REPORT TO

HEALTH INFRASTRUCTURE

ON

REMEDIATION ACTION PLAN (RAP)

FOR

PROPOSED NEW INTEGRATED SERVICES BUILDING

AT

LIVERPOOL HOSPITAL, MAIN CAMPUS, ELIZABETH STREET, LIVERPOOL, NSW

Date: 29 April 2020
Ref: E32837BDrpt2-RAP

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Executive Summary

Johnstaff Projects Pty Ltd on behalf of Health Infrastructure NSW ('the client') commissioned JK Environments (JKE) to prepare a Remediation Action Plan (RAP) for the proposed new Integrated Services Building at Liverpool Health + Academic Precinct (Liverpool Hospital), Main Campus, Elizabeth Street, Liverpool, NSW ('the site'). The site location is shown on Figure 1 and the RAP applies to the land within the site boundaries as shown on Figure 2 attached in Appendix A.

This report has been prepared for the proposed new Integrated Services Building development and supports the lodgement of the associated Sate Significant Development Application (SSDA).

JKE have previously undertaken a Stage 1 and Preliminary Stage 2 Environmental Site Assessment (ESA) at the site. Information from the JKE ESA is presented throughout this report (where relevant) and a detailed summary of the findings is included in Section 2. The JKE ESA encountered polycyclic aromatic hydrocarbons (PAHs) and friable asbestos in the fill (soil) at concentrations that exceeded the human health Site Assessment Criteria (SAC) which require remediation. Surface Asbestos Containing Materials (ACM) were also identified. The contamination data is shown on Figure 3 attached in Appendix C.

The goal of the remediation is to render the site suitable for the proposed development from a contamination viewpoint. The primary aim of the remediation at the site is to reduce the human health risks posed by the site contamination to an acceptable level. The remediation objectives are to:

- Provide a methodology to undertake inspections, further sampling and assessment of the extent of contamination after demolition;
- Provide a methodology to remediate and validate the site;
- Provide a contingency plan for the remediation works;
- Outline site management procedures to be implemented during remediation work; and
- Provide an unexpected finds protocol to be implemented during the development works.

Post-demolition validation sampling is required to assess the extent of remediation prior to excavation. The Post-demolition validation scope of works is outlined in Section 4.

The preferred option for remediation of the contaminated fill at the site is excavation and off-site disposal of the contaminated material. The contaminated fill should be excavated/removed prior to the commencement of bulk excavation of the natural soil/bedrock in order to limit the potential for cross-contamination and blending of waste streams.

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

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

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Abbreviations

Asbestos Containing Material	**ACM**
Asbestos Fines/Fibrous Asbestos	**AF/FA**
Australian Height Datum	**AHD**
Below Ground Level	**BGL**
Benzo(a)pyrene Toxicity Equivalent Factor	**BaP TEQ**
Benzene, Toluene, Ethylbenzene, Xylene	**BTEX**
Contaminated Land Management	**CLM**
Contaminant(s) of Potential Concern	**CoPC**
Chain of Custody	**COC**
Conceptual Site Model	**CSM**
Development Application	**DA**
Data Quality Indicator	**DQI**
Data Quality Objective	**DQO**
Detailed Site Investigation	**DSI**
Ecological Investigation Level	**EIL**
Environmental Investigation Services	**EIS**
Ecological Screening Level	**ESL**
Environmental Management Plan	**EMP**
Environment Protection Authority	**EPA**
Environmental Site Assessment	**ESA**
Ecological Screening Level	**ESL**
General Approval of Immobilisation	**GAI**
Health Investigation Level	**HILs**
Health Screening Level	**HSL**
JK Environments	**JKE**
Map Grid of Australia	**MGA**
National Association of Testing Authorities	**NATA**
National Environmental Protection Measure	**NEPM**
Organochlorine Pesticides	**OCP**
Organophosphate Pesticides	**OPP**
Polycyclic Aromatic Hydrocarbons	**PAH**
Polychlorinated Biphenyls	**PCBs**
Photo-ionisation Detector	**PID**
Protection of the Environment Operations	**POEO**
Practical Quantitation Limit	**PQL**
Quality Assurance	**QA**
Quality Control	**QC**
Remediation Action Plan	**RAP**
Site Assessment Criteria	**SAC**
Sampling, Analysis and Quality Plan	**SAQP**
Source, Pathway, Receptor	**SPR**
State Significant Development Application	**SSDA**
Toxicity Characteristic Leaching Procedure	**TCLP**
Total Recoverable Hydrocarbons	**TRH**
Trip Spike	**TS**
Upper Confidence Limit	**UCL**
United States Environmental Protection Agency	**USEPA**
Validation Assessment Criteria	**VAC**
Virgin Excavated Natural Material	**VENM**
Volatile Organic Compounds	**VOC**
Work Health and Safety	**WHS**

Units

Litres	**L**
Metres BGL	**mBGL**
Metres	**m**
Millilitres	**ml or mL**
Micrograms per Litre	**µg/L**
Milligrams per Kilogram	**mg/kg**
Milligrams per Litre	**mg/L**
Parts Per Million	**ppm**
Percentage	**%**

1 INTRODUCTION

Johnstaff Projects Pty Ltd on behalf of Health Infrastructure NSW ('the client') commissioned JK Environments (JKE) to prepare a Remediation Action Plan (RAP) for the proposed new Integrated Services Building at Liverpool Health + Academic Precinct (Liverpool Hospital), Main Campus, Elizabeth Street, Liverpool, NSW ('the site'). The site location is shown on Figure 1 and the RAP applies to the land within the site boundaries as shown on Figure 2 attached in Appendix A.

JKE have previously undertaken a Stage 2 Environmental Site Assessment (ESA) at the site (JKE Ref: E32837BDrpt, dated 13 February 2020)[1]. Information from the JKE ESA is presented throughout this report (where relevant) and a summary of the findings is included in Section 2.

This report has been prepared for the proposed new Integrated Services Building development and supports the lodgement of the associated Sate Significant Development Application (SSDA).

The RAP includes a methodology to remediate and validate the site. A contingency plan for remediation is included together with site management procedures and an unexpected finds protocol to be implemented during remediation.

1.1 Proposed Development Details

JKE understand that the proposed development will include demolition of the existing Cancer Building, Pathology Building, Alex Grimson building and the Thomas and Rachael Moore Education Centre. We understand that the existing oncology bunkers in the central/west and the existing P1 car park basement in the south section of the site are to be retained.

A new three to six storey Integrated Services Building is proposed to occupy the majority of the site. The Integrated Services Building will be occupied for hospital associated hospital use, with retail use also proposed in some areas on the ground floor. New hard stand pavements and landscaping are proposed in areas of the site not occupied by the proposed new building.

The proposed new building will be underlain by a partial basement level located in central section of the site. The proposed basement level will be constructed at RL7.9m, and will require excavation to approximately 1.5m Below Ground Level (mBGL) to 4.0mBGL. The ground floor level will be constructed at RL12.2m, and will require cut and fill earthworks around the basement level to a maximum depth/height of approximately 1.5m.

Copies of relevant proposed development drawings supplied by the Johnstaff Projects Pty Ltd are attached in Appendix B.

[1] JKE, (2020). Report to Health Infrastructure on Stage 1 and Preliminary Stage 2 Environmental Site Assessment (ESA) for Proposed New Integrated Services Building at Liverpool Hospital, Main Campus, Elizabeth Street, Liverpool, NSW (referred to as the 'JKE ESA')

1.2 Remediation Goal, Aims and Objectives

The goal of the remediation is to render the site suitable for the proposed development from a contamination viewpoint. The primary aim of the remediation at the site is to reduce the human health risks posed by the site contamination to an acceptable level.

The remediation objectives are to:

- Provide a methodology to undertake inspections, further sampling and assessment of the extent of contamination after demolition;
- Provide a methodology to remediate and validate the site;
- Provide a contingency plan for the remediation works;
- Outline site management procedures to be implemented during remediation work; and
- Provide an unexpected finds protocol to be implemented during the development works.

1.3 Scope of Work

The RAP was prepared generally in accordance with a JKE proposal (Ref: EP50653BD) of 6 November 2019 and written acceptance from the client of 27 November 2019. The scope of work included consultation with the client, regarding the remedial options and sequence of works, and preparation of a RAP.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)[2], other guidelines made under or with regards to the Contaminated Land Management Act (1997)[3] and SEPP55. A list of reference documents/guidelines is included in the appendices.

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

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

2 SITE INFORMATION

2.1 Background and Summary of Site History

JKE have recently prepared a number of reports for the future development of Liverpool Hospital. The JKE ESA for the site included a site inspection and a desktop review of historical information. The JKE ESA also incorporated data obtained during the JKE Stage 2 ESA (JKE Ref: E32465BDrpt4, dated 10 October 2019)[4], which included soil sampling within the north east section of the site.

The potential contamination sources and contaminants of potential concern (CoPC) identified by the JKE ESA prior to assessment of the soil and groundwater data are presented in the following table:

Table 2-1: Potential (and/or known) Contamination Sources and Contaminants of Potential Concern

Source / AEC	CoPC
Fill material: The site appeared to have been historically filled to achieve the existing levels. The fill may have been imported from various sources and was identified in the JKE ESA as being potentially contaminated.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Historical agricultural use: The site appeared to have been used for grazing and market garden purposes and a piggery. This could have resulted in contamination across the site via use of machinery, application of pesticides and building/demolition of various structures. Irrigation pipes made from asbestos cement may also be associated with this AEC. Additionally, pesticides may have been used beneath the buildings and/or around the site	Heavy metals, TRH, PAHs, OCPs, PCBs and asbestos
Hazardous Building Material: Johnstaff Projects Pty Ltd have provided JKE with a Hazardous Materials Survey Report and Register prepared for the Hospital[5]. The EMS HAZMAT report indicated that hazardous building materials including friable and non-friable asbestos are located within the Alex Grimson Building. Additionally, lead containing paints and PCB containing light capacitors maybe located within the buildings. Potential Asbestos Containing Materials (ACM) in the form of fibre cement fragments were identified on surface in the north/central section of the site in the adjacent areas around the Alex Grimson Building. The	Asbestos, lead and PCBs

[4] JKE, (2019). Report to Health Infrastructure on Stage 2 Environmental Site Assessment (ESA) for Proposed Liverpool Hospital – Civil Infrastructure Works, Elizabeth Street, Liverpool, NSW (referred to as the 'JKE Stage 2 ESA')

[5] Report to South Western Sydney LHD, on Hazardous Materials Survey Report and Register, for Liverpool Hospital, Liverpool, NSW (EMS Report No: EMS19 6723, dated 9 May 2019) (referred to as EMS HAZAMT report)

Source / AEC	CoPC
approximate location of the sampled potential ACM are shown in Figure 3, attached in Appendix C. Further information is present below. Hazardous building material may be present at the surface or within the fill material as a result of former building and demolition activities at Liverpool Hospital.	
<u>Onsite and Off-site – Fuel storage and mechanical workshops:</u> SafeWork NSW records and the site inspection indicated that stored hazardous chemicals including Ethyl Alcohol Solution, Acetone and Xylene were identified in the northern section of the site (located immediately east of the existing pathology building) and within the site area as shown in Figure 3 attached in Appendix C. SafeWork NSW records for dangerous good (e.g. petroleum storage) indicated that a number of Underground Storage Tanks (USTs) and Above Ground Storage Tanks (ASTs) were formerly located within the western campus of Liverpool Hospital and off-site. The closest UST and AST locations to the site are shown on Figure 3 attached in Appendix C. UST 3 was likely removed during the basement excavation of the hospitals clinical services building. The potential UST 3 and existing ASTs 5 locations are down gradient from the site and were not considered to be a potential source of off-site migration to the site. A former service station and mechanical workshops have been identified to the south-west, within 175m of the site and up-gradient of the site. Spillage or discharge of stored chemicals from up-gradient sites could have occurred and have the potential to migrate onto the site via groundwater or underground service pipework/trenches which run through the site.	Heavy metals (lead), TRH and BTEX
<u>Offsite - Dry Cleaners and Printers</u>: Former dry cleaning and printing/letterpress businesses were identified between approximately 100m and 411m to the west and up gradient of the site. Spillage or discharge of stored chemicals from up-gradient sites could have occurred and has the potential to migrate onto the site via groundwater or underground services pipework/trenches which run through the site.	TRHs and VOCs, including tetrachloroethene (also known as perchloroethylene - PCE) and the breakdown products trichloroethene (TCE), cis-1,2-dichloroethene (cis-DCE) and vinyl chloride (VC).

The JKE ESA included a review of historical information and sampling from a total of 22 boreholes (including the seven previous boreholes drilled for the previous JKE Stage 2 ESA) and four groundwater monitoring

wells. Selected soils samples and representative groundwater samples were submitted for laboratory analysis to assess whether the soils and/or groundwater were impacted by the CoPC.

Elevated soil concentrations of nickel and TRH (F3) and groundwater concentrations of copper, zinc benzo(a)pyrene and phenanthrene were identified above the ecological-based site assessment criterion (SAC). The ecological elevations are shown on Figure 4 attached in Appendix C. Based on the Tier 1 risk assessment, the levels of contamination identified in the soils and groundwater at the site above the ecological-based SAC were assessed to pose a low risk to the receptors and remediation was not proposed due to the ecological elevations.

The soil laboratory results identified elevated concentrations of contaminants above the human-health based site SAC as summarised below:

- The carcinogenic PAHs result of 15mg/kg for the fill sample DUPMP103 (MW3 (0-0.2m)) was above HIL-A SAC of 3mg/kg and greater than 250% of the SAC. This result is also above the above HIL-C SAC of 3mg/kg for 'public open space, secondary schools and footpaths' land use scenarios. The sampling location and carcinogenic PAHs contamination data is shown in Figure 3 attached in Appendix C. The source of the carcinogenic PAHs contamination was considered to be the historically imported soil (fill);
- The calculated Asbestos Fines (AF)/ Fibrous Asbestos (FA) concentrations of 0.0373% w/w (JKE136 (0-0.2m)) and 0.0085% w/w (JKE137 (0.04-0.2m)) were above the SAC of 0.001% w/w. These sampling locations are in the north-east section of the site. The sampling locations and contamination data are shown in Figure 3 attached in Appendix C. AF/FA or ACM were not observed during soil sampling and bulk screening field works. AF/FA materials are considered friable; and
- Surface ACM were identified in the north and east sections of the site. The ACM sampling locations are shown in Figure 3 attached in Appendix C. The ACM were unable to be broken by hand and therefore considered non-friable by our field staff.

Exposed surface soils were evident at sampling location JKE136. To further assess the risk of asbestos dust exposure to receptors, Interim asbestos controls recommended by JKE were implemented by the South Western Sydney Local Health District (SWSLHD), including asbestos air fibre monitoring and temporary capping/barricading of the exposed surface soils within the area surrounding sampling location JKE136. JKE have subsequently prepared an Interim Asbestos Management Plan (IAMP) in December 2019[6] for the entire Liverpool Hospital grounds for the SWSLHD. The IAMP included the recommendations for an 'emu pick' of potential surface ACM across the entire hospital grounds, a visual asbestos surface clearance inspection/certificate and at the SWSLHD request a semi-permanent capping procedure for the area surrounding JKE136. JKE have since visually observed the surface where the semi-permanent capping appeared to have been implemented in the landscaped areas around sampling location JKE136, however no further information has been provided.

[6] Report to South Western Sydney Local Health District, on Interim Asbestos Management Plan (IAMP), Interim Due Diligence and Management, at Liverpool Hospital, Elizabeth Street, Liverpool, NSW (JKE ref: E32865PLrpt IAMP, dated 13 December 2019) (referred to as JKE IAMP)

Based on the Tier 1 risk assessment, the surface ACM, concentrations of friable asbestos (AF/FA) within the fill soils at sampling locations JKE136 and JKE137 and Carcinogenic PAHs within the fill soils at sampling location MW3, were identified as a risk to the receptors and therefore a RAP was recommended to document the procedure for remediating the site.

The JKE ESA identified the following data gaps in the table below:

Table 2-2: Data Gaps from the JKE ESA

Data Gap	Assessment
Soil sampling density below minimum guideline density	Sampling was limited to approximately 58% of the minimum sampling density recommended in the EPA Sampling Design Guidelines 1995. A further 16 sampling location are required to meet the EPA Sampling Design Guidelines 1995 recommended minimum sampling density. The assessment identified fill containing ash, slag, demolition waste, friable asbestos (AF/FA) within the fill soils at sampling locations JKE136 and JKE137 and Carcinogenic PAHs in the fill soils at sampling location MW3. Due to site access constraints associated with the existing hospital buildings associated hospital use, the additional soil assessment will need to be undertaken following the demolition of the existing buildings. The additional 16 sampling locations should be placed in a systematic grid sampling pattern. Additional sampling undertaken to target the fill material beneath the buildings and beneath the hazardous good storage area at the east end of the existing pathology building. This data gap should be further assessed to inform the remedial tasks to be identified in the RAP.
Extent of fill soil AF/FA (friable asbestos) at and adjacent to sampling location JKE136 and JKE137	The vertical and horizontal extent of friable asbestos (AF/FA) within the fill soils at sampling locations JKE136 and JKE137 requires further assessment. This data gap should be further assessed to inform the remedial tasks to be identified in the RAP.
Extent of fill soil Carcinogenic PAHs at Sampling location MW3	The vertical and horizontal extent of Carcinogenic PAHs in the fill soils at sampling location MW3 requires further assessment. This data gap should be further assessed to inform the remedial tasks to be identified in the RAP.
Potential for groundwater contamination in the south section of the site (MW3)	Based on the site history and the results reported, the potential for significant groundwater contamination to pose a risk to the receptors is considered to be low. However, concentrations of PAHs were encountered in the groundwater samples MW3 above the SAC and mid to heavy fractions TRHs were encountered. The groundwater sample obtained from groundwater monitoring well MW3 was extremely silty. JKE recommend that MW3 be redeveloped, sampled and additional groundwater samples analysed for PAHs, TRH, BTEX and VOCs.

Data Gap	Assessment
	This data gap should be further assessed to inform the remedial tasks to be identified in the RAP. Further groundwater investigations may be required following an assessment of the additional groundwater results from MW3.

The JKE ESA concluded that the site could be made suitable for the proposed development provided that the following was implemented:

- The data gaps identified were addressed;
- A RAP and Asbestos Management Plan (AMP) are prepared;
- A Validation Report is prepared on completion of the remediation works;
- A long-term Environmental Management Plan (EMP) is prepared at the completion of remediation and validations works, in the event that the capping and containment approached to remediation is adopted; and
- A Salinity Management Plan (SMP) is prepared and implemented during development works.

