ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

LORETO NORMANHURST

ON

REMEDIATION CONCEPT PLAN

FOR

LORETO NORMANHURST MASTER PLAN

AT

91-93 PENNANT HILLS ROAD, NORMANHURST, NSW

15 MAY 2019 **REF: E31772KLrpt4-RCP**

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Document Distribution Record		
Report Reference	**Distribution**	**Report Date**
E31772KLrpt4-RCP	Client via email	15 May 2019

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EXECUTIVE SUMMARY

Allen Jack + Cottier ('the client') commissioned Environmental Investigation Services (EIS)[1] to prepare a Remediation Concept Plan (RCP) for the proposed Loreto Normanhurst Master Plan at 91-93 Pennant Hills Road, Normanhurst, NSW. The site location is shown on Figure 1 and the plan applies to the proposed development area as shown on Figure 2. The proposed Master Plan development area is referred to as 'the site' in this report.

From the information provided by the client, EIS understand that RCP is required by the Department of Planning and Environment (DoPE) as part of the development application (DA) for the proposed Concept Master Plan. The DoPE advised that a PSI is required to identify the potential contamination issues at the site. This information will provide the framework for the conceptual remediation strategies outlined in the RCP.

EIS have previously conducted the following works at the site:

- Preliminary Site Investigation (PSI) Report (EIS Ref: E31772KLrpt), dated 24 October 2018[2]; and
- Preliminary Site Investigation (PSI) Report (EIS Ref: E31772KLrpt3), dated 2 May 2019[3].

The results of these assessments/investigations are summarised in Section 2 and have been considered in the development of this plan.

The goal of this plan (referred to herein as the RCP) is to provide technical recommendations for further contamination investigations, remediation works and unexpected finds protocols during the development works.

The objectives of the RCP are to:

- Provide a framework for undertaking intrusive investigations and remediation prior to the future stages of Concept Master Plan development;
- Provide a methodology to manage contamination, remediate and validate the site;
- Provide a contingency plan for the remediation works;
- Outline site management procedures to be implemented during remediation work; and
- Provide an unexpected finds protocol to be implemented during the development works; and
- Facilitate the approval of the Concept Master Plan development application.

The site was historically used for residential and private activities and has been owned and used as Loreto Normanhurst School since 1933. The EIS 2018 Report identified an elevated concentration of carcinogenic PAHs in the fill material within BH2 (0.04-0.2). The site walkover inspection undertaken as part of the EIS 2019 Report also identified a number of other Areas of Environmental Concern (AEC) including hazardous building materials, and the potential use of pesticides across the site. A summary of the AEC is provided in the following table:

Source/AEC	Contaminants / CoPC
Fill material – From the 2018 PSI, fill material is known to be present at the site within the proposed boarding house area (Site 1A). Elevated levels of PAHs were encountered within the fill material in this area.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs),

[1] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

[2] Referred to as EIS 2018 report

[3] Referred to as EIS 2019 report

Source/AEC	Contaminants / CoPC
Other areas of the site appeared to have been historically filled to achieve existing levels.	organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Use of pesticides – Pesticides may have been used beneath the buildings and/or around the site.	Heavy metals and OCPs
Hazardous Building Material – Hazardous building materials may be present as a result of former building and demolition activities. These materials may also be present in the existing buildings/structures on site.	Asbestos, lead and PCBs

The proposed remediation strategy includes a detailed site investigation (DSI) for each stage of the master plan development, remediation using one or more of the preferred strategies, and implementation of an unexpected finds protocol. In summary, the preferred remedial strategies include the following:

- Excavation and off-site disposal of waste and contaminated soil to a licenced facility; and
- Capping of contaminated soil on-site (where excavation and removal is not feasible).

EIS are of the opinion that the site can be made suitable for the proposed development described in Section 1.1 provided this RAP is implemented accordingly. A site validation report should be prepared on completion of remediation activities and should be submitted to the consent authority. If required, remediation and validation can be staged along with the proposed development. A separate validation report would be required for each development stage.

EIS have assessed that the remediation work is likely to fall within Category 2. EIS recommend that a specialist planner confirm the remediation category prior to the submission of this report to Council. Other regulatory requirements for remediation are discussed in Section 11.2.

The conclusions and recommendations should be read in conjunction with the limitations presented in the body of the report.

TABLE OF CONTENTS

1	INTRODUCTION		1
	1.1	Proposed Development Details	1
	1.2	Goal, Aims and Objectives	2
	1.3	Scope of Work	2
2	SITE INFORMATION		4
	2.1	Site Identification	4
	2.2	Site Location and Regional Setting	5
	2.3	Topography	5
	2.4	EIS Site Inspection (2019)	5
	2.5	Previous Investigations	7
	2.6	Summary of Site History	8
	2.7	Summary of Geology and Hydrogeology	8
3	CONCEPTUAL SITE MODEL		10
	3.1	Potential contamination sources/AEC and CoPC	10
	3.2	Mechanism for Contamination, Affected Media, Receptors and Exposure Pathways	10
	3.3	Assessment of Data Gaps	11
4	DETAILED SITE INVESTIGATION (DSI) FOR EACH STAGE		13
	4.1	Soil Sampling	13
	4.2	Groundwater Sampling	13
	4.3	Decontamination and Sample Preservation	14
	4.4	Quality Assurance/Quality Control (QA/QC)	14
	4.5	Data Assessment	14
	4.6	Reporting	15
5	REMEDIATION EXTENT		16
6	REMEDIATION OPTIONS		17
	6.1	Soil Remediation Options	17
	6.2	Consideration of Remediation Options	18
	6.3	Preferred Remediation Options and Rationale	20
7	REMEDIATION MANAGEMENT		21
	7.1	Roles and Responsibilities	21
	7.2	Sequence of Works	21
	7.3	Remedial Actions - Preferred Option A (off-site disposal)	22
	7.4	Remedial Actions - Preferred Option B (capping)	23
	7.5	Remediation Documentation	23
	7.6	Waste Volume and Disposal Assessment	24
8	VALIDATION PLAN		25
	8.1	Validation Sampling and Documentation	25
	8.2	Validation Assessment Criteria and Data Assessment	28
	8.3	Validation Report	29
	8.4	Data Quality	30
9	CONTINGENCY PLAN		31
	9.1	Unexpected Finds	31
	9.2	Soil Validation Failure	31
	9.3	Importation Failure for VENM or other Imported Materials	31
	9.4	Disposal of Hazardous Waste	31
10	SITE MANAGEMENT PLAN FOR REMEDIATION WORKS		33
	10.1	Interim Site Management	33
	10.2	Project Contacts	33
	10.3	Security	33
	10.4	Timing and Sequencing of Remediation Works	34
	10.5	Site Soil and Water Management Plan	34
	10.6	Noise and Vibration Control Plan	34
	10.7	Dust Control Plan	34
	10.8	Air Monitoring	35

TABLE OF CONTENTS

	10.9	Odour Control Plan	35
	10.10	Health and Safety Plan	36
	10.11	Waste Management	36
	10.12	Incident Management Contingency	36
	10.13	Hours of Operation	36
11	CONCLUSION		37
	11.1	Remediation Category	37
	11.2	Regulatory Requirements	38
12	LIMITATIONS		39

List of In-Text Tables

Important Information About this Report

Report Figures

Appendices
Appendix A: Loreto Normanhurst Master Plan Development Proposal
Appendix B: EIS 2018 Sample Location Plan

ABBREVIATIONS

Asbestos Fines/Fibrous Asbestos	**AF/FA**
Asbestos Containing Material	**ACM**
Area of Environmental Concern	**AEC**
Australian Height Datum	**AHD**
Acid Sulfate Soil	**ASS**
Above-Ground Storage Tank	**AST**
Benzo(a)pyrene Toxicity Equivalent Factor (carcinogenic PAHs)	**BaP TEQ**
Benzene, Toluene, Ethylbenzene, Xylene	**BTEX**
Contaminated Land Management	**CLM**
Contaminant(s) of Potential Concern	**CoPC**
Conceptual Site Model	**CSM**
Development Application	**DA**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Ecological Investigation Level	**EIL**
Environmental Investigation Services	**EIS**
Ecological Screening Level	**ESL**
Environmental Management Plan	**EMP**
Environment Protection Authority	**EPA**
Ecological Screening Level	**ESL**
Health Investigation Level	**HILs**
Health Screening Level	**HSLs**
International Organisation of Standardisation	**ISO**
Lab Control Spike	**LCS**
Light Non-Aqueous Phase Liquid	**LNAPL**
Map Grid of Australia	**MGA**
National Association of Testing Authorities	**NATA**
National Environmental Protection Measure	**NEPM**
Organochlorine Pesticides	**OCP**
Organophosphate Pesticides	**OPP**
Polycyclic Aromatic Hydrocarbons	**PAH**
Polychlorinated Biphenyls	**PCBs**
Protection of the Environment Operations	**POEO**
Practical Quantitation Limit	**PQL**
Quality Assurance	**QA**
Quality Control	**QC**
Remediation Action Plan	**RAP**
Sampling, Analysis and Quality Plan	**SAQP**
Source, Pathway, Receptor	**SPR**
Standing Water Level	**SWL**
Trip Blank	**TB**
Toxicity Characteristic Leaching Procedure	**TCLP**
Total Recoverable Hydrocarbons	**TRH**
Trip Spike	**TS**
Underground Storage Tank	**UST**
Validation Assessment Criteria	**VAC**

ABBREVIATIONS

Virgin Excavated Natural Material	**VENM**
Work Health and Safety	**WHS**

Units

Metres	**m**
Milligrams per Kilogram	**mg/kg**
Percentage	**%**
Percentage weight for weight	**% w/w**

1 INTRODUCTION

Allen Jack + Cottier ('the client') commissioned Environmental Investigation Services (EIS)[4] to prepare a Remediation Concept Plan (RCP) for the proposed Loreto Normanhurst Master Plan at 91-93 Pennant Hills Road, Normanhurst, NSW. The site location is shown on Figure 1 and the plan applies to the proposed development area as shown on Figure 2. The proposed Master Plan development area is referred to as 'the site' in this report.

From the information provided by the client, EIS understand that a RCP is required by the Department of Planning and Environment (DoPE) as part of the development application (DA) for the proposed Concept Master Plan. The DoPE advised that a PSI is required to identify the potential contamination issues at the site. This information will provide the framework for the conceptual remediation strategies outlined in the RCP.

EIS have previously conducted the following works at the site:

- Preliminary Site Investigation (PSI) Report (EIS Ref: E31772KLrpt), dated 24 October 2018[5]; and
- Preliminary Site Investigation (PSI) Report (EIS Ref: E31772KLrpt3), dated 2 May 2019[6].

The results of these assessments/investigations are summarised in Section 2 and have been considered in the development of this plan.

1.1 Proposed Development Details

From the information provided by the client, EIS understands the Loreto Normanhurst Girls School Concept Master Plan has outlined the concept plans for the following future works:

- Section 1 includes the construction of a boarding house located on the eastern boundary of the school. It is proposed that the new building will comprise four levels including two partial basement levels. The building will be cut into the existing batters to the north and east elevations to create the two partial basement levels for car parking and common areas.
- Section 2 includes the upgrading of a 5,600m^2 area of the senior school located on the north western boundary. Six buildings are to be upgraded within the whole area.
- Section 3 includes the construction of a new building within an area of 1,800m^2 located in the northern section.
- Section 4 includes the upgrading of a 4,300m^2 area of the junior school located on the western boundary of the school. Two buildings are to be upgraded.
- Section 5 includes the Mary Ward Wing renovation located in the centre of the northern section of the school.

[4] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

[5] Referred to as EIS 2018 report

[6] Referred to as EIS 2019 report

- Section 6 includes the upgrading of a 2,750m^2 area of the gymnasium located in the central northern section of the school.
- Section 7 includes the upgrading of the Gonzaga Barry Centre Extension in an area of 1,100m^2 located on the western boundary of the school.
- Section 8 includes the construction of an all-weather playing field and underground carpark within a 6,250m^2 area on the north western boundary of the school.
- Section 9 includes the construction of the Mount Pleasant pavilion within a 1,050m^2 area located on the western boundary of the school.
- Section 10 includes the construction of a Bush Chapel within a 200m^2 area of the forested space in the south western section of the school.
- Section 11 includes an Early Learning Centre located on the north eastern boundary of the school which is under another Development Application.
- Section 12 includes the construction of a pedestrian bridge link 150m^2 area between LRC and the Mary Ward Wing located in the centre of the northern section of the school.

1.2 Goal, Aims and Objectives

The goal of this plan (referred to herein as the RCP) is to provide technical recommendations for further contamination investigations, remediation works and unexpected finds protocols during the development works.

The objectives of the RCP are to:

- Provide a framework for undertaking intrusive investigations and remediation prior to the future stages of Concept Master Plan development;
- Provide a methodology to manage contamination, remediate and validate the site;
- Provide a contingency plan for the remediation works;
- Outline site management procedures to be implemented during remediation work; and
- Provide an unexpected finds protocol to be implemented during the development works; and
- Facilitate the approval of the Concept Master Plan development application.

1.3 Scope of Work

The plan was prepared in accordance with an EIS proposal (Ref: EP49147PL) of 18 March 2019 and written acceptance from the client's representative of 20 March 2019. The scope of work included:

- Review of relevant reports prepared by EIS;
- Preparation of a draft report for client review; and
- Preparation of a final report.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[7], other guidelines made under

[7] National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

or with regards to the Contaminated Land Management Act (1997)[8] and State Environmental Planning Policy No.55 – Remediation of Land (1998)[9]. Other guidelines are referenced throughout this report.

[8] Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)

[9] *State Environmental Planning Policy No. 55 – Remediation of Land 1998* (NSW) (referred to as SEPP55)

2 SITE INFORMATION

2.1 Site Identification

Table 2-1: Site Identification

Site Address:	91 – 93 Pennant Hills Road, Normanhurst
Lot & Deposited Plan:	Lot 3 DP1217496 Lot 1 DP809066 Lot 16 DP6612 Lot 20 DP6612 Lot 21 DP6612 Lot 22 DP6612 Lot 23 DP6612 Lot 24 DP6612 Lot 25 DP6612 Lot 26 DP6612 Lot 27 DP6612 Lot 28 DP6612 Lot 29 DP6612 Lot 30 DP6612 Lot 31 DP6612 Lot 32 DP6612 Lot 33 DP6612 Lot 34 DP6612 Lot 35 DP6612 Lot 36 DP6612 Lot 1 DP809066 Lot 1 DP34834 Lot 1 DP114580
Current Land Use:	School
Proposed Land Use:	School
Local Government Authority (LGA):	Hornsby Shire Council
Current Zoning:	R2 – Low Density Residential
Approx. Entire School Site Area (ha):	13 hectares
Geographical Location (decimal degrees) (approx.):	Latitude: -33.726726 Longitude: 151.098743
Site Location Plan:	Figure 1

Stage 1 Master Plan:	Figure 2

2.2 Site Location and Regional Setting

The site is located in a predominantly residential area of Normanhurst. The school is bounded by Pennant Hills Road to the north, Mount Pleasant Avenue to the east and south and Osborn Road to the west.

2.3 Topography

The regional topography is characterised by an east-west orientated ridgeline than runs between Mount Pleasant Avenue and Osborn Road, through the northern third of the school property. The site extends over the ridgeline and has a gentle slope towards the east and north-east at approximately 2° to 3° in the north section and towards the south and south-west in the south section. Parts of the site appear to have been levelled to account for the slope and accommodate the existing development.

2.4 EIS Site Inspection (2019)

A walkover inspection of the site was undertaken by EIS on 11 January 2019. The inspection was limited to accessible areas of the school grounds and immediate surrounds. An internal inspection of buildings was not undertaken. Selected site photographs obtained during the inspection are attached in the appendices. A summary of the other inspection findings are outlined in the following subsections:

2.4.1 Current Site Use and/or Indicators of Former Site Use

At the time of the inspection, the majority of the north section of the school was occupied by school associated buildings including covered outdoor learning areas (COLAs). The southern section of the school was occupied by a recreational area that included car parking, playing fields and bushland. The boarding houses located at the north-east section of the school appeared to have been former residential buildings converted for school use.

2.4.2 Buildings, Structures and Roads

The north-eastern section of the school consisted of the main boarding house and the central section contained classrooms, amenities and administration offices. The buildings were mostly of brick construction with potential asbestos containing fibre cement sheeting noted on the external areas of the buildings.

2.4.3 Boundary Conditions, Soil Stability and Erosion

The school was bounded by metal security fencing along most boundaries with the exception to the east of the boarding house which was bounded by a small brick retaining wall. There were no visible signs of erosion or soil instability along the school boundaries.

2.4.4 Visible or Olfactory Indicators of Contamination

No visible or olfactory signs of contamination were noted at the time of the site inspection.

2.4.5 Presence of Drums/Chemicals, Waste and Fill Material

The maintenance yard located in the northern area of the school housed minor quantities of various chemicals and fuel for general maintenance of the school grounds. The yard appeared properly contained and the chemicals stored correctly with no direct pathway to reach bare soil or grass.

The playing fields and tennis courts located centrally in the school ground appeared to have been historically cut and filled to achieve existing levels.

2.4.6 Drainage and Services

Stormwater pits were located across the low-level areas of the school and were assumed to be connected to the local stormwater system. The surface run-off was assumed to follow the general gradient of the site towards the south and east.

2.4.7 Sensitive Environments

Sensitive environments such as wetlands, ponds, creeks or extensive areas of natural vegetation were not identified on site or in the immediate surrounds.

2.4.8 Landscaped Areas and Visible Signs of Plant Stress

Various raised garden beds, grassed areas and ground-level garden beds were identified across the school grounds. The vegetation present included large (>10m high) native trees, exotic and native grasses and exotic shrubs. No visible signs of plant stress or dieback was noted during the site inspection.

