File No: SF5992

MS

Your Ref: NA

21/09/2016

Catherine Mainsbridge
Planning Department
City of Launceston
PO Box 396
LAUNCESTON TAS 7250

Dear Catherine,

Development Application -Redevelopment of Macquarie House

Please find accompanying this correspondence, documentation outlining the proposed redevelopment of Macquarie House, a significant Council-owned Heritage listed property located at 92 Cameron Street (Civic Square).

Consultation with both Council Planning Department staff, and Heritage Tasmania has been undertaken during the development of the project scope.

The documentation included with this correspondence includes:

- Executed Permit Application form.
- Property Title information.
- Architectural Documentation (drawings SK_01 to Sk_16), prepared by HBV Architects.
- Permit Application Report, prepared by HBV Architects.
- Statement of Archaeological Potential, prepared by HBV Architects.
- Response to 36 Conservation Policies from the Macquarie House *Conservation Management Plan* (2010), relevant to the scope of works proposed in this Development Application.

Development Description

The Macquarie House redevelopment project is being undertaken as part of the City of Launceston's support for the *Macquarie House Innovation Hub* project.

The Innovation Hub will be a world class co-working space, designed and managed to advance entrepreneurialism in the technology, digital and creative industries.

This new facility at Macquarie House, will cater to freelancers, start-up companies and early career professionals; particularly those in fields relating to technology, digital and creative industries. The national context shows that entrepreneurial activities by these types of

industries are shown to benefit from being brought together in co-working spaces that are managed for the purpose of fostering innovation and collaborative work practices.

Co-working spaces have been proven to be powerful drivers of business and economic growth, in both major population centres and regional economies. The Macquarie House project represents a fantastic opportunity for Launceston to be placed firmly on the map as a centre of excellence in innovation, entrepreneurialism and creative industries.

Development Approach

The proposal includes restoration, reinstatement works, and refurbishment of the original 1830's four storey Macquarie House building. Demolition of the 1980's amenity building on the northern side of Macquarie House is proposed, with a new four storey building proposed to house building amenities, services and provide compliant vertical circulation (stair and lift access), constructed on the footprint of the demolished structure.

The accompanying report, prepared by HBV Architects outlines the approach to the significant cultural and built heritage values represented by Macquarie House, that underpin the final design response contained within the redevelopment proposal.

In terms of the broader site context, the development proposal includes elements design to enhance the buildings connectivity with Civic Square. The arrangement of the main building frontage to Civic Square (South elevation to Cameron Street) will remain unchanged however, it is proposed to relocate the stair access to the lower level courtyard area to a more visually prominent location, and to construct a ramped access to the new amenity building at the rear.

As part of these changes to the access arrangements around the building perimeter, it is proposed to remove some existing vegetation on the southern edge of the courtyard area, including a large weeping-form tree in this location that is incompatible with the proposed new stair access location, and dominates the lower level courtyard area making a large portion of this space unusable (refer Image 01 and 02 below). One additional tree at the rear of the building has also been identified for removal due to its proximity to the new building envelope, and its growth habit (refer image 03 and 04 below).

Image 01: Weeping-form tree proposed for removal - viewed from upper level edge of existing courtyard space.

Image 02: Weeping-form tree proposed for removal - viewed from existing basement access stair landing.

Image 03 & 04: Tree located adjacent existing rear stair access (north-west corner) proposed for removal, due to proximity to proposed building envelope, and leaning growth habit.

I believe the accompanying documentation, along with this correspondence, satisfies the required application documentation. Please do not hesitate in contacting me should you require any additional information, or clarification, regarding this permit application.

Yours sincerely

Matthew Skirving

Manager Architectural Services, City of Launceston.

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M A C Q U A R I E H O U S E D E V E L O P M E N T

CIVIC SQUARE, LAUNCESTON, TASMANIA

NOTES FOR PLANNING SUBMISSION

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MACQUARIE HOUSE REDEVELOPMENT
NOTES FOR PLANNING SUBMISSION

Introduction

This project involves the redevelopment of Macquarie House, Cameron Street, Launceston, for Launceston City Council.

The proposal includes refurbishment works to the original 1830s four (4) storey Macquarie House building, the demolition of an existing 1980s public toilet block to the rear, and construction of a new four (4) storey facilities building housing services, amenities and vertical circulation for the development.

The proposal also includes removal of incompatible vegetation, construction of a terraced stair to link Cameron Street (Civic Square) to the existing sunken courtyard and basement areas, construction of an external access ramp to the new building's first floor entrance, and repaving generally.

Historic Significance

The place, Macquarie House, is recognised for its historic cultural heritage significance and is listed on the Register of the National Estate and the Tasmanian Heritage Register.

A Conservation Management Plan, specific to the place, was prepared in 2010 by birelli architects for Launceston City Council. This provides a more detailed statement of significance and reaffirms that any intervention should be based on the principles and processes described in the Australian ICOMOS Charter for the Conservation of Places of Cultural Significance (The Burra Charter) including its Guidelines on Cultural Significance and Conservation Policy.

The approach taken in this redevelopment adopts these principles and in general adheres to the Conservation Management Plan's general and specific conservation policies.

Approach

The key philosophical approach has been to restore the Macquarie House 1830's building envelope, taking it back to its original open floor configuration. This involves removal of all non-significant introduced elements including partitions, staircase, linings, bulkheads and services including ducts and pipes.

To make the floor spaces usable without compromising the original open configuration, a four (4) storey extension is proposed to the rear. This will house all vertical circulation provisions including lift and stairs, and all amenities, sanitary facilities and service ducts and risers, negating the need to introduce incompatible elements into Macquarie House itself.

Form

Cognisant of the high significance attached to the original 1830's building form being freestanding, the service building addition has been located to the rear and distanced from the original with a thin, frameless glazed bridge link. The link aligns with, and slips within, the reveals of an existing building opening ensuring that no original fabric is disturbed.