2.2 Site Identification and Site Information

Table 2-3: Site Identification

Current Site Owner:	Health Infrastructure NSW
Site Address:	Part of 50 Goulburn Street, Liverpool, NSW (Liverpool Hospital). Address also known as Elizabeth Street, Liverpool, NSW.
Lot & Deposited Plan:	Part of Lot 501 DP 1165217
Current Land Use:	Hospital
Proposed Land Use:	Hospital
Local Government Authority:	Liverpool City Council
Current Zoning:	SP2 Infrastructure (Health Services Facility and Education) – Liverpool LEP 2008 (Liverpool Hospital)
Site Area (m^2):	Approximately 23,000m^2
RL (AHD in m) (approx.):	11-14
Geographical Location (decimal degrees) (approx.):	Latitude: -33.919454 Longitude: 150.928948
Site Location & Regional Setting:	The site is located in a predominantly residential and commercial area of Liverpool and within the west section of Liverpool hospitals western campus. The site is bounded by Campbell Street to the north, Goulburn Street to the west, Elizabeth to the south and Liverpool Hospital western campus to the west. The south east section of the site is located approximately 220m to the north-west of Georges River.

Topography:	The regional topography is characterised by gentle slopes which generally fall to the east and south east at approximately 2-4°. The site is located on the side of a hill and has a gentle slope towards the south at approximately 1-2°. Parts of the site appear to have been levelled to account for the slope and accommodate the existing development.
Geology & Hydrogeology:	Regional geological information presented in the JKE ESA indicated that the site is underlain by Bringelly Shale of the Wianamatta Group, which typically consists of shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff. The JKE ESA encountered fill to ranging depths from 1.1mBGL to 2.1mBGL overlying clay and siltstone bedrock at some locations. A number of the sampling locations drilled with hand tools (due to access limitations) were terminated in the fill due to refusal (fill depths are shown on Figure 2 in Appendix C). The subsurface conditions at the site are likely to consist of relatively low permeability residual soils overlying shallow bedrock. The potential for viable groundwater abstraction and use of shallow groundwater under these conditions is considered to be low. There is a reticulated water supply in the area and consumption of groundwater is not expected to occur at the site or in the vicinity. Use of groundwater is not proposed as part of the development. Considering the local topography and surrounding land features, JKE expected groundwater to flow towards the south-east. There was considered to be a potential for the basement excavation to encounter perched groundwater seepage flowing over the top of the bedrock or within cracks in the bedrock. Standing Water Levels (SWLs) measured in the monitoring wells installed at the site ranged from 4.0mBGL (MW3) to 8.06mBGL (MW135). Groundwater RLs calculated on these measurements ranged from RL2.81m to RL7.9m. The groundwater RLs indicate that excavation for the proposed basement may intercept groundwater. A groundwater contour plot was prepared for the groundwater levels using Surfer v11.0.642 (Surface Mapping Program) for the previous JKE Stage 2 ESA undertaken the proposed separate civil infrastructure works development. The groundwater contours plot incorporated the previous groundwater levels recorded at MW135 (within the site boundaries). The groundwater RLs calculated on these measurements ranged from RL 1.70m to RL 2.99m and indicted that groundwater was likely to flow from the west to the north-east in this area of the hospital.
Surrounding Land Use:	During the site inspections for JKE ESA, the following land uses in the immediate surrounds were observed: • North – Campbell Street, Liverpool Hospitals Health Service and Ingham institute. Liverpool Girls/Boys High School was located to the north east of the site; • South – Elizabeth Street, Bigge Park and TAFE NSW; • East – Liverpool Hospital western campus and the Main Southern Railway, bisecting Liverpool Hospitals western and eastern campuses; and • West – Goulburn Street, residential apartments and commercial land use approximately 150m to the west and south-west of the site.

2.3 Site Inspection

At the time of the JKE ESA site inspection, the majority of site was occupied by a number of multistorey hospital buildings identified as Education building, Alex Grimson building, Pathology Building and the Cancer Therapy building. A multistorey car park (identified as P2) partially occupied the north east section of the site and a basement car park (identified as P1) partially occupied the south east section of the site. A concrete surfaced loading dock was located in the central section of the site, with vehicle access to the loading dock gained via Goulburn Street.

The open space areas were paved by hardstand and landscaped areas were located along Elizabeth, Goulburn, Forbes and Campbell Street and within internal areas of the site not occupied by buildings. The landscaped areas included large trees, shrubs and grass cover. The vegetation generally appeared relatively healthy with no sign of stress; however, the grass cover was scarce in some areas.

A dangerous goods storage area was observed at a second smaller located dock located at the east end of the Pathology building as shown in Figure 2. Access to the dangerous goods storage was restricted at the time of the inspection, however signage indicated that stored chemicals included ethyl alcohol (100L), methyl alcohol (100L) and xylene (1,000L).

Potential ACM (fibre cement fragments) observed on the surface approximately in the landscaped areas surrounding the Alex Grimson building in the north/central section of the site. Representative surface FCF samples were confirmed to contain asbestos by the laboratory. The surface ACM sampling location are shown of Figure 3 attached in Appendix C.

JKE note that the site has been occupied by the hospital since the late 1800's.

2.4 Summary of Site Contamination

The JKE ESA encountered carcinogenic PAHs and friable asbestos (AF/FA) in the fill (soil) at concentrations that exceeded the human health SAC which require remediation. Surface ACM were also identified. The contamination data is shown on Figure 3 attached in Appendix C. Post-demolition validation sampling is required to assess the extent of remediation prior to excavation. The Post-demolition validation scope of works is outlined in Section 4.

The ecological elevations are shown on Figure 4 attached in Appendix C for information purposes. Based on the Tier 1 risk assessment, the levels of contamination identified in the soils and groundwater at the site above the ecological-based SAC were assessed to pose a low risk to the receptors and remediation due to ecological elevations is not proposed.

3 REVIEW OF CONCEPTUAL SITE MODEL

The table below includes a review of the conceptual site model (CSM) and this CSM has been used to design the remediation strategy. The CSM will require further review when additional site data becomes available.

Table 3-1: CSM Review

Contaminant source(s) and contaminants of concern	The contamination source is the historically imported fill (soil) and/or demolition of former buildings containing asbestos. At this stage, the primary contaminants of concern for remediation include PAHs, specifically carcinogenic PAHs and asbestos. Other CoPC identified in the JKE ESA will be considered for the post-demolition validation.
Affected media	At this stage, soil/fill has been identified as the affected medium for remediation. The potential for groundwater impacts in the south west section of the site are to be assessed further as part of the post-demolition validation. However, groundwater remediation is not yet deemed necessary and is not being targeted for remediation at this stage.
Receptor identification	Human receptors include construction workers who come into contact with the contaminated soil and site occupants/users (including adults and children in a commercial-type land use scenario as a hospital).
Exposure pathways	At this stage, the exposure pathway associated the identified CoPC and relevant to the human receptors includes ingestion, dermal absorption, inhalation of dust and inhalation of airborne fibres.

4 POST-DEMOLITION VALIDATION

Post-demolition validation is required to address the data gaps identified by the JKE ESA as summarised below:

- Soil sampling density was below the minimum guideline density and not undertaken beneath the existing buildings. This will be addressed as part of the post-demolition validation (see Section 4.2);
- Extent of fill soil AF/FA (friable asbestos) at and adjacent to sampling locations JKE136 and JKE137. This will be addressed as part of the post-demolition validation (see Section 4.3);
- Extent of fill soil Carcinogenic PAHs at Sampling location MW3. This will be addressed as part of the post-demolition validation (see Section 4.4); and
- Potential for groundwater PAHs, TRH, BTEX and VOCs contamination in the south section of the site (MW3). Due to the high silt content in the groundwater sample MW3 sample encountered during the JKE ESA, the laboratory was unable to analyse the sample for the CoPC. This will be addressed as part of the post-demolition validation (see Section 4.5).

The post-demolition validation must occur following demolition of buildings and structures, removal of hardstand and prior to any excavation/off-site disposal of the fill. The removal of the building and structures at the site must consider the EMS HAZMAT report and be undertaken in accordance with the relevant guidelines to prevent cross contamination to the surface soil.

The north east section of the site has been identified as 'high risk' area in the JKE IAMP due to the detection of friable asbestos in soil at JKE former sampling locations JKE136 and JKE137. JKE assume that at the time of the post-demolition validation assessment, the site would be a construction site and under management by the principal contactor. A separate and standalone Asbestos Management Plan (AMP) must be prepared and implemented for all asbestos removal/remediation works. The post-demolition validation field works must consider and implement suitable asbestos related controls where necessary.

4.1 Objectives

The objectives of the post-demolition validation investigation are to:

- Further characterise the fill/soil contamination conditions;
- Additional assessment of groundwater contamination conditions;
- Finalise the waste classification for the fill soil disposal;
- Confirm the extent of the required soil remediation;
- Assess whether any of the CoPC occur at concentrations that require further remediation and/or variation to the validation plan outlined in the RAP; and
- Facilitate the preparation of a Remedial Works Plan (RWP) in the event that additional or alternative remediation/validation strategies are required.

4.2 Additional Soil Sampling for Site Coverage

- Soil samples are to be collected from 18 sampling locations (MW101 to MW118) positioned across the site to primarily provide further site coverage, further assess the vertical extent of the fill (where refusal was previously encountered) and target the building footprint post demolition. A systematic

sampling grid was not previously achievable due to the retention of the oncology bunkers, P1 car access ramp/basement and the site access limitation of the JKE ESA. Sampling location MW103 has been positioned to target the dangerous good storage area located in the loading dock. The proposed sampling locations are shown on Figure 2 attached in Appendix A;

- Sampling is preferably to occur by test pitting using an excavator. Samples are to be collected from each fill profile and from the top (~ 0.5m) of the natural soil/bedrock beneath the fill; and
- Asbestos quantification of bulk fill samples is required in accordance with the NEPM 2013; and
- All soil samples will be screened using a photo-ionisation detector (PID).

4.3 Additional Soil Sampling to Assess the Extent of Friable Asbestos (AF/FA)

- Soil samples are to be collected from five sampling locations (MW119 to MW123) positioned approximately 5m from JKE ESA sampling locations JKE136 and JKE137. The proposed sampling locations are shown on Figure 2 attached in Appendix A;
- Sampling is preferably to occur by test pitting using an excavator. Samples are to be collected from each fill profile and from the top (~ 0.5m) of the natural soil/bedrock beneath the fill; and
- Asbestos quantification of bulk fill samples is not proposed due to the detection of AF/FA JKE ESA sampling locations JKE136 and JKE137; and
- All soil samples will be screened using a PID.

4.4 Additional Soil Sampling to Assess the Extent Carcinogenic PAHs at MW3

- Soil samples are to be collected from four sampling locations (MW124 to MW27) positioned approximately 5m from JKE ESA sampling locations JKE136 and JKE137. The proposed sampling locations are shown on Figure 2 attached in Appendix A;
- Sampling is preferably to occur by test pitting using an excavator. Samples are to be collected from each fill profile and from the top (~ 0.5m) of the natural soil/bedrock beneath the fill; and
- Asbestos quantification of bulk fill samples is required in accordance with the NEPM 2013; and
- All soil samples will be screened using a PID.

4.5 Additional Groundwater Sampling at MW3

- Monitoring well MW3 is to be re-developed using an electric pump in attempt to remove the silt content in groundwater;
- Groundwater samples (if encountered) are to be obtained approximately 5-7 days after re-development using low flow sampling equipment. Calibrated units will be used to record the following: standing water level (SWL); free phase hydrocarbons (LNAPL) using an interface probe; pH; electrical conductivity (EC); dissolved oxygen (DO); redox potential; and temperature;
- All samples will be recorded on field logs and collected in accordance with the NEPM 2013;
- The well be screened using a PID; and
- The groundwater samples from MW3 will be analysed for PAHs, TRH, BTEX and VOCs.

4.6 Decontamination and Sample Preservation

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

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

One sample per fill profile at each location is to be submitted for analysis of the CoPC identified for fill (see Table 2-2). Leachate testing (TCLP) will also be undertaken for waste classification purposes. Additional analysis should also be scheduled as required based on any observations of odours, staining and/or elevated PID results.

4.7 Quality Assurance/Quality Control (QA/QC)

Rinsate samples should be obtained during the decontamination process of re-usable equipment as part of the field QA/QC requirements. Inter and intra-laboratory duplicates should be collected and analysed for the soil assessment at a rate of 5% for inter-laboratory and 5% for intra-laboratory analysis. A trip spike and trip blank should also be submitted and analysed with each batch of samples.

4.8 Data Assessment

The data for the site should be assessed using the validation assessment criteria (VAC) outlined in Section 8.2.

For waste classification purposes, the soil data should be assessed against the NSW Waste Classification Guidelines, Part 1: Classifying Waste (2014)[7].

4.9 Reporting

On completion of the investigation, an interim validation and waste classification assessment report must be completed presenting the results of the investigation and confirming the extent of the required soil remediation works.

In the event that additional contamination and/or groundwater contamination is encountered that requires remedial measures to be implemented outside the scope of this RAP, a RWP must be prepared. The client and validation consultant are to discuss whether the RWP needs to be submitted to the consent authority (this will depend on how substantial the changes are to the scope of remediation) and the client is to take steps to notify consent authority and other relevant authorities as required.

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

5 REMEDIATION EXTENT

For the purpose of the RAP, the extent of the remediation includes all fill soil to the full extent of the site boundaries. Fill depths in the boreholes drilled for the JKE ESA are shown on Figure 2 attached in Appendix C. These fill depths can be used as a guide, however, it is noted that a number of the boreholes were terminated within the fill, due to the use of hand tools at sampling locations inaccessible to a drill rig. The extent of actual remediation will be further assessed by the post-demolition validation assessment.

6 REMEDIATION OPTIONS

6.1 Soil Remediation

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

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

Or if the above are not practicable:

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

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

The Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)[8] provides the following additional requirements to be taken into consideration:

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

The NEPM 2013 and Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009)[9] prefer the following asbestos remediation hierarchy:

1. Minimisation of public risk;
2. Minimisation of contaminated soil disturbance; and
3. Minimisation of contaminated material/soil moved to landfill.

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

[9] Western Australian (WA) Department of Health (DoH), (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia. (referred to as WA DoH 2009)

6.2 Consideration of Remediation Options

The table below discusses a range of remediation options:

Table 6-1: Consideration of Remediation Options

Option	Discussion	Applicability
Option 1 On-site treatment of contaminated soil	On-site treatment provides a mechanism to reuse the processed material and, in some instances, to avoid the need for large scale earthworks. Some of the treatment options include bio-remediation, soil washing, air sparging and soil vapour extraction, thermal desorption and physical removal of bonded Asbestos Containing Material (ACM). Depending on the treatment option, licenses may be necessary for specific individual waste streams due to the potential for air pollution and the formation of harmful by-products during incineration processes.	Not applicable for the contaminant of concern identified at the site.
Option 2 Off-site treatment of contaminated soil	Contaminated soils are excavated, transported to an approved/ licensed treatment facility, treated to remove/stabilise the contaminants then returned to the subject site, transported to an alternative site or disposed to an approved landfill facility. This option provides for a relatively short program of on-site works, however there may be some delays if the material is to be returned to the site following treatment. The cost per tonne for transport to and from the site and for treatment is considered to be relatively high. The material would also have to be assessed in terms of suitability for reuse as part of the proposed development works under the waste and resource recovery regulatory framework.	Not applicable for this project as noted above.
Option 3 Removal of contaminated material to an appropriate facility	Contaminated soils would be classified in accordance with NSW EPA guidelines for waste disposal, excavated and disposed of off-site to a NSW EPA licensed landfill. The material would have to meet the requirements for landfill disposal. Landfill gate fees (which may be significant) would apply in addition to transport costs.	Considering that the proposed development includes excavations to construct a basement and significant earthworks across the entire site area, this option is considered to be the most practical, technically achievable and economically viable option for this project. JKE also understand that this is the preferred remediation option by Health Infrastructure.

Option	Discussion	Applicability
<u>Option 4</u> Consolidation and isolation of impacted soil by cap and containment	This would include the placement of an impermeable barrier such as concrete/pavers etc, or a warning barrier and non-contaminated soil material, over the existing ground surface to isolate the contaminated material and thereby reduce the health risk to future site users. This action may also reduce the transport of contamination via surface water movement and dust generation. The capping and/or containment must be appropriate for the specific contaminants of concern. An ongoing Environmental Management Plan (EMP) would be required and site identification documentation, possibly including the Section 10.7 council planning certificate, land title or other appropriate statutory documentation, would be modified to note the presence of the contamination. This may impact upon development approval conditions, place restrictions on the use of the land and limit the future potential land value.	Potentially applicable for the contaminants of concern (asbestos and PAHs). However, may be onerous for Health Infrastructure.

6.3 Preferred Remediation Option and Rationale

The preferred option for remediation of the contaminated fill at the site is Option 3 – excavation and off-site disposal of the contaminated material. The contaminated fill should be excavated/removed prior to the commencement of bulk excavation of the natural soil/bedrock in order to limit the potential for cross-contamination and blending of waste streams.

7 REMEDIATION DETAILS

Prior to commencement of any demolition, site preparation or remediation work within the site, a suitably qualified contaminated land consultant[10] should be engaged as the validation consultant to validate the implementation of the RAP.

7.1 Roles and Responsibilities

Table 7-1: Roles and Responsibilities

Role	Responsibility
Client/Developer	To be confirmed. The client is required to appoint the project team for the remediation and must provide all investigation reports including this RAP to the project manager, remediation contractor, consent authority and any other relevant parties involved in the project.
Project Manager	To be appointed. The project manager is required to review all documents prepared for the project and manage the implementation of the procedures outlined in this RAP. The project manager is to take reasonable steps so that the remediation contractor and others have understood the RAP and will implement it in it's totality. The project manager will review the RAP and other documents and will update the parties involved of any changes to the development or remediation sequence (in consultation with the validation consultant).
Remediation Contractor	To be appointed. The remediation contractor is required to review all documents prepared for the project, apply for any relevant removal licences or permits and implement the remediation requirements outlined in this RAP. The remediation contractor is required to collect all necessary documentation associated with the remediation activities and forward this documentation onto the client, project manager and validation consultant as it becomes available. Further details are outlined in the sections below.
Validation Consultant	JKE – subject to formal engagement Contact: Mitchell Delaney, Senior Associated Environmental Scientist The validation consultant provides consulting advice and validation services in relation to the remediation. The validation is required to review any deviation to this RAP or in the event of unexpected finds if and when encountered during the site work. The validation consultant is to have a SafeWork Licensed Asbestos Assessor on staff to provide the necessary surface clearance inspections and certificates for the project. The validation consultant is required to liaise with the client, project manager and remediation contractor on all matters pertaining to the site contamination, remediation and validation.

[10] The consultant must be a certified practitioner (specialising in site contamination), under one of the NSW EPA endorsed certification schemes

7.2 Pre-commencement

The project team is to have a pre-commencement meeting to discuss the sequence of remediation, and the remediation and validation tasks. The site management plan for remediation works (see Section 10) should be reviewed by project manager and remediation contractor, and appropriate steps are to be taken to ensure the adequate implementation of the plan.

7.3 Sequence of Remediation Works

JKE anticipate the following general sequence of work for the project (in the context of the remediation):

1. Demolition and removal of structures and pavement;
2. Completion of the post-demolition validation investigation outlined in Section 4;
3. Remediation and validation of the fill contamination at the site; and
4. Validation of imported soil materials. This includes engineering material such as sub-base and drainage materials (e.g. recovered aggregate etc), or any other materials imported for service trenches etc.

