



FOUNDATION
EARTH
SCIENCES

REMEDIATION ACTION PLAN

Property Address

29-31 and 41-45 Victoria Street, 27 Adelaide Street, 16 & 20
Brougham Street, East Gosford NSW

Prepared for

Bonython Elanora Pty Ltd

Date



July 2023

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ABBREVIATIONS

AIP	<i>Australian Institute of Petroleum Ltd</i>	QA/QC	<i>Quality Assurance, Quality Control</i>
ANZECC	<i>Australian and New Zealand Environment and Conservation Council</i>	RAC	<i>Remediation Acceptance Criteria</i>
AST	<i>Aboveground Storage Tank</i>	RAP	<i>Remediation Action Plan</i>
BGL	<i>Below Ground Level</i>	RPD	<i>Relative Percentage Difference</i>
BTEX	<i>Benzene, Toluene, Ethyl benzene and Xylene</i>	SAC	<i>Site Assessment Criteria</i>
COC	<i>Chain of Custody</i>	SVC	<i>Site Validation Criteria</i>
DA	<i>Development Approval</i>	SWL	<i>Standing Water Level</i>
DP	<i>Deposited Plan</i>	TCLP	<i>Toxicity Characteristics Leaching Procedure</i>
DQOs	<i>Data Quality Objectives</i>	TPH	<i>Total Petroleum Hydrocarbons</i>
EPA	<i>Environment Protection Authority</i>	UCL	<i>Upper Confidence Limit</i>
ESA	<i>Environmental Site Assessment</i>	UST	<i>Underground Storage Tank</i>
HIL	<i>Health-Based Soil Investigation Level</i>	VHC	<i>Volatile Halogenated Compounds</i>
LGA	<i>Local Government Area</i>	VOC	<i>Volatile Organic Compounds</i>
NEHF	<i>National Environmental Health Forum</i>	DPI	<i>Department of Primary Industries</i>
NEPC	<i>National Environmental Protection Council</i>		
NHMRC	<i>National Health and Medical Research Council</i>		
OCP	<i>Organochlorine Pesticides</i>		
OPP	<i>Organophosphate Pesticides</i>		
PAH	<i>Polycyclic Aromatic Hydrocarbon</i>		
PCB	<i>Polychlorinated Biphenyl</i>		
PID	<i>Photo Ionisation Detector</i>		
PQL	<i>Practical Quantitation Limit</i>		



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EXECUTIVE SUMMARY

Foundation Earth Sciences (FES) was appointed by Bonython Elanora Pty Ltd to prepare a Remediation Action Plan (RAP) for the property located at 29-31 and 41-45 Victoria St, 27 Adelaide St, 16 & 20 Brougham St, East Gosford NSW ("the site").

The adopted remedial strategy is the removal of contaminated material to a licensed landfill. The remediation of the site is to take place in the following stages:

- Stage One -Site Preparation;
- Stage Two – Site Walkover;
- Stage Three –Building footprint sampling;
- Stage Four (a)– Classification, removal, and validation of impacted areas;
- Stage Four (b) – Asbestos Clearance;
- Stage Five – Validation of final surface level across the site; and
- Stage Six – Validation Report Preparation.

Therefore, it is considered that the site will be ***suitable*** for the proposed development, subject to the implementation of the remediation and validation works in accordance with this RAP.



1.0 INTRODUCTION

Foundation Earth Sciences (FES) was appointed by Bonython Elanora Pty Ltd to prepare a Remediation Action Plan (RAP) for the property located at 29-31 and 41-45 Victoria St, 27 Adelaide St, 16 & 20 Brougham St, East Gosford NSW (“the site”).

This RAP has been prepared in order to be part of the Development Application (DA) for this site. Work and reporting were conducted in general accordance with the FES proposal, FES environmental protocols and with reference to relevant environmental regulatory criteria including the guidelines issued or endorsed by the NSW EPA.

2.0 OBJECTIVES, SCOPE & DEVIATIONS

2.1 Objectives

The primary objective of this RAP is to inform and guide site remediation and validation through the following:

- Summary of the current contamination status of the site;
- Providing a description of the remediation strategy(s) that will effectively manage the environmental concerns identified, in a manner that protects both human health and the environment;
- Provide a preliminary sampling and analytical quality plan to be used for site validation;
- Comply with DA Conditions for Development;



2.2 Scope

The scope is outlined below:

- Establish remediation goals and criteria
- Evaluation of remedial technologies and selection of appropriate remedial strategy(s)
- Facilitate guidance on approvals, licences, contractor WHS Plan & any other site management plans required for the remedial works.
- Provide an outline of the additional investigations (if required) to be carried out in order to address the recommendations identified in the previous investigation;
- Develop sampling, analysis and quality plan for additional works, remedial works, and proposed validation.
- The area of impact includes surface soils surrounding F1 & F2 and the COPC is Asbestos.
- Ten additional locations are proposed to be completed post demolition targeting the soil beneath the existing building footprints.
- Waste Classification including TCLP (leachates).



2.3 Deviation from this RAP

It is recommended that an experienced and qualified Environmental Engineer / Scientist be appointed to the project to enable:

- Coordination and implementation of the staged approach to the proposed remediation / validation works;
- Any proposed deviations from the works specified in this RAP are documented and approved as required under NSW EPA "*Consultants Reporting on Contaminated Land*" dated 2020.
- The format of this report closely follows that recommended in the NSW EPA "*Consultants Reporting on Contaminated Land*" dated 2020.

Completion of remedial works without adequate supervision from a qualified Environmental Engineer / Scientist could leave to project delays and extra costs due to additional requirements imposed by a third party, to confirm the environmental status of site. Any waste material removed from site without sufficient characterisation and/or waste classification may lead to regulatory actions.



3.0 SITE IDENTIFICATION, SITE HISTORY, ENVIRONMENTAL SETTINGS, AND BACKGROUND INFORMATION

3.1 Site identification and zoning

Table 1: Site Identification

Site Identifier	Site Details	
Site Location	29-31 and 41-45 Victoria St, 27 Adelaide St, 16 & 20 Brougham St, East Gosford NSW	
Lot/DP	Lot 7 in DP658304 Lot 15 in DP1061216 Lot 2, 3 & 4 in DP1016073 Lot 7A in DP365458	
Site Coordinates #	N Corner: Latitude -33.438046, Longitude: 151.355208	
Parish	Gosford	
County	Northumberland	
Site Area #	Approximately 7,686m ²	
Local Government Area (LGA)	Central Coast	
Zoning##	B2 – Local Centre	
Surrounding Land Uses	<i>North</i>	Adelaide St, Commercial then Residential
	<i>South</i>	Residential then Victoria St
	<i>East</i>	Brougham St, then Residential
	<i>West</i>	Adelaide St, then Commercial and Residential



3.2 Site description

The following observations were made during the DSI works:

The site is currently occupied by several commercial entities. Lot 15 in DP1061216 is occupied by the Elanora Hotel, which is a licenced pub, restaurant, drive through bottle shop and large sealed driveway/carparking area. Lots 2, 3 & 4 in DP1016073 are occupied by a Motel, with several guest rooms and a grassed area. Lot 7 in DP658304 is occupied by a commercial dwelling, with several storefronts along Victoria Street and an external hand carwash to the rear of the Lot. Lot 7A in DP365458 is a sealed carparking area.

3.3 Proposed development

The proposed development for the site is that the motel currently on the site will be cleared and expanded along Brougham Street. The proposed development plans indicate that the new Elanora Hotel will run through Lots 3 & 4 in DP 1016073, Lot 15 in DP1061216 and Lot 7A in DP365458. The Hotel will be 3 storeys high, with each level having 15 rooms. The carparking area will be extended between the hotel and the Elanora Hotel pub, and a carparking area will be located underneath and extended outdoor eating eat. The current hand carwash dwelling will be removed to allow for more carparking spaces, which will be landscaped. The commercial dwelling along Victoria Street in Lot 7 in DP658304 will be refurbished into a bottle shop.

Refer to **Appendix B** - Proposed Development Plans.



3.4 Site Conditions and Surrounding Environmental

Table 2: Environmental Settings

Site Information	Descriptions
Sensitive Receivers	The nearest sensitive human receptors are the current and future users of the site, construction workers during the site redevelopment and the general public. The nearest downgradient watercourse is Erina Creek located approximate 380m to the east of the site.
Soil Landscape <i>Review of NSW Soil and Land Information website ESPADE.</i>	The Soil Landscape Map viewed on NSW ESPADE indicates that the site is Erina area. The soil is undulating to rolling rises and low hills on the Terrigal Formation. Local relief <60m; slope gradients <25%. Rounded narrow crests with moderately inclined slopes. Extensively cleared tall open-forest with open-heathland in exposed coastal areas.
Topography <i>Review of NSW Soil and Land Information website ESPADE.</i>	Undulating to rolling rises and low hills with local relief <60m and slopes <25%. Ridges and crests are moderately broad (100-300m) and valleys moderately narrow (300-800m). Slopes are gently to moderately inclined. Rock outcrop is rarely present. This landscape also occurs as footsteps and gently inclined crests and ridges closely associated with the steep hills of the Watagan (wn) soil landscape. Based on the site inspection, it was determined that the site was slightly sloping to the North East at approximately 2-4°
Geological Profile	The 1:100,000 Geological Map of Gosford – Lake Macquarie, published by NSW Government in 1998, indicates that the site is underlain by Lithic-quartz to quartz sandstone, siltstone, minor sedimentary breccia, claystone, and conglomerate
Presence of Acid Sulphate Soils <i>Review of NSW Department of Land & Water Conservation (DLWC) Acid Sulphate Soil Risk Maps (Edition Two, December 1997, Scale 1:250,000.</i>	A review of the “Gosford” map indicated that the site is in “No Known Occurrence” area of acid sulphate soil material within the soil profile. However, the site is located close to a “High Probability” area. The Central Coast Council Online Mapping website (“Environmental Layers,” Online Mapping (nsw.gov.au)) indicated the site was in an area with low to no



Site Information	Descriptions					
	known occurrences of Acid Sulphate Soils. However, the map demonstrated the site is near an area of “Disturbed Terrain” and “High probability of occurrence.”					
Localised Hydrogeology Review of DPI (Office of Water) Database.	Number	Location from Site	Depth	SWL	Use	Water Bearing Zones
	GW201096	161m NW	9.00	2.75	Monitoring Bore	Unknown
	GW201094	160m NW	7.50	1.80	Monitoring Bore	Unknown
	GW202606	170m NW	8.20	3.50	Monitoring Bore	-
	GW201095	170m NW	9.00	2.70	Monitoring Bore	Unknown
	GW202607	170m NW	8.20	3.50	Monitoring Bore	-
	GW202605	180m NW	7.00	3.50	Monitoring Bore	-
	GW201093	180m NW	6.00	2.40	Monitoring Bore	Unknown
	GW201099	180m NW	7.50	2.20	Monitoring Bore	Unknown
	GW201098	217m NW	6.00	2.30	Monitoring Bore	-
	GW201097	240m NW	6.00	2.20	Monitoring Bore	Unknown
	GW202600	249m NW	4.00	-	Monitoring Bore	Unknown
	GW202601	238m NW	4.00	-	Monitoring Bore	Unknown
	GW202602	255m NW	4.00	-	Monitoring Bore	Unknown



Site Information	Descriptions					
					Bore	
	GW202603	295m NW	4.00	-	Monitoring Bore	Unknown
	GW202604	327m NW	4.00	-	Monitoring Bore	Unknown
Nearest Surface Water Body	The nearest downgradient watercourse is Erina Creek located approximate 380m to the east of the site.					
Nearest Active Service Station & Dry Cleaner	Service station is 1.9km to the east of the site. Dry Cleaners is 200m to the north-west of the site.					
Local Meteorology (Bureau of Meteorology BOM website)	The monthly rainfall of the local surrounding area is represented by the data collected from the BOM rainfall gauge located in Gosford (AWS NSW), which is located approximately 1.2km from Site. The records indicate that the monthly rainfall for the month of April (date of fieldwork) was 225.2mm in 2022.					

3.5 Previous environmental investigations

Four (4) previous environmental investigations are listed below and summarised in the following section:

- JM Environments (2020), Preliminary Contamination Assessment for JME2040-1 – 29-31 and 41-45 Victoria Street, 27 Adelaide Street and 16 and 20 Brougham Street, East Gosford, dated 10 July 2020.
- Foundation Earth Sciences 2023, 'Detailed Site Investigation', 29-31 and 41-45 Victoria Street, 27 Adelaide Street, 16 & 20 Brougham Street, East Gosford NSW, Ref E3019, dated May 2023
- Foundation Earth Sciences 2023, 'Acid Sulphate Soil Assessment', 29-31 and 41-45 Victoria Street, 27 Adelaide Street, 16 & 20 Brougham Street, East Gosford NSW, Ref E3019-2, dated May 2023.



- Foundation Earth Sciences 2023, 'Additional Hazardous Ground Gas Monitoring', 29-31 and 41-45 Victoria Street, 27 Adelaide Street, 16 & 20 Brougham Street, East Gosford NSW, Ref E3019-3, dated July 2023.

3.5.1 JM Environments Preliminary Contamination Assessment 2020

This report presents the findings of a Preliminary Contamination Assessment of 29-31 and 41-45 Victoria Street, 27 Adelaide Street and, 16 and 20 Brougham Street, East Gosford NSW undertaken by JM Environments. The report was commissioned by Michal Leavy Consulting on behalf of Bonython Elanora Pty Ltd.

Bonython Elanora Pty Ltd are planning to redevelop the site for commercial and residential land use. The purpose of this assessment is to provide a support for the development application for the redevelopment.

Based on information gained from the desktop study and field observations, JME considers that the site is potentially contaminated by its previous and current land use. It is important to note that the risk to health and the local environment is considered low but further assessment is required to suitably quantify the risk.

At this stage, the contamination status of the site is not known. JME recommends the preparation and implementation of a Sampling and Analysis Quality Plans as part of a Detailed Site Contamination Assessment to assess the extent of soil, soil vapour and groundwater contamination present on the site.



3.5.2 FES DSI 2022

Foundation Earth Sciences was appointed by Bonython Elanora Pty Ltd to undertake a Detailed Site Investigation for the property situated 29-31 and 41-45 Victoria St, 27 Adelaide St, 16 & 20 Brougham St, East Gosford NSW ("the site").

The site is currently occupied by several commercial entities. Lot 15 in DP1061216 is occupied by the Elanora Hotel, which is a licenced pub, restaurant, drive through bottle shop and large sealed driveway/carparking area. Lots 2, 3 & 4 in DP1016073 are occupied by a Motel, with several guest rooms and a grassed area. Lot 7 in DP658304 is occupied by a commercial dwelling, with several storefronts along Victoria Street and an external hand carwash to the rear of the Lot. Lot 7A in DP365458 is a sealed carparking area.

Soils sampled across the Site were assessed against the Site Acceptance Criteria (SAC) provided by the National Environment Protection (Assessment of Site Contamination) Measure (NEPM 2013) Table 1A – Commercial and Industrial D.

The soil data revealed the following:

- Asbestos was detected in the surface sample fragments denoted as F1 & F2. Further remediation works are required at this location.

The following lines of evidence support the low-risk groundwater conclusions in relation to site suitability:

- The elevated heavy metals of nickel and zinc are related to offsite regional contaminant concentrations and/or background levels & therefore of limited concern in relation to the GILs;



- Surface soil materials did not indicate a significant presence of the elevated groundwater analytes and therefore unlikely to be a source of the metal exceedances.
- The site is not located in a catchment with contains the water quality objectives of drinking water (i.e. beneficial use) and therefore drinking water guidelines were not applied; and
- The groundwater analysis indicated PFAS and ammonia were below the adopted guidelines.

Hazardous ground gas spot monitoring was undertaken in April to May 2023 and the data collected from the seven rounds indicates the following;

- The maximum concentration of methane recorded was 2.3% v/v from BH1 /GW1 during round six on 10th May, 2023 & round seven on the 12th May, 2023;
- The maximum concentration of carbon dioxide was recorded at 11.3% v/v from BH1 /GW1 during round five on 3RD May, 2023;
- The minimum concentration of oxygen recorded was 0% from BH1 /GW1 during round six on 10th May, 2023 & round seven on the 12th May, 2023;
- Carbon monoxide was detected at maximum concentration of 431ppm in BH3/GW3 during round one on the 19th April 2023;
- The maximum PID reading was recorded at 10.8ppm in BH3/GW3 in round one dated 19th April 2023;
- The maximum (LEL%) reading was recorded at 28% during round seven in BH1 / GW1 dated 12th May 2023.

Based on the historical review, environmental information, proposed development and laboratory results of the investigation, the site can be made **suitable** for the proposed development, subject to the following:



- It is considered that the site would be deemed suitable for the proposed development subject to the implementation of a Remediation Action Plan (RAP) to manage the abovementioned environmental concerns and data gaps.
- Completion of a longer-term ground gas monitoring program including continuous landfill gas monitoring and additional landfill gas monitoring wells to provide a more detailed assessment of the risk posed to the proposed development.
- Any soil requiring removal from the site, as part of future site works, should be classified in accordance with the “Waste Classification Guidelines, Part 1: Classifying Waste” NSW EPA (2014).

3.5.3 FES ASSA 2023

Foundation Earth Sciences (FES) was appointed by Bonython Elanora Pty Ltd to prepare an Acid Sulphate Soil Assessment (ASSA) for the property located at 29-31 and 41-45 Victoria Street, 27 Adelaide Street, 16 & 20 Brougham Street, East Gosford NSW (“the site”). The site is in the City of Gosford area.

The site is rectangular in shape and is currently occupied by several commercial entities. Lot 15 in DP1061216 is occupied by the Elanora Hotel, which is a licenced pub, restaurant, drive through bottle shop and large sealed driveway/carparking area. Lots 2, 3 & 4 in DP1016073 are occupied by a Motel, with several guest rooms and a grassed area. Lot 7 in DP658304 is occupied by a commercial dwelling, with several storefronts along Victoria Street and an external hand carwash to the rear of the Lot. Lot 7A in DP365458 is a sealed carparking area.



An ASSA assessment is required as disturbances to Potential Acid Sulphate Soil (PASS) or Actual Acid Sulphate Soils, which may occur during construction and excavation works, can result in the formation of acid. The acid, once formed, could then damage infrastructure or harm ecological systems. The results of the field parameters from this assessment should only be used as a preliminary study to determine if further investigations are required. If results exceed the criteria, then further work, including an ASS Management Plan, may be required.

A soil sampling and analysis program was used to consolidate the nature and degree of Acid Sulphate Soils present in the surface and subsurface geology. Samples were collected from four (4) boreholes within the site. Field analysis was performed on the collected samples for pH_f and pH_{fox} in accordance with the required sampling techniques outlined in the Acid Sulphate Soil Manual (ASSMAC 1998). This includes the Field pH and peroxide test protocol. Following the field tests undertaken by FES (administered SGS Australia), five (5) soil samples from FES (collected from 13th April 2023) were submitted to the NATA certified laboratory of SGS Australia for the SPOCAS test.

The assessment of acid sulphate material can be quite complex and can have a lot of interferences associated with the test methods and soil matrix. The following points outline the evidence to support the site is **NOT** impacted to the maximum depth of sampling:

- Analysis using the pH_f showed the soil indicators to be absence for AASS;
- Analysis using the pH_{fox} field test protocol showed the soil indicators to be unlikely for AASS / PASS due to slight reaction rate in majority of field samples;
- Analysis via the SPOCAS test indicated the percentage of oxidisable Sulphur (SPOS) were below the relevant action criteria in all samples.



- Analysis using the Chromium reducible suite indicated that no inorganic sulphur sources were present above the relevant action criteria.
- FES has concluded the existing acid trail may have been consistent with organic occurring materials within the natural clays.
- The site is located at an elevation of approximately 11-14m AHD according to google earth. Acid Sulphate Soils occur in soil horizons less than 5m AHD.

Therefore, it has been determined that the site is **NOT impacted by Acid Sulphate Soils** within the borehole locations **ASSA1 to ASSA4** to a maximum depth of analysis. Therefore, an Acid Sulphate Soil Management plan (ASSMP) is not required for the site as it is not impacted with AASS/PASS to the maximum depth of analysis.

3.5.4 FES Additional Hazardous Ground Gas Monitoring 2023

Foundation Earth Sciences was appointed by Bonython Elanora Pty Ltd to undertake an Additional Hazardous Ground Gas Monitoring for the property situated at 29-31 and 41-45 Victoria Street, 27 Adelaide Street, 16 & 20 Brougham Street, East Gosford NSW.

It is proposed that the motel currently on the site will be cleared and expanded along Brougham Street. The proposed development plans indicate that the new Elanora Hotel will run through Lots 3 & 4 in DP 1016073, Lot 15 in DP1061216 and Lot 7A in DP365458. The Hotel will be 3 storeys high, with each level having 15 rooms. The carparking area will be extended between the hotel and the Elanora Hotel pub, and a carparking area will be located underneath and extended outdoor eating eat. The current hand carwash dwelling will be removed to allow for more carparking spaces, which will be landscaped. The commercial dwelling along Victoria Street in Lot 7 in DP658304 will be refurbished into a bottle shop.



In reference to Figure 6 'Summary of Risk Assessment and Management Process' in the NSW EPA 2019 "Assessment and Management of Hazardous Ground Gases", CS is not greater than 1. The following Wilson and Card method for the characteristic gas situation (CS) has been calculated to be 1 (**very low risk**). As per NSW EPA 2019 "Assessment and Management of Hazardous Ground Gases", **no gas protection measures required.**

Furthermore, the methane concentrations detected on route to the former landfill were either non-detect or very minimal (<0.3ppm) and therefore no pathway linkages were located between the former landfill and current site.

3.6 Site History

The site history as listed in the DSI is outlined below:

- The land titles indicated from 1925 to 1982, the site was owned by as number of private individuals. From 1982 to the present time, the site has been owned by several commercial entities.
- The aerial photographs indicate that the site has been used as a Commercial entity since the mid-1960s. At this point in time, the Elanora Hotel (pub) and associated motel were developed on the site and remained unchanged until 2005, when the pub was redeveloped. A sealed driveway and carparking area were developed in the mid-1970 and appeared to have been redeveloped in the 90s. Sometime prior to 1976, two other commercial dwellings were developed on the site, once used as a hand carwash. The site has remained relatively unchanged to the present time.



- The aerial photographs indicate the surrounding land appeared to be a combination of Commercial, Residential and Vacant land in the 1960s. At this time, two service stations, one to the north-west and the other immediately south of the site, were developed. By the 1970s, more Commercial dwellings to the north and Residential properties to the east had been developed. This trend continued through the 1980s, with a Community Hall also been developed to the east of the site. From the late 1960s to the 1990s, the vacant land to the north of the site was used as a landfill which expanded significantly over this time to the east and south. By the early 1990s, several Residential properties in the surrounding areas appeared to be redeveloped, and a Fire Station was established to the east of the site. In the 2000s, the area previously used for landfill was redeveloped into parklands and recreational spaces, with sporting fields and sealed carparks being added. By 2003, the service station next to the site had been redeveloped into townhouses. By 2005, some properties to the south and east of the site continued to be developed, and a large Commercial building was developed to the west of the site. Sometime between 2013 and the present time, the petrol station to the north-west of the site was also decommissioned and removed. The surrounding areas have remained relatively unchanged to the present time.
- The NSW EPA contaminated land database, List of Notified Sites and PFAS Investigation program indicate the subject site is not listed.
 - The NSW EPA list of notified sites indicates there are three (3) sites within the suburb of East Gosford. Each of these are located within 500m of the subject site, and the contamination type has been classified as either former Landfill or a Service Station. The Hylton Moore Park Site (former landfill) is currently regulated under the CLM Act.



- The NSW EPA contaminated land database indicates a Mobil Service Station was former regulated under CLM.
- A search of the POEO Register revealed the subject site, and other locations in the suburb of East Gosford, were not listed.
- Foundation Earth Sciences has undertaken a SafeWork NSW search for this site. The email received from SafeWork indicated records were held pertaining to the site, however information was provided on the site located 44 Victoria Street, East Gosford which was a former service station as discussed in Section 4.6 and not located on the current site.



4.0 CONCEPTUAL SITE MODEL - CURRENT

4.1 Conceptual Site Model Components

4.1.1 Potential Contaminated Media

Table 3: Potential Contaminated Media

Known and potential contamination source	Associated Contaminants
<i>Fill Material</i>	There is the potential for contamination to be present in the upper fill material.
<i>Groundwater</i>	There is the potential for the leaching of contaminants into groundwater onsite and migration of the contaminants.
<i>Soil Vapour / Bulk Ground Gas</i>	Given the site history and surrounding land uses, soil vapour / ground gas is considered a potential contaminated media.

4.1.2 Area of Concern

Table 4: Area of Concern

Known and potential contamination source	Associated Contaminants
<i>Historical Site Uses & Current Site Uses</i>	Heavy Metals, TRH, BTEX, PAH, OCP, PCB, Asbestos & VOC
<i>Surrounding Land Uses (Commercial & Industrial, Service Station, Former Landfill, Fire Station)</i>	Heavy Metals, TRH, BTEX, PAH, OCP, PCB, Asbestos, PFAS, Ammonia, VOC, Bulk Ground Gas
<i>Imported Fill</i>	Heavy Metals, TRH, BTEX, PAH, OCP, PCB & Asbestos
<i>Car parking Areas</i>	TRH, BTEX, PAH
<i>Building degradation/ Demolition</i>	Heavy Metals, Lead and Asbestos



4.1.3 Chemicals of Concern

Soils

Asbestos fragments were detected on the surface in two locations denoted as F1 & F2 during the FES DSI 2023.

4.1.4 Sources

Soil

The most likely source of the contaminants of concern is the quality of the soil materials impacted from historical and current industrial land use (resource recovery) across the site.

Hazardous Ground Gas

Former Landfill at Hylton Moore Park – Althorp Street East Gosford

The NSW EPA has described the following land known as Hylton Moore Park, Althorp Street, East Gosford as significantly contaminated. The land includes the following lots:

- Lot 1-33 in DP197405, Lots 14-29 in DP24248, Lot 40 in DP519355, Lot 2 in DP247233, Lots 8A & 8B in DP413380, Lot 1 in DP232403 & Lot 1 in DP56797

The NSW EPA believes the land is contaminated with the following:

- Ammonia
- PFAS
- Hazardous Ground Gas



However, FES have investigated the ground gas and confirm the risk to be very low and concluded no gas protection measures required.

4.1.5 Pathways (Transport of COC)

Potential exposure pathways include:

- Dermal;
- Ingestion; and
- Inhalation.

Due to the presence of exposed potentially impacted soil/fill on ground surfaces, dermal and inhalation exposure is considered a potential exposure pathway.

The potential for ingestion of soil is considered as a potential exposure pathway. Although groundwater is not used at the site, there is the potential, for ingestion of contaminants via groundwater removed from monitoring wells.

The proposed development does include the construction of a lower ground floor. Because of this dermal and inhalation exposure pathway by potentially contaminated groundwater is considered a potential.