The new addition is articulated to read very much as a separate element. This will allow Macquarie House to retain its freestanding character and ensure maximum areas of its façade remain exposed.

The addition is designed as a simple and neutral cubic form devoid of ornamentation or stylistic embellishments that might detract from an appreciation of the original building. It is sheathed with a timber battened screen which is continued over all external surfaces. This will mask contrasting new building elements such as windows and openings which otherwise might draw the eye and compete with the presence and detailing of the original building.

Timber as a material has been specifically chosen rather than masonry. This is to provide a clear delineation between the old and the new and to suggest a contrast between the solidity and permanence of the heritage structure and the lightness and transience of the extension. This reinforces the notion that the addition can be removed at any time in the future without any detrimental impact on the original.

The simple timber 'box' character alludes to a storage use which sits comfortably with the mercantile warehouse function of the original building. it also brings a subtle reference to elements of Japanese architecture, providing a contextual link with the Japanese gardens alongside.

New Work

In general the proposal seeks to minimise intervention in the original building fabric. There are two key areas where the proposed works will have an impact.
The first is in the basement where it is proposed to form two new openings and enlarge an existing one. The first opening will provide a connection to a new kitchen and the others will provide access to the external courtyard. These will provide natural light and ventilation to the basement and make the space more habitable. The openings are limited in size and are reversible. Much of the fabric removed includes modern (1980s) stonework facing applied to the exterior wall after it was exposed by the excavation of the sunken courtyard. The reveals to the openings will be lined in mild steel plate, clearly articulating that the penetrations are contemporary.

The second area of impact relates to the retrieval of original window openings on the rear (northern) façade. It is assumed these were bricked up at the same time a large gabled extension was added to the rear, most likely in the late1800's. The original projecting stone sills to these openings have been chipped back and lost but timber window frames and casement sashes (suspected as not original) have been retained behind the brick infill. It is proposed to remove the brickwork and expose the existing windows. However, rather than restore the window openings by

replacing stone sills, heads and quoins where lost or damaged, the intent is to leave the openings as they are whilst providing frameless glazed mild steel plate sleeves fitted within the window reveals. The existing sashes will remain in place and be visible, but the openings will be identified as being different, and having a story to tell.

Archaeological Potential

A Statement of Archaeological Potential relating to Macquarie House was prepared in 2010 by Brad Williams (Praxis Environment). In this report areas of differing levels of archaeological potential were determined and a site plan provided depicting the locations of each level. Refer Appendix A.

All of the proposed new works external to Macquarie House are to the rear of the original building, in an area which has been significantly disturbed and heavily excavated. This area has been defined as being of medium archaeological potential which, according to the report's management policies, requires any excavations in the area to be archaeologically monitored. However, should the sub-paving strata be found to be virgin ground (sub-historic ground level) it is suggested no further archaeological input will be required.

Within Macquarie House itself the management policies call for any intervention in sub-floor and intra floor cavities to be archaeologically monitored.
The basement currently has a concrete floor which abuts the original stone perimeter wall. It is intended that this concrete floor be cut back 150mm at the perimeter to form a separating trench (gravel filled) to allow the base of the stone walls to ventilate.
Apart from this there are no sub-floor excavations proposed within the original building, with all excavations for foundations, drainage pipes and services generally restricted to the area at the rear.

All excavations within the areas of 'medium' or 'high' archaeological potential will be archaeologically monitored in accordance with Part 12 of the SoAP (Praxis Environment 2010). Refer Appendix A.

CONSERVATION POLICY

5.1 General Conservation Policy **Response**

5.1.1 In order to retain its cultural significance, Macquarie House and its setting within the Cameron Street civic precinct should be conserved.	The development is concentrated to the rear and previously modified part of the building. The principal view fields and setting of Macquarie House will be conserved.
5.1.2 Macquarie House should be adapted in accordance with the specific policies within this document.	In general, adaptive works will be in accordance with specific conservation policies of the Conservation Management Plan
5.1.3 Surviving significant elements should be conserved in situ. Repairs should be carried out without removing significant elements from their original locations.	Generally all significant elements will be conserved in situ.
5.1.4 When reconstructing a missing section of substantially intact original fabric such as window apertures in the outer envelope, then copying should be considered appropriate. In these instances, new fabric should be identifiable upon close inspection by the subtle reinterpretation of finer details or by date stamping in an unobtrusive location.	In general where intact original fabric is repaired it will be identified.
5.1.5 Later alterations and additions c.1920s may be removed only where their removal reveals fabric or configurations of greater cultural significance.	Removal of current (non original) stairs and partitions will reveal original open configuration.
5.1.6 Later alterations and additions post 1975 should be removed to reveal fabric and configurations of greater cultural significance.	Removal of fit out elements, linings and services will reveal original fabric and open configuration.
5.1.7 New fit out and finishes, where required and where an entirely new entity, should be modern and not imitate an historic element of finish that was never there.	New fit out and finishes will be limited and modern and clearly distinguishable from original fabric.
5.1.8 New development can occur beside and behind Macquarie House provided its does not obscure an understanding of the building as a free standing warehouse in the Colonial Georgian style. Any adjacent development along Cameron Street	The new development is behind Macquarie House and will not obscure an understanding of the building as a free standing warehouse

should seek to re establish the original setting of Macquarie House as a free standing building in a Georgian scale townscape.	