7.4 Remediation Details – Preliminary Set up / Establishment

The fill is to be excavated to the full extent of the contamination areas which are to be confirmed by the post-demolition assessment. Advice should be obtained from the project engineers in order to facilitate this. Such advice may include, but would not be limited to, geotechnical advice in relation to shoring and/or structural advice in relation to adjoining structures and land.

The positioning of site sheds and entry/exit points for truck movements etc should be well thought out so as to facilitate the excavation and removal of fill from contamination areas.

7.5 Demolition of Buildings and Structures

Further to the exiting EMS HAZMAT report for the site building and structures. We understand that a destructive hazardous building materials survey is to be undertaken once the buildings have been vacated. The buildings are to be demolished with regards to the findings of the EMS HAZMAT, the pending destructive hazardous building materials survey and in accordance with the relevant codes and standards. All demolition waste from the buildings/structures are to be disposed off-site to facilities that are appropriately licensed to receive the waste.

7.6 Remediation Details – Excavation and Disposal of Contaminated Fill

The procedure for excavation of contaminated fill soil is outlined below:

Table 7-2: Remediation Details – Excavation and disposal of contaminated fill

Step	Primary Role/ Responsibility	Procedure
1.	Remediation contractor	Personal Protective Equipment (PPE) and Work Health and Safety (WHS): Check PPE and WHS requirements prior to commencement of remediation works. The minimum PPE required for the remediation at the site includes covered clothing, gloves, dust masks and steel cap boots. Other site/project specific PPE may be required including hard hat, eye protection, steel toed boots etc and will be dependent on the requirements of the contractor for the site. Further PEE required for asbestos removal works are to be detailed in the AMP.
2.	Remediation contractor (or their nominated sub-contractor) and to be confirmed by the validation consultant	Preparation of Excavation Area: The extent of the areas to be excavated for off-site disposal should be clearly delineated on-site using pegs/star pickets or other appropriate means.
3.	Remediation contractor (or their nominated sub-contractor) and validation consultant	Removal of contaminated fill: Excavation of the remediation area further assessed by the post-demolition validation investigation will be undertaken as follows: • Submit an application to dispose the fill (in accordance with the assigned waste classification) to a landfill licensed by the NSW EPA to receive the waste and obtain authorisation to dispose; • A water system will need to be in place to spray the excavated soil during excavation/ remediation works and to decontaminate trucks entering the work area. The general site area should be kept damp during remediation works to minimise the generation of dust; • Asbestos related controls for asbestos removal works are to be implemented as per the AMP; • The remediation area should be excavated to the base of the fill and down to the surface of the underlying natural soil (or bedrock, whichever is encountered first). The works should be done in the most efficient manner that minimises cross contamination. We note that the natural soil/rock levels may vary across the site and provisions will need to be made for careful, detailed excavation and removal of all fill. Even minor amount of fill, if left present at the surface, will result in validation failure and the need for further excavation; • Load the fill onto trucks and dispose in accordance with the assigned waste classification. The receiving licenced landfill facility; • The validation consultant is to obtain validation samples from the base and walls of the remediation excavation to demonstrate that the contaminated fill has been removed and that the underlying natural soil is VENM (see the Validation Plan in Section 8); • The occurrence of unexpected finds (staining/odours, asbestos in areas where not anticipated etc) during the soil removal are to be documented and addressed with regards to Section 9; • If any temporary backfilling/reinstatement is required, this is to occur using clean/validated materials. Preferably the backfill would be sourced from on-site. However, if materials are imported for this purpose, the imported

Step	Primary Role/ Responsibility	Procedure
		materials must be validated in accordance with the Validation Plan in Section 8; and • All documents including landfill disposal dockets should be retained by the remediation contractor and forwarded to the client and validation consultant. This documentation forms a key part of the validation process and is to be included in the validation report.
4.	Remediation contractor (or their nominated sub-contractor)	Isolation/Quarantining of Validated Areas: Following excavation of fill and validation of the excavated area, the area should be appropriately isolated/quarantined from the adjoining areas to limit the potential for cross-contamination that could occur via the movement of vehicles and machinery. This could include the installation of temporary fences (e.g. barrier mesh). Any haul routes established to transport contaminated material off site suitably defined/established to prevent cross contamination to other areas of the site.

7.7 Disposal Requirements

The fill must be disposed of to a waste facility licensed by the NSW EPA to receive the waste stream. The waste classification for the site will be updated by the post-demolition validation assessment (as outlined in Section 4) must be used to facilitate the lawful disposal of the waste.

7.8 Remediation Documentation

The construction/remediation contractor must keep records and retain all documentation associated with the remediation, including but not limited to:

- Waste/surplus soil disposal dockets;
- Asbestos management documentation, including all relevant notifications, licences, clearance certificates and air monitoring reports (additional details in this regard are to be outlined in the AMP);
- Imported materials information;
- Photographs of remediation works; and
- Waste tracking documentation.

Copies of the documents must be forwarded to the validation consultant on completion of the remediation for inclusion in the validation report.

Any waste movements should be documented. A copy example of a waste tracking spreadsheet is attached in Appendix D. Copies of the documents must be forwarded to the validation consultant on completion of the remediation for inclusion in the validation report.

7.9 Soil Disposal - Volume and Disposal Analysis

A soil volume analysis should be undertaken on completion of the validation works and reconciled with the quantities shown on the soil disposal dockets. This information is to be reviewed by the validation consultant on completion of the works and an assessment of the quantities of soil disposed off-site (e.g. comparison

with the estimated and actual volumes) is to be included in the waste classification report. A review of the disposal facility's licence issued under the Protection of the Environment Operations (POEO) Act (1997)[11] should also be undertaken to assess whether the facility is appropriately licensed to receive the waste.

An estimate of the fill soil volumes for each of the waste streams is to be provided in the post-demolition validation assessment report.

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

8 VALIDATION PLAN

Validation is necessary to demonstrate that remedial measures described in this RAP have been successful and that the site is suitable for the intended land use. The validation can be staged if required, depending on the sequence of excavation.

The sampling and documentation requirements for the validation are outlined in Section 8.1. These are the minimum requirements based on conditions anticipated to exist at the site. Additional validation sampling may be required based on site observations made during remediation. Site observations will also be used as a validation tool to assess the extent of site contamination.

8.1 Validation Sampling and Documentation

The table below outlines the validation requirements for the site.

Table 8-1: Validation Requirements

Aspect	Sampling	Analysis	Observations and Documentation
Demolition of Buildings and Structures (Section 7.5)			
Demolition of structures	As per the hazardous building materials reports	As per the hazardous building materials reports	Copy of destructive hazardous building materials report to be provided to the validation consultant along with any monitoring and/or clearance reports from the demolition. Letter of compliance is required from the demolition contractor confirming that the demolition occurred with regards to the hazardous building materials reports.
Post-demolition Validation Assessment (Section 4.2 – Additional Soil Sampling for Site Coverage)			
Soil sampling	As per Section 4.2	Asbestos (500ml), heavy metals, TRH/BTEX, PAHs, OCPs, OPPs, PCBs.	Post-demolition investigation report to be prepared by the validation consultant presenting the results and recommendations. Waste classification assessment to be included.
Post-demolition Validation Assessment (Section 4.3 – Additional Soil Sampling to Assess Friable Asbestos (AF/FA))			
Soil sampling	As per Section 4.3	Asbestos (500ml)	Post-demolition investigation report to be prepared by the validation consultant presenting the results and recommendations. Waste classification assessment to be included.

Aspect	Sampling	Analysis	Observations and Documentation
Post-demolition Validation Assessment (Section 4.4 – Additional Soil Sampling to Assess Extent of Carcinogenic PAHs)			
Soil sampling	As per Section 4.4	PAHs	Post-demolition investigation report to be prepared by the validation consultant presenting the results and recommendations. Waste classification assessment to be included.
Post-demolition Validation Assessment (Section 4.5– Additional Groundwater Sampling at MW3)			
Groundwater sampling	As per Section 4.5	PAHs, TRH, BTEX and VOCs.	Post-demolition investigation report to be prepared by the validation consultant presenting the results and recommendations.
Excavation and off-site Disposal of Asbestos Contaminated Fill (Section 7.6)			
Validation following removal of asbestos contaminated fill	Base sample to include min of two samples per excavation, or at least one sample per 10m^2 (~3m x 3m grid), whichever is greater. Wall sampling at a minimum of 1 sample per wall but no less than one sample per 5m lineal length. Sampling is to target the same depth/profile where the initial exceedance was encountered.	Asbestos (500ml) and No visible FCF observed within walls of the based on the excavation	Observations of staining and odour to be recorded. Photographs to be taken. Visual asbestos clearance certificate/s and asbestos sir fibre monitoring results to be undertaken and provided. Disposal dockets to be retained.
Excavation and off-site Disposal of Carcinogenic PAHs Contaminated Fill (Section 7.6)			
Validation following removal of Carcinogenic PAHs contaminated fill	Base sample to include min of two samples per excavation, or at least one sample per 10m^2 (~3m x 3m grid), whichever is greater. Wall sampling at a minimum of 1 sample per wall but no less than one sample per 5m lineal length. Sampling is to target the same depth/profile where the initial exceedance was encountered.	PAHs	Samples to be screened using PID. Observations of staining and odour to be recorded. Photographs to be taken. Disposal dockets to be retained.

Aspect	Sampling	Analysis	Observations and Documentation
Imported Materials – validation of imported materials is required for any materials imported onto the site during the remediation and to the point in time that the site validation report is prepared (e.g. gravels for site preparation, basecourse, landscaping materials, VENM, backfill for service trenches etc).			
Imported VENM backfill (if required)	Minimum of three samples per source. Additional sampling may be required at the validation consultant's discretion based on robustness of supplier documentation/ VENM report.	Asbestos (presence/absence), heavy metals, TRH/BTEX, PAHs, OCPs, OPPs, PCBs. Additional analysis may be required depending on the site history of the source property.	VENM documentation/report required from the remediation contractor. The documentation/report must be provided to the validation consultant prior to importation to the site. The provided documentation/report should include source site history to demonstrate analytes are appropriate. Photographs of the VENM at the source site. The VENM material is to be inspected upon importation by the validation consultant to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Photographic documentation and an inspection log are to be maintained. Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing VENM documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the validation assessment criteria (VAC).
Imported engineering materials such as recycled aggregate, road base etc or Excavated Natural Material (ENM)	Minimum of three samples per source/material type. Additional testing may be required for ENM to meet the specification within the ENM Order.	Heavy metals (as above), TRHs, BTEX, PAHs, OCP/OPP, PCBs and asbestos (presence/ absence). Additional testing may be required for ENM (e.g. foreign materials, pH and electrical conductivity) depending on available documentation.	Documentation required to confirm material has been classified with reference to a relevant Resource Recovery Order/Exemption. Review of the facility's Environment Protection Licence (EPL). Photographs of the ENM at the source site. Material is to be inspected by the validation consultant upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Dockets for imported material to be provided.

Aspect	Sampling	Analysis	Observations and Documentation
			Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.
Imported engineering materials comprising only natural quarried products.	At the validation consultant's discretion based on robustness of supplier documentation.	At the validation consultant's discretion based on robustness of supplier documentation.	Documentation to be provided from the supplier confirming the material is a product comprising only VENM (i.e. natural quarried product). Review of the quarry's EPL. Material is to be inspected by the validation consultant upon importation to confirm it is free of anthropogenic materials, visible and olfactory indicators of contamination, and is consistent with documentation. Dockets for imported material to be provided. Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.
Imported landscaping materials, including mulches, topsoil, garden mix etc	Minimum of three samples per source/material type. Additional sampling may be required at the validation consultant's discretion based on robustness of supplier documentation.	Heavy metals (as above), TRHs, BTEX, PAHs, OCP/OPP, PCBs and asbestos (presence/ absence).	Documentation required to confirm material has been produced under an appropriate Australian Standard or similar. Material is to be inspected by the validation consultant upon importation to confirm it is free of visible/olfactory indicators of contamination and is consistent with documentation. Dockets for imported material to be provided.

Aspect	Sampling	Analysis	Observations and Documentation
			Where check sampling occurs by the validation consultant due to deficiencies or irregularities in existing documentation, the following is required: - Date of sampling and description of material sampled; - An estimate of the volume of material imported at the time of sampling; - Sample location plan; and - Analytical reports and tabulated results with comparison to the VAC.

8.2 Validation Assessment Criteria and Data Assessment

The validation assessment criteria (VAC) to be adopted for the validation assessment are outlined in the table below:

Table 8-2: VAC

Validation Aspect	Criteria
Waste classification	In accordance with the procedures and criteria outlined in the NSW EPA Waste Classification Guidelines 2014.
Soil validation	The soil validation criteria to be adopted for the proposed development at the site will be the health-based investigation/screening levels for land use type A (residential with accessible soils' HILs/HSLs). These have been selected as a screening tool. Alternate land use VAC may be considered on a case by case basis. JKE note that the Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009)[12] (endorsed in NEPM 2013), HSL criteria for asbestos fines/fibrous asbestos (AF/FA) in soil is <0.001% w/w for all land use scenarios.
Groundwater at monitoring well MW3	The NEPM (2013) groundwater Health Screening Levels (HSLs) are not applicable for this project as the proposed basement will either intersect groundwater or groundwater will be located at <2m below the basement floor level. Under these circumstances NEPM (2013) requires that a site-specific assessment (SSA) is undertaken to assess the potential human health risks posed by volatile contaminants in groundwater. JKE propose the following VAC for the SSA, which are based on available drinking water guidelines: • Australian Drinking Water Guidelines 2011 (updated 2018)[13] for BTEX compounds and selected VOCs;

[12] Western Australian (WA) Department of Health (DoH), (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia. (referred to as WA DoH 2009)

[13] National Health and Medical Research Council (NHMRC), (2018). *National Water Quality Management Strategy, Australian Drinking Water Guidelines 2011* (referred to as ADWG 2011)

Validation Aspect	Criteria
	• World Health Organisation (WHO) document titled Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality (2008)[14] for petroleum hydrocarbons; • USEPA Region 9 screening levels for naphthalene (threshold value for tap water); and • The use of the laboratory PQLs for other contaminants where there were no Australian guidelines.
Imported materials	Heavy metal concentrations to be consistent with background range, organic compounds to be less than the laboratory practical quantitation limits (PQLs) and asbestos to be absent. Imported landscaping materials are also to consider ecological investigation levels (EILs) and ecological screening levels (ESLs) based on NEPM 2013. Aesthetics: soils to be free of staining and odours.

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

For imported materials, further assessment of risk can be considered in relation to site specific circumstances/application and available documentation for each material type, although such assessment and importation/use of materials on site should not be contrary to waste exemptions/orders or waste definitions.

8.3 Validation Report

As part of the validation process (in addition to the post-demolition validation reporting requirements outlined in Section 4) a site validation report will be prepared on completion of remediation and validation by the validation consultant. The report will outline the remediation work undertaken at the site and any deviations to the remediation strategy. The report will present the results of the validation assessment and will be prepared in accordance with the NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (2020)[15].

The validation report should draw conclusions regarding the success of the remediation/validation and the suitability of the site for the proposed development (from a contamination viewpoint).

8.4 Data Quality

Appropriate QA/QC samples should be obtained during the validation (where applicable) and analysed for the contaminants of concern. As a minimum, QA/QC sampling should include duplicates (5% inter-laboratory and 5% intra-laboratory), trip spikes, trip blanks and rinsate samples.

[14] World Health Organisation (WHO), (2008). *Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality* (referred to as WHO 2008)

[15] NSW EPA, (2020). Guidelines for Consultants Reporting on Contaminated Sites (referred to as Reporting Guidelines 2020)

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

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

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

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

9 CONTINGENCY PLAN

A review of the proposed remediation works has indicated that the greatest risks that may affect the success of the remediation include identification of unexpected finds. Contingency plans to address these risks are outlined below, in conjunction with a selection of other contingencies that may apply to this project.

9.1 Unexpected Finds

Residual hazards that may exist at the site would generally be expected to be detectable through visual or olfactory means. At this site, these types of hazards may include: underground tanks, soil impacted by asbestos (other than that known) and odorous or stained hydrocarbon impacted soils.

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

- In the event of an unexpected find, all work in the immediate vicinity should cease and the client should be contacted immediately;
- Temporary barricades should be erected to isolate the area from access to the public and workers;
- The client should engage the validation consultant to attend the site and assess the extent of remediation that may be required and/or adequately characterise the contamination in order to allow for remediation of the material;
- In the event additional remediation is required, the procedures outlined within this report should be adopted where appropriate. Alternatively, an addendum RAP or RWP should be prepared;
- An additional sampling and analytical rationale should be established by the consultant and should be implemented with reference to the relevant guideline documents; and
- Appropriate validation sampling should be undertaken and the results should be included in the validation report.

9.2 Continual Validation Failure (after fill removal)

In the event of a soil validation failure when validating fill removal, the client should be advised then the excavation should be extended in the direction of the failure (in consultation with the validation consultant, client and other relevant stakeholders) and the area re-validated.

9.3 Importation Failure for Imported Materials

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

10 SITE MANAGEMENT PLAN FOR REMEDIATION WORKS

The information outlined in this section of the RAP is for the remediation work only. The client should make reference to the development consent for specific site management requirements for the overall development of the site.

10.1 Asbestos Management Plan

Prior to the commencement of any soil disturbance in the remediation areas, a remediation/construction-phase AMP is to be prepared to document the asbestos-related management requirements for the remediation.

10.2 Interim Site Management

The JKE IAMP is to be implemented for the site prior to the commencement of remediation. No further interim site management measures are considered necessary at this stage.

10.3 Project Contacts

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

Table 10-1: Project Contacts

Role	Company	Contact Details
Project Manager	To be appointed	-
Remediation Contractor	To be appointed	-
Validation Consultant	JKE (at the time of the RAP preparation)	Mitch Delaney Senior Associate **mdelaney@jkenvironments.com.au** P: 9888 5000
Certifier	To be appointed	-
NSW EPA	Pollution Line	131 555
Emergency Services	Ambulance, Police, Fire	000

10.4 Security

Prior to the commencement of site works, fencing should be installed as required to secure the remediation areas. Warning signs should be erected, which outline the PPE required for remediation work.

10.5 Timing and Sequencing of Remediation Works

The anticipated sequence of remediation works is outlined in Section 7.3. The buildings and structures at the site will need to be demolished to allow site access for the poste-demolition assessment and for remediation works to occur.

10.6 Site Soil and Water Management Plan

The contractor should prepare a detailed soil and water management plan prior to the commencement of site works. Silt fences should be used to control the surface water runoff at all appropriate locations of the site.

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

10.7 Noise and Vibration Control Plan

The guidelines for minimisation of noise on construction sites outlined in AS-2460 (2002)[16] should be adopted. Other measures specified in the consent conditions should also be complied with. Noise producing machinery and equipment should only be operated between the hours approved by Council (refer to consent documents).

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

10.8 Dust Control Plan

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

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

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

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

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

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

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

All equipment and machinery should be brushed or washed down before leaving the site to limit dust and sediment movement off-site. In the event of prolonged rain and lack of paved areas all vehicles should be washed down prior to exit from the site, and any soil or dirt on the wheels of the vehicles removed. Water used to clean the vehicles should be collected and tested prior to appropriate disposal under the Waste Classification Guidelines 2014.