Based on the soil and groundwater sampling to date there is a low potential for vapour to be present in the underlying profile within the site.



4.1.6 Receptors

Human:

The site groundwater is not currently used for or planned to be used for drinking water as town water is provided by Central Coast Council.

Ecological

The ecological receptors would be surface water and benthic organisms in Erina Creek.

4.1.7 Potential for Migration

Contaminants generally migrate from site via a combination of windblown dusts, rainwater infiltration, groundwater migration and surface water runoff. The potential for contaminants to migrate is a combination of:

- The nature of the contaminants (solid/liquid and mobility characteristics);
- The extent of the contaminants (isolated or widespread);
- The location of the contaminants (surface soils or at depth); and
- The site topography, geology, hydrology, and hydrogeology.

The potential contaminants identified as part of the site history review & site inspection are present in solid (e.g., impacted fill, asbestos), liquid (e.g. dissolved in water) & gaseous forms.

The proposed development once constructed will create minimal unsealed ground surfaces and therefore, there is a low risk for migration of contaminants via wind-blown dust.



Likewise, rainfall infiltration at the site is expected to occur in unsealed areas. There is therefore the potential that soil contamination could result in impacts to groundwater.

The removal of the contaminated soil will reduce the risk for any ongoing / future migration of soil contaminants. Based on the historical uses, previous reports and sampling to date, the site has a low potential for possible migration of contaminants in liquid (on-off site migration).

4.1.8 Preferential Pathways

For the purpose of this assessment, preferential pathways have been identified as natural and/or man-made pathways that result in the preferential migration of COPCs as either liquids or gases.

Man-made preferential pathways are present throughout the site, generally associated with fill materials and services present beneath existing ground surface. Fill materials and service lines are anticipated to have a higher permeability than the underlying natural soil and/or bedrock.

4.1.9 Frequency of Exposure

As the potential for ingestion of soil is considered a potential exposure pathway during site development works as construction workers would be exposed to soil. The frequency of exposure will be occurring from removal of the existing hard standing surfaces until construction of the new surfaces across the proposed development area.



4.1.10 Offsite Contamination

Impacted soil contamination could migrate off site during site development works with surface water run-off.

Former service stations are located north and south of the site and a fire station is also located on the southern boundary of the site. These are known offsite contamination risks. However, soil and groundwater sampling completed during the DSI has indicated limited concerns.

A former landfill site is located approximately 140m north east of the site. This site is currently regulated by NSW EPA.

4.1.11 Data Gap Identification

The following data gaps remain:

- Waste classification to facilitate disposal (noting TCLPs may be required).



5.0 REMEDIATION CRITERIA

5.1 Soil

5.1.1 Health Investigation Levels (HIL)

To assess the contamination status of soils at a site, the NSW EPA refers to the document entitled National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) (Amendment 2013).


During any future soil investigations, the site will be assessed against the NEPM exposure scenario 'Commercial and Industrial D' Health Investigation Levels of the above-mentioned guidelines and specifically refers to the following:

HIL 'D' Commercial / industrial, includes premises such as shops, offices, factories and industrial sites

The soil regulatory guidelines are presented in the table below.



Table 5: Health Investigation Levels (HIL) Criteria for Soil Contaminants

 FOUNDATION EARTH SCIENCES	Commerical/Industrial D	Reference
Heavy Metals		
Arsenic	3000	NEPM 2013 - Table 1(A)1 HILs
Beryllium	500	NEPM 2013 - Table 1(A)1 HILs
Boron	300000	NEPM 2013 - Table 1(A)1 HILs
Cadmium	900	NEPM 2013 - Table 1(A)1 HILs
Chromium (VI)	3600	NEPM 2013 - Table 1(A)1 HILs
Cobalt	4000	NEPM 2013 - Table 1(A)1 HILs
Copper	240000	NEPM 2013 - Table 1(A)1 HILs
Lead	1500	NEPM 2013 - Table 1(A)1 HILs
Manganese	60000	NEPM 2013 - Table 1(A)1 HILs
Mercury (Inorganic)	730	NEPM 2013 - Table 1(A)1 HILs
Methyl Mercury	180	NEPM 2013 - Table 1(A)1 HILs
Nickel	6000	NEPM 2013 - Table 1(A)1 HILs
Selenium	10000	NEPM 2013 - Table 1(A)1 HILs
Zinc	400000	NEPM 2013 - Table 1(A)1 HILs
Cyanide (Free)	1500	NEPM 2013 - Table 1(A)1 HILs
Polycyclic Aromatic Hydrocarbons (PAHs)		
Carcinogenic PAHs (as Bap TEQ)	40	NEPM 2013 - Table 1(A)1 HILs
Total PAHs	4000	NEPM 2013 - Table 1(A)1 HILs
Organochlorine Pesticides		
DDT + DDE + DDD	3600	NEPM 2013 - Table 1(A)1 HILs
Aldrin + Dieldrin	45	NEPM 2013 - Table 1(A)1 HILs
Chlordane	530	NEPM 2013 - Table 1(A)1 HILs
Endosulfan	2000	NEPM 2013 - Table 1(A)1 HILs
Heptachlor	50	NEPM 2013 - Table 1(A)1 HILs
HCB	80	NEPM 2013 - Table 1(A)1 HILs
Phenols		
Phenols	240000	NEPM 2013 - Table 1(A)1 HILs
Pentachlorophenol	660	NEPM 2013 - Table 1(A)1 HILs
Cresols	25000	NEPM 2013 - Table 1(A)1 HILs
Polychlorinated Biphenyls (PCBs)		
PCBs	7	NEPM 2013 - Table 1(A)1 HILs
Other Pesticides		
Atrazine	2500	NEPM 2013 - Table 1(A)1 HILs
Chlorpyrifos	2000	NEPM 2013 - Table 1(A)1 HILs
Bifenthrin	4500	NEPM 2013 - Table 1(A)1 HILs
Herbicides		
2,4,5-T	5000	NEPM 2013 - Table 1(A)1 HILs
2,4-D	9000	NEPM 2013 - Table 1(A)1 HILs
MCPA	5000	NEPM 2013 - Table 1(A)1 HILs
MCPB	5000	NEPM 2013 - Table 1(A)1 HILs
Mecoprop	5000	NEPM 2013 - Table 1(A)1 HILs
Picloram	35000	NEPM 2013 - Table 1(A)1 HILs
Other Organics		
PDBe (Br1-Br9)	10	NEPM 2013 - Table 1(A)1 HILs


Note - All values are in mg/kg



5.1.2 Health Screening Levels (HSLs) – HSL A & B

For selection of the health screening criteria an assessment of the in-situ soil profile should be undertaken. The soil profile consisted of predominantly Clay.

Table 6: Health Screening Levels (HSL) Criteria

	HSL D	HSL D	HSL D	HSL D	Soil Saturation Concentration (Csat)	Reference
	0m to <1m	1m to <2m	2m to <4m	4m+		
SAND						
Toluene	NL	NL	NL	NL	560	NEPM 2013 - Table 1(A) 3 HSLs
Ethylbenzene	NL	NL	NL	NL	64	NEPM 2013 - Table 1(A) 3 HSLs
Xylenes	NL	NL	NL	NL	300	NEPM 2013 - Table 1(A) 3 HSLs
Naphthalene	NL	NL	NL	NL	9	NEPM 2013 - Table 1(A) 3 HSLs
Benzene	3	3	3	3	360	NEPM 2013 - Table 1(A) 3 HSLs
F1	260	370	630	NL	950	NEPM 2013 - Table 1(A) 3 HSLs
F2	NL	NL	NL	NL	560	NEPM 2013 - Table 1(A) 3 HSLs
SILT						
Toluene	NL	NL	NL	NL	640	NEPM 2013 - Table 1(A) 3 HSLs
Ethylbenzene	NL	NL	NL	NL	69	NEPM 2013 - Table 1(A) 3 HSLs
Xylenes	NL	NL	NL	NL	330	NEPM 2013 - Table 1(A) 3 HSLs
Naphthalene	NL	NL	NL	NL	10	NEPM 2013 - Table 1(A) 3 HSLs
Benzene	4	4	6	10	440	NEPM 2013 - Table 1(A) 3 HSLs
F1	250	360	590	NL	910	NEPM 2013 - Table 1(A) 3 HSLs
F2	NL	NL	NL	NL	570	NEPM 2013 - Table 1(A) 3 HSLs
CLAY						
Toluene	NL	NL	NL	NL	630	NEPM 2013 - Table 1(A) 3 HSLs
Ethylbenzene	NL	NL	NL	NL	68	NEPM 2013 - Table 1(A) 3 HSLs
Xylenes	NL	NL	NL	NL	330	NEPM 2013 - Table 1(A) 3 HSLs
Naphthalene	NL	NL	NL	NL	10	NEPM 2013 - Table 1(A) 3 HSLs
Benzene	4	6	9	20	430	NEPM 2013 - Table 1(A) 3 HSLs
F1	310	480	NL	NL	850	NEPM 2013 - Table 1(A) 3 HSLs
F2	NL	NL	NL	NL	560	NEPM 2013 - Table 1(A) 3 HSLs


Note - All values are in mg/kg



Ecological Investigation Levels (EILs) -

Any validation samples in the future will be assessed against the site derived EILs. A copy of the site derived EILs is provided below.

Table 7: Site Derived EIL Criteria

	EIL Analytes (mg/kg)							
	ARSENIC	CHROMIUM (VI) ^a	COPPER	LEAD	NICKEL	ZINC	NAPHTHALENE	DDT
Site Derived Ecological Investigation Levels (EILs)								
FES Fill BH3 (0.2-0.3m)	160	670	140	1810	55	290	370	640
FES Natural BH3 (0.9-1.0m)	160	670	140	1810	56	215	370	640

Notes: a

Chromium VI has been used in lieu of Chromium III

Ecological Screening Levels (ESLs) -

Ecological screening levels (ESLs) are presented based on a review of Canadian guidance for petroleum hydrocarbons in soil and application of the Australian methodology (Schedule B5b) to derive Tier 1 ESLs for BTEX, benzo(a)pyrene and F1 and F2 (Warne 2010a, 2010b)

The Canadian Council of the Ministers of the Environment (CCME) has adopted risk-based TPH standards for human health and ecological aspects for various land uses in the *Canada-wide standard for petroleum hydrocarbons (PHC) in soil* (CCME 2008) (CWS PHC). The standards established soil values including ecologically based criteria for sites affected by TPH contamination for coarse- and fine-grained soil types.



Table 8: (EIL) and (ESL) Criteria

FOUNDATION EARTH SCIENCES	Contaminant Age/Soil Texture	National parks and areas of high conservation value	Urban residential and open public spaces	Commercial and industrial	Reference
Ecological Investigation Levels (EILs)					
Heavy Metals					
Arsenic	Fresh	20	50	80	NEPM 2013 - Table 1(B) 1-5 EILs
	Aged	40	100	160	NEPM 2013 - Table 1(B) 1-5 EILs
Chromium (III)	Fresh	Site Specific Calculation Required			NEPM 2013 - Table 1(B) 1-5 EILs
	Aged				NEPM 2013 - Table 1(B) 1-5 EILs
Copper	Fresh	Site Specific Calculation Required			NEPM 2013 - Table 1(B) 1-5 EILs
	Aged				NEPM 2013 - Table 1(B) 1-5 EILs
Lead	Fresh	110	270	440	NEPM 2013 - Table 1(B) 1-5 EILs
	Aged	470	1100	1800	NEPM 2013 - Table 1(B) 1-5 EILs
Nickel	Fresh	Site Specific Calculation Required			NEPM 2013 - Table 1(B) 1-5 EILs
	Aged				NEPM 2013 - Table 1(B) 1-5 EILs
Zinc	Fresh	Site Specific Calculation Required			NEPM 2013 - Table 1(B) 1-5 EILs
	Aged				NEPM 2013 - Table 1(B) 1-5 EILs
Polycyclic Aromatic Hydrocarbons (PAHs)					
Naphthalene	Fresh	10	170	370	NEPM 2013 - Table 1(B) 1-5 EILs
	Aged	10	170	370	NEPM 2013 - Table 1(B) 1-5 EILs
Organochlorine Pesticides					
Ecological Screening Levels (ESLs) and Management Limits					
F1 (C ₆ -C ₁₀)	Coarse	125*	180*	215*	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine				NEPM 2013 - Table 1(B) 6-7 EILs
F1 (C ₆ -C ₁₀) (Management Limits)	Coarse	-	700	700	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine		800	800	NEPM 2013 - Table 1(B) 6-7 EILs
F2 (>C ₁₀ -C ₁₆)	Coarse	25*	120*	170*	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine				NEPM 2013 - Table 1(B) 6-7 EILs
F2 (>C ₁₀ -C ₁₆) (Management Limits)	Coarse	-	1000	1000	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine		1000	1000	NEPM 2013 - Table 1(B) 6-7 EILs
F3 (>C ₁₆ -C ₃₄)	Coarse	-	300	1700	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine		1300	2500	NEPM 2013 - Table 1(B) 6-7 EILs
F3 (>C ₁₆ -C ₃₄) (Management Limits)	Coarse	-	2500	3500	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine		3500	5000	NEPM 2013 - Table 1(B) 6-7 EILs
F4 (>C ₃₄ -C ₄₀)	Coarse	-	2800	3300	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine		5600	6600	NEPM 2013 - Table 1(B) 6-7 EILs
F4 (>C ₃₄ -C ₄₀) (Management Limits)	Coarse	-	10000	10000	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine		10000	10000	NEPM 2013 - Table 1(B) 6-7 EILs
Benzene	Coarse	10	50	75	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine	10	65	95	NEPM 2013 - Table 1(B) 6-7 EILs
Toluene	Coarse	10	85	135	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine	65	105	135	NEPM 2013 - Table 1(B) 6-7 EILs
Ethylbenzene	Coarse	1.5	70	165	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine	40	125	185	NEPM 2013 - Table 1(B) 6-7 EILs
Xylenes	Coarse	10	105	180	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine	1.6	45	95	NEPM 2013 - Table 1(B) 6-7 EILs
Benzo(a)pyrene	Coarse	0.7	0.7	0.7	NEPM 2013 - Table 1(B) 6-7 EILs
	Fine	0.7	0.7	0.7	NEPM 2013 - Table 1(B) 6-7 EILs

Notes

- Urban residential/public open space is broadly equivalent to the HIL-A, HIL-B and HIL-C land use scenarios in Table 1A(1) Footnote 1 and as described in Schedule B7.
- Aged values are applicable to arsenic contamination present in soil for at least two years. For fresh contamination refer to Schedule B5c.
- Insufficient data was available to calculate aged values for DDT and naphthalene, consequently the values for fresh contamination should be used.
- Insufficient data was available to calculate ACLs for As, DDT and naphthalene. The EIL should be taken directly from Table 1B(5).
- ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability.
- “-” indicates that insufficient data was available to derive a value.
- To obtain F1, subtract the sum of BTEX concentrations from C₆-C₁₀ fraction and subtract naphthalene from >C₁₀-C₁₆ to obtain F2.
- Management limits are applied after consideration of relevant ESLs and HSLs
- Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.



5.1.3 Asbestos – Residential A, FA & AF + All forms

Health screening for asbestos in soil, which are based on scenario-specific likely exposure levels, are adopted from the WA DoH guidelines and are referred in Table 7 in Schedule B1. The following health screening levels for asbestos can be seen below:

Table 9: Health Screening Levels for Asbestos

	Health Screening Levels (w/w)			
Form of Asbestos	Residential A	Residential B	Recreational C	Commercial/Industrial D
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF (Friable Asbestos)	0.001%			
All forms of asbestos	No visible asbestos for surface soil			

5.1.4 Export of waste

Any additional soil material requiring offsite disposal will be analysed against the NSW EPA refers to the NSW EPA (2014) *“Waste Classification Guidelines, Part 1: Classifying Waste”*.

5.1.5 Aesthetic Considerations

Schedule B1 in NEPC (2013) requires the consideration of aesthetic issues arising from soils and groundwater within the site. The following assessment criteria were adopted when considering aesthetics:



- no persistently malodourous soils or extracted groundwater;
- no persistent hydrocarbon sheen on surface water;
- no staining or discolouration in soils, taking into consideration the natural state of the soil; and
- no large or frequently occurring anthropogenic materials present (to the extent practicable).



5.2 Groundwater (Contingency)

The NSW DECC has endorsed the use of the Groundwater Investigation Levels (GILs) given in the 1999 NEPM '*Schedule B (1) Guideline on the Investigation Levels for Soil and Groundwater*' (Amendment 2013) and the water quality trigger levels given in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ, 2000). These Guidelines provide criteria for:

- Aquatic ecosystems – both marine and fresh waters

The NEPM advises that 'when assessing groundwater contamination, the GILs are to be applied at the point of extraction and as response levels at the point of use, or where there is a likelihood of an adverse environmental effect at the point of discharge.'

For assessing groundwater quality, it is first necessary to assess the potential uses of groundwater downgradient of the site being assessed.

Potential uses of groundwater downgradient of the site include:

- Discharge to water bodies sustaining aquatic ecosystems particularly Fresh Water.
- Extraction of groundwater by local users.

The threshold concentrations presented in the ANZG (2018) Fresh and Marine Waters Quality Guidelines are considered applicable for the protection of aquatic ecosystems of the receiving waters. As these guidelines apply to receiving waters, it is generally conservative to apply these to groundwater discharging to receiving waters. It is important to note that these are not threshold values at which an environmental




problem is likely to occur if exceeded, rather, if the trigger values are exceeded, then further action is required which may include either further site-specific investigations to assess whether there is an actual problem or management / remedial action should be undertaken.

It is considered that **Marine Water trigger** values are applicable for investigating chemical concentrations in groundwater at the site. The nearest downgradient watercourse is Erina Creek located approximate 380m to the east of the site. It is understood that the NSW EPA policy is that the trigger values for the protection of 95% of aquatic ecosystems should be used as groundwater assessment criteria when considering moderately or highly disturbed receiving environments. The receiving waters for groundwater at the site are moderately disturbed ecosystems and the ANZG (2018) 95% protection values are therefore considered appropriate groundwater assessment criteria for the site.




Table 10: Groundwater Investigation Levels (GILs)

 FOUNDATION EARTH SCIENCES	GIL-Marine Low Reliability 95%	Reference
	(µg/L)	
Heavy Metals		
Arsenic	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Cadmium	0.7	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Chromium, Cr (III)	27.4	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Chromium, Cr (VI)	4.4	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Copper	1.3	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Lead	4.4	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Mercury (Total)	0.1	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Nickel	7	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Zinc	15	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Polycyclic Aromatic Hydrocarbons (PAHs)		
Naphthalene	50	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Benzo[a]pyrene	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Monocyclic Aromatic Hydrocarbons		
Benzene	500	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Toluene	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Etylbenzene	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Xylenes	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Phenols		
Phenols	400	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Chlorinated Alkanes		
Dichloromethane	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Tetrachloromethane (carbon tetrachloride)	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Trichloromethane (chloroform)	770	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000) & ANZG 2018
Trihalomethanes (total)	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
1,2-Dichloroethane	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
1,1,2-Trichloroethane	1900	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Chlorinated Alkenes		
Chloroethene (vinyl chloride)	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
1,1-Dichloroethene	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
1,2-Dichloroethene	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Trichloroethene	330	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Tetrachloroethene (PCE)	70	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
Chlorinated Benzenes		
Chlorobenzene	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
1,2- Dichlorobenzene	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
1,3- Dichlorobenzene	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
1,4- Dichlorobenzene	60	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
1,2,3- Trichlorobenzene	-	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)
1,2,4- Trichlorobenzene	20	NEPM 2013 - Table 1C GILs & ANZECC & ARMICANZ (2000)

The adopted GILs is Marine.



Table 11: Groundwater Health Screening Levels (HSLs)

	HSLD	HSLD	HSLD	SolubilityLimit	Reference
	2m to <4m	4m to <8m	8m+		
SAND					
Toluene	NL	NL	NL	61	NEPM 2013 - Table 1(A) 4 HSLs
Ethylbenzene	NL	NL	NL	3.9	NEPM 2013 - Table 1(A) 4 HSLs
Xylenes	NL	NL	NL	21	NEPM 2013 - Table 1(A) 4 HSLs
Naphthalene	NL	NL	NL	0.17	NEPM 2013 - Table 1(A) 4 HSLs
Benzene	5	5	5	59	NEPM 2013 - Table 1(A) 4 HSLs
F1	6	6	7	9	NEPM 2013 - Table 1(A) 4 HSLs
F2	NL	NL	NL	3	NEPM 2013 - Table 1(A) 4 HSLs
SILT					
Toluene	NL	NL	NL	61	NEPM 2013 - Table 1(A) 4 HSLs
Ethylbenzene	NL	NL	NL	3.9	NEPM 2013 - Table 1(A) 4 HSLs
Xylenes	NL	NL	NL	21	NEPM 2013 - Table 1(A) 4 HSLs
Naphthalene	NL	NL	NL	0.17	NEPM 2013 - Table 1(A) 4 HSLs
Benzene	30	30	30	59	NEPM 2013 - Table 1(A) 4 HSLs
F1	NL	NL	NL	9	NEPM 2013 - Table 1(A) 4 HSLs
F2	NL	NL	NL	3	NEPM 2013 - Table 1(A) 4 HSLs
CLAY					
Toluene	NL	NL	NL	61	NEPM 2013 - Table 1(A) 4 HSLs
Ethylbenzene	NL	NL	NL	3.9	NEPM 2013 - Table 1(A) 4 HSLs
Xylenes	NL	NL	NL	21	NEPM 2013 - Table 1(A) 4 HSLs
Naphthalene	NL	NL	NL	0.17	NEPM 2013 - Table 1(A) 4 HSLs
Benzene	30	30	35	59	NEPM 2013 - Table 1(A) 4 HSLs
F1	NL	NL	NL	9	NEPM 2013 - Table 1(A) 4 HSLs
F2	NL	NL	NL	3	NEPM 2013 - Table 1(A) 4 HSLs

Units in mg/L

The adopted Groundwater HSL is D for clay profile.

6.0 REMEDIATION STRATEGY

6.1 General

All works undertaken during the remediation program must be monitored by a suitably qualified person experienced in the assessment and remediation of contaminated sites. The RAP must be adhered to by all personnel and sub-contractors involved in the remediation program.

6.2 NSW EPA preferred hierarchy of options for site remediation

The NSW EPA has a preferred hierarchy of options for site remediation and/or management which is outlined below:

- If practicable, on-site treatment of the contamination so that it is destroyed, and the associated risk is reduced to an acceptable level; and
- Off-site treatment of excavated soil, so that the contamination is destroyed, or the associated risk is reduced to an acceptable level.

If the above is not practicable:

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



6.3 Remediation option review

6.3.1 Available remediation / management technologies

There is a range of different remediation technologies that are available for remediation of contaminated sites. Some of these technologies are proven while others have not been successfully implemented, particularly in Australia and / or there is limited local expertise for implementation.

A review of the available soil remediation methods and technologies indicated that the following strategies may be applicable to the remediation of fill material contaminated at concentrations exceeding health-based threshold concentrations:

- Excavation and off-site disposal of contaminated soil to landfill;
- Bioremediation;
- Thermal treatment;
- Cap and contain.

6.3.2 Excavation and off-site disposal

This method involves the excavation of contaminated materials and disposal of the materials off-site to a landfill licensed by the NSW EPA.

Excavated soils must be classified before disposal to an appropriate landfill. Depending on the levels of contamination, soil may require pre-treatment (to reduce contaminant levels or immobilise contaminants) prior to off-site disposal to the licensed landfill.



6.3.3 Treatment

There is a range of soil treatment technologies available depending on the type of contaminant including in-situ and ex-situ remediation methods. Most commonly, for contamination, the technologies adopted are ex-situ, requiring excavation of the contaminated material. In-situ remediation technologies generally require a longer timeframe for completion than ex-situ technologies. Most of the treatment technologies that require excavation of the contaminated material could be undertaken on or off-site, subject to obtaining licences.

Some possible treatment methods for heavy metals include soil washing and stabilisation of soil.

6.3.4 Managing risks by preventing any direct exposure pathway between contaminated soil and site users (through capping)

On-site capping is used to isolate areas in the subsurface from the surrounding uncontaminated environment. A physical barrier such as a layer of clean soil, synthetic material liners, asphalt and concrete layers may be installed to cap the contaminated material. A cap is typically used where it is required to remove exposure to the contaminated soils and where the contaminated soils are not mobile or there is no contact with groundwater and / or groundwater is not contaminated.

A site management plan is required with any cap and contain strategy. The site management plan identifies the party responsible for adhering to the plan, and includes commitments for ongoing monitoring and maintenance of the cap as well as control of future excavations, which must be minimised or if required, the appropriate



occupational health and safety procedures are adopted and permits acquired before work is carried out.

6.4 Rationale for selection of remedial strategy

Usual considerations in selecting and implementing a remediation strategy for a site include:

- **Proven technology:** the remediation method should have a proven track record of success/failure;
- **Reliability:** this is a measure of the degree of certainty that the remediation method will succeed in meeting the site remediation goals in the short and long term;
- **Regulatory approvals:** the remediation method needs to be endorsed by the relevant regulatory authorities. The difficulty in obtaining regulatory approvals will be largely dependent upon the nature of the remediation method proposed;
- **Cost:** provides an indication as to the likely costs involved in implementing each type of remediation method;
- **Implementation time:** provides an indication as to the likely time frame involved in implementing each type of remediation strategy;
- **Land use restrictions:** if contaminated material is left on-site, the regulatory authority may place restrictions on the land use and/or require notification of the contamination on the property title;
- **Ongoing liabilities (maintenance and monitoring requirements):** a remediation strategy that does not involve the complete removal of all contaminants from the site will necessitate some form of ongoing



maintenance and/or monitoring to ensure the longer-term integrity of the remediation strategy adopted;

- **Future liability:** any remediation strategy that does not involve the complete removal of all contaminants from the site will result in future liability for the contamination;
- **Local contractor experience:** the success and cost effectiveness of any remediation method will be at least partially dependent upon the experience local contractors have in undertaking the type of remediation works proposed;
- **On-site space requirements:** some remediation techniques (e.g., land farming) require relatively large amounts of space to spread soil and will only be feasible if sufficient land is available;
- **Disruptions to site structures and activities:** remediation of the site is likely to create some disturbance, both to the existing site operations and structures, as well as to underground services which may pass through the remediation area (e.g., any work involving excavation of the contaminated soil mass will involve the removal of any structures located atop the excavation zone);
- **Human health risks during remediation:** the remediation workers, site users and the general public may be exposed to hazards posed by contamination during the remediation (e.g., significant levels of vapours may be released when disturbing soil contaminated with volatile organic compounds); and
- **Availability of appropriate disposal sites (for remediation techniques involving excavation and off-site disposal):** landfill disposal of contaminated soil will only be feasible if a landfill licensed to accept the contaminated soils excavated from the site is available at a reasonable distance from the site.