5.2 Specific Conservation Policy-Exterior	**Response**
5.2.1 The significant fabric of the building envelope should be conserved.	Generally all of the fabric of the building envelope is being retained and conserved
5.2.2 Original brickwork should be conserved. Unless necessary to address water ingress problems, damaged brick work showing evidence of earlier additions should be preserved.	It is intended to retain the existing brickwork and stone detailing as is, including areas of damage such as chipped brick window sills. Stonework will be exposed. Brickwork will be refinished with an approved lime wash.
5.2.3 Original door and window joinery should be conserved. Accurate reconstructions post 1975 should be identified and maintained. Speculative reconstructions should be identified and may be removed to reveal significant fabric.	Generally all door and window joinery will be conserved in situ. Where removal is proposed, such as with some of the loading bay doors, (date and origin unknown but probably not original) these will be incorporated into fit out screens adjacent.
5.2.4 The bricked up window apertures on the rear elevation may be reconstructed. Bricks should be carefully removed and salvaged for future repairs. Cut back sills should be indented to below the timber casement sill and reconstructed with new, compatible stone. Original casement sashes and frames still in situ should be protected during masonry work and carefully conserved.	It is proposed to retain the existing windows and apertures without reconstructing the stone sills. The brick infills will be removed and mild steel plate sleeves installed as detailed, to provide a modern response which retains evidence of the changes that have occurred.
5.2.5 Original ground levels adjacent to the building may be restored.	In general existing ground and surface levels will be retained.

5.3 Specific Conservation Policy-Interior **Response**

5.3.1 No internal works should be undertaken until a detailed inspection of all interior surfaces has been completed by a qualified heritage practitioner. This will require the building to be substantially vacant and some selective removal of modern introduced materials.	Since the CMP was written, the interior has been vacated and generally all interior surfaces, floor framing and roof space have been inspected
5.3.2 The original open floor plans should be reinstated on all floors.	The proposal reinstates all floors to the original open floor plan
5.3.3 Prior to any further work to door and window joinery, a detailed analysis of existing hardware should be carried out.	A detailed analysis of existing hardware will be carried out. It is anticipated that much of what is there will be retained.
5.3.4 Prior to any work to interior areas, the floor structure and floor boards should undergo a detailed analysis, to establish the location of original stair ladders, hatches and the like, and evidence of alteration.	A preliminary investigation has been undertaken from the underside of the floors, which suggests locations of original stairs/ladders. A more detailed investigation will be undertaken when existing floor coverings are removed.

5.4 Specific Conservation Policy -Interpretation **Response**

5.4.1 A coordinated interpretive strategy for the place should be prepared by a suitably qualified interpretation consultant.	Consultants will be engaged during the course of the project to prepare an interpretive strategy which will be implemented on completion.
5.4.2 A brief text explaining the significance of Macquarie House should be made available to visitors to the place, either in the form of a pamphlet or as part of interpretive panels mounted in relevant locations throughout the building.	Interpretive material will be prepared and form part of the redevelopment so that it coincides with completion of the project.
5.4.3 The place should continue to be known as Macquarie House.	The name Macquarie House will be retained.
5.4.4 All evidence of the development and alteration of Macquarie House since 1830 should be identified and interpreted.	Interpretive material will include an overview of the building history and will identify changes to Macquarie House since 1830.
5.4.5 All persons involved in the management and maintenance of the place should be made fully aware of its significance.	A successful onsite interpretation strategy will alert all involved with the building of its significance.

5.5 Specific Conservation Policy-Control of Physical Intervention	**Response**
5.5.1 Generally, work should be carried out in accordance with the principles and articles of the ICOMOS Burra Charter.	Principles and articles of the ICOMOS Burra Charter will be adapted in this project.
5.5.2 Disturbance of the physical fabric is acceptable where it provides information necessary for the conservation of the place and the loss of cultural significance is slight.	Disturbance of physical fabric is minimal.
5.5.3 Where intervention of significant fabric for non-conservation purposes is unavoidable, the loss of cultural significance should be minimised. Within these areas, fabric of lower relative significance should be disturbed in preference to fabric with a higher relative value.	In general intervention of significant fabric will be avoided.
5.5.4 Where significant fabric is damaged, the repair of the original element should be done in preference to its replacement with new. This preserves the intactness and significance of the place.	Repairs of original fabric will take precedence over replacement.
5.5.5 All significant fabric should wherever possible be repaired on site without removal of fixings. Earlier finishes such as paint, lime wash, etc. should not be removed unless it is necessary for the repair of an element, or the finish has deteriorated or substantially detached to the extent that the finish cannot be maintained.	Where possible fabric will be repaired on site.
5.5.6 The introduction of new fabric into an existing significant element should only occur when the original element is in danger of failure and the new fabric will ensure the elements long term survival.	At this stage there is no circumstance foreseen where new fabric will need to be introduced into an existing significant element.

5.6 Specific Conservation Policy -Management & Maintenance	**Response**
5.6.1 Irrigation of garden beds adjacent to perimeter walls should cease as a matter of priority.	All irrigation adjacent perimeter walls will be removed.
5.6.2 In order to conserve the significance of the place, a strategy for management and maintenance must be adopted.	A strategy for management and maintenance will be prepared prior to completion of the project and adapted there after.
5.6.3 A Schedule of Ongoing Monitoring and Maintenance Works for the place should be prepared by a qualified conservation architect and put in to action.	The management and maintenance strategy will include a schedule of ongoing monitoring and maintenance works prepared by a qualified conservation architect.
5.6.4 Maintenance involving the repair of significance fabric should be carried out by persons knowledgeable and skilled in the use of traditional materials and methods. All contractors should be made fully aware of the significance of the place.	The maintenance strategy will call for ongoing repairs to significant fabric to be undertaken by tradesmen skilled in traditional methods.
5.6.5 At the documentation and construction stage of any development of the place, a qualified conservation architect should be appointed. This architect should assist in the documentation and provide site advice as work proceeds.	A qualified architect in conservation has been engaged and will assist in the documentation and construction stages of the project.

5.7 Specific Conservation Policy-Adoption & Review **Response**

5.7.1 This Conservation Policy document should be reviewed and considered by the client, Launceston City Council. Following consideration, it should be adopted as a policy document when considering any Development Approvals for the place. It can then guide all future development of the place.	The Conservation Policy of the Macquarie House Conservation Management Plan has been adopted by the Launceston City Council and is being used to guide and assess, the proposal under consideration for Development Approval.
5.7.2 This Conservation Policy document should be reviewed *•If there is a use proposed other than the current proposal* *•Every ten years* *•If upon opening up of the fabric or upon further research, new evidence changes the known significance of the place.*	At this stage there is no circumstance described which would trigger the Conservation Policy document to be reviewed.

