium strength shale					
102							

Dynamic Penetrometer Test (blows per 150mm)



RIG: JCB 4WD backhoe - 450mm bucket **LOGGED:** MJC **SURVEY DATUM:** MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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Geotechnics / Environment / Groundwater

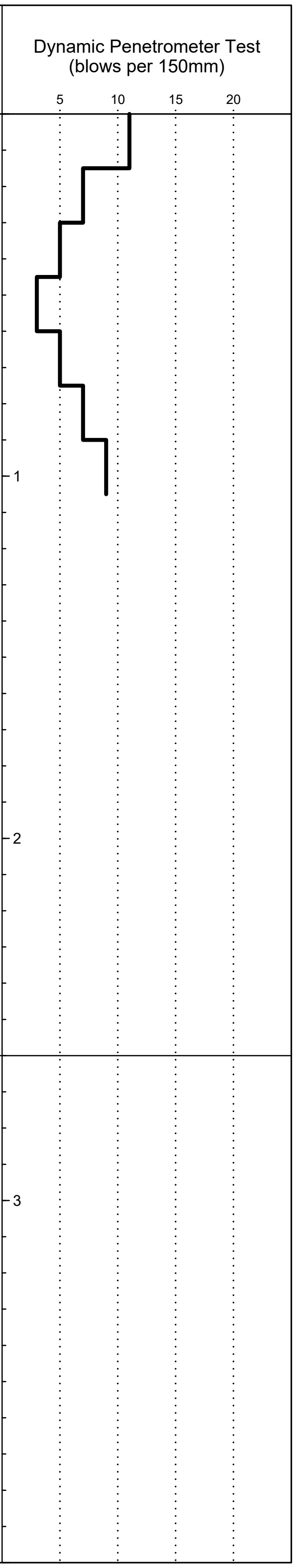
TEST PIT LOG

CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 102.0 mAHD
EASTING: 297915
NORTHING: 6237526

PIT No: 9-4
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Sampling & In Situ Testing Type	Depth	Sample	Results & Comments	Water
102		TOPSOIL - light brown silt with some clay and rootlets	D	0.1 0.2			
	0.2	SILTY CLAY - stiff to very stiff, red mottled orange silty clay with trace (ironstone) gravel, mc<pl	D D/B	0.4 0.5			
		- becoming grey below 0.8m					
101	1		D	1.0			
		- becoming very stiff to hard with some very low strength shale bands below 1.5m	D	1.5			
	1.8	SHALE - low to medium strength, moderately weathered, dark grey shale with trace silty clay banding					
100	2		D	2.0			
			D	2.5			
	2.6	Pit discontinued at 2.6m - refusal in low to medium strength shale					
99	3						



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

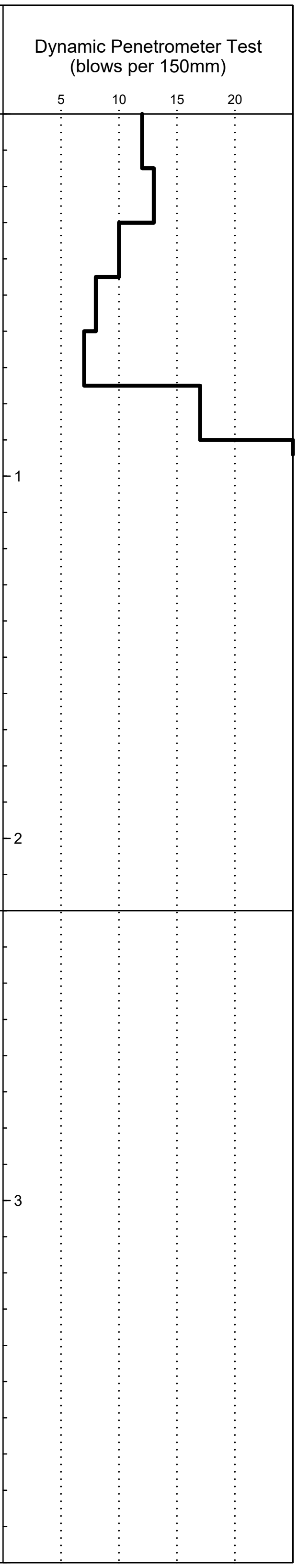
TEST PIT LOG

CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 108.5 mAHD
EASTING: 298066
NORTHING: 6237436

PIT No: 9-5
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
	0.2	TOPSOIL - light brown silt with some clay and rootlets	D	0.1 0.2			
108	0.9	SILTY CLAY - very stiff to hard, orange and brown mottled red silty clay with trace sand, mc<pl	D D	0.4 0.5			
107	1.8	SANDSTONE - extremely low to very low strength, extremely weathered, light grey and red sandstone with some sandy silty clay banding	D D	1.0 1.5			
	2.2	SHALE - low to medium strength, moderately weathered, red and grey shale	D	2.0			
106 105		Pit discontinued at 2.2m - refusal in low to medium strength shale					



RIG: JCB 4WD backhoe - 450mm bucket
LOGGED: MJC
SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

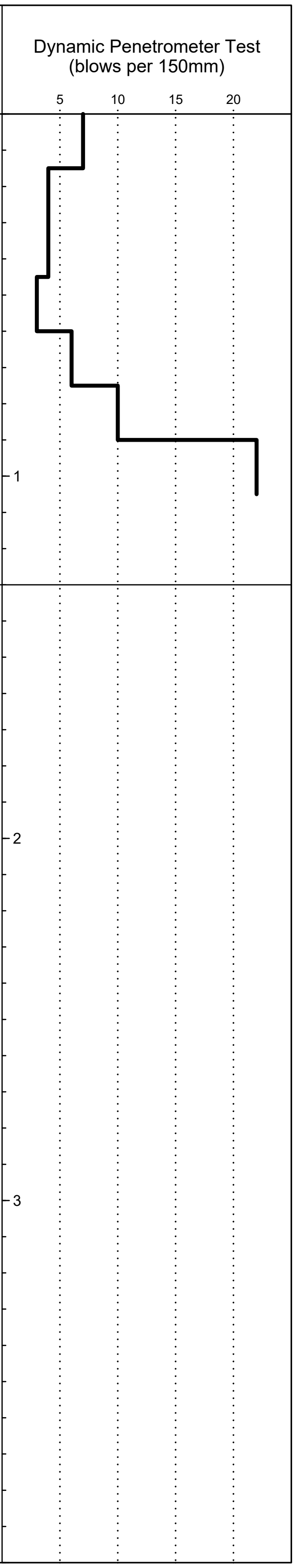
TEST PIT LOG

CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 104.3 mAHD
EASTING: 297969
NORTHING: 6237375

PIT No: 9-6
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		TOPSOIL - light brown silt with some rootlets	D	0.1 0.2			
	0.15	SILT - stiff, light brown silt with trace rootlets					
104	0.3	SILTY CLAY - stiff to very stiff, red mottled orange silty clay with trace (ironstone) gravel, mc<pl	D D U₅₀	0.4 0.5 0.9			
	1.0	SANDSTONE - low to medium strength, grey sandstone with some silty clay banding	D	1.0			
103	1.3	Pit discontinued at 1.3m - refusal in low to medium strength sandstone					



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

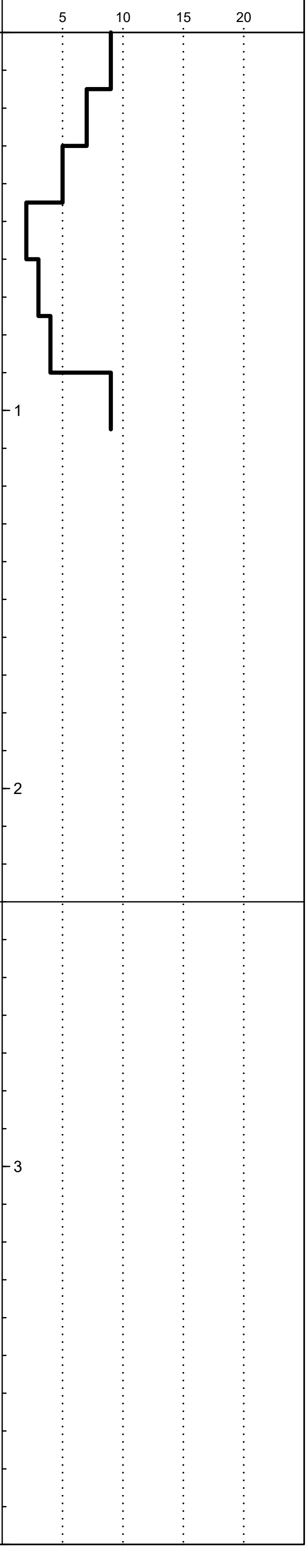
CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 107.3 mAHD
EASTING: 298092
NORTHING: 6237330

PIT No: 9-7
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		TOPSOIL - light brown and grey silt with some clay		D	0.1 0.2			
107	0.2	SILTY CLAY - stiff to very stiff, red mottled orange silty clay, mc~pl		D D	0.4 0.5			
	1	- becoming mottled grey, mc<pl below 1.0m		B D	1.0			
106		- becoming very stiff to hard with some very low strength red shale bands below 1.2m		D	1.5			
	1.8	SHALE - low to medium strength, moderately weathered, red and grey shale with some silty clay banding		D	2.0			
105	2.3	Pit discontinued at 2.3m - refusal in low to medium strength shale						
	3							
104								

Dynamic Penetrometer Test (blows per 150mm)



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

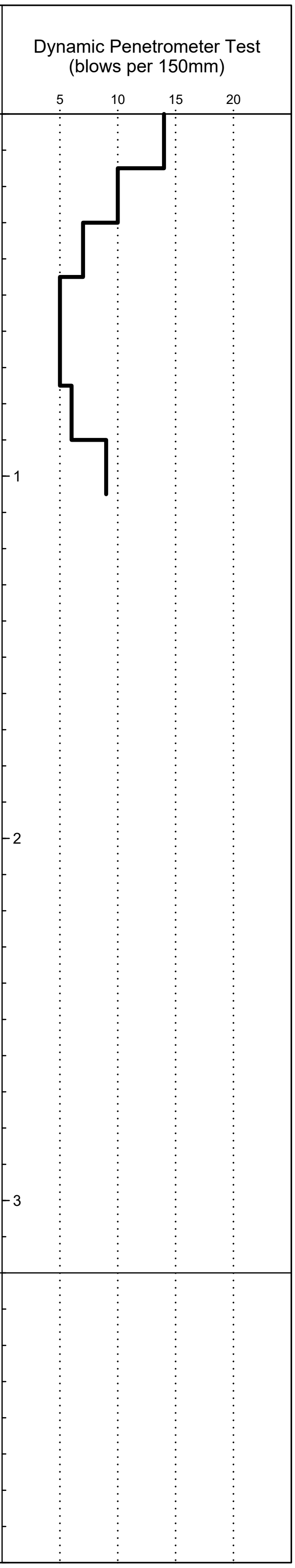
TEST PIT LOG

CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 101.3 mAHD
EASTING: 297886
NORTHING: 6237279

PIT No: 9-8
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water
				Type	Depth	Sample	Results & Comments	
		FILLING - dark brown silt with roots and rootlets and trace clay		D	0.1 0.2			
101								
	0.4	SILT - stiff, light brown and orange silt with some silty clay (possible former topsoil)		D D	0.4 0.5			
	0.6	SILTY CLAY - stiff to very stiff, red mottled orange silty clay with trace (ironstone) gravel, mc<pl		B	0.8			
	1	- becoming grey below 1.0m		D	1.0			
100								
		- becoming very stiff to hard below 1.5m		D	1.5			
	2			D	2.0			
99								
		- with some very low strength shale bands below 2.5m		D	2.5			
	3			D	3.0			
	3.2	Pit discontinued at 3.2m - limit of investigation						
98								



RIG: JCB 4WD backhoe - 450mm bucket
LOGGED: MJC
SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Localised fill mound (3m x 3m)

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

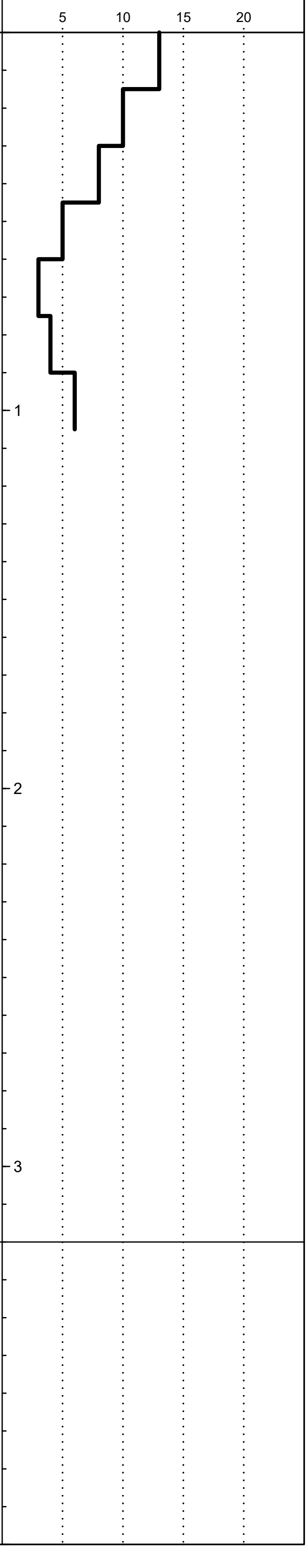
CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 107.0 mAHD
EASTING: 297997
NORTHING: 6237170

PIT No: 9-9
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Type	Depth	Sample	Results & Comments	Water
107		TOPSOIL - light brown and grey silt with trace clay					
			D	0.1 0.2			
	0.15	SILT - hard, light brown and grey silt					
	0.3	SILTY CLAY - stiff to very stiff, red mottled grey silty clay with trace (ironstone) gravel, mc<pl					
			D	0.4 0.5			
			D	0.5 0.8			
106	1		U$_{50}$ D	1.0 1.2			
			D/B	1.5			
	1.8	SHALE - low strength, highly weathered, red and grey shale with some silty clay banding					
105	2		D	2.0			
	2.2	SANDSTONE - very low to low strength, highly weathered, grey and red sandstone with trace sandy clay banding					
			D	2.5			
104	3		D	3.0			
	3.2	Pit discontinued at 3.2m - limit of investigation					

Dynamic Penetrometer Test
(blows per 150mm)



RIG: JCB 4WD backhoe - 450mm bucket
LOGGED: MJC
SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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TEST PIT LOG

CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

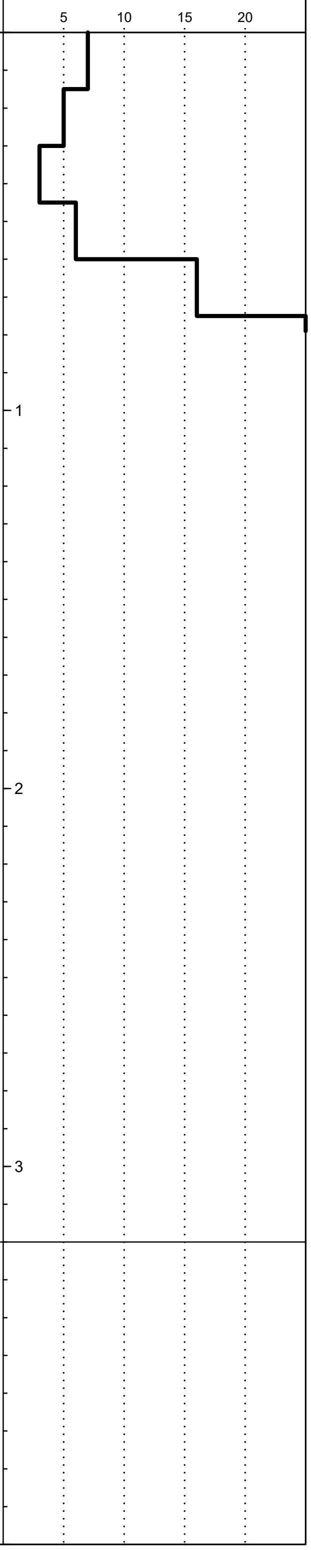
SURFACE LEVEL: 103.0 mAHD
EASTING: 297848
NORTHING: 6237186

PIT No: 9-10
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata
103	0.0	TOPSOIL - brown silt with some clay
	0.15	SILT - stiff, brown silt
	0.3	SILTY CLAY - very stiff to hard, orange mottled red silty clay with trace (ironstone) gravel, mc<pl
102	1	
		- becoming very stiff to hard below 1.2m
	1.8	SHALE - very low to low strength, highly weathered, grey and red shale with some silty clay banding
101	2	
		- becoming low to medium strength, moderately weathered below 2.8m
100	3	
	3.2	Pit discontinued at 3.2m - limit of investigation

Sampling & In Situ Testing				
Type	Depth	Sample	Results & Comments	Water
D	0.1 0.2			
D	0.4 0.5			
D	0.5			
D	1.0			
D	1.5			
D	2.0			
D	2.5			
D	3.0			

Dynamic Penetrometer Test (blows per 150mm)



RIG: JCB 4WD backhoe - 450mm bucket
LOGGED: MJC
SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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TEST PIT LOG

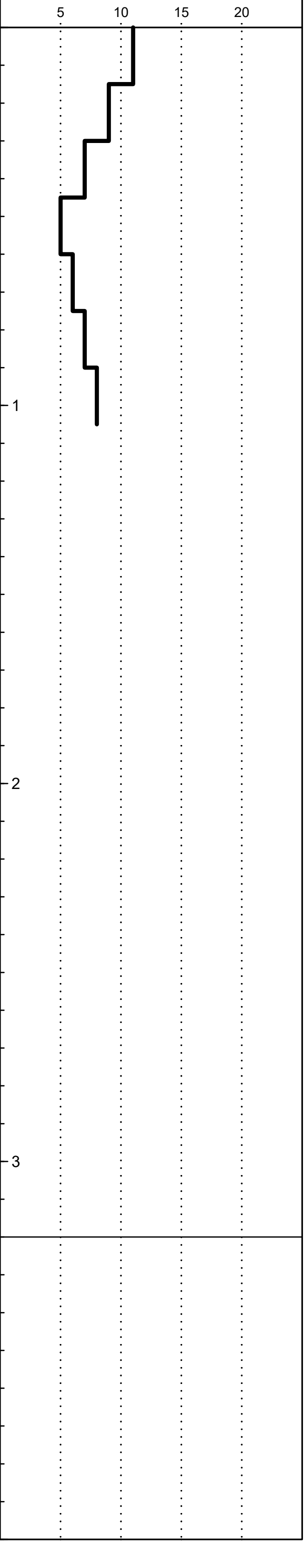
CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 102.5 mAHD
EASTING: 297826
NORTHING: 6237099

PIT No: 9-11
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		FILLING - light brown silt with some clay, roots and rootlets (possible reworked natural)		D	0.1 0.2			
				D	0.4 0.5			
102				D	0.5			
	0.7	SILTY CLAY - very stiff, red mottled brown and grey silty clay with trace (ironstone) gravel, mc<pl		D	0.9 1.0			
	1			D	1.0			
		- becoming grey mottled red below 1.2m						
101				D	1.5			
		- becoming very stiff to hard below 1.8m						
	2			D	2.0			
100				D	2.5			
		- with some very low strength shale bands below 2.5m						
	2.8	SHALE - low to medium strength, moderately weathered, grey shale with trace silty clay banding						
	3			D	3.0			
	3.2	Pit discontinued at 3.2m - limit of investigation						
99								

Dynamic Penetrometer Test (blows per 150mm)



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Dam embankment

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

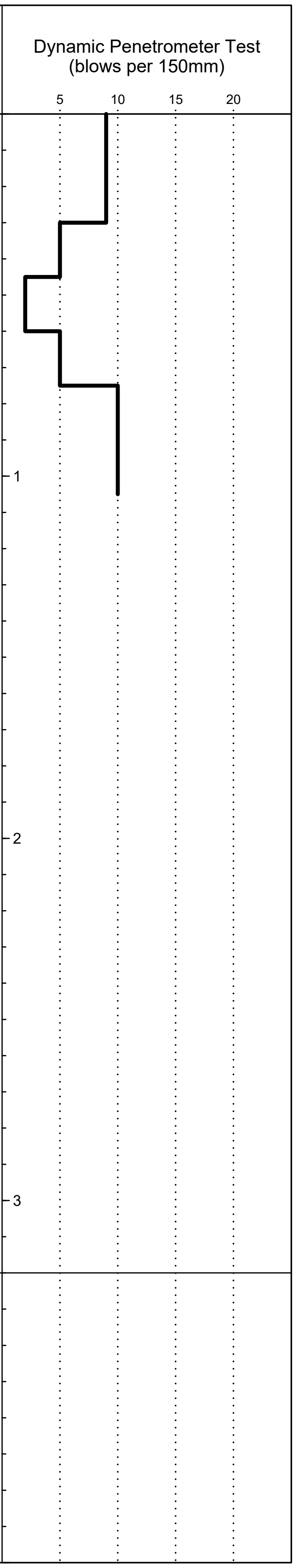
TEST PIT LOG

CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 103.8 mAHD
EASTING: 297900
NORTHING: 6237040