10.9 Air Monitoring

Reference is to be made to the remediation/construction-phase AMP for details regarding asbestos air fibre monitoring. Air monitoring must only be carried out by personnel registered and accredited by NATA (National Association of Testing Authorities). Filter analysis must only be carried out within a NATA certified laboratory. The monitoring results must conform to the requirements of the NOHSC Guidance note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003 (2005)].

The monitoring program will be used to assess whether the control procedures being applied are satisfactory and that criteria for airborne asbestos fibre levels are not being exceeded. The following levels will be used as action criteria during the air monitoring:

- <0.01 Fibres/ml: Work procedures deemed to be successful;
- 0.01 to 0.02 Fibres/ml: Inspection of the site and review of procedures; and
- >0.02 Fibres/ml: Stop work, inspection of the site, review of procedures, clean-up, rectification works where required and notify the relevant regulator.

10.10 Odour Control Plan

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

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

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

The following odour management plan should be implemented to limit the exposure of site personnel and surrounding residents to unpleasant odours:

- Excavation and stockpiling of material should be scheduled during periods with low winds if possible;
- A suitable proprietary product could be sprayed on material during excavation and following stockpiling to reduce odours (subject to an appropriate assessment of the product by the validation consultant);
- All complaints from workers and neighbours should be logged and a response provided. Work should be rescheduled as necessary to minimise odour problems;
- The site foreman should consider the following odour control measures as outlined in NEPM:
  - reduce the exposed surface of the odorous materials;
  - time excavation activities to reduce off-site nuisance (particularly during strong winds); and
  - cover exposed excavation faces overnight or during periods of low excavation activity.
- If continued complaints are received, alternative odour management strategies should be considered and implemented.

10.11 Dewatering

Temporary dewatering is not anticipated to be required as part of the remediation works. If a rain event occurs, this water should be managed appropriately on site in accordance with the remediation contractor's soil and water management plan. This water should not be pumped to stormwater or sewer unless a prior application is made and this is approved by the relevant authorities.

10.12 Health and Safety Plan

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

As a minimum requirement, personnel must wear appropriate protective clothing, including long sleeve shirts, long trousers, steel cap boots and hard hats. Additional asbestos-related PPE will be required and this will be specified in the remediation/construction-phase AMP. Washroom and lunchroom facilities should also be provided to allow workers to remove potential contamination from their hands and clothing prior to eating or drinking.

10.13 Waste Management

Prior to commencement of remedial works and excavation for the proposed development, the remediation contractor should develop a waste management or recycling plan to minimise the amount of waste produced by the site. This should, as a minimum, include measures to recycle and re-use natural excavated material wherever possible.

10.14 Incident Management Contingency

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

10.15 Hours of Operation

Hours of operation should be between those approved by the consent authority under the development approval process.

11 CONCLUSION

JKE are of the opinion that the site can be made suitable for the proposed development provided this RAP is implemented. A site validation report is to be prepared on completion of remediation activities and submitted to the consent authority to demonstrate that the site is suitable for the proposed development.

11.1 Remediation Category

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

Table 11-1: Remediation Category

Category	Details
Category 1	Category 1 remediation works are those undertaken in the following areas specified under Clause 9 of SEPP55: • A designated development; • Carried out on land declared to be a critical habitat; • Development for which another SEPP or REP requires a development consent; or • Carried out in an area or zone classified as: ➢ Coastal Protection; ➢ Conservation or heritage conservation; ➢ Habitat protection, or habitat or wildlife corridor; ➢ Environmental protection; ➢ Escarpment protection or preservation; ➢ Floodway or wetland; ➢ Nature reserve, scenic area or scenic protection; etc. • Work that is not carried out in accordance with the site management provisions contained in the consent authority Development Control Plan (DCP)/Local Environmental Plan (LEP) etc. Approval is required from the consent authority for Category 1 remediation work. The RAP needs to be assessed as part of the development consent. Category 1 remediation work is identified as advertised development work unless the remediation work is a designated development or a state significant development (Clause 13 of SEPP55).
Category 2	Remediation works which do not fall under the above category are classed as Category 2. Development consent is not required for Category 2 remediation works, however the consent authority should be given 30 days' notice prior to commencement of works.

Based on the above, JKE have assessed that the remediation falls within Category 1. Further information is provided in Section 11.2.

11.2 Regulatory Requirements

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

Table 11-2: Regulatory Requirement

Guideline / Legislation / Policy	Applicability
SEPP55	JKE have assessed that the remediation falls within Category 1, as the proposed development has been identified as a SSDA under the Stage and Regional Development SEPP and development consent is required from the NSW Department of Planning, Industry and Environment, under the *Environmental Planning & Assessment Act 1997*. This should be confirmed by the client's planner.
Duty to Report Contamination (2015)[17]	At this stage, JKE consider that there is no requirement to notify the NSW EPA of the site contamination. This requirement should be reassessed following review of the validation results.
POEO Act 1997	Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner. Appropriate waste tracking is required for all waste that is disposed off-site. Activities should be carried out in a manner which does not result in the pollution of waters.
POEO (Waste) Regulation 2014	Part 7 of the POEO Waste Regulation 2014 set outs the requirements for the transportation and management of asbestos waste and Clause 79 of the POEO Waste Regulation requires waste transporters to provide information to the NSW EPA regarding the movement of any load in NSW of more than 10 square meters of asbestos sheeting, or 100 kilograms of asbestos waste. To fulfil these legal obligations, asbestos waste transporters must use WasteLocate. Clause 78 of the POEO Waste Regulation requires that a person who transport asbestos waste must ensure that: • Any part of any vehicle in which the person transports the waste is covered, and leak-proof, during the transportation; and • If the waste consists of bonded asbestos material—it is securely packaged during the transportation; and • If the waste consists of friable asbestos material—it is kept in a sealed container during transportation; and • If the waste consists of asbestos-contaminated soils—it is wetted down. Asbestos waste in any form cannot be re-used or recycled.
SafeWork NSW Code of Practice: How to manage and control asbestos in the workplace (2019)	Sites with asbestos become a 'workplace' when work is carried out there and require a register and AMP. Appropriate SafeWork NSW notification will be required for asbestos removal works or handling. Contractors are also required to be appropriately licensed for the asbestos works undertaken (i.e. Class A licence for friable asbestos work).

[17] NSW EPA, (2015), *Guidelines on the Duty to Report Contamination under the Contamination Land Management Act 1997.* (referred to as Duty to Report Contamination 2015)

12 LIMITATIONS

The report limitations are outlined below:

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

Important Information About This Report

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

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

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

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

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

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

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

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

Misinterpretation of Site Assessments by Design Professionals

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

Logs Should not be Separated from the Assessment Report

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

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

Read Responsibility Clauses Closely

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

Appendix A: Report Figures

0 20 40 60 80 100

SCALE 1:2000 @A4 m

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

Title: **SITE LOCATION PLAN**

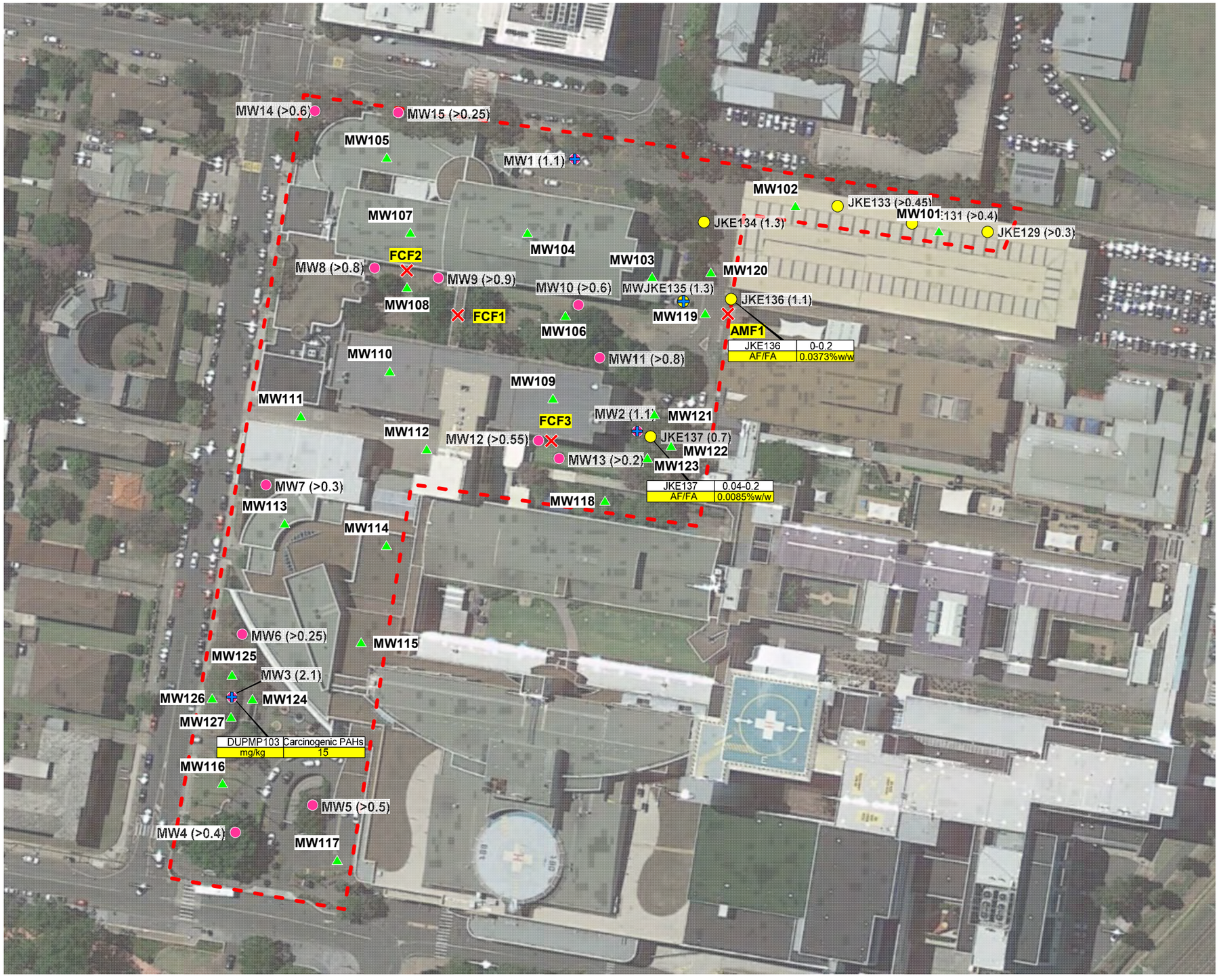
Location: MAIN CAMPUS, LIVERPOOL HOSPITAL, ELIZABETH STREET, LIVERPOOL, NSW

Job No: E32837BDrpt2-RAP

Figure: 1

JKEnvironments

PLOT DATE: 30/01/2020 3:47:59 PM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\32000'S\32837A LIVERPOOL HOSPITAL\CAD\32837A.DWG



LEGEND:

- APPROXIMATE SITE BOUNDARY
- **MW (0.1)** — JKE ESA (2020) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- **MW (0.1)** — JKE ESA (2020) BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- **JKE (0.1)** — JKE STAGE 2 ESA (2019) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- **MWJKE (0.1)** — JKE STAGE 2 ESA (2019) BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- **MW101** — POST-DEMOLITION VALIDATION, PROPOSED BOREHOLE LOCATION AND NUMBER
- **FCF1** — SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER
- **AMF1** — SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER (JKE Rpt ref: E32465BDrpt4, dated October 2019)
- SOIL CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK (%W/W or mg/kg)

0 — 65
Scale — Metres

Notes: Reference should be made to the report text for a full understanding of this plan.

Image Sources: Google Earth and Fitzpatrick and Partners (Project No: 21807, Drawing No: A-EW-0220, dated 9/12/2019)

Title: **PROPOSED POST-DEMOLITION VALIDATION SAMPLING PLAN**

Location: MAIN CAMPUS, LIVERPOOL HOSPITAL, ELIZABETH STREET, LIVERPOOL, NSW

Project No: E32837BDrpt2-RAP

Figure No: 2

JK ENVIRONMENTS

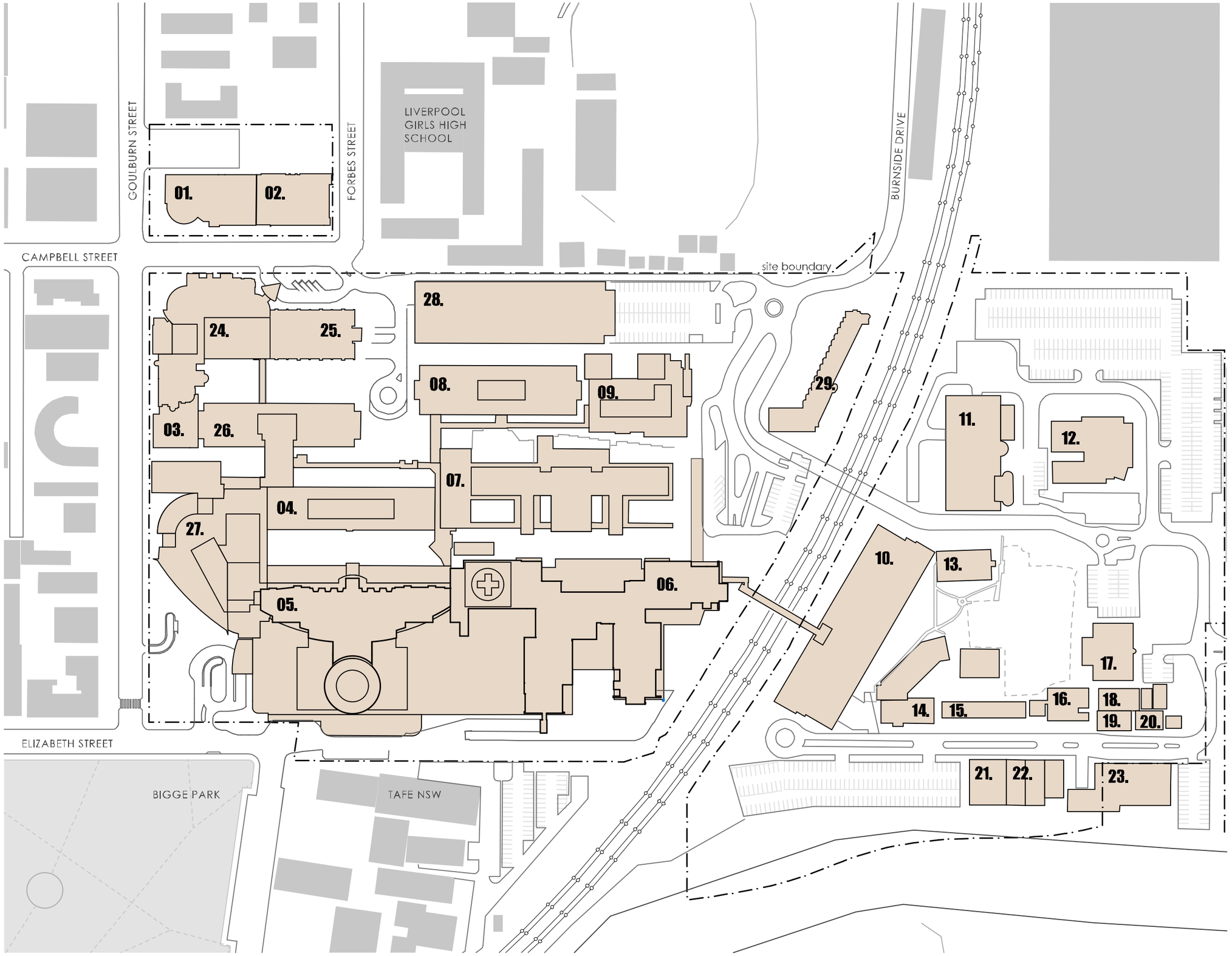
Appendix B: Selected Development Plans

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit
10. P4 multi-storey car park
11. central energy building
12. ngara health education
13. bungala building
14. child care centre
15. staff education trainning
16. physical recources
17. admin building
18. multicultural health services
19. biu admin
20. biu nursing area
21. interpret building
22. store shed
23. isd swsahs
24. cancer building
25. pathology building
26. alex grimson
27. thomas & rachael moore edu. centre
28. P2 car park
29. ron dunbier

liverpool campus

existing buildings



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a. LEVEL 6, 156 CLARENCE STREET, SYDNEY 2000, AUSTRALIA

AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE 1:2000 @A3
25mm ON ORIGINAL

DRAWING
EXISTING SITE PLAN

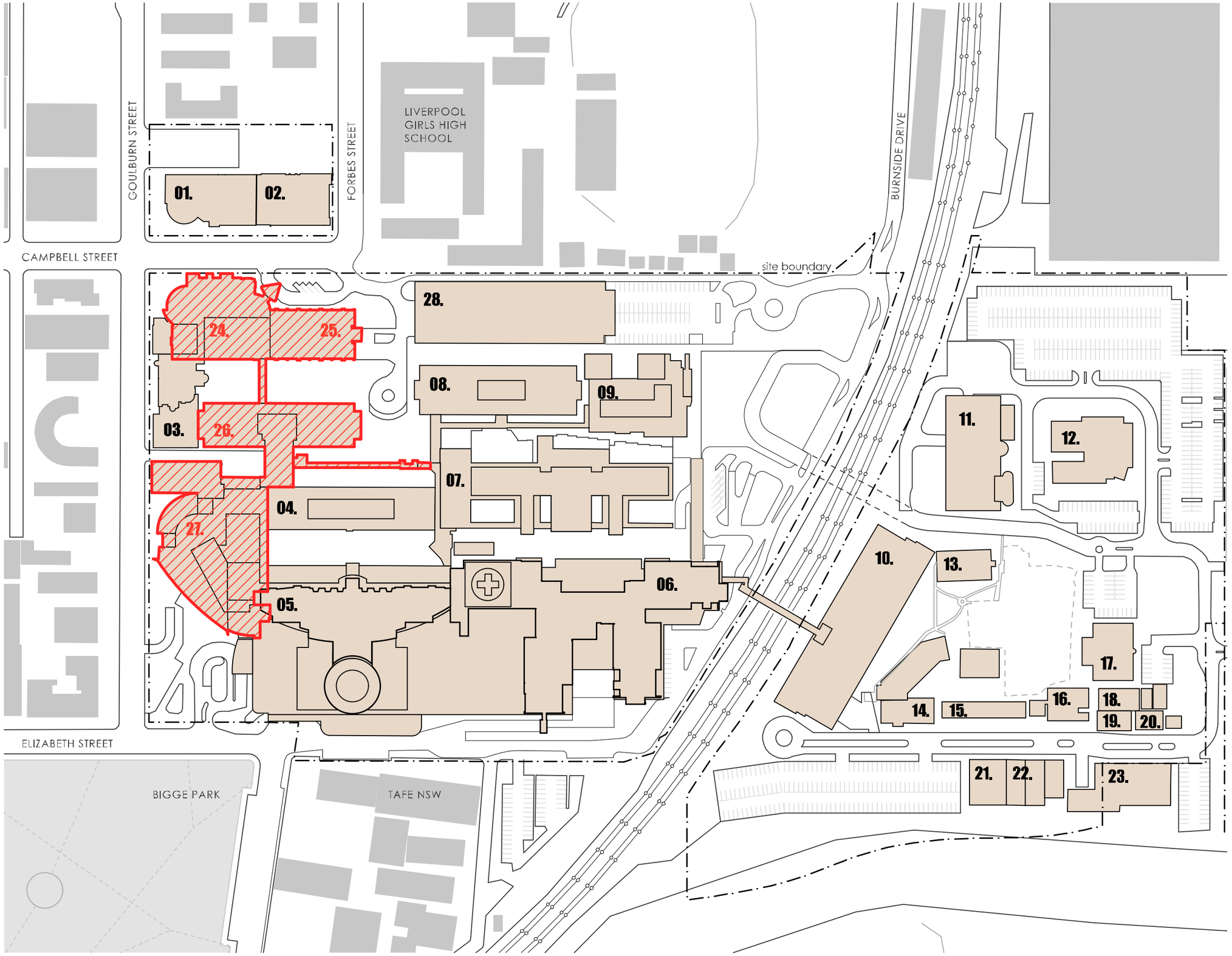
PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-03
ISSUE 05

STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit
10. P4 multi-storey car park
11. central energy building
12. ngara health education
13. bungala building
14. child care centre
15. staff education trainning
16. physical recources
17. admin building
18. multicultural health services
19. biu admin
20. biu nursing area
21. interpret building
22. store shed
23. isd swsahs
24. cancer building
25. pathology building
26. alex grimson
27. thomas & rachael moore education centre
28. P2 car park



buildings to be demoslished

liverpool campus

existing buildings

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE 1:2000 @A3
25mm ON ORIGINAL

DRAWING
BUILDING DEMOLITION PLAN

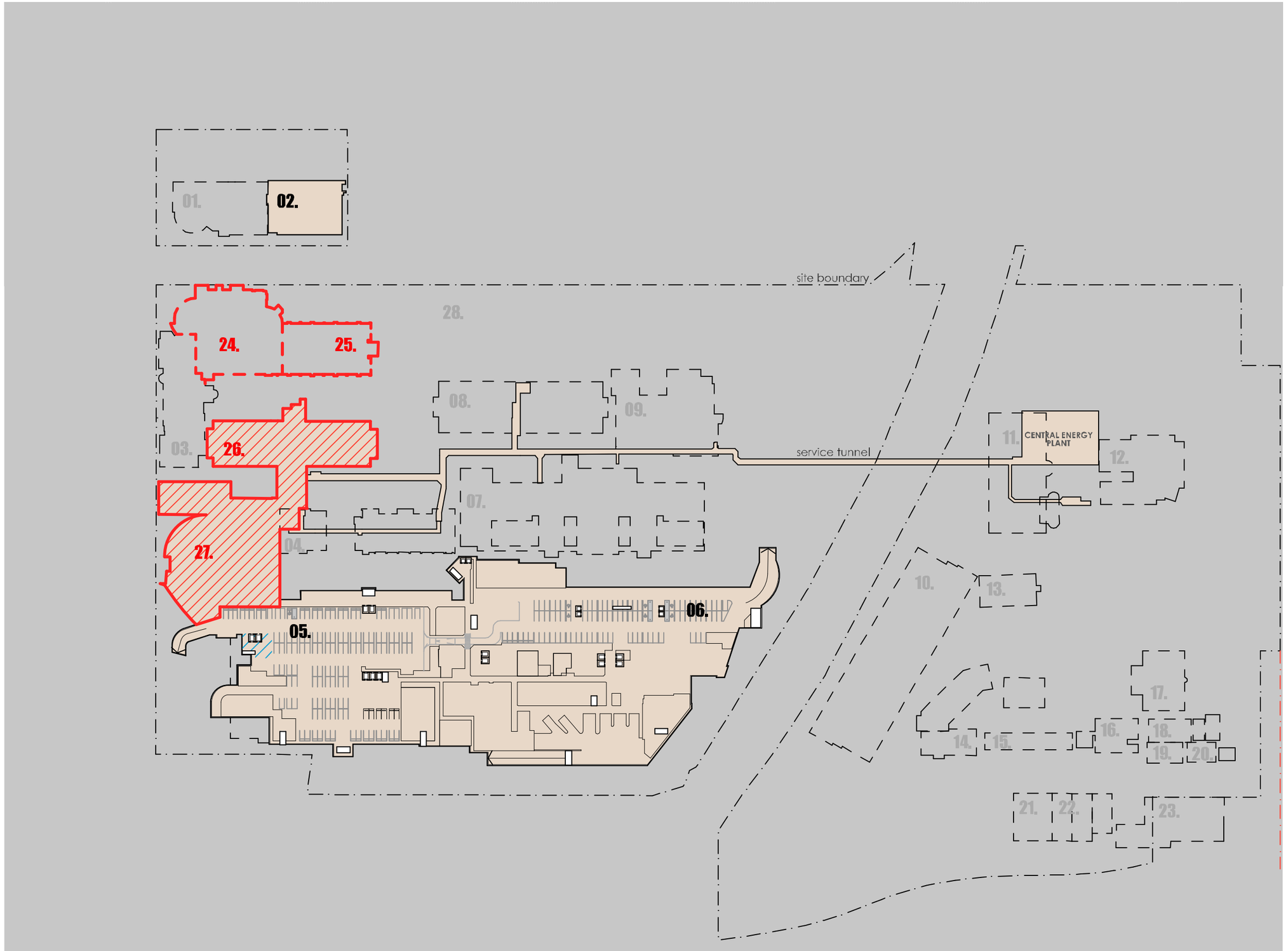
PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-04
ISSUE 05

STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit
10. P4 multi-storey car park
11. central energy building
12. ngara health education
13. bungala building
14. child care centre
15. staff education trainning
16. physical recources
17. admin building
18. multicultural health services
19. biu admin
20. biu nursing area
21. interpret building
22. store shed
23. isd swsahs
24. cancer building
25. pathology building
26. alex grimson
27. thomas & rachael moore education centre
28. P2 car park



buildings above shown dotted

buildings above to be demolished

basement to be demoslished

liverpool campus

existing buildings

fitzpatrick+partners

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a. LEVEL 6, 156 CLARENCE STREET, SYDNEY 2000, AUSTRALIA

AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH
SCALE 1:2000 @A3
25mm ON ORIGINAL

DRAWING
BASEMENT DEMOLITION PLAN

PRINT DATE
23/01/2020

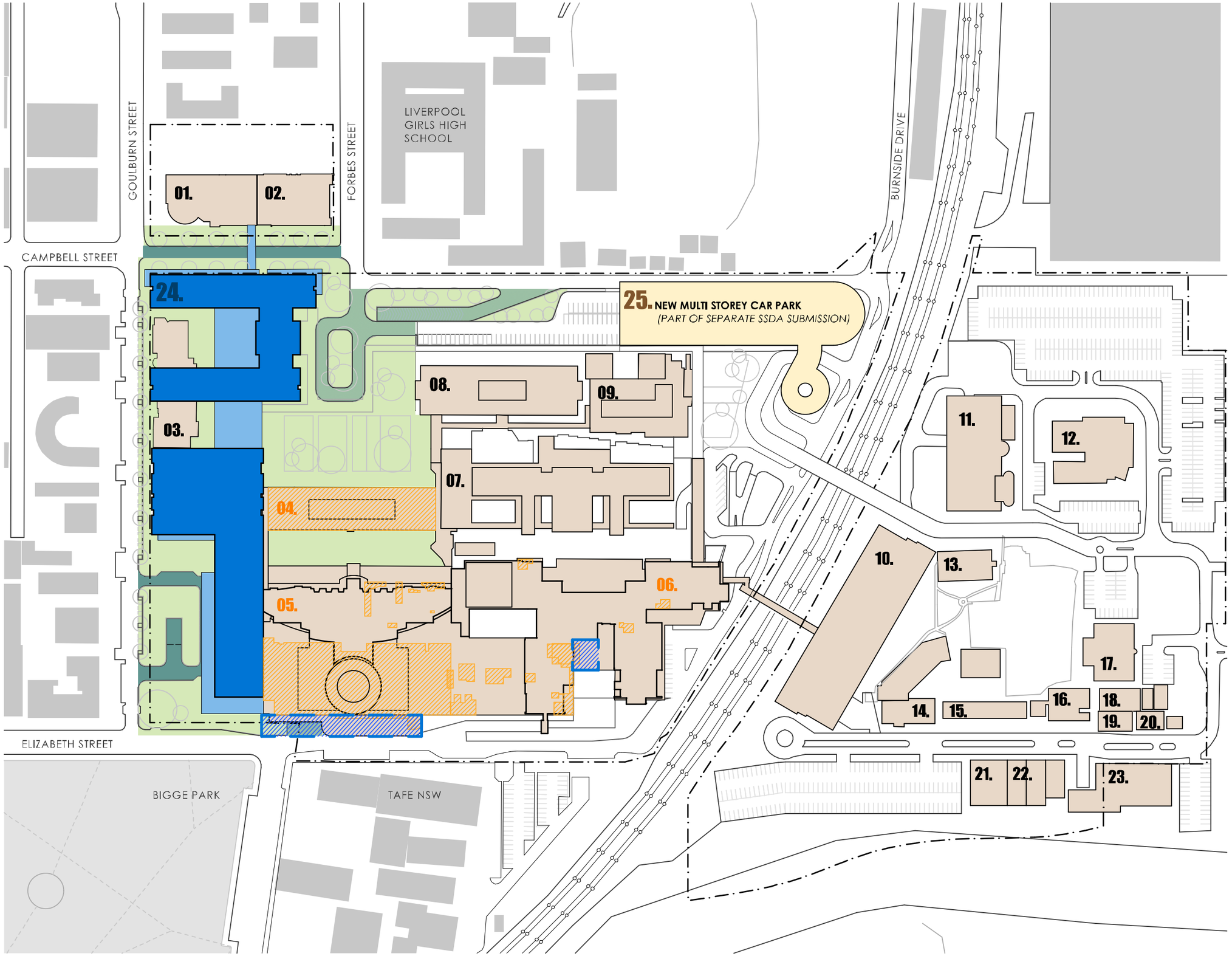
PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-05
ISSUE 05

STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit
10. P4 multi-storey car park
11. central energy building
12. ngara health education
13. bungala building
14. child care centre
15. staff education trainning
16. physical recources
17. admin building
18. multicultural health services
19. biu admin
20. biu nursing area
21. interpret building
22. store shed
23. isd swsahs
24. new integrated services building (ISB)
25. new multi storey car park
(part of separate SSDA)

** BUILDINGS 04, 05 & 06 TO BE REFURBISHED INTERNALLY*



road works
landscape works
new integrated services building (ISB)
external facade/works to existing clinical services buildings
refurbished area of existing building. internal works only
liverpool campus
existing buildings

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AMENDMENTS

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02	10/01/20	FOR REVIEW	RP
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04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH
SCALE 1:2000 @A3
25mm ON ORIGINAL

DRAWING
SITE PLAN

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-06
ISSUE 05

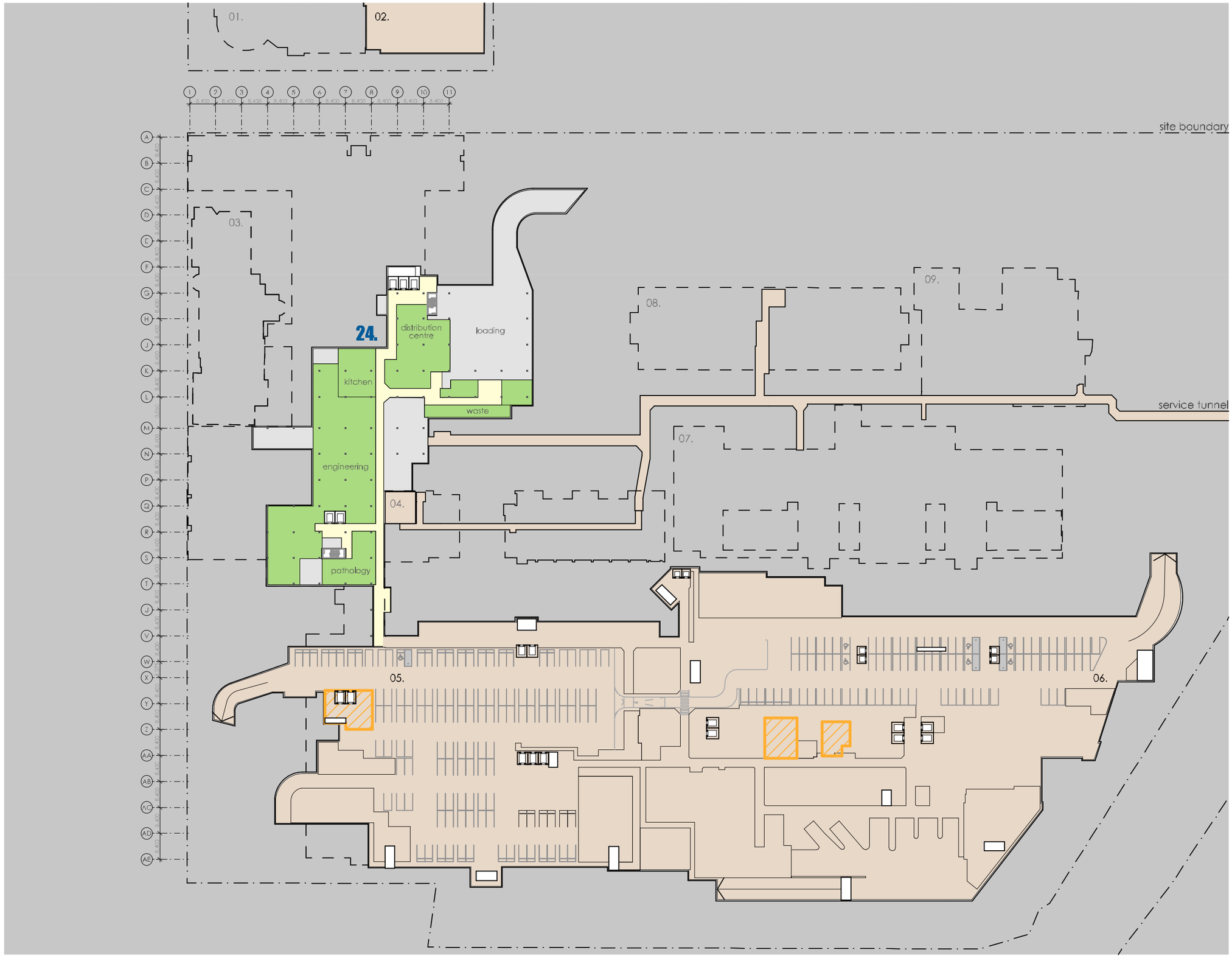
STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit

24. new integrated services building (ISB)

BASEMENT **RL+ 7.900**



refurbished area of existing building. internal works only

new external facade/works expansion of existing building

buildings above shown dotted

liverpool campus

existing clinical buildings

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02	10/01/20	FOR REVIEW	RP
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04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH
SCALE 1:1200 @A3
25mm ON ORIGINAL

DRAWING
BASEMENT

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-07
ISSUE 05

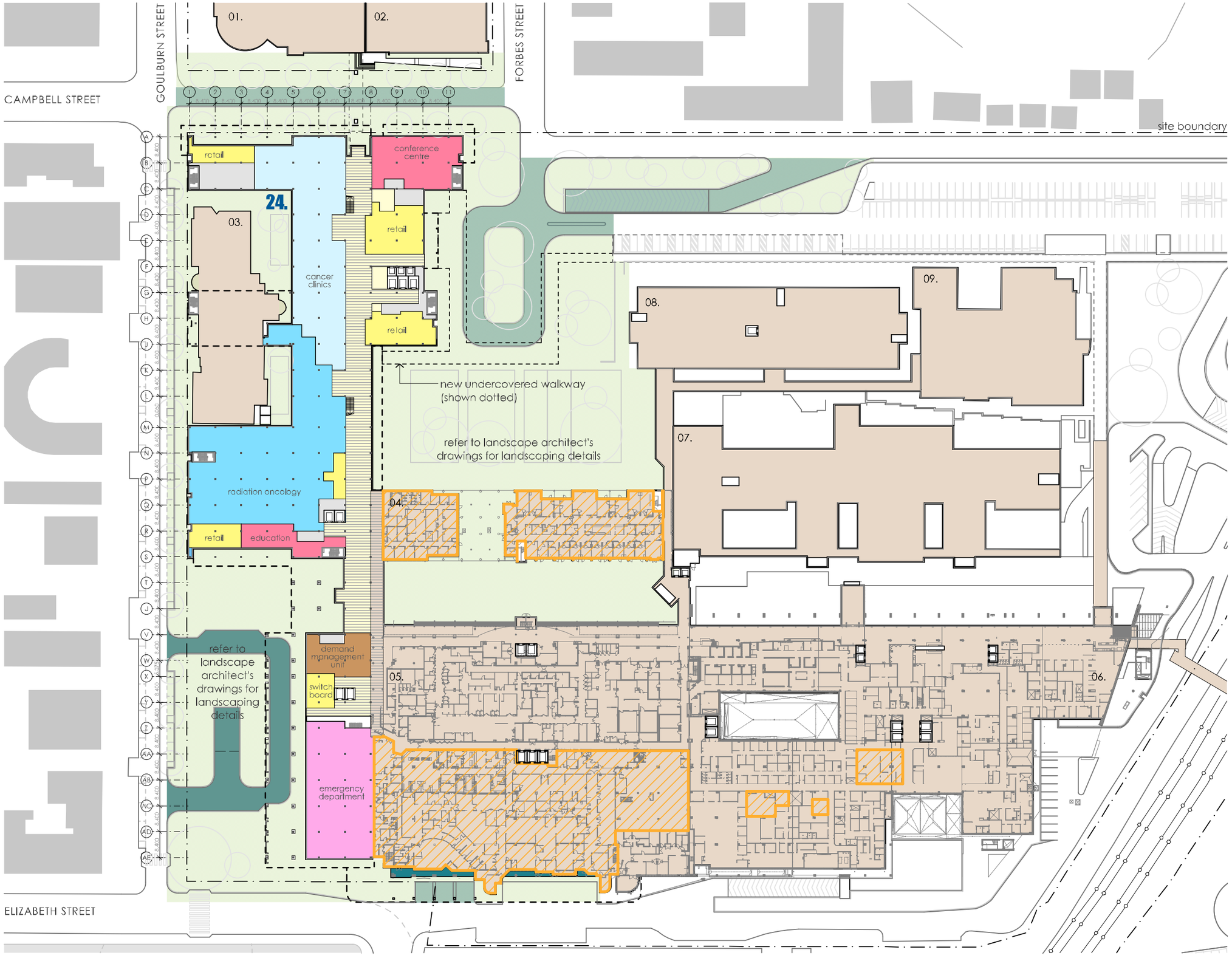
STATUS
DRAFT FOR REVIEW

LEGEND

01. health services building
02. ingham building
03. oncology bunkers
04. caroline chisholm
05. old clinical services building
06. new clinical services bld
07. mental health centre
08. don everett building
09. brain injury unit