2.4.9 Surrounding Land Use

During the site inspection, EIS observed the following land uses in the immediate surrounds:

- North – Cumberland Highway and Normanhurst Public School;
- South – Loreto Normanhurst Girls School, including grassed playing fields and bushland that extended to Mount Pleasant Avenue. An aged care facility was located further south;
- East – Mount Pleasant Avenue and residential properties; and

- West – Osborn Road and residential properties.

EIS did not observe any land uses in the immediate surrounds that were identified as potential contamination sources for the site.

2.5 Previous Investigations

2.5.1 EIS 2019 Report[10]

EIS previously conducted a *preliminary site investigation* (PSI) for the entire Loreto Normanhurst Girls School Master Plan. The PSI included a review of all relevant site history information as well as the soil data from the EIS 2018 Report.

The PSI identified the following potential contamination sources/AEC:

- Fill material - From the EIS 2018 investigation, fill material is known to be present at the site within the proposed boarding house (Site 1A). Elevated levels of contaminants were encountered within the fill material in this area. Other areas of the site appeared to have been historically filled to achieve existing levels;
- Use of Pesticides - Pesticides may have been used beneath the buildings and/or around the site; and
- Hazardous Building Material – Hazardous building materials may be present as a result of former building and demolition activities. These materials may also be present in the existing buildings/structures on site.

The report recommended the implementation of a Remediation Concept Plan (RCP) for the ongoing stages of work as outlined in the Master Plan. The RCP will include the following steps for all future stages of the development:

- Detailed Site Investigation (DSI) to be undertaken to better characterise the site contamination issues for each individual stage within the Master Plan; and
- Consultation of the Remediation Concept Plan to implement remediation strategies tailored for each stage to make them suitable for their respective developments.

2.5.2 EIS 2018 Report[11]

EIS has previously undertaken a preliminary site investigation (PSI) in 2018. The PSI was limited to the proposed development areas located in the north-eastern section of the property, known as the Boarding House and Early Learning Centre, as shown in the appendices.

[10] *"Report to Allen Jack + Cottier Architects on Preliminary Site Investigation (PSI) for Loreto Normanhurst Girls School Master Plan at Loreto Normanhurst Girls School, 91-93 Pennant Hills Road, Normanhurst, NSW"* (EIS Ref: E31772KLrpt3, dated 30 April 2019, referred to as EIS 2019 Report

[11] *"Report to TTW on Preliminary Site Investigation (PSI) for Proposed New School Buildings at Loreto Normanhurst Girls School, 91-93 Pennant Hills Road, Normanhurst, NSW"* (EIS Ref: E31772KLrpt, dated 24 October 2018, referred to as EIS 2018 Report

The findings of the EIS 2018 Report are outlined below:

- The site history assessment identified imported fill material, use of pesticides and hazardous building materials as areas of environmental concern (AEC);
- Soil sampling was undertaken from six locations within the Boarding House area (Site 1A) and extended to a maximum depth of 14.0m;
- Fill material was encountered at the surface or beneath the pavement in all boreholes and extended to depths of between 0.1m to 2.4m. The fill material typically consisted of silty sandy clay with inclusions of ironstone gravel, ash and roots;
- Natural silty clay was encountered in BH2 to BH6 and extended to depths of between 0.6m to 4.8m;
- Elevated concentrations of carcinogenic PAHs, above the human-health based Site Assessment Criteria (SAC), were encountered in the fill sample collected from BH2 (0.04-0.2); and
- The investigation identified the following data gaps:
    - The number of sampling points across did not meet the minimum density recommended in the NSW EPA Sampling Design Guidelines (1995); and
    - Groundwater sampling was not undertaken.

2.6 Summary of Site History

The EIS 2019 report included a full site history assessment comprising a review of a Lotsearch Pty Ltd Environmental Risk and Planning Report, historical aerial photographs, historical land titles, SafeWork dangerous goods records, Section 10.7 (2) & (5) certificates and statutory notices by the NSW EPA. From this information, the site history can be summarised as follows:

- Land titles indicated that pre-1933 the majority of the site was vacant grassland in the south section with residential properties in the northern section and was owned by various individuals with professions unlikely to be associated with on-site activities; and
- The site was purchased by The Loreto Property Association in 1933 and has been operational as Loreto Normanhurst School to the present day construction and various additions over this time.

2.7 Summary of Geology and Hydrogeology

2.7.1 Regional Geology

Regional geological information presented in the Lotsearch report (attached in the appendices) indicated that the site is underlain by Ashfield Shale of the Wianamatta Group, which typically consists of black to dark grey shale and laminite.

2.7.2 Acid Sulfate Soil Risk

A review of the acid sulfate soil (ASS) risk map prepared by Department of Land and Water Conservation (1997)[12] indicated that the site is not located within a risk area.

[12] Department of Land and Water Conservation, (1997). *1:25,000 Acid Sulfate Soil Risk Map (Series 9130N3, Ed 2)*

ASS information presented in the Lotsearch report (attached in the appendices) indicated that a Class 5 area is located directly to the south of the site. EIS do not consider this to pose a risk of encountering ASS during the proposed development works.

2.7.3 Hydrogeology

Hydrogeological information presented in the Lotsearch report indicated the regional aquifer includes porous, extensive aquifers of low to moderate productivity. There were a total of 10 registered bores within 2km of the site.

The EIS 2019 report indicated that the subsurface conditions at the site are likely to consist of relatively low permeability (residual) soils overlying shallow bedrock. The potential for viable groundwater abstraction and use of groundwater under these conditions is considered to be low. Use of groundwater is not proposed as part of the development.

2.7.4 Receiving Water Bodies

Surface water bodies were not identified in the immediate vicinity of the site. The closest surface water body is Coups Creek located approximately 354m to the east of the site. Due to the distance from the site, this creek is not considered to be a potential receptor.

3 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information (including the site inspection information) assessed by EIS. Reference should also be made to the figures attached in the appendices.

3.1 Potential contamination sources/AEC and CoPC

The potential contamination sources/AEC and CoPC are outlined in the table below:

Table 3-1: Potential (and/or known) Contamination Sources/AEC and Contaminants of Potential Concern

Source/AEC	Contaminants / CoPC
Fill material – From the 2018 PSI, fill material is known to be present at the site within the proposed boarding house area (Site 1A). Elevated levels of PAHs were encountered within the fill material in this area. Other areas of the site appeared to have been historically filled to achieve existing levels.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Use of pesticides – Pesticides may have been used beneath the buildings and/or around the site.	Heavy metals and OCPs
Hazardous Building Material – Hazardous building materials may be present as a result of former building and demolition activities. These materials may also be present in the existing buildings/structures on site.	Asbestos, lead and PCBs

3.2 Mechanism for Contamination, Affected Media, Receptors and Exposure Pathways

The mechanisms for contamination, affected media, receptors and exposure pathways relevant to the potential contamination sources/AEC are outlined in the following CSM table:

Table 3-2: CSM

Potential mechanism for contamination	The potential mechanisms for contamination are most likely to include 'top-down' impacts and spills. There is a potential for sub-surface releases to have occurred if deep fill (or other buried industrial infrastructure) is present, although this is considered to be the least likely mechanism for contamination.

	The mechanisms for contamination from off-site sources could have occurred via 'top down' impacts and spills, or sub-surface release. Impacts to the site could occur via the migration of contaminated groundwater.
Affected media	Soil/soil vapour and groundwater have been identified as potentially affected media. The potential for groundwater impacts is considered to be relatively low. However, groundwater would need to be considered in the event significant contamination was identified in soil.
Receptor identification	Human receptors include site occupants/users (including adults and children), construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users. Ecological receptors include terrestrial organisms and plants within unpaved areas.
Potential exposure pathways	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene and BTEX). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site. Potential exposure pathways for ecological receptors include primary contact and ingestion. Exposure during future site use could occur via direct contact with soil in unpaved areas such as gardens, inhalation of airborne asbestos fibres during soil disturbance, or inhalation of vapours within enclosed spaces such as buildings and basements.
Potential exposure mechanisms	The following have been identified as potential exposure mechanisms for site contamination: • Vapour intrusion into the proposed basement and/or building (either from soil contamination or volatilisation of contaminants from groundwater); • Contact (dermal, ingestion or inhalation) with exposed soils in landscaped areas and/or unpaved areas; and • Migration of groundwater off-site into areas where groundwater is being utilised as for recreational purposes.

3.3 Assessment of Data Gaps

EIS has undertaken a preliminary data gap analysis based on the findings of assessment. The data gaps and our comments are outlined in the following table:

Table 3-3: Data Gap Assessment

Data Gap	EIS Comments
Sampling Density	The six locations sampled as part of 2018 PSI will not meet the minimum density recommended in the NSW EPA Sampling Design Guidelines (1995) for the total Master Plan area of 13.35ha (132,500m^2). Soil sampling should be undertaken to properly characterise the potential contamination for each subsequent stage of the Master Plan development.
Groundwater Sampling	Groundwater sampling was not undertaken as part of the 2018 PSI. Groundwater sampling should be undertaken as part of each subsequent stage of the Master Plan development.

4 DETAILED SITE INVESTIGATION (DSI) FOR EACH STAGE

Prior to commencement of remediation, detailed site investigations (DSI) are required for each stage of the Master Plan development. The primary objective of the investigations is to characterise the nature and extent of the contamination (actual or potential) in order to define the remedial extent and select the remediation option for each development stage.

4.1 Soil Sampling

- Samples should be collected from a minimum of five locations for a development area of less than 500m^2. For larger development areas, sampling should be conducted on a grid based pattern with a spacing of 15m between sampling points;
- Additional targeted locations are to be included in areas of suspected contamination (i.e. FCF at the surface). Stratified sampling is required to confirm the vertical extent of the fill material;
- Samples should be collected from boreholes drilled using a drill rig (spiral flights augers and SPT sampling methods);
- The boreholes should extend to a minimum of 0.5m into the natural soil (the final depth will be based on other observations such as odours or staining etc);
- A selection of samples (fill and natural) should be analysed for the CoPC as outlined in the CSM. As a minimum, at least one sample should be analysed from each fill profile identified at each location, and one representative sample of the underlying natural soil from each location; and
- All soil samples should be screened using a photo-ionisation detector (PID).

4.2 Groundwater Sampling

- Installation of a minimum of one groundwater monitoring well within each development area for screening purposes;
- Well locations should be positioned to target potential point sources of contamination;
- The monitoring wells should be installed using a drill rig (spiral flight auger and SPT methods);
- The monitoring wells should be installed to a suitable depth to achieve the objectives of the screening and in accessible areas based on field observations;
- The monitoring wells will be constructed using Class 18 PVC and will include a lockable environmental cap at the ground surface;
- The monitoring wells should be developed after installation using a an electric pump;
- A calibrated Photo-ionisation Detector (PID) will be used to screen the monitoring wells for the presence of volatile contaminants;
- Groundwater samples (if encountered) will be obtained approximately five to seven days after development using dedicated low flow sampling equipment. Calibrated units will be used to record the following: standing water level (SWL); free phase hydrocarbons (LNAPL) using an interface probe; pH; electrical conductivity (EC); dissolved oxygen (DO); redox potential; and temperature; and
- Groundwater samples will be analysed for a range of potential contaminants based of field observations and previous data obtained from the wider Master Plan site.

4.3 Decontamination and Sample Preservation

Any re-usable equipment should be decontaminated using a scrubbing brush and potable water and Decon 90 solution (phosphate free detergent) followed by rinsing with potable water.

Samples will be preserved by immediate storage in an insulated sample container with ice. Any additional sample preservation requirements for specific analytes should also be adopted as required. On completion of the fieldwork, the samples should be delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody (COC) procedures.

4.4 Quality Assurance/Quality Control (QA/QC)

Rinsate samples should be obtained during the decontamination process of re-usable equipment as part of the field QA/QC requirements. Inter and intra-laboratory duplicates should be collected and analysed for the soil assessment at a rate of 10% for inter-laboratory and 10% for intra-laboratory analysis (an increase in the duplicate frequency from 5% is proposed due to the limited QA/QC data collected during the ESA). A trip spike and trip blank should also be submitted and analysed with each batch of samples.

4.5 Data Assessment

The soil data should be assessed using the validation assessment criteria (VAC) outlined in Section 8.2 which are based on a 'residential with minimal access to soils' (land use B) exposure setting, and the Waste Classification Guidelines, Part 1: Classifying Waste (2014)[13]. Statistical analysis may be undertaken where relevant in accordance with the procedures provided in the EPA Sampling Design Guidelines 1995 and NEPM (2013).

Data Quality Objectives (DQOs) and DQIs should be clearly outlined and assessed as part of the investigation/validation process. A framework for the DQO and DQI process is outlined below and should be reflected in the validation report.

DQOs should be established for the validation with regards to the seven-step process outlined in the Site Auditor Guidelines 2017 and with reference to USEPA documents Data Quality Objectives Processes for Hazardous Waste Site Investigations (2000) and Guidance on Systematic Planning Using the Data Quality Objectives Process (2006). The seven steps include the following:

- State the problem;
- Identify the decisions/goal of the study;
- Identify information inputs;
- Define the study boundary;
- Develop the analytical approach/decision rule;
- Specify the performance/acceptance criteria; and

[13] NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

- Optimise the design for obtaining the data.

DQIs are to be assessed based on field and laboratory considerations for precision, accuracy, representativeness, completeness and comparability.

4.6 Reporting

On completion of the detailed investigation for each stage of the Master Plan development, a DSI report should be completed presenting the results of the investigation. The results of the DSI should be evaluated and the remedial actions outlined in this report should be assessed as to whether they are adequate to address any contamination issues that are identified.. A RAP report for each stage of the development should be prepared.

5 REMEDIATION EXTENT

The remediation extent is to be confirmed based on three primary information inputs:

- The outcome of the DSI for each stage; and
- The identification of any unexpected finds.

A discussion of the anticipated extent of remediation based on the current data is provided below. Reference should also be made to the attached Figure 2.

Table 5-1: Remediation Extent

AEC	Extent
Fill material	Currently unknown. Likely to be limited to the depth and extent of fill material on the site. The extent of remediation and waste classification of fill material will be confirmed by the DSI at each stage. An outline of remediation management requirements to address this AEC is included in Section 7.
Use of Pesticides	Currently unknown. Impacts to groundwater and soil may occur. An outline of remediation management requirements to address this AEC is included in Section 7.
Hazardous Building Materials	Currently unknown. Likely to be limited to the existing building fabric and surface soils. The extent of removal prior to demolition will be confirmed following the Hazardous Building Materials Survey. An outline of remediation management requirements to address this AEC is included in Section 7.

Due to the lack of detailed investigation data and the complexities associated with managing/remediating contaminated groundwater, the scope of remediation in Section 7 has been limited to fill material. In the event that the detailed investigations for each stage identify potential risks from groundwater contamination associated with an on-site issue, an addendum RAP is to be prepared and submitted to the consent authority. This should better define the extent of remediation and the specific remediation requirements to address the impacts identified.

6 REMEDIATION OPTIONS

6.1 Soil Remediation Options

The NSW EPA follows the hierarchy set out in NEPM 2013 for the remediation of contaminated sites. The preferred order for soil remediation and management is as follows:

1. On-site treatment of soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated material so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;

Or if the above are not practicable:

3. Consolidation and isolation of the soil by on-site containment within a properly designed barrier; and
4. Removal of contaminated material to an approved site or facility, followed where necessary by replacement with clean material; or
5. Where the assessment indicates that remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

For simplicity herein, the above hierarchy are respectively referred to as Option 1, Option 2, Option 3 etc.

The Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)[14] provides the following additional requirements to be taken into consideration:

- Remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed; and
- Where there are large quantities of soil with low levels of contamination, alternative strategies should be considered or developed.

[14] NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme, 3rd ed.* (referred to as Site Auditor Guidelines 2017)

6.2 Consideration of Remediation Options

The tables below discusses a range of remediation options:

Table 6-1: Consideration of Remediation Options

Option	Discussion	Applicability
Option 1 On-site treatment of contaminated soil	Various on-site treatment technologies exist such as bio-remediation, air sparging and soil vapour extraction, and thermal desorption. With regards to fibre cement/bonded asbestos containing material (ACM), the only relevant on-site treatment option would include the physical removal of bonded ACM via picking. This would include a systematic process whereby the impacted fill is excavated and ACM fragments are physically removed from the soil by hand.	Physical removal of bonded asbestos materials via hand picking is not considered a viable approach when taking into account the sensitivity of the ongoing land use as a school. Other treatment technologies are unlikely to be applicable (or viable) for addressing the variety of contaminants/CoPC for this project.
Option 2 Off-site treatment of contaminated soil	Contaminated soils are excavated, transported to an approved/ licensed treatment facility, treated to remove/stabilise the contaminants then returned to the subject site, transported to an alternative site or disposed to an approved landfill facility. This option provides for a relatively short program of on-site works, however there may be some delays if the material is to be returned to the site following treatment and regulatory requirements would need to be carefully considered. The cost per tonne for transport to and from the site and for treatment is considered to be relatively high. The material would also have to be assessed in terms of suitability for reuse as part of the proposed development works.	Not applicable for this project considering the limited volumes of material potentially to be remediated, the limitations associated with treatment technologies, and the regulatory implications.
Option 3 Capping and containment of contaminated soils	This would include the placement of a warning layer (such as geo-grid or geofabric) and pavement over the surface of the contaminated soil to isolate the material and thereby reduce the health risk to future site users.	Capping is a viable option for the contamination at the site. Capping and containment of impacted soils would require on-going management via an EMP.