PIT No: 9-12
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		TOPSOIL - dark brown silt and clay with rootlets		D	0.1 0.2			
	0.2	SILT - light grey silt with trace clay						
103 102	0.4 1 2	SILTY CLAY - stiff to very stiff, orange mottled brown silty clay, mc<pl - becoming very stiff below 0.8m - becoming very stiff to hard with some extremely low to very low strength shale bands below 2.0m		D D/B D D D	0.4 0.5 1.0 1.5 2.0			
101	2.2 3	SHALE - very low to low strength, highly weathered, grey and brown shale with some silty clay banding		D D	2.5 3.0			
100	3.2	Pit discontinued at 3.2m - limit of investigation						



RIG: JCB 4WD backhoe - 450mm bucket
LOGGED: MJC
SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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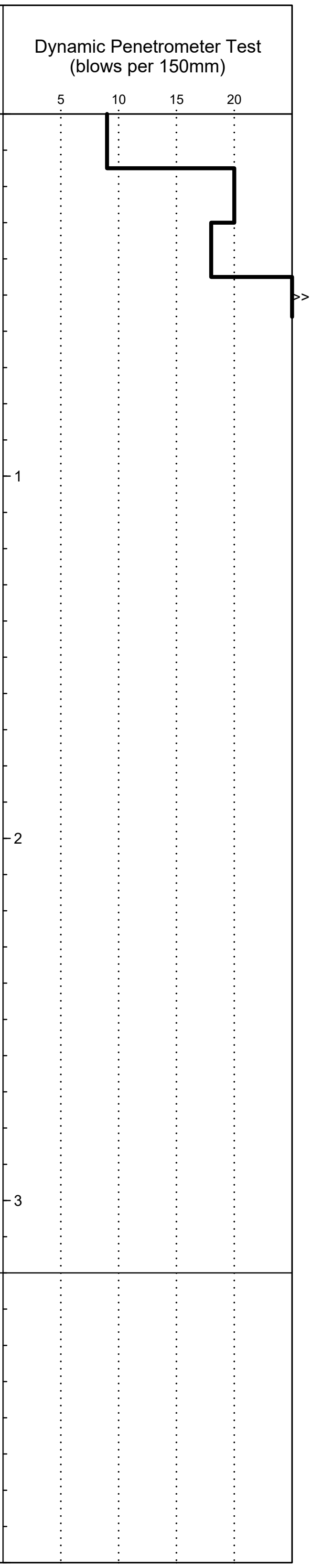
TEST PIT LOG

CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 101.3 mAHD
EASTING: 297743
NORTHING: 6237054

PIT No: 9-13
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		TOPSOIL - brown silt with some clay and rootlets	D	0.1 0.2			
	0.2	SILT - light brown and grey silt with trace clay					
	0.4	SILTY CLAY - hard, orange and brown mottled red silty clay with trace (ironstone) gravel, mc<pl	D D	0.4 0.5			
	1		B	1.0			
			D	1.5			
	2	- becoming mottled grey below 2.0m	D	2.0			
		- with some extremely low strength shale banding below 2.5m	D	2.5			
	2.8	SHALE - very low to low strength, highly weathered, grey shale and silty clay banding					
	3		D	3.0			
	3.2	Pit discontinued at 3.2m - limit of investigation					



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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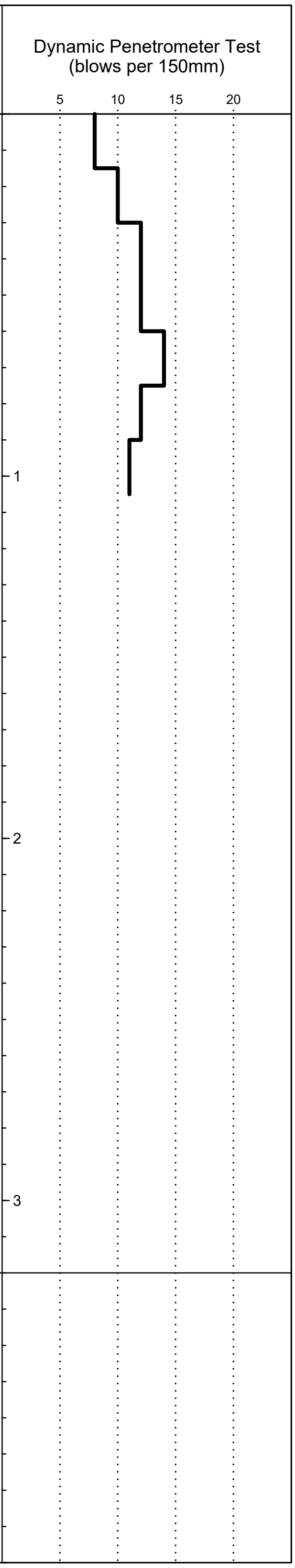
TEST PIT LOG

CLIENT: Stockland Development Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Precinct 9, Willowdale
Leppington East

SURFACE LEVEL: 103.3 mAHD
EASTING: 297795
NORTHING: 6236953

PIT No: 9-14
PROJECT No: 76611.02
DATE: 13/10/2014
SHEET 1 OF 1

Depth (m)	Description of Strata	Type	Depth	Sample	Results & Comments	Water
	SILT - light grey silt with some roots and trace clay	D*	0.1 0.2			
0.4	SILTY CLAY - hard, red and orange silty clay with trace (ironstone) gravel, mc<pl	D D	0.4 0.5 0.6			
		U_{50}	1.0			
1	- becoming grey below 1.0m	D				
	- with some very low strength shale bands below 1.5m	D	1.5			
1.8	SHALE - low strength, highly weathered, grey and brown shale with trace silty clay banding					
2		D	2.0			
	- becoming low to medium strength, moderately weathered, red below 2.5m	D	2.5			
3		D	3.0			
3.2	Pit discontinued at 3.2m - limit of investigation					



RIG: JCB 4WD backhoe - 450mm bucket
LOGGED: MJC
SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD2/131014 collected; Edge of dam

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

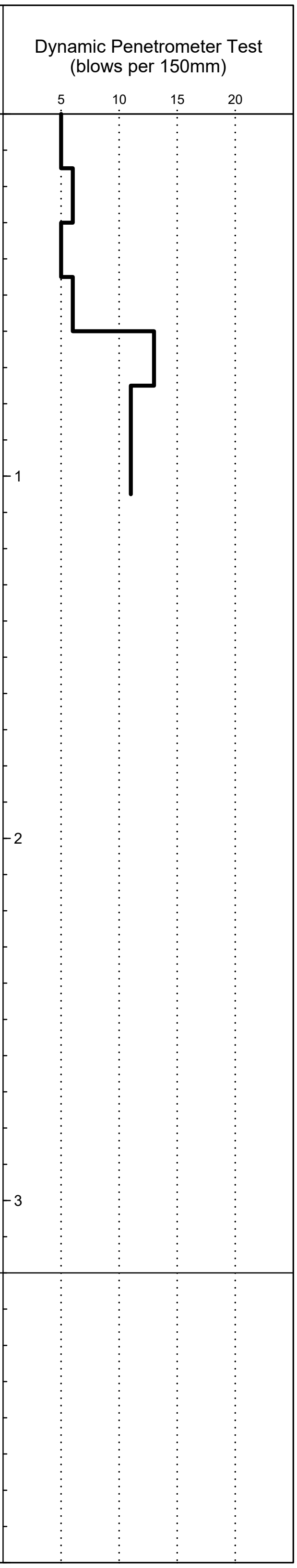
TEST PIT LOG

CLIENT: Stockland Development Pty Limited
PROJECT: Willowdale Residential Community
LOCATION: East Leppington

SURFACE LEVEL: 95.5 mAHD
EASTING: 298300
NORTHING: 6237850

PIT No: 7-14
PROJECT No: 76611.01
DATE: 4/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Sampling & In Situ Testing Type	Depth	Sample	Results & Comments	Water
		TOPSOIL - dark brown silt with some clay	D*	0.1 0.2			
	0.15	SILT - stiff, brown silt and clay					
95	0.4	SILTY CLAY - stiff to very stiff, orange mottled grey silty clay with some (ironstone) gravel, mc~pl	D D	0.4 0.5			
	1	- with some very low strength shale banding, mc>pc below 1.5m	D	1.0			
94			D	1.5			
	2		D	2.0			
93		- with trace sand below 2.5m	D	2.5			
	3		D	3.0			
92	3.2	Pit discontinued at 3.2m - limit of investigation					



RIG: JCB 4WD backhoe - 450mm bucket **LOGGED:** MJC **SURVEY DATUM:** MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD7/040614 collected

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
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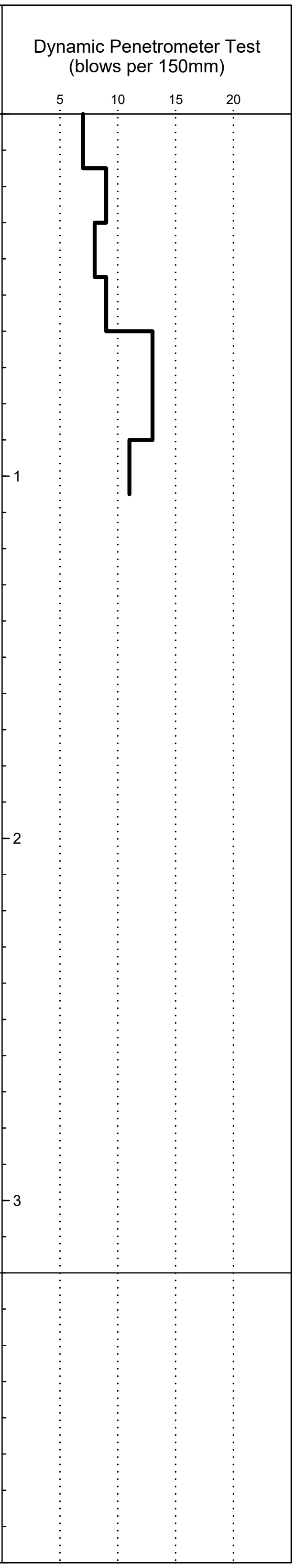
TEST PIT LOG

CLIENT: Stockland Development Pty Limited
PROJECT: Willowdale Residential Community
LOCATION: East Leppington

SURFACE LEVEL: 97.2 mAHD
EASTING: 298386
NORTHING: 6237784

PIT No: 7-15
PROJECT No: 76611.01
DATE: 4/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
	0.0	TOPSOIL - dark brown silt with some clay	D	0.1 0.2			
97	0.15	SILT - very stiff, brown silt and clay					
	0.4	SILTY CLAY - very stiff, red mottled brown silty clay, mc<pl	D D	0.4 0.5			
96	1	- with trace sand below 1.0m	D	1.0			
			D	1.5			
95	2	- with some very low strength shale bands, mc~pl below 2.0m	D	2.0			
		- becoming mottled grey below 2.5m	D	2.5			
	3		D	3.0			
94	3.2	Pit discontinued at 3.2m - limit of investigation					



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Test pit moved ~25m west due to pipelines (gas x 2)

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

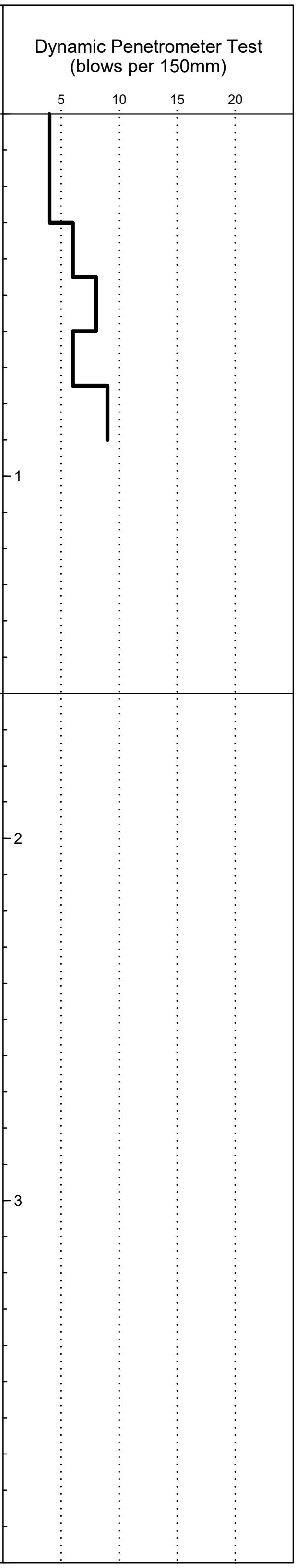
TEST PIT LOG

CLIENT: Stockland Development Pty Limited
PROJECT: Willowdale Residential Community
LOCATION: East Leppington

SURFACE LEVEL: 98.3 mAHD
EASTING: 298130
NORTHING: 6237791

PIT No: 7-16
PROJECT No: 76611.01
DATE: 3/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		TOPSOIL - dark brown silt with some clay and rootlets		D	0.1 0.2			
98	0.15	SILT - stiff, brown silt with some clay						
	0.4	SILTY CLAY - very stiff, red and orange mottled orange silty clay with trace (ironstone) gravel		D D	0.4 0.5			
	1	- becoming very stiff to hard, grey mottled orange with trace sand below 1.0m		D	1.0			
97	1.3	SANDSTONE - low strength, grey and orange sandstone - becoming low to medium strength below 1.5m		D	1.5			
	1.6	Pit discontinued at 1.6m - refusal in low to medium strength sandstone/shale						
96	2							
95	3							



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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TEST PIT LOG

CLIENT: Stockland Development Pty Limited
PROJECT: Willowdale Residential Community
LOCATION: East Leppington

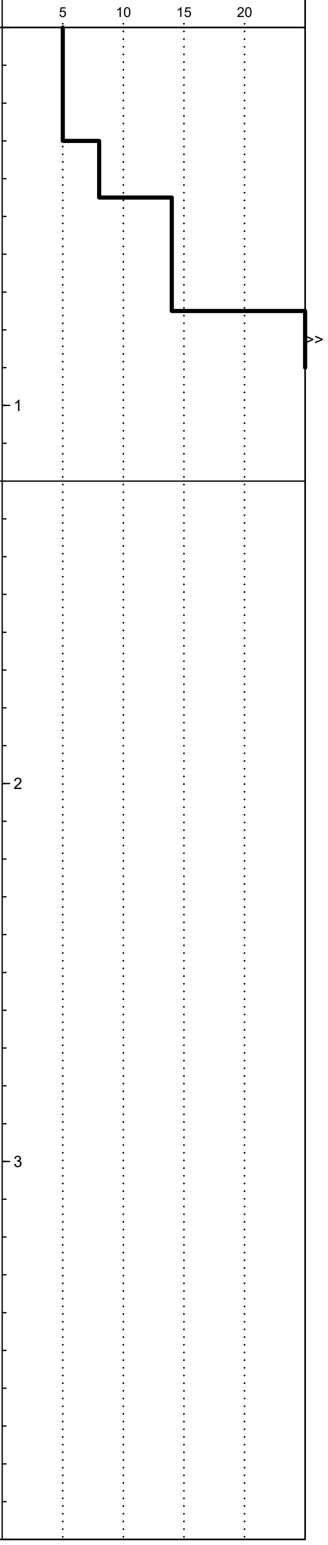
SURFACE LEVEL: 97.4 mAHD
EASTING: 298261
NORTHING: 6237710

PIT No: 7-17
PROJECT No: 76611.01
DATE: 3/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Water
		TOPSOIL - dark brown silt with some clay		
	0.15	SILT - very stiff, brown silt with some clay		
97	0.4	SILTY CLAY - hard, red and orange silty clay with some shale banding, mc<pl		
	0.9	SHALE - low to medium strength, highly weathered, grey shale		
	1.2	Pit discontinued at 1.2m - refusal in low to medium strength shale		
96				
95				
94				

Sampling & In Situ Testing			
Type	Depth	Sample	Results & Comments
D	0.1 0.2		
D	0.4		
D	0.5		
U_{50}			
B	0.9 1.0		

Dynamic Penetrometer Test (blows per 150mm)



RIG: JCB 4WD backhoe - 450mm bucket
LOGGED: MJC
SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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TEST PIT LOG

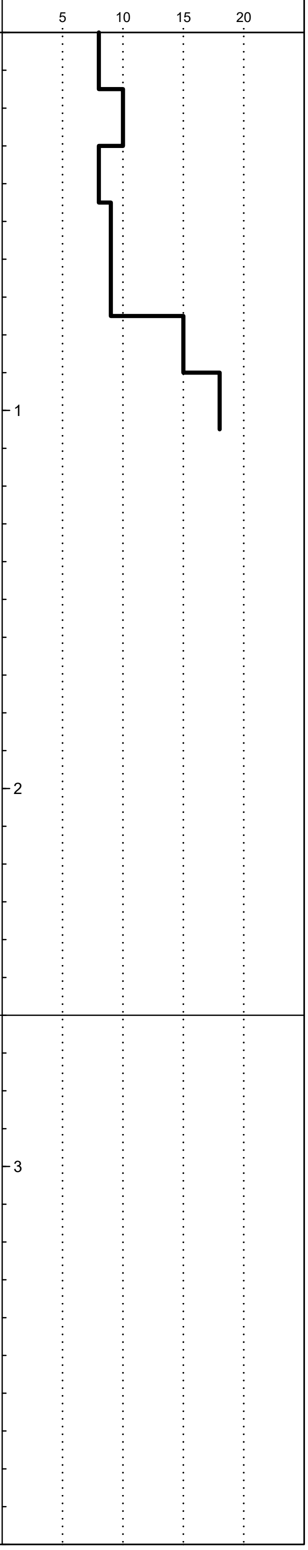
CLIENT: Stockland Development Pty Limited
PROJECT: Willowdale Residential Community
LOCATION: East Leppington

SURFACE LEVEL: 106.3 mAHD
EASTING: 297998
NORTHING: 6237658

PIT No: 7-18
PROJECT No: 76611.01
DATE: 3/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		FILLING - brown silt with some clay and gravel						
				D	0.1 0.2			
		- cobble sized concrete fragment at 0.2m						
106	0.3	SILTY CLAY - very stiff, red mottled grey silty clay with trace (ironstone) gravel, mc<pl						
				D	0.4 0.5			
				D	0.5			
		- becoming hard below 0.8m						
	1			D	1.0			
105		- with extremely low to very low strength shale bands below 1.3m						
				D	1.5			
	1.8	SHALE - very low to low strength, grey shale with silty clay banding						
	2			D	2.0			
104		- becoming low to medium strength below 2.3m						
				D	2.5			
	2.6	Pit discontinued at 2.6m - refusal in low to medium strength shale						
	3							
103								

Dynamic Penetrometer Test (blows per 150mm)



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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TEST PIT LOG

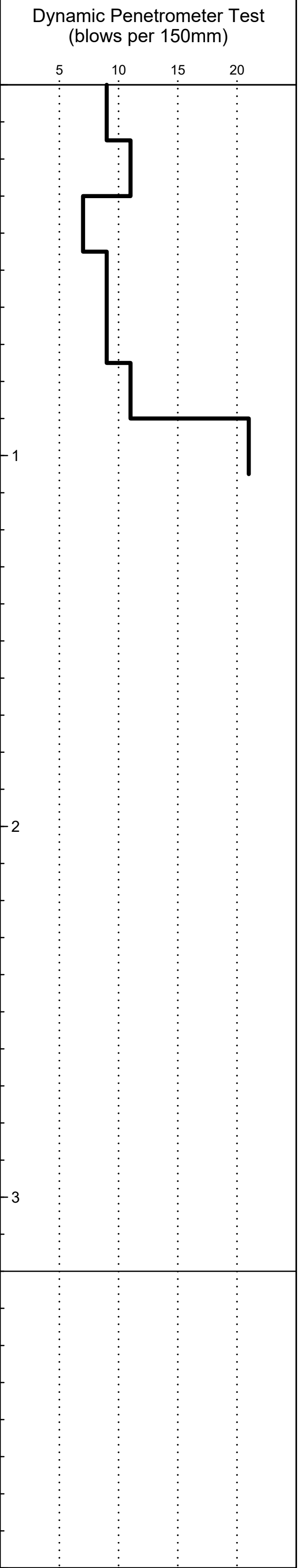
CLIENT: Stockland Development Pty Limited
PROJECT: Willowdale Residential Community
LOCATION: East Leppington