File No: SF5992

MS

Your Ref: DA0440/2016

13/02/2017

Mr Ashley Brook
C/- Planning Department
City of Launceston
PO Box 396
LAUNCESTON TAS 7250

DA0440/2016 - Request for Further Information

I write in response to the request for additional information associated with the above mentioned application, dated 20 October 2016.

Please find attached to this correspondence the following documents:

- Contaminated Site Assessment - Civic Square.
- Amended Drawing "*Macquarie House DA-SK-02-Rev-02*"

Item 01 - Potentially Contaminated Land

The Request for Further Information does not outline the identified potentially contaminating activity at the site, however it assumed this relates to the former Jackson Motor Company/BP Service Station located on the corner of Charles and Cameron Streets, and the liquid fuel storage associated with this use. It is noted that this construction and activity was principally located on land to the South-west of the Macquarie House Building, on an adjacent allotment. This adjacent site now forms part of the title area of land including the Macquarie House building.

As part of a broader redevelopment of the Civic Square precinct currently being developed by the City of Launceston, a *Contaminated Site Assessment* (CSA) has been undertaken, noting two former potentially contaminating activities at the western end of Civic Square - namely the former liquid fuel storage facility, and a timber yard on the site now occupied by Henty House.

Soil and groundwater sampling and testing in the direct locality of Macquarie House site has confirmed the potentially contaminating activities at 92 Cameron Street have not impacted the site. On this basis, Council believe the requirements of item *E2.4.3* of the *Contaminated Land Code* has been satisfied as it relates to this development application.

Item 02 - Pathway Construction on Adjacent Title

I confirm that the reconstruction of the existing pathway to the north-east of Macquarie House forms part of this application. However,

I confirm that the land title impacted by these minor works is not listed as a *Local Heritage Place*, therefore not subject to the provisions of the *Local Historic Cultural Heritage Code*. Further, the nature of the work proposed is limited to the reconstruction and repaving of an existing pathway, and as such Council believe these works are exempt from requiring Planning Approval in accordance with *Part B, Clause 5.4* of the *Launceston Interim Planning Scheme 2015*.

On this basis, consent of the land owner is not required.

Item 03 - Tree Removal

Amended drawing *Macquarie House DA-SK-02-Rev-02* included with this correspondence has been updated to show both trees proposed for removal.

An Arborists Report has not been included with this application. The applicant acknowledges both trees proposed for removal are in a healthy state however, retention is not compatible with the proposed development. As such, an Arborists Report is believe to provide little additional beneficial information to assist with the assessment of this application.

Item 04 - Colours and Materials

It is proposed to replace the current roof sheeting with new custom orb profile roof sheeting. To comply with National Construction Code Energy Efficiency Requirements, additional roof insulation is required to be installed as part of this development. The current roof sheeting is not original, although the specific date of installation is not absolutely certain. A large proportion of the original timber roof framing and slate or shingle battening is still intact - and visible from the interior of the building.

The intent of installing new roof sheeting, is to enable the retention of this original timberwork in a visible position on the building interior, with the required installation to be installed above this building fabric layer.

The applicant would be happy for Council's Heritage Officer or representatives from Heritage Tasmania to provide direction or conditional approval as to the external colour selection for the new roof sheeting.

I trust the above information, along with attached documentation provides a sufficient response to your request.

Please do not hesitate contacting me with any additional queries you may have.

Yours sincerely

Matthew Skirving

Manager Architectural Services, City of Launceston.

City of LAUNCESTON

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Contaminated Site Assessment

92 Cameron Street, Launceston 7250

Project No: 5757

Environmental Service & Design

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FINAL V4	Rod Cooper	ES&D	31/10/2016

This report has been prepared, based on information generated by Environmental Service and Design Pty Ltd from a wide range of sources. If you believe that Environmental Service and Design Pty Ltd has misrepresented or overlooked any relevant information, it is your responsibility to bring this to the attention of Environmental Service and Design Pty Ltd before implementing any of the report's recommendations. In preparing this report, we have relied on information supplied to Environmental Service and Design Pty Ltd, which, where reasonable, Environmental Service and Design Pty Ltd has assumed to be correct. Whilst all reasonable efforts have been made to substantiate such information, no responsibility will be accepted if the information is incorrect or inaccurate.

This report is prepared solely for the use of the client to whom it is addressed and Environmental Service and Design Pty Ltd will not accept any responsibility for third parties. In the event that any advice or other services rendered by Environmental Service and Design Pty Ltd constitute a supply of services to a consumer under the Competition and Consumer Act 2010 (as amended), then Environmental Service and Design Pty Ltd's liability for any breach of any conditions or warranties implied under the Act shall not be excluded but will be limited to the cost of having the advice or services supplied again. Nothing in this Disclaimer affects any rights or remedies to which you may be entitled under the Competition and Consumer Act 2010 (as amended). Each paragraph of this disclaimer shall be deemed to be separate and severable from each other. If any paragraph is found to be illegal, prohibited or unenforceable, then this shall not invalidate any other paragraphs.

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Executive Summary

Environmental Service and Design (ES&D) were commissioned by Launceston City Council to conduct an Environmental Site Assessment for the proposed development at Macquarie House, 92 Cameron Street, Launceston 7250 (the "Site"). Risk and concern was raised by Launceston City Council relating to the operation of "fuel storage and automotive activities" at the site. The assessment was conducted Site Contamination Practitioners Australia (SCPA) certified practitioner Mr. Rod Cooper of Environmental Service and Design (SCPA certification no. 15020).