Option	Discussion	Applicability
	The capping and/or containment must be appropriate for the specific contaminants of concern. An ongoing Environmental Management Plan (EMP) would be required and site identification documentation, including the Section 10.7 Council planning certificate (or other appropriate notification mechanism), would be modified to note the presence of the contamination/EMP in the event that contamination remains at concentrations that exceed the Validation Assessment Criteria (VAC). This may impact upon development approval conditions, place restrictions on the use of the land and limit the future potential land value.	
Option 4 Removal of contaminated material to an appropriate facility and reinstatement with clean material	Contaminated soils would be classified in accordance with NSW EPA guidelines for waste disposal, excavated and disposed of off-site to an appropriately licensed facility. The material would have to meet the requirements for landfill disposal. Landfill gate fees (which may be significant) would apply in addition to transport costs.	Removal is considered a viable option for this project considering the potential variety of contaminant types on site.

6.3 Preferred Remediation Options and Rationale

In the absence of detailed characterisation and delineation data for all AEC, the RCP has outlined a number of options that can be selected. These are discussed in detail below:

- Preferred Option A – this includes excavation and off-site disposal of waste and contaminated soil to a suitably licensed landfill (Option 4 in the remediation hierarchy). This option provides for a relatively short programme of on-site works and is the only valid option for the general waste materials. The other preferred option below could also be applied for remediation of soil depending on the contamination/contaminants present; and
- Preferred Option B – this includes the capping of contaminated soil beneath the proposed development. An EMP would be required for the on-going management of the site.

The preferred remedial options were selected based on technical feasibility and waste reduction principles, and are considered valid to achieve the remedial goals/aims. The applicability of these options may vary depending on the type and extent of any contamination that may be identified during the DSI. In the event that the capping strategy is adopted (Preferred Option B), this approach should be agreed to by the land owner and council prior to implementing it.

7 REMEDIATION MANAGEMENT

7.1 Roles and Responsibilities

The two primary roles under the RCP include the validation consultant and the remediation contractor. The validation consultant should be engaged to undertake the detailed investigations and to implement the validation plan outlined in this RCP. It would be prudent to select a consultant that is a Certified Environmental Practitioner (Site Contamination Specialist) under the Environment Institute of Australia and New Zealand scheme.

The remediation contractor should be engaged to carry out the remediation tasks required under this RCP. The role of the contractor is to remediate the site in accordance with the remediation methods and the validation consultant's advice, apply for any necessary permits/licenses required for remediation, retain all necessary documentation for waste disposal, imported materials etc., and to keep the validation consultant informed regarding the progress of the site works and any unexpected finds.

7.2 Sequence of Works

EIS anticipate the following sequence of work for each stage of the Master Plan development (in the context of the remediation):

1. Hazardous Building Materials assessment (if required as demolition is proposed);
2. Detailed Site Investigation;
3. Preparation of RAP (if required) based on the findings of the DSI;
4. Remediation of the AEC;
5. Validation of the AEC (following remediation or progressively during remediation); and
6. Validation of any imported soil materials (even those not intended for remediation purposes) until the finalisation of the site validation report. This includes bulk fill and/or engineering material such as recovered aggregate etc. for roadmaking.

Prior to commencement of remediation, appropriate steps should be taken to implement the *Site Management Plan for Remediation Works* (Section 10). Advice regarding shoring and excavation in relation to the remediation should also be provided by a suitably qualified geotechnical engineer, and this advice should also be implemented to the extent required to facilitate the remediation.

7.3 Remedial Actions - Preferred Option A (off-site disposal)

The following procedure (Preferred Option A) will apply to AEC1 and AEC2. This may also be applied for soil in AEC3 and AEC4 if soil contamination is identified during the data gap investigation.

Table 7-1: Remedial Actions – Preferred Option A

Step	Procedure
1.	Establish Remediation Extent: The horizontal and vertical extent of the contamination should be marked out as per details provided in the DSI report. The scope of remediation will vary from each stage depending on specific site observations and findings of the intrusive investigations.
2.	Waste Classification: A waste classification report should be prepared for the waste in accordance with the NSW Waste Classification Guidelines, Part 1: Classifying Waste (2014)[15].
3.	PPE and WHS: Check PPE and WHS requirements prior to commencement of remediation works. The minimum PPE required for the remediation includes the following: • Disposable gloves; • P2 dust mask; • Eye protection; and • Hard hat, covered clothing and steel toed boots.
4.	Shoring / stabilisation: For areas where soil is to be excavated, or if buried waste is identified, any necessary requirements for shoring or stabilising the remediation area should be implemented based on the advice of the geotechnical engineer.
5.	Removal of fill/soil: Remediation of fill/soil will be undertaken as follows: • The extent of the contamination should be established and the area is to be marked out using appropriate methods (pegs/marking paint); • Excavate the fill/soil to the full extent of remediation under the guidance of the validation consultant; • Load the fill onto trucks and dispose to a licenced facility in accordance with the assigned waste classification; • Validate the excavation in accordance with Section 8; and • Reinstate the area (if required) to an appropriate level using clean material.

[15] NSW EPA, (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

7.4 Remedial Actions - Preferred Option B (capping)

Preferred Option C should only be applied in the following circumstances:

- Where soil contaminant concentrations are above the SAC and it is considered valid to cap the contaminated material on-site; and/or
- Where soil contaminant concentrations are above the SAC in an area of the site that will not be paved with concrete/hardstand.

Based on the existing data, this approach may be applicable for the range of contaminants outlined in the CSM. The results of the DSI at each stage and other validation tasks are to be used to confirm whether this option is appropriate for the concentrations and type of contaminants identified.

Table 7-2: Remedial Actions – Preferred Option B

Step	Procedure
1.	Establish Appropriate Controls (WHS and Earthworks) and Licenses: Prior to commencement, appropriate controls should be setup and licenses obtained as outlined in Steps 1 and 4 of Section 7.3.
2.	Establish Capping Area: The extent of the contamination (requiring capping) should be established and the area is to be marked out using appropriate methods (pegs/marking paint). The capping material/layer should cover the entire contamination area including an overlap of at least 1m from the edge of the contamination area to minimise the potential for the soil to be exposed or cross-contaminate the adjoining areas.
4.	Capping Material Placement: • Any visible contamination (FCF/ACM) should be picked and removed from the surface and a clearance certificate attained; • The soil should be compacted using an appropriate earthworks specification to meet the engineering requirements for the project. Advice should be sought from a suitably qualified geotechnical engineer as required; • The geo-fabric layer should be placed directly on top of the contaminated material and secured with soil nails; • Adjoining layers of geo-fabric should overlap by approximately 50cms; and • The pavement/building should be constructed as required.

7.5 Remediation Documentation

The remediation contractor must retain all documentation associated with the remediation, including but not limited to:

- Waste classification and waste tracking documentation;

- Soil/waste disposal dockets;
- Photographs of remediation works;
- Asbestos removal documentation, including licences, removal control plans, clearance certificates and air monitoring results; and
- Imported materials information.

Copies of the above documentation must be forwarded to the validation consultant for review and inclusion in the final site validation report.

7.6 Waste Volume and Disposal Assessment

A soil volume analysis should be undertaken on completion of the works and reconciled with the quantities shown on the soil disposal dockets. A review of the disposal facility's licence issued under the Protection of the Environment Operations (POEO) Act (1997)[16] should also be undertaken to confirm whether or not each facility is appropriately licensed to receive the waste.

[16] NSW Government, (1997)). *Protection of Environment Operations Act.* (referred to as POEO Act 1997)

8 VALIDATION PLAN

Validation is necessary to demonstrate that remedial measures described in this RCP have been successful and that the site is suitable for the intended land use. The sampling program for the validation is outlined in Section 8.1. This is the minimum requirement based on the remedial strategies provided. Additional validation sampling may be required based on site observations made during remediation.

Site observations will also be used as a validation tool to assess the extent of site contamination. In particular visual and olfactory indicators such as petroleum odours, staining and visible occurrence of fibre cement/ACM should be recorded.

8.1 Validation Sampling and Documentation

The table below outlines the validation requirements for the site.

Table 8-1: Validation Requirements

Aspect	Sampling	Analysis	Observations and Documentation
Excavations / Waste Removal			
Base of excavation after remediation (includes soil surfaces following removal of surface waste in the AEC). Walls of excavations after remediation.	One sample per 100m^2 (10m by 10m grid), with a minimum of one sample per excavation base. One sample per 10m lineal, with a minimum of one sample per excavation wall. Sample depth should target the same depth as the initial contaminant exceedance(s).	To target specific contaminants of concern based on the results of the DSI.	Observations of staining/odours and presence/absence of fibre cement to be recorded. Photographs to be taken. Disposal dockets and waste tracking documentation to be retained.

Aspect	Sampling	Analysis	Observations and Documentation
Capping			
Capping area prior to laying of capping material	-	Visual surface clearance inspection	Visual inspection of the surface for staining or other indicators of contamination (i.e. ACM). Location and scope of capping area to be confirmed by DSI and following discussion with the land owner and council.
After Capping			
Capping area prior to laying of capping material	-	Inspection	Inspection to confirm laying of geo-fabric and appropriate overlap. Inspection required and photographs to be taken to confirm construction of overlying pavement/slab, or landscaped areas.

Aspect	Sampling	Analysis	Observations and Documentation
Imported Material			
Imported virgin excavated natural material (VENM) backfill (if required).	Minimum of three samples per source.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRH, BTEX PAHs, OCP/OPP, PCBs and asbestos. Additional analysis may be required depending on site history.	VENM documentation/ report required (should include source site history to demonstrate analytes are appropriate). Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation.
Imported engineering materials such as recycled aggregate, road base etc.	Minimum of three samples per source/material type.	Asbestos (40-50g analysis) and heavy metals.	Documentation required to confirm material has been classified with reference to a relevant exemption and is fit for purpose on site.

Aspect	Sampling	Analysis	Observations and Documentation
			Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Dockets for imported material to be provided.
Imported engineering materials comprising only natural quarried products such as blue metal etc.	At the validation consultant's discretion based on supplier documentation.	At the validation consultant's discretion based on supplier documentation.	Documentation to be provided from the supplier confirming the material is a product comprising only VENM (i.e. quarried product). Review of quarry Environment Protection Licence. Material to be inspected upon importation to confirm it is free of anthropogenic materials, visible and olfactory indicators of contamination, and is consistent with documentation. Dockets for imported material to be provided.
Imported landscaping materials.	Minimum of three samples per source/material type.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRHs, BTEX, PAHs, OCPs, OPPs, PCBs and asbestos.	Documentation required to confirm material has been produced under an appropriate standard and is fit for purpose on site. Material to be inspected upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Dockets for imported material to be provided.

8.2 Validation Assessment Criteria and Data Assessment

The VAC for the site are provided in the following table. Criteria have only been provided for the CoPC identified previously in this report. In the event that other contaminants are identified (e.g. as a result of an unexpected find), additional validation criteria must be developed by the validation consultant.

Table 8-2: Summary of Validation Criteria (in mg/kg unless stated otherwise)

Contaminant	VAC Human Health	VAC Environmental/Ecological
Asbestos (40-50g samples)	Absent	-
ACM (bulk)	≤ 0.05 % w/w[a]	-
AF/FA (500ml)	≤ 0.001 % w/w	-
Arsenic	≤500	100
Cadmium	≤150	-
Chromium	≤500	190
Copper	≤30,000	60
Lead	≤1,200	1,100
Mercury	120	-
Nickel	≤1,200	30
Zinc	≤60,000	70
TRH F1	≤45 (sand) ≤40 (silt) ≤50 (clay)	180
TRH F2	≤1,000[c]	120
TRH F3	≤2,500 (coarse)[c] ≤3,500 (fine)[c]	300 (coarse soil) 1,300 (fine soil)
TRH F4	≤8,100[d]	2,800 (coarse soil) 5,600 (fine soil)
Benzene	≤0.5 (sand) ≤0.6 (silt) ≤0.7 (clay)	50 (coarse soil) 65 (fine soil)

Contaminant	VAC Human Health	VAC Environmental/Ecological
Toluene	≤21,000[d]	85 (coarse soil) 105 (fine soil)
Ethylbenzene	≤5,900[d]	70 (coarse soil) 125 (fine soil)
Total xylenes	≤40	105 (coarse soil) 45 (fine soil)
Naphthalene	≤2,200[d]	170
Total PAHs	≤400	-
Carcinogenic PAHs	≤4	-
Benzo(a)pyrene	-	33
OCPs	≤10[b]	180
OPPs	< Laboratory practical quantitation limit (PQL)	-
PCBs	≤1	-

a – Material exceeding this ACM validation criterion can be re-treated and re-validated.
b – Most conservative criteria adopted for aldrin/dieldrin. Alternatively, thresholds for other individual OCP compounds could be considered with regards to Schedule B1 of NEPM (2013).
c – VAC based on Management Limits.
d – VAC based on direct contact criteria which is also applicable for intrusive maintenance workers. The validation should also consider odours and potential impacts to groundwater. Odorous soil should not be retained on-site.

Data should initially be assessed as above or below the VAC. Statistical analysis may be applied if deemed appropriate by the consultant and undertaken in accordance with the NEPM (2013).

8.3 Validation Report

As part of the validation process, a site validation report will be prepared by the validation consultant. The report will outline the remediation work undertaken at the site and will summarise the results of the validation assessment. The report is to be prepared in accordance with the NSW OEH *Guidelines for Consultants Reporting on Contaminated Sites* (2011). The report should draw conclusions regarding the success of the remediation/validation and the suitability of the site for the proposed development (from a contamination viewpoint).

If required, remediation and validation can be staged along with the proposed development. A separate validation report would be required for each development stage. Further input in this regard should be sought from the validation consultant.

8.4 Data Quality

All validation sampling should include appropriate QA/QC together with the documentation and assessment of DQOs and DQIs in accordance with the framework set out in Section 4.

9 CONTINGENCY PLAN

A review of the proposed remediation works has indicated that the greatest risk that may affect the success of the remediation is an unexpected find. A contingency plan for unexpected finds is outlined below, in conjunction with a selection of other contingencies that may apply to this project.

9.1 Unexpected Finds

Residual hazards that may exist at the site would generally be expected to be detectable through visual or olfactory means. At this site, these types of hazards may include: suspected ACM outside of the identified AEC, suspected friable types of asbestos in soil, odorous or stained hydrocarbon impacted soils, and ash/slag impacted soil.

The procedure to be followed in the event of an unexpected find is presented below:

- In the event of an unexpected find, all work in the immediate vicinity should cease and the remediation contractor should contact the validation consultant immediately;
- Temporary barricades should be erected to isolate the area from access by the workers and machinery;
- In the event suspected friable asbestos material is encountered, a qualified occupational hygienist and/or asbestos consultant should be contacted (preferably the validation consultant will have an in-house hygienist or asbestos assessor);
- The validation consultant should attend the site and assess the extent of remediation that may be required and/or adequately characterise the contamination;
- In the event remediation is required, the procedures outlined within this report should be adopted where appropriate, alternatively an addendum RAP should be prepared; and
- Appropriate validation sampling should be undertaken and the results should be included in the validation report.

9.2 Soil Validation Failure

In the event of soil validation failure, the excavation should be extended in the direction of the failure (in consultation with the validation consultant) and the area re-validated.

9.3 Importation Failure for VENM or other Imported Materials

Where material to be imported onto the site does not meet the importation acceptance criteria detailed in Section 8, the only option is to not accept the material. Alternative material must be sourced that meets the importation requirements.

9.4 Disposal of Hazardous Waste

Material classed as ‘Hazardous Waste’ under the Waste Classification Guidelines (2014) may require further assessment and stabilisation prior to off-site disposal. Disposal approval may also be required

from the NSW EPA and EPA licensed landfill facility. The presence of Hazardous Waste may result in significant delays and additional cost to the project.

10 SITE MANAGEMENT PLAN FOR REMEDIATION WORKS

The information outlined in this section of the RAP is for the remediation work only. The client should contact the local consent authority (Council or certifier) for specific site management requirements for the overall development of the site.

10.1 Interim Site Management

A hazardous building material survey should be completed prior to any demolition works. The demolition contractor should provide appropriate clearance documentation following removal of any hazardous building materials.

10.2 Project Contacts

Emergency procedures and contact telephone numbers should be displayed in a prominent position at the site entrance gate and within the main site working areas. The contact details of key project personnel are summarised below.

Table 10-1: Project Contacts

Task	Company	Contact Details
Project Manager	IPM Holdings Pty Ltd	Alek Novakovic 0402 276 963
Remediation Contractor	To be appointed	-
Environmental Consultant	EIS (at the time of the RAP preparation)	Harry Leonard 9888 5000
Certifier	To be appointed	-
NSW EPA	Pollution Line	131 555
Emergency Services	Ambulance, Police, Fire	000

10.3 Security

Prior to the commencement of remediation works, fencing should be installed as required to secure the remediation areas. Warning signs should be erected, which outline the PPE required for remediation work. All excavations should be clearly marked and secured to reduce the risk to site personnel from injury by falling into open excavations.

10.4 Timing and Sequencing of Remediation Works

In general, all remedial works should be completed prior to the commencement of any building works (except potentially building associated with the car parks and construction of the concrete floor slabs for the proposed buildings). In the event of unexpected delays, geo-fabric should be used to cover the remediation areas in order to reduce the dust generation, surface water run-off and/or exposure to receptors.

10.5 Site Soil and Water Management Plan

The contractor should prepare a detailed soil and water management plan prior to the commencement of remediation works. This should be specific for the remediation tasks. Silt fences should be used to control the surface water runoff at all appropriate locations of the site. Reference should be made to the consent conditions for more details.

All stockpiled materials should be placed within an erosion containment boundary with silt fences and sandbags employed to limit sediment movement. The containment area should be located away from drainage lines, gutters, stormwater pits and inlets and the site boundary. No liquid waste or runoff should be discharged to the stormwater or sewerage system without the approval of the appropriate authorities.