SURFACE LEVEL: 105.5 mAHD
EASTING: 298162
NORTHING: 6237554

PIT No: 7-19
PROJECT No: 76611.01
DATE: 3/6/2014
SHEET 1 OF 1

Depth (m)	Description of Strata
0.0	TOPSOIL - brown silt with trace clay
0.15	SILT - very stiff, brown silt with trace clay
0.3	SILTY CLAY - very stiff, brown and orange silty clay with some (ironstone and shale) gravel, mc<pl - becoming hard, red mottled grey below 1.0m - with trace sand and extremely low strength sandstone bands below 2.0m
2.3	SANDSTONE - extremely low to very low strength, extremely weathered, sandstone with some silty clay banding - becoming very low to low strength below 2.8m
3.2	Pit discontinued at 3.2m - limit of investigation

Type	Depth	Sample	Results & Comments
D	0.1 - 0.2		
D	0.4 - 0.5		
D	0.5		
B	1.0		
D	1.5		
D	2.0		
D	2.5		
D	3.0		



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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TEST PIT LOG

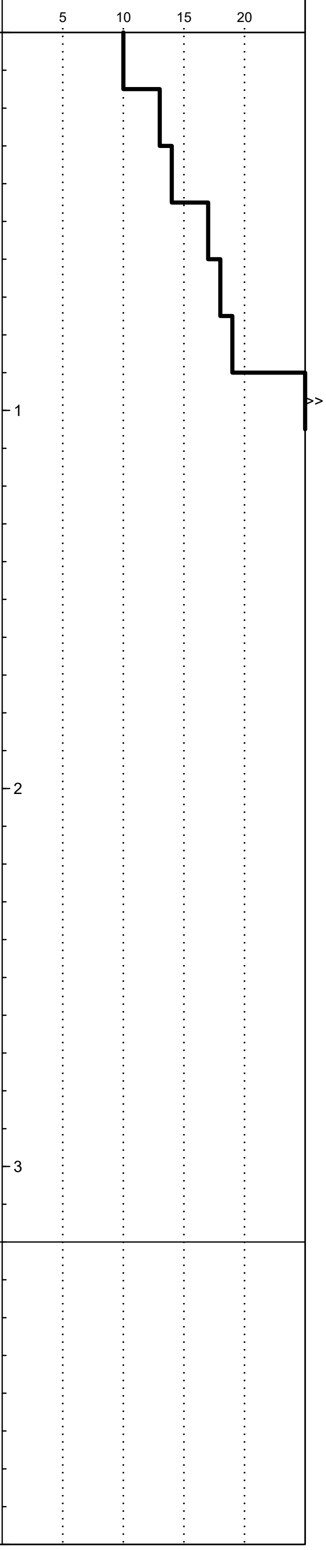
CLIENT: Stockland Development Pty Limited
PROJECT: Willowdale Residential Community
LOCATION: East Leppington

SURFACE LEVEL: 107.7 mAHD
EASTING: 298122
NORTHING: 6237493

PIT No: 7-21
PROJECT No: 76611.01
DATE: 3/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water
		TOPSOIL - brown silt with some clay and (ironstone) gravel		D	0.1 0.2			
	0.15	SILT - hard, brown silt with some clay						
	0.4	SILTY CLAY - hard, brown mottled orange silty clay with trace (ironstone) gravel, mc<pl		D	0.5			
107				U_{50}				
	1	- becoming grey below 1.0m		D	0.98 1.0			
106		- with some extremely low to very low strength shale bands below 1.5m		B	1.5			
	1.8	SHALE - very low to low strength, orange and grey shale with silty clay banding						
	2			D	2.0			
				D	2.5			
105		- becoming low to medium strength below 2.8m						
	3			D	3.0			
	3.2	Pit discontinued at 3.2m - limit of investigation						
104								

Dynamic Penetrometer Test
(blows per 150mm)



RIG: JCB 4WD backhoe - 450mm bucket **LOGGED:** MJC **SURVEY DATUM:** MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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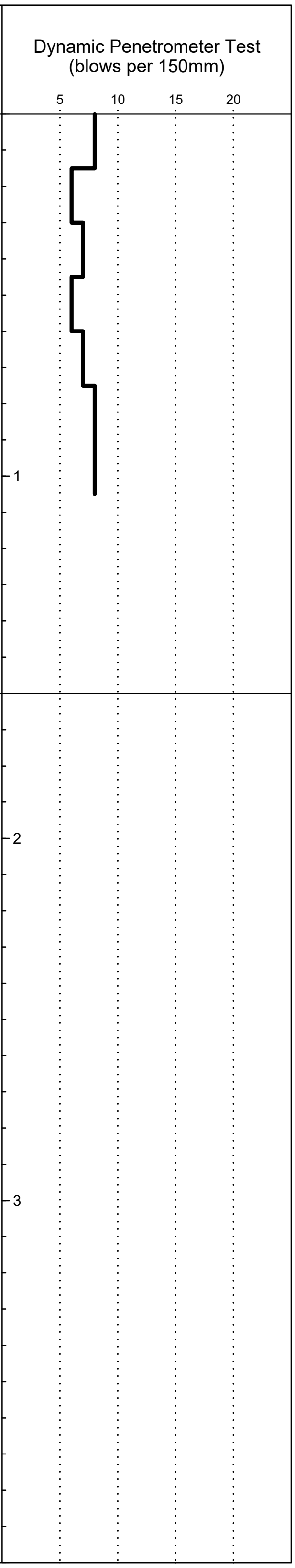
TEST PIT LOG

CLIENT: Stockland Development Pty Limited
PROJECT: Willowdale Residential Community
LOCATION: East Leppington

SURFACE LEVEL: 108.3 mAHD
EASTING: 298163
NORTHING: 6237450

PIT No: 7-23
PROJECT No: 76611.01
DATE: 3/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water
				Type	Depth	Sample	Results & Comments	
		TOPSOIL - brown silt and clay		D	0.1 0.2			
	0.15	SILT - stiff to very stiff, brown silt and clay						
108	0.3	SILTY CLAY - very stiff, red mottled grey silty clay with trace (ironstone) gravel, mc<pl - becoming grey mottled orange below 0.8m		D D D	0.4 0.5 1.0			
107	1.3	SHALE - medium strength, brown and grey shale with some silty clay banding		D	1.5			
	1.6	Pit discontinued at 1.6m - refusal in medium strength shale						



RIG: JCB 4WD backhoe - 450mm bucket

LOGGED: MJC

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Test pit moved ~20m west due to pipeline (gas)

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

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Appendix C

Laboratory Summary Table

Test Bore or Pit	Test Location			Sample ID	Sample Depth	pH	Chloride Concentration	Sulphate Concentration	Resistivity	Soil Condition	Sample Aggressivity Class				
	East	North	Proposed Cut (-) and Fill (+)						By inversion of EC1:5		Aggr. to Concrete - from sample pH	Aggr. to Concrete - from Sulphate conc.	Aggr. to Steel - from sample pH	Aggr. to Steel - from Chloride conc.	Aggr. to Steel - from sample Resistivity
	(m MGA56)	(m MGA56)	(m)		(m bgl)	(pH units)	(mg/kg)	(mg/kg)	Ω.cm	[AS2159-2009]	[AS2159-2009]				
9-2	298166.0	6237623.0	0.00	9-2/0.5	0.5	5	650	340	1786	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				9-2/1.0	1.0	4.8			1190	B	Mild		Non-Aggressive		Mild
				9-2/1.5	1.5	5			1471	B	Mild		Non-Aggressive		Mild
				9-2/2.0	2.0	5.2	610	270	1695	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				9-2/2.5	2.5	5.3			1471	B	Mild		Non-Aggressive		Mild
				9-2/3.0	3.0	6			2439	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
9-3	298039.0	6237532.0	-2.00	9-3/0.5	0.5	5.6			14286	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				9-3/1.0	1.0	8.5	110	42	4762	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
				9-3/1.5	1.5	9.1			6250	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				9-3/2.0	2.0	8.9			7143	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				9-3/2.5	2.5	8.9			8333	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
9-4	297915.0	6237526.0	-1.75	9-4/0.5	0.5	5			2703	B	Mild		Non-Aggressive		Non-Aggressive
				9-4/1.0	1.0	4.9			1190	B	Mild		Non-Aggressive		Mild
				9-4/1.5	1.5	5			1471	B	Mild		Non-Aggressive		Mild
				9-4/2.0	2.0	5.2			1389	B	Mild		Non-Aggressive		Mild
				9-4/2.5	2.5	6.9			2941	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
9-5	298066.0	6237436.0	-0.50	9-5/0.5	0.5	5.3			4762	B	Mild		Non-Aggressive		Non-Aggressive
				9-5/1.0	1.0	5.3			3571	B	Mild		Non-Aggressive		Non-Aggressive
				9-5/1.5	1.5	5.6			4762	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				9-5/2.0	2.0	5.9			3448	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
9-6	297969.0	6237375.0	-0.25	9-6/0.5	0.5	5.3	92	140	6667	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
				9-6/1.0	1.0	5.6	200	86	5882	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
9-7	298092.0	6237330.0	0.25	9-7/0.5	0.5	4.9			2564	B	Mild		Non-Aggressive		Non-Aggressive
				9-7/1.0	1.0	4.8			1754	B	Mild		Non-Aggressive		Mild
				9-7/1.5	1.5	4.9			1852	B	Mild		Non-Aggressive		Mild
				9-7/2.0	2.0	5.2			1923	B	Mild		Non-Aggressive		Mild
9-8	297886.0	6237279.0	1.50	9-8/0.5	0.5	4.8			1587	B	Mild		Non-Aggressive		Mild
				9-8/1.0	1.0	4.9			1042	B	Mild		Non-Aggressive		Mild
				9-8/1.5	1.5	4.9			1205	B	Mild		Non-Aggressive		Mild
				9-8/2.0	2.0	5.4			1266	B	Mild		Non-Aggressive		Mild
				9-8/2.5	2.5	6.1			1818	B	Non-Aggressive		Non-Aggressive		Mild
				9-8/3.0	3.0	6.6			1667	B	Non-Aggressive		Non-Aggressive		Mild
9-9	297997.0	6237170.0	1.50	9-9/0.5	0.5	5			3226	B	Mild		Non-Aggressive		Non-Aggressive
				9-9/1.0	1.0	4.8			2703	B	Mild		Non-Aggressive		Non-Aggressive
				9-9/1.5	1.5	4.7			1923	B	Mild		Non-Aggressive		Mild
				9-9/2.0	2.0	4.7			1852	B	Mild		Non-Aggressive		Mild
				9-9/2.5	2.5	5			2174	B	Mild		Non-Aggressive		Non-Aggressive
				9-9/3.0	3.0	5.1			2083	B	Mild		Non-Aggressive		Non-Aggressive
9-10	297848.0	6237186.0	0.75	9-10/0.5	0.5	6.2			3846	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				9-10/1.0	1.0	6.4	430	150	2381	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
				9-10/1.5	1.5	6			1613	B	Non-Aggressive		Non-Aggressive		Mild
				9-10/2.0	2.0	6.3			1961	B	Non-Aggressive		Non-Aggressive		Mild
				9-10/2.5	2.5	7.1			2083	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				9-10/3.0	3.0	7.1			2703	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
9-12	297900.0	6237040.0	2.00	9-12/0.5	0.5	6.1			13158	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				9-12/1.0	1.0	5.2	880	84	1639	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				9-12/1.5	1.5	6.7			1587	B	Non-Aggressive		Non-Aggressive		Mild
				9-12/2.0	2.0	7.9			1587	B	Non-Aggressive		Non-Aggressive		Mild
				9-12/2.5	2.5	7.6	380	38	3448	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
				9-12/3.0	3.0	8			4167	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
9-13	297743.0	6237054.0	3.00	9-13/0.5	0.5	5.7			2778	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				9-13/1.0	1.0	7.6			1515	B	Non-Aggressive		Non-Aggressive		Mild
				9-13/1.5	1.5	7.7			1493	B	Non-Aggressive		Non-Aggressive		Mild
				9-13/2.0	2.0	7.7			1515	B	Non-Aggressive		Non-Aggressive		Mild
				9-13/2.5	2.5	7.8			1010	B	Non-Aggressive		Non-Aggressive		Mild
				9-13/3.0	3.0	7.8			1000	B	Non-Aggressive		Non-Aggressive		Mild
9-14	297795.0	6236953.0	1.25	9-14/0.5	0.5	5.1			1163	B	Mild		Non-Aggressive		Mild
				9-14/1.0	1.0	5.3			833	B	Mild		Non-Aggressive		Moderate
				9-14/1.5	1.5	6.7			1370	B	Non-Aggressive		Non-Aggressive		Mild
				9-14/2.0	2.0	7.6			1852	B	Non-Aggressive		Non-Aggressive		Mild
				9-14/2.5	2.5	8			2273	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				9-14/3.0	3.0	8.2			2041	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
P7-14			2.0	P7-14	0.5	5.5			3846	B	Mild		Non-Aggressive		Non-Aggressive
				P7-14	1.0	5.4	630	180	1754	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				P7-14	1.5	7.2			1299	B	Non-Aggressive		Non-Aggressive		Mild
				P7-14	2.0	7.2	770	130	1333	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				P7-14	2.5	7.6			1031	B	Non-Aggressive		Non-Aggressive		Mild
				P7-14	3.0	7.7	950	150	1064	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
P7-15			3.0	P7-15	0.5	5.3			2083	B	Mild		Non-Aggressive		Non-Aggressive
				P7-15	1.0	5.6			1333	B	Non-Aggressive		Non-Aggressive		Mild
				P7-15	1.5	6			1075	B	Non-Aggressive		Non-Aggressive		Mild
				P7-15	2.0	6.9			1176	B	Non-Aggressive		Non-Aggressive		Mild
				P7-15	2.5	7			1408	B	Non-Aggressive		Non-Aggressive		Mild
				P7-15	3.0	7			1136	B	Non-Aggressive		Non-Aggressive		Mild
P7-16			0.50	P7-16	0.5	5	580	150	1786	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				P7-16	1.0	5	820	140	1351	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				P7-16	1.5	5.7	620	140	1695	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
P7-17			0.75	P7-17	0.5	6	110	97	5882	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
				P7-17	1.0	6.1	92	38	8333	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
P7-18			0.25	P7-18	0.5	5	380	280	2083	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
				P7-18	1.0	4.9			1333	B	Mild		Non-Aggressive		Mild
				P7-18	1.5	5.1	630	230	1639	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				P7-18	1.5	5.3			2326	B	Mild		Non-Aggressive		Non-Aggressive
				P7-18	2.0	5.6	360	150	2128	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
P7-19			-0.50	P7-19	2.5	5.8			1887	B	Non-Aggressive		Non-Aggressive		Mild
				P7-19	0.5	4.9	600	330	1515	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				P7-19	1.0	5			2128	B	Mild		Non-Aggressive		Non-Aggressive
				P7-19	1.5	5.3	460	160	2128	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
				P7-19	2.0	5.8			2857	B	Non-Aggressive		Non-Aggressive		Non-Aggressive
				P7-19	2.0	6.3	170	89	4348	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
P7-21			-0.75	P7-21	0.5	7			1818	B	Non-Aggressive		Non-Aggressive		Mild
				P7-21	1.0	5			1220	B	Mild		Non-Aggressive		Mild
				P7-21	1.5	4.9			1613	B	Mild		Non-Aggressive		Mild
				P7-21	2.0	5.1			2041	B	Mild		Non-Aggressive		Non-Aggressive
				P7-21	2.5	5.1			2500	B	Mild		Non-Aggressive		Non-Aggressive
				P7-21	3.0	5.2			2273	B	Mild		Non-Aggressive		Non-Aggressive
P7-23			-0.75	P7-23	0.5	4.8	470	110	2174	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
				P7-23	1.0	4.7	1100	47	1250	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				P7-23	1.5	5.8	540	70	2041	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive
33	297902.0	6237431.0	0.00	33	1.0				1538	B					Mild
				33	1.5				1695	B					Mild
34	298107.0	6237573.0	-1.50	34	0.5				19608	B					Non-Aggressive
				34	0.9				4000	B					Non-Aggressive
40	297839.0	6237077.0	1.50	40	1.0				2439	B					Non-Aggressive
				40	2.2				2381	B					Non-Aggressive
41	298002.0	6237243.0	1.00	41	1.0				2439	B					Non-Aggressive
				41	2.0				2632	B					Non-Aggressive
105	297948.0	6237585.0	-0.50	105	0.1	5.5			10309	B	Mild		Non-Aggressive		Non-Aggressive
				105	0.5	4.7			1613	B	Mild		Non-Aggressive		Mild
				105	1.0	4.4	1600	410	1205	B	Moderate	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				105	1.5	4.7			1149	B	Mild		Non-Aggressive		Mild
				105	2.0	4.9	1200	340	1515	B	Mild	Non-Aggressive	Non-Aggressive	Non-Aggressive	Mild
				105	2.5	5.1			1370	B	Mild		Non-Aggressive		Mild
				105	3.0	5.2			1449	B	Mild		Non-Aggressive		Mild