The table below presents an evaluation of the various options for general remediation projects in Australia based on the above. The table also includes several limitations and risks associated with each method.

Table 12: Remediation options

Technical Characteristics	Option 1 Excavation – Off-Site Disposal	Option 2 Bioremediation	Option 3 Thermal Treatment	Option 4 Cap and contain
Cost	Low- Medium	Medium	High	Low
Technical feasibility	Possible for a range of contaminants including those encountered at the site during the investigations	Not possible for heavy metal contaminated material	Not possible for heavy metal contaminated material	Possible for a wide range of contaminants including those encountered at the site
Human Health Risks	Relatively low – excavation and direct offsite disposal will minimise personal contact	Variable – relatively low risk associated with in-situ bioremediation but greater with ex-situ, as soil needs to be excavated	Significant – excavation and handling of contaminated materials will create a volatile contaminant release hazard	Relatively low – only minimal soil disturbance involved



Technical Characteristics	Option 1 Excavation – Off-Site Disposal	Option 2 Bioremediation	Option 3 Thermal Treatment	Option 4 Cap and contain
Reliability	Excellent – system ensures the removal of all contaminated materials	Variable – in-situ bioremediation presents only a low potential to adequately remediate all organic species. Ex-situ is more reliable, due to the more complete mixing of organisms, nutrients, and oxygen with the contamination	Moderate – thermal processes have been successfully implemented on most organic contaminant species	Moderate – some potential may exist for contaminant breakthrough if containment wall not properly keyed into bedrock. Care also needs to be taken to prevent preferential gas venting.
Regulatory Approval	Satisfactory – Compliance with Regulatory Authorities. Licensed landfills available for day cover	Satisfactory – on-site treatment is generally the EPA's preferred strategy for site remediation	May be difficult. May require an EIS	Generally satisfactory – whilst on-site containment is not the EPA's preferred option, it is often accepted as a feasible option



Technical Characteristics	Option 1 Excavation – Off-Site Disposal	Option 2 Bioremediation	Option 3 Thermal Treatment	Option 4 Cap and contain
Disruption to Site Structures and Activities	Significant – all existing site structures need to be demolished or relocated to allow excavation of contaminated soils	Variable – disturbance relatively minor for in-situ bioremediation, but ex-situ would require existing structures to be demolished or relocated	Significant – all existing site structures need to be demolished or relocated to allow excavation of contaminated soils	Moderate – some disruption likely to proposed underground services
Ongoing Liabilities	Minimal – all heavily contaminated materials removed	Variable – need for ongoing monitoring will be largely dependent upon the success of bioremediation in destroying contaminants	Variable – need for ongoing monitoring will be largely dependent upon the success of thermal desorption in destroying contaminants	Moderate to high – capping system need to be maintained, and ongoing monitoring necessary to ensure the integrity of the cap and cut-off wall
Contractor Experience	Good – relatively simple strategy involving only basic technologies	Very Limited – technology is still developing, and only a limited amount of trials undertaken in Australia	Very Limited – technology is still developing, and only a limited amount of trials undertaken in Australia	Moderate – contractors available with experience in the implementation of cap and contain systems



Technical Characteristics	Option 1 Excavation – Off-Site Disposal	Option 2 Bioremediation	Option 3 Thermal Treatment	Option 4 Cap and contain
Availability of Disposal Sites	Good – landfills available to accept solid waste	Not Applicable	Not Applicable	Not Applicable (assuming all materials excavated to form the cut-off wall are retained on-site)
Implementation Time Frame	Short	Long	Short to Moderate	Short to Moderate

6.5 Preferred remediation strategy

For this site, on- and off-site treatment of contaminants, which are the most preferred remedial strategies of the NSW EPA, were ruled out for the following reasons:

- Materials must be removed from site so if land farming took place, materials would ultimately be removed; and
- The costs of reuse and treatment for more sensitive sites would be substantially higher than off-site disposal to landfill.

The next most preferred strategy of on-site containment was ruled out for the following reasons:

- The site requires a reduction of soils as excavation is required within the site.

The next most preferred remedial option strategy is removal of contaminated material to a licensed landfill and is the selected strategy for the following reasons:

- The costs of off-site disposal to landfill are considerably less than treatment costs.



- The method fits in with the proposed development.

Relative benefits of the “excavate and dispose” strategy are as follows:

- The costs associated with the ‘excavate and dispose’ remediation method is low to medium;
- The ‘excavate and dispose’ remediation method is a proven technology for the type of contaminants identified at the site, likely to be approved by the regulatory bodies;
- The ‘excavate and dispose’ remediation method is dependent upon the cost and availability of suitable landfill disposal sites. These are readily available and cost-effective;
- After completion of the remediation works by the ‘excavate and dispose’ remediation method, the site would continue to be suitable for the proposed use, and there would be no ongoing liabilities, and very limited (if any) ongoing maintenance / monitoring required;
- As part of the site development, a net reduction of soils is required thus fitting into this remediation strategy; and
- The timeframe for implementation of the ‘excavate and dispose’ remediation method is relatively short compared to other possible remediation methods.



6.6 Excavation Risk – Offsite Disposal

Prior to commencement of any excavation works, the remediation contractor should refer to the **engineering report to limit any undermining risks to the adjacent properties.** An assessment by a suitable qualified contractor / engineering is required to identify a suitable excavation method prior to start of excavation works to ensure integrity of adjacent structures remain.

Removal of waste materials from the site shall only be carried out by a licensed contractor holding appropriate licence, consent and/ or approvals to dispose of the waste materials according to the assigned waste classification, and with the appropriate approvals obtained from the EPA, if required. **Details of all soils removed from the site (including VENM) shall be documented by the Contractor with source location, volume/tonnage, waste classification, disposal date, disposal destination, copies of weighbridge slips, landfill receipts/disposal docket, tip tickets and consignment disposal confirmation (where appropriate) provided to the Environmental Consultant and/or the NSW EPA Accredited Site Auditor.**

Material tracking needs to include information on source location, volume /tonnage, waste classification, disposal date, disposal destination, disposal docket, including waste locate consignment number of any asbestos soil waste disposed, transporters details (including EPL No) and a tally of estimated versus actual volume disposed.



7.0 REMEDIATION WORKS

7.1 Remediation Goal & Objectives

The remediation goal is to render the site suitable for the proposed development upon completion of the remediation and validation works. This would be achieved by remediating the:

- The area of impact includes surface soils surrounding F1 & F2 and the COPC is Asbestos.
- Ten (10) additional sample locations are proposed to be completed post demolition targeting the soil beneath the existing building.

7.2 Remediation program

Assuming appropriate permits have been granted, the remediation of the site is to take place in the following stages:

Stage One -Site Preparation

- Notice should be given to council at least 30 days prior to the commencement of remediation works. The site developer needs to prepare and implement a Construction Environmental Management Plan (CEMP) and site Work Health and Safety Plan prior to any site works.
- Hazardous Materials Assessment is recommended to be completed prior to demolition of the site buildings and structures.



Stage Two -Site Walkover

- Post demolition of structures and removal of hardstand pavements, an appraisal of the prevailing site conditions is to be performed by a suitable qualified environmental scientist / engineer.
- The purpose of the site walkover is to observe any signs / evidence of potential contamination including fibro cement fragments, ACM, heavy staining, odours, presence of waste.
- Unexpected finds protocol will be implemented if signs / evidence of contamination is encountered.

Stage Three -Building Footprint Locations

- Works to occur prior to offsite removal of soil.
- Post demolition of the site buildings, ten test pit locations are proposed to be completed to assess the quality of soil under the former building footprint.
 - One fill soil sample from each test pit. If the fill is greater than 1m deep, additional fill samples to be analysed and collected in each soil horizon.
 - Soil samples will be analysed in a NATA-accredited laboratory under Chain of Custody. Laboratory analysis for HM, TRH, BTEXN, PAH, OC, PCB & Asbestos.

Stage Four (a) -Classification, Removal, and Validation of Impacted Areas

Refer to Section 10 for validation sampling frequency and listed of analytes to be tested.

F1 & F2

- F1 & F2– contains asbestos impacted surface fill soil materials to a depth of up to approximate 0-0.1m BGL. Bonded / Non friable asbestos fragments have been



identified within the soil surfaces. Due to the sensitive nature of the area and the potential for NON-FRIABLE/BONDED ASBESTOS to be identified it is advised that a contractor with suitable experience and expertise shall move/remove the asbestos cement sheeting pieces from the impacted area. As such it is recommended that a contractor with a Non-Friable Asbestos License (Class B) be engaged to move/remove any asbestos containing materials from within the site.

- The material is to be classified in accordance with the NSW EPA Waste Classification Guidelines and can be disposed of at EPA licenced landfill facility that can accept the waste.
- Asbestos Air monitoring should be set up in order to monitor the removal works being undertaken. Asbestos monitoring canisters should be set up each day and removed and sent to a NATA Accredited Laboratory for analysis.
- Handpicking to occur across impacted areas F1 & F2 targeting visible ACM across the impacted surface area. Licensed Asbestos Assessor to complete asbestos clearance on the area including appropriate handling and disposal of asbestos in accordance with the relevant legislation. Asbestos %w/w sampling to be completed at double density of the proposed sampling density over the impacted area.
- The borehole will be validated to ensure the successful removal of contaminated fill soils. Chasing up of contaminants may be required during this stage of works if levels are found over site criteria.



The lateral and vertical extent of the above locations may be extended pending results of the validation sampling. The material is to be classified in accordance with the NSW EPA Waste Classification Guidelines and can be disposed of at EPA licenced landfill facility that can accept the waste.

Sampling of asbestos %w/w will be undertaken as follows:

- A minimum 10L sample from each sample location will be recovered;
- Each asbestos sample (minimum of 10 L) will be screened through a 7mm sieve and the material retained on the sieve examined for any bonded ACM and / or suspect material and forwarded to the laboratory for analysis if any suspected ACM is encountered;
- If visible FA material is present or suspected, the soil should be wetted to minimise the release of fibres;
- Identified bonded ACM and FA should be weighed for each sample; and
- One wetted 500ml sample from each asbestos sampling location will be submitted for laboratory analysis for AF.

The fill layer has already been sampled as part of the previous works and these samples will be included within the sampling density for characterisation. Further samples will be recovered either in-situ or from stockpiles. Any excavated fill will be temporarily stockpiled on a heavy-duty plastic sheet or a sealed surface such as concrete, and covered with an impermeable plastic sheet to prevent rain infiltration.

Waste classified for offsite disposal should be loaded onto EPA licensed waste vehicles for transport to designated landfill. Waste classification ex-situ at rate of 1 per 25m³ up to 250m³ for waste classification purposes. Minimum of 3 samples per stockpile.



Stockpiles greater than 250m³ up to 2500m³, sampling frequency is minimum of 10 samples plus 95%UCL. Stockpiles greater than 2500m³ will have sampling frequency of 1 sample per 250m³.

- Collection of QA/QC
- Analysis includes HM, TRH, BTEXN, PAH, OCP, PCBs and Asbestos
- TCLP Analysis of heavy metals and benzo(a)pyrene is required to facilitate waste classification and offsite disposal.

Stockpile Footprint Validation

Validation of stockpile footprints to occur	1 floor sample per 25m ² 1 inter-laboratory duplicate 1 intra-laboratory duplicate Spikes / blanks	HM, TRH, BTEX, PAH, OC, PCB and Asbestos
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If ACM/ asbestos is detected during remedial validation or at building footprint, validation must be performed at appropriate sampling frequency via analysis of 10L and 500ml sample.

Stage Four (b) – Asbestos Clearance

Following the completion of the remediation and validation, an accredited Asbestos Assessor / Occupational Hygienist should undertake & provide an Asbestos Clearance Certificate.

If ACM/ asbestos is detected during remedial validation, validation must be performed at appropriate sampling frequency via analysis of asbestos %w/w samples.



Stage Five – Validation of final surface level across the site

The floors of the lower ground floor footprint and remaining site area will be sampled by taking twenty-two (22) floor samples plus QA/QC samples to validate the area.

If ACM/ asbestos is detected during remedial validation, validation must be performed at appropriate sampling frequency via analysis of asbestos %w/w samples.

Stage Six– Validation Report Preparation

- Remediation will occur by managing soil for offsite disposal to landfill for contaminated soils.
- A validation report will be prepared to present the remediation works undertaken and confirm that the objectives of the remediation works have been attained.

The extent of the remediation works would be extended whether any USTs, associated infrastructure &/or any further contaminated material via unexpected finds are identified during remediation works.

7.3 Extent of remediation works required

As described above the preferred remediation strategy for the site is excavation and off-site disposal of the fill materials. If contaminated material is found during the remediation works, these materials will be chased up and removed.

7.4 Regulatory requirements such as licenses and approvals



Approval from a licensed disposal facility will be required prior to removal of any contaminated material from the site.

7.5 Disposal of excavated contaminated material

The contaminated fill or soil excavated from the site will be disposed of at a licensed landfill facility. If disposal of contaminated liquids is required, this will be undertaken by a licensed contractor. The weighbridge and truck dockets will be retained by the contractor and made available to the principal's environmental representative.

Details of all soils removed from the site (including VENM) shall be documented by the Contractor with source location, volume/tonnage, waste classification, disposal date, disposal destination, copies of weighbridge slips, landfill receipts/disposal docket, tip tickets and consignment disposal confirmation (where appropriate) provided to the Environmental Consultant and/or the NSW EPA Accredited Site Auditor.

Material tracking needs to include information on source location, volume /tonnage, waste classification, disposal date, disposal destination, disposal docket, including waste locate consignment number of any asbestos soil waste disposed, transporters details (including EPL No) and a tally of estimated versus actual volume disposed.

7.6 Contingencies during Remedial Works

7.6.1 Contaminated Soils

Follow the unexpected finds protocol as detailed in Section 16.2 & Appendix A. Works to be suspended until the environmental project manager can further assess impacted soils / materials.



7.6.2 Contaminated Groundwater

During remediation works if any other form of contamination is noticed during excavation works, such as buried drums, waste pits, unexpected USTs etc, a review of groundwater conditions will be required.

Groundwater Investigation (contingencies)

The minimal groundwater contingency will include the installation and sampling of three (3) new monitoring wells is required to determine the water quality at the site. The proposed groundwater monitoring wells are to be surveyed by a registered surveyor.

Any dewatering may require approval under the Water Management Act 2000. Remedial measure may include; source removal, natural attenuation, bioremediation, PSH recovery using active pumping, groundwater permeability barrier, in-situ oxidation / stabilisation.

If a groundwater contaminant plume is identified and migrating offsite or increasing in contaminant concentrations the following is required:

- Review contaminant increase and analytes;
- Review remediation alternatives;
- Undertake downgradient monitoring;
- Complete fate / transport modelling if required; and
- Assess the need for further action.



8.0 VALIDATION PLAN (DATA QUALITY OBJECTIVES)

Data quality objectives have been developed for the validation assessment.

8.1 State the problem

The site is proposed to be redeveloped; however, previous investigations identified the following concerns:

- Soil remediation is currently limited to the asbestos impacted locations surrounding F1 & F2 to depth of 0-0.1m;

8.2 Identify the issue

Based on the decision-making process for assessing urban redevelopment sites, the following decisions must be made:

- Are there any unacceptable risks to likely future onsite receptors from soil?
- Are there any impacts of chemical mixtures?
- Are there any aesthetic issues?
- Is there any evidence of, or potential for, migration of contaminants from the site?
- Is a site management strategy required?
- Is the site suitable for the proposed residential land use?



The following decision is also required to assess the remediation works as a whole:

- Have the excess materials, if any, removed from site been disposed to a landfill lawfully licenced to receive such material?

8.3 Identify the inputs to the decision

The inputs to the decisions are:

- Physical observations, including visual and olfactory results during site activities;
- The results of previous investigations (Sections 4.5);
- Soil analytical data from any imported fill;
- Soil analytical data for waste classification purposes for materials requiring off-site disposal; and
- Waste disposal documentation for excess materials disposed off-site

8.4 Define the study boundaries

The study boundary is defined as follows:

- The lateral extent of the study boundary is defined by the site boundaries as shown in Figure 1 - Site Location & Figure 2 - Site Features, Borehole Locations, Impacted Areas & Exceedances Plan; and
- The vertical extent of the soil removal is approximately 0.2m BGL surrounding surface soil locations F1 & F2 and/or up to clean underlying material;

8.5 Decision Rules

The following outlines the decision rules for the project:



Table 13: Summary of Decision Rules

Decisions	Decision Rule
Are there any unacceptable risks to likely future onsite receptors from soil or groundwater?	If there is the decision is <i>Yes</i> then controlling measures are required to manage the risk. Otherwise, the decision is <i>No</i>
Are there any chemical mixtures?	Are there more than one group of contaminants presents which increase the risk of harm? If there is the decision is <i>Yes</i> Otherwise, the decision is <i>No</i>
Any aesthetic issues?	If there are any soil discolouration and/or unacceptable odours the decision is <i>Yes</i> Otherwise, the decision is <i>No</i>
Is there any evidence of, or potential for, migration of contaminants from the site?	Evidence and/or potential will be outlined and the decision is <i>Yes</i> Otherwise, the decision is <i>No</i>
Site Management Strategy required?	Was the answer to any of the above decisions <i>Yes</i> ? If <i>yes</i> , a site management strategy is required. If <i>no</i> , a site management strategy is not required. The requirement for site management can typically be precluded by remediation of the areas of environmental impact that causes a site decision to be <i>yes</i> .
Is the site suitable for the proposed residential land use	Soil, soil vapour and groundwater data will be compared to the remediation criteria outlined in Section 4. Statistics may be undertaken where appropriate. If the material is suitable the decision is <i>Yes</i> Otherwise, the decision is <i>No</i>
Have the excess materials, if any, removed from site been disposed to a landfill lawfully licenced to receive such material?	Fill/soil analytical data will be compared against adopted criteria. Statistical analysis of the data in accordance with relevant guidance documents will be undertaken, where appropriate, to facilitate the decisions (as detailed above).



	<p>Documentation from the operation receiving the material including the dates, tonnage and classification of the accepted material will be required to facilitate the decision. If the statistical criteria stated above are satisfied, the decision is <i>Yes</i>, and if receipts are provided recording the disposal of material to an off-site licensed facility, the decision is <i>Yes</i>.</p> <p>If the material fails the criteria, and no disposal receipts are provided, the answer is <i>No</i>.</p>
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8.6 Specify Limits of Decision Error

This step is to state the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data.

Data collected and generated during this project must be considered appropriate to allow decisions to be made with confidence. Specific limits for this project have been applied in accordance with the appropriate guidance documents from the NSW EPA, NEPM 2013, appropriate indicators of data quality (DQIs used to assess quality assurance / quality control) and standard operating FES procedures for field sampling and handling.

8.7 Optimising the Design for Obtaining Data

This step enables decision makers to identify a resource-effective field investigation sampling design that generates data that are expected to satisfy the site manager's decision performance criteria, as specified in the preceding steps of the DQO Process. The output of this step is the sampling design that will guide development of the field sampling and analysis plan. This step provides a general description of the activities



necessary to generate and select data collection designs that satisfy decision performance criteria.

Validation data is required to be collected to verify:

- The effectiveness of the remediation works;
- Any contaminated soils retained on-site have been appropriately contained and managed;
- Any material imported to backfill excavations are suitable for the proposed site use; and
- Document the condition of the site as being suitable for the proposed future use.

The proposed validation soil sampling program is outlined in Section 11.



9.0 VALIDATION SAQP & METHODOLOGY

Remediation of the impacted area will be considered validated following the achievement of the two validation objectives;

- Validation of the remedial excavations will continue to the extent of the impacts and resulting samples are within the adopted criteria.
- In the event of backfilling, validation of the imported fill materials used is required to confirm the suitability for the intended land use.

9.1 Soil Validation Methodology

Soil sampling and handling is outlined in the table below:

Table 14: Sampling and Handling

Action	Outline
Sample collection	Soil validation sampling will be collected directly from exposed surface of excavation, or from the material scraped from the excavator bucket. Data shall be recorded in accordance with COC requirements
Sampling, handling, transport, and tracking	1.Validation soil samples to be transferred directly into appropriately labelled clean laboratory supplied containers. 2.Validation soil samples to be transferred into chilled eskies for sample preservation.



	<p>3.A PID should be used during the collection of each validation soil sample if analysis includes volatiles.</p> <p>4.All equipment used in the sampling program was decontaminated prior to use and between samples to prevent cross contamination. Decontamination of equipment involved the following procedures:</p> <ul style="list-style-type: none"> -Cleaning equipment in potable water to remove gross contamination; -Cleaning in a solution of Decon 90; -Rinsing in clean demineralised water then wiping with clean lint free cloths; <p>5.A Chain of Custody to be completed and forwarded to the laboratory to ensure sample tracking.</p>
Sampling Frequency	<p><u>Validation sampling</u></p> <p>Refer to table 11</p> <p><u>Stockpile sampling:</u></p> <p>Small Volumes (<250m³)- 1 sample every 25m³</p> <p>Large Volumes (>250 <2500 m³) minimum of 10 samples with 95%UCL</p> <p>>2500m³ minimum sampling rate should be 1 per 250m³</p>
Laboratory Quality Assurance and Quality Control	<p>The contracted laboratory to conduct in-house QA/QC procedures involving by not limiting to:</p> <p>Blanks, spike recoveries, laboratory duplicates & analysis.</p>
Assessment of DQOs	<p>Provide analysis of the QA/QC samples and procedures & provide assessment of the overall data quality.</p>



9.2 Soil Validation Reporting

All fieldwork, chemical analysis, discussions, conclusions, and recommendations will be provided in the final validation report for the site. The validation report will be prepared in accordance with the *NSW EPA, Consultants Reporting on Contaminated Land, 2020* and *NSW DEC (2017) Guidelines for the NSW Site Auditor Scheme* and will confirm the site is suitable for the proposed development. Waste tracking documentation and disposal details will be provided in the validation report.



10.0 VALIDATION WORKS

10.1 Objectives

The objective of the validation program is to ensure that at completion of the remediation works, the site is suitable for continued use and the proposed redevelopment.

Table 15: Soil Validation Sampling Program

Item	Sampling Frequency	Analytes
Impacted locations F1 & F2	Excavation Floor <ul style="list-style-type: none"> 1 sample every 25m² Excavation wall <ul style="list-style-type: none"> 1 sample every 5m (from each distinct horizon / material type) 1/20 inter-laboratory duplicates 1/20 intra-laboratory duplicates Spikes / blanks Per location	Asbestos %w/w
Validation final surface area across the site	22 floor samples 1 inter-laboratory duplicate 1 intra-laboratory duplicate Spikes / blanks	HM, TRH, BTEX, PAH, OC, PCB, and Asbestos
Validation stockpile footprints	1 floor sample per 25m ² 1 inter-laboratory duplicate 1 intra-laboratory duplicate Spikes / blanks	HM, TRH, BTEX, PAH, OC, PCB and Asbestos



Backfill Material (If required)	Certified VENM or 1 sample per 25m ³	HM, TPH, BTEX, PAH, OCP, PCB, Phenol, Cyanide & Asbestos. Additional COPC may need to be included in the testing suite depending on the source site.
	Certified ENM as per NSW EPA Resource Recovery Order 2014	HM, TPH, BTEX, PAH, EC, PH & Foreign Materials & Asbestos
Unexpected Finds	Excavation Floor 1 sample every 25m ² Excavation Wall 1 sample every 5m (from each distinct horizon / material type)	Dependent on the location, type, and characteristic of the unexpected find.
Waste Classification (stockpiles)	1 sample per 25m ³ up to 200m ² 10 sample per 200-2500m ² (using 95%UCL – not for asbestos) 1 sample per 25m ³ (including asbestos)	HM, TRH, BTEX, PAH, OC, PCB and Asbestos



10.2 Waste classification of the fill

During excavation works a suitable qualified environmental consultant / hygienist should be present to confirm no unexpected finds arise during the removal works. If unexpected find arises, then refer to section 16.2 for procedures.

Any excavated fill will be temporarily stockpiled (prior to disposal) on a heavy-duty plastic sheet or a sealed surface such as concrete, and covered with an impermeable plastic sheet to prevent rain infiltration.

- Asbestos transporters and facilities receiving asbestos waste in NSW weighing more than 100 kilograms or consisting of more than 10m² of asbestos sheeting in one load must track and report this waste to NSW EPA using WasteLocate.
- Tracking of asbestos waste is to be done via the NSW EPA's online system known as WasteLocate.
- Refer to Section 13.12 for more details.

A preliminary waste classification has been completed during the DSI. The waste classification refers to the fill material from nineteen boreholes designated as BH1 to BH19. The samples were analysed for a selection of Heavy Metals, Total Petroleum Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylene (BTEX), Polycyclic Aromatic Hydrocarbons (PAH), Organochlorine Pesticides (OCP), Polychlorinated Biphenyls (PCB), OPP, Phenol & Asbestos.

With reference to the site figures, laboratory analysis, table K4 and with reference to NSW EPA guidelines, the insitu fill soil materials found within the site have been classified as follows;



- *Soil fill material located within the vicinity of FES (DSI 2023) borehole locations BH1 to BH19 including D1/D2 & SS1 & SS2 are classified as **General Solid Waste (non-putrescible)**.*
- *Soil fill material located within the vicinity of FES (DSI 2023) surface locations denoted as F1 & F2 are classified as **Special Waste (Asbestos)**.*
- TCLP analysis is required to further assess the waste and will be required at the time of disposal for PFAS.
- This waste classification is preliminary in nature and further works are required to be undertaken during the excavation phase of the development to classify soils for offsite disposal.

Refer to **Appendix C** – Summary Tables.

Removal of waste materials from the site shall only be carried out by a licensed contractor holding appropriate licence, consent and/ or approvals to dispose of the waste materials according to the assigned waste classification, and with the appropriate approvals obtained from the EPA, if required. **Details of all soils removed from the site (including VENM) shall be documented by the Contractor with copies of weighbridge slips, landfill receipts, tip tickets and consignment disposal confirmation (where appropriate) provided to the Environmental Consultant and/or the NSW EPA Accredited Site Auditor.**



10.3 Validation of Impacted Locations (F1 & F2)

Following removal of soils from locations F1 & F2, photographic records of the floor and wall of the excavation will be taken for reference in the Validation Report. Soil validation samples will be collected as per Table 15.

Where contaminant concentrations in validation samples exceed the site remediation criteria, further excavation must be carried out, until new validation samples return concentrations below the site validation criteria.



10.4 Validation of final surface area across the site

General site validation samples are proposed to be collected. Sampling is to follow a systematic pattern and be analysed for the contaminants of concern identified at these locations, including heavy metals, TRH, BTEX, PAH, OC, PCB & Asbestos. The soil samples will be collected from between 0-150 mm depth from freshly excavated surfaces.

Samples will be recovered from twenty-two (22) locations. Where contaminant concentrations in validation samples exceed the site remediation criteria, further excavation must be carried out, until new validation samples return concentrations below the site validation criteria.