10.6 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in AS-2460 (2002)[17] should be adopted. Other measures specified in the consent conditions should also be complied with. Noise producing machinery and equipment should only be operated between the hours approved by Council (refer to consent documents).

All practicable measures should be taken to reduce the generation of noise and vibration to within acceptable limits. In the event that short-term noisy operations are necessary, and where these are likely to affect residences, notifications should be provided to the relevant authorities and the residents by the project manager, specifying the expected duration of the noisy works.

10.7 Dust Control Plan

All practicable measures should be taken to reduce dust emanating from the site. Factors that contribute to dust production are:

- Wind over a cleared surface;
- Wind over stockpiled material; and
- Movement of machinery in unpaved areas.

[17] Australian Standard, (2002). *AS2460: Acoustics - Measurement of the Reverberation Time in Rooms.*

Visible dust should not be present at the site boundary. Measures to minimise the potential for dust generation include:

- Use of water sprays on unsealed or exposed soil surfaces;
- Covering of stockpiled materials and excavation faces (particularly during periods of site inactivity and/or during windy conditions) or alternatively the erection of hessian fences around stockpiled soil or large exposed areas of soil;
- Establishment of dust screens consisting of a 2m high shade cloth or similar material secured to a chain wire fence;
- Maintenance of dust control measures to keep the facilities in good operating condition;
- Concrete surfaces brushed or washed to remove dust;
- Stopping work during strong winds;
- Loading or unloading of dry soil as close as possible to stockpiles to prevent spreading of loose material around the site; and
- The expanse of cleared land should be kept to a minimum.

If stockpiles are to remain on-site or an excavation remains open for a period of longer than several days, dust monitoring should be undertaken at the site. If excessive dust is generated all site activities should cease until either wind conditions are more acceptable or a revised method of excavation/remediation is developed.

Dust is also produced during the transfer of material to and from the site. All material should be covered during transport and should be properly disposed of on delivery. No material is to be left in an exposed, un-monitored condition.

All equipment and machinery should be brushed or washed down before leaving the site to limit dust and sediment movement off-site. In the event of prolonged rain and lack of paved areas all vehicles should be washed down prior to exit from the site, and any soil or dirt on the wheels of the vehicles removed. Water used to clean the vehicles should be collected and tested prior to appropriate disposal under the Waste Classification Guidelines.

10.8 Air Monitoring

Requirements for air monitoring should be considered by the asbestos removal contractor for any asbestos-related works. EIS recommend that air monitoring be undertaken for the duration of asbestos remediation works.

10.9 Odour Control Plan

All activities undertaken at the site should be completed in a manner that minimises emissions of smoke, fumes and vapour into the atmosphere and any odours arising from the works or stockpiled material should be controlled. Control measures may include:

- Maintenance of construction equipment so that exhaust emissions comply with the Clean Air Regulations issued under the Protection of the Environment Operations Act (1997);
- Demolition materials and other combustible waste should not be burnt on site;
- The spraying of a suitable proprietary product to suppress any odours that may be generated by excavated materials; and
- Use of protective covers (e.g. tarpaulins or builder's plastic).

All practicable measures should be taken to reduce fugitive emissions emanating from the site so that associated odours do not constitute a nuisance and that the ambient air quality is not adversely impacted.

10.10 Health and Safety Plan

A site specific WHS plan should be prepared by the contractor for all work to be undertaken at the site. The WHS plan should meet all the requirements outlined in SafeWork NSW WHS regulations.

As a minimum requirement, personnel must wear appropriate protective clothing, including long sleeve shirts, long trousers and steel cap boots. Asbestos-related PPE is also required as outlined in Section 7.3 (and to be formally documented in the asbestos removal control plan). Washroom and lunchroom facilities should also be provided to allow workers to remove potential contamination from their hands and clothing prior to eating or drinking.

10.11 Waste Management

Prior to commencement of remedial works and excavation for the proposed development, the contractor should develop a waste management or recycling plan to minimise the amount of waste produced by the site.

10.12 Incident Management Contingency

The validation consultant should be contacted if any unexpected conditions are encountered at the site. This should enable the scope of remedial/validation works to be adjusted as required. Similarly if any incident occurs on site, the validation consultant should be advised to assess potential impacts on site contamination conditions and the remediation/validation timetable.

10.13 Hours of Operation

Hours of operation should be between those approved by Council under the development approval process. Reference should also be made to any specific conditions imposed by other consent authority/regulatory bodies.

11 CONCLUSION

EIS are of the opinion that the site can be made suitable for the proposed development described in Section 1.1 provided this RCP is implemented accordingly. A site validation report should be prepared on completion of remediation activities and should be submitted to the consent authority.

11.1 Remediation Category

Site remediation can fall under the following two categories outlined in SEPP55:

Table 11-1: Remediation Category

Category	Details
Category 1	Category 1 remediation works are those undertaken in the following areas specified under Clause 9 of SEPP55: • A designated development; • Carried out on land declared to be a critical habitat; • Development for which another State Environmental Planning Policy (SEPP) or Regional Environmental Plan (REP) requires a development consent; or • Carried out in an area or zone classified as: ➢ Coastal Protection; ➢ Conservation or heritage conservation; ➢ Habitat protection, or habitat or wildlife corridor; ➢ Environmental protection; ➢ Escarpment, escarpment protection or preservation; ➢ Floodway or wetland; ➢ Nature reserve, scenic area or scenic protection; etc. • Work that is not carried out in accordance with the site management provisions contained in the consent authority Development Control Plan (DCP)/Local Environmental Plan (LEP) etc. Approval is required from the consent authority for Category 1 remediation work. The RAP needs to be assessed and determined either as part of the existing DA or as a new and separate DA. Category 1 remediation work is identified as advertised development work unless the remediation work is a designated development or a state significant development.
Category 2	Remediation works which do not fall under the above category are classed as Category 2. Development consent is not required for Category 2 remediation works, however the consent authority should be given 30 days' notice prior to commencement of works.

Considering the above, EIS have assessed that the remediation work is likely to fall within Category 2. EIS recommend that a specialist planner confirm the remediation category prior to the submission of this report to Council.

11.2 Regulatory Requirements

The regulatory requirements applicable for remediation are outlined in the following table:

Table 11-2: Regulatory Requirement

Guideline	Applicability
Duty to Report Contamination (2015)	At this stage, EIS consider that there is no requirement to notify the NSW EPA of the site contamination. This requirement should be reassessed following review of the validation results, including the asbestos air monitoring data.
POEO Act 1997	Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner. Appropriate waste tracking is required for all relevant waste that is disposed off-site. Asbestos waste must be tracked using WasteLocate.
Water Management Act (2000)	The development (and therefore the remediation) may require a controlled activity approval. This requirement should be assessed by the client and confirmed by the relevant authorities.
WHS Code of Practice (2016)	Sites with asbestos become a 'workplace' when work is carried out there and require a register and asbestos management plan. Appropriate SafeWork NSW notification will be required for asbestos removal works or handling. Contractors are also required to be appropriately licensed for the asbestos works undertaken (Class B license is required based on the proposed remediation and existing asbestos data).

12 LIMITATIONS

The report limitations are outlined below:

- EIS accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the EIS proposal; and terms of contract between EIS and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, EIS has not undertaken any verification process, except where specifically stated in the report;
- EIS has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- EIS accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- EIS have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. EIS should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa; and
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose.

LIST OF IN-TEXT TABLES

Table 2-1: Site Identification **4**
Table 3-1: Potential (and/or known) Contamination Sources/AEC and Contaminants of Potential Concern **10**
Table 3-2: CSM **10**
Table 5-3: Data Gap Assessment **12**
Table 5-1: Remediation Extent **16**
Table 6-1: Consideration of Remediation Options **18**
Table 7-1: Remedial Actions – Preferred Option A **22**
Table 7-2: Remedial Actions – Preferred Option B **23**
Table 8-1: Validation Requirements **25**
Table 8-2: Summary of Validation Criteria (in mg/kg unless stated otherwise) **28**
Table 10-1: Project Contacts **33**
Table 11-1: Remediation Category **37**
Table 11-2: Regulatory Requirement **38**

IMPORTANT INFORMATION ABOUT THIS REPORT

These notes have been prepared by EIS to assist with the assessment and interpretation of this report.

The Report is based on a Unique Set of Project Specific Factors:
This report has been prepared in response to specific project requirements as stated in the EIS proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- The proposed land use is altered;
- The defined subject site is increased or sub-divided;
- The proposed development details including size, configuration, location, orientation of the structures or landscaped areas are modified;
- The proposed development levels are altered, eg addition of basement levels; or
- Ownership of the site changes.

EIS/J&K will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by EIS to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions:
Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is based on Professional Interpretations of Factual Data:
Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Assessment Limitations:
Although information provided by a site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Site Assessments by Design Professionals:
Costly problems can occur when other design professionals develop plans based on misinterpretation of an assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Assessment Report:
Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the rest of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely:
Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

REPORT FIGURES

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM, 29 DEC 2018.

This plan should be read in conjunction with the EIS report.

Title: **SITE LOCATION PLAN**

Location: LORETO NORMANHURST, 91-93 PENNANT HILLS ROAD NORMANHURST, NSW

Report No: E31772KL

Figure No: 1

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

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Appendix A: Loreto Normanhurst Master Plan Development Proposal

DRAWING LIST

A0000	COVER SHEET	NTS	4
A0001	EXISTING SITE PLAN	1:1000 @ A1	4
A0002	PROPOSED BUILDING ENVELOPE SITE PLAN	1:1000 @ A1	4
A0003	STAGE 1 WORKS	1:500 @ A1	3
A0004	INDICATIVE EXTENT OF FUTURE ENVELOPES	1:500 @ A1	3
A0005	SITE ELEVATIONS	1:500 @ A1	4
A0006	SITE ELEVATIONS	1:500 @ A1	4
A0007	SITE SECTIONS	1:500 @ A1	4
A0008	SITE SECTIONS	1:500 @ A1	4
A0009	OVERALL 3D VIEW - EXISTING	NTS	4
A0010	OVERALL 3D VIEW - STAGE 1 ENVELOPES	NTS	4
A0011	OVERALL 3D VIEW - FUTURE PROJECTS	NTS	3
A0012	SHADOW DIAGRAMS - WINTER SOLSTICE 9am - 11am	1:2000 @ A1	3
A0013	SHADOW DIAGRAMS - WINTER SOLSTICE 12pm - 2pm	1:2000 @ A1	2
A0014	SHADOW DIAGRAMS - WINTER SOLSTICE 3pm	1:2000 @ A1	2
A0015	SHADOW DIAGRAMS - SUMMER SOLSTICE 9am - 11am	1:2000 @ A1	3
A0016	SHADOW DIAGRAMS - SUMMER SOLSTICE 12pm - 2pm	1:2000 @ A1	2
A0017	SHADOW DIAGRAMS - SUMMER SOLSTICE 3pm	1:2000 @ A1	2
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A0020	SHADOW DIAGRAMS - EQUINOX 3pm	1:2000 @ A1	2
A0021	VIEW IMPACT ANALYSIS	NTS	1

LORETO NORMANHURST
CONCEPT PROPOSAL
91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076

Revisions

No.	Date	Description	Ver	App'd
1	30.11.2018	DRAFT MASTERPLAN ISSUE		
2	10.12.2018	ISSUED FOR COORDINATION		
3	18.12.2018	CONCEPT PROPOSAL		
4	10.01.2019	CONCEPT PROPOSAL - SUBMISSION		

Key

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Project
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NORMANHURST. NSW 2076
Proj. No. 18008

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Project
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91-93 PENNANT HILLS ROAD
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Proj. No. 18008

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2 SENIOR SCHOOL UPGRADE
3 FUTURE SCHOOL USE
4 JUNIOR SCHOOL UPGRADE
5 MARY WARD BUILDING UPGRADE
6 GYMNASIUM
7 GONZAGA BARRY CENTRE EXTENSION
8 ALL WEATHER PLAYING FIELD AND UNDERGROUND CARPARK
9 MOUNT PLEASANT PAVILION
10 BUSH CHAPEL
11 ELC SUBJECT OF HORNSBY SHIRE COUNCIL DEVELOPMENT APPLICATION
12 PEDESTRIAN BRIDGE LINK FROM LRC TO MARY WARD WING

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NORMANHURST, NSW 2076
Proj. No. 18008

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Proj. No. 18008

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INDICATES EXTENT OF FUTURE WORKS ENVELOPE SCOPES

INDICATES EXTENT OF FUTURE PROPOSED ENVELOPES

GENERAL LANDSCAPE WORKS THROUGHOUT ENTIRE CAMPUS

NOTE: FINAL EXTENTS OF WORKS MAY NOMINALLY CHANGE

KEY

1. NEW BOARDING HOUSE
2. SENIOR SCHOOL UPGRADE
3. FUTURE SCHOOL USE
4. JUNIOR SCHOOL UPGRADE
5. MARY WARD BUILDING UPGRADE
6. GYMNASIUM
7. GONZAGA BARRY CENTRE EXTENSION
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Proj. No. 18008

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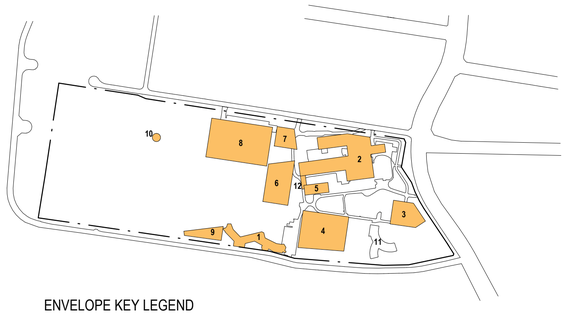

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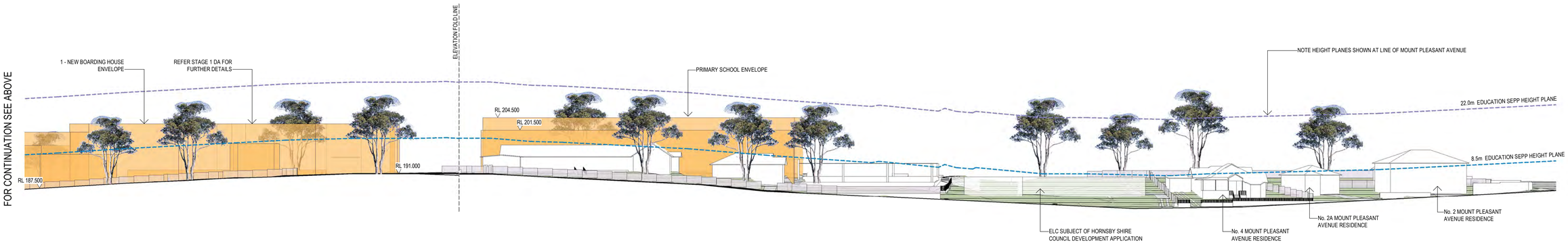

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Proj. No. 18008

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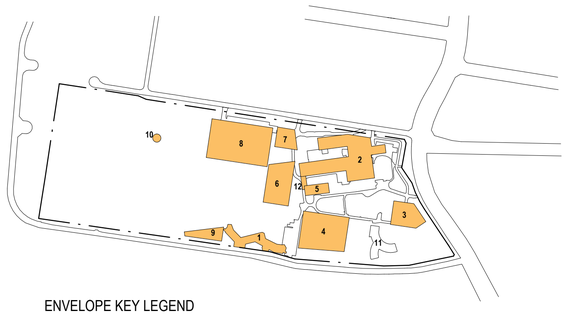

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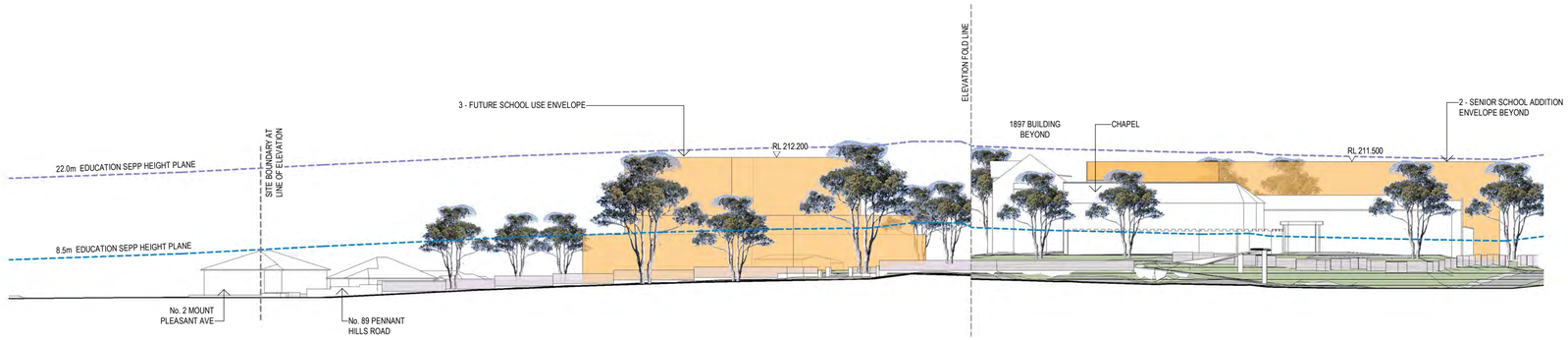