The objective of the environmental site assessment was to:

- Collate site historical information to establish whether activities have occurred on or near the site which may have resulted in contamination of the land;
- Assess the previous land uses and subsurface conditions to determine the potential for soil and groundwater contamination at the Site;
- Provide an assessment of the suitability of the Site for the proposed development; and
- Provide recommendations for additional investigation, if required.

After a review of the site history from Worksafe Tasmania (WST) was conducted, it was found that the potential contamination was in fact at what was 92 Cameron Street. This is suitable distance away and down gradient from the development. As there is a long history of contaminating activities in the area it was decided to take a precautionary approach to "general" contamination of soil in the area.

As previous assessments have occurred recently in the area the data was used to confirm that there is no risk from vapour intrusion from contaminated groundwater in the area of the development.

Two groundwater bores were installed and soil samples were taken, one down gradient and one up gradient of the development. The bores were constructed to a standard suitable as permanent monitoring bores should council wish to perform future groundwater monitoring.

Although it was noted that groundwater TRH F2 level for C10 – C16 Fraction was 2,850 ug/l indicating a general low level of groundwater contamination in the area, results confirmed that there is no risk to potential receptors in the vicinity of the development as the contamination levels in both groundwater and soil were below the NEPM Health Screening Levels and the Groundwater Investigation Levels.

Thus the investigation which mainly includes a detailed site history meets the LCC Planning requirement:

E2.5.1 P1(b) – Land is suitable for the intended use, having regard to an environmental site assessment that demonstrates that the level of contamination does not present a risk to human health or the environment.

and

E2.6.2 P1(b) – Excavation does not adversely impact on health and the environment, having regard to an environmental site assessment that demonstrates that the level of contamination does not present a risk to human health or the environment.

1 Introduction

Environmental Service and Design (ES&D) were engaged by their client Launceston City Council to undertake a Preliminary Contaminated Site Assessment (CSA) on the proposed development at 92 Cameron Street, Launceston. Property ID 6670558, Title Reference 118058/1. The aim of the CSA is to establish whether activities have occurred on the site which may result in contamination of the land and if so, whether the level of risk will increase with the proposed development.

Under the *Launceston City Council Interim Planning Scheme 2015* the proposed development will need to satisfy the Contaminated Land Code E2.5 and E2.6;

E2.5.1 P1(b) – Land is suitable for the intended use, having regard to an environmental site assessment that demonstrates that the level of contamination does not present a risk to human health or the environment.

and

E2.6.2 P1(b) – Excavation does not adversely impact on health and the environment, having regard to an environmental site assessment that demonstrates that the level of contamination does not present a risk to human health or the environment.

2 Scope of Works

The scope of the environmental site assessment was as follows:

- Pertaining the site history and information from WorkSafe Tasmania (WST);
- Consideration of the sites environmental settings;
- Identification of potential human and ecological receptors and consideration of risks to identified receptors;
- Development of a Conceptual Site Model (CSM);
- Preparation of the assessment report; the report was prepared by S Smith (Environmental Consultant) of ES&D and reviewed by R Cooper (Principal Consultant) of ES&D.

3 Basis for Assessment

As a State Policy for the purposes of *State Policies and Procedures Act 1993*, the *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (NEPM)* was the guideline used for the assessment.

The assessment included elements of a *Preliminary Environmental Site Assessment* as defined in *NEPM Schedule B2*.

4 Site Details

4.1 Ownership and Location

Street Address	Property ID	Approximate Area (m2)
92 Cameron Street, Launceston 7250	6670558	1437

Property Information sourced from thelist.com.au (Feb 2017)

The property is currently owned by the Launceston City Council, with construction proposed of a general learning area with wet area, support spaces and toilet facilities. The investigation area (the Site) covers approximately 1437 m2. The sites location is shown on Figure 1.

Figure 1 Site Plan

4.2 Site Layout

Civic square is a large open square that is almost completely paved. 92 Cameron Street allows free access to various government buildings and has benches, gardens and fountain.

The proposed development will occur mainly behind where the service station was and some distance from potential contamination. Groundwater flow is in a westerly direction.

Figure 2. Civic Square Sample Point – up gradient

5 Zoning and Land Use

The site is zoned “Urban Mixed Use” (Launceston Interim Planning Scheme 2015, Figure 2) and is largely surrounded by “Urban Mixed Use”. Sections of “Open Space” are present to the south and north, with “Central Business” to the south-east.

The current zoning will not change as part of the development application.