10.5 Validation of Stockpile (reuse onsite)

Following remediation works, any stockpiles to be reused onsite to be validated to ensure suitability to remain onsite. Validation of the stockpiles is to occur as follows:

- Small Volumes (<250m³)- 1 sample every 25m³
- Large Volumes (>250<2500m³) minimum of 10 samples plus 95%UCL.
- Volumes larger than 2500m³ – 1 sample every 250m³
- Contaminants of concern to be assessed include HM, TRH, BTEXN, PAH, OCP, PCB & Asbestos %w/w.

10.6 Validation Results

If validation criteria exceedances are encountered, statistical analysis will be applied to the dataset. The 95% UCL of the mean concentrations of the COPC will be calculated, the standard deviation is required to be less than 50% of the adopted criteria and no single concentration exceeded the criteria by more than 250%.



10.7 Remediation Groundwater Monitoring (contingency only if required)

Installation and sampling of three new monitoring wells to determine water quality at the site.

10.7.1 Groundwater Methodology

Proposed monitoring wells will be constructed by adopting the following methodology:

- 50mm diameter, Class 18PVC threaded and flush joined casing and 0.45 machine-slotted screens were used;
- Coarse, washed sand and gravel to be placed in the annulus surrounding the piping to a height of the screen;
- Bentonite pellets to be placed in the annulus to form an impermeable plug near the top of the well to prevent surface runoff from entering directly into the well;
- Bentonite pellets to be placed in the annulus to form an impermeable plug near the top of the encountered rock (if appropriate);
- A PVC cap placed on the casing;
- 100mm diameter stainless steel flushed covers to be used for all well finishes and concreted onto the ground surface.

10.7.2 Groundwater Sample Collection Methodology

Prior to groundwater sampling, the resting water level will be recorded within the well while checking for the presence of phase separated hydrocarbon.

Sampling will be completed using a low flow pump – a low flow/minimum drawdown sampling technique used to minimise any disturbance to the aquifer.



Field measured parameters will be collected using a certified and calibrated water quality meter. Samples will be collected when field measured parameters (pH, electrical conductivity, redox potential, dissolved oxygen, and temperature) have stabilised. The samples will be placed into appropriate laboratory supplied bottles and preserved on ice. The low flow pump and other sampling equipment will be decontaminated before and after use to avoid possible cross contamination. All samples collected will be preserved on ice and couriered directly to the laboratory under COC documentation.

10.7.3 Groundwater Laboratory Analysis

Laboratory analysis will include the following HM, TRH, BTEXN, PAH & VOC.

10.8 Validation of areas where fill has been temporarily stockpiled

The excavated contaminated fill will be temporarily stockpiled on a plastic sheet and covered with an impermeable plastic sheet to prevent rain infiltration. In order to confirm that cross-contamination of the soil underneath has not occurred during stockpiling; testing of the soil's underneath stockpiles will be required after disposal of the stockpile off-site (where necessary).

10.9 Validation of imported fill

If importation of fill is required it must be ***certified VENM or ENM*** material. Certified VENM must be tested in accordance with the requirements of the NSW EPA waste classification guidelines (including testing for asbestos). Certified ENM material is also acceptable and will be tested in accordance with the NSW EPA Resource Recovery Order 2014 for ENM. VENM and/or ENM will also be visually assessed for fibro sheeting and samples analysed for asbestos if detected.



10.10 Duration of remediation and validation works

Based on the proposed scope of the remediation and validation works, it is expected that the works should be completed within approximately four to eight weeks following receipt of the regulatory approvals. This timeframe does not include reporting which should be completed approximately three to five weeks after completion of the remediation and validation works.

10.11 Validation Reporting

The following information will be included in the final validation report to order to render the site suitable for the proposed and development and/or satisfy any NSW EPA Site Audit condition:

- Summarise the contamination assessments carried out and the remediation recommendations provided in previous reports.
- Describe the remediation works carried out on-site and subsequent validation.
- Classify soils within the site for suitable disposal.
- Representative soil sampling and testing to validate site areas.
- Assessment of laboratory analytical results, based on currently accepted and applicable guidelines.
- Assessment of field and laboratory quality assurance (QA) and quality control (QC).
- Assessment of the resultant suitability of the site for the proposed development.
- The preparation of a validation report.
- Provide a statement on the resultant contamination status of the site and suitability for the proposed development.



11.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The quality assurance/quality control (QA/QC) program aims at ensuring that the data collected is sufficiently accurate, precise, and reproducible to be used for the purpose of the validation report. QA/QC should be in accordance with the NEMP 2013 and with the Australian Standard AS4482.1-2005.

11.1 General QA/QC

The frequency required for each field quality assurance / quality control (QA/QC) sample is presented in the table below.

Table 16: QA/QC Frequencies

	Intra Lab	Inter Lab	Rinsate	Spikes	Blanks
Sampling Frequency	1 in 20	1 in 20	1/day	1/day	1/day

During the contamination assessment the integrity of data collected is considered vital. With the assessment of the site, several measures were taken to ensure the quality of the data. These are as follows:

11.2 Sample Containers

Soil samples to be collected remediation work are to be placed immediately into laboratory prepared glass jars with Teflon lid inserts. Standard identification labels are



to be used for each individual container and labelled according to depth, date, sampling team and media collected.

11.3 Decontamination

All equipment used in the proposed sampling program are to be decontaminated prior to use and between samples to prevent cross contamination. Decontamination of equipment involved the following procedures:

- Cleaning equipment in potable water to remove gross contamination;
- Cleaning in a solution of Decon 90;
- Rinsing in clean demineralised water then wiping with clean lint free cloths;

FES adopts a sampling gradient of lowest to highest potential contamination to minimise the impact of cross contamination. This gradient is determined from the historical review and the on-site inspection that was carried out prior to sampling.

11.4 Sample Tracking, Identification and Holding Times

All samples are to be forwarded to NATA Accredited laboratories under recognised chain of custodies with clear identification outlining the date, location, sampler, and sample ID. All samples are required to comply with the laboratories respective holding times. The sample tracking system is considered adequate for the purposes of sample collection.



11.5 Sample Transport

All samples are to be packed into an esky with ice from the time of collection. A trip blank and trip spike are collected where appropriate. Samples were kept below 4°C at all times, soil samples submitted for asbestos analysis are not required to be kept below 4°C.

11.6 Data Quality Indicators

The pre-determined data quality indicators for the validation program are discussed below in relation to precision, accuracy, representativeness, comparability, and completeness and are summarised in the table below:

Table 17: Data Quality Indicator for the proposed Validation Program

Data Quality Indicator	Frequency	DQI Indicator
Completeness		
Data from critical samples is considered valid	All samples	All samples
Satisfactory frequency / result for QC samples	All samples	95%
Field documentation completed	All samples	All samples
Boreholes logs & COCs completed and holding times complied with.	All samples	All samples
Comparability		
Standard operating procedures	All samples	All samples



Data Quality Indicator	Frequency	DQI Indicator
used		
Consistent field conditions, sampling staff and laboratory analysis	All samples	All samples
Same analytical methods used	All samples	All samples
Limit of reporting appropriate and consistent	All samples	All samples
Representativeness		
Sampling appropriate for media and analytes	All samples	All samples
Samples adequately preserved	All samples	All samples
Precision		
SOPs appropriate and complied with in relation to field duplicates	All samples	All samples
RPDs of the field duplicates within control limits	1/20 samples	<50% RPD
RPDs of the laboratory duplicates within control limits	All samples	All samples
Accuracy		
SOPs appropriate and complied with in relation to field blanks	All samples	All samples
Rinsate Blanks, trip blanks & laboratory blanks free of	Laboratory blanks (LB) = 1 per batch	LB = <LOR RB = <LOR



Data Quality Indicator	Frequency	DQI Indicator
contaminants	Rinsate Blanks (RB) = 1 / day Trip Blank (TB)= 1/day	TB= <LOR
Surrogate spikes within control limits	All organic analytes	70-130%
Laboratory control spikes within control limits	Yes	Yes
Matrix Spike recoveries within control limits	1 /20 samples	70-130%
Trip spike recoveries within control limits	1/day	>70%



12.0 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

A site-specific Construction Environmental Management Plan (CEMP) should be prepared for the construction phase for the proposed development. The CEMP should set out the requirements for environmental management during the works including:

- Management structure and responsibilities;
- Approval and licensing requirements;
- Environmental induction and training;
- Emergency contacts;
- Environmental incident response;
- Implementation of the plan;
- Community consultation process consistent with council requirements; and
- Monitoring required during the works and the process for review of the CEMP, if required.



13.0 SITE MANAGEMENT PLAN

Adherence to the SMP will be monitored by an on-site Environmental Scientist who will be present during all critical remediation / validations works. The Site Management Plan (SMP) for the remediation will address:

- Site access;
- Working hours;
- Stormwater and soil management;
- Traffic management;
- Noise, dust, and odour control; and
- Work health and safety.

Each of the issues to be addressed in the site management plan is briefly discussed in the following sections.

13.1 General

The remediation and validation work must be undertaken in accordance with applicable statutory requirements. The site manager/foreman of the remediation contractor should have a thorough understanding of the contents of the RAP, corresponding Site Management Plan (SMP), Work Health & Safety Plan (WHS) and should ensure that each employee or sub-contractor is familiarised with the requirements of these plans.

The remediation and validation work will be undertaken under the monitoring of the principal's environmental representative, who will be represented on-site by a field environmental scientist.



13.2 Site access

The contractor will ensure that adequate barriers have been placed around the site to prevent access of unauthorised personnel to areas where contaminated material is exposed. The contractor will also place adequate warning signs around the site.

13.3 Working hours

The working hours for the remediation / validation works will be between 7.00am to 5.00pm Mondays to Fridays and 7.00am to 1.00pm on Saturdays. No work will be carried out on Sundays and public holidays.

13.4 Demolition (including Asbestos Management)

Demolition works are to be completed in accordance with SafeWork NSW Standards and Codes of Practice. Any asbestos identified within the building materials should be managed in accordance with the SafeWork NSW Codes of Practice and Australian Standards.

13.5 Surface water and soil management

The contractor will put in place adequate stormwater runoff, run-on and sediment control measures for the remedial works. These requirements are outlined in Schedule B (9) of the (*site contamination*) NEPM (2013).



These include stockpiling excavated soil in a manner that will prevent contamination from being transported off-site by stormwater, and include the following measures:

- Divert stormwater runoff outside the site so that it does not flow through the site;
- Control drainage on the site by intercepting and redirecting runoff in a controlled manner;
- Stormwater collected at the site in trenches and sumps should be appropriately managed; and
- Silt stop fences should be erected at locations where stormwater may flow outside the site.

The presence of sediment in surface water or runoff must be minimised using sediment controls such as diversion drains, hay bales and silt fencing.

Soils that require stockpiling must be managed in such a manner that these materials remain well contained and easily identifiable and that the effects of wind and rain have minimal impact on their integrity. Subsequently, if adverse weather conditions are anticipated, or if the stockpile is to remain on-site for an extended period, stockpiles must be protected and covered. Stockpile records must be maintained to track the re-use of soils at the site (if any).

Any plant or equipment that encounters soils must be inspected prior to leaving the site, and cleaned as necessary.



13.6 Groundwater management

If groundwater is encountered during excavation works, the groundwater is to be directed to and collected in trenches and sumps. No discharge of groundwater will occur without approval of appropriate regulatory bodies.

13.7 Traffic management

The management of the material leaving the site will be under the monitoring of the principal's environmental representative, who will record the details of these materials.

Vehicular movement is to be conducted in accordance with Council requirements. The contractor will install a vehicle wheel washing or shaking facility and will manage all vehicles as indicated by the principal's environmental representative (FES) to minimise tracking of any materials onto public roads. The wheels of the vehicles will be washed and brushed prior to leaving the site. Loads leaving the site should be maintained moist and must be covered to prevent materials from the site being spilled or left on public or private roadway or adjacent areas. Care should be taken if UST or any unexpected material have been encountered and are to be removed from the site.

13.8 Noise Control

The contractor should keep noise levels to a minimum and levels should not exceed limits indicated in AS 2436 1981. Noise levels must also comply with Council and NSW EPA requirements. It is expected that the equipment to be used in the remediation works will not generate noise levels above these requirements.



13.9 Dust control

Works must comply with the requirements listed in Schedule B (9) of the NEPM (2013), Council and the NSW EPA. The generation of dust should be kept to a minimum. Stockpiled contaminated material should be bunded and covered. Water sprays may be used to minimise dust. Water used for this purpose should not be allowed to flow off-site through the stormwater system, sewer, or any other way.

13.10 Odour control

The level of odours generated during remedial activities must be monitored and local Council and NSW EPA requirements must be complied with. Due to the nature of contamination, odours may be encountered. It is noted however that it is expected only small volumes of fill will be excavated at one time and this should minimise the generation of significant odours.

Should odorous compounds be encountered, the remediation contractor should take measures to mitigate them and to prevent their migration outside the site boundaries. This may involve placing the odorous materials as soon as possible in a bunded area, covered with plastic membrane, and spraying with an odour suppressant approved by the environmental consultant.

13.11 Work Health and Safety Plan

As personnel on-site may be exposed to potentially toxic or hazardous compounds, the Contractor will prepare a site-specific Work Health and Safety Plan (WHS) prior to commencement of remediation and validation work in accordance with relevant



legislation. The WHS will identify hazards, assess the risks posed by the hazards and recommend measures to control the hazards. This should include detailed descriptions of vehicle decontamination, protective clothing, equipment, and appropriate safety controls that will be adopted during remediation and validation works carried out at the site.

If odours are detected at areas around the site PID measurements will be collected by the on-site Environmental Scientist. If PID readings >30 ppm is recorded breathing masks should be worn by workers in the vicinity of the odour and >300 ppm odour suppressants as well as controlled excavations should be applied.

Personnel working on the site are required to read, understand, and apply the requirements of the WHS. All staff working on the site must be inducted by an authorised induction trainer and must sign the relevant induction form.

13.12 Waste / Soil Management Plan (Importation, stockpiles, tracking & disposal)

13.12.1 Imported Soil

Importation of any soil, rock or aggregate is required to meet the following requirements:

- They must be legally able to be imported onto the site in accordance with the Protection of the Environment Operations (Waste) Regulation 2014 and any required consent approvals;
- The soils must meet the remediation criteria for the site (refer to Section 4);
- The soils must be classified as Virgin Excavated Natural Material (VENM), Excavated Natural Material (ENM) or other materials legally able to be imported



onto the site based on a Resource Recovery Exemptions. Where available VENM should be imported in preference to ENM. Soils must be assessed in accordance with the EPA requirements;

- Prior to importation appropriate documentation needs to be provided to, and approved by, the Environmental Consultant and the materials must be inspected at the source site to confirm that there are no signs of contamination;
- The material must be inspected during importation by the Contractor, and any materials not meeting the description given in the provided documentation or displaying signs of contamination will be rejected.
- Volume of imported material;
- Appropriate asbestos analysis is required for site suitability (as per WA DOH 2009) if it is not a quarried product;
- Transporter details; and
- Placement located onsite.

For waste classifications the following documentation is required:

- Waste classification document;
- Material source and description;
- Sampling density, sampling patterns, COPCs;
- Result summary, including appropriate table with comparison to acceptance criteria; and
- Waste classification.



13.12.2 Stockpiles

Stockpiles should be managed to minimise the risk of dust generation, erosion, and leaching. The measures required to achieve this should include:

- Restrict the height of stockpiles to reduce dust generation;
- Construct erosion, sediment, and runoff control measures;
- Cover stockpiles of contaminated soils to be left on site for more than 24 hours, or if windy conditions are expected;
- Manage the potential for leaching

13.12.3 Waste Tracking

All transport of waste and disposal of materials must be conducted in accordance with the requirements of the POEO Act. All licences and approvals required for disposal of the material will be obtained prior to removal of the materials from the site.

Removal of waste materials from the site shall only be carried out by a licensed contractor holding appropriate licence, consent and/ or approvals to dispose of the waste materials according to the assigned waste classification, and with the appropriate approvals obtained from the EPA, if required. Details of all soils removed from the site (**including VENM**) shall be documented by the Contractor with copies of weighbridge slips, tip tickets and consignment disposal confirmation (where appropriate) provided to the Environmental Consultant and the contractor.

A site log shall be maintained by the Contractor to track disposed loads against on-site origin. Transport of spoil shall be via a clearly delineated, pre-defined haul route. The proposed waste transport route will be notified to the local Council and truck dispatch



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

Details of all soils removed from the site (including VENM) shall be documented by the Contractor with source location, volume/tonnage, waste classification, disposal date, disposal destination, copies of weighbridge slips, landfill receipts/disposal docket, tip tickets and consignment disposal confirmation (where appropriate) provided to the Environmental Consultant and/or the NSW EPA Accredited Site Auditor.

Material tracking needs to include information on source location, volume /tonnage, waste classification, disposal date, disposal destination, disposal docket, including waste locate consignment number of any asbestos soil waste disposed, transporters details (including EPL No) and a tally of estimated versus actual volume disposed.

13.12.4 Special Waste (Asbestos Waste)

All transport of waste and disposal of materials must be conducted in accordance with the requirements of the POEO Act. All licences and approvals required for disposal of the material will be obtained prior to removal of the materials from the site.

Asbestos transporters and facilities receiving asbestos waste in NSW weighing more than 100 kilograms or consisting of more than 10m² of asbestos sheeting in one load must track and report this waste to NSW EPA using WasteLocate.

Tracking of asbestos waste is to be done via the NSW EPA's online system known as WasteLocate.



Removal of waste materials from the site shall only be carried out by a licensed contractor holding appropriate licence, consent and/ or approvals to dispose of the waste materials according to the assigned waste classification, and with the appropriate approvals obtained from the EPA, if required. Details of all soils removed from the site shall be documented by the Contractor with copies of weighbridge slips, tip tickets and consignment disposal confirmation (where appropriate) provided to the Environmental Consultant and the contractor.

A site log shall be maintained by the Contractor to track disposed loads against on-site origin. Transport of spoil shall be via a clearly delineated, pre-defined haul route. The proposed waste transport route will be notified to the local Council and truck dispatch shall be logged and recorded by the Contractor for each load leaving the site. A record of the truck dispatch will be provided to the contractor.

13.12.5 Waste Disposal

All off-site disposal of wastes, where appropriate, will be undertaken in accordance with the POEO Act.

Any soil and rock to be removed from the site will be classified in accordance with either:

- The NSW EPA Waste Classification Guidelines 2014; or
- A General or Specific Exemption under the Protection of the Environment Operations (Waste) Regulation 2014.

No soils should leave the site without a formal waste classification.



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

A record of the disposal of materials will be maintained. Copies of all consignment notes for the transport, receipt, landfill receipts and disposal of all materials (**including VENM**) will be maintained as part of the site log and made available to the Environmental Consultant for inspection and reporting purposes upon request.

Removal of waste materials from the site shall only be carried out by a licensed contractor holding appropriate licence, consent and/ or approvals to dispose of the waste materials according to the assigned waste classification, and with the appropriate approvals obtained from the EPA, if required. **Details of all soils removed from the site (including VENM) shall be documented by the Contractor with copies of weighbridge slips, landfill receipts, tip tickets and consignment disposal confirmation (where appropriate) provided to the Environmental Consultant and the NSW EPA Accredited Site Auditor.**

13.13 Community Engagement

Community engagement should be consistent with council requirements in relation to the development application conditions. The client as listed in Section 15.1 is responsible for implementing community consultation and complaint handling.



14.0 OPERATIONAL CONTROLS

14.1 Fire and explosion hazard

Explosive atmospheres may be present where any petroleum products or other potentially flammable or explosive substance is encountered / used, including machinery. Therefore, the contractor will put into place measures to prevent fires and explosions, which include:

- pumping and degassing of tanks prior to removal;
- preventing access to the site by unauthorised persons;
- forbidding smoking or using naked flame at the site;
- cutting of concrete to be carried out under a blanket of water in proximity to any underground storage tanks;
- approved fire extinguishers to be maintained in proximity to excavations;
- ensuring that no free product or fuel used for refuelling equipment enters a confined space or drainage/sewer system; and
- using only certified flameproof equipment in proximity to locations where free petroleum fuel is present or is expected to be present.

14.2 Public complaints registry

Given the nature of the remediation and validation works, it is considered that community consultation should be consistent with council requirements in relation to the development application conditions.



14.3 Duties of the on-site environmental scientist

The duties of the on-site environmental scientist include:

- ensure adherence to the Remediation Action Plan, the Work Health and Safety Plan and other plans applicable to the site;
- monitor the excavation of contaminated material undertaken at the site;
- ensure environmental compliance of contractors;
- monitoring with a PID the areas adjacent to open excavated pits at least three times throughout the day, and at additional times if strong or unusual odours or if unusual substances are encountered during the excavations part of the remediation works;
- inspection of the integrity of the sediment controls placed around the site;
- inspection at approximately two hourly intervals of the roadway in the vicinity of the site used by the vehicles leaving the site to ensure that no significant amounts of materials have been tracked off-site by vehicles;
- immediately report actual or potential non-compliances to the principal's environmental representative who will report those to appropriate regulatory bodies;
- note weather conditions, approximate temperature, direction and velocity of the wind, and rainfall at the commencement of work, at about midday and at the end of the day;
- collect samples for validation or other purposes as required by the principal's environmental representative;
- maintain a site diary which will record the following information:
 - date
 - weather conditions
 - presence of odours at the site and at the site boundaries



- PID measurements
- details of materials excavated during the remediation works, and details of actions taken if unexpected materials are encountered
- details of accidents, near misses or incidents, which may have resulted in injury, and the actions taken to prevent their recurrence
- details of environmental issues, which may result in environmental incidents and measures taken to correct them
- details of visitors to the site or other matters relating to environmental or health issues

14.4 Unexpected occurrences

If during remediation works, significant odours and/or evidence of gross contamination not previously detected are encountered, or any other significant unexpected occurrence, site works should cease in that area, at least temporarily, and immediate action taken to abate the odours or prevent / manage cross-contamination occurring. If required, the administering authority will be notified in writing within two working days of significant unexpected occurrence and informed of the remediation actions implemented.

14.5 Non-compliances

If the on-site environmental scientist suspects that some works carried out at the site do not comply with the requirements of the RAP, the WHS or other plans applicable to the site, this should be reported immediately to the principal's environmental representative. If the principal's environmental representative cannot be contacted or if immediate action is required, the on-site environmental scientist has authority to stop



the work or request appropriate action to be taken. This is particularly the case under the following circumstances:

- injury to person due to exposure to materials excavated from the site;
- spillage of materials at the site or on areas adjacent to the site; and
- other events that the environmental scientist believes could give rise to unacceptable risk to human health or to adverse impact to the site or to areas adjacent to the site.



15.0 CONTINGENCY MANAGEMENT

The conditions that may be encountered when excavating is uncertain. As unknown and variable subsurface conditions impose a degree of uncertainty for the project a set of anticipated conditions has been assumed in developing the excavation plan. However, because field conditions vary, flexibility has been built into the excavation plan to adapt to differing conditions.

Table 18: Contingency Management

Anticipated Problem	Corrective Action by Contractor
Asbestos cement sheeting, lagging, pipping etc.	Stop excavations if there is the potential for people to inhale airborne asbestos fibres. Contact FES immediately to assess whether the material is asbestos. Cover the area with plastic and suppress dust by wetting down if needed. Place a warning sign at the entrance to the site where asbestos removal or site remediation is taking place. Adhere to WHS regulations and follow the unexpected finds protocol outlined in 15.2 & Appendix A.
Discovery of USTs	Stop excavations, contact FES immediately. Follow the unexpected finds protocol and UST finds protocol outlined in section 15.2 & 15.3 & Appendix A.
Chemical spill / exposure	Stop work, refer to Occupational Health, Safety and Rehabilitation Plan and immediately contact FES.
Excessive rain	Maintain access roads, cover high-traffic areas with gravel; or cover working areas/stockpiles with plastic during off-shifts; or shut down operations until runoff is more manageable. Inspect & maintain sediment control pond & filter fences.
Unmanageable mud in excavation zone	Improve drainage collection system; add geotextile/gravel in problem areas; or strip off mud/slurry materials; or excavate from the top of the fill.



Excessive drainage	Minimise active/contaminated work area; or improve diversion clean run-on; or maintain sufficient on-site wastewater storage capacity; or mobilise additional storage and/or treatment systems as needed.
Excessive dust	Use water sprays or biodegradable dust sprays, or cease dust-generating activity until better dust control can be achieved, or apply interim capping systems.
Sediment pond water for discharge – analytical results exceed site response levels	Perform in-situ treatment, e.g., flocculants dosing, until response levels are met. Alternatively arrange off-site disposal by a licensed Contractor.
Excessively wet materials	Stockpile and dewater on-site; or add absorbents.
Equipment failures	Maintain spare equipment or parts; or maintain alternate rental options; or shut down affected operations until repairs are made.
Release of fuel/oil from machinery	Remove source, use absorbent booms to remove oil and make any repairs as required.
Silt fence fails	Stop work and repair fence to specifications.
Excessive noise	Identify source and review noise attenuation equipment and as necessary provide silencers on noisy equipment.



Excessive odours / vapours	<p>If excessive organic odours / vapours are generated, stop works and monitor for volatiles at the site boundaries using PID and upgrade PPE if necessary.</p> <p>Implement control measures including respirators for on-site workers, wetting down excavated material, use of odour and volatile suppressing agents to eliminate or reduce odours as required and/or cover odorous material if practicable.</p> <p>FES notes that no nuisance odours shall be detected at any site boundary as part of the remedial works. If odours/vapours are detected then it is recommended, as part of the CEMP & community consultation procedure, that the project manager, client, and remediation contractor:</p> <ol style="list-style-type: none"> 1. Notify the owners / occupiers of the adjoining premises in writing regarding the potential odour issues. Include contact details for any concerns in relation to the odour emissions during remediation. 2. Temporarily pause site works to allow excessive odour to subside whilst implementing the control measures. 3. Record logs for volatile emissions and odours.
Excavation extends below water table into natural materials which are assessed and confirmed to comprise potential acid sulphate soils (PASS).	Implement Acid Sulphate Soils management plan. This will include on-site treatment of the soils in the excavation area. Treatment would likely involve lime addition at a rate to be calculated using methods specified in the ASS Manual (1998).
Unearthing drummed material	Isolate and contact Superintendent. Arrange temporary storage in a secure part of the remediation site (to be nominated).
Identification of cultural or building heritage items	Stop work and notify project manager. Follow the unexpected finds protocol as detailed in section 15.2 & Appendix A.



Complaint Management	Notify client, project managers, and environmental consultant following complaint. Report complaint as per internal procedures, implement control measures to address complaint and notify complainant of the results of the remedial actions.
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In addition to the above listed contingencies, the following steps may need to be undertaken should non-spadeable sludge's or buried drums be discovered during the remediation works:

- upgrade of personal protective equipment (PPE), for workers within the active work zone, in accordance with the site Occupational Health, Safety and Rehabilitation Plan;
- segregation and bunding of discovered material;
- use of odour suppressants (where appropriate);
- cover the discovered material with plastic sheeting;
- appropriate sampling and analysis to assess potential contaminants; and
- appropriate off-site disposal of the materials following receipt of analytical results and any associated regulatory approvals required.