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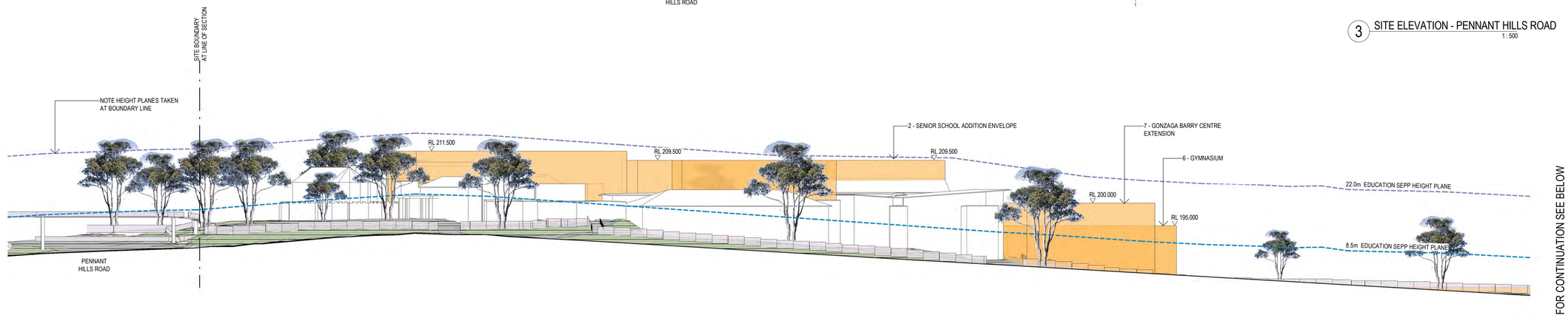

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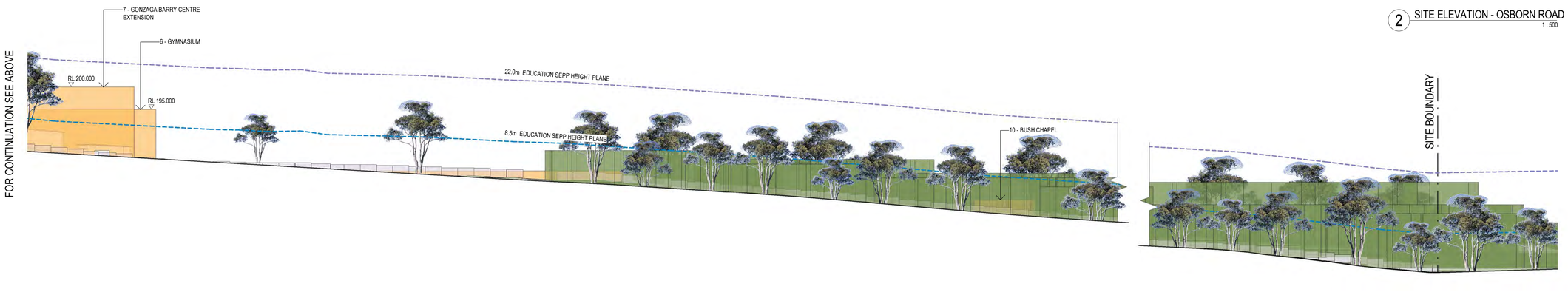

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Proj. No. 18008

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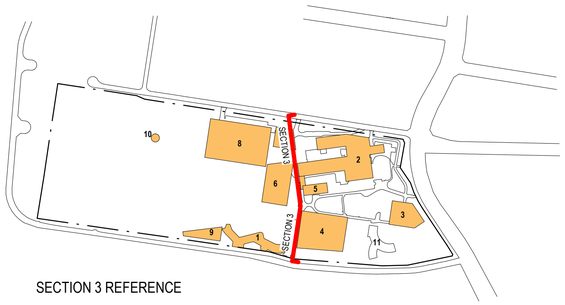
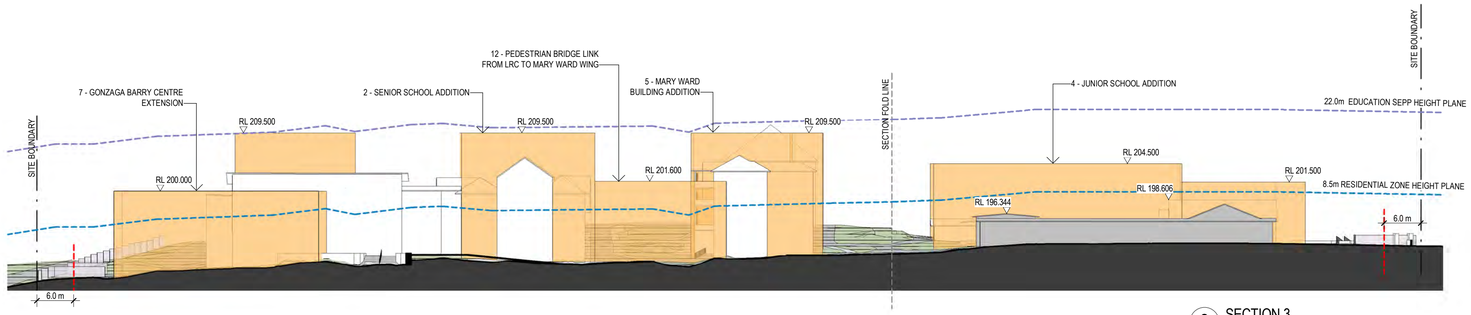


SECTION 3 REFERENCE



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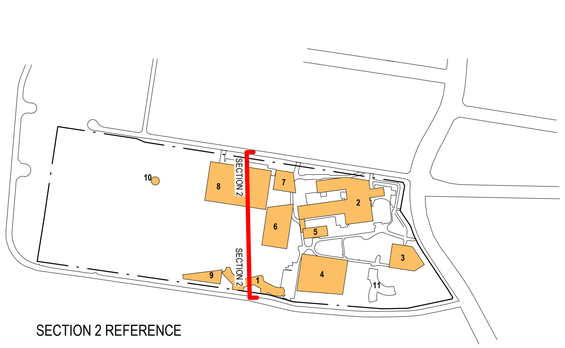

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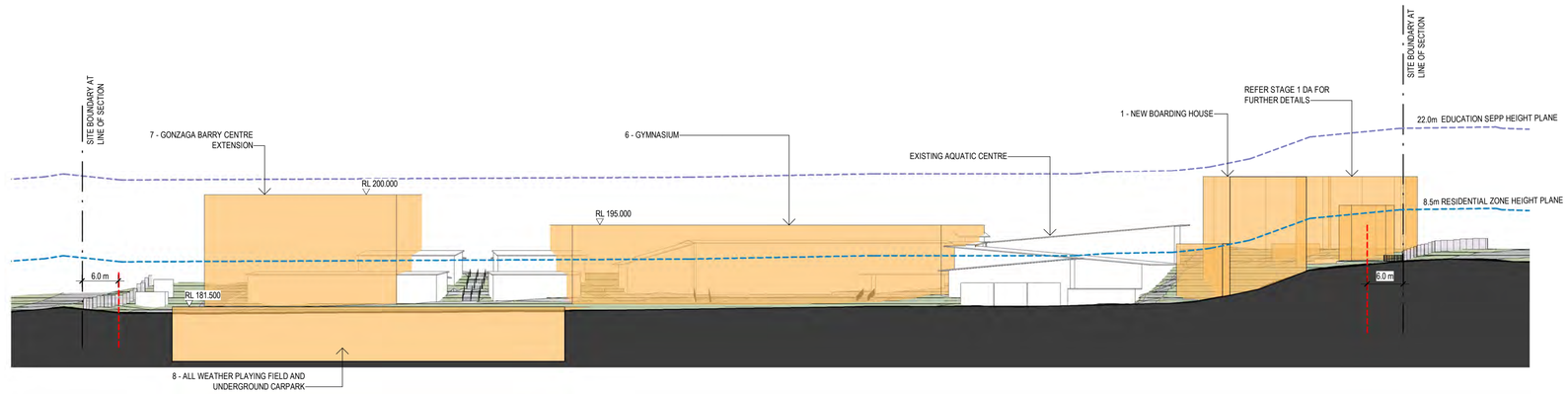

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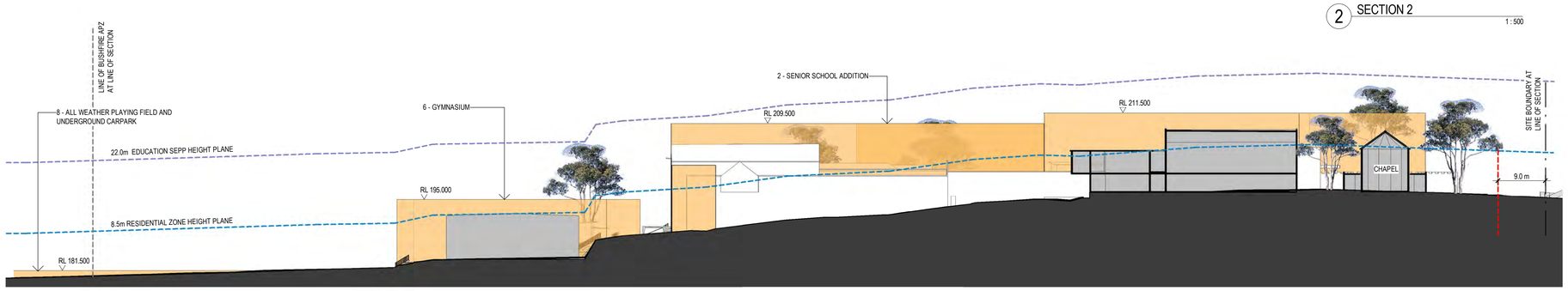
SECTION 1 REFERENCE



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Revisions No.	Date	Description	Ver	App'd
1	30.11.2018	DRAFT MASTERPLAN ISSUE		
2	10.12.2018	ISSUED FOR COORDINATION		
3	18.12.2018	CONCEPT PROPOSAL		
4	10.01.2019	CONCEPT PROPOSAL - SUBMISSION		

Key

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Project
LORETO NORMANHURST
CONCEPT PROPOSAL
91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076
Proj. No. 18008

Drawing Title
SITE SECTIONS

Sheet Status
NOT FOR CONSTRUCTION

Scale
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Drawing No.
A0007

Issue
4

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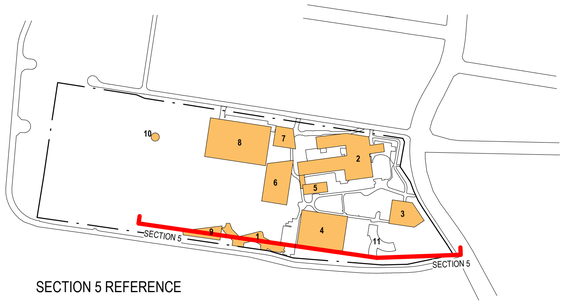
PLOTTED & CHECKED BY: Author
REF: C:\Users\hunvisible\Documents\18008_MasterPlan_jhunstable.rvt



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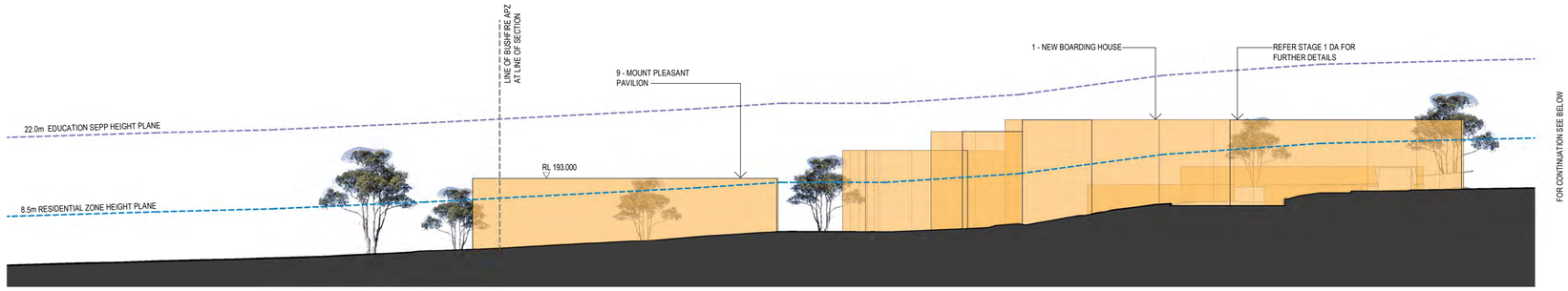

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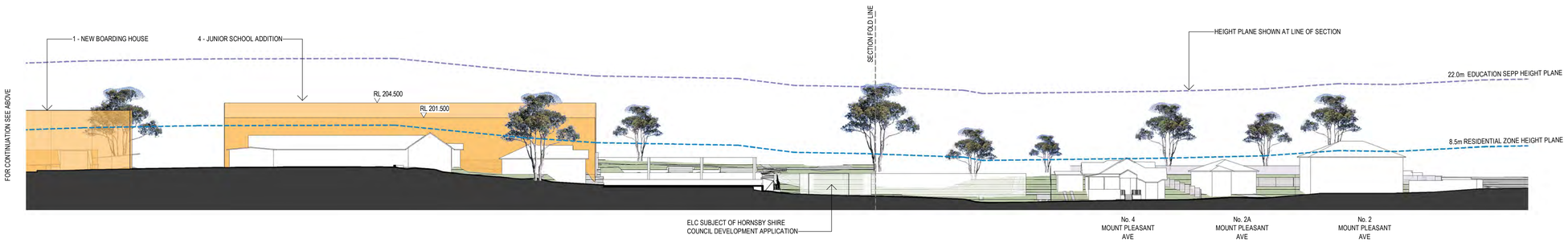

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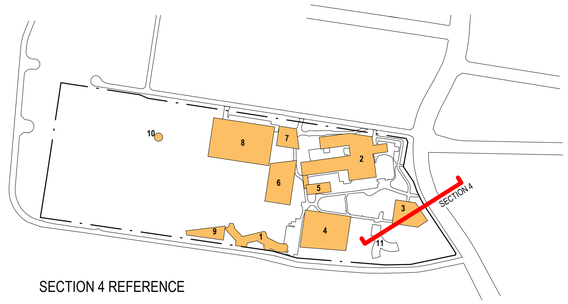

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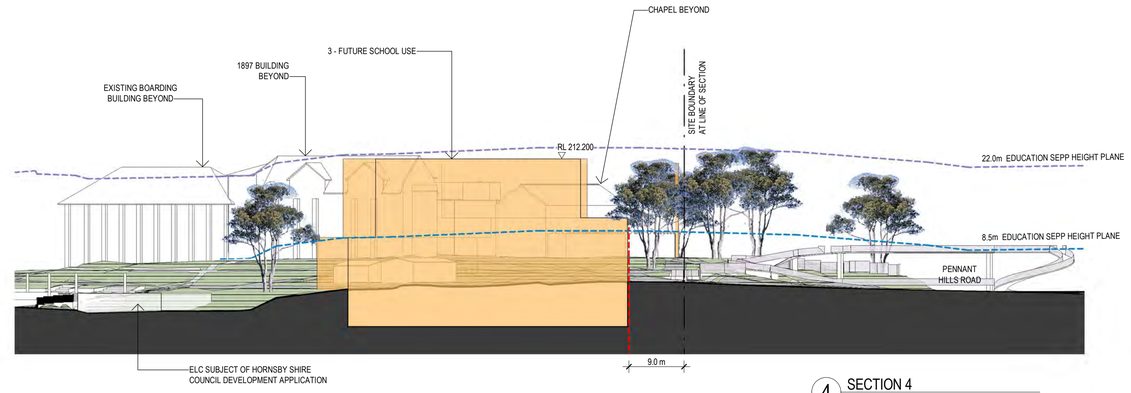

4 SECTION 4
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Revisions

No.	Date	Description	Ver	App'd
1	30.11.2018	DRAFT MASTERPLAN ISSUE		
2	10.12.2018	ISSUED FOR COORDINATION		
3	18.12.2018	CONCEPT PROPOSAL		
4	10.01.2019	CONCEPT PROPOSAL - SUBMISSION		

Key

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Project
LORETO NORMANHURST
CONCEPT PROPOSAL
91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076
Proj. No. 18008

Drawing Title
SITE SECTIONS

Sheet Status
NOT FOR CONSTRUCTION

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Drawing No.
A0008

Issue
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2	10.12.2018	ISSUED FOR COORDINATION		
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Project