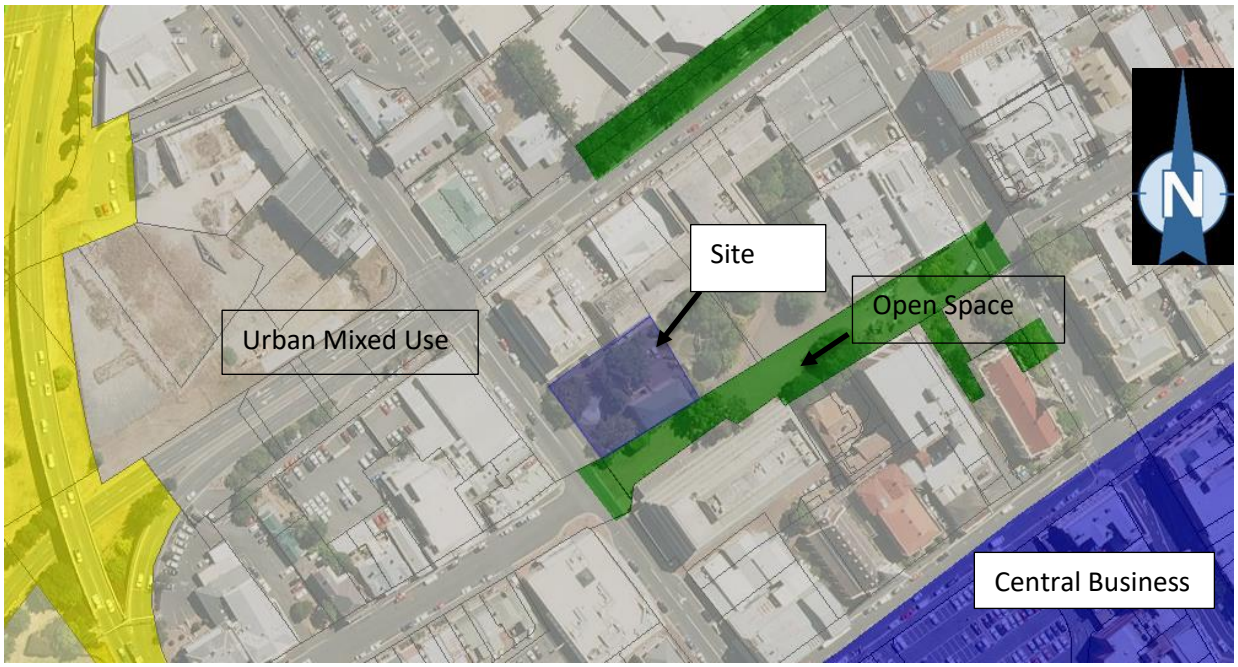

Figure 3 Zoning – Urban Mixed Use

6 Site Description

The subject site Macquarie House, 92 Cameron Street is currently a public building with gardens and a fountain with public access as part of the civic square. Concern has been raised by Launceston City Council due to the historic use as a service station at 94 Cameron Street.

6.1 Surrounding Land Use

Mainly commercial with open space.

7 Chemicals of Concern

Chemicals of Concern (COC) include hydrocarbons, BTEX, and lead. Potential for hydrocarbon and lead contamination arises from the previous land use as service stations in the area

8 Geology, Hydrology and Hydrogeology

Geology is Cenozoic age, comprising loose to poorly consolidated, clast composition poorly known, dominantly siliceous clasts in some areas.

8.1 Topography

The site is situated on relatively flat land, at the western end of Civic Square. The approximate elevation is 15m AHD with the regional topography sloping towards the west.

8.2 Surface Water

The nearest surface water body is the River Tamar located ~405m to the west of the site.

8.3 Regional Geology

The Tasmanian Land Information System (the List, accessed February 2017) indicates that the site is Cenozoic age, comprising loose to poorly consolidated, clast composition poorly known, dominantly siliceous clasts in some areas.

8.4 Regional Hydrogeology

Based on the regional topography and the location of the nearby surface water bodies, groundwater flow is likely to the west. Reference to the Department of Primary Industries, Parks, Water and Environment (DPIPWE) Groundwater Information Access Portal indicates there are no registered bores within 500m of the site. The groundwater map is presented in figure 5.

9 Site Drainage and Discharge Points

9.1 Soil and Surface Water

The proximity to historic service stations and other underground storage tanks (see figure 5) would most likely not impact on the site soils. There is potential for the groundwater to be contaminated and if so then the risk if vapour intrusion occurs in the Civic Square. With excavation, there is little potential for worker exposure to the vapours.

9.2 Groundwater

Groundwater contamination from underground fuel tanks up gradient from the Civic Square is a possibility. The inferred groundwater direction is to the west. A wider investigation indicates that the presence of underground fuel tanks located at 68-72 Cameron Street in the 1930's, up gradient of the proposed development, along with 94 Cameron Street, west of the development. If these tanks have leaked it could potentially impact on groundwater directly away from the development to the west. A preliminary Conceptual Site Model (CSM) is presented in Figure 4.

9.3 Waste

No waste issues have been identified in this desktop study.

10 Potential Receptors

A preliminary Conceptual Site Model (CSM) (Figure 4) was developed after consideration of risks to potential human and ecological receptors as outlined below.

10.1 Human Receptors

The site use will not change. The surrounding buildings contain commercial employees and customers. The square is an open space containing users passing through. Workers and subsurface workers will work on the development. Risks to human health from hydrocarbon contamination can arise via the inhalation route from vapour intrusion into building spaces, or when people are in close proximity to vapours for extended periods (e.g., subsurface workers), and/or by direct contact with contaminated soil, surface water or groundwater (e.g., ingestion, dermal contact).

Subterranean services in the street could provide preferential pathways for movement of contaminants towards the development and present an exposure risk to sub-surface workers, although organisations likely to be involved in such works generally have mature safety management systems whereby uncontrolled excavations are not likely to occur.

10.2 Ecological Receptors

The suspected groundwater flow direction indicated the Tamar River ~500 meters to the west as the main receiving surface water body for groundwater discharging from the site. High levels of contaminants in the groundwater are unlikely to present a risk to ecological receptors in the river.

Basis for Assessment

Health Screening Levels (HSLs), Health Investigation Levels (HILs), and Groundwater Investigation Levels (GILs) provided in the National Environmental protection (Assessment of Site Contamination) Measure 1999, as amended April 11, 2013 (NEPM) were the designated criteria for assessing potential ecological and human health risks posed by hydrocarbon contamination of soil and groundwater as applicable. Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) documents used in the assessment comprised CRC CARE Technical Report No. 10 “Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater Part 2: Application Document” (TR10).

Soil and groundwater screening / investigation levels considered are given in Tables 1, 2 and 3. Section 4.6 of CRC CARE TR10 suggests that when the soil type does not match any of the three soil categories used in the derivation of HSLs the appropriate option when deciding on soil types for assessment of key scenarios / receptors is to assume the soil is sand as the most conservative of the HSLs and this was the strategy adopted for the assessment.

Site soils were predominantly silt and silty clay, but silty sand and sandy gravel were also encountered during drilling on the site.

NEPM advises that a pragmatic risk-based approach should be taken in applying ESLs & EILs in commercial/industrial land use settings, and that these generally only apply to the top 2.0 meters of soil. ESLs relating to coarse grained soil were considered to be appropriate because in reality there was clay and we took a conservative approach.