15.1 Contact Persons

Table 19: Contact Persons

Responsible Party	Details
Principal Environmental Representative	Foundation Earth Sciences PO Box 4405, East Gosford NSW 2250 Benjamin Buckley 0466 385 221
Project Manager and Client	Bonython Elanora Pty Ltd Rachel Hulks

15.2 Unexpected Finds Protocol

The sampling strategy for each “unexpected find” shall be designed by a suitably qualified environmental consultant. The strategy will, however, be aimed at determining the nature of the substance – that is, is it hazardous and, if so, at concentrations which pose an unacceptable risk to human health or the environment.

The sampling frequency of the identified substance / materials shall meet the following minimum requirements:

- Excavation Floor
 - 1 sample every 25m²
 - Samples should be analysed for the chemicals of concern.
- Excavation Wall
 - 1 sample every 5m (from each distinct horizon / material type)
 - Samples should be analysed for the chemicals of concern.

All additional works should be documented using field notes, site photographs, site plans and reporting.



Refer to **Appendix A** for a copy of the Unexpected Finds Protocol.

15.3 USTs

Any unexpected USTs found within the site should be removed in accordance with SafeWork NSW & UPSS Regulation 2014 requirements, and AS4897-2008: The design, installation, and operation of underground petroleum storage systems. In the event of conflict between the guidance documents, the latter shall prevail. Due to the volatile nature of petroleum storage tanks, it is recommended that the USTs be excavated and disposed of by an experienced contractor and with an environmental representative present.

Following the removal of any USTs and associated visibly stained or odorous soils, in samples should be collected from the walls and floor of the tank-pits/hotspots and submitted to a NATA accredited laboratory for analysis. The targeted analytes should be, but not be limited to, heavy metals, TPH, BTEX & PAH.

The minimum sampling protocols to be used for unexpected UST areas include:

- 3 samples per backfill UST sands per UST pit;
- 1 sample per tank line;
- 1 sample per vent pipe area;
- 1 sample per spill box (currently not present but may be found);
- 2 base samples and 8 walls (2 samples per wall face) of each tank pit



15.4 Groundwater Contingency

If groundwater contamination is observed during the remediation process, it is recommended to assess the potential impact on the proposed development.

16.0 REGULATORY APPROVALS AND LICENSES

16.1 State Environmental Planning Policies

State Environmental Planning Policy No 55 (SEPP 55) – Remediation of Land sets the regulatory framework for contaminated land and remediation works in NSW. SEPP 55 defines the regulations for Category 1 and Category 2 remediation works. The remedial works to be undertaken at the site constitute Category 2 works (as defined in SEPP 55). Appropriate permissions for remediation should be obtained prior to commencement.

16.2 State Protection of the Environmental Operations (UPSS) Regulation 2014

UPSS Regulation requires if a storage system is decommissioned, a report for the storage system must be served on the relevant authority within 60 days of decommissioning or remediation is completed. The report must be prepared by a duly qualified person in accordance with EPA guidelines, and must describe the processes used to decommission the storage system and assess contamination at the storage site.



16.3 Duty to Report

Under Section 60 of the Contaminated Land Management Act 1997, the owner of the land is required to notify contamination in circumstances as indicated in the NSW EPA (2015) *Guidelines on Duty to Report Contamination under the Contaminated Land Management Act 1997*.

Sites that are significantly impacted by soil, groundwater and ground gases are likely to require notification to the NSW EPA under section 60 of the CLM Act. A decision process for use by site owners or responsible persons considering reporting contamination under section 60 is provided in Appendix 1 (Figure 1) of the guidelines.

No notification to NSW EPA is recommended based on the sampling and investigation to date.

16.4 Development Consent and Control Plans

All works should be in accordance with the Council Development Control Plans and any development consent issued by Council for the development.

16.5 Asbestos Removal Regulations / Work Health Safety Regulations

16.5.1 General

The removal and disposal of asbestos will be managed in accordance with the Work Health and Safety Act (2011) and Work Health and Safety Regulation (2011), "How to Safely Remove Asbestos: Code of Practice (WorkCover 2012), the, SafeWork NSW Guidelines and the NSW EPA Waste Classification Guidelines.



Health screening for asbestos in soil, which are based on scenario-specific likely exposure levels, are adopted from the WA DoH guidelines and are referred in Table 7 in Schedule B1.

The WHS Regulations require a person conducting a business or undertaking who commissions the removal of asbestos at the workplace must also ensure asbestos removal work is carried out only by a licensed asbestos removalist who is appropriately licensed to carry out the work, unless specified in the WHS Regulations that a licence is not required.

If asbestos is non-friable, is more than 10m² and has been determined that it should be removed, it must be removed by a licensed asbestos removalist as soon as reasonably practicable. Where it is not reasonably practicable to remove it, control measures must be put in place to eliminate any exposure, so far as is reasonably practicable, or to minimise exposure so far as is reasonably practicable, but always ensuring the exposure standard is not exceeded.

Class A License can remove any amount or quantity of asbestos or ACM, including:

- any amount of friable asbestos or ACM
- any amount of ACD
- any amount of non-friable asbestos or ACM

Class B Licence can remove:

- any amount of non-friable asbestos or ACM



- Note: A Class B licence is required for removal of more than 10 m² of non-friable asbestos or ACM but the licence holder can also remove up to 10 m² of non-friable asbestos or ACM)
- ACD associated with the removal of non-friable asbestos or ACM
 - Note: A Class B licence is required for removal of ACD associated with the removal of more than 10 m² of non-friable asbestos or ACM but the licence holder can also remove ACD associated with removal of up to 10m² of non-friable asbestos or ACM

16.5.2 Notification of Asbestos Removal Works

WorkCover must be notified five days before licensed asbestos removal work is commenced.

Asbestos removalists licensed in NSW can lodge the notification electronically using WorkCover's Asbestos and demolition online notification system or complete the form.

Interstate asbestos removalists who hold an asbestos removal licence issued under another Work Health and Safety Regulation must lodge the notification by completing the notification form.

16.5.3 Notification of Respirable Asbestos Fibre Levels at more than 0.02 fibres / ml

WorkCover must be notified within 5 days when the respirable asbestos fibre levels exceed 0.02 fibres/ml in the removal area.



NSW licensed asbestos removalists and interstate asbestos removalists who hold an asbestos removal licence issued under a work health and safety regulation must lodge the notification by completing the notification form.

16.5.4 Notification of the Emergency Demolition of a Structure or plant involving Asbestos

Notification of the demolition or refurbishment of a structure or plant is required for the following:

- that was constructed or installed before 31 December 2003;
- is in either a workplace or a residential premise where an emergency has occurred;
- the structure or plant must be demolished; and
- asbestos is fixed or installed in the structure or plant before the emergency has occurred.

Demolition or refurbishment does not include minor or routine maintenance work or other minor work.

An emergency is defined if:

- a structure or plant is structurally unsound
- collapse of the structure or plant is imminent.



The person with management or control of the workplace or, if in residential premises, the licensed asbestos removalist must notify WorkCover by completing the notification form.

Interstate asbestos removalists who hold an asbestos removal licence issued under another work health and safety regulation must also notify WorkCover if the work is in NSW.

Completed notification forms can be lodged by:

- contact (02) 8260 5885
- email to adu@safework.nsw.gov.au
- delivery to 92-100 Donnison Street, Gosford 2250 or any Safework office

Asbestos notifications are free and the asbestos and demolition hotline number is (02) 8260 5885.

16.6 Protection of the Environment Operations (Waste) Regulations 2005

The regulations make requirements relating to non-licensed waste activities and waste transporting.

Section 42 of the Regulation stipulates special transportation, re-use or recycling requirements relating to asbestos waste and must be complied with regardless whether the activity is licensed.

The requirements for the transportation of asbestos waste include:

- bonded asbestos material must be securely packaged at all times,



- friable asbestos material must be kept in a sealed container,
- asbestos-contaminated soils must be wetted down,
- all asbestos waste must be transported in a covered, leak-proof vehicle.

The requirements relating to the off-site disposal of asbestos waste are as follows:

- asbestos waste in any form must be disposed of only at a landfill site that may lawfully receive the waste,
- when asbestos waste is delivered to a landfill site, the occupier of the landfill site must be informed by the person delivering the waste that the waste contains asbestos,
- when unloading and disposing of asbestos waste at a landfill site, the waste must be unloaded and disposed of in such a manner as to prevent the generation of dust or the stirring up of dust,
- asbestos waste disposed of at a landfill site must be covered with virgin excavated natural material or other material as approved in the facility's environment protection licence.

Section 48 of the Regulation requires that wastes are stored in an environmentally safe manner. It also stipulates that vehicles used to transport waste must be covered when loaded.

16.7 Other licences required

Transporters of contaminated waste are required to be licensed to transport contaminated waste to licensed landfills. Landfills are required to be licensed for the category of waste they are scheduled to receive.



Waste classification documentation and waste dockets from the receiving landfill should be kept on file for site validation purposes.

If water is discharged as part of any dewatering activities, the relevant discharge consents must be obtained.

The appointed site contractor should prepare appropriate Construction Environmental Management Plans CEMP, work health safety plans & other plans required by the Council DA and DCPs. Where asbestos removal is required, the contractor must be appropriately licensed to carry out the designated works.



17.0 CONCLUSION

The proposed development plans indicate that the new Elanora Hotel will run through Lots 3 & 4 in DP 1016073, Lot 15 in DP1061216 and Lot 7A in DP365458. The Hotel will be 3 storeys high, with each level having 15 rooms. The carparking area will be extended between the hotel and the Elanora Hotel pub, and a carparking area will be located underneath and extended outdoor eating area. The current hand carwash dwelling will be removed to allow for more carparking spaces, which will be landscaped. The commercial dwelling along Victoria Street in Lot 7 in DP658304 will be refurbished into a bottle shop.

The remediation goal is to render the site suitable for the proposed development upon completion of the remediation and validation works. This would be achieved by remediating the:

- Soil remediation is currently limited to the asbestos impacted locations surrounding F1 & F2 to depth of 0-0.1m;

Therefore, it is considered that the site will be made **suitable** for the proposed development, subject to the implementation of the remediation and validation works in accordance with this RAP. No recommendations for further works are proposed pending successful implementation of the RAP.

The following assumptions have been utilised in concluding the site will be considered **suitable**:

- Removal of impacted fill material from the areas of concern and dispose of appropriately.



- Collection of validation samples from the areas of concern.
- Contaminant concentrations in the validation samples are shown to be below the adopted site validation criteria.
- Data collected and generated during the project is considered appropriate to allow decisions to be made with confidence. Specific limits for the project have been applied in accordance with the appropriate guidance documents from the NSW EPA, NEPM 2013, appropriate indicators of data quality (DQIs used to assess quality assurance / quality control) and standard operating FES procedures for field sampling and handling.



18.0 REFERENCES

- ANZG (2018) “Australian and New Zealand Guidelines for Fresh and Marine Water Quality”, Australian and New Zealand Governments and Australian State and Territory Governments, Canberra ACT.
- Department of Urban Affairs and Planning – EPA (1998) *“Managing Land Contamination – Planning Guidelines – SEPP 55 – Remediation of Land”*.
- HEPA 2020, ‘PFAS National Environmental Management Plan’, Version 2, 2020.
- National Environmental Protection Council (NEPC) (1999) – *National Environmental Protection (Assessment of Site Contamination) Measure. Amendment 2013*
- National Health and Medical Research Council (NHMRC) & National Resource Management Ministerial Council (NRMMC) “National Water Quality Management Strategy, Australian Drinking Water Guidelines” (2011)
- NSW EPA (2014) *“Technical Note: Investigation of Service Station Sites”*.
- NSW EPA (2020), “Consultants Reporting on Contaminated Land”. NSW Environment Protection Authority, Parramatta
- NSW DEC “Guidelines for the NSW Site Auditor Scheme” (2017, 3rd edition). NSW Environment Protection Authority, Sydney.
- NSW EPA (2014) – “Waste Classification Guidelines, Part 1: Classifying Waste”;
- NSW EPA (2015) “Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997”;
- NSW EPA “Sampling Design Guidelines” (1995). NSW Environment Protection Authority, Sydney.
- US EPA “Regional Screening Level (RSL) Summary Tables” (2016). United States Environment Protection Authority.



19.0 LIMITATIONS

Whilst to the best of our knowledge, information contained in this report is accurate at the date of issue, although subsurface conditions, including groundwater levels and contaminant concentrations, can change in a limited time. This should be borne in mind if the report is used after a protracted delay.

There is always some disparity in subsurface conditions across a site that cannot be fully defined by investigation. Hence it is unlikely that measurements and values obtained from sampling and testing during environmental works carried out at a site will characterise the extremes of conditions that exist within the site.

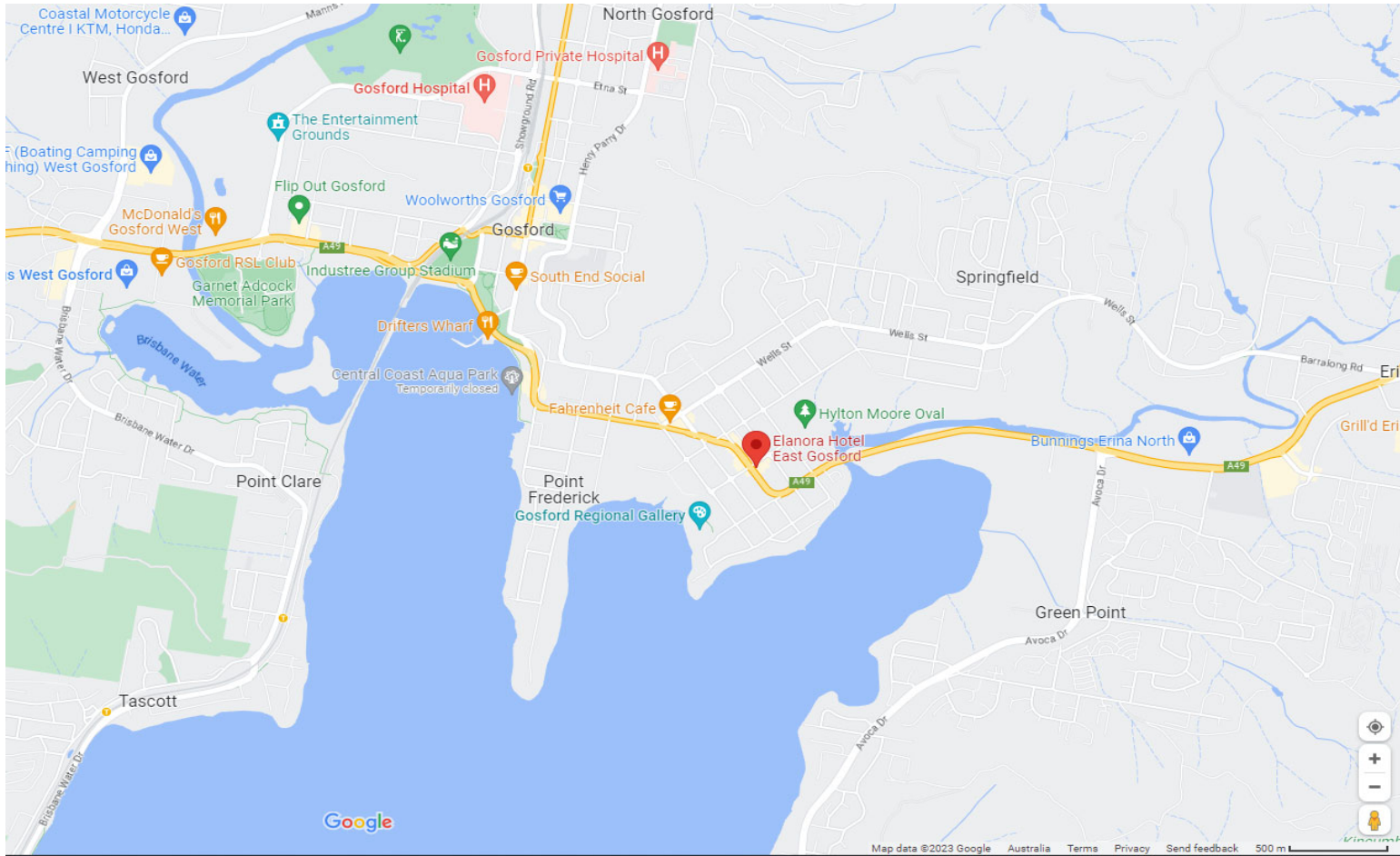
There is no investigation that is thorough enough to preclude the presence of material that presently or in the future, may be considered hazardous at the site. Since regulatory criteria are constantly changing, concentrations of contaminants presently considered low may, in the future, fall under different regulatory standards that require remediation.

Opinions are judgements, which are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions.



FIGURE 1: SITE LOCATION





Key

Site Location



DRAWN
KV

FIGURE
1

Job #

E3019-4

SITE LOCATION

Bonython Elanora Pty Ltd

29-31 and 41-45 Victoria St, 27 Adelaide St, 16 & 20 Brougham Street, East Gosford
NSW

FIGURE 2: SITE FEATURES, BOREHOLE LOCATIONS, IMPACTED LOCATIONS & EXCEEDANCE PLAN

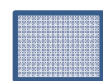




Feature No	Details
a	Elanora hotel
b	Commercial
c	Fire station
d	Carpark
e	Vacant building

Soil Exceedance (mg/Kg)

Groundwater Exceedance (ug/L)



Impacted Areas



Proposed Building Footprint



Key
Site Location
FES 2023 Soil Sampling Locations
FES 2023 Water Sampling Locations



DRAWN DG
Figure 2
Job # E3019-4

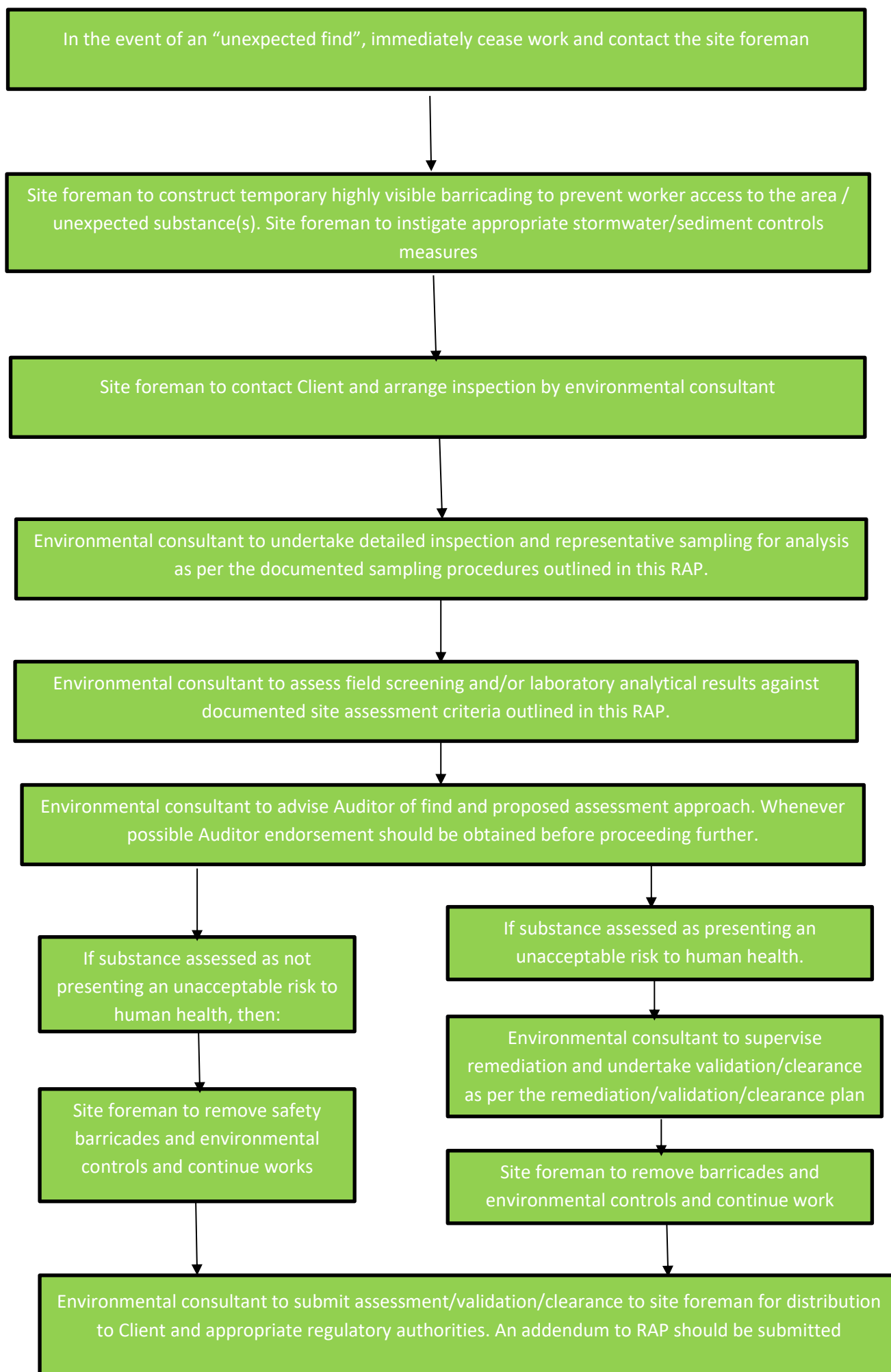
Site Features, Borehole Locations, Impacted Areas and Exceedance Plan

Bonython Elanora Pty Ltd

29-31 and 41-45 Victoria St, 27 Adelaide St, 16 & 20 Brougham Street, East Gosford NSW

APPENDIX A: UNEXPECTED FINDS PROTOCOL





APPENDIX B: PROPOSED DEVELOPMENT PLANS





TSS TOTAL SURVEYING
SOLUTIONS

LANE COVE | CAMDEN | MANLY VALE | CENTRAL COAST

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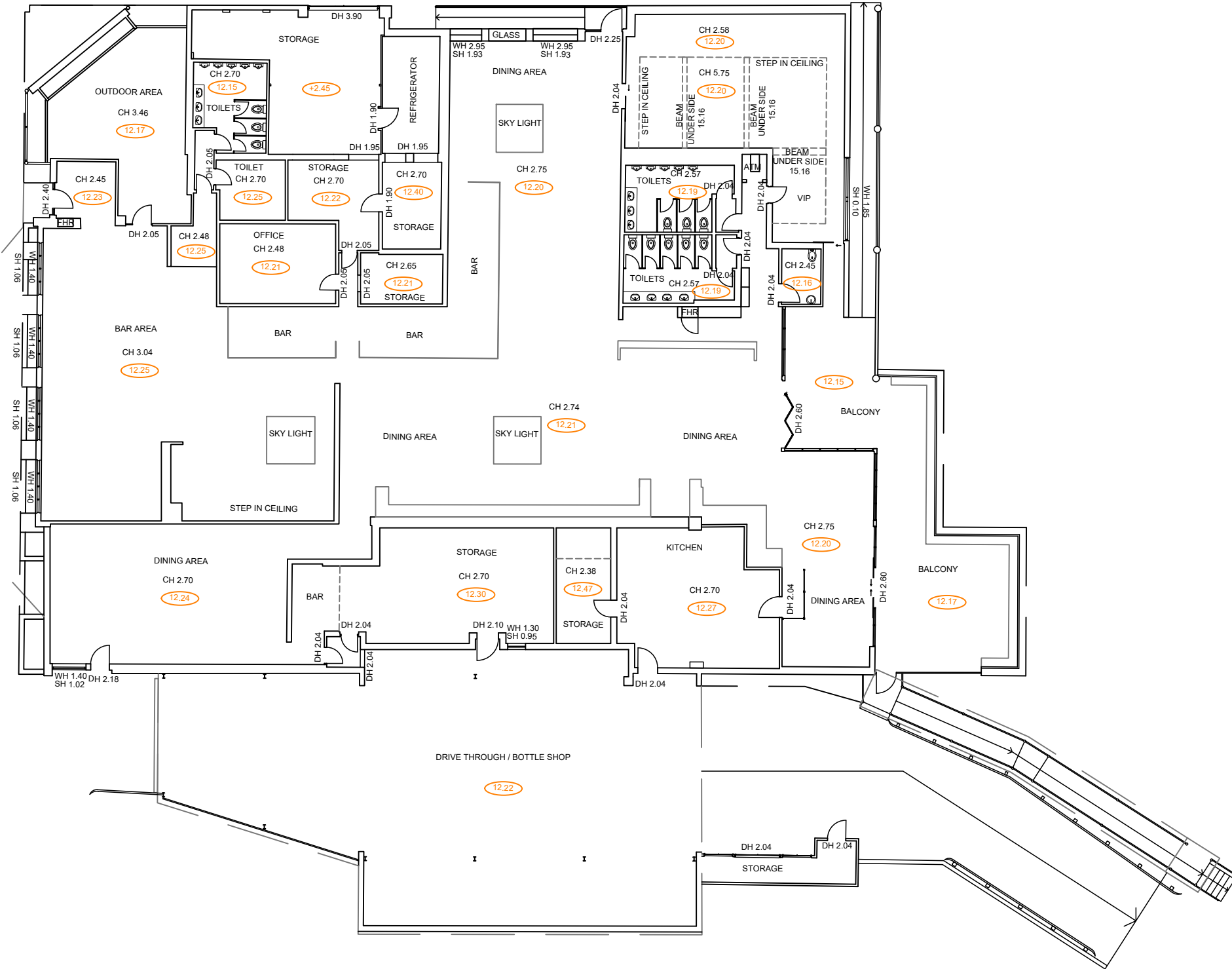
**PLAN SHOWING DETAIL & LEVELS
UNDERGROUND**

CLIENT: Bonython Property & Investments Pty Limited
PROJECT: Elanora Hotel
ADDRESS: 41 Victoria St, East Gosford NSW 2250

JOB No.: 190897	LGA: CITY OF GOSFORD
PLAN No.: 9000	DATUM: AHD
DATE: 17/10/2022	SCALE: 1:250@A3
DRAWN: EJ	CONT. INTERVAL: N/A
CHK: JS	SHEET 1 OF 4

ADELAIDE STREET

VICTORIA STREET



M.G.A.