Test Bore or Pit	Test Location			Sample ID	Sample Depth	Exchangeable Sodium (Na) Concentration	Cation Exchange Capacity	Sodicity	Sodicity Class	Emerson Crumb Class Number	Dispersion?	Soil Texture Group	Textural Factor (M)	$EC_{1:5}$	EC_e	Sample Salinity Class
	East	North	Proposed Cut (-) and Fill (+)					[Na/CEC]			(from Emerson Class)	(for detailed soil logs see Report Appendix)		[Lab.]	[M x $EC_{1:5}$]	(Based on sample ECe)
	(m MGA56)	(m MGA56)	(m)		(m bgl)	(meq/100g)	(meq/100g)	(%)	[after DLWC]		[AS1289.3.8.1]	[after DLWC]	[after DLWC]	(microS/cm)	(deciS/m)	[Richards 1954]
9-2	298166.0	6237623.0	0.00	9-2/0.5	0.5							Medium clay	7	560	3.9	Slightly Saline
				9-2/1.0	1.0							Light clay	8.5	840	7.1	Moderately Saline
				9-2/1.5	1.5							Light clay	8.5	680	5.8	Moderately Saline
				9-2/2.0	2.0	3.2	12	27	Highly Sodic			Medium clay	7	590	4.1	Moderately Saline
				9-2/2.5	2.5							Clay loam	9	680	6.1	Moderately Saline
.	.	.	.	9-2/3.0	3.0							Medium clay	7	410	2.9	Slightly Saline
9-3	298039.0	6237532.0	-2.00	9-3/0.5	0.5							Clay loam	9	70	0.6	Non-Saline
				9-3/1.0	1.0	2.2	19	12	Sodic			Medium clay	7	210	1.5	Non-Saline
				9-3/1.5	1.5							Medium clay	7	160	1.1	Non-Saline
				9-3/2.0	2.0							Medium clay	7	140	1.0	Non-Saline
.	.	.	.	9-3/2.5	2.5							Medium clay	7	120	0.8	Non-Saline
9-4	297915.0	6237526.0	-1.75	9-4/0.5	0.5							Medium clay	7	370	2.6	Slightly Saline
				9-4/1.0	1.0							Medium clay	7	840	5.9	Moderately Saline
				9-4/1.5	1.5							Clay loam	9	680	6.1	Moderately Saline
				9-4/2.0	2.0	3.7	15	25	Highly Sodic			Medium clay	7	720	5.0	Moderately Saline
.	.	.	.	9-4/2.5	2.5							Medium clay	7	340	2.4	Slightly Saline
9-5	298066.0	6237436.0	-0.50	9-5/0.5	0.5							Loam	10	210	2.1	Slightly Saline
				9-5/1.0	1.0							Medium clay	7	280	2.0	Non-Saline
				9-5/1.5	1.5							Medium clay	7	210	1.5	Non-Saline
.	.	.	.	9-5/2.0	2.0							Medium clay	7	290	2.0	Slightly Saline
9-6	297969.0	6237375.0	-0.25	9-6/0.5	0.5	1.7	11	15	Highly Sodic			Medium clay	7	150	1.1	Non-Saline
.	.	.	.	9-6/1.0	1.0							Medium clay	7	170	1.2	Non-Saline
9-7	298092.0	6237330.0	0.25	9-7/0.5	0.5							Medium clay	7	390	2.7	Slightly Saline
				9-7/1.0	1.0							Medium clay	7	570	4.0	Slightly Saline
				9-7/1.5	1.5							Light clay	8.5	540	4.6	Moderately Saline
.	.	.	.	9-7/2.0	2.0							Medium clay	7	520	3.6	Slightly Saline
9-8	297886.0	6237279.0	1.50	9-8/0.5	0.5							Clay loam	9	630	5.7	Moderately Saline
				9-8/1.0	1.0							Light clay	8.5	960	8.2	Very Saline
				9-8/1.5	1.5							Medium clay	7	830	5.8	Moderately Saline
				9-8/2.0	2.0							Light clay	8.5	790	6.7	Moderately Saline
				9-8/2.5	2.5							Medium clay	7	550	3.9	Slightly Saline
.	.	.	.	9-8/3.0	3.0	3.1	17	18	Highly Sodic			Medium clay	7	600	4.2	Moderately Saline
9-9	297997.0	6237170.0	1.50	9-9/0.5	0.5							Clay loam	9	310	2.8	Slightly Saline
				9-9/1.0	1.0							Light clay	8.5	370	3.1	Slightly Saline
				9-9/1.5	1.5							Light medium clay	8	520	4.2	Moderately Saline
				9-9/2.0	2.0							Medium clay	7	540	3.8	Slightly Saline
				9-9/2.5	2.5							Medium clay	7	460	3.2	Slightly Saline
.	.	.	.	9-9/3.0	3.0							Medium clay	7	480	3.4	Slightly Saline
9-10	297848.0	6237186.0	0.75	9-10/0.5	0.5							Light medium clay	8	260	2.1	Slightly Saline
				9-10/1.0	1.0	2.6	13	20	Highly Sodic			Light clay	8.5	420	3.6	Slightly Saline
				9-10/1.5	1.5							Medium clay	7	620	4.3	Moderately Saline
				9-10/2.0	2.0							Medium clay	7	510	3.6	Slightly Saline
				9-10/2.5	2.5							Medium clay	7	480	3.4	Slightly Saline
.	.	.	.	9-10/3.0	3.0							Medium clay	7	370	2.6	Slightly Saline
9-12	297900.0	6237040.0	2.00	9-12/0.5	0.5							Light medium clay	8	76	0.6	Non-Saline
				9-12/1.0	1.0	2.2	11	20	Highly Sodic			Medium clay	7	610	4.3	Moderately Saline
				9-12/1.5	1.5							Light medium clay	8	630	5.0	Moderately Saline
				9-12/2.0	2.0							Light clay	8.5	630	5.4	Moderately Saline
				9-12/2.5	2.5							Medium clay	7	290	2.0	Slightly Saline
.	.	.	.	9-12/3.0	3.0							Medium clay	7	240	1.7	Non-Saline
9-13	297743.0	6237054.0	3.00	9-13/0.5	0.5							Light clay	8.5	360	3.1	Slightly Saline
				9-13/1.0	1.0							Medium clay	7	660	4.6	Moderately Saline
				9-13/1.5	1.5							Clay loam	9	670	6.0	Moderately Saline
				9-13/2.0	2.0							Light medium clay	8	660	5.3	Moderately Saline
				9-13/2.5	2.5							Medium clay	7	990	6.9	Moderately Saline
.	.	.	.	9-13/3.0	3.0							Medium clay	7	1000	7.0	Moderately Saline
9-14	297795.0	6236953.0	1.25	9-14/0.5	0.5							Light clay	8.5	860	7.3	Moderately Saline
				9-14/1.0	1.0							Light medium clay	8	1200	9.6	Very Saline
				9-14/1.5	1.5							Light medium clay	8	730	5.8	Moderately Saline
				9-14/2.0	2.0	3.7	14	26	Highly Sodic			Medium clay	7	540	3.8	Slightly Saline
				9-14/2.5	2.5							Medium clay	7	440	3.1	Slightly Saline
.	.	.	.	9-14/3.0	3.0							Clay loam	9	490	4.4	Moderately Saline
P7-14			2.0	P7-14	0.5					6	No	Light clay	8.5	260	2.2	Slightly Saline
				P7-14	1.0							Light medium clay	8	570	4.6	Moderately Saline
				P7-14	1.5							Medium clay	7	770	5.4	Moderately Saline
				P7-14	2.0	3.1	8.8	35	Highly Sodic			Heavy clay	6	750	4.5	Moderately Saline
				P7-14	2.5							Medium clay	7	970	6.8	Moderately Saline
.	.	.	.	P7-14	3.0							Heavy clay	6	940	5.6	Moderately Saline
P7-15			3.0	P7-15	0.5							Clay loam	9	480	4.3	Moderately Saline
				P7-15	1.0							Medium clay	7	750	5.3	Moderately Saline
				P7-15	1.5							Light clay	8.5	930	7.9	Moderately Saline
				P7-15	2.0							Medium clay	7	850	6.0	Moderately Saline
				P7-15	2.5							Light medium clay	8	710	5.7	Moderately Saline
.	.	.	.	P7-15	3.0							Medium clay	7	880	6.2	Moderately Saline
P7-16			0.50	P7-16	0.5							Light medium clay	8	560	4.5	Moderately Saline
				P7-16	1.0	4	15	27	Highly Sodic			Medium clay	7	740	5.2	Moderately Saline
.	.	.	.	P7-16	1.5							Medium clay	7	590	4.1	Moderately Saline
P7-17			0.75	P7-17	0.5	1.5	14	11	Sodic			Light medium clay	8	170	1.4	Non-Saline
.	.	.	.	P7-17	1.0							Medium clay	7	120	0.8	Non-Saline
P7-18			0.25	P7-18	0.5	2.9	17	17	Highly Sodic			Light medium clay	8	480	3.8	Slightly Saline
				P7-18	1.0							Light medium clay	8	750	6.0	Moderately Saline
				P7-18	1.5							Heavy clay	6	610	3.7	Slightly Saline
				P7-18	1.5							Medium clay	7	430	3.0	Slightly Saline
.	.	.	.	P7-18	2.0							Medium clay	7	470	3.3	Slightly Saline
P7-19			-0.50	P7-19	2.5							Light medium clay	8	530	4.2	Moderately Saline
				P7-19	0.5							Light medium clay	8	660	5.3	Moderately Saline
				P7-19	1.0							Light clay	8.5	470	4.0	Slightly Saline
				P7-19	1.5	4.4	21	21	Highly Sodic			Medium clay	7	470	3.3	Slightly Saline
				P7-19	2.0							Medium clay	7	350	2.5	Slightly Saline
.	.	.	.	P7-19	2.0							Medium clay	7	230	1.6	Non-Saline
P7-21			-0.75	P7-21	0.5							Clay loam	9	550	5.0	Moderately Saline
				P7-21	1.0							Clay loam	9	820	7.4	Moderately Saline
				P7-21	1.5							Light medium clay	8	620	5.0	Moderately Saline
				P7-21	2.0							Medium clay	7	490	3.4	Slightly Saline
				P7-21	2.5							Medium clay	7	400	2.8	Slightly Saline
.	.	.	.	P7-21	3.0							Medium clay	7	440	3.1	Slightly Saline
P7-23			-0.75	P7-23	0.5	1.8	22	8	Sodic			Light clay	8.5	460	3.9	Slightly Saline
				P7-23	1.0							Light medium clay	8	800	6.4	Moderately Saline
.	.	.	.	P7-23	1.5							Light clay	8.5	490	4.2	Moderately Saline
33	297902.0	6237431.0	0.00	33	1.0							Light medium clay	8	650	5.2	Moderately Saline
.	.	.	.	33	1.5							Light medium clay	8	590	4.7	Moderately Saline
34	298107.0	6237573.0	-1.50	34	0.5							Light medium clay	8	51	0.4	Non-Saline
.	.	.	.	34	0.9							Light medium clay	8	250	2.0	Slightly Saline
40	297839.0	6237077.0	1.50	40	1.0							Light medium clay	8	410	3.3	Slightly Saline
.	.	.	.	40	2.2							Clay loam	9	420	3.8	Slightly Saline
41	298002.0	6237243.0	1.00	41	1.0							Medium clay	7	410	2.9	Slightly Saline
.	.	.	.	41	2.0							Clay loam	9	380	3.4	Slightly Saline
105	297948.0	6237585.0	-0.50	105	0.1							Loam	10	97	1.0	Non-Saline
				105	0.5							Medium clay	7	620	4.3	Moderately Saline
				105	1.0	6.1	18	34	Highly Sodic			Medium clay	7	830	5.8	Moderately Saline
				105	1.5							Medium clay	7	870	6.1	Moderately Saline
				105	2.0	6.5	18	37	Highly Sodic			Light medium clay	8	660	5.3	Moderately Saline
				105	2.5							Light clay	8.5	730	6.2	Moderately Saline
.	.	.	.	105	3.0							Clay loam	9	690	6.2	Moderately Saline

Aggressivity Flags
- Very Severe
- Severe
- Moderate
- Mild
- Non-Aggressive

Sodicity Flags
- Highly Sodic
- Sodic
- Non-Sodic

Dispersion Flags
- Complete
- Some
- Dispersive
- No

Salinity Flags
- Highly Saline
- Very Saline
- Moderately Saline
- Slightly Saline
- Non-Saline

Appendix D

NATA Report and Chain Of Custody

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

SAMPLE RECEIPT ADVICE

Client:

Douglas Partners Pty Ltd Smeaton Grange	ph: 02 4647 0075
Unit 5/50 Topham Rd	Fax: 02 4646 1886
Smeaton Grange NSW 2567	

Attention: John Russell

Sample log in details:

Your reference:	**76611.01, Precinct 7 Leppington**
Envirolab Reference:	**111097**
Date received:	05/06/2014
Date results expected to be reported:	**16/06/14**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	120 Soils
Turnaround time requested:	Standard
Temperature on receipt (°C)	11.2
Cooling Method:	None
Sampling Date Provided:	YES

Comments:

If there is sufficient sample after testing, samples will be held for the following time frames from date of receipt of samples:
Water samples - 1 month
Soil and other solid samples - 2 months
Samples collected in canisters - 1 week. Canisters will then be cleaned.
All other samples are not retained after analysis
If you require samples to be retained for longer periods then retention fees will apply as per our pricelist.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

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

CERTIFICATE OF ANALYSIS 111097

Client:

Douglas Partners Pty Ltd Smeaton Grange
Unit 5/50 Topham Rd
Smeaton Grange
NSW 2567

Attention: John Russell

Sample log in details:

Your Reference:	**76611.01, Precinct 7 Leppington**		
No. of samples:	120 Soils		
Date samples received / completed instructions received	05/06/2014	/	05/06/2014

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	16/06/14	/	16/06/14
Date of Preliminary Report:	Not Issued		

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

Results Approved By:

Jacinta Hurst
Laboratory Manager

ACCREDITED FOR TECHNICAL COMPETENCE

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-1	111097-2	111097-3	111097-4	111097-5
Your Reference	-------------	P7-1	P7-1	P7-1	P7-1	P7-1
Depth	------------	0.4-0.5	1.0	1.5	2.0	2.5
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.9	5.3	5.4	5.5	5.0
Electrical Conductivity 1:5 soil:water	µS/cm	200	610	550	420	400
Chloride, Cl 1:5 soil:water	mg/kg	190	[NA]	580	[NA]	520
Sulphate, SO4 1:5 soil:water	mg/kg	46	[NA]	170	[NA]	120

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-6	111097-7	111097-8	111097-9	111097-10
Your Reference	-------------	P7-2	P7-2	P7-2	P7-2	P7-2
Depth	------------	0.4-0.5	1.0	1.5	2.0	2.5
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	6.0	4.9	4.8	5.0	5.5
Electrical Conductivity 1:5 soil:water	µS/cm	440	580	620	490	460

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-11	111097-12	111097-13	111097-14	111097-15
Your Reference	-------------	P7-2	P7-3	P7-3	P7-3	P7-3
Depth	------------	3.0	0.5	1.0	1.5	2.0
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.6	5.2	5.1	5.6	5.6
Electrical Conductivity 1:5 soil:water	µS/cm	450	490	430	330	320

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-16	111097-17	111097-18	111097-19	111097-20
Your Reference	-------------	P7-3	P7-3	P7-4	P7-4	P7-4
Depth	------------	2.5	3.0	0.5	1.0	1.5
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.9	5.9	5.9	5.8	6.2
Electrical Conductivity 1:5 soil:water	µS/cm	350	360	100	600	340

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-21	111097-22	111097-23	111097-24	111097-25
Your Reference	-------------	P7-4	P7-4	P7-4	P7-5	P7-5
Depth	------------	2.0	2.5	3.0	0.5	1.0
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	6.0	6.6	6.5	5.3	4.8
Electrical Conductivity 1:5 soil:water	µS/cm	290	280	430	180	600

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-26	111097-27	111097-28	111097-29	111097-30
Your Reference	-------------	P7-5	P7-5	P7-5	P7-5	P7-6
Depth	------------	1.5	2.0	2.5	3.0	0.5
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	4.9	4.8	4.9	5.3	5.0
Electrical Conductivity 1:5 soil:water	µS/cm	500	540	470	410	800

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-31	111097-32	111097-33	111097-34	111097-35
Your Reference	-------------	P7-6	P7-6	P7-6	P7-6	P7-7
Depth	------------	1.0	1.5	2.0	2.5	0.5
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	4.9	5.5	6.0	6.6	5.4
Electrical Conductivity 1:5 soil:water	µS/cm	1,100	810	440	480	210

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-36	111097-37	111097-38	111097-39	111097-40
Your Reference	-------------	P7-7	P7-7	P7-7	P7-7	P7-7
Depth	------------	1.0	1.5	2.0	2.5	3.0
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.3	5.6	5.6	5.7	6.2
Electrical Conductivity 1:5 soil:water	µS/cm	520	460	530	760	550

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-41	111097-42	111097-43	111097-44	111097-45
Your Reference	-------------	P7-8	P7-8	P7-8	P7-8	P7-8
Depth	------------	0.5	1.0	1.5	2.0	2.5
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.2	5.2	5.4	5.2	5.6
Electrical Conductivity 1:5 soil:water	µS/cm	580	660	550	850	510
Chloride, Cl 1:5 soil:water	mg/kg	630	[NA]	590	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	230	[NA]	140	[NA]	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-46	111097-47	111097-48	111097-49	111097-50
Your Reference	-------------	P7-8	P7-9	P7-9	P7-9	P7-9
Depth	------------	3.0	0.5	1.0	1.5	2.0
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	6.8	5.4	5.7	5.9	5.9
Electrical Conductivity 1:5 soil:water	µS/cm	570	410	380	410	270
Chloride, Cl 1:5 soil:water	mg/kg	650	[NA]	[NA]	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	160	[NA]	[NA]	[NA]	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-51	111097-52	111097-53	111097-54	111097-55
Your Reference	-------------	P7-9	P7-10	P7-10	P7-10	P7-10
Depth	------------	2.5	0.5	1.0	1.5	2.0
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	6.3	5.8	5.6	6.2	5.8
Electrical Conductivity 1:5 soil:water	µS/cm	290	50	150	420	610
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	22	[NA]	450	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	32	[NA]	97	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-56	111097-57	111097-58	111097-59	111097-60
Your Reference	-------------	P7-10	P7-10	P7-11	P7-11	P7-11
Depth	------------	2.5	3.0	0.5	1.0	1.5
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	6.1	6.4	4.8	4.9	4.8
Electrical Conductivity 1:5 soil:water	µS/cm	550	580	660	410	640
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	580	[NA]	450	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	100	[NA]	100	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-61	111097-62	111097-63	111097-64	111097-65
Your Reference	-------------	P7-11	P7-11	P7-11	P7-12	P7-12
Depth	------------	2.0	2.5	3.0	0.5	1.0
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.0	5.5	5.7	5.1	5.0
Electrical Conductivity 1:5 soil:water	µS/cm	450	360	530	420	450
Chloride, Cl 1:5 soil:water	mg/kg	480	[NA]	560	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	120	[NA]	150	[NA]	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-66	111097-67	111097-68	111097-69	111097-70
Your Reference	-------------	P7-12	P7-13	P7-13	P7-13	P7-13
Depth	------------	1.5	0.5	1.0	1.5	2.0
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.6	4.8	4.8	4.9	5.1
Electrical Conductivity 1:5 soil:water	µS/cm	170	450	620	410	420
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	710	[NA]	410
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	170	[NA]	100

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-71	111097-72	111097-73	111097-74	111097-75
Your Reference	-------------	P7-13	P7-14	P7-14	P7-14	P7-14
Depth	------------	2.5	0.5	1.0	1.5	2.0
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.1	5.5	5.4	7.2	7.2
Electrical Conductivity 1:5 soil:water	µS/cm	400	260	570	770	750
Chloride, Cl 1:5 soil:water	mg/kg	340	[NA]	630	[NA]	770
Sulphate, SO4 1:5 soil:water	mg/kg	97	[NA]	180	[NA]	130

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-76	111097-77	111097-78	111097-79	111097-80
Your Reference	-------------	P7-14	P7-14	P7-15	P7-15	P7-15
Depth	------------	2.5	3.0	0.5	1.0	1.5
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	7.6	7.7	5.3	5.6	6.0
Electrical Conductivity 1:5 soil:water	µS/cm	970	940	480	750	930
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	950	[NA]	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	150	[NA]	[NA]	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-81	111097-82	111097-83	111097-84	111097-85
Your Reference	-------------	P7-15	P7-15	P7-15	P7-16	P7-16
Depth	------------	2.0	2.5	3.0	0.5	1.0
Date Sampled		4/06/2014	4/06/2014	4/06/2014	3/06/2014	3/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	6.9	7.0	7.0	5.0	5.0
Electrical Conductivity 1:5 soil:water	µS/cm	850	710	880	560	740
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	580	820
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	150	140

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-86	111097-87	111097-88	111097-89	111097-90
Your Reference	-------------	P7-16	P7-17	P7-17	P7-18	P7-18
Depth	------------	1.5	0.5	1.0	0.5	1.0
Date Sampled		3/06/2014	3/06/2014	3/06/2014	3/06/2014	3/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.7	6.0	6.1	5.0	4.9
Electrical Conductivity 1:5 soil:water	µS/cm	590	170	120	480	750
Chloride, Cl 1:5 soil:water	mg/kg	620	110	92	380	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	140	97	38	280	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-91	111097-92	111097-93	111097-94	111097-95
Your Reference	-------------	P7-18	P7-18	P7-18	P7-19	P7-19
Depth	------------	1.5	2.0	2.5	0.5	1.0
Date Sampled		3/06/2014	3/06/2014	3/06/2014	3/06/2014	3/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.1	5.3	5.6	5.8	4.9
Electrical Conductivity 1:5 soil:water	µS/cm	610	430	470	530	660
Chloride, Cl 1:5 soil:water	mg/kg	630	[NA]	360	[NA]	600
Sulphate, SO4 1:5 soil:water	mg/kg	230	[NA]	150	[NA]	330

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-96	111097-97	111097-98	111097-99	111097-100
Your Reference	-------------	P7-19	P7-19	P7-19	P7-19	P7-20
Depth	------------	1.5	2.0	2.5	3.0	0.5
Date Sampled		3/06/2014	3/06/2014	3/06/2014	3/06/2014	3/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.0	5.3	5.8	6.3	5.5
Electrical Conductivity 1:5 soil:water	µS/cm	470	470	350	230	77
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	460	[NA]	170	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	160	[NA]	89	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-101	111097-102	111097-103	111097-104	111097-105
Your Reference	-------------	P7-20	P7-20	P7-20	P7-20	P7-20
Depth	------------	1.0	1.5	2.0	2.5	3.0
Date Sampled		3/06/2014	3/06/2014	3/06/2014	3/06/2014	3/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	7.1	8.1	8.2	7.8	7.7
Electrical Conductivity 1:5 soil:water	µS/cm	170	260	220	730	750

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-106	111097-107	111097-108	111097-109	111097-110
Your Reference	-------------	P7-21	P7-21	P7-21	P7-21	P7-21
Depth	------------	0.5	1.0	1.5	2.0	2.5
Date Sampled		3/06/2014	3/06/2014	3/06/2014	3/06/2014	3/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	7.0	5.0	4.9	5.1	5.1
Electrical Conductivity 1:5 soil:water	µS/cm	550	820	620	490	400

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-111	111097-112	111097-113	111097-114	111097-115
Your Reference	-------------	P7-21	P7-22	P7-22	P7-22	P7-22
Depth	------------	3.0	0.5	1.0	1.5	2.0
Date Sampled		3/06/2014	3/06/2014	3/06/2014	3/06/2014	3/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.2	4.8	4.6	4.8	4.9
Electrical Conductivity 1:5 soil:water	µS/cm	440	720	750	550	600
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	820	[NA]	560
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	190	[NA]	150

Miscellaneous Inorg - soil						
Our Reference:	UNITS	111097-116	111097-117	111097-118	111097-119	111097-120
Your Reference	-------------	P7-22	P7-22	P7-23	P7-23	P7-23
Depth	------------	2.5	3.0	0.5	1.0	1.5
Date Sampled		3/06/2014	3/06/2014	3/06/2014	3/06/2014	3/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
Date analysed	-	12/06/2014	12/06/2014	12/06/2014	12/06/2014	12/06/2014
pH 1:5 soil:water	pH Units	5.2	5.6	4.8	4.7	5.8
Electrical Conductivity 1:5 soil:water	µS/cm	550	460	460	800	490
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	450	470	1,100	540
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	110	110	47	70

ESP/CEC						
Our Reference:	UNITS	111097-1	111097-5	111097-43	111097-57	111097-61
Your Reference	-------------	P7-1	P7-1	P7-8	P7-10	P7-11
Depth	------------	0.4-0.5	2.5	1.5	3.0	2.0
Date Sampled		4/06/2014	4/06/2014	4/06/2014	4/06/2014	4/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Exchangeable Ca	meq/100g	1.3	0.1	0.1	<0.1	<0.1
Exchangeable K	meq/100g	0.3	0.4	0.2	0.2	0.2
Exchangeable Mg	meq/100g	10	12	11	9.4	5.8
Exchangeable Na	meq/100g	0.97	4.0	4.1	4.4	2.0
Cation Exchange Capacity	meq/100g	13	16	15	14	8.1
ESP	%	8	25	27	31	24

ESP/CEC						
Our Reference:	UNITS	111097-68	111097-75	111097-85	111097-87	111097-89
Your Reference	-------------	P7-13	P7-14	P7-16	P7-17	P7-18
Depth	------------	1.0	2.0	1.0	0.5	0.5
Date Sampled		4/06/2014	4/06/2014	3/06/2014	3/06/2014	3/06/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Exchangeable Ca	meq/100g	<0.1	0.2	0.9	1.2	1
Exchangeable K	meq/100g	0.3	0.2	0.2	0.2	0.3
Exchangeable Mg	meq/100g	8.3	5.3	9.6	12	13
Exchangeable Na	meq/100g	2.8	3.1	4.0	1.5	2.9
Cation Exchange Capacity	meq/100g	12	8.8	15	14	17
ESP	%	24	35	27	10	17

ESP/CEC					
Our Reference:	UNITS	111097-97	111097-113	111097-117	111097-118
Your Reference	-------------	P7-19	P7-22	P7-22	P7-23
Depth	------------	2.0	1.0	3.0	0.5
Date Sampled		3/06/2014	3/06/2014	3/06/2014	3/06/2014
Type of sample		Soil	Soil	Soil	Soil
Exchangeable Ca	meq/100g	4.5	3.4	2.8	8.7
Exchangeable K	meq/100g	0.2	0.3	0.3	0.3
Exchangeable Mg	meq/100g	12	11	9.5	11
Exchangeable Na	meq/100g	4.4	3.4	3.4	1.8
Cation Exchange Capacity	meq/100g	21	18	16	22
ESP	%	21	19	21	8

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soil based on Rayment and Lyons 2011.

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			12/06/2014	111097-1	12/06/2014 || 12/06/2014	LCS-1	12/06/2014
Date analysed	-			12/06/2014	111097-1	12/06/2014 || 12/06/2014	LCS-1	12/06/2014
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	111097-1	5.9 || 5.7 || RPD: 3	LCS-1	101%
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	111097-1	200 || 240 || RPD: 18	LCS-1	101%
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	111097-1	190 || 240 || RPD: 23	LCS-1	98%
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	111097-1	46 || 50 || RPD: 8	LCS-1	102%

QUALITY CONTROL ESP/CEC	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	111097-1	1.3 || 1.3 || RPD: 0	LCS-1	107%
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	111097-1	0.3 || 0.3 || RPD: 0	LCS-1	105%
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	111097-1	10 || 11 || RPD: 10	LCS-1	104%
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	111097-1	0.97 || 1.0 || RPD: 3	LCS-1	98%
Cation Exchange Capacity	meq/100g	1	Metals-009	<1.0	111097-1	13 || 13 || RPD: 0	[NR]	[NR]
ESP	%	1	Metals-009	<1	111097-1	8 || 8 || RPD: 0	[NR]	[NR]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	111097-11	12/06/2014 || 12/06/2014	LCS-2	12/06/2014
Date analysed	-	111097-11	12/06/2014 || 12/06/2014	LCS-2	12/06/2014
pH 1:5 soil:water	pH Units	111097-11	5.6 || 5.5 || RPD: 2	LCS-2	101%
Electrical Conductivity 1:5 soil:water	µS/cm	111097-11	450 || 520 || RPD: 14	LCS-2	103%
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]	LCS-2	104%
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]	LCS-2	106%

QUALITY CONTROL ESP/CEC	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Exchangeable Ca	meq/100g	111097-97	4.5 || 4.7 || RPD: 4
Exchangeable K	meq/100g	111097-97	0.2 || 0.2 || RPD: 0
Exchangeable Mg	meq/100g	111097-97	12 || 12 || RPD: 0
Exchangeable Na	meq/100g	111097-97	4.4 || 4.3 || RPD: 2
Cation Exchange Capacity	meq/100g	111097-97	21 || 21 || RPD: 0
ESP	%	111097-97	21 || 20 || RPD: 5

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	111097-21	12/06/2014 || 12/06/2014	LCS-3	12/06/2014
Date analysed	-	111097-21	12/06/2014 || 12/06/2014	LCS-3	12/06/2014
pH 1:5 soil:water	pH Units	111097-21	6.0 || 5.9 || RPD: 2	LCS-3	100%
Electrical Conductivity 1:5 soil:water	µS/cm	111097-21	290 || 290 || RPD: 0	LCS-3	99%
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]	LCS-3	103%
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]	LCS-3	106%

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	111097-31	12/06/2014 || 12/06/2014	LCS-4	12/06/2014
Date analysed	-	111097-31	12/06/2014 || 12/06/2014	LCS-4	12/06/2014
pH 1:5 soil:water	pH Units	111097-31	4.9 || 4.9 || RPD: 0	LCS-4	101%
Electrical Conductivity 1:5 soil:water	µS/cm	111097-31	1100 || 1100 || RPD: 0	LCS-4	100%
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]	[NR]	[NR]
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	111097-41	12/06/2014 || 12/06/2014	LCS-5	12/06/2014
Date analysed	-	111097-41	12/06/2014 || 12/06/2014	LCS-5	12/06/2014
pH 1:5 soil:water	pH Units	111097-41	5.2 || 5.2 || RPD: 0	LCS-5	101%
Electrical Conductivity 1:5 soil:water	µS/cm	111097-41	580 || 530 || RPD: 9	LCS-5	100%
Chloride, Cl 1:5 soil:water	mg/kg	111097-41	630 || 540 || RPD: 15	[NR]	[NR]
Sulphate, SO4 1:5 soil:water	mg/kg	111097-41	230 || 230 || RPD: 0	[NR]	[NR]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	111097-51	12/06/2014 || 12/06/2014	LCS-6	12/06/2014
Date analysed	-	111097-51	12/06/2014 || 12/06/2014	LCS-6	12/06/2014
pH 1:5 soil:water	pH Units	111097-51	6.3 || 6.2 || RPD: 2	LCS-6	101%
Electrical Conductivity 1:5 soil:water	µS/cm	111097-51	290 || 280 || RPD: 4	LCS-6	101%
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]	LCS-6	98%
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]	LCS-6	102%

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	111097-61	12/06/2014 || 12/06/2014	111097-3	12/06/2014
Date analysed	-	111097-61	12/06/2014 || 12/06/2014	111097-3	12/06/2014
pH 1:5 soil:water	pH Units	111097-61	5.0 || 5.1 || RPD: 2	[NR]	[NR]
Electrical Conductivity 1:5 soil:water	µS/cm	111097-61	450 || 420 || RPD: 7	[NR]	[NR]
Chloride, Cl 1:5 soil:water	mg/kg	111097-61	480 || 440 || RPD: 9	111097-3	95%
Sulphate, SO4 1:5 soil:water	mg/kg	111097-61	120 || 120 || RPD: 0	111097-3	84%

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	111097-72	12/06/2014 || 12/06/2014	111097-43	16/06/2014
Date analysed	-	111097-72	12/06/2014 || 12/06/2014	111097-43	16/06/2014
pH 1:5 soil:water	pH Units	111097-72	5.5 || 5.5 || RPD: 0	[NR]	[NR]
Electrical Conductivity 1:5 soil:water	µS/cm	111097-72	260 || 240 || RPD: 8	[NR]	[NR]
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]	111097-43	#
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]	111097-43	112%

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	111097-81	12/06/2014 || 12/06/2014	111097-63	12/06/2014
Date analysed	-	111097-81	12/06/2014 || 12/06/2014	111097-63	12/06/2014
pH 1:5 soil:water	pH Units	111097-81	6.9 || 6.8 || RPD: 1	[NR]	[NR]
Electrical Conductivity 1:5 soil:water	µS/cm	111097-81	850 || 630 || RPD: 30	[NR]	[NR]
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]	111097-63	#
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]	111097-63	101%

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	111097-91	12/06/2014 || 12/06/2014
Date analysed	-	111097-91	12/06/2014 || 12/06/2014
pH 1:5 soil:water	pH Units	111097-91	5.1 || 5.0 || RPD: 2
Electrical Conductivity 1:5 soil:water	µS/cm	111097-91	610 || 520 || RPD: 16
Chloride, Cl 1:5 soil:water	mg/kg	111097-91	630 || 580 || RPD: 8
Sulphate, SO4 1:5 soil:water	mg/kg	111097-91	230 || 200 || RPD: 14

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	111097-101	12/06/2014 || 12/06/2014
Date analysed	-	111097-101	12/06/2014 || 12/06/2014
pH 1:5 soil:water	pH Units	111097-101	7.1 || 7.1 || RPD: 0
Electrical Conductivity 1:5 soil:water	µS/cm	111097-101	170 || 170 || RPD: 0
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	111097-111	12/06/2014 || 12/06/2014
Date analysed	-	111097-111	12/06/2014 || 12/06/2014
pH 1:5 soil:water	pH Units	111097-111	5.2 || 5.2 || RPD: 0
Electrical Conductivity 1:5 soil:water	µS/cm	111097-111	440 || 460 || RPD: 4
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]

Report Comments:

Cl # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test
NA: Test not required
<: Less than
PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than
NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

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

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

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Precinct 7 Leppington	**To:**	Envirolab Services
Project No:	76611.01 **Sampler:** MJC		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	JR **Mob. Phone:** 0422 000 434	**Attn:**	Tania Notaras
Email:	John.russell@douglaspartners.com.au	**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard	**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
P7-1/0.5	1	04/06/14	S	G	x	x	X	X						
P7-1/1.0	2	04/06/14	S	G	x	x								
P7-1/1.5	3	04/06/14	S	G	x	x	X							
P7-1/2.0	4	04/06/14	S	G	x	x								
P7-1/2.5	5	04/06/14	S	G	x	x	X	X						
P7-2/0.5	6	04/06/14	S	G	x	x								
P7-2/1.0	7	04/06/14	S	G	x	x								
P7-2/1.5	8	04/06/14	S	G	x	x								
P7-2/2.0	9	04/06/14	S	G	x	x								
P7-2/2.5	10	04/06/14	S	G	x	x								
P7-2/3.0	11	04/06/14	S	G	x	x								
			S	G	x	x								

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph. (02) 9910 6200
Job No: 111097
Date Received: 05/06
Time Received: 19:00
Received by: SK
Temp: [✓ Cool]/Ambient
Cooling: ~~Ice/Icepack~~
Security: [✓ Intact]/Broken/None

Lab Report No:

Send Results to: Douglas Partners Pty Ltd **Address** Unit 5, 50 Topham Road, Smeaton Grange 2567 **Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886

Relinquished by: MJC **Transported to laboratory by:**

Signed: **Date & Time:** 5.06.14 **Received by:**

Form COC

Page 1 of 12

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Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

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Attn: Tania Notaras
Phone: (02) 9910 6200 **Fax:** (02) 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
P7-3/0.5	12	04/06/14	S	G	x	x								
P7-3/1.0	13	04/06/14	S	G	x	x								
P7-3/1.5	14	04/06/14	S	G	x	x								
P7-3/2.0	15	04/06/14	S	G	x	x								
P7-3/2.5	16	04/06/14	S	G	x	x								
P7-3/3.0	17	04/06/14	S	G	x	x								
P7-4/0.5	18	04/06/14	S	G	x	x								
P7-4/1.0	19	04/06/14	S	G	x	x								
P7-4/1.5	20	04/06/14	S	G	x	x								
P7-4/2.0	21	04/06/14	S	G	x	x								
P7-4/2.5	22	04/06/14	S	G	x	x								
P7-4/3.0	23	04/06/14	S	G	x	x								

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Relinquished by: MJC **Transported to laboratory by:**
Signed: **Date & Time:** 5.06.14 **Received by:** SK

Form COC

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Precinct 7 Leppington			**To:**	Envirolab Services
Project No:	76611.01	**Sampler:**	MJC		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	JR	**Mob. Phone:**	0422 000 434	**Attn:**	Tania Notaras
Email:	John.russell@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Sampling Date	Sample Type S - soil W - water	Container Type G - glass P - plastic	Analytes EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					Notes/preservation
P7-5/0.5	24	04/06/14	S	G	x	x								
P7-5/1.0	25	04/06/14	S	G	x	x								
P7-5/1.5	26	04/06/14	S	G	x	x								
P7-5/2.0	27	04/06/14	S	G	x	x								
P7-5/2.5	28	04/06/14	S	G	x	x								
P7-5/3.0	29	04/06/14	S	G	x	x								
P7-6/0.5	30	04/06/14	S	G	x	x								
P7-6/1.0	31	04/06/14	S	G	x	x								
P7-6/1.5	32	04/06/14	S	G	x	x								
P7-6/2.0	33	04/06/14	S	G	x	x								
P7-6/2.5	34	04/06/14	S	G	x	x								

Lab Report No:

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Date Required:	Standard	**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
P7-9/0.5	47	04/06/14	S	G	x	x								
P7-9/1.0	48	04/06/14	S	G	x	x								
P7-9/1.5	49	04/06/14	S	G	x	x								
P7-9/2.0	50	04/06/14	S	G	x	x								
P7-9/2.5	51	04/06/14	S	G	x	x								
P7-10/0.5	52	04/06/14	S	G	x	x	X							
P7-10/1.0	53	04/06/14	S	G	x	x								
P7-10/1.5	54	04/06/14	S	G	x	x	X							
P7-10/2.0	55	04/06/14	S	G	x	x								
P7-10/2.5	56	04/06/14	S	G	x	x								
P7-10/3.0	57 -	04/06/14	S	G	x	x	X	X						

Lab Report No:

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Relinquished by: MJC **Transported to laboratory by:**

Signed: **Date & Time:** 5.06.14 **Received by:** SK

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

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Project No: 76611.01
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Phone: (02) 9910 6200 **Fax:** (02) 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
P7-11/0.5	58	04/06/14	S	G	x	x								
P7-11/1.0	59	04/06/14	S	G	x	x	X							
P7-11/1.5	60	04/06/14	S	G	x	x								
P7-11/2.0	61	04/06/14	S	G	x	x	X	X						
P7-11/2.5	62	04/06/14	S	G	x	x								
P7-11/3.0	63	04/06/14	S	G	x	x	X							
P7-12/0.5	64	04/06/14	S	G	x	x								
P7-12/1.0	65	04/06/14	S	G	x	x								
P7-12/1.5	66	04/06/14	S	G	x	x								

Lab Report No:
Send Results to: Douglas Partners Pty Ltd **Address** Unit 5, 50 Topham Road, Smeaton Grange 2567 **Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886
Relinquished by: MJC
Transported to laboratory by:
Signed: **Date & Time:** 5.06.14
Received by: SK

Form COC

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Precinct 7 Leppington			**To:**	Envirolab Services	
Project No:	76611.01	**Sampler:**	MJC		12 Ashley Street, Chatswood NSW 2067	
Project Mgr:	JR	**Mob. Phone:**	0422 000 434	**Attn:**	Tania Notaras	
Email:	John.russell@douglaspartners.com.au			**Phone:**	(02) 9910 6200	**Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au	

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
P7-13/0.5	67	04/06/14	S	G	x	x								
P7-13/1.0	68	04/06/14	S	G	x	x	X	X						
P7-13/1.5	69	04/06/14	S	G	x	x								
P7-13/2.0	70	04/06/14	S	G	x	x	X							
P7-13/2.5	71	04/06/14	S	G	x	x	X							
P7-14/0.5	72	04/06/14	S	G	x	x								
P7-14/1.0	73	04/06/14	S	G	x	x	X							
P7-14/1.5	74	04/06/14	S	G	x	x								
P7-14/2.0	75	04/06/14	S	G	x	x	X	X						
P7-14/2.5	76	04/06/14	S	G	x	x								
P7-14/3.0	77	04/06/14	S	G	x	x	X							

Lab Report No:

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Relinquished by: MJC **Transported to laboratory by:**

Signed: **Date & Time:** 5.06.14 **Received by:** SK

Form COC

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name: Precinct 7 Leppington
Project No: 76611.01
Project Mgr: JR
Email: John.russell@douglaspartners.com.au
Date Required: Standard
Sampler: MJC
Mob. Phone: 0422 000 434

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

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
P7-15/0.5	78	04/06/14	S	G	x	x								
P7-15/1.0	79	04/06/14	S	G	x	x								
P7-15/1.5	80	04/06/14	S	G	x	x								
P7-15/2.0	81	04/06/14	S	G	x	x								
P7-15/2.5	82	04/06/14	S	G	x	x								
P7-15/3.0	83	04/06/14	S	G	x	x								
P7-16/0.5	84	03/06/14	S	G	x	x	X							
P7-16/1.0	85	03/06/14	S	G	x	x	X	X						
P7-16/1.5	86	03/06/14	S	G	x	x	X							

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Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name: Precinct 7 Leppington
Project No: 76611.01
Sampler: MJC
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Email: John.russell@douglaspartners.com.au
Date Required: Standard

To: Envirolab Services
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Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
P7-17/0.5	87	03/06/14	S	G	x	x	X	X						
P7-17/1.0	88	03/06/14	S	G	x	x	X							
[redacted]					X	X								
P7-18/0.5	89	03/06/14	S	G	x	x	X	X						
P7-18/1.0	90	03/06/14	S	G	x	x								
P7-18/1.5	91	03/06/14	S	G	x	x	X							
P7-18/2.0	92	03/06/14	S	G	x	x								
P7-18/2.5	93	03/06/14	S	G	x	x	X							

Lab Report No:
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Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Precinct 7 Leppington			**To:**	Envirolab Services
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Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
P7-19/0.5	94	03/06/14	S	G	x	x								
P7-19/1.0	95	03/06/14	S	G	x	x	X							
P7-19/1.5	96	03/06/14	S	G	x	x								
P7-19/2.0	97	03/06/14	S	G	x	x	X	X						
P7-19/2.5	98	03/06/14	S	G	x	x								
P7-19/3.0	99	03/06/14	S	G	x	x	X							
P7-20/0.5	100	03/06/14	S	G	x	x								
P7-20/1.0	101	03/06/14	S	G	x	x								
P7-20/1.5	102	03/06/14	S	G	x	x								
P7-20/2.0	103	03/06/14	S	G	x	x								
P7-20/2.5	104	03/06/14	S	G	x	x								
P7-20/3.0	105	03/06/14	S	G	x	x								