Table 1 - Soil Assessment Criteria, Health Screening Levels / Health Investigation Levels

Land Use Units – mg/kg	*Commercial / Industrial*	
HSLs - Derived from NEPM Schedule B1, Table 1A(3)	HSL-D 1-2m, sand	HSL-D 2-4 m, sand
Chemical		
Naphthalene	NL	NL
C_6-C_{10} (F1)	370	630
>C_{10}-C_{16} (F2)	NL	NL
Benzene	3	3.0
Toluene	NL	NL
Ethylbenzene	NL	NL
Xylenes	NL	NL
HILs – Derived from NEPM Schedule B1, Table 1A(1)		
Lead	1500	
NL = Not Limiting: indicates that vapour reaches saturation point and cannot increase to a point which would result in an unacceptable health risk.		

Table 2 - Soil Assessment Criteria, Ecological Investigation Levels / Ecological Screening Levels

Land Use	Commercial / Industrial	
Chemical	Soil (mg/kg)	
Soil (mg/kg)		
Lead	*ABC*	Not known
	ACL	1800
	EIL	1800+
ESLs – Derived from NEPM Schedule B1, Table 1B(6)		
C_6-C_{10} (F1)	Coarse substrate	215
>C_{10}-C_{16} (F2)		170
>C_{16}-C_{34} (F3)		1700
>C_{34}-C_{40} (F4)		3300
Benzene		75
Toluene		135
Ethylbenzene		165
Xylenes		180

Table 3 - Groundwater Assessment Criteria

Health Screening Levels / Groundwater Investigation Levels

Chemical	Groundwater (µg/L)
HSLs - Derived from NEPM Schedule B1, Table 1A(4)	
	HSL-D 4m to <8 sand
Naphthalene	NL
C_6-C_{10} (F1)	6000
>C_{10}-C_{16} (F2)	NL
Benzene	5000
Toluene	NL
Ethylbenzene	NL
Xylenes	NL
GILs – Derived from NEPM Schedule B1, Table 1C	
	Fresh Water
Lead	3.4
Benzene	950
o-xylene	350
p-xylene	200
Naphthalene	16
NL = Not Limiting: indicates that vapour reaches saturation point and cannot increase to a point which would result in an unacceptable health risk.	

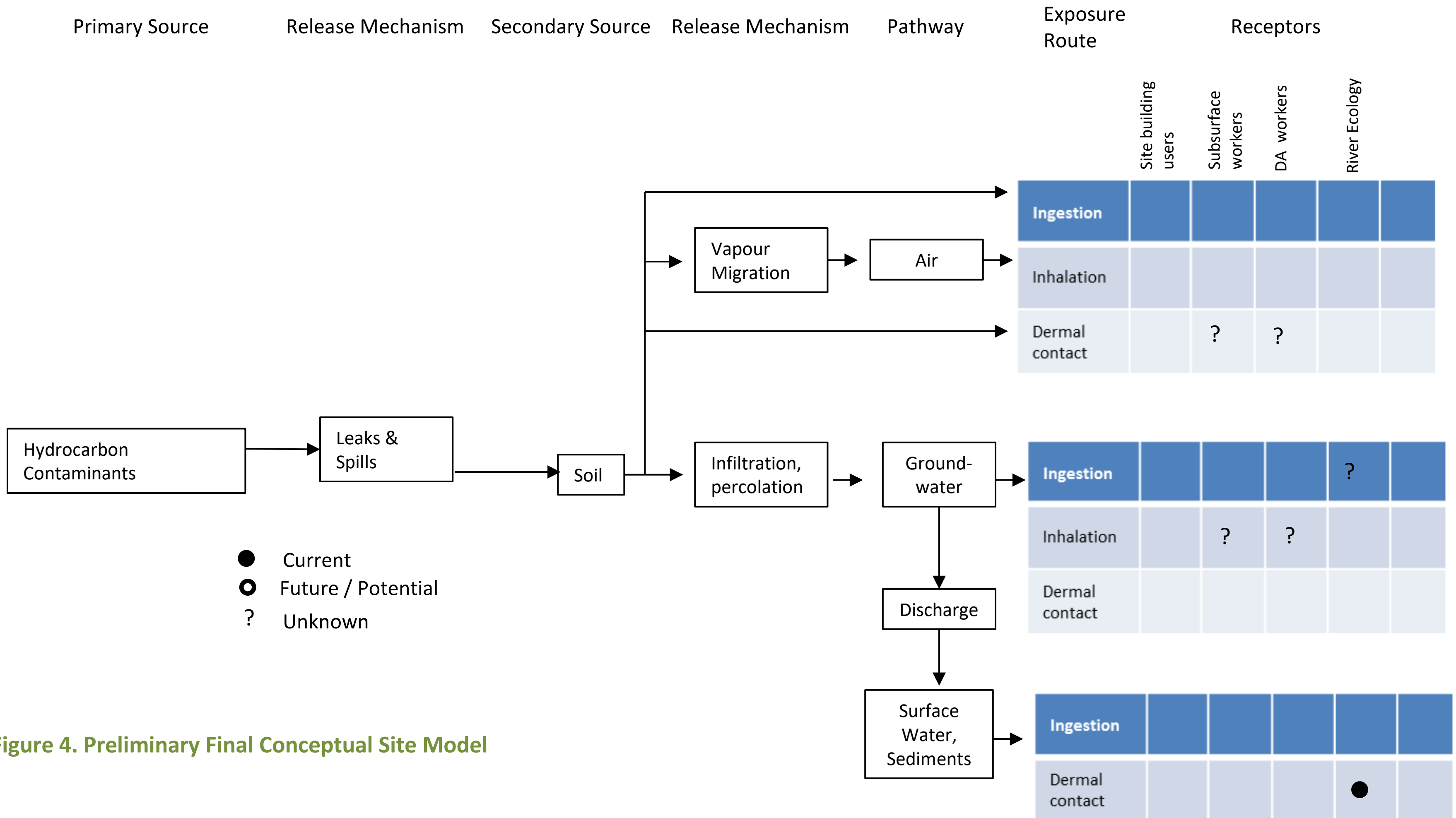

Figure 4. Preliminary Final Conceptual Site Model

11 Site History Assessment

All available WST data was reviewed from the early 1930's while part of the site was a service station. It was concluded and summarised in figure 5. Firstly that the service station is on what was 94 Cameron Street down gradient and not where the development is to occur at 92 Cameron Street. Thus contaminating activities did not occur near the development and even so down gradient of the development. This removes risk of vapour and contaminated soil. The history search did not discover if any of the 9 tanks found were removed. It was also noted that if a plume from the UPSS did exist it would go to the west away from the development and city square across Charles Street. This is the main risk determined in this assessment. There are no civil issues as garden and fountains cover the potentially impacted areas.