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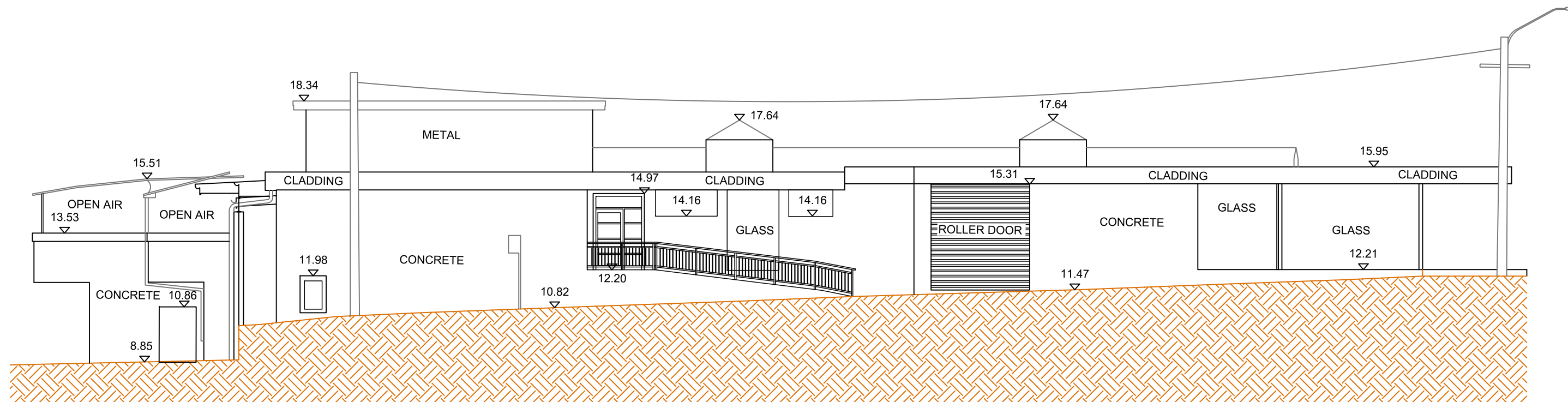
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PLAN SHOWING DETAIL & LEVELS
GROUND

CLIENT: Bonython Property & Investments Pty Limited
PROJECT: Elanora Hotel
ADDRESS: 41 Victoria St, East Gosford NSW 2250

JOB No.: 190897	LGA: CITY OF GOSFORD
PLAN No.: 9001	DATUM: AHD
DATE: 17/10/2022	SCALE: 1:250@A3
DRAWN: EJ	CONT. INTERVAL: N/A
CHK: JS	SHEET 2 OF 4



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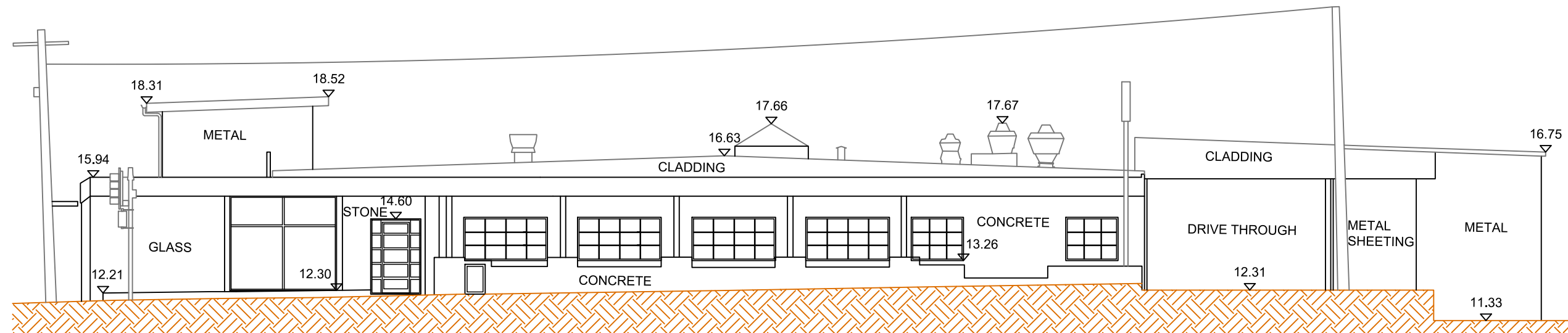
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ELEVATION SHOWING DETAIL & LEVELS ADELAIDE STREET VIEW

CLIENT: Bonython Property & Investments Pty Limited
PROJECT: Elanora Hotel
ADDRESS: 41 Victoria St, East Gosford NSW 2250

JOB No.: 190897	LGA: CITY OF GOSFORD
PLAN No.: 9002	DATUM: AHD
DATE: 17/10/2022	SCALE: 1:150@A3
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CHK: JS	SHEET 3 OF 4



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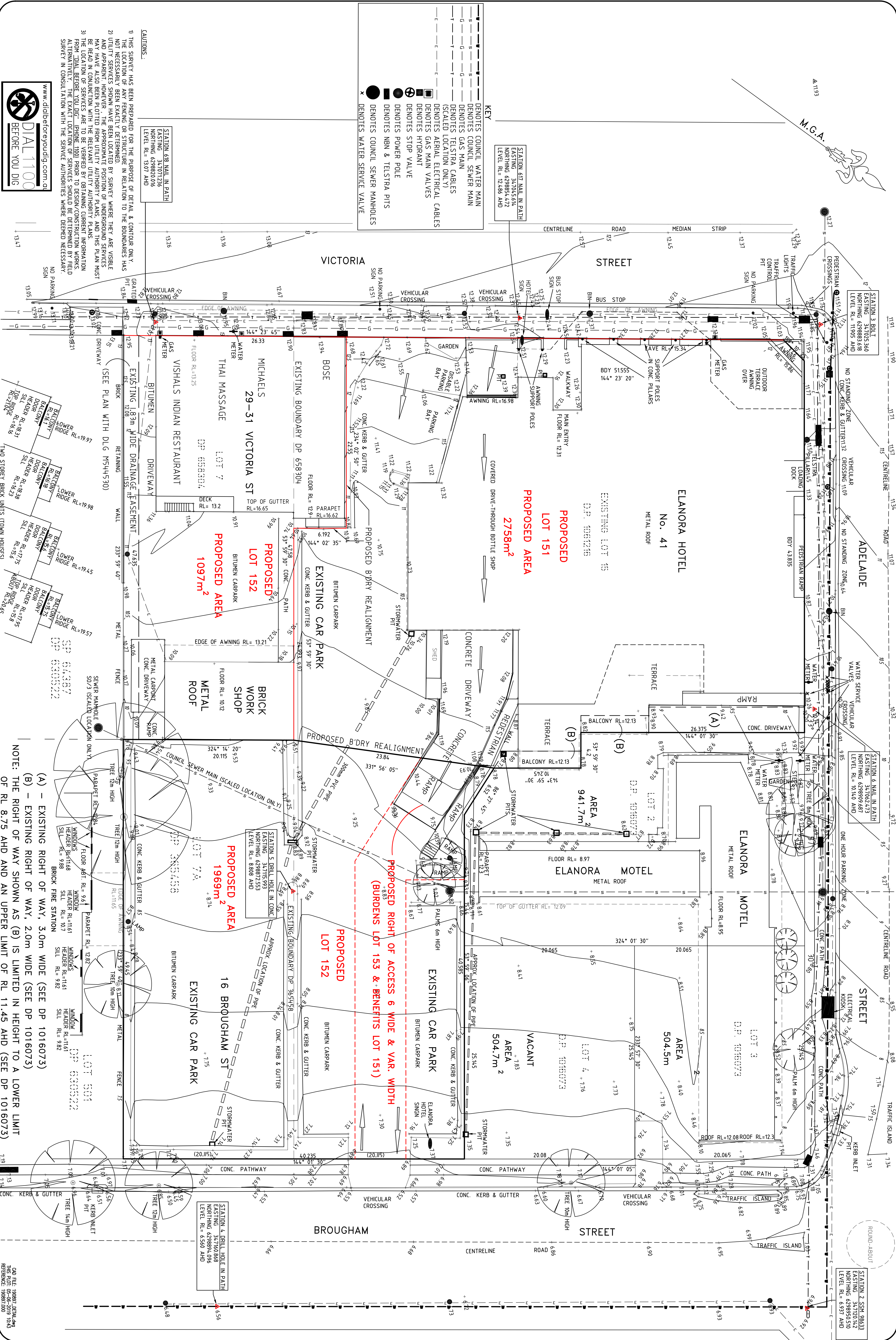
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**ELEVATION SHOWING DETAIL & LEVELS
VICTORIA STREET VIEW**

CLIENT: Bonython Property & Investments Pty Limited
PROJECT: Elanora Hotel
ADDRESS: 41 Victoria St, East Gosford NSW 2250

JOB No.: 190897	LGA: CITY OF GOSFORD
PLAN No.: 9003	DATUM: AHD
DATE: 17/10/2022	SCALE: 1:150@A3
DRAWN: EJ	CONT. INTERVAL: N/A
CHK: JS	SHEET 4 OF 4



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Elanora Hotel

Concepts

01.03.2023

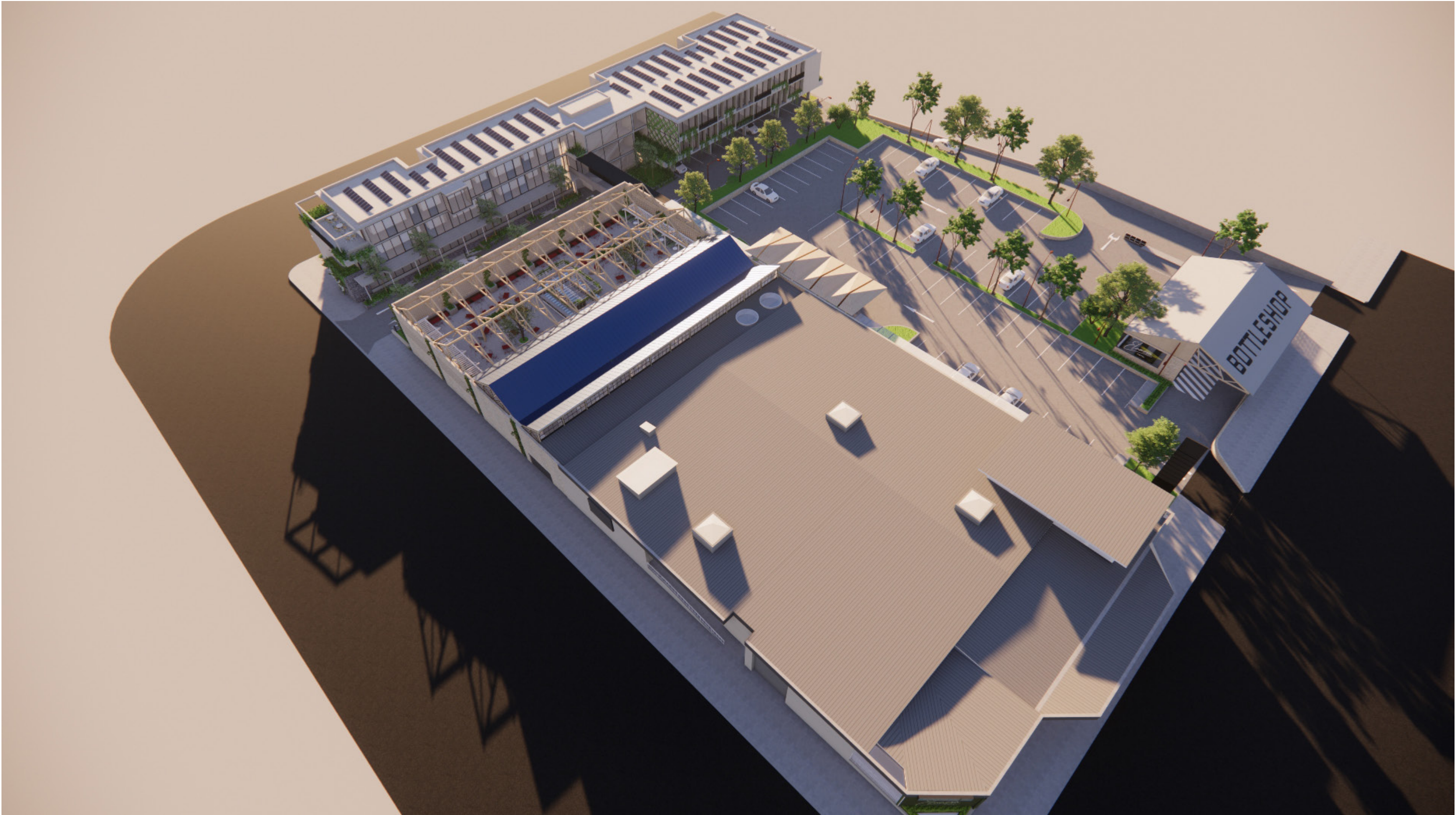
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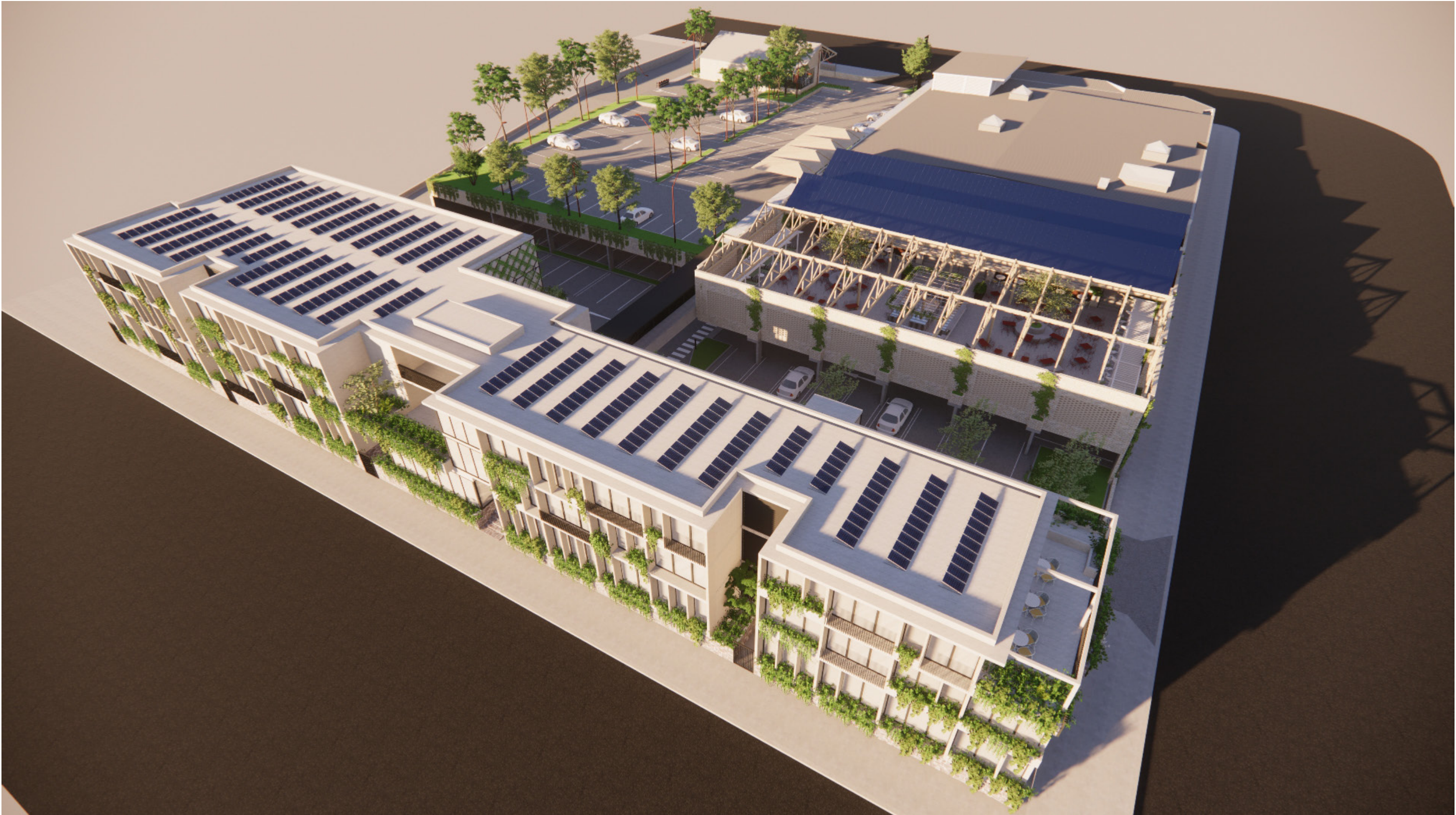
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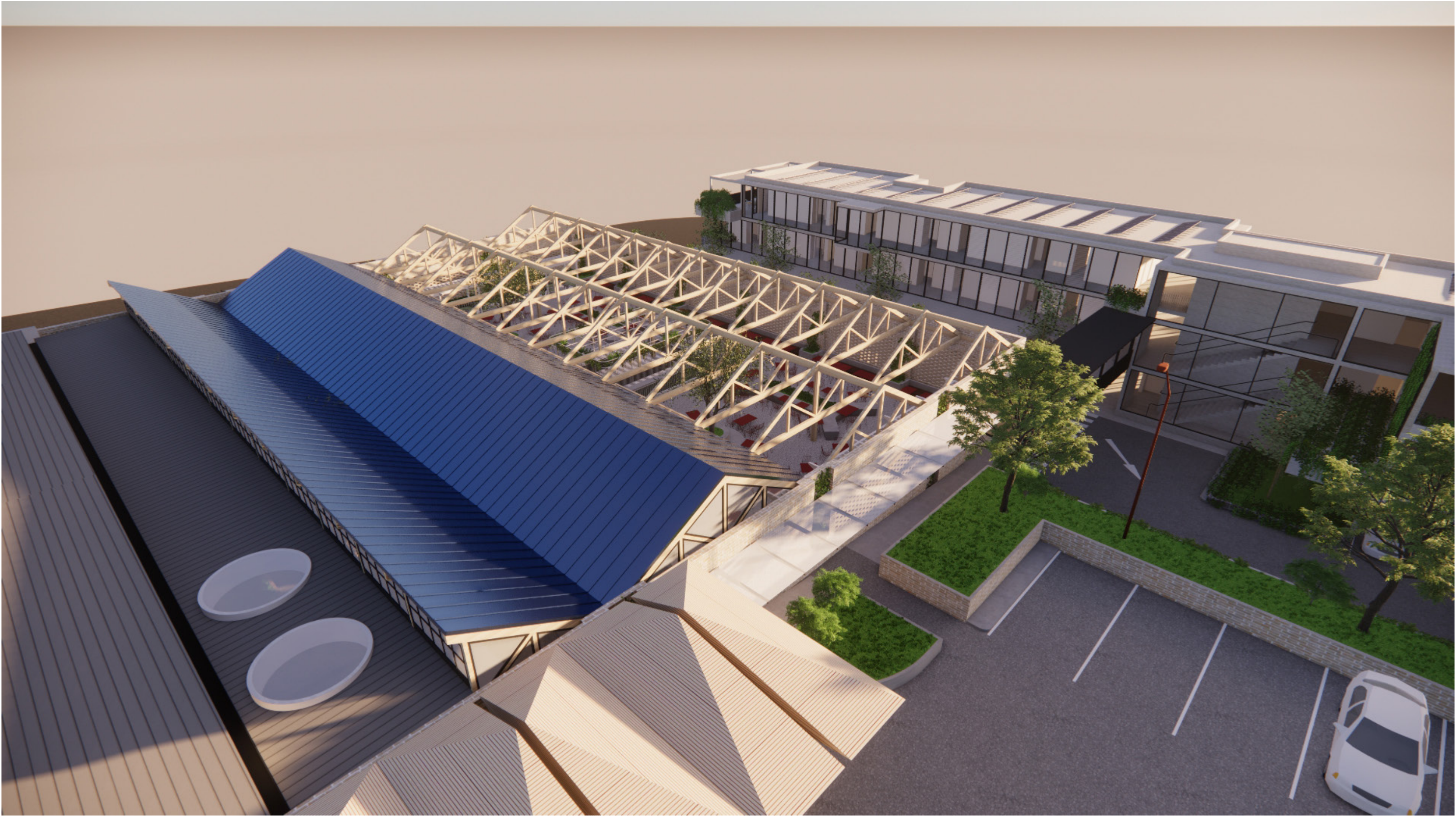
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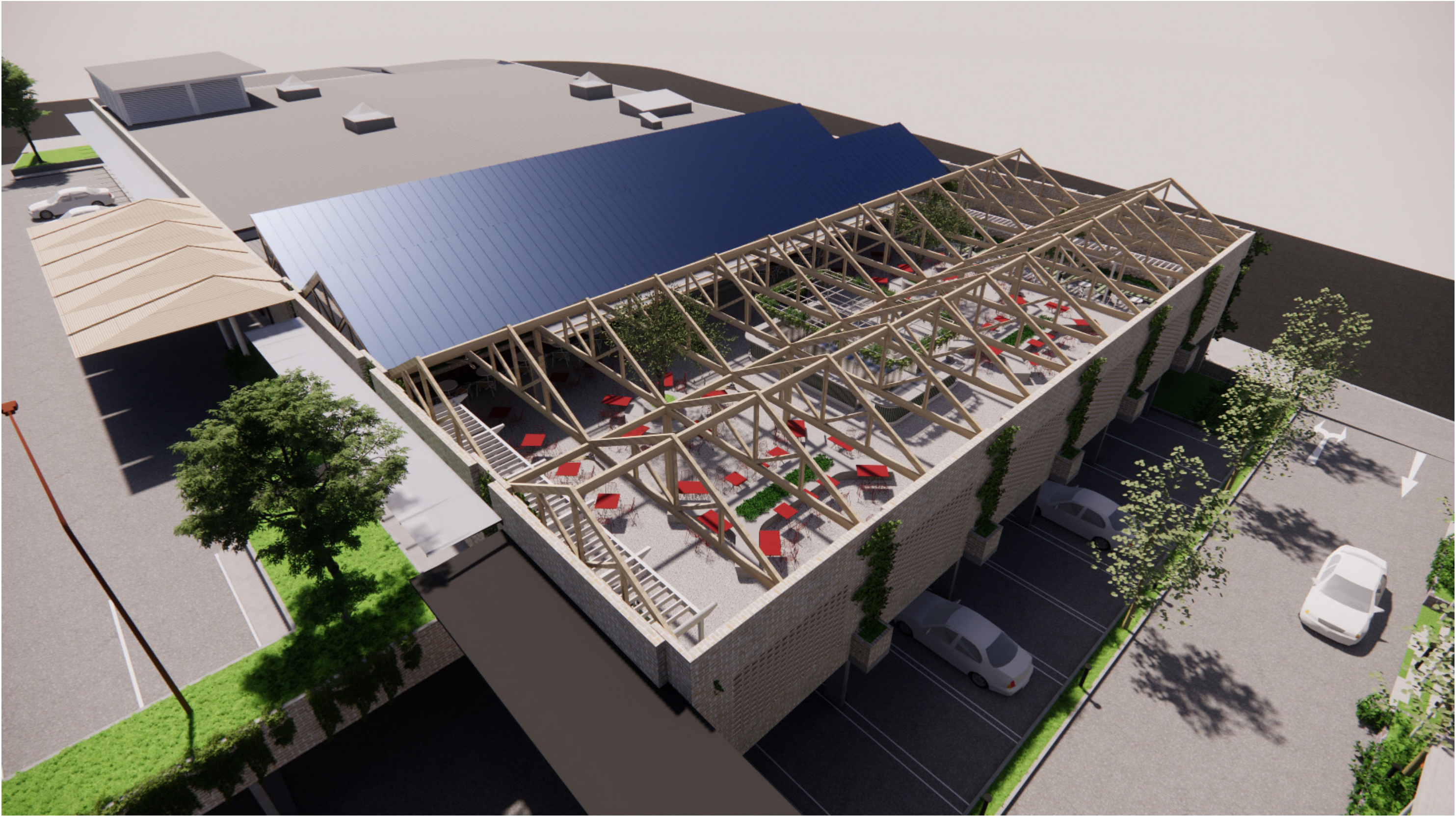
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Rev	Description	Date
01	FOR INFORMATION	13.03.23



Client Elanora Hotel

Project Elanora Hotel
Alterations & Additions
41 Victoria St, East Gosford NSW 2250

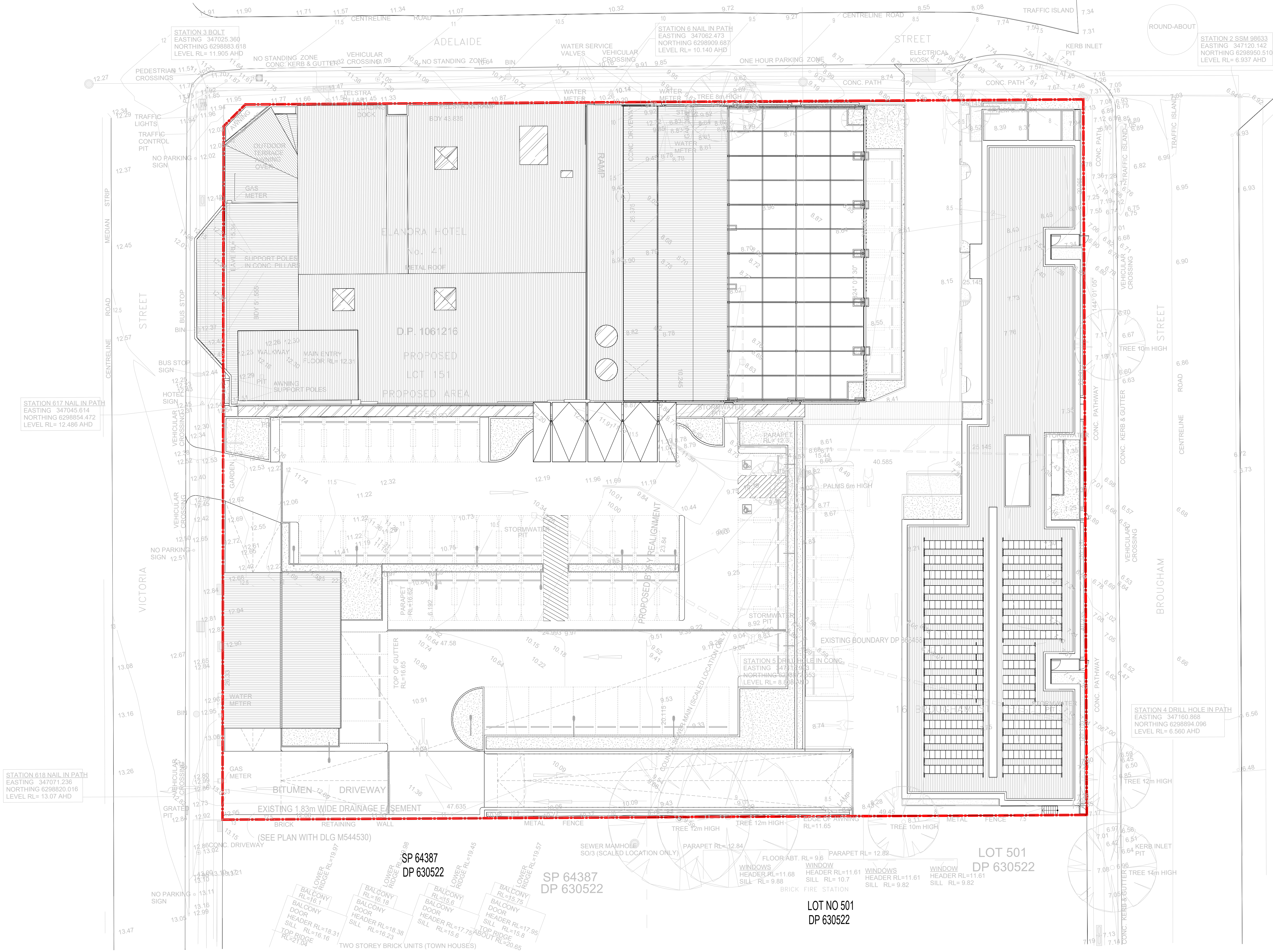
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Project No 22039