24. new integrated services building (ISB)

GROUND FLOOR **RL+ 12.200**



road works
landscape works
refurbished area of existing building. internal works only
new external facade/works expansion of existing building
liverpool campus
existing clinical buildings

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02	10/01/20	FOR REVIEW	RP
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05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

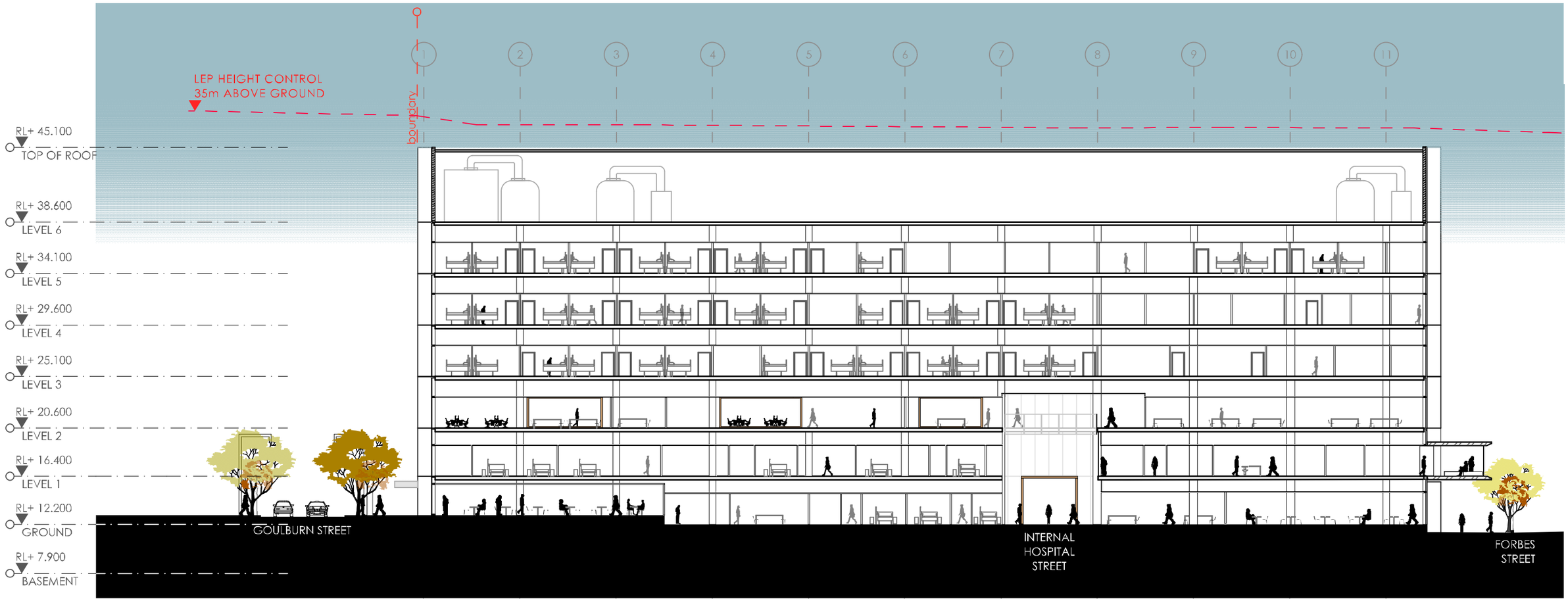
PROJECT NORTH
SCALE 1:1200 @A3
25mm ON ORIGINAL

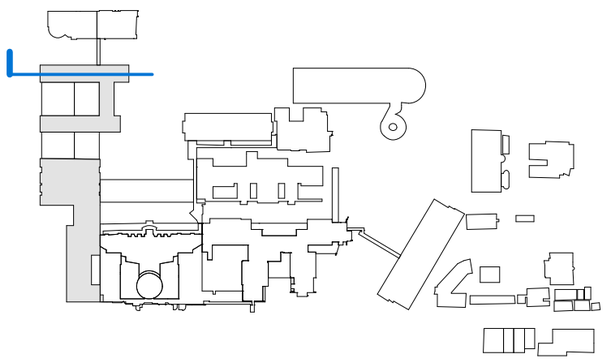
DRAWING
GROUND PLAN

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-08
ISSUE 05

STATUS
DRAFT FOR REVIEW





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04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

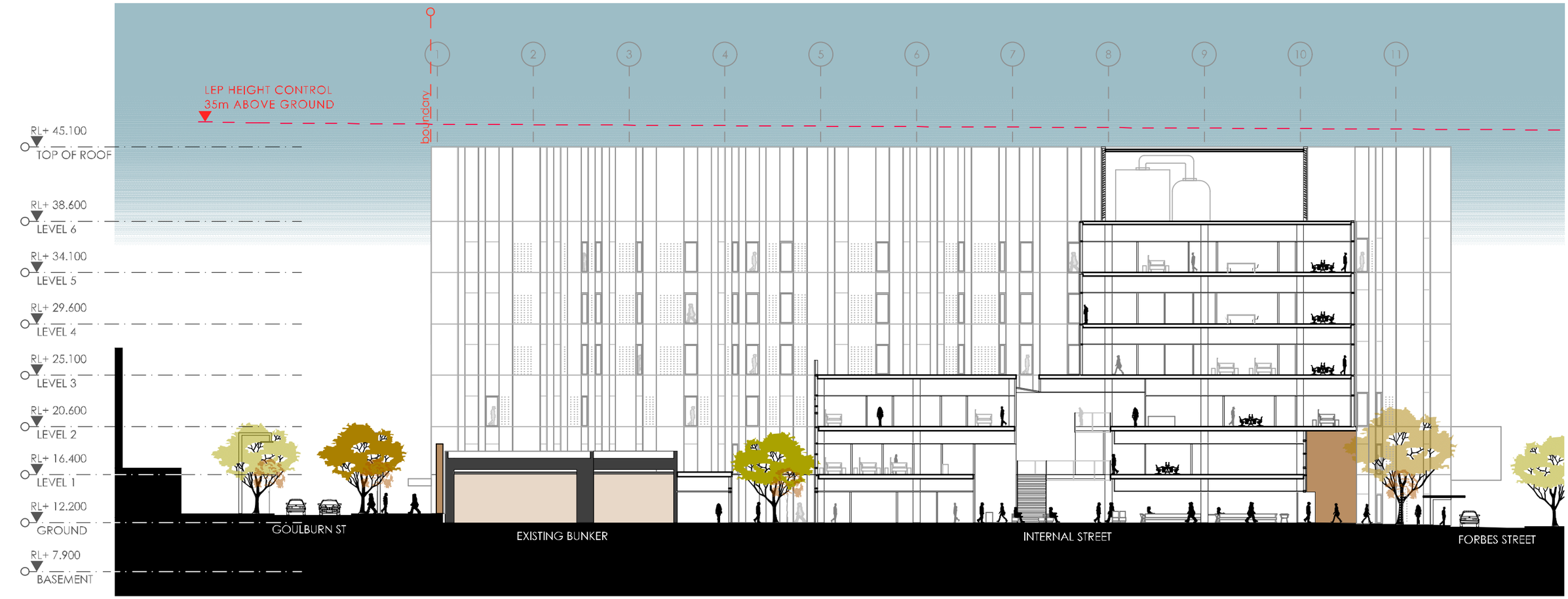
PROJECT NORTH
SCALE 1:350 @A3
25mm ON ORIGINAL

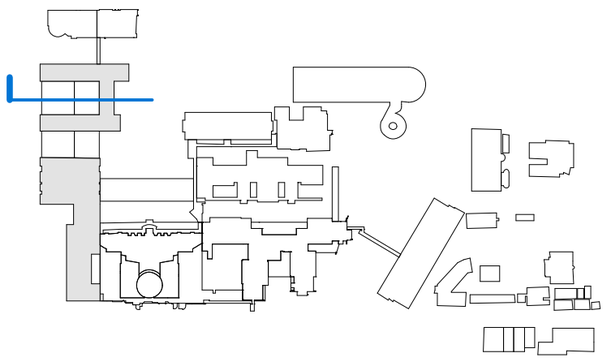
DRAWING
SECTION THROUGH NORTH IPU TOWER

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-16
ISSUE 05

STATUS
DRAFT FOR REVIEW





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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

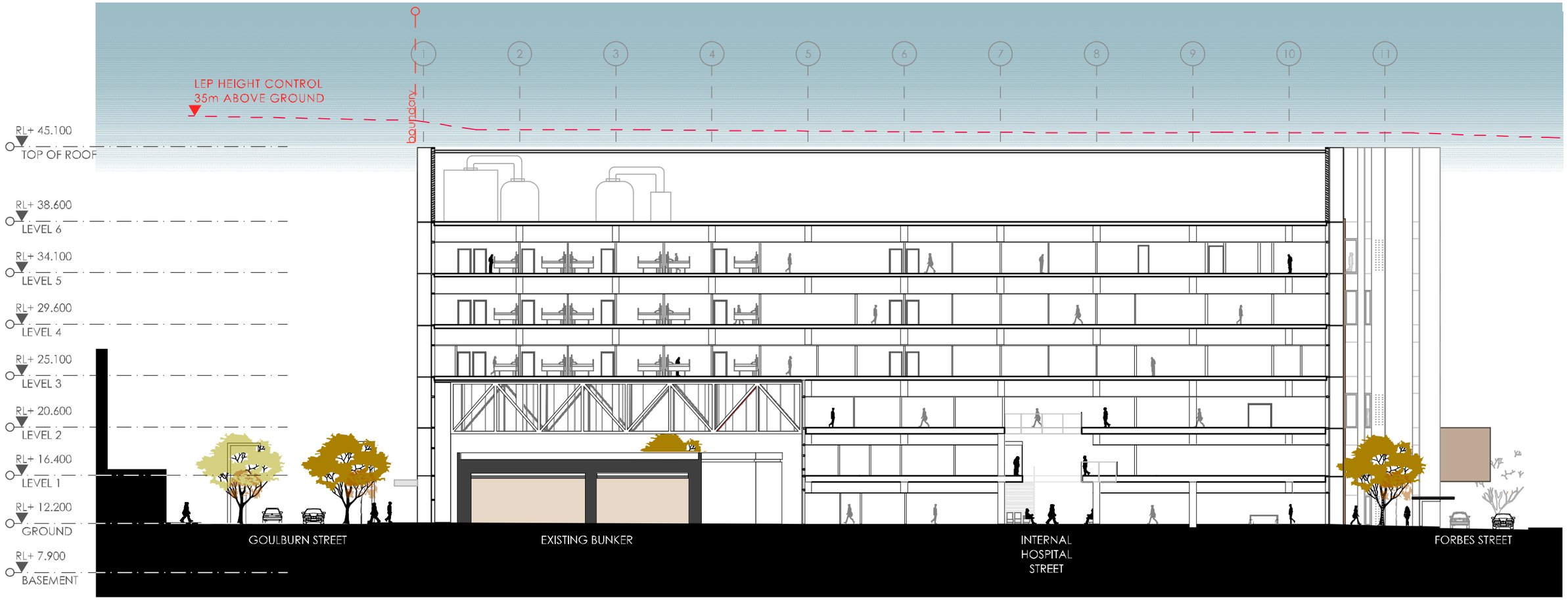
PROJECT NORTH SCALE
1:350 @A3
25mm ON ORIGINAL

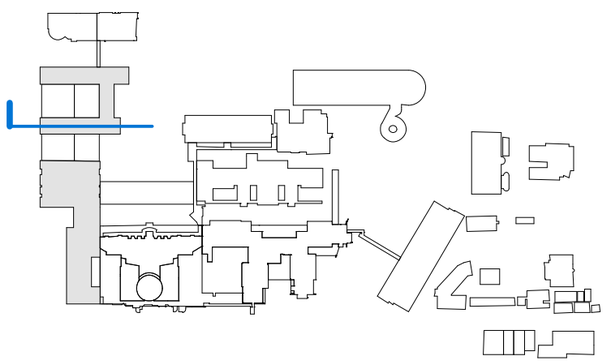
DRAWING
SECTION THROUGH EXISTING BUNKER

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-17
ISSUE 05

STATUS
DRAFT FOR REVIEW





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02	10/01/20	FOR REVIEW	RP
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05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

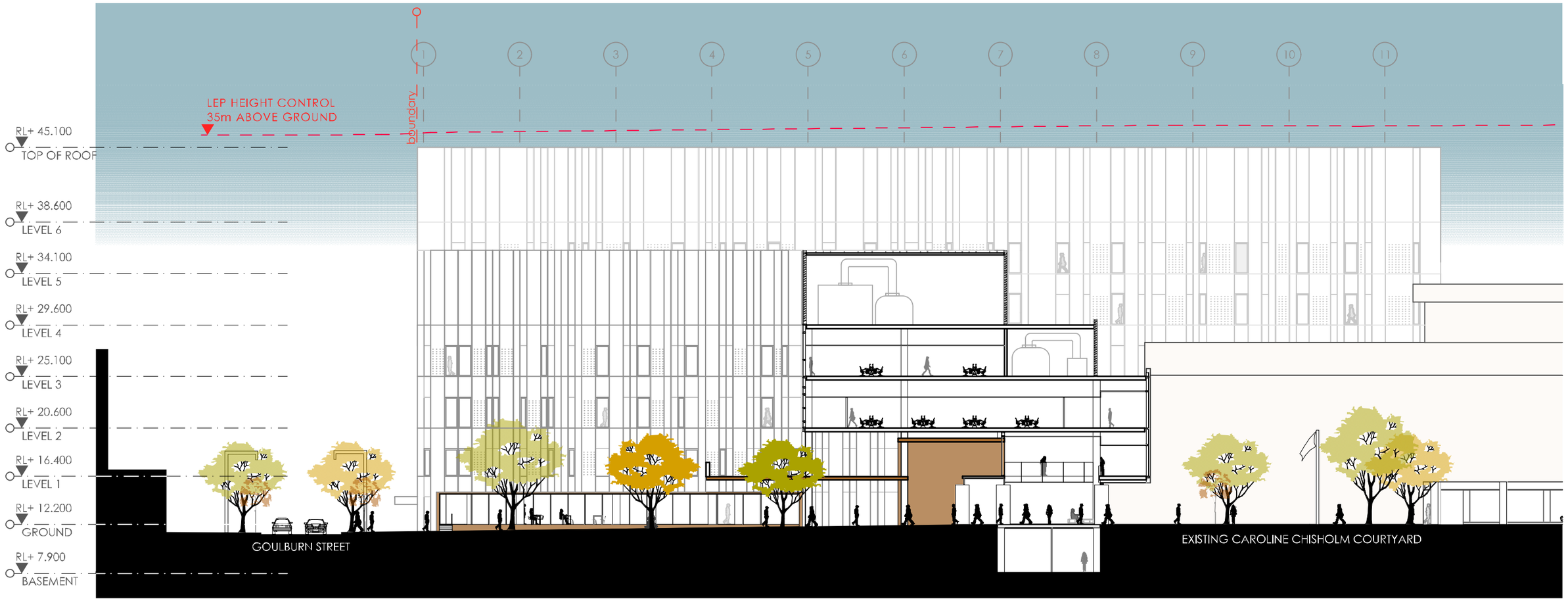
PROJECT NORTH SCALE
1:350 @A3
25mm ON ORIGINAL

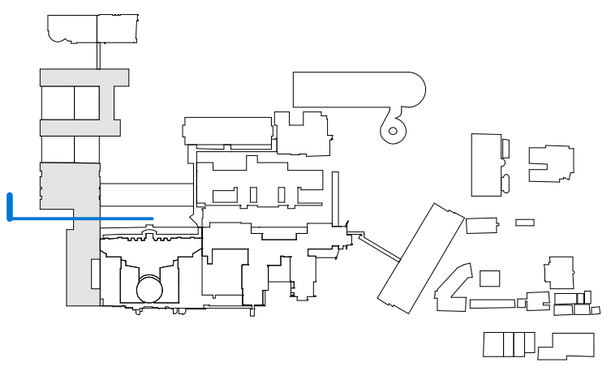
DRAWING
SECTION THROUGH SOUTH IPU TOWER

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-18
ISSUE 05

STATUS
DRAFT FOR REVIEW





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PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

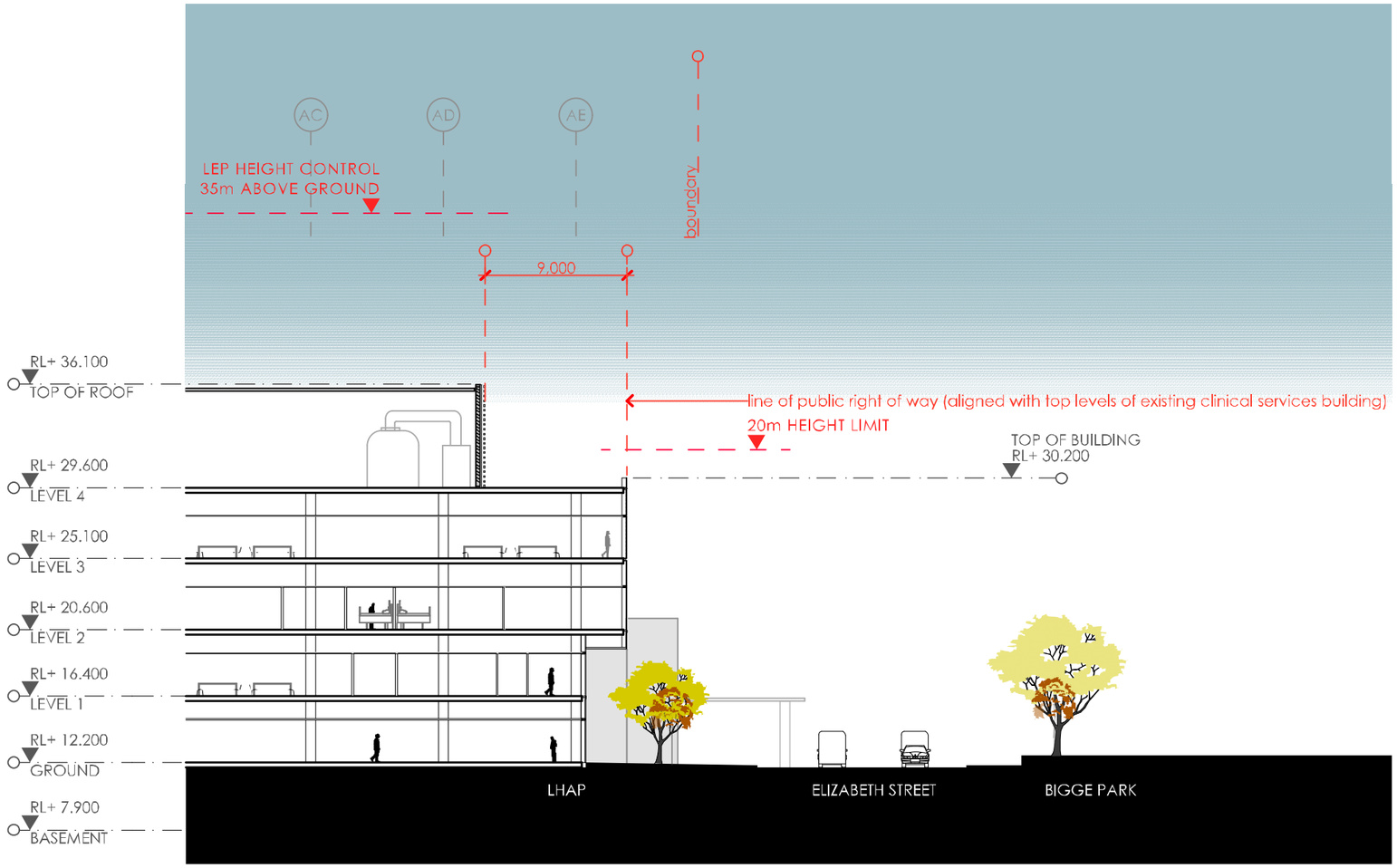
PROJECT NORTH SCALE
1:350 @A3
25mm ON ORIGINAL