Figure 5 Historic Locations of UPSS

All contaminants that could be reasonably expected to disperse to the environment from an Underground

12 Analytical and Sampling Plan

All contaminants that could be reasonably expected to disperse to the environment from an Underground Petroleum Storage System (UPSS) used for storing and dispensing petrol and diesel were included in the analytical plan. These comprised Total Petroleum Hydrocarbon / Total Recoverable Hydrocarbon (TPH/TRH) fractions, Benzene, Toluene, Ethylbenzene and Xylene (BTEX) and Lead (Pb).

Figure 6 Proposed Bores MWN (North) and MWS (South)

Planned QC/QA samples included duplicate samples as necessary. A soil duplicate was to be collected with a frequency of 1 per 20 samples, but notwithstanding this, for both soil and groundwater, one duplicate was to be collected for each. The sampling and analytical plan is summarised in Table 7.

Table 4 – Sample Information

Soil	*Number of samples*	*Number of duplicates*	*Total*	*Pb*	*TRH Fractions*	*PAH (selected samples)*	*BTEX / BTEXN*
Samples taken during groundwater bore installation (1 taken from soil/water interface and SAMPLES AT REGULAR POINTS	8	1	9	X	X	X	X
Groundwater	2	1	3	X	X	X	X

13 Field Activities

On the 27/10/2016 two groundwater bores were installed and the bores conditioned and purged. Soil samples were taken along with PID readings using a MultiRAE Pro (Table 8). No odour was detected in the bores MWN and MWS. The borelog and drilling notes are provided in Appendix 2.

The ground water wells were developed, purged and sampled on the 27/10/2016. This is not strictly to the standard but feedback was required quickly and the samples taken were representative of the aquifer groundwater quality. SWLs were measured prior to purging and sampling using a Solinst electronic probe. Water quality parameters were measured using a Horiba ™ U50 series multi-parameter probe (refer Table 9). Bailer was cleaned between samples by sequentially pumping through with a solution of Decon 90, tap water and demineralised water.

The soil sample were taken on the 27/10/2016 directly from the tip of the auger, no odour was detected during drilling.

Table 5 – Bore PID readings

Bore	*Depth (mbgsl)*	*VOC*	*LEL*	*SO_2*
MWN	7.2	0.0	0	0
MWS	7.1	0.0	0	0

Table 6 – Bore Physical Characteristics

Bore	*Temp (oC)*	*pH*	*EC (µS/cm)*	*DO (%)*	*TDS (mg/L)*	*Salinity (ppt)*
MWN	12.10	6.48	210	38	215	0.1
MWS	12.08	6.55	207	39	201	0.1

14 Sampling Information

Laboratory Certificates of Analysis (COA) for all samples are attached in Appendix 3. Sampling QA/QC protocols and QC results are presented.

14.1 Sampling guidelines, standards and techniques

- NEPM Schedule B (2), Guideline on Site Characterisation; judgmental sampling
- AS 4482.1 (2005) Guide to the Sampling and Investigation of Potentially Contaminated Soil - Part 1: Non-Volatile and Semi Volatile Compounds
- AS 4482.2 – Part 2: Volatile Substances
- AS 5667.1 (1998) Guidance on the design of sampling programs, sampling techniques and the preservation and handling of sampling
- AS 5667.11 (1998) Water quality – Sampling Part 11: Guidance on Sampling of Groundwaters

Soil samples were taken directly from the drill or hand auger. A bailer was used to collect groundwater samples.

Samples were immediately placed into an esky with ice bricks, after collection, and were dispatched by overnight airfreight to the analytical laboratory. The analytical laboratory used for all samples was NATA certified Australian Laboratory Services (ALS), Springvale, Victoria.

14.2 Sampling activities

Soil samples were taken at regular intervals during drilling. 4 soil samples were taken from each hole, with the depth recorded in the sample label. A duplicate was taken of MWN-8.0m. Bore water samples were taken after conditioning and purging the two bores and the bore number was included in the label. A duplicate was taken of MWS-8.0 m.

14.3 QA/QC

ALS Laboratory supplies a full QC report covering laboratory QA/QC activities with each COA. Field duplicates were collected as described above.

Techniques used to prevent cross contamination of samples and ensure the integrity of samples were as follows:

- Soil samples were collected using a new pair of disposable gloves for each sample;
- Bailer used for collection of groundwater samples was cleaned between samples by triple rinsing with a solution of Decon 90, tap water and demineralised water; and
- All samples were immediately collected into ALS supplied analyte appropriate bottles, individually labelled, placed in an Eski with freezer packs and dispatched for overnight delivery to the Laboratory with an accompanying chain of custody document.

AS 4482.1 (2005) suggests that typical Measurable Data Quality Indicators (MDQI) should be ≤50% Relative Percentage Difference (RPD), and this was the adopted MDQI for all samples. Results for the initial QA/QC in table 10. All RPDs are less than 50% for the volatile organic compounds.

15 Results

The comprehensive data is presented in Tables 7-9 together with assessment criteria. Values above LORs are highlighted in