Drawing No A-011

Revision 01



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Drawing Title LOWER GROUND FLOOR PLAN

Scale @A1 1 : 200

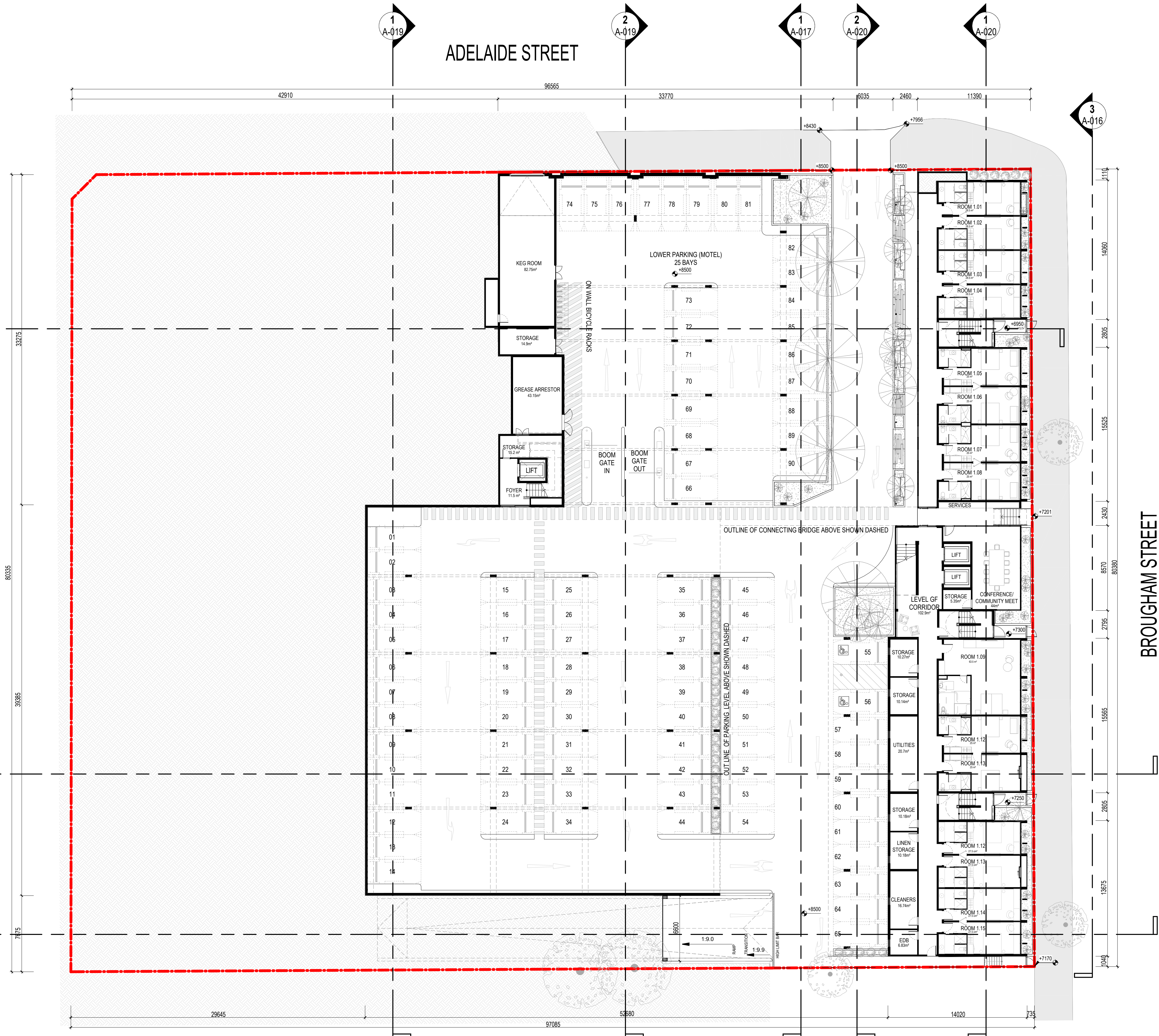
Project No 22039

Drawing No A-012

Revision 01

ADELAIDE STREET

BROUGHAM STREET



1
A-018

2
A-018

3
A-018

Rev	Description	Date
01	FOR INFORMATION	13.03.23



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Alterations & Additions
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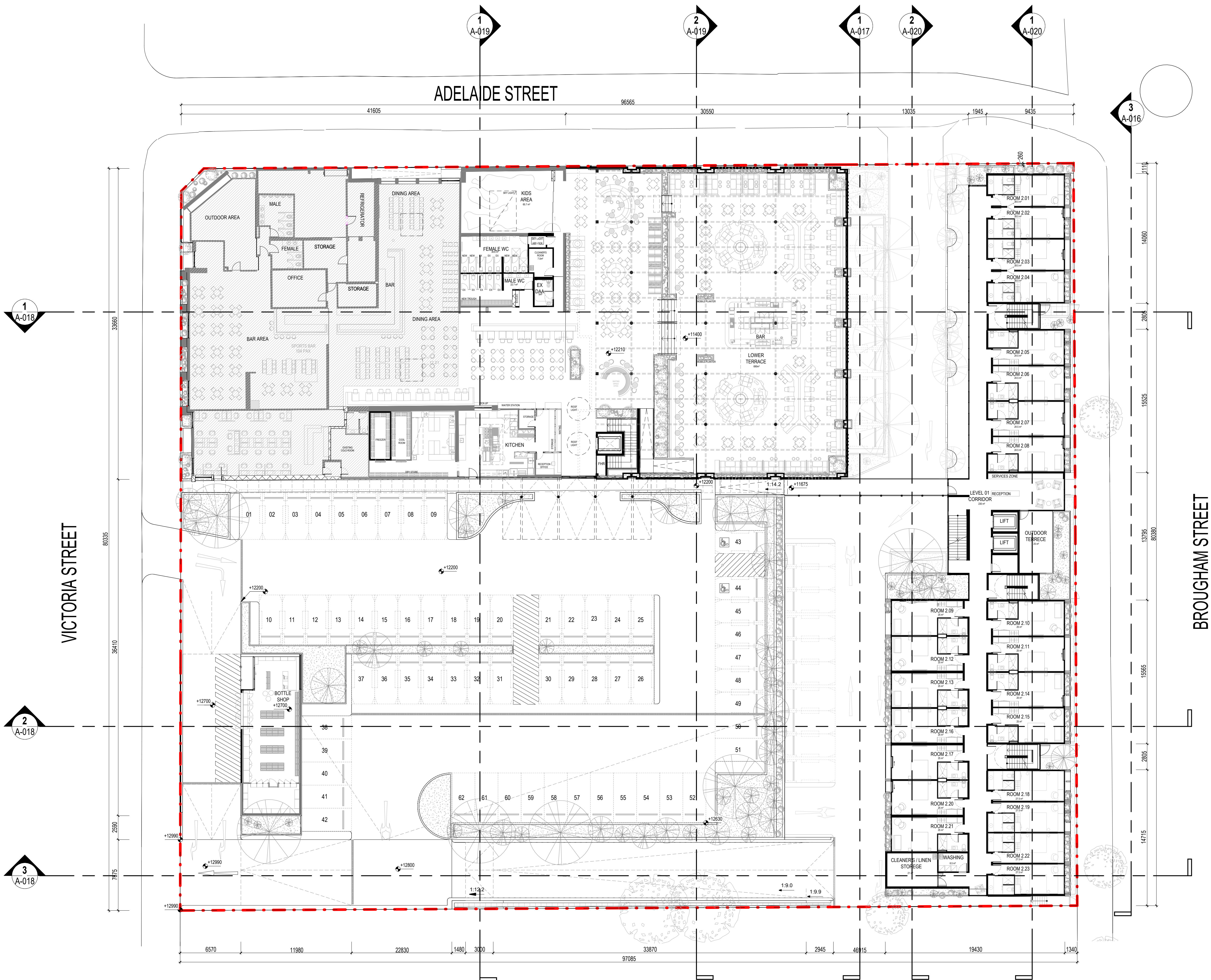
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Scale @A1 1 : 200

Project No 22039

Drawing No A-013

Revision 01



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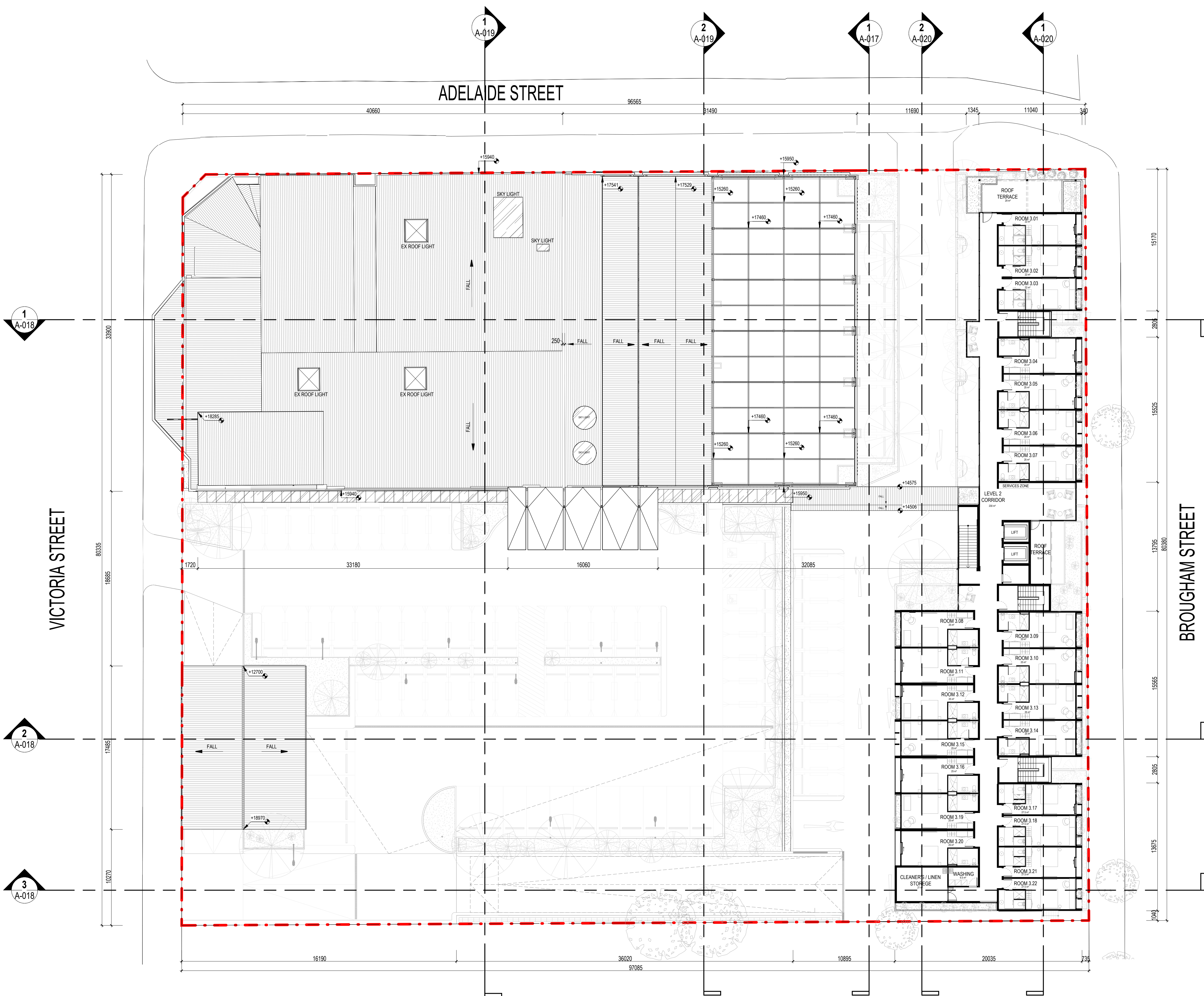
Drawing Title SECOND FLOOR PLAN

Scale @A1 1 : 200

Project No 22039

Drawing No A-014

Revision 01



1 SECOND FLOOR PLAN
SCALE 1 : 200

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Project Elanora Hotel
Alterations & Additions
41 Victoria St, East Gosford NSW 2250

Drawing Title ROOF PLAN

Scale @A1 1 : 200

Project No 22039

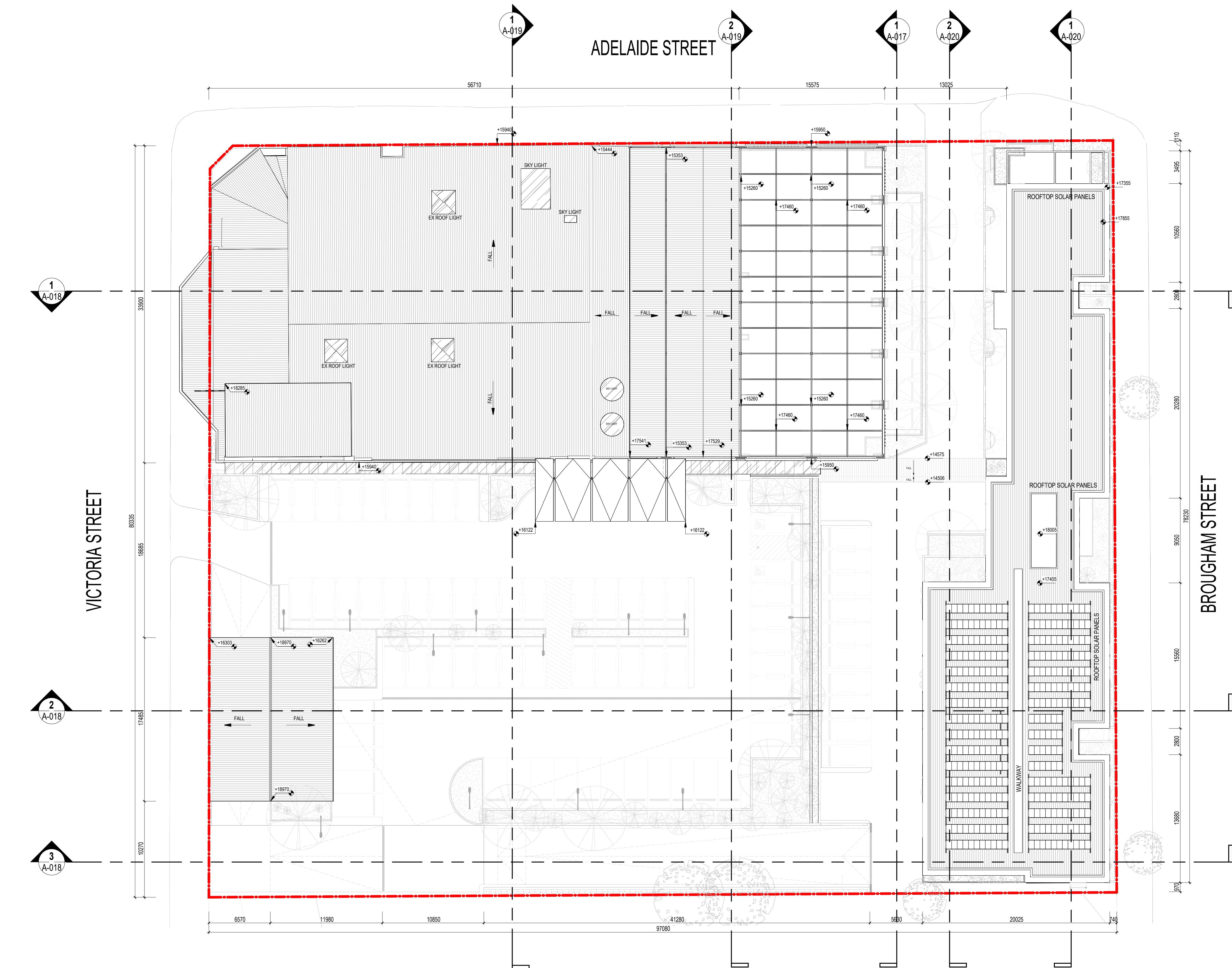
Drawing No A-015

Revision 01

ADELAIDE STREET

VICTORIA STREET

BROUGHAM STREET



A

ROOF PLAN
SCALE 1 : 200

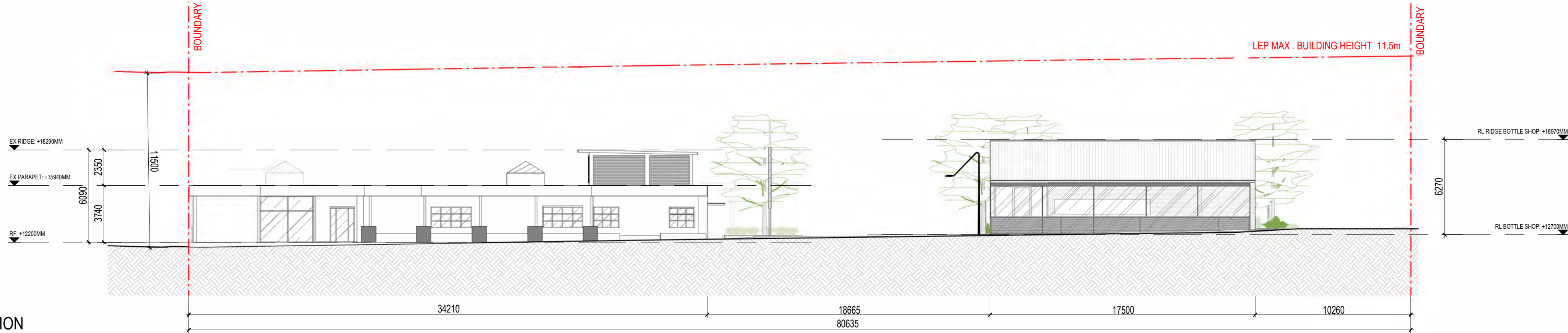
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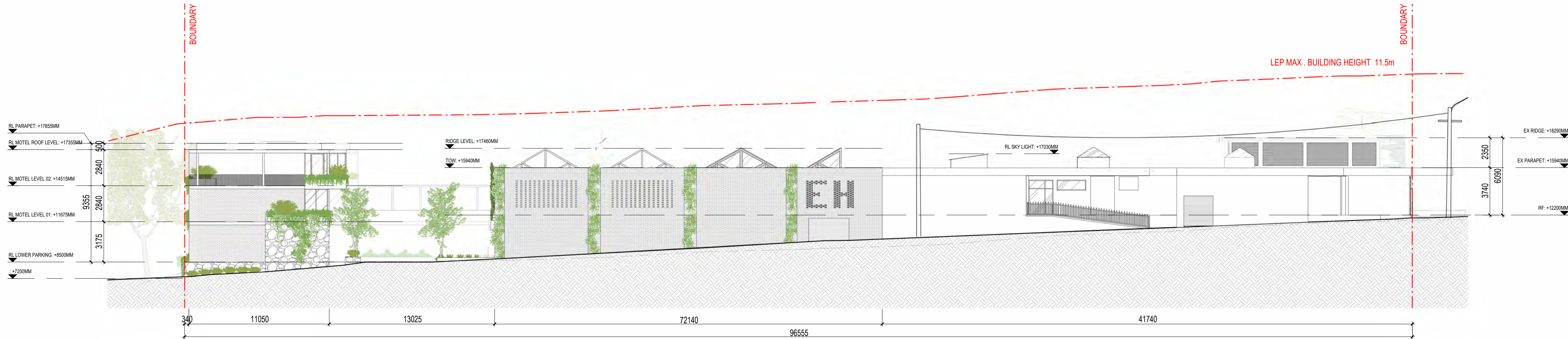
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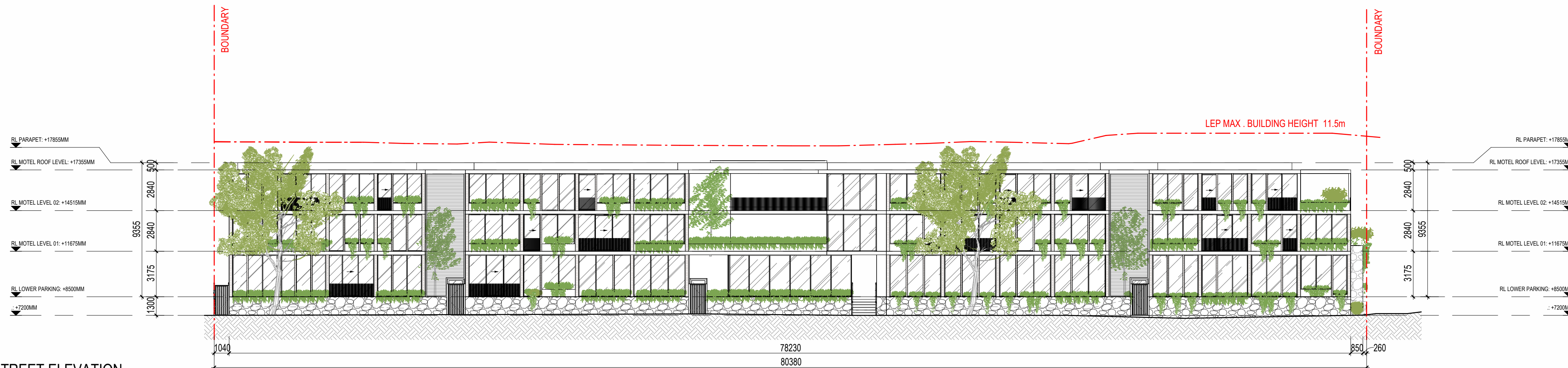
1 VICTORIA STREET ELEVATION
SCALE 1 : 200



2 ADELAIDE STREET ELEVATION
SCALE 1 : 200



3 BROUGHAM STREET ELEVATION
SCALE 1 : 200



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41 Victoria St, East Gosford NSW 2250

Drawing Title ELEVATION

Scale @A1 1 : 200

Project No 22039

Drawing No A-016

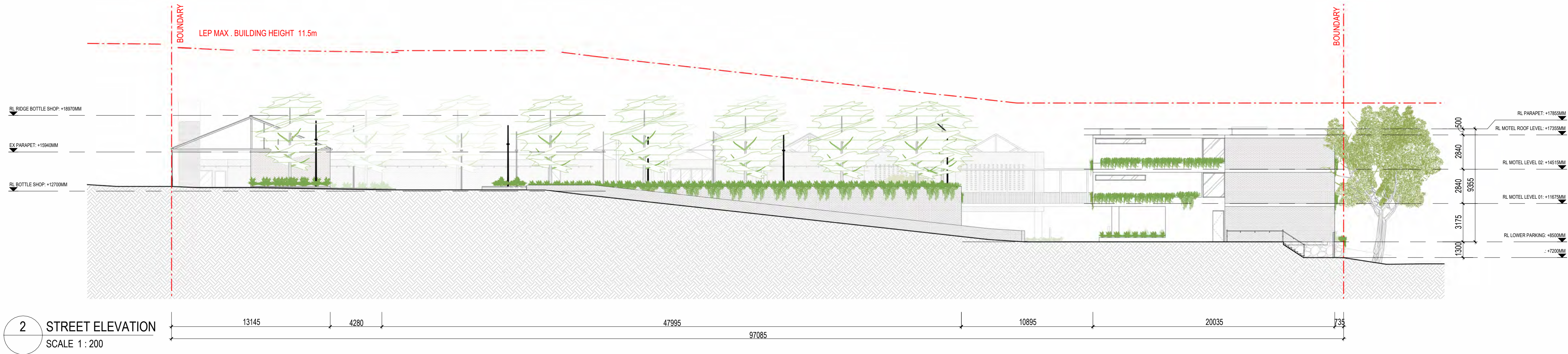
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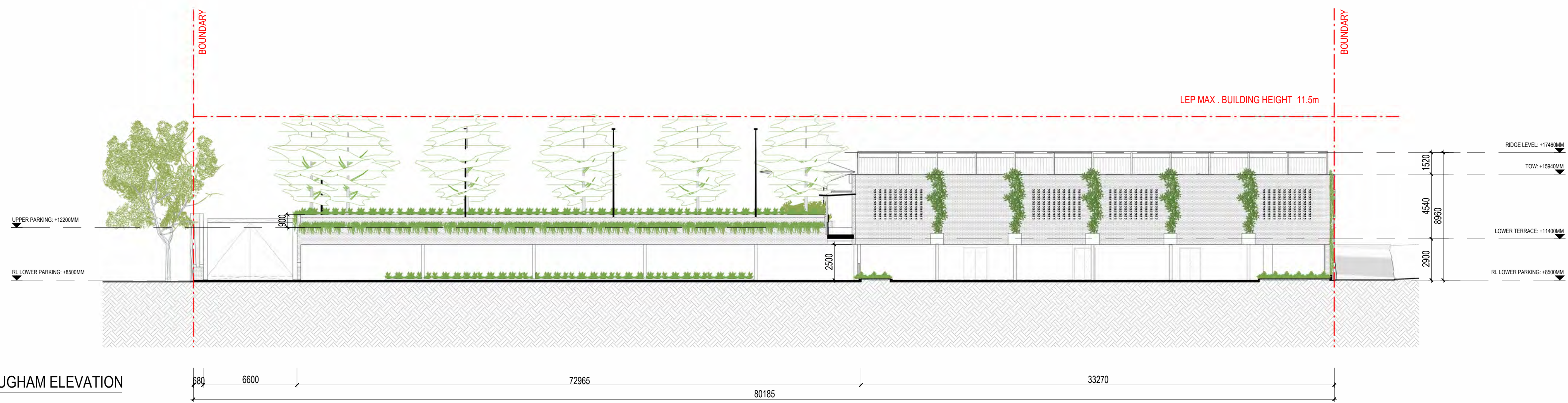
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2 STREET ELEVATION
SCALE 1 : 200