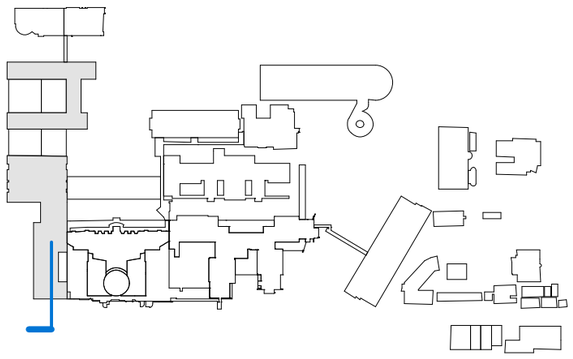
DRAWING
SECTION THROUGH MAIN ENTRY

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-19
ISSUE 05

STATUS
DRAFT FOR REVIEW





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PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH

SCALE @A3

25mm ON ORIGINAL

DRAWING
SECTION THROUGH ELIZABETH STREET

PRINT DATE
23/01/2020

PROJECT NO. 21807

DRAWING NO. A-SSDA-MW-20

ISSUE 05

STATUS
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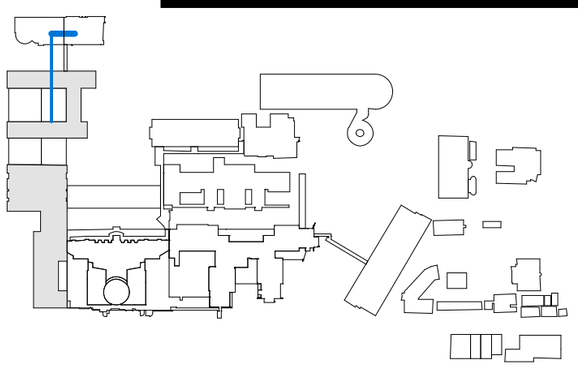

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02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
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05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

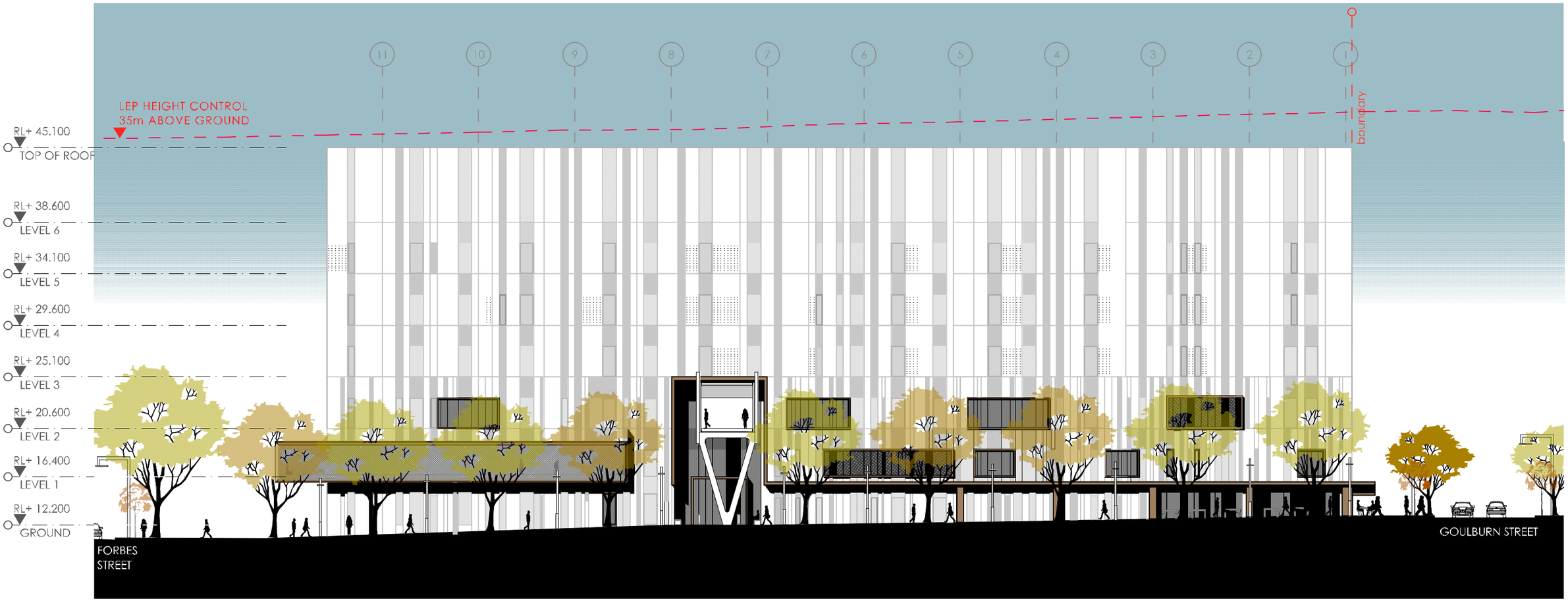
PROJECT NORTH
SCALE 1:200 @A3
25mm ON ORIGINAL

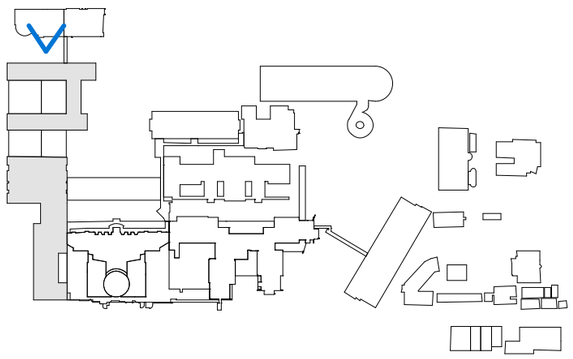
DRAWING
SECTION THROUGH CAMPBELL STREET

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-21
ISSUE 05

STATUS
DRAFT FOR REVIEW





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AMENDMENTS

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02	10/01/20	FOR REVIEW	RP
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05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH
SCALE 1:350 @A3
25mm ON ORIGINAL

DRAWING
NORTH ELEVATION

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-22
ISSUE 05

STATUS
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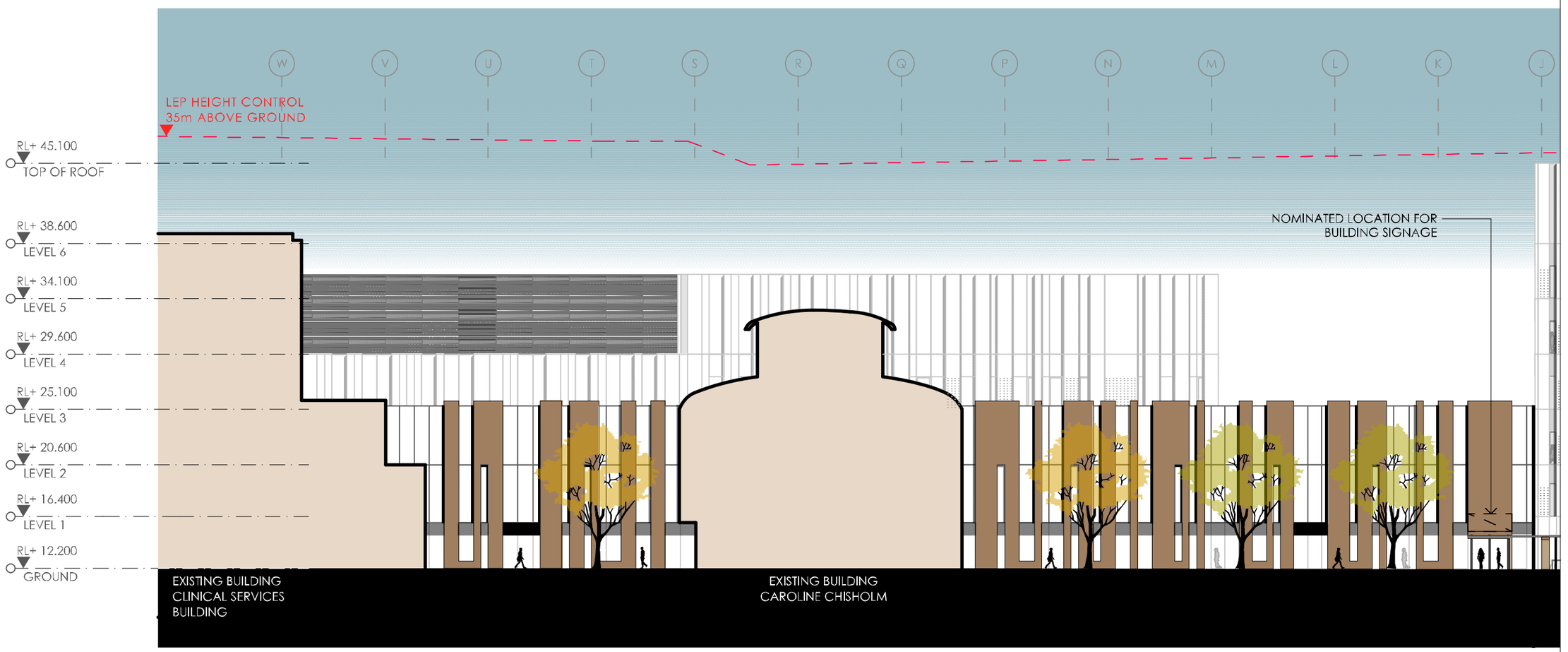
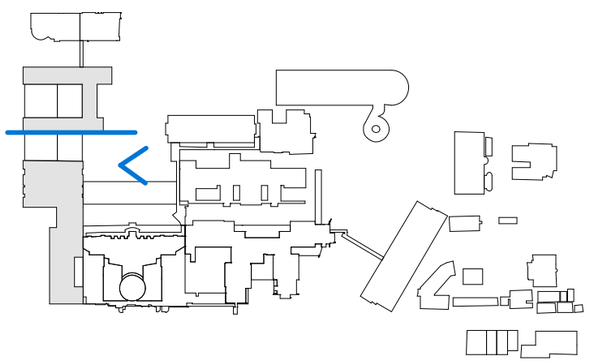
continue to A-SSDA-MW-24





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PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE
1:350 @A3
25mm ON ORIGINAL

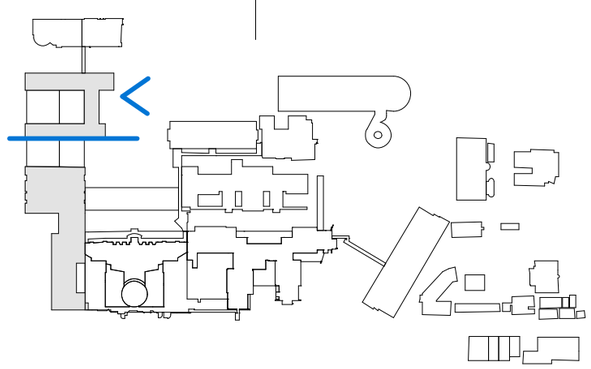
DRAWING
EAST ELEVATION 01

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-23
ISSUE 05

STATUS
DRAFT FOR REVIEW

continue to A-SSDA-MW-23



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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE
1:350 @A3
25mm ON ORIGINAL

DRAWING
EAST ELEVATION 02

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-24
ISSUE 05

STATUS
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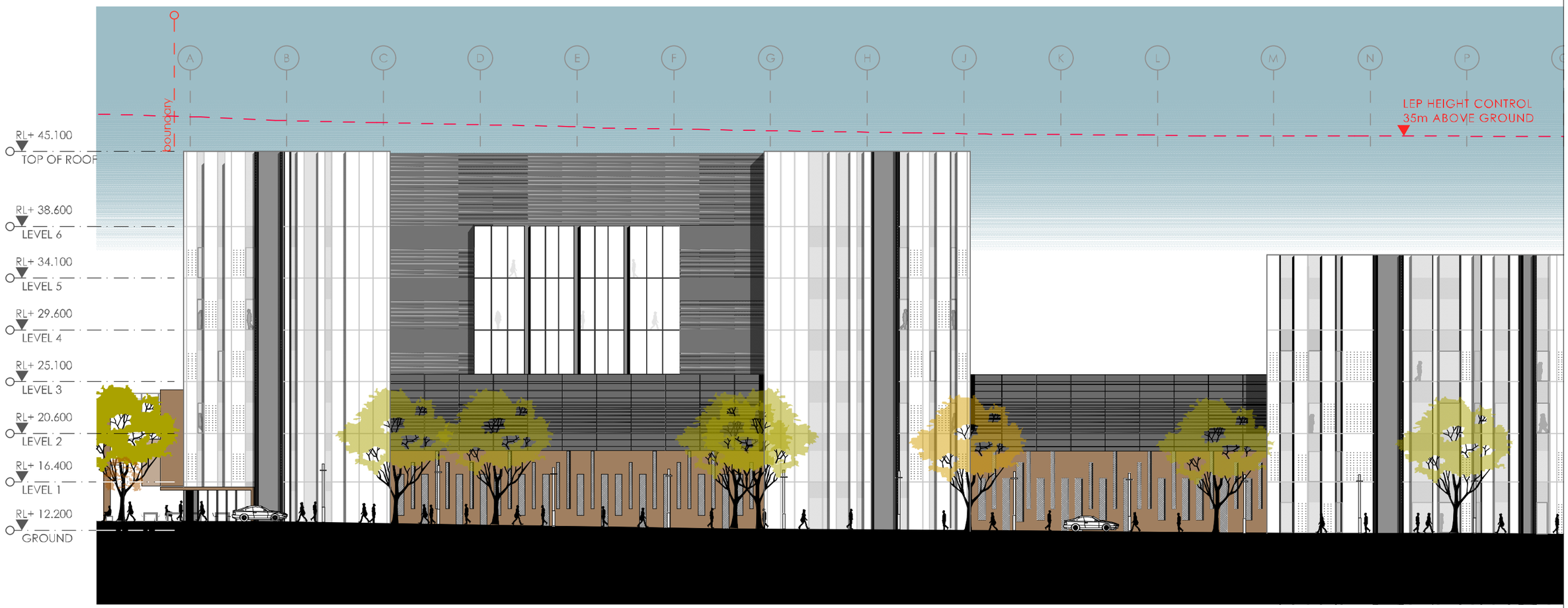
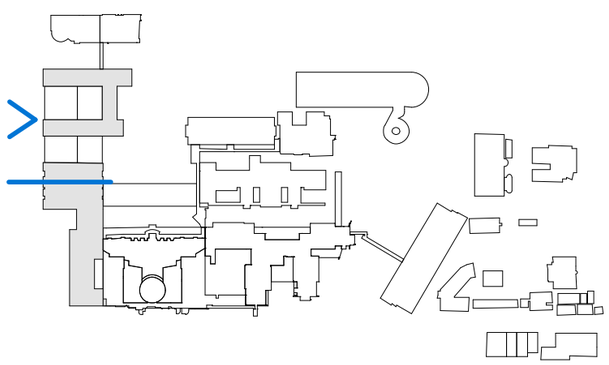
continue to A-SSDA-MW-26





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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
03	15/01/20	FOR REVIEW	RP
04	17/01/20	FOR REVIEW	RP
05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE
1:350 @A3
25mm ON ORIGINAL

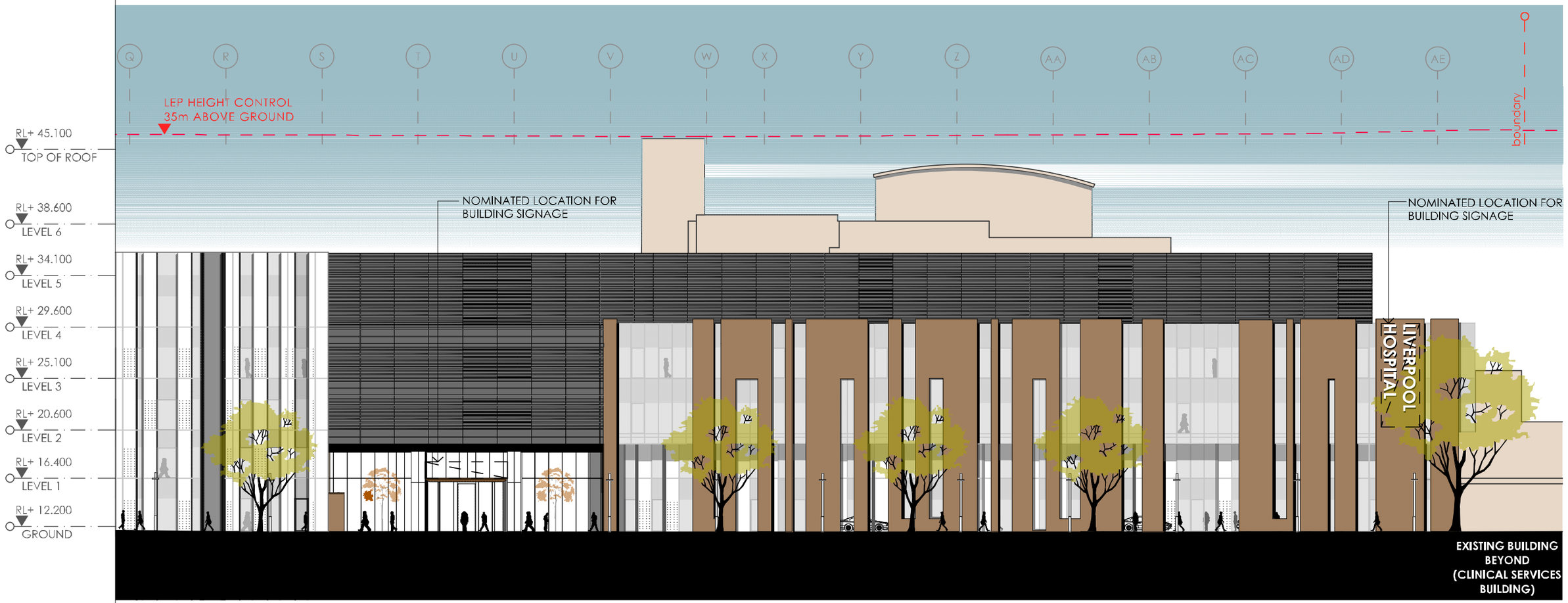
DRAWING
WEST ELEVATION 01

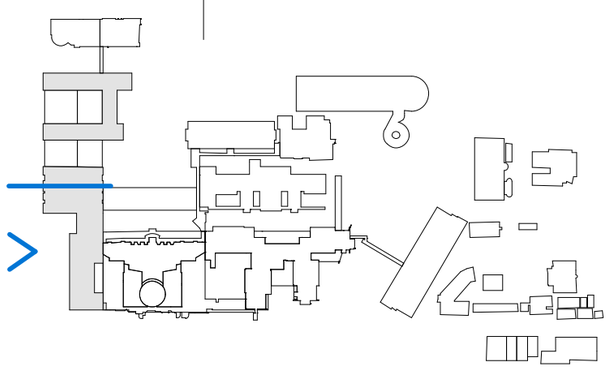
PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-25
ISSUE 05