LORETO NORMANHURST
CONCEPT PROPOSAL

91-93 PENNANT HILLS ROAD
NORMANHURST, NSW 2076

Proj. No. 18008

Drawing Title

OVERALL 3D VIEW - EXISTING

Sheet Status

NOT FOR CONSTRUCTION

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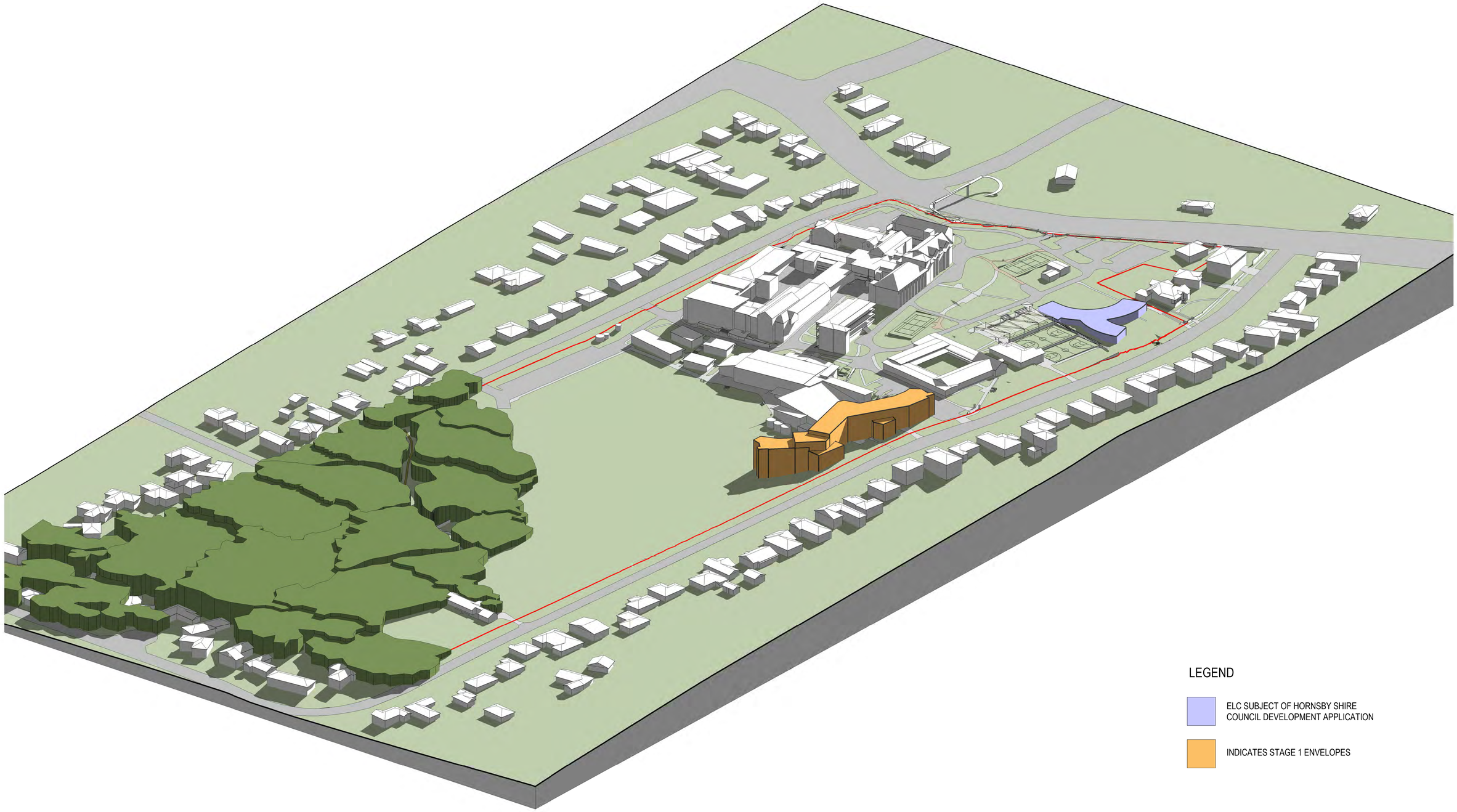

LEGEND

ELC SUBJECT OF HORNSBY SHIRE COUNCIL DEVELOPMENT APPLICATION

INDICATES STAGE 1 ENVELOPES

Revisions

No.	Date	Description	Ver	App'd
1	30.11.2018	DRAFT MASTERPLAN ISSUE		
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Project
LORETO NORMANHURST
CONCEPT PROPOSAL
91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076

Proj. No. 18008

Drawing Title
OVERALL 3D VIEW - STAGE 1 ENVELOPES

Sheet Status
NOT FOR CONSTRUCTION

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Issue: 4

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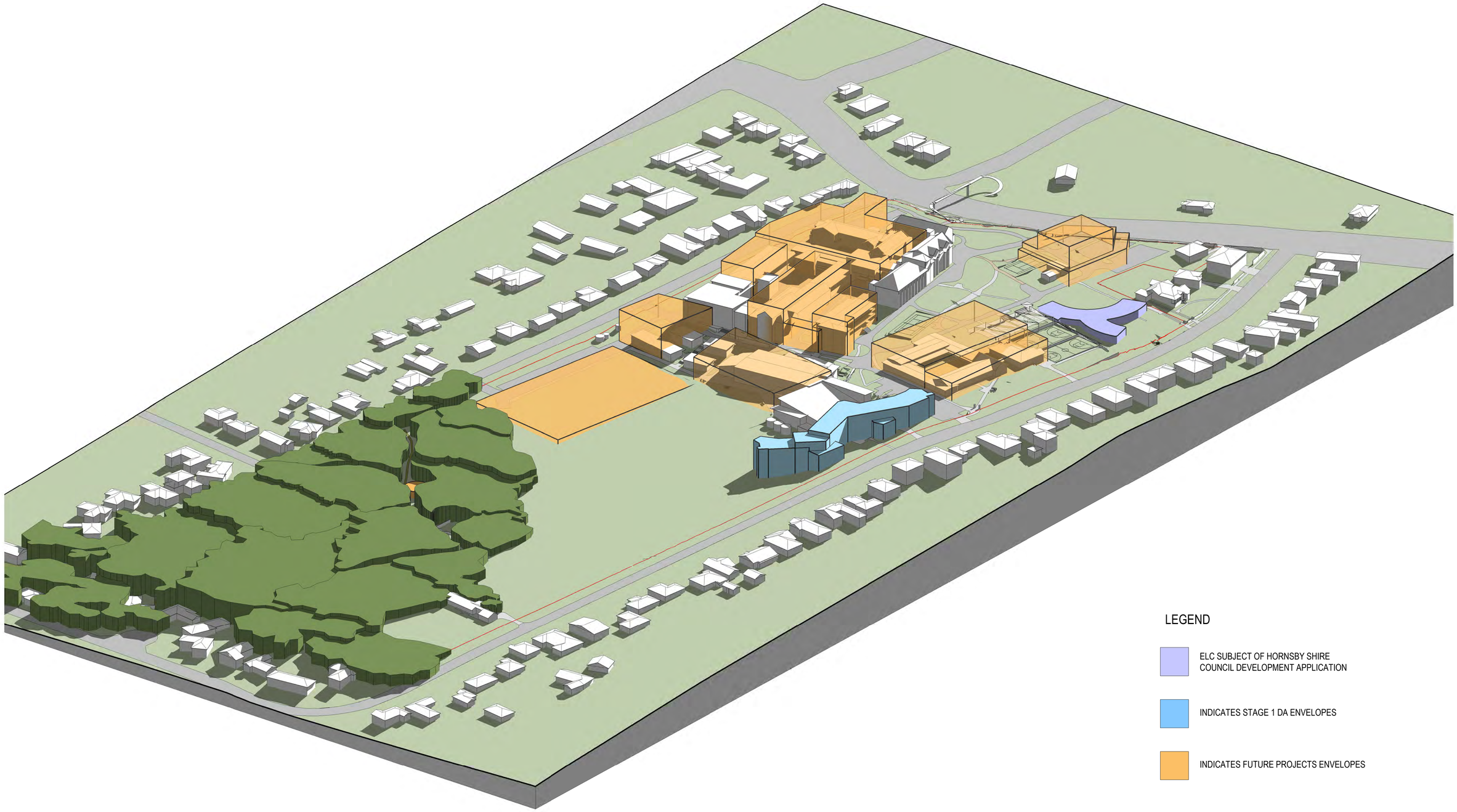

LEGEND

ELC SUBJECT OF HORNSBY SHIRE COUNCIL DEVELOPMENT APPLICATION

INDICATES STAGE 1 DA ENVELOPES

INDICATES FUTURE PROJECTS ENVELOPES

Revisions

No.	Date	Description	Ver	App'd
1	10.12.2018	ISSUED FOR COORDINATION		
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91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076
Proj. No. 18008

Drawing Title
OVERALL 3D VIEW - FUTURE PROJECTS

Sheet Status
NOT FOR CONSTRUCTION

Scale
NTS

Drawing No.
A0011

Issue
3

PLOT DATE & TIME: 10/01/2019 4:05:51 PM
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6 EXISTING SHADOW DIAGRAMS - 9am WINTER SOLSTICE
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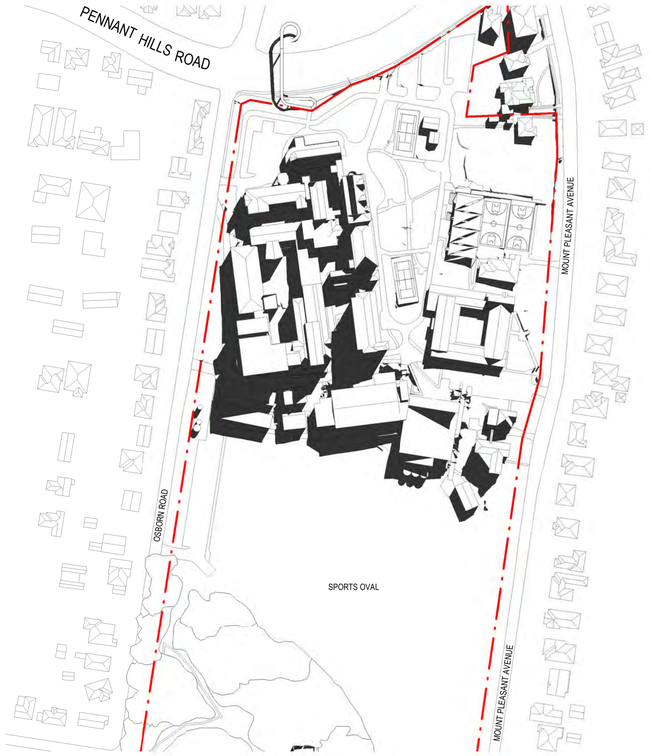

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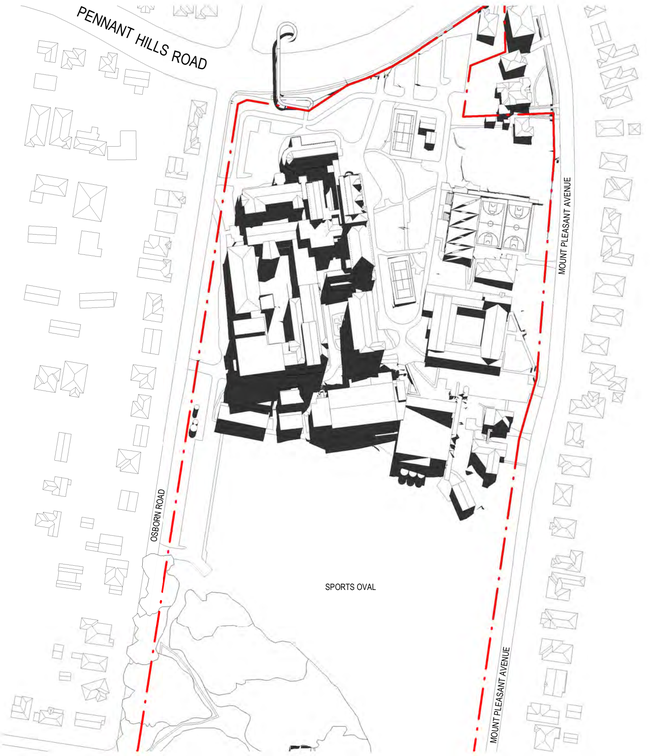

2 EXISTING SHADOW DIAGRAMS - 11am WINTER SOLSTICE
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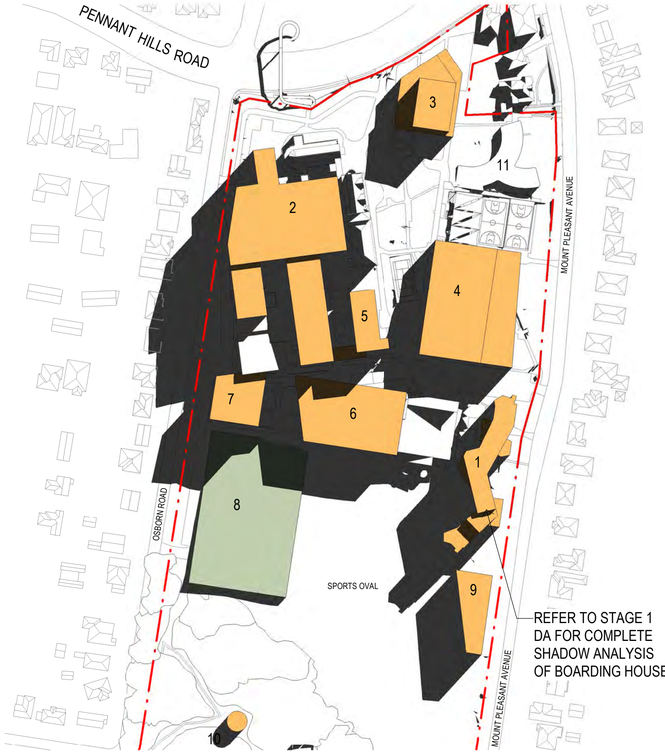

5 PROPOSED SHADOW DIAGRAMS - 9am WINTER SOLSTICE
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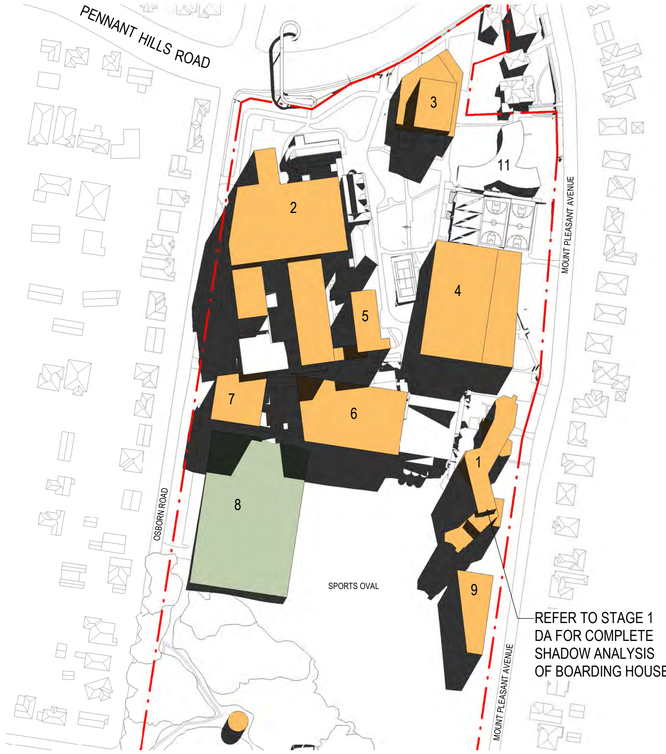

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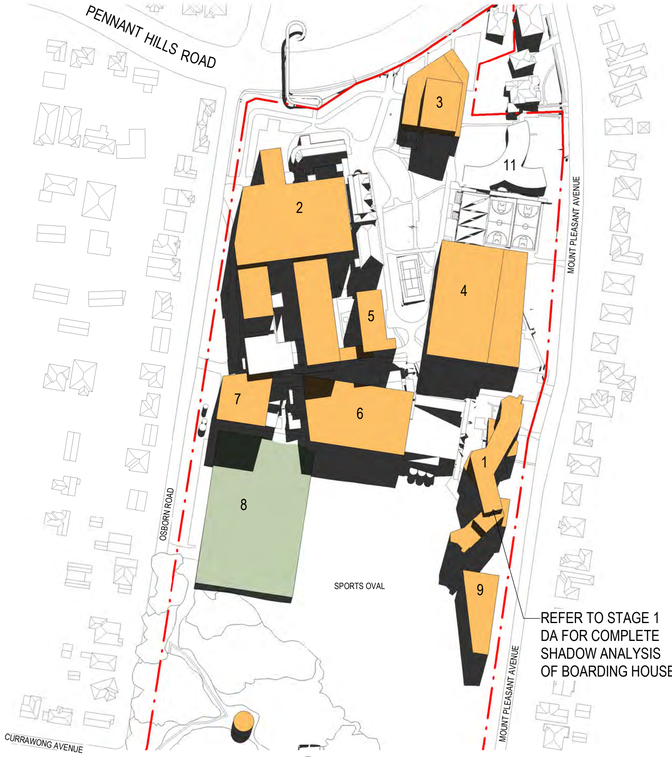

1 PROPOSED SHADOW DIAGRAMS - 11am WINTER SOLSTICE
1 : 2000

NOTE: MAXIMUM OVERSHADOWING CAST BY PROPOSED DEVELOPMENT ENVELOPES

Revisions

No.	Date	Description	Ver	App'd
1	10.12.2018	ISSUED FOR COORDINATION		
2	18.12.2018	CONCEPT PROPOSAL		
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Key

N

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Project
LORETO NORMANHURST
CONCEPT PROPOSAL
91-93 PENNANT HILLS ROAD
NORMANHURST, NSW 2076
Proj. No. 18008

Drawing Title
SHADOW DIAGRAMS - WINTER SOLSTICE 9am - 11am
Sheet Status
NOT FOR CONSTRUCTION

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Drawing No.
A0012
Issue
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PLOT DATE & TIME: 10/01/2019 4:05:58 PM
PLOTTED & CHECKED BY: Author
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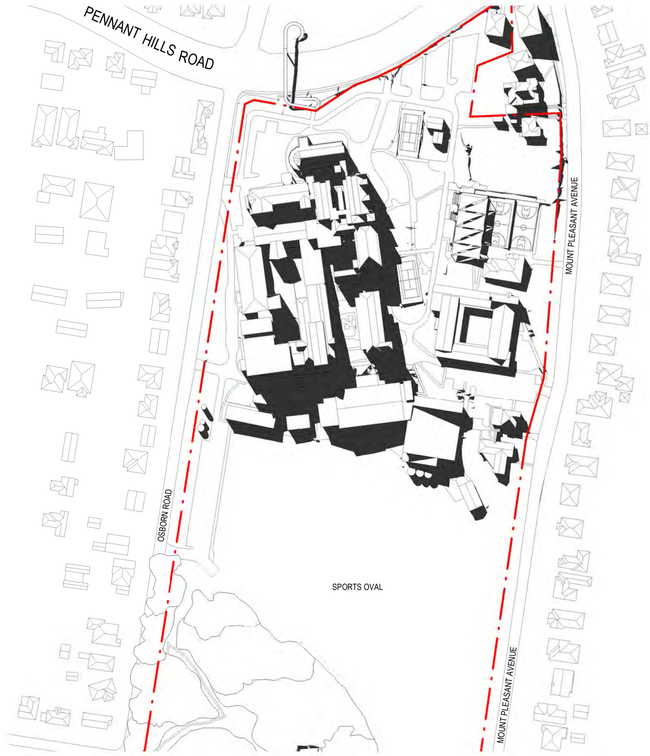
6 EXISTING SHADOW DIAGRAMS - 12pm WINTER SOLSTICE
1 : 2000