1 INSIDE BROUGHAM ELEVATION
SCALE 1 : 200



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Drawing Title ELEVATION

Scale @A1 1 : 200

Project No 22039

Drawing No A-017

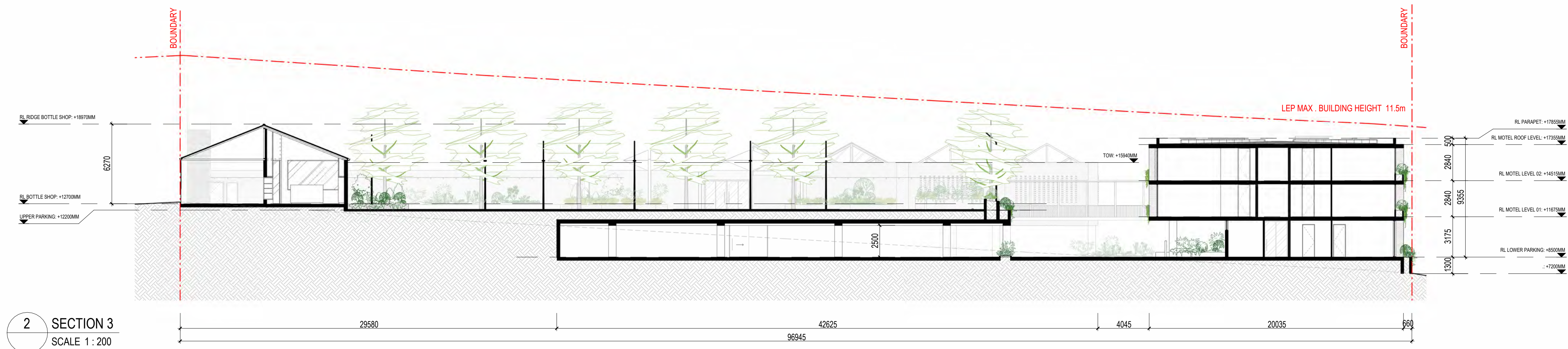
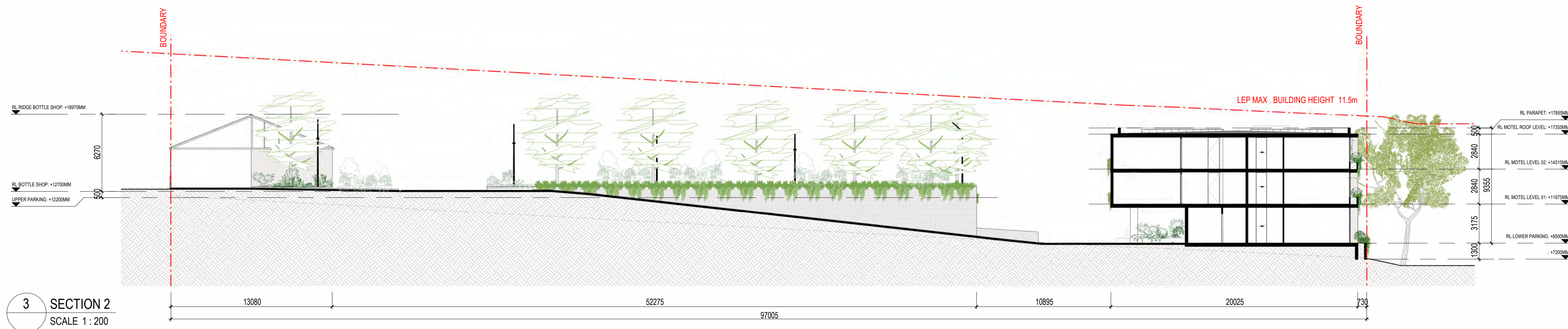
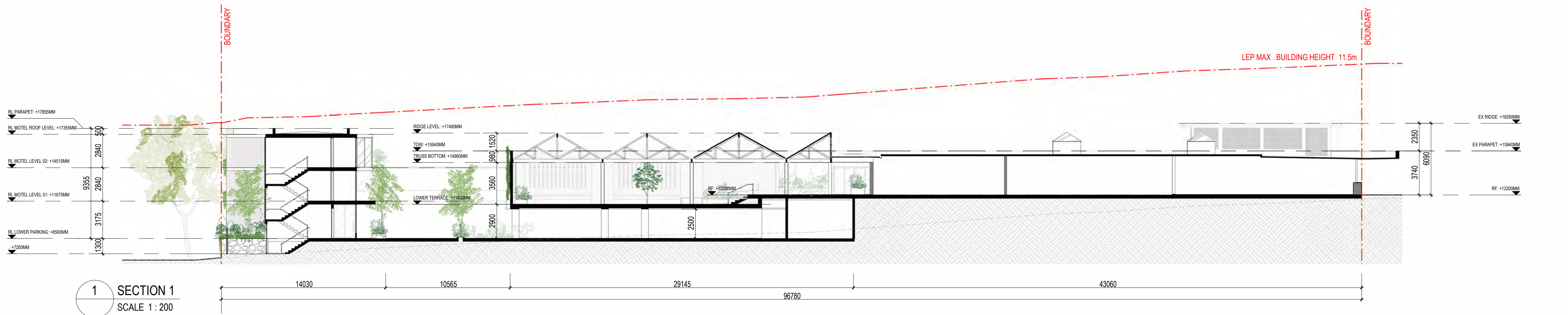
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Project Elanora Hotel
Alterations & Additions
41 Victoria St, East Gosford NSW 2250

Drawing Title SECTION

Scale @A1 1 : 200

Project No 22039

Drawing No A-018

Revision 01

Rev	Description	Date
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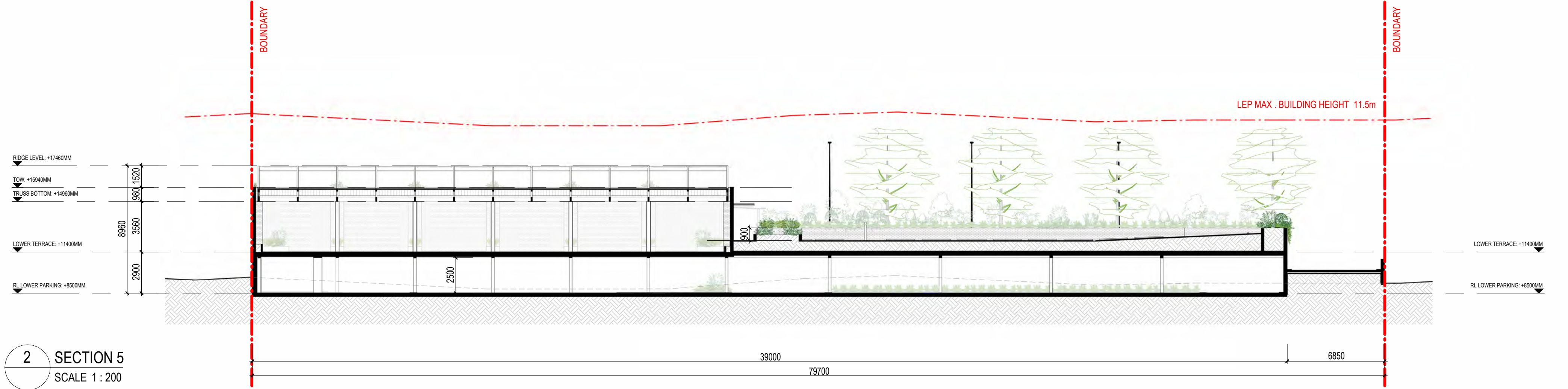
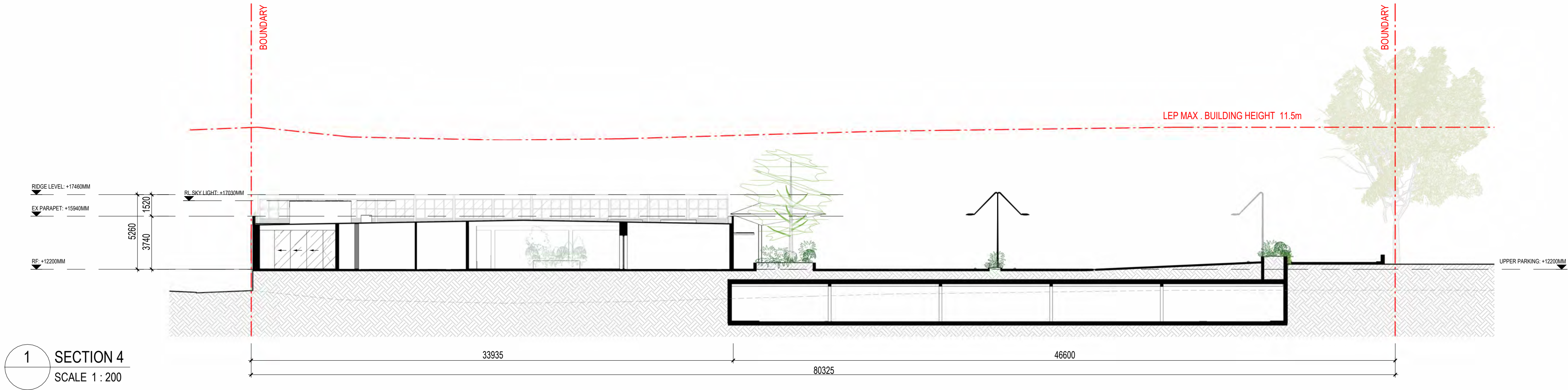
Drawing Title SECTION 2

Scale @A1 1 : 200

Project No 22039

Drawing No A-019

Revision 01

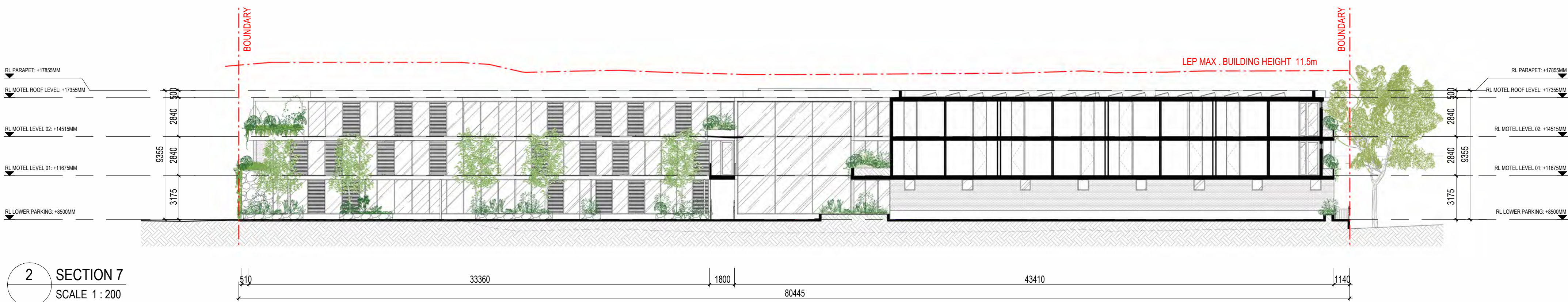
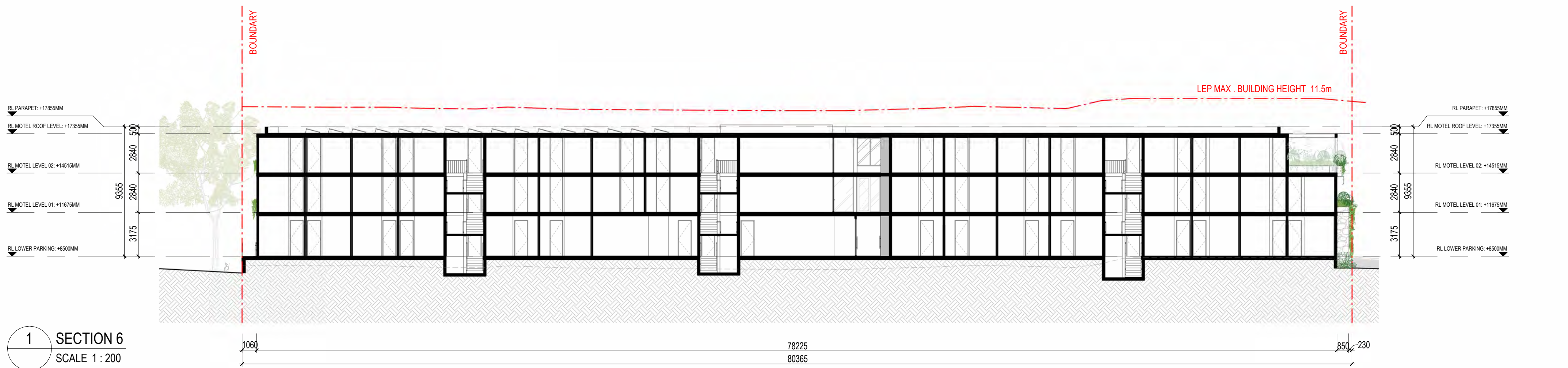


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Project Elanora Hotel
Alterations & Additions
41 Victoria St, East Gosford NSW 2250

Drawing Title SECTION 3

Scale @A1 1 : 200

Project No 22039

Drawing No A-020

Revision 01

APPENDIX C: SUMMARY TABLES



Table C1

[illegible]

Notes

- | | |
|----|--|
| 1 | Urban residential / public open space is broadly equivalent to the HIL-A, HIL-B and HIL-C land use scenarios in Table 1A(1) Footnote 1 and as described in Schedule B7 |
| 2 | To obtain F1 subtract the sum of BTEX concentrations from the C6-C10 fraction. |
| 3 | To obtain F2 subtract naphthalene from the >C ₁₀ -C ₁₈ fraction. |
| NL | Calculated HSL is Non Limiting per NEPM (2013) |
| ND | Not detected |

Table C2

Sample Information		Heavy Metals								TRH		BTEX							PAH					PFAS		Ammonia
SAMPLE ID	Date	ARSENIC	CADMIUM	CHROMIUM	COPPER	LEAD	MERCURY	NICKEL	ZINC	F1 (C ₆ -C ₁₀) ²	F2 (>C ₁₀ -C ₁₆) ³	BENZENE	TOLUENE	ETHYL BENZENE	M/P-XYLENE	O-XYLENE	NAPHTHALENE	TOTAL-XYLENE	BENZO(A)PYRENE	ANTHRACENE	PHENANTHRENE	FLUORANTHENE	NAPHTHALENE	PFOS	PFOA	Ammonia
FES DSI 2023																										
GW1	17.04.2023	<1	0.2	<1	<1	<1	<0.0001	3	<5	<50	<60	<1	<0.5	<0.5	<1	<0.5	<0.5	<1.5	<0.1	<0.1	<0.1	<0.1	<0.1			350
GW2	17.04.2023	<1	<0.1	<1	1	<1	0.0001	12	32	<50	<60	<1	<0.5	<0.5	<1	<0.5	<0.5	<1.5	<0.1	<0.1	<0.1	<0.1	<0.1			<10
GW3	17.04.2023	<1	<0.1	<1	<1	<1	<0.0001	16	55	<50	110	<1	<0.5	<0.5	<1	<0.5	<0.5	<1.5	<0.1	<0.1	<0.1	<0.1	<0.1			50
D1	17.04.2023	1	0.2	<1	<1	<1	<0.0001	66	12	<50	<60	<1	<0.5	<0.5	<1	<0.5	<0.5	<1.5	<0.1	<0.1	<0.1	<0.1	<0.1			230
SS1	17.04.2023	<1	<0.1	<1	<1	<1	<0.05	1	4	<10	<50	<0.5	<1	<1	<2	<1	<1	<3	<0.1	<0.1	<0.1	<0.1	<0.2			-
GW1	19.04.2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.059	0.007	-
GW2	19.04.2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.024	0.004	-
GW3	19.04.2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	<0.002	-
D1	19.04.2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.011	0.003	-
GWSS1	19.04.2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	0.01	-
Limit of Resolution (LOR)		1	0.1	1	1	1	0.05	1	1	10	50	1	1	1	2	1	1	2	0.1	0.1	0.1	0.1	0.2	10	50	10
GILs - NEPM (2013) - Groundwater Investigation Levels																										
Fresh Waters ²		24 / 13	0.20	1.00	1.40	3.40	0.06	11.00	8.00			950	-	-	200	350			-	-	-	-	16			900
Fresh Waters - Low Reliability (Trigger Values) ³													180	80					0.1	0.01	0.6	1	-			
Marine Water ²		-	0.70	4.40	1.30	4.40	0.10	7.00	15.00			500	-	-	-	-			-	-	-	1	50			910
Drinking Water ⁴		10.00	2.00	50.00	2000.00	10.00	1.00	20.00	-			1	800	300	600				0.01	-	-	-	-			
Groundwater HSLs - NEPM (2013) HSL D (CLAY)																										
2m to <4m										NL	NL	30,000	NL	NL	-	-	NL	NL								
4m to <8m										NL	NL	30,000	NL	NL	-	-	NL	NL								
Solubility Limit										9,000	3,000	59,000	61,000	3,900	-	-	170	21,000								
PFAS NEPM 2020																										
Fresh Waters - 95% Species protection																								0.13	220	0.13
Marine - Interim																								0.13	220	0.13

Notes

- 1
- All units are in ug/L
- 2
- Investigation Levels apply to typical slightly-moderately disturbed systems
- 3
- QSAR derived, statistical distribution method used, 95% trigger values applied as per ANZECC 2000
- 4
- Investigation levels are taken from the health values of the Australian Drinking Water Guidelines NHMRC 2011
- NL
- Non Limiting


Table C3

Sample Information		ALKANES							ALKENES					BENZENES											Other VOC		
SAMPLE ID	GME DATE	TETRACHLOROMETHANE (CARBON TETRACHLORIDE)	TRICHLOROMETHANE (CHLOROFORM)	BROMODICHLOROMETHANE	TRICHLOROMETHANES (TOTAL)	1, 2-DICHLOROETHANE	CYCLOHEXANE	1,1,2-TRICHLOROETHANE	CHLOROETHENE (VINYL CHLORIDE)	TRICHLOROETHENE	CIS-1,2-DICHLOROETHENE	1,1-DICHLOROETHENE	TETRACHLOROETHENE (PCE PERCHLOROETHENE)	CHLOROBENZENE	1,2-DICHLOROBENZENE	1,3-DICHLOROBENZENE	1,4-DICHLOROBENZENE	1,2,3-TRICHLOROBENZENE	1,2,4-TRICHLOROBENZENE	ISOPROPYL BENZENE (CUMENE)	SEC-BUTYL BENZENE	1,3,5-TRIMETHYL BENZENE	N-PROPYL BENZENE	N-BUTYL BENZENE	1,2,4 - TRIMETHYL BENZENE	4-ISOPROPYL TOULENE	HEXACHLOROBUTADIENE
FES DSI 2023		<0.5	<0.5	<0.5	<1	<0.5	<1	<0.5	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
GW1	17.04.2023	<0.5	<0.5	<0.5	<1	<0.5	<1	<0.5	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
GW2	17.04.2023	<0.5	<0.5	<0.5	<1	<0.5	<1	<0.5	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
GW3	17.04.2023	<0.5	<0.5	<0.5	<1	<0.5	<1	<0.5	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
D1	17.04.2023	<0.5	<0.5	<0.5	<1	<0.5	<1	<0.5	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
SS1	17.04.2023	<1	<1	<1	<1	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Limit of Resolution (LOR)		1	1	1	1	1	1	1	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GILs - NEPM (2013) - Groundwater Investigation Levels																											
Fresh Waters ²		NV	NV		-		NV	6,500	NV	NV	NV	NV	NV	NV	160	260	60	3	85							NV	NV
Marine Waters ²								1,900									60		20								
Marine Low reliability									330.00																		
Fresh Water Low reliability (Trigger Values -99%) ^a			370		-																						
Fresh Water Low reliability (Trigger Values -95%) ^b					-					330										30							
Drinking Water ⁴		3	3		250	3			0.30		60	30	50														
US EPA Regional Screening Levels (RSLs) May 2016																											
US EPA MCLs ^c		NV												NV											NV		
US EPA Tapwater ^d		13,000												NV											NV		

Notes

- 1 All units are in ug/L
- 2 Investigation levels apply to typical slightly-moderately disturbed systems
- 4 Investigation levels are taken from the health values of the Australian Drinking Water Guidelines NHMRC 2011
- NV - no derived value
- " - " Not Tested
- a: QSAR derived, statistical distribution method used, 99% trigger value applied as per ANZECC guidelines for slightly-moderately disturbed systems
- b: QSAR derived, statistical distribution method used, 95% trigger value applied as per ANZECC guidelines for slightly-moderately disturbed systems
- c: US EPA Region 9 RSL (MCLs) utilised in absence of criteria from NEPM 2013. MCLs are legally enforceable USEPA drinking water standards
- d: US EPA Region 9 RSL (Tapwater) utilised in absence of criteria from NEPM 2013. Non cancer

Table C4

<div></div>			Heavy Metals (mg/kg)							TRH (mg/kg)					BTEX (mg/kg)				PAH (mg/kg)		OCP (mg/kg)		OPP (mg/kg)		Phenol mg/kg	PCB (mg/kg)	ASBESTOS ID (Presence / Absen		
			ARSENIC	CADMIUM	CHROMIUM	COPPER	LEAD	MERCURY	NICKEL	ZINC	C6-C9	C10-C14	C15-C28	C29-C36	C10-C36 ^a	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	BENZO(a)PYRENE	TOTAL PAH	Other OCPs	TOTAL ENDOSULFAN ¹¹	CHLORPYRIFOS	Total OPP	Total Phenol		TOTAL PCB	
NSW EPA Waste Criteria (No Leachates)			100	20	100	-	100	4	40	-	NA	-	-	-	NA	10	288	600	1000	0.8	200	<50	60	4	250	288	<50	Detected	
CT1			400	80	400	-	400	16	160	-	NA	-	-	-	NA	40	1152	2400	4000	3.2	800	<50	240	16	1000	1152	<50		
NSW EPA Waste Criteria (With Leachates)			500	100	1900	-	1500	50	1050	-	650	-	-	-	10000	18	518	1080	1800	10	200	Total = <50**	108	7.5	250	518	<50**		
SCC1			2000	400	7600	-	6000	200	4200	-	2600	-	-	-	40000	72	2073	4320	7200	23	800	Total = <50**	432	30	1000	2073	<50**		
SCC2			2000	400	7600	-	6000	200	4200	-	2600	-	-	-	40000	72	2073	4320	7200	23	800	Total = <50**	432	30	1000	2073	<50**		
Limit of Resolution (LOR)			4	0.4	5	5	5	0.10	5	5	25	50	100	100	NA	0.2	0.5	1	3	0.05	0.05	0.1	0.1	-	-	-	0.1		
Sample ID	Date Sampled	Depth	FES DSI 2023																										
BH1	13.04.2023	0.3-0.4	2	<0.3	20	13	14	<0.05	27	24	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	<0.2	<1.7	<0.5	<1	ND	
BH1	13.04.2023	0.9-1.0	1	<0.3	7.1	<0.5	5	<0.05	0.6	<2	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH1	13.04.2023	1.9-2.0	3	<0.3	9.7	0.7	9	<0.05	0.8	2.7	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH2	13.04.2023	0.2-0.3	2	<0.3	21	<0.5	10	<0.05	0.6	3.3	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	<0.2	<1.7	<0.5	<1	ND	
BH2	13.04.2023	0.9-1.0	4	<0.3	28	<0.5	13	<0.05	1.1	4.7	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH3	13.04.2023	0.2-0.3	1	<0.3	7.1	1.3	11	<0.05	1.3	11	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	<0.2	<1.7	<0.5	<1	ND	
BH3	13.04.2023	0.9-1.0	2	<0.3	12	<0.5	8	<0.05	0.8	3.3	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH4	13.04.2023	0.1-0.2	4	<0.3	25	1.5	19	<0.05	2.2	12	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH5	13.04.2023	0.1-0.2	1	<0.3	7.1	25	28	<0.05	2.2	47	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	<0.2	<1.7	<0.5	<1	ND	
BH5	13.04.2023	0.6-0.7	3	<0.3	12	0.7	14	<0.05	0.6	5.5	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH5	13.04.2023	0.1-0.2	6	<0.3	18	1	19	<0.05	0.6	11	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH6	13.04.2023	0.1-0.2	3	<0.3	7.6	20	9	<0.05	4	7.7	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH7	13.04.2023	0.2-0.3	4	0.6	18	9.5	55	0.07	5	77	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH7	13.04.2023	0.4-0.5	3	<0.3	14	1.6	17	<0.05	1.3	18	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH8	13.04.2023	0.3-0.4	<1	<0.3	4.3	0.8	7	<0.05	1.4	3.8	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH8	13.04.2023	0.6-0.7	1	<0.3	8	<0.5	4	<0.05	0.6	<2	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH9	13.04.2023	0.2-0.3	2	<0.3	22	14	8	<0.05	31	19	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH9	13.04.2023	0.9-1.0	2	<0.3	21	4.9	10	<0.05	11	12	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH10	13.04.2023	0.2-0.3	2	<0.3	21	10	8	<0.05	24	13	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	<0.2	<1.7	-	<1	ND	
BH10	13.04.2023	0.9-1.0	3	<0.3	17	1.5	5	<0.05	5.9	5.1	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH11	13.04.2023	0.3-0.4	3	<0.3	15	<0.5	8	<0.05	0.9	5.8	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH11	13.04.2023	0.8-0.9	4	<0.3	24	<0.5	11	<0.05	0.7	6.7	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH12	13.04.2023	0.3-0.4	7	<0.3	47	<0.5	15	<0.05	0.9	7.1	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH12	13.04.2023	0.8-0.9	7	<0.3	19	<0.5	14	<0.05	<0.5	2.9	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH13	13.04.2023	0.3-0.4	2	<0.3	6.9	5.1	41	<0.05	0.8	160	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	<0.2	<1.7	-	<1	ND	
BH13	13.04.2023	0.8-0.9	3	<0.3	24	<0.5	9	<0.05	0.6	18	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH14	13.04.2023	0.1-0.2	2	<0.3	11	10	44	<0.05	7.5	63	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH15	13.04.2023	0.1-0.2	2	<0.3	11	20	82	<0.05	6.5	180	<20	<20	55	110	160	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH16	13.04.2023	0.3-0.4	3	<0.3	23	<0.5	8	<0.05	3.5	11	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH16	13.04.2023	1.0-1.1	3	<0.3	29	<0.5	8	<0.05	3.4	74	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	-	
BH17	13.04.2023	0.0-0.1	2	<0.3	8.6	5.8	31	<0.05	1.8	46	<20	<20	<45	55	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH18	13.04.2023	0.2-0.3	2	<0.3	12	26	65	0.08	9.6	410	<20	<20	180	97	280	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	-	-	-	<1	ND	
BH19	13.04.2023	1.1-1.2	2	<0.3	14	2.1	17	<0.05	1.3	12	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	0.1	1.2	<LOR	<0.1	<0.2	<1.7	<0.5	<1	ND	
F1	13.04.2023	fragment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<LOR	<0.1	-	-	-	-	-	Asbestos Detected	
F2	13.04.2023	fragment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<LOR	<0.1	-	-	-	-	-	Asbestos Detected	
D1	13.04.2023	-	<1	<0.3	3.7	1.4	6	<0.05	2.6	7.4	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	<0.2	<1.7	<0.5	<1	-	
D2	13.04.2023	-	1	<0.3	6.9	1	11	<0.05	1.2	12	<20	<20	<45	<45	<110	<0.1	<0.1	<0.1	<0.3	<0.1	<0.8	<LOR	<0.1	<0.2	<1.7	<0.5	<1	-	
SS1	13.04.2023	-	<4	<0.4	7	3	8	<0.1	6	13	<25	<50	<100	<100	<50	<0.2	<0.5	<											

Notes