STATUS
DRAFT FOR REVIEW

continue to A-SSDA-MW-25





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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	10/01/20	FOR REVIEW	RP
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05	23/12/20	FOR REVIEW	RP

PROJECT
LIVERPOOL HEALTH & ACADEMIC PRECINCT
ELIZABETH STREET LIVERPOOL NSW

CLIENT
HEALTH INFRASTRUCTURE
14/77 PACIFIC HWY, NORTH SYDNEY NSW 2060

PROJECT NORTH SCALE
1:350 @A3
25mm ON ORIGINAL

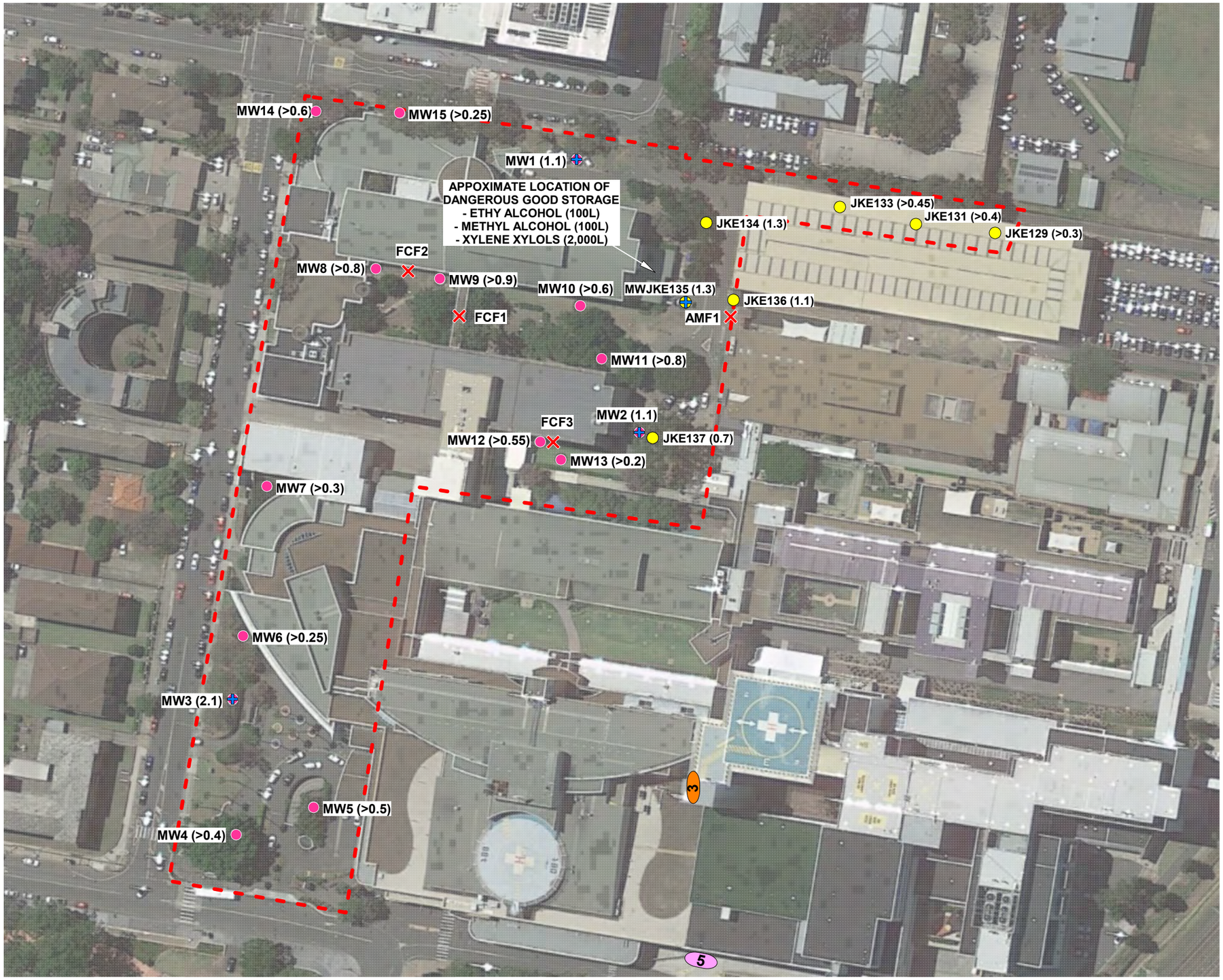
DRAWING
WEST ELEVATION 02

PRINT DATE
23/01/2020

PROJECT NO. 21807
DRAWING NO. A-SSDA-MW-26
ISSUE 05

STATUS
DRAFT FOR REVIEW

Appendix C: JKE ESA Contamination Figures



LEGEND:

- APPROXIMATE SITE BOUNDARY
- **MW (0.1)** — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- **MW (0.1)** — BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- **JKE (0.1)** — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
- **MWJKE (0.1)** — RPT4 OCTOBER 2019 BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
- **FCF1** — SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER
- **AMF1** — SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER (JKE Rpt ref: E32465BDrpt4, dated October 2019)
- **3** — APPOXIMATE LOCATION OF UNDERGROUND STORAGE TANK, STATUS UNKNOWN
- **5** — APPOXIMATE LOCATION OF EXISTING ABOVEGROUND STORAGE TANKS, WITHIN A BASEMENT

0 — Scale — 65 Metres

Notes: Reference should be made to the report text for a full understanding of this plan.

Image Sources: Google Earth and Fitzpatrick and Partners (Project No: 21807, Drawing No: A-EW-0220, dated 9/12/2019)

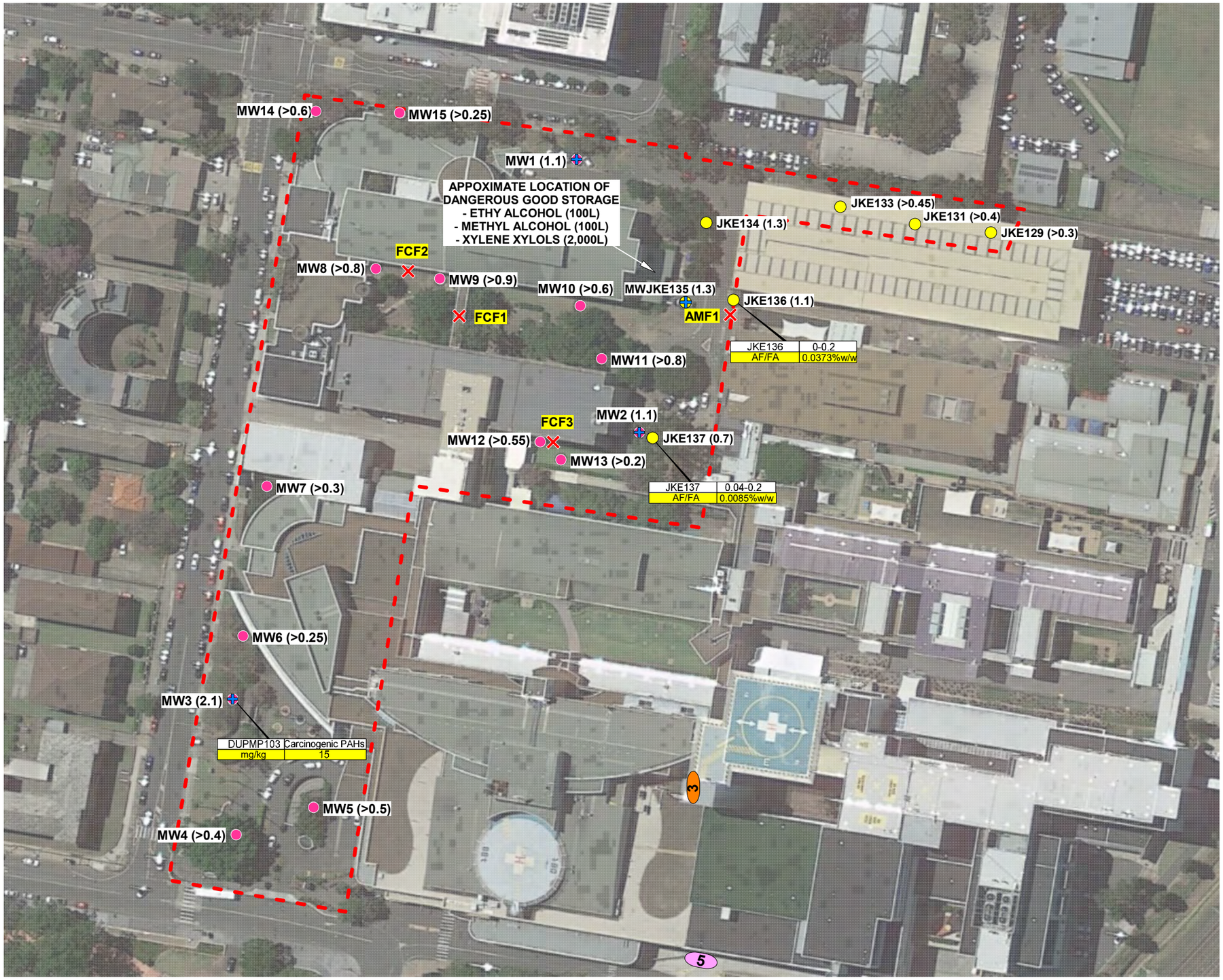
Title: **SAMPLE LOCATION PLAN**

Location: MAIN CAMPUS, LIVERPOOL HOSPITAL, ELIZABETH STREET, LIVERPOOL, NSW

Project No: E32837BDrpt

Figure No: 2

JK ENVIRONMENTS



LEGEND:

- APPROXIMATE SITE BOUNDARY
- MW (0.1) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- MW (0.1) — BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- JKE (0.1) — RPT4 OCTOBER 2019 BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
- MWJKE (0.1) — RPT4 OCTOBER 2019 BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
- FCF1 — SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER
- AMF1 — SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER (JKE Rpt ref: E32465BDrpt4, dated October 2019)
- 3 — APPOXIMATE LOCATION OF UNDERGROUND STORAGE TANK, STATUS UNKNOWN
- 5 — APPOXIMATE LOCATION OF EXISTING ABOVEGROUND STORAGE TANKS, WITHIN A BASEMENT
- SOIL CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK (%W/W or mg/kg)

0 — 65
Scale — Metres

Notes: Reference should be made to the report text for a full understanding of this plan.

Image Sources: Google Earth and Fitzpatrick and Partners (Project No: 21807, Drawing No: A-EW-0220, dated 9/12/2019)

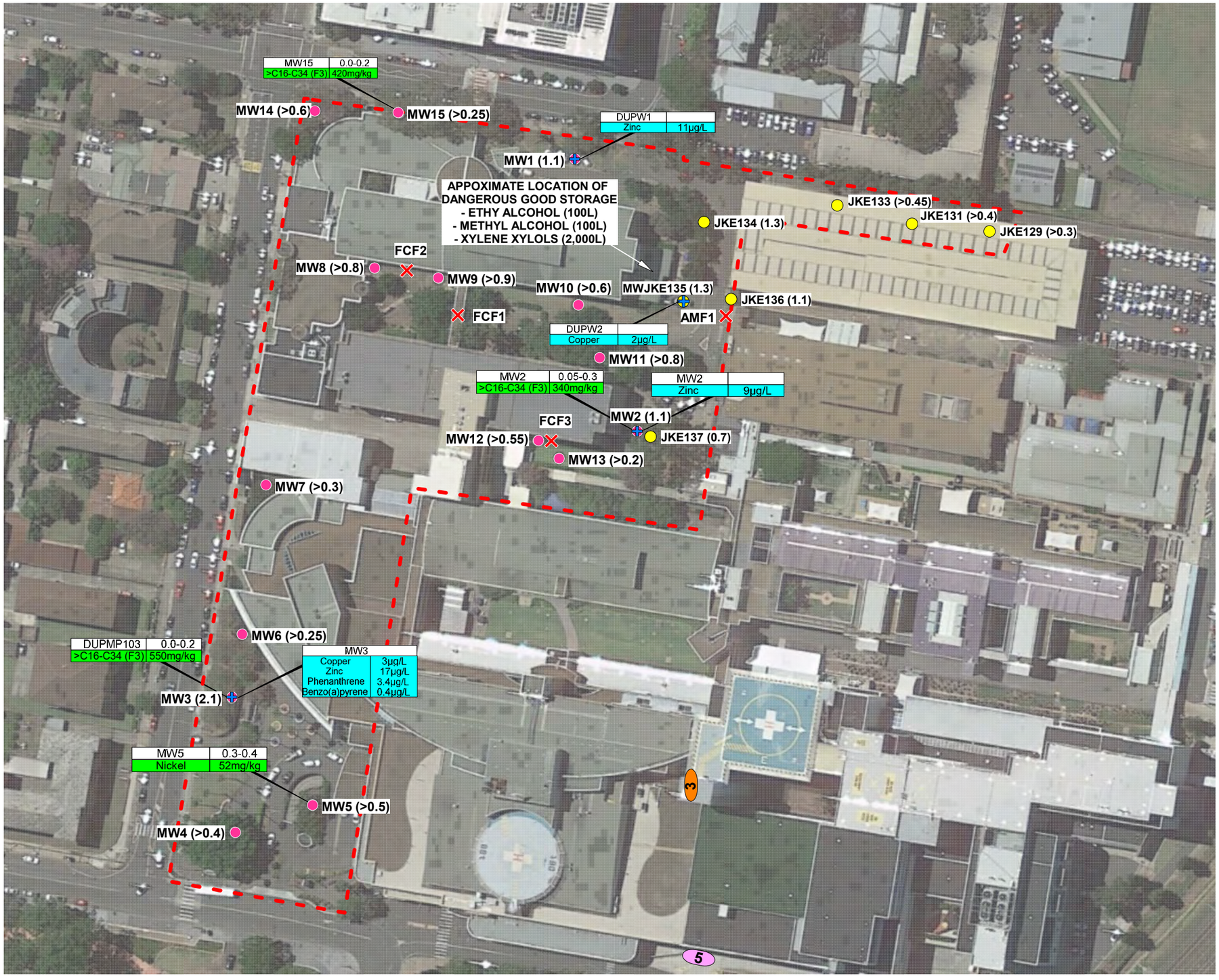
Title: **CONTAMINATION DATA PLAN - HUMAN HEALTH**

Location: MAIN CAMPUS, LIVERPOOL HOSPITAL, ELIZABETH STREET, LIVERPOOL, NSW

Project No: E32837BDrpt

Figure No: 3

JK ENVIRONMENTS



LEGEND:

- APPROXIMATE SITE BOUNDARY
- MW (0.1) — BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- MW (0.1) — BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- JKE (0.1) — RPT4 OCTOBER 2019 BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
- MWJKE (0.1) — RPT4 OCTOBER 2019 BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) (JKE Rpt ref: E32465BDrpt4, dated October 2019)
- FCF1 — SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER
- AMF1 — SURFACE FIBRE CEMENT FRAGMENT LOCATION AND NUMBER (JKE Rpt ref: E32465BDrpt4, dated October 2019)
- 3 — APPOXIMATE LOCATION OF UNDERGROUND STORAGE TANK, STATUS UNKNOWN
- 5 — APPOXIMATE LOCATION OF EXISTING ABOVEGROUND STORAGE TANKS, WITHIN A BASEMENT
- SOIL CONTAMINATION ABOVE SAC FOR ECOLOGICAL RISK (mg/kg)
- GROUNDWATER CONTAMINATION ABOVE SAC (µg/L)

0 — 65 Scale Metres

Notes: Reference should be made to the report text for a full understanding of this plan.

Image Sources: Google Earth and Fitzpatrick and Partners (Project No: 21807, Drawing No: A-EW-0220, dated 9/12/2019)

Title: **CONTAMINATION DATA PLAN - ECOLOGICAL**

Location: MAIN CAMPUS, LIVERPOOL HOSPITAL, ELIZABETH STREET, LIVERPOOL, NSW

Project No: E32837BDrpt

Figure No: 4

JK ENVIRONMENTS

Appendix D: Waste Tracking Spreadsheet

Offsite Disposal

Waste Classification Report/ Letter			Source Area Matches Area in Classification Letter/ Report?	Stockpile [2]					Material Observations		Treatments [7]				Statistics [7]	
Reference	Classification Under Letter[1]	Volume Classified Under Letter (m^3)		ID	Volume	Temporary Storage Area/ Reference	Volume (m^3)	Bulking Factor Used	Description	Evidence of Contamination	Treatment Details	Post-Treatment	Post Treatment Sampling	Post Treatment Classification [1]	Type	Results

[1] After NSW EPA Waste Classification Guidelines/ The excavated natural material order 2014 / Meets POEO VENM Definition / other

[2] If material was excavated and stockpiled post classification

[3] Samples must include those collected specifically for waste classification purposes and samples collected from the source area for purposes other than waste classification

[4] Keep Units Consistant

[5] If volume on docket is different to volume on Waste Classification Letter

[6] If one is available

[7] If undertaken

Disposal						
Receiving Facility	Receiving Facility Licence Numbr	Disposal Docket Reference	Quantity on Docket (m^3/ tonnes) [4]	Bulking Factor [5]	Consignment Note Reference [6]	Running Total Under the Waste Classification Letter (m3/ tonnes) [4]

Appendix E: Guidelines and Reference Documents

Contaminated Land Management Act 1997 (NSW)

Managing Land Contamination, Planning Guidelines SEPP55 – Remediation of Land (1998)

NSW EPA, (1995). Contaminated Sites Sampling Design Guidelines

NSW EPA, (2014). Waste Classification Guidelines - Part 1: Classifying Waste

NSW EPA, (2015). Guidelines on the Duty to Report Contamination under Section 60 of the CLM Act 1997

NSW EPA, (2017). Guidelines for the NSW Site Auditor Scheme, 3rd Edition

NSW EPA (2020). Guidelines for Consultants Reporting on Contaminated Sites.

NSW SafeWork, (2019). Code of Practice: How to Safely Remove Asbestos.

NSW SafeWork, (2019). Code of Practice: How to Manage and Control Asbestos in the Workplace.

National Environment Protection Council (NEPC), (2013). National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)

Protection of the Environment Operations Act 1997 (NSW)

Protection of the Environment Operations (Waste) Regulation 2014 (NSW)

State Environmental Planning Policy No.55 – Remediation of Land 1998 (NSW)