Lab Report No:

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Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name: Precinct 7 Leppington
Project No: 76611.01
Sampler: MJC
Project Mgr: JR
Mob. Phone: 0422 000 434
Email: John.russell@douglaspartners.com.au
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To: Envirolab Services
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Email: tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
P7-21/0.5	106	03/06/14	S	G	x	x								
P7-21/1.0	107	03/06/14	S	G	x	x								
P7-21/1.5	108	03/06/14	S	G	x	x								
P7-21/2.0	109	03/06/14	S	G	x	x								
P7-21/2.5	110	03/06/14	S	G	x	x								
P7-21/3.0	111	03/06/14	S	G	x	x								
P7-22/0.5	112	03/06/14	S	G	x	x								
P7-22/1.0	113	03/06/14	S	G	x	x	X	X						
P7-22/1.5	114	03/06/14	S	G	x	x								
P7-22/2.0	115	03/06/14	S	G	x	x	X							
P7-22/2.5	116	03/06/14	S	G	x	x								
P7-22/3.0	117	03/06/14	S	G	x	x	X	X						

Lab Report No:
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Signed:
Date & Time: 5.06.14
Received by: SK

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Precinct 7 Leppington			**To:**	Envirolab Services		
Project No:	76611.01	**Sampler:**	MJC		12 Ashley Street, Chatswood NSW 2067		
Project Mgr:	JR	**Mob. Phone:**	0422 000 434	**Attn:**	Tania Notaras		
Email:	John.russell@douglaspartners.com.au			**Phone:**	(02) 9910 6200	**Fax:**	(02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au		

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
P7-23/0.5	118	03/06/14	S	G	x	x	X	X						
P7-23/1.0	119	03/06/14	S	G	x	x	X							
P7-23/1.5	120	03/06/14	S	G	x	x	X							

Lab Report No:

Send Results to: Douglas Partners Pty Ltd **Address** Unit 5, 50 Topham Road, Smeaton Grange 2567 **Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886

Relinquished by: MJC **Transported to laboratory by:**

Signed: **Date & Time:** 5.06.14 **Received by:** SK

Form COC

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

SAMPLE RECEIPT ADVICE

Client:

Douglas Partners Pty Ltd Smeaton Grange
Unit 5/50 Topham Rd
Smeaton Grange NSW 2567

ph: 02 4647 0075
Fax: 02 4646 1886

Attention: John Russell

Sample log in details:

Your reference:	**76611.02, Precinct 9 Leppington**
Envirolab Reference:	**117600**
Date received:	14/10/2014
Date results expected to be reported:	**21/10/14**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	62 Soils
Turnaround time requested:	Standard
Temperature on receipt (°C)	10.9
Cooling Method:	Ice Pack
Sampling Date Provided:	YES

Comments:

If there is sufficient sample after testing, samples will be held for the following time frames from date of receipt of samples:
Water samples - 1 month
Soil and other solid samples - 2 months
Samples collected in canisters - 1 week. Canisters will then be cleaned.
All other samples are not retained after analysis
If you require samples to be retained for longer periods then retention fees will apply as per our pricelist.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

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

CERTIFICATE OF ANALYSIS 117600

Client:

Douglas Partners Pty Ltd Smeaton Grange
Unit 5/50 Topham Rd
Smeaton Grange
NSW 2567

Attention: John Russell

Sample log in details:

Your Reference:	**76611.02, Precinct 9 Leppington**		
No. of samples:	62 Soils		
Date samples received / completed instructions received	14/10/2014	/	14/10/2014

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	21/10/14	/	21/10/14
Date of Preliminary Report:	Not Issued		

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

Results Approved By:

Jacinta Hurst
Laboratory Manager

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-1	117600-2	117600-3	117600-4	117600-5
Your Reference	-------------	9-2	9-2	9-2	9-2	9-2
Depth	------------	0.5	1.0	1.5	2.0	2.5
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	560	840	680	590	680
pH 1:5 soil:water	pH Units	5.0	4.8	5.0	5.2	5.3
Chloride, Cl 1:5 soil:water	mg/kg	650	[NA]	[NA]	610	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	340	[NA]	[NA]	270	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-6	117600-7	117600-8	117600-9	117600-10
Your Reference	-------------	9-2	9-3	9-3	9-3	9-3
Depth	------------	3.0	0.5	1.0	1.5	2.0
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	410	70	210	160	140
pH 1:5 soil:water	pH Units	6.0	5.6	8.5	9.1	8.9
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	110	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	42	[NA]	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-11	117600-12	117600-13	117600-14	117600-15
Your Reference	-------------	9-3	9-4	9-4	9-4	9-4
Depth	------------	2.5	0.5	1.0	1.5	2.0
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	120	370	840	680	720
pH 1:5 soil:water	pH Units	8.9	5.0	4.9	5.0	5.2

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-16	117600-17	117600-18	117600-19	117600-20
Your Reference	-------------	9-4	9-5	9-5	9-5	9-5
Depth	------------	2.5	0.5	1.0	1.5	2.0
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	340	210	280	210	290
pH 1:5 soil:water	pH Units	6.9	5.3	5.3	5.6	5.9

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-21	117600-22	117600-23	117600-24	117600-25
Your Reference	-------------	9-6	9-6	9-7	9-7	9-7
Depth	------------	0.5	1.0	0.5	1.0	1.5
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	150	170	390	570	540
pH 1:5 soil:water	pH Units	5.3	5.6	4.9	4.8	4.9
Chloride, Cl 1:5 soil:water	mg/kg	92	200	[NA]	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	140	86	[NA]	[NA]	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-26	117600-27	117600-28	117600-29	117600-30
Your Reference	-------------	9-7	9-8	9-8	9-8	9-8
Depth	------------	2.0	0.5	1.0	1.5	2.0
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	520	630	960	830	790
pH 1:5 soil:water	pH Units	5.2	4.8	4.9	4.9	5.4

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-31	117600-32	117600-33	117600-34	117600-35
Your Reference	-------------	9-8	9-8	9-9	9-9	9-9
Depth	------------	2.5	3.0	0.5	1.0	1.5
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	550	600	310	370	520
pH 1:5 soil:water	pH Units	6.1	6.6	5.0	4.8	4.7

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-36	117600-37	117600-38	117600-39	117600-40
Your Reference	-------------	9-9	9-9	9-9	9-10	9-10
Depth	------------	2.0	2.5	3.0	0.5	1.0
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	540	460	480	260	420
pH 1:5 soil:water	pH Units	4.7	5.0	5.1	6.2	6.4
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	[NA]	430
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	[NA]	150

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-41	117600-42	117600-43	117600-44	117600-45
Your Reference	-------------	9-10	9-10	9-10	9-10	9-12
Depth	------------	1.5	2.0	2.5	3.0	0.5
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	620	510	480	370	76
pH 1:5 soil:water	pH Units	6.0	6.3	7.1	7.1	6.1

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-46	117600-47	117600-48	117600-49	117600-50
Your Reference	-------------	9-12	9-12	9-12	9-12	9-12
Depth	------------	1.0	1.5	2.0	2.5	3.0
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	610	630	630	290	240
pH 1:5 soil:water	pH Units	5.2	6.7	7.9	7.6	8.0
Chloride, Cl 1:5 soil:water	mg/kg	880	[NA]	[NA]	380	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	84	[NA]	[NA]	38	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-51	117600-52	117600-53	117600-54	117600-55
Your Reference	-------------	9-13	9-13	9-13	9-13	9-13
Depth	------------	0.5	1.0	1.5	2.0	2.5
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	360	660	670	660	990
pH 1:5 soil:water	pH Units	5.7	7.6	7.7	7.7	7.8

Miscellaneous Inorg - soil						
Our Reference:	UNITS	117600-56	117600-57	117600-58	117600-59	117600-60
Your Reference	-------------	9-13	9-14	9-14	9-14	9-14
Depth	------------	3.0	0.5	1.0	1.5	2.0
Date Sampled		13/10/2014	13/10/2014	13/10/2014	13/10/2014	13/10/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/10/2014	15/10/2014	15/10/2014	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014	17/10/2014	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	1,000	860	1,200	730	540
pH 1:5 soil:water	pH Units	7.8	5.1	5.3	6.7	7.6

Miscellaneous Inorg - soil			
Our Reference:	UNITS	117600-61	117600-62
Your Reference	-------------	9-14	9-14
Depth	------------	2.5	3.0
Date Sampled		13/10/2014	13/10/2014
Type of sample		Soil	Soil
Date prepared	-	15/10/2014	15/10/2014
Date analysed	-	17/10/2014	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	440	490
pH 1:5 soil:water	pH Units	8.0	8.2

ESP/CEC Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------- ------------	117600-4 9-2 2.0 13/10/2014 Soil	117600-8 9-3 1.0 13/10/2014 Soil	117600-15 9-4 2.0 13/10/2014 Soil	117600-21 9-6 0.5 13/10/2014 Soil	117600-32 9-8 3.0 13/10/2014 Soil
Date extracted	-	16/10/2014	16/10/2014	16/10/2014	16/10/2014	16/10/2014
Date analysed	-	16/10/2014	16/10/2014	16/10/2014	16/10/2014	16/10/2014
Exchangeable Ca	meq/100g	<0.1	8.5	0.2	1.2	1.8
Exchangeable K	meq/100g	0.4	<0.1	0.4	0.2	0.3
Exchangeable Mg	meq/100g	8.6	7.8	11	8.3	12
Exchangeable Na	meq/100g	3.2	2.2	3.7	1.7	3.1
Cation Exchange Capacity	meq/100g	12	19	15	11	17
ESP	%	26	12	24	15	18

ESP/CEC Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ------------- ------------	117600-40 9-10 1.0 13/10/2014 Soil	117600-46 9-12 1.0 13/10/2014 Soil	117600-60 9-14 2.0 13/10/2014 Soil
Date extracted	-	16/10/2014	16/10/2014	16/10/2014
Date analysed	-	16/10/2014	16/10/2014	16/10/2014
Exchangeable Ca	meq/100g	<0.1	0.1	<0.1
Exchangeable K	meq/100g	0.1	0.2	0.2
Exchangeable Mg	meq/100g	10	8.1	10
Exchangeable Na	meq/100g	2.6	2.2	3.7
Cation Exchange Capacity	meq/100g	13	11	14
ESP	%	20	21	26

Method ID	Methodology Summary
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soil based on Rayment and Lyons 2011.

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			15/10/2014	117600-1	15/10/2014 || 15/10/2014	LCS-1	15/10/2014
Date analysed	-			17/10/2014	117600-1	17/10/2014 || 17/10/2014	LCS-1	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	117600-1	560 || 600 || RPD: 7	LCS-1	101%
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	117600-1	5.0 || 4.9 || RPD: 2	LCS-1	101%
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	117600-1	650 || 780 || RPD: 18	LCS-1	105%
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	117600-1	340 || 260 || RPD: 27	LCS-1	111%

QUALITY CONTROL ESP/CEC	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			16/10/2014	117600-40	16/10/2014 || 16/10/2014	LCS-1	16/10/2014
Date analysed	-			16/10/2014	117600-40	16/10/2014 || 16/10/2014	LCS-1	16/10/2014
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	117600-40	<0.1 || <0.1	LCS-1	110%
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	117600-40	0.1 || 0.1 || RPD: 0	LCS-1	106%
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	117600-40	10 || 9.8 || RPD: 2	LCS-1	110%
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	117600-40	2.6 || 2.5 || RPD: 4	LCS-1	102%
Cation Exchange Capacity	meq/100g	1	Metals-009	<1.0	117600-40	13 || 12 || RPD: 8	[NR]	[NR]
ESP	%	1	Metals-009	<1	117600-40	20 || 20 || RPD: 0	[NR]	[NR]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	117600-11	15/10/2014 || 15/10/2014	LCS-2	15/10/2014
Date analysed	-	117600-11	17/10/2014 || 17/10/2014	LCS-2	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	117600-11	120 || 130 || RPD: 8	LCS-2	101%
pH 1:5 soil:water	pH Units	117600-11	8.9 || 9.0 || RPD: 1	LCS-2	101%
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]	[NR]	[NR]
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	117600-21	15/10/2014 || 15/10/2014	LCS-3	15/10/2014
Date analysed	-	117600-21	17/10/2014 || 17/10/2014	LCS-3	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	117600-21	150 || 150 || RPD: 0	LCS-3	103%
pH 1:5 soil:water	pH Units	117600-21	5.3 || 5.3 || RPD: 0	LCS-3	101%
Chloride, Cl 1:5 soil:water	mg/kg	117600-21	92 || 82 || RPD: 11	[NR]	[NR]
Sulphate, SO4 1:5 soil:water	mg/kg	117600-21	140 || 140 || RPD: 0	[NR]	[NR]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	117600-31	15/10/2014 || 15/10/2014	LCS-4	15/10/2014
Date analysed	-	117600-31	17/10/2014 || 17/10/2014	LCS-4	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	117600-31	550 || 570 || RPD: 4	LCS-4	103%
pH 1:5 soil:water	pH Units	117600-31	6.1 || 6.0 || RPD: 2	LCS-4	101%
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]	[NR]	[NR]
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	117600-41	15/10/2014 || 15/10/2014	117600-22	15/10/2014
Date analysed	-	117600-41	17/10/2014 || 17/10/2014	117600-22	17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	117600-41	620 || 620 || RPD: 0	[NR]	[NR]
pH 1:5 soil:water	pH Units	117600-41	6.0 || 6.1 || RPD: 2	[NR]	[NR]
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]	117600-22	70%
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]	117600-22	97%

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	117600-51	15/10/2014 || 15/10/2014
Date analysed	-	117600-51	17/10/2014 || 17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	117600-51	360 || 440 || RPD: 20
pH 1:5 soil:water	pH Units	117600-51	5.7 || 5.6 || RPD: 2
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	117600-61	15/10/2014 || 15/10/2014
Date analysed	-	117600-61	17/10/2014 || 17/10/2014
Electrical Conductivity 1:5 soil:water	µS/cm	117600-61	440 || 440 || RPD: 0
pH 1:5 soil:water	pH Units	117600-61	8.0 || 8.1 || RPD: 1
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

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

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

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name: Precinct 9 Leppington
Project No: 76611.02
Sampler: MJC
Project Mgr: JR
Mob. Phone: 0422 000 434
Email: John.russell@douglaspartners.com.au
Date Required: Standard

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

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
9-2/0.5	1	13/10/14	S	G	x	x	x							
9-2/1.0	2	13/10/14	S	G	x	x								
9-2/1.5	3	13/10/14	S	G	x	x								
9-2/2.0	4	13/10/14	S	G	x	x	x	x						
9-2/2.5	5	13/10/14	S	G	x	x								
9-2/3.0	6	13/10/14	S	G	x	x								

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 117600
Date Received: 14/10/14
Time Received: 13.30
Received by: LSB
Temp: [✓ Cool]/Ambient
Cooling: Ice/[✓ Icepack] 10.9
Security: [✓ Intact]/Broken/None

Lab Report No:
Send Results to: Douglas Partners Pty Ltd **Address** Unit 5, 50 Topham Road, Smeaton Grange 2567 **Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886
Relinquished by: MJC
Transported to laboratory by:
Signed: **Date & Time:** 14.10.14
Received by: LSB ECS 14/10/14 13.30

Form COC

Page 1 of 7

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Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
9-3/0.5	7	13/10/14	S	G	x	x								
9-3/1.0	8	13/10/14	S	G	x	x	x	x						
9-3/1.5	9	13/10/14	S	G	x	x								
9-3/2.0	10	13/10/14	S	G	x	x								
9-3/2.5	11	13/10/14	S	G	x	x								
9-4/0.5	12	13/10/14	S	G	x	x								
9-4/1.0	13	13/10/14	S	G	x	x								
9-4/1.5	14	13/10/14	S	G	x	x								
9-4/2.0	15	13/10/14	S	G	x	x		x						
9-4/2.5	16	13/10/14	S	G	x	x								

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Signed:
Date & Time: 14.10.14
Received by: LSB ELS 14/10/14 13.30

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Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
9-5/0.5	17	13/10/14	S	G	x	x								
9-5/1.0	18	13/10/14	S	G	x	x								
9-5/1.5	19	13/10/14	S	G	x	x								
9-5/2.0	20	13/10/14	S	G	x	x								
9-6/0.5	21	13/10/14	S	G	x	x								
9-6/1.0	22	13/10/14	S	G	x	x	x	x						
9-7/0.5	23	13/10/14	S	G	x	x	x							
9-7/1.0	24	13/10/14	S	G	x	x								
9-7/1.5	25	13/10/14	S	G	x	x								
9-7/2.0	26	13/10/14	S	G	x	x								
			S	G										

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Relinquished by: MJC **Transported to laboratory by:**
Signed: **Date & Time:** 14.10.14 **Received by:** OSR ELS 14/10/14 13.30

Form COC

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Sample ID	Lab ID	Sampling Date	Sample Type S - soil W - water	Container Type G - glass P - plastic	Analytes									Notes/preservation
					EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
9-8/0.5	27	13/10/14	S	G	x	x								
9-8/1.0	28	13/10/14	S	G	x	x								
9-8/1.5	29	13/10/14	S	G	x	x								
9-8/2.0	30	13/10/14	S	G	x	x								
9-8/2.5	31	13/10/14	S	G	x	x								
9-8/3.0	32	13/10/14	S	G	x	x								
9-9/0.5	33	13/10/14	S	G	x	x		x						
9-9/1.0	34	13/10/14	S	G	x	x								
9-9/1.5	35	13/10/14	S	G	x	x								
9-9/2.0	36	13/10/14	S	G	x	x								
9-9/2.5	37	13/10/14	S	G	x	x								
9-9/3.0	38	13/10/14	S	G	x	x								

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Relinquished by: MJC **Transported to laboratory by:**
Signed: **Date & Time:** 14.10.14 **Received by:** CSB ECS8 14/10/14 13.30

Form COC

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Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
9-10/0.5	39	13/10/14	S	G	x	x								
9-10/1.0	40	13/10/14	S	G	x	x								
9-10/1.5	41	13/10/14	S	G	x	x	x	x						
9-10/2.0	42	13/10/14	S	G	x	x								
9-10/2.5	43	13/10/14	S	G	x	x								
9-10/3.0	44	13/10/14			x	x								

Lab Report No:
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Relinquished by: MJC **Transported to laboratory by:**
Signed: **Date & Time:** 14.10.14 **Received by:** LSB ELS 14/10/14 13.20

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CHAIN OF CUSTODY

Project Name: Precinct 9 Leppington
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Phone: (02) 9910 6200 **Fax:** (02) 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
9-12/0.5	45	13/10/14	S	G	x	x								
9-12/1.0	46	13/10/14	S	G	x	x								
9-12/1.5	47	13/10/14	S	G	x	x	x	x						
9-12/2.0	48	13/10/14	S	G	x	x								
9-12/2.5	49	13/10/14	S	G	x	x								
9-12/3.0	50	13/10/14	S	G	x	x	x							
9-13/0.5	51	13/10/14	S	G	x	x								
9-13/1.0	52	13/10/14	S	G	x	x								
9-13/1.5	53	13/10/14	S	G	x	x								
9-13/2.0	54	13/10/14	S	G	x	x								
9-13/2.5	55	13/10/14	S	G	x	x								
9-13/3.0	56	13/10/14	S	G	x	x								

Lab Report No:
Send Results to: Douglas Partners Pty Ltd **Address** Unit 5, 50 Topham Road, Smeaton Grange 2567 **Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886
Relinquished by: MJC
Signed: **Date & Time:** 14.10.14
Transported to laboratory by:
Received by: CSB 14/10/14 13.30

Form COC

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Geotechnics / Environment / Groundwater

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Sample ID	Lab ID	Sampling Date	Sample Type	Container Type	Analytes									Notes/preservation
			S - soil W - water	G - glass P - plastic	EC	pH	Chlorides Sulphates	Sodicity	Texture (only)					
9-14/0.5	57	13/10/14	S	G	x	x								
9-14/1.0	58	13/10/14	S	G	x	x								
9-14/1.5	59	13/10/14	S	G	x	x								
9-14/2.0	60	13/10/14	S	G	x	x								
9-14/2.5	61	13/10/14	S	G	x	x		x						
9-14/3.0	62	13/10/14	S	G	x	x								

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Transported to laboratory by:
Received by: CSB ELS 14/10/14 13.30

A.8 Construction Waste Management Plan

HANSENYUNCKEN

Construction Waste Management Plan

Project: New High-Quality Classroom – East Leppington Public School

Job No: SC126

Rev: D | May 2021

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Contents

1 Document Information

1.1 Review & Approval

Review			
Position	**Name**	**Sign**	**Date**
Contracts Authorised Person	Dean Marcon		
Snr Contracts Administrator	Ronaldo Bermudez		
Services Engineer	Nicholas Ko		
(LP) Project Manager	Zac Casimatis		
(LP) Contracts Administrator	Mikky Baroni		
(LP) Site Manager	Ross Pearson		
(LP) Site Safety Officer	Andrew Wackwitz		
(LP) Project Engineer	Zac Carson		
(LP) Site Engineer	Rachel Berry		
(LP) Site Engineer	Marco Beretta		
(LP) Foreman	Paul Tane		
(LP) Foreman	Tom Maishman		

Approval			
Position	**Name**	**Sign**	**Date**
Operations Manager	John Wilson		
State HSE Manager	Peter Fay		
Construction Manager	Dean Marcon		
QA & Systems Manager	Patrick Carnuccio		

1.2 Change Information

Change Information			
Revision	**Description**	**Issued by**	**Issue date**
A	Issued for Draft SSDA submission	MOG	August 2019
B	Issue for SSDA Main Works	MB	September 2020
C	Update of Waste Contractor	ZC	November 2020
D	Update due to layout of site compound	MB	May 2021

2 Definitions

The following definitions and abbreviations have been used in this Environmental Management Plan. Further definitions and abbreviations are provided in referenced procedures and plans.