4 EXISTING SHADOW DIAGRAMS - 1pm WINTER SOLSTICE
1 : 2000



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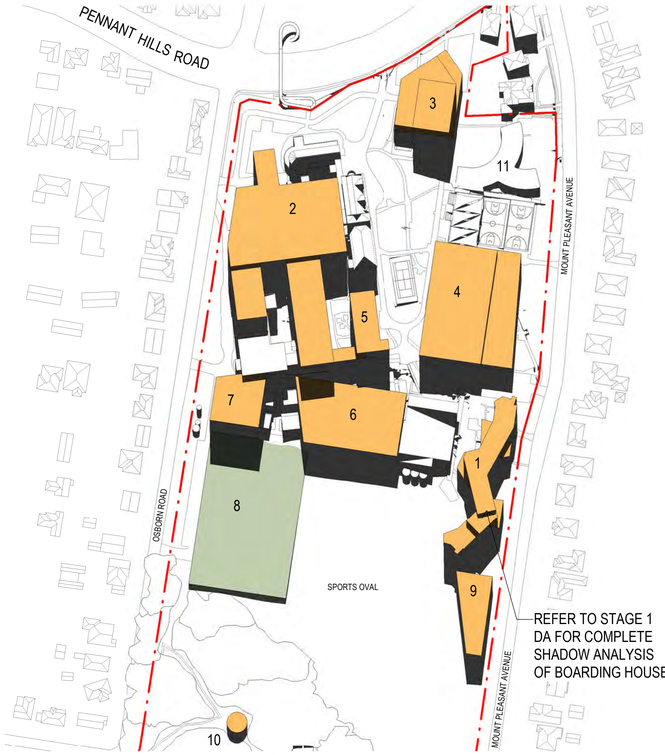

5 PROPOSED SHADOW DIAGRAMS - 12pm WINTER SOLSTICE
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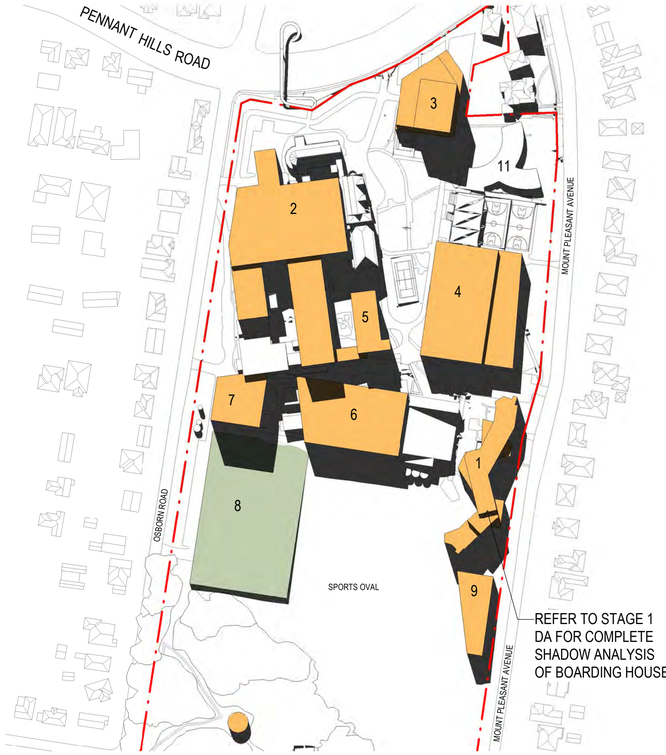

3 PROPOSED SHADOW DIAGRAMS - 1pm WINTER SOLSTICE
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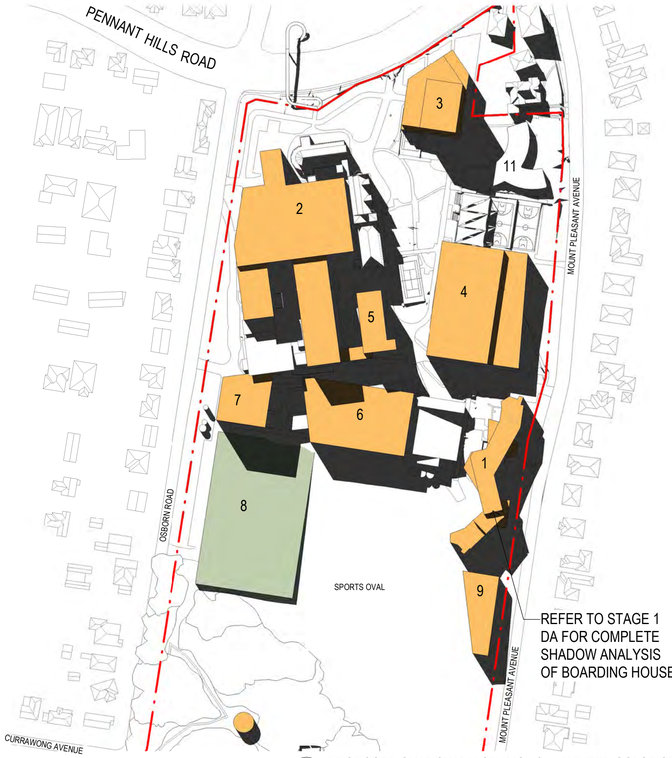

1 PROPOSED SHADOW DIAGRAMS - 2pm WINTER SOLSTICE
1 : 2000

NOTE: MAXIMUM OVERSHADOWING CAST BY PROPOSED DEVELOPMENT ENVELOPES

Revisions

No.	Date	Description	Ver	App'd
1	18.12.2018	CONCEPT PROPOSAL		
2	10.01.2019	CONCEPT PROPOSAL - SUBMISSION		

Key

N

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Project
LORETO NORMANHURST
CONCEPT PROPOSAL
91-93 PENNANT HILLS ROAD
NORMANHURST, NSW 2076
Proj. No. 18008

Drawing Title
SHADOW DIAGRAMS - WINTER SOLSTICE 12pm - 2pm
Sheet Status
NOT FOR CONSTRUCTION

Scale
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Drawing No.
A0013
Issue
2

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PLOT DATE & TIME: 10/01/2019 4:06:06 PM
PLOTTED & CHECKED BY: Author
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4 EXISTING SHADOW DIAGRAMS - 3pm WINTER SOLSTICE
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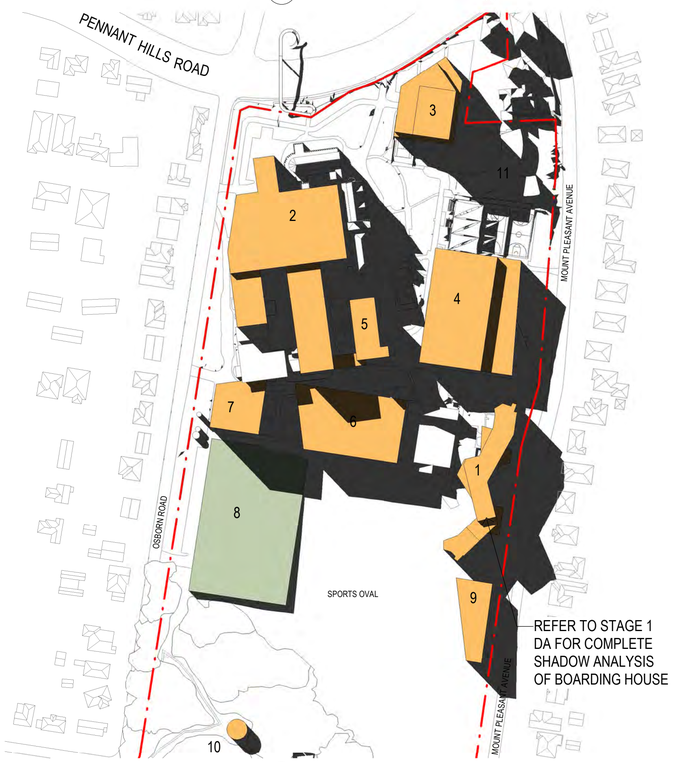

2 PROPOSED SHADOW DIAGRAMS - 3pm WINTER SOLSTICE
1 : 2000

NOTE: MAXIMUM OVERSHADOWING CAST BY PROPOSED DEVELOPMENT ENVELOPES

Revisions				
No.	Date	Description	Ver	App'd
1	18.12.2018	CONCEPT PROPOSAL		
2	10.01.2019	CONCEPT PROPOSAL - SUBMISSION		

Key

N

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Project
LORETO NORMANHURST
CONCEPT PROPOSAL
91-93 PENNANT HILLS ROAD
NORMANHURST, NSW 2076
Proj. No. 18008

Drawing Title
SHADOW DIAGRAMS - WINTER SOLSTICE 3pm

Sheet Status
NOT FOR CONSTRUCTION

Scale: 1:2000 @ A1
Drawing No.: A0014
Issue: 2

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PLOT DATE & TIME: 10/01/2019 4:06:09 PM
PLOTTED & CHECKED BY: Author
REF: C:\Users\shuntable\Documents\18008_MasterPlan_shuntable.rvt

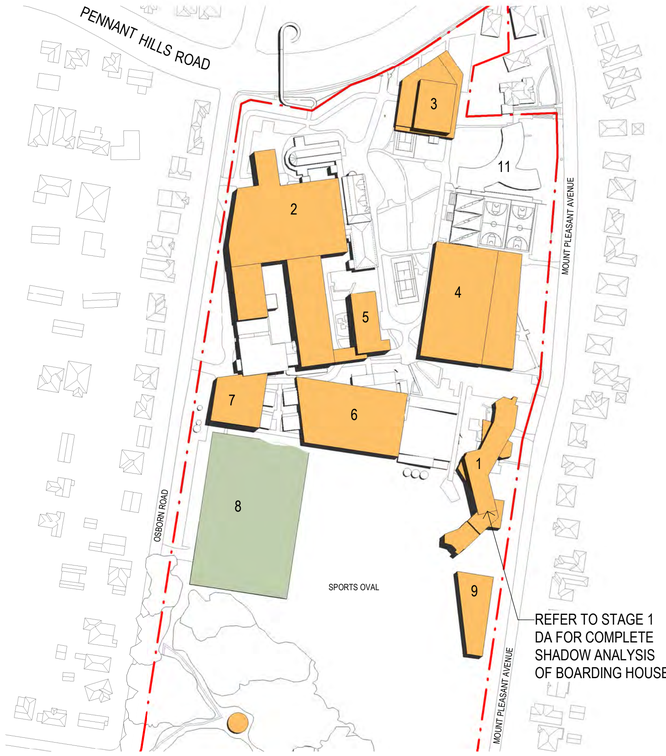
6 EXISTING SHADOW DIAGRAMS - 9am SUMMER SOLSTICE
1 : 2000

4 EXISTING SHADOW DIAGRAMS - 10am SUMMER SOLSTICE
1 : 2000

2 EXISTING SHADOW DIAGRAMS - 11am SUMMER SOLSTICE
1 : 2000

5 PROPOSED SHADOW DIAGRAMS - 9am SUMMER SOLSTICE
1 : 2000

3 PROPOSED SHADOW DIAGRAMS - 10am SUMMER SOLSTICE
1 : 2000



1 PROPOSED SHADOW DIAGRAMS - 11am SUMMER SOLSTICE
1 : 2000

NOTE: MAXIMUM OVERSHADOWING CAST BY PROPOSED DEVELOPMENT ENVELOPES

Revisions

No.	Date	Description	Ver	App'd
1	10.12.2018	ISSUED FOR COORDINATION		
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Key

N

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Project
LORETO NORMANHURST
CONCEPT PROPOSAL
91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076
Proj. No. 18008

Drawing Title
SHADOW DIAGRAMS - SUMMER SOLSTICE 9am - 11am
Sheet Status
NOT FOR CONSTRUCTION

Scale
1:2000 @ A1
Drawing No.
A0015
Issue
3

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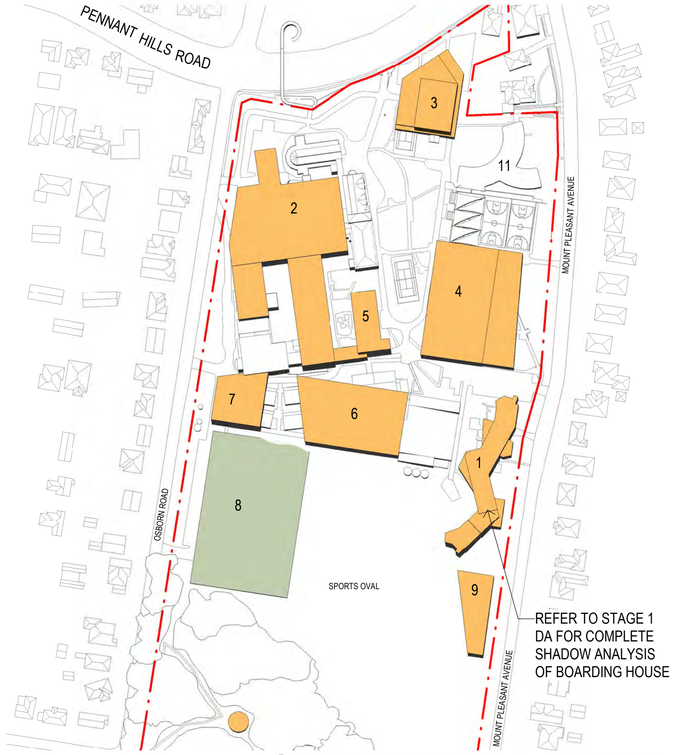
REF: C:\Users\ahuddale\Documents\18008_MasterPlan_ahuddale.rvt
PLOTTED & CHECKED BY: Author
PLOT DATE & TIME: 10/01/2019 4:08:17 PM

4 EXISTING SHADOW DIAGRAMS - 12pm SUMMER SOLSTICE
1 : 2000

5 EXISTING SHADOW DIAGRAMS - 1pm SUMMER SOLSTICE
1 : 2000

6 EXISTING SHADOW DIAGRAMS - 2pm SUMMER SOLSTICE
1 : 2000



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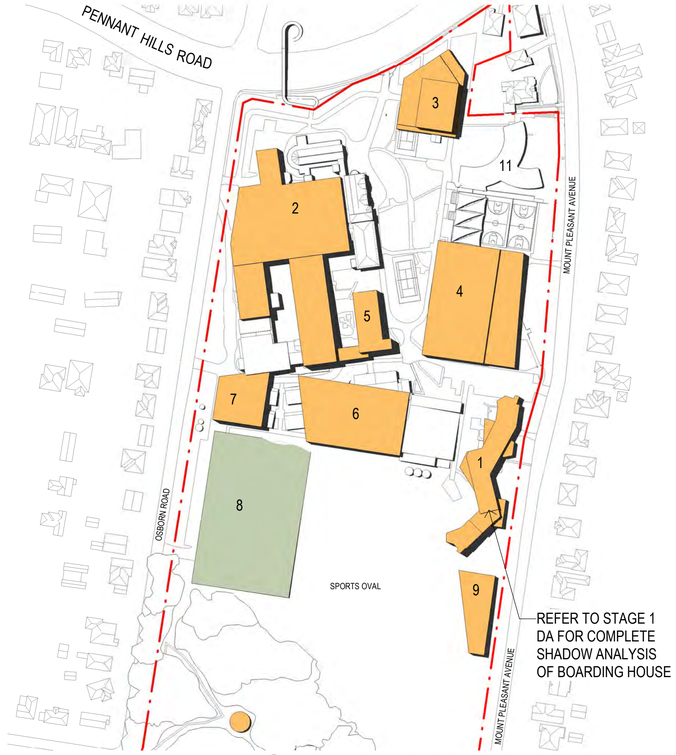

2 PROPOSED SHADOW DIAGRAMS - 1pm SUMMER SOLSTICE
1 : 2000

1 PROPOSED SHADOW DIAGRAMS - 2pm SUMMER SOLSTICE
1 : 2000

NOTE: MAXIMUM OVERSHADOWING CAST BY PROPOSED DEVELOPMENT ENVELOPES

Revisions

No.	Date	Description	Ver	App'd
1	18.12.2018	CONCEPT PROPOSAL		
2	10.01.2019	CONCEPT PROPOSAL - SUBMISSION		

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CONCEPT PROPOSAL
91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076
Proj. No. 18008

Drawing Title
SHADOW DIAGRAMS - SUMMER SOLSTICE 12pm - 2pm
Sheet Status
NOT FOR CONSTRUCTION

Scale
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Drawing No.
A0016
Issue
2

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REF: C:\Users\ahuddale\Documents\18008_MasterPlan_ahuddale.rvt
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PLOT DATE & TIME: 10/01/2019 4:08:25 PM