BIM360 Field	Cloud based QHSE field management software application designed specifically for the construction industry.
EMP	Environmental Management Plan (this document)
EPA	State Environment Protection Authority
ESD	Ecologically Sustainable Development
HSE	Health, Safety & Environment
HY	Hansen Yuncken Pty Ltd
HYWAY	An information management platform developed by HY utilising Microsoft SharePoint
NC	Non-Conformance
NGER	National Greenhouse and Energy Reporting
SC126	New High-Quality Classroom – East Leppington Public School
NVMP	Noise and Vibration Management Plan
OEH	Office of Environment and Heritage
PLN	HY Plan
PMP	Project Management Plan
POEO	The Protection of the Environment Operations Act
PROJ	Project Management
REO	Regional Environmental Officer
RMS	Roads and Maritime Services
RTS	Roads and Traffic Authority
S/C	Subcontract(s) or Subcontractor(s) as the context requires
Site Safety Supervisor	Site Manager
SSC	Site Safety Coordinator
SSO	Site Safety Officer
SWMS	Safe Work Method Statement
TMP	Traffic Management Plan

3 Introduction

3.1 Purpose of the Waste Management Plan

The Construction Waste Management Plan (CWMP) has been developed to identify the expected waste streams for the East Leppington Public School, and to outline the strategy for reducing this waste. The plan addresses Condition B18 of SSD 9476 in accordance with the objectives of the plan listed below. The prime objective is to minimise the amount of materials transferred from this project to landfill.

The CWMP will;

- Detail the quantities of each waste type generated during construction and the proposed reuse, recycling and disposal locations; and
- Removal of hazardous materials, particularly the method of containment and control of emission of fibres to the air, and disposal at an approved waste disposal facility in accordance with the requirements of the relevant legislation, codes, standards and guidelines, prior to the commencement of construction.
- Identify, quantify and classify the likely waste streams that will be generated during the construction.
- Identify the measures to be implemented to manage, reuse, recycle and safely dispose of the waste.
- Identify appropriate servicing arrangements, including waste management and loading zones for the site.

3.2 Project and Site Description

The New High-Quality Classrooms Package 2 will involve the new construction of East Leppington (EL) Public School. It involves the design and construction of the following through a combination of offsite and onsite construction techniques.

Teaching Spaces – East Leppington - 44 new permanent teaching spaces for 1000 students in accordance with EFSG standards.

Core Facilities - Library, Administration, Canteen, staffing and pupil facilities to Core 35 Standards to and shared Community Hall & parking.

Site Configuration - Site must be configured to allow for teaching spaces, parking, sporting facilities, open space, infrastructure and area for future demountable.

The East Leppington Public School site covers an area of approximately 3.0Ha, and is located within a growth precinct. The surrounding area includes newly constructed single dwellings to the west with undeveloped open space to the north, east and south.

A combination of offsite and onsite construction techniques will be used to deliver a high quality, future focused innovative, state of the art school. Meeting the current and future school and community needs whilst complying with the requirements as detailed in the Educational Facilities Standards and Guidelines (EFSG) and providing a high level of end user satisfaction.

4 Targets, Objectives & Legislation

4.1 Objectives

The project waste objectives include, complying will all environmental legislation (listed in section 4.3), minimising the amount of waste sent to landfill and maximising the amount of waste recycling.

4.2 Targets

- Disposal of no more than 20% of residual waste materials to a licensed landfill.
- The diversion from landfill of 80% of construction waste by weight.

4.3 Legislation

Relevant legislation and guidelines applicable to the project are listed below;

- Environmental Planning and Assessment Act 1979 No 203
- Environmental Planning and Assessment Regulation 2000
- Protection of the Environment Operations Act 1997 (NSW)
- Protection of the Environment Operations (General) Regulation 2009
- ISO 14001; 2015 Environmental management systems - Requirements with guidance for use
- NSW Government Environmental Management System Guidelines (edition 3 - August 2013)

5 Implementation

5.1 Waste Management

5.1.1 Waste Reduction

The main source of waste associated with the construction works would be demolished material (bricks, concrete, steel etc.) resulting from the demolition and refurbishment of existing buildings. It is likely that some excess building materials will be produced due to the construction work such as miscellaneous waste associated with packaging and transport of plant and equipment and various other manufactured items forming part of the augmentation works. Excavation for buildings, inground services and civil landscapes will create Virgin excavated natural material (VENM) which can create an amount of waste attributed to the project. Fortunately, this project does not contain any demolition which eliminates the main source of waste associated with construction. VENM will be utilised on site where possible for landscaping and to fill low building footprint areas. Waste generated as a result of construction will be minimised, recycled, reused or recovered, where practical.

HY has accepted the challenge to reduce waste on this construction project, particularly in materials transferred to landfill.

The strategy for reducing the waste on the project will be made up of three strategies as detailed below in order of priority. The prime objective is to keep the amount of materials transferred to landfill from this project to the minimum possible amount.

1. Reduce the amount of waste material produced on the project by ensuring that only enough materials required to perform the works are ordered.
2. Any excess materials from particular work areas are to be retained and incorporated into other work areas where practical.
3. Encourage “just in time” delivery of construction materials (minimum storage on site) to reduce the potential of loss / waste due to damage prior to usage.
4. Utilise VENM on site where possible.

5.1.2 Non-Recyclable Waste

Non-recyclable waste will be disposed of at an EPA approved landfill or transfer station.

5.1.3 Waste Collection & Disposal

Appropriate waste bins are to be provided by HY and made available to all S/C.

All S/C shall be directed to place waste in the bins provided. This shall be included in the Site Induction.

Waste collection points are nominated on the waste management loading zone (refer to Appendix 7.1).

Waste will be collected by Hansen Yuncken sub-contractor Dump It and taken to their facility for disposal and recycling.

5.1.4 Waste Reporting

Waste generation is monitored by HY on monthly basis to ensure that the company’s waste reduction objectives are achieved. Waste disposal quantities are monitored monthly by HY to ensure compliance.

The Project Administrator shall record waste disposal data on BIM360 Field using the waste record checklist. Waste quantities from the PMR shall be entered into the State HSE Database for analysis and reporting against HY Waste reduction targets.

5.1.5 Concrete Waste & Washout

Concrete trucks and pumps shall be washed out at designated locations as shown on the site layout plan. Washout of concrete pumps and AGI's in other areas will not be permitted.

Washout shall be captured using membranes or other suitable means and allowed to set.

Waste shall be placed in bins for disposal with site waste.

Excess concrete shall be returned to the concrete plant for disposal or re-use.

5.1.6 Mitigation Strategies

- Accurate written records are to be kept such as:
  - Who transported the waste (company name, ABN, vehicle registration and driver details, date and time of transport, description of waste)
  - Copies of waste dockets/receipts for the waste facility (date and time of delivery, name and address of the facility, it's ABN, contact person).
- The construction contractor to ensure that waste generated by the works is transported to a place that can lawfully accept it as per Section 143 of the *Protection of the Environment Operations Act* 1997.
- The removal of any asbestos containing material if found is only to undertaken by an appropriately licenced contractor as per WorkCover NSW requirements and current guidelines.
- All waste, including excess spoil be recycled where practicable.
- Trucks transporting spoil off site to be covered.
- The EPA is to be notified immediately of any pollution incidents or harm to the environment (as defined under Part 5.7 of the POEO Act).

5.1.7 Soil Transfer

As the NHQC project involves the construction of multiple schools, a strategy to transfer soil between the sites will be in place to mitigate the amount of waste for the project. Soil from the East Leppington site will be transferred to the Catherine Fields site to create the required levels during the bulk earthwork stages. For cut and fill quantities refer to the civil consultant drawings.

5.1.8 Removal of Hazardous Material

In accordance with SSD 9476 Condition B18, the removal of hazardous materials is addressed in this section of the Waste Management Plan. The initial contamination assessment completed by Environmental Investigative Services identified existing fill material as a potential source of contaminated/hazardous materials. Upon commencement of bulk earthworks, a Contaminated Soil Assessment was completed which confirmed that there was no hazardous materials present on site. Given the bulk earthworks are now complete and the material that has been imported as fill is VENM (Virgin Excavated Natural Material), the likelihood of encountering hazardous materials is extremely low. Despite this, the following unexpected finds protocol will be adopted in the event that a hazardous material is encountered on site.

5.1.9 Removal of Hazardous Material

Given the bulk earthworks are now complete and the material that has been imported as fill is VENM (Virgin Excavated Natural Material), the likelihood of encountering hazardous materials is extremely low. Despite this, the following unexpected finds protocol will be adopted in the event that a hazardous material is encountered on site. This is consistent with the unexpected finds protocol contained within Section 4.11.8 & Section 4.12 of the CEMP.

Unexpected Finds Protocol – Asbestos and contamination

If asbestos is detected in unexpected areas prior to, or during, site development works the following 'Unexpected Finds Protocol' will apply:

a. Upon discovery of suspected asbestos containing material, the site manager is to be notified and the affected area closed off by the use of barrier tape and warning signs. Warning signs shall be specific to Asbestos Hazards and shall comply with the AS1319-1994 – Safety Signs for the Occupational Environment.

b. An Occupational Hygienist is to be notified to inspect the area and confirm the presence of asbestos and to determine the extent of remediation works to be undertaken. A report detailing this information would be compiled by the Occupational Hygienist and provided to the Principal (or their representative) and the site manager.

c. The location of the identified asbestos material would be surveyed using sub-meter Differential Global Positioning System (DGPS).

d. If the impacted soil is to be disposed off site, it should be classified in accordance with the DECCW's Waste Classification Guidelines (2008) and disposed of, as a minimum, as asbestos contaminated waste to a suitably licensed landfill. In dry and windy conditions the stockpile would be lightly wetted and covered with plastic sheet whilst awaiting disposal.

e. All work associated with asbestos in soil would be undertaken by a contractor holding a class ASA Licence. WorkCover must be notified 7 days in advance of any asbestos works.

f. Monitoring for airborne asbestos fibres is to be carried out during the soil excavation in asbestos contaminated materials.

g. Documentary evidence (weighbridge dockets) of correct disposal is to be provided to the Principal (or their representative).

h. At the completion of the excavation, a clearance inspection is to be carried out and written certification is to be provided by an Occupational Hygienist that the area is safe to be accessed and worked. If required, the filling material remaining in the inspected area can be covered/sealed by an appropriate physical barrier layer of non-asbestos containing material prior to sign–off.

i. Validation samples would be collected from the remedial excavation to confirm the complete removal of the asbestos containing materials. If the asbestos pipes/conduits are uncovered, then sampling density would typically comprise one sample per 10-20 linear meter (depending on the length of the pipe). If asbestos debris are found, then the sampling density would typically comprise 1 sample per 5 metre x 5 metre grid.

j. The sampling locations should be surveyed using a sub-meter DGPS.

k. Details are to be recorded in the site record system.

l. Following clearance by an Occupational Hygienist, the area may be reopened for further excavation or construction work.

6 Waste Estimates and Treatment Methods

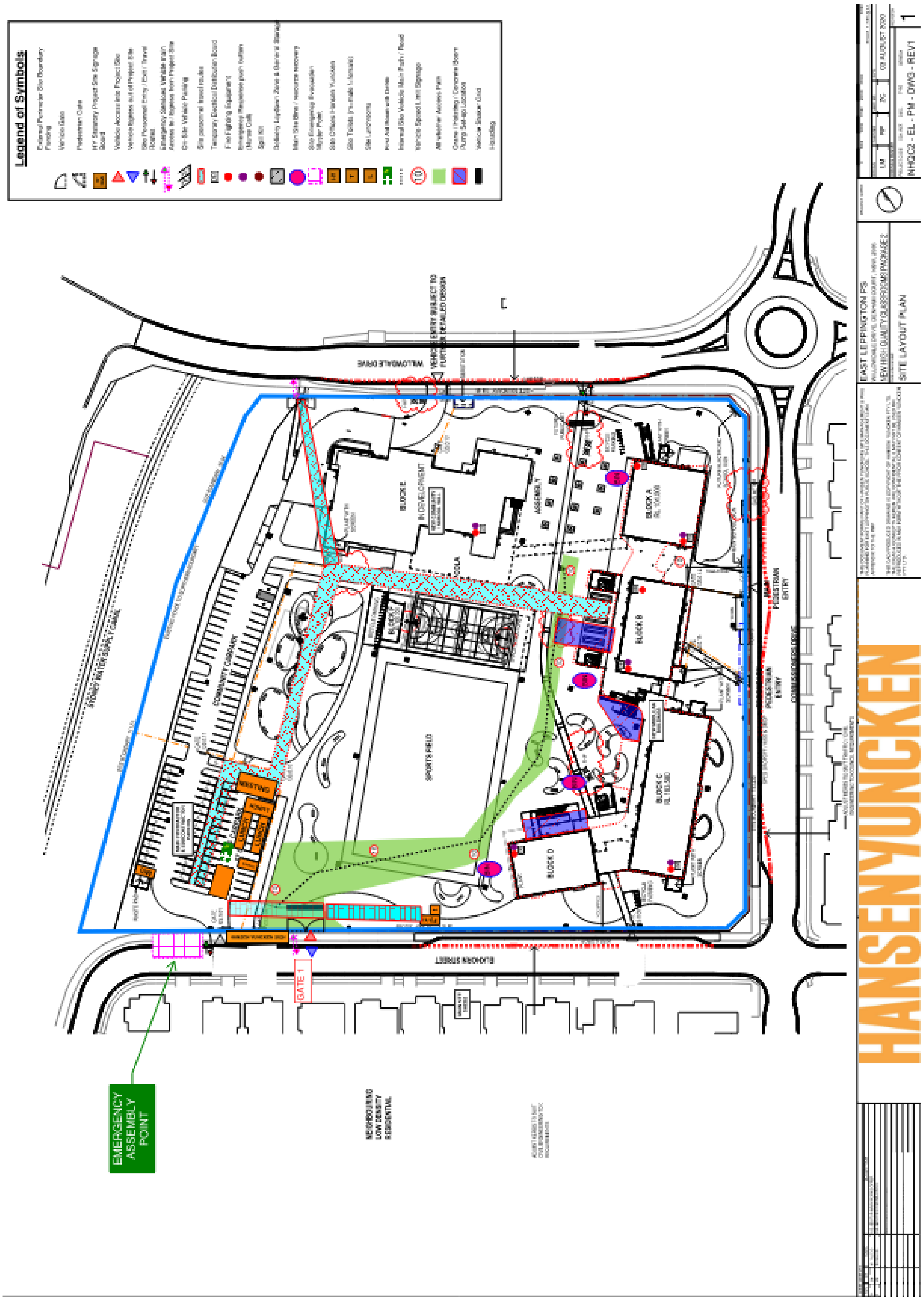
6.1 Excavation and Construction Waste Estimates

In accordance with SSD 9476 Condition B18a), the following table summarises each type of waste to be generated during construction along with the proposed reuse, recycling and disposal locations.

Material Type on Site	Estimated Volume (m^3) or Weight (t)			On-Site Treatment	Off-Site Treatment	
	Reuse	Recycle	Disposal	Proposed Reuse and / or Recycling Methods	Disposal / Transport Contractor	Waste Depot, Recycling Outlet or Landfill Site
Excavated material (VENM)	1200m^3	Reused	Nil	Reuse for landscaping	TBA	TBA
Metals		120m^3		Co-mingled bins	TBA	Scrap metal dealer for smelting
Concrete Brick, Block & Tile		210m^3		Co-mingled bins	TBA	Crushed for road base
Timber		260 m^3		Co-mingled bins	TBA	TBA
Cardboard		180 m^3		Co-mingled bins	TBA	Recycled into cardboard
Plasterboard		190 m^3		Co-mingled bins	TBA	Recycled as soil conditioner
Plastics & packaging		150 m^3	30 m^3	Co-mingled bins	TBA	TBA
Pallets and Cable Drums	140 units			Separated and collected	TBA	Returned to the supplier
Liquid Waste			20 m^3	Separated onsite	TBA	Transferred to licenced landfill
General Waste			180 m^3	Co-mingled bins	TBA	Transferred to licenced landfill
Sub Total	**1200m^3**	**1100 m^3**	**230m^3**	Plus 140 units of pallet and drums that are returned to the suppliers for reuse.		
Total	**2260m3**			Plus 140 units of pallet and drums that are returned to the suppliers for reuse.		
Note: The disposal contractor and waste depot are yet to be determined as the contracts have not be let, as such they are listed as TBA.						

7 Appendices

7.1 East Leppington Site Layout Plan

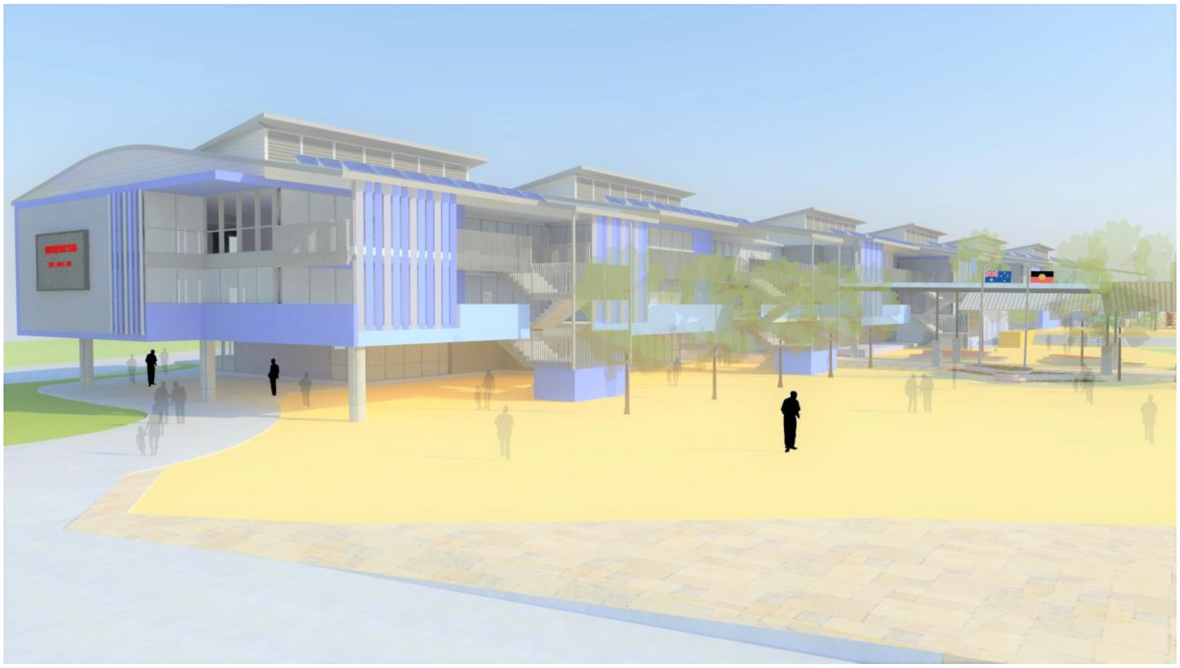


7.2 Construction Waste Management Advice

environmental management pty ltd

EAST LEPPINGTON PRIMARY SCHOOL

CONSTRUCTION WASTE MANAGEMENT PLAN



VERSION NUMBER:

VERSION 1

REPORT DATE:

20/11/2018

SUBMITTED TO:

MARTIN FENN

SENIOR PROJECT MANAGER | TSA
LVL 15, 207 KENT STREET | SYDNEY NSW 2000

PRESENTED BY:

JO DRUMMOND

ECCELL ENVIRONMENTAL MANAGEMENT PTYLTD
35 WAVERLY CRST, BONDI JUNCTION NSW 2022

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EAST LEPPINGTON – CONSTRUCTION WASTE MANAGEMENT PLAN

1. INTRODUCTION

This report has been prepared based on the requirements of the Secretary's Environmental Assessment Requirements Condition 20 Section 4.12 (8) of the Environmental Planning Assessment, Section 2 Environmental Planning and Assessment Regulation 2000. There is a requirement to prepare a Construction Waste Management Plan.

The Waste Management Plan will:

a) Identify, quantity and classify waste streams to be generated during construction.
b) Describe measures to be implemented to manage, reuse, and recycle and safely dispose of the waste.
c) Identify servicing arrangements (including but not limited to waste management loading zones and mechanical plant for the site.
d) Prepare a site drawing for Construction Waste Management Loading Zones.

2. PROJECT PROFILE

The new Leppington Primary School will be built within Stockland's Willowdale development and falls within the Raby Road Primary Schools Community Group, and falls under Western City District Plan. The Raby Road Primary schools cluster is identified in Sydney Metropolitan plan "A Plan for Growing Sydney" with a significant focus for intensive growth and infrastructure investment over next 20 years.

The Cluster falls within the Camden and Campbelltown Local Government area (LGA) and includes 7 new schools, one of which is New Leppington Primary School.

The projections for the Raby Road Primary School Community Group are for an increase in numbers of primary school age children, and demand for teaching space, and facilities to at least 2031. The expansions of existing and building of new schools are required to cater for the population growth.

3. PROJECT DESCRIPTION

The new primary school will be located on a 3.0 Ha vacant lot, on the Corner of Willowdale Drive and Commissioner Drive in Willowdale, within Stockland development, that is expected to generate substantial general population and school aged population growth.

Single stage construction will include as noted on CDR-East Leppington Binder 17028

- 44 new teaching spaces to accommodate 1012 students
- Core Facilities, Staff Facilities and Administration to Core 35 Standard
- Infrastructure
- Parking facilities
- Substantial landscape treatment to provide contemporary educational and recreational facility.

4. OBJECTIVES & TARGETS

The project objectives include:

- Meeting all waste management standards while ensuring the health and safety of the workers on the project.
- Maximising the quantities of materials diverted from landfill by reusing, recycling and reprocessing off-site.
- Disposal of no more than 20% of residual waste materials to a licensed landfill in accordance with both regulatory and legal requirements.
- The diversion from landfill of 80% of construction waste by weight, to meet the criteria of the NSW State Government's waste legislation, waste policy settings and regulatory regime.

5. LEGISLATIVE REQUIREMENTS AND GUIDELINES

Relevant key legislation and guidelines applicable to the project include

- Protection of the Environment Operations Act 1997
- Protection of the Environment (General) Operations Act 1998
- Waste Avoidance and Resource Recovery Act 2001
- Protection of the Environment Operations (Waste} Regulation 2014
- Secretary's Environmental Assessment Requirements

6. RISK MANAGEMENT

The current legislation determines that the generator of waste is the owner of the waste until the waste crosses a weighbridge into a licensed facility. Waste contractors including construction contractors are the primary transporters of waste off-site, accordingly contractors will be required to provide monthly reports on waste reused, reprocessed or recycled, thus diverted from landfill or waste sent to landfill. These reports have a direct bearing on the generator's regulations.

The WMP will be implemented on site throughout excavation and construction.

All entries in the Waste Data File must include:

- Time and Date of material removed
- Description and size of waste
- Waste facility used
- Vehicle registration and Waste Contractors Company name

The Waste Data File will be available for inspection to any authorized officer at any time during site works. At the conclusion of site works, the designated person will retain all waste documentation and make this validating documentation available for inspection.

7. WASTE MANAGEMENT STRATEGIES

The waste management strategy for the project will operate over the design, procurement, and construction including fit out of the project.

Management Strategies	Responsibilities
Design:	
Use of modular components in design	Architect & Engineer
Use of prefabricated components in design	Architect, Builder, Subcontractors.
Design for materials to standard sizes	Architect, Subcontractors
Design for operational waste minimization	Architect & Builder
Procurement:	
Select recycled and reprocesses materials	Architect, Engineer, Builder & Sub Contractors
Components that can be reused after deconstruction	Architect, Engineer & Builder
Pre-construction	
Waste management plan to be reviewed & approved prior to construction	Builder
Construction on-site:	
Use the avoid, reuse, reduce, recycle principles	Builder & Waste Contractor
Minimisation of recurring packaging materials	Sub-contractors
Returning packaging to the supplier	Builder & Sub-contractor
Separation of recycling of materials off site	Waste Contractor
Audit & monitor the correct usage of bins	Builder & Waste Contractor
Audit and monitor the Waste Contractor	Builder

8. WASTE MANAGEMENT PLAN FOR DEVELOPMENT APPLICATION

Brief Outline of Proposal:

The new primary school will be located on 3.0 Ha vacant lot, corner of Willowdale Dr and Commissioner Drive in Willowdale, within Stockland development, that is expected to generate substantial population and school aged population growth.

Single stage construction will include:

- 44 new teaching spaces to accommodate 1012 students.
- Core Facilities, Staff Facilities and Administration to Core 35 Standard
- Infrastructure
- Parking facilities
- Site will Undergo substantial landscape treatment to provide contemporary educational and recreational facility.

Project Site Address:

East Leppington, Corner Commissioner Drive and Elkhorn Street, Willowdale

Applicants Name

Martin Fenn (TSA Management)
c/o Department of Education NSW

Applicant's Address:

Level 15, 207 Kent Street | Sydney NSW 2000

Phone Number:

Existing and other structures currently on site:

No existing structures the site is a Greenfields site

Signature of Applicant:

………………………………………………………………………… **Date:** / / 2018

PHASE DEMOLITION

Material Type on Site	Estimated Volume (m^3) or Weight (t) (Most Favourable → Least)			ON-SITE TREATMENT	OFF-SITE TREATMENT	
	Reuse	Recycling	Disposal	Proposed reuse and/or recycling collection methods	Disposal / Transport Contractor	Waste Depot, Recycling Outlet or Landfill site
Nil	Nil	Nil	Nil	Nil	N/A	N/A
Sub Total	**Nil**					
TOTAL	**Reused on site**					
Narrative: There is no demolition as this is a green fill site.						

PHASE EXCAVATION

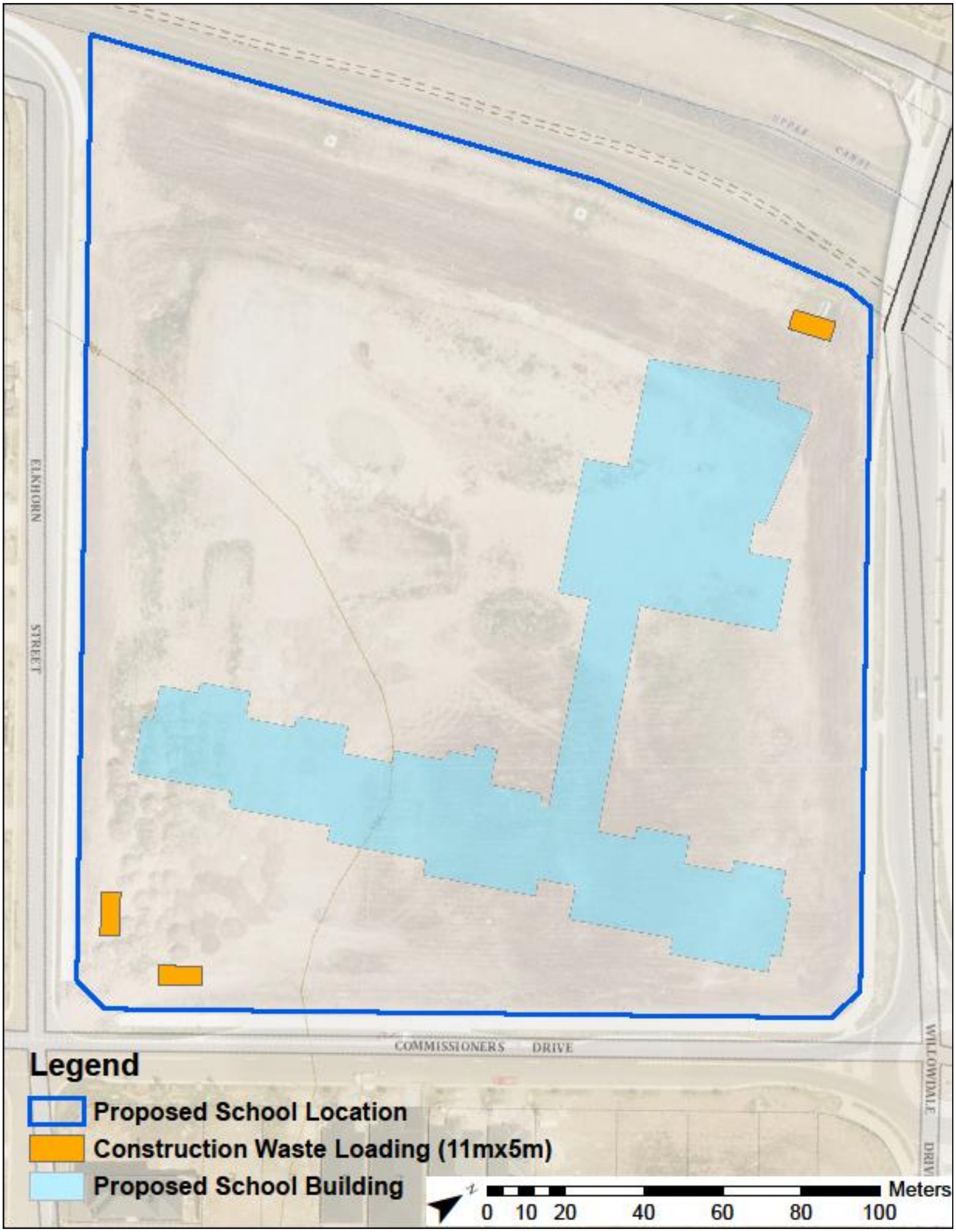
Material Type on Site	Estimated Volume (m^3) or Weight (t) (Most Favourable → Least)			ON-SITE TREATMENT	OFF-SITE TREATMENT	
	Reuse	Recycling	Disposal	Proposed reuse and/or recycling collection methods	Disposal / Transport Contractor	Waste Depot, Recycling Outlet or Landfill site
Excavated VENM Green file site	1,200 m3	Reused	Nil	Reuse for landscaping	N/A	N/A
Sub Total	**1,200**					
TOTAL	**1,200 m3 reused on site**					
Narrative: There is minimal excavation of VEN material, which will be used back on the site for landscaping.						

PHASE CONSTRUCTION

Material Type on Site	Estimated Volume (m^3) or Weight (t) (Most Favourable → Least)			ON-SITE TREATMENT	OFF-SITE TREATMENT	
	Reuse	Recycling	Disposal	Proposed reuse and/or recycling collection methods	Disposal / Transport Contractor	Waste Depot, Recycling Outlet or Landfill site
Concrete Brick Block-work & Tile		210 m^3		Co-mingled Bins	TBA	Crushed for road base
Metals		120m^3		Co-mingled Bins	TBA	Scrap Metal Dealer for smelting
Timber off-cuts		260m^3		Co-mingled Bins	TBA	Recycled for chips and mulch
Cardboard		180m^3		Co-mingled Bins	TBA	Recycled into cardboard
Plasterboard		190m^3		Co-mingled Bins	TBA	Recycled as soil conditioner
Plastics, plastic packaging, paint drums, containers		150m^{3*}	30 m^{3-}	Co-mingled Bins	TBA	- Styrene and plastic to landfill * Paint drums nested and recycled
Pallets and Reels	140 units			Separated onsite	TBA	Returned to the supplier
Liquid Waste			20 m^3	Separated onsite	TBA	Transferred to licenced landfill
General Waste			180 m^3	Co-mingled Bins	TBA	Transferred to licenced landfill
Sub Total	**NB: 140 units**	**1,110m^3**	**230 m^3**			
TOTAL	**1,340 m^3**			**NB: Plus an additional140 pallets (single units returned to suppliers for reuse)**		

Narrative:
As the contracts for all contractors have not been let there are still those including the waste contractor To Be advised (TBA**).**
All waste will be co-mingled and taken for off-site separation and reuse or recycling except Pallets and Reels and liquid waste to be sent to landfill for processing.

9. APPENDIX A – WASTE MANAGEMENT LOADING ZONE



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A.10 External Lighting Compliance

Light is really the source of all being...
all materials in nature are made of light
which has been spent, and this crumpled
mass called material casts a shadow, and
the shadow belongs to light.
Louis Kahn

Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

Copenhagen
London
Sydney
Canberra
Hong Kong
New York

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STEENSEN VARMING

Hansen Yuncken
Sydney Corporate Park (SCP)
Building 1, Level 3
75-85 O'Riordan Street
Alexandria NSW 2015

Att. Marco Beretta

Sydney August 27th, 2020

Dear Marco Beretta,

Building Services Design Statement for the external lighting design for East Leppington Public School.

In my professional opinion the design of the lighting services for the above project is in general accordance with the Australian Standards current at the time of design, as referenced in SSD 9476 condition B13. In particular:

AS/NZS 4282.1: 2019	Control of the obtrusive effects of outdoor lighting -Refer to notes below
AS/NZS 1158: 2005	External Lighting -Pathways designed to category P3 -Entry points designed to category P2 -Carparks designed to category P11b and P12

The following documents formed the design documents for the building services systems:

Document Number	Rev.	Drawing Title	Date
NHQC2-LP-EL-S-EL_1010	G	Lighting Site Plan	27.07.2020

The exterior lighting has been designed in consideration of minimizing obtrusive light outside of the site boundaries and in consideration of public amenity. Refer to appendix A for the mitigation measures considered in the design to align with the intent of AS4282 Control of Obtrusive Effects of Outdoor Lighting.

Kind regards

Mira

Ivan Mira
Associate
BE Electrical, CPEng, NER

Light is really the source of all being...
all materials in nature are made of light
which has been spent, and this crumpled
mass called material casts a shadow, and
the shadow belongs to light.
Louis Kahn

Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

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STEENSEN VARMING

1.0 Appendix A

The exterior lighting focuses on functional illumination and consists of pole top and directional spotlight luminaires to provide lighting to the site carpark and key pathways, with light focused on the ground below.

- **Lighting controls -** EFSG guidelines recommend the control of external lighting be divided into two functions, thus limiting the operation of lighting during curfew hours, and ensuring operation is as per the schools needs. The following outline the functions:
    1. Predawn function: all external lighting on between 5:00am – 9:00am for the safe access of cleaners and staff
    2. Night function: only select lighting fixtures to operate as 'access' lighting from school closure – 5:00am

- **Minimise sky glow with downward directed lighting –** all external lighting for East Leppington Primary school utilises fixed downward directed pole top luminaires or directional spotlights for the purposes of pathway illumination, dedicated soley for the illumination of the ground surface. All pole top luminaires also have no upward lighting component.

- **Minimise horizontal spread light** – The external lighting design for East Leppington Primary School utilises luminaires with optical control for the purposes of directing and controlling light throw. This also in turn addresses the use of assymetric light beams where possible.

- **Do not over light –** The external lighting design has been developed in line with the appropriate and applicable lighting levels as per AS1158.3.1 Pedestrian area (Category P) lighting. The calculations indicate that the relevant P categories are generally met and not excessively exceeded.

- **Minimise glare –** Potential glare sources have been minimised through the implementation of proper aiming, luminaire mounting heights, and optical control.

In general, the external lighting for East Leppington Primary School is dedicated solely to functional lighting with no decorative or architectural lighting features. At current there is no uplighting, tree lighting, externally illuminated signage or surfaces, nor does Steensen Varming's lighting design specify internally illuminated signage.

Overall consideration has been given to the direction of luminaire aiming, height of luminaire mounting timing and duration of the exterior lighting in line with the intent to minimise obtrusive light.

A.11 Site Investigation Executive Summary (Groundwater Investigation)

The below is an extract from the Environmental Site Assessment for the East Leppington Primary School that was conducted from Environmental Investigation Services (EIS) on 20 December 2018.

EXECUTIVE SUMMARY

This report presents the findings of a Stage 2 Environmental Site Assessment (ESA) for the proposed new school development at Commissioners Drive, Denham Court, Leppington, NSW. The site location is shown on Figure 1 and the assessment was confined to the site boundaries as shown on Figure 2.

This report has been prepared to address Point 1 to 5 of Key Issue and Desired Performance Outcome 15, as specified in the Soils section of the NSW Department of Planning and Environment, Standard Secretary's Environmental Assessment Requirements (SEARs) for Critical State Significant Infrastructure Projects, dated December 2015.

The aim of the assessment was to: identify potential contamination sources and contaminants of concern; assess the soil and groundwater contamination conditions; provide a preliminary waste classification for off-site disposal of in-situ soil; assess the potential for Acid Sulfate Soils (ASS); assess the potential for dryland salinity; and comment on site suitability for the proposed development.

The scope of works included: review of site information; site history information; detailed inspection of accessible areas of the site; preparation of a Conceptual Site Model (CSM); design and implementation of a Sampling Analysis Quality Plan (SAQP) including soil and groundwater sampling from selected locations (see Figure 2); interpretation of the analytical results against the Site Assessment Criteria (SAC); Data Quality Assessment; review of CSM and Tier 1 Risk Assessment; and preparation of this report summarising the results of the ESA.

The CSM identified potential sources of contamination/ Areas of Environmental Concern (AEC) at the site associated with: fill material; and dryland salinity. The ESA included the following works:

- Soil sampling from forty-one (41) locations (boreholes/test pits);
- Groundwater sampling from three monitoring wells;
- Laboratory analysis of selected soil and groundwater samples for contaminants of potential concern (CoPC) identified in the CSM; and
- Interpretation and discussion of the results.

A CSM has been developed to address potential contaminant sources, transport mechanisms/ pathways and sensitive receptors. The CSM has identified potential on-site contamination sources and associated CoPC which have the potential to pose a risk to site receptors.

All of the soil results were below the SAC adopted for this ESA. The groundwater samples encountered marginally elevated concentrations of zinc above the SAC. The source of this contaminant could be associated with the leaching of metals from the fill or urban background sources. EIS understand that groundwater will not be used as a resource at the site. Based on the results of the assessment, the AEC are not considered to pose a risk to site receptors.

The ESA identified saline conditions at the site which warrant management. Landscaped areas and built structures exposed to soil and groundwater should be designed to withstand aggressive and saline conditions.

Based on the findings of the assessment, EIS are of the opinion that the site is suitable for the proposed development. A salinity management plan should be prepared and implemented when development plans have been finalised.

The report should be read in conjunction with the limitations presented in the body of the report.

A.12 Site Layout Plan

AMMENDMENTS

REV	BY	DATE	DESCRIPTION
A	LM	01.10.2019	ISSUED FOR MAIN WORKS OFFER
1	LM	03.08.2020	ISSUED FOR CONSTRUCTION

HANSENYUNCKEN

THIS DOCUMENT FORMS PART OF HANSEN YUNCKEN'S SITE MANAGEMENT & WHS PLANNING FOR EAST LEPPINGTON PUBLIC SCHOOL. THIS DOCUMENT IS AN APPENDIX TO THE PMP

EAST LEPPINGTON PS
WILLOWDALE DRIVE, DENHAM COURT, NSW, 2565
NEW HIGH QUALITY CLASSROOMS PACKAGE 2

DRAWING NAME
SITE LAYOUT PLAN

PROJECT NORTH
NORTH

0 5000 10000 15000 20000 25000 50000
SCALE 1 : 500 @ A1

DRAWN	CHECKED	VERIFIED	DATE
LM	RP	ZC	03 AUGUST 2020

DRAWING NUMBER
PROJECT CODE SCH. REF. DISC. TYPE SERIES#
NHQC2 - EL - PM - DWG - REV1

REVISION
1