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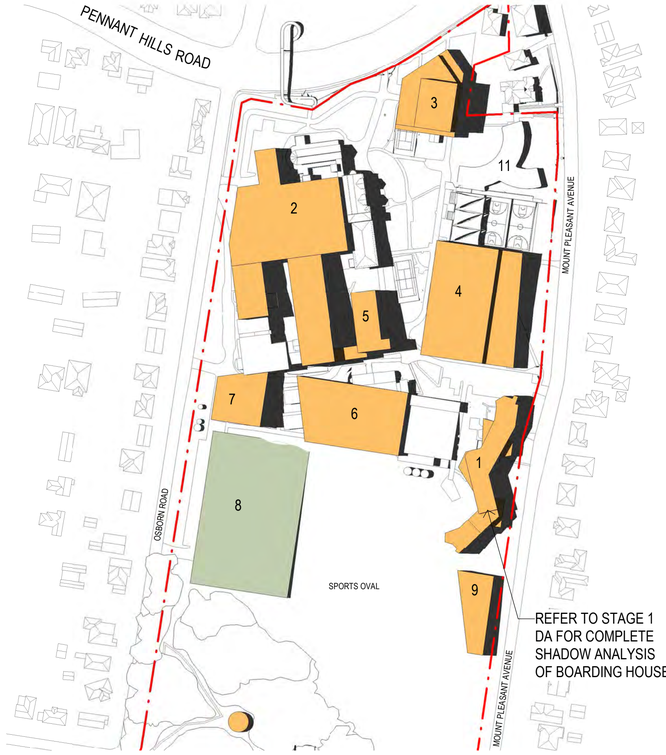

1 PROPOSED SHADOW DIAGRAMS - 3pm SUMMER SOLSTICE
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NOTE: MAXIMUM OVERSHADOWING CAST BY PROPOSED DEVELOPMENT ENVELOPES

Revisions

No.	Date	Description	Ver	App'd
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NORMANHURST. NSW 2076
Proj. No. 18008

Drawing Title
SHADOW DIAGRAMS - SUMMER SOLSTICE 3pm
Sheet Status
NOT FOR CONSTRUCTION

Scale
1:2000 @ A1
Drawing No.
A0017
Issue
2
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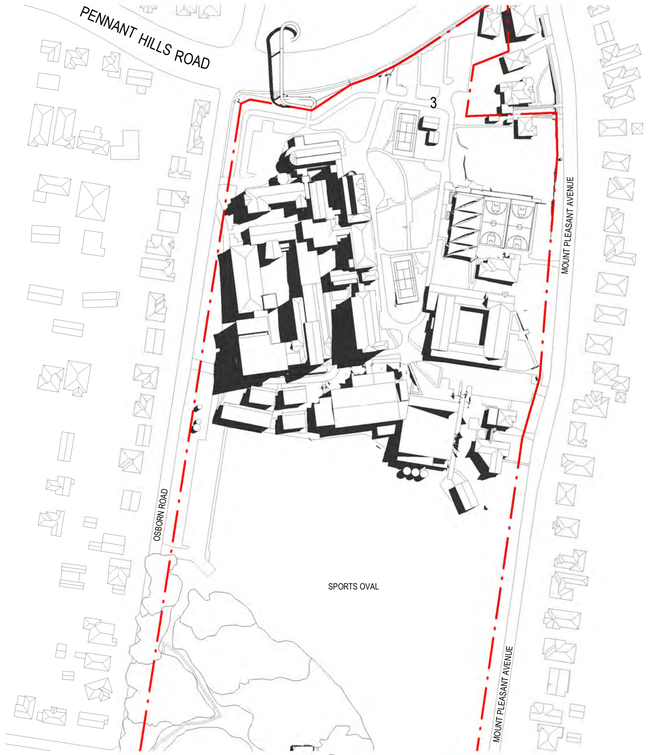
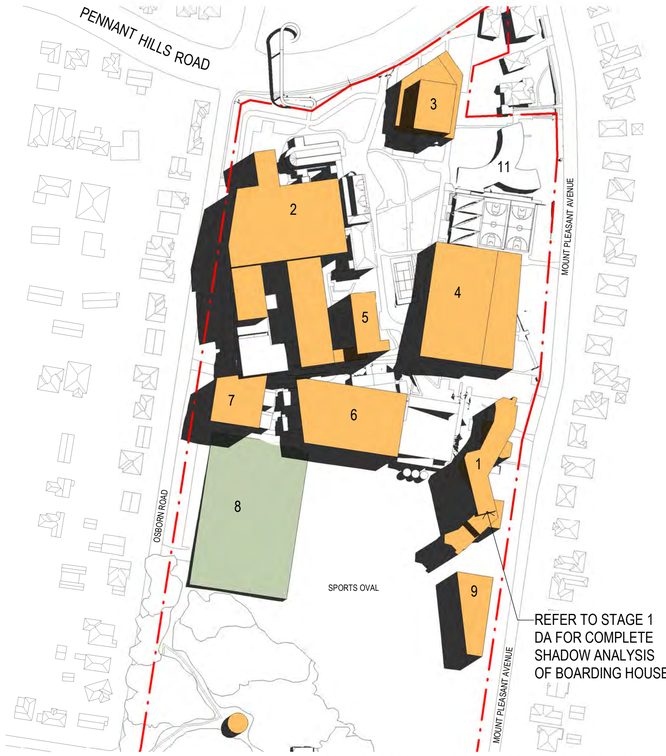
PLOTTED & CHECKED BY: Author
PLOT DATE & TIME: 10/01/2019 4:06:28 PM



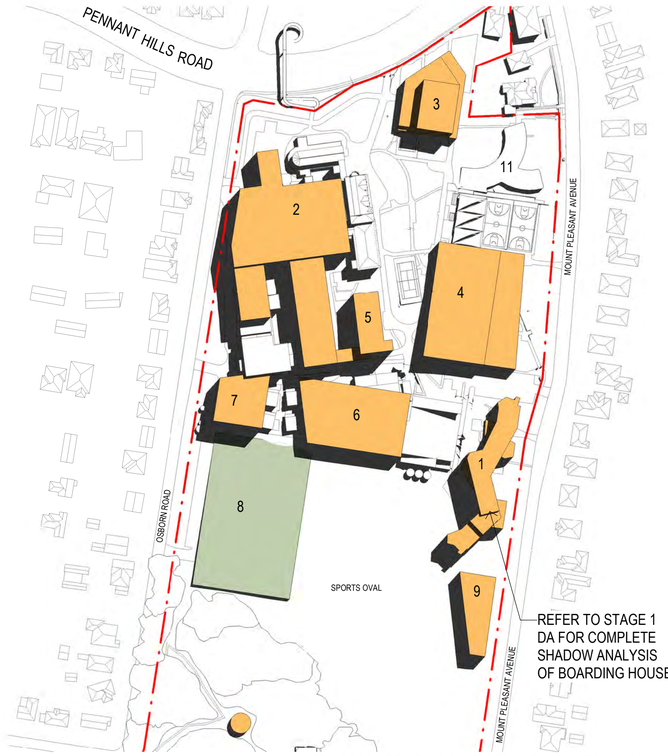
6 EXISTING SHADOW DIAGRAMS - 9am EQUINOX
1 : 2000

4 EXISTING SHADOW DIAGRAMS - 10am EQUINOX
1 : 2000

2 EXISTING SHADOW DIAGRAMS - 11am EQUINOX
1 : 2000



5 PROPOSED SHADOW DIAGRAMS - 9am EQUINOX
1 : 2000



3 PROPOSED SHADOW DIAGRAMS - 10am EQUINOX
1 : 2000

1 PROPOSED SHADOW DIAGRAMS - 11am EQUINOX
1 : 2000

NOTE: MAXIMUM OVERSHADOWING CAST BY PROPOSED DEVELOPMENT ENVELOPES

Revisions

No.	Date	Description	Ver	App'd
1	10.12.2018	ISSUED FOR COORDINATION		
2	18.12.2018	CONCEPT PROPOSAL		
3	10.01.2019	CONCEPT PROPOSAL - SUBMISSION		

Key

N

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Project
LORETO NORMANHURST
CONCEPT PROPOSAL
91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076
Proj. No. 18008

Drawing Title
SHADOW DIAGRAMS - EQUINOX 9am - 11am

Sheet Status
NOT FOR CONSTRUCTION

Scale
1:2000 @ A1

Drawing No.
A0018

Issue
3

0 20 40 80 160 m

REF: C:\Users\ahuda\Documents\18008_MasterPlan_ahuda\ble.rvt
PLOTTED & CHECKED BY: Author
PLOT DATE & TIME: 10/01/2019 4:06:35 PM

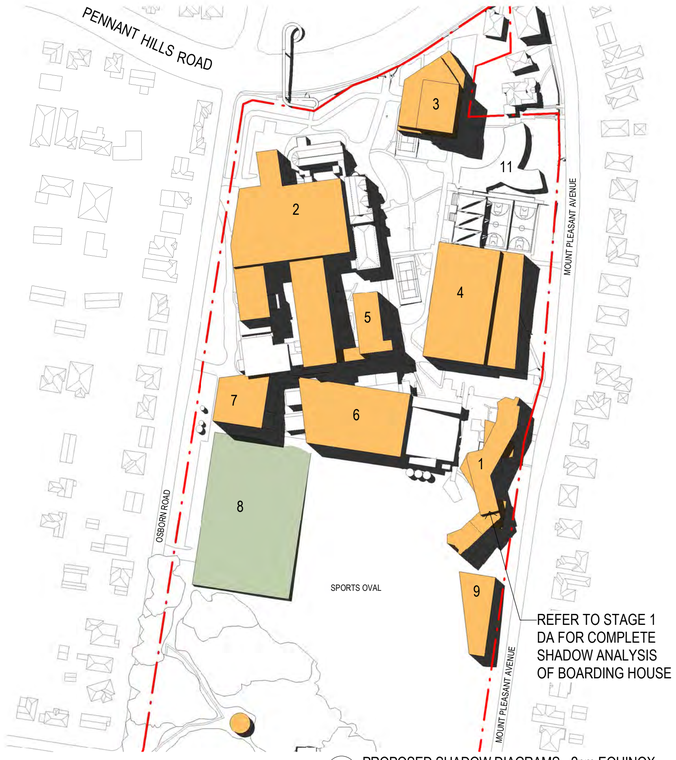
6 EXISTING SHADOW DIAGRAMS - 12pm EQUINOX
1 : 2000

4 EXISTING SHADOW DIAGRAMS - 1pm EQUINOX
1 : 2000

2 EXISTING SHADOW DIAGRAMS - 2pm EQUINOX
1 : 2000

5 PROPOSED SHADOW DIAGRAMS - 12pm EQUINOX
1 : 2000

3 PROPOSED SHADOW DIAGRAMS - 1pm EQUINOX
1 : 2000



1 PROPOSED SHADOW DIAGRAMS - 2pm EQUINOX
1 : 2000

NOTE: MAXIMUM OVERSHADOWING CAST BY PROPOSED DEVELOPMENT ENVELOPES

Revisions

No.	Date	Description	Ver	App'd
1	18.12.2018	CONCEPT PROPOSAL		
2	10.01.2019	CONCEPT PROPOSAL - SUBMISSION		

Key

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91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076
Proj. No. 18008

Drawing Title
SHADOW DIAGRAMS - EQUINOX 12pm - 2pm

Sheet Status
NOT FOR CONSTRUCTION

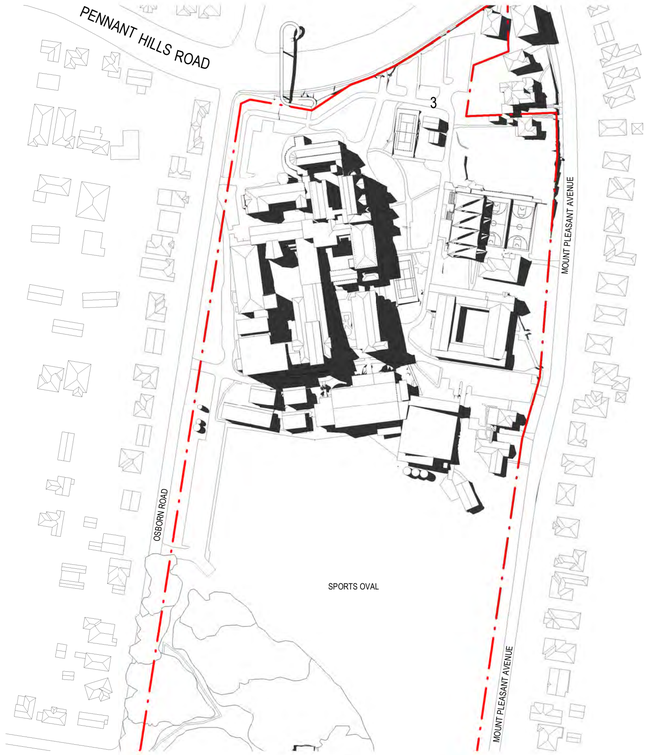
Scale
1:2000 @ A1

Drawing No.
A0019

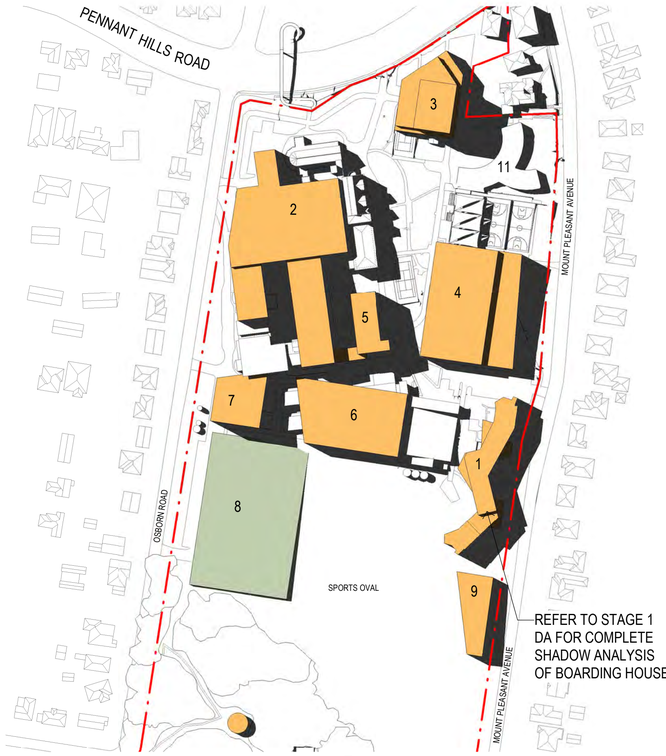
Issue
2

0 20 40 80 160 m

PLOT DATE & TIME: 10/01/2019 4:06:43 PM
PLOTTED & CHECKED BY: Author
REF: C:\Users\ahuxtable\Documents\18008_MasterPlan_ahuxtable.rvt



2 EXISTING SHADOW DIAGRAMS - 3pm EQUINOX
1 : 2000



1 PROPOSED SHADOW DIAGRAMS - 3pm EQUINOX
1 : 2000

NOTE: MAXIMUM OVERSHADOWING CAST BY PROPOSED DEVELOPMENT ENVELOPES

Revisions

No.	Date	Description	Ver	App'd
1	18.12.2018	CONCEPT PROPOSAL		
2	10.01.2019	CONCEPT PROPOSAL - SUBMISSION		

Key

N

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Project
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91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076
Proj. No. 18008

Drawing Title
SHADOW DIAGRAMS - EQUINOX 3pm

Sheet Status
NOT FOR CONSTRUCTION

Scale
1:2000 @ A1

Drawing No.
A0020

Issue
2

0 20 40 80 160 m

PLOT DATE & TIME: 10/01/2019 4:09:46 PM
PLOTTED & CHECKED BY: Author
REF: C:\Users\ahuda\Documents\18008_MasterPlan_ahuda\da.rvt

EXISTING VIEW FROM 96 PENNANT HILLS ROAD LOOKING TOWARDS
LORETO NORMANHURST CAMPUS

EXISTING VIEW FROM 83 PENNANT HILLS ROAD
LOOKING TOWARDS LORETO NORMANHURST CAMPUS

EXISTING VIEW TOWARDS No. 4 MOUNT PLEASANT AVENUE

PROPOSED VIEW FROM 96 PENNANT HILLS ROAD LOOKING TOWARDS LORETO
NORMANHURST CAMPUS WITH ENVELOPE 3 SHOWN BEYOND TREES

PROPOSED VIEW FROM 82 PENNANT HILLS ROAD
LOOKING TOWARDS LORETO NORMANHURST
CAMPUS WITH ENVELOPE 3 SHOWN BEYOND TREES

PROPOSED VIEW TOWARDS No. 4 MOUNT PLEASANT AVENUE WITH
ENVELOPE 3 SHOWN BEYOND

Revisions

No.	Date	Description	Ver	App'd
1	10.01.2019	CONCEPT PROPOSAL - SUBMISSION		

Key

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91-93 PENNANT HILLS ROAD
NORMANHURST. NSW 2076
Proj. No. 18008

Drawing Title
VIEW IMPACT ANALYSIS
Sheet Status
NOT FOR CONSTRUCTION

Scale
NTS

Drawing No.
A0021

Issue
1

PLOT DATE & TIME: 10/01/2019 4:08:47 PM
PLOTTED & CHECKED BY: Author
REF: C:\Users\ahuxtable\Documents\18008_MasterPlan_ahuxtable.rvt

Appendix B: EIS 2018 Sample Location Plan

LEGEND

- APPROXIMATE SITE BOUNDARY
- BH (Fill Depth) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- APPROXIMATE OUTLINE OF PROPOSED BUILDING

0 20 40 60 80 100
SCALE 1:2000 @A3 METRES

This plan should be read in conjunction with the EIS report.

Title: **SAMPLE LOCATION PLAN**

Location: LORETO NORMANHURST, 91-93 PENNANT HILLS ROAD NORMANHURST, NSW

Report No: E31772KL

Figure No: 2

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

PLOT DATE: 7/02/2019 11:36:37 AM DWG FILE: S:\5 EIS\5C EIS JOBS\31000'S\E31772KL NORMANHURST\CAD\E31772KL2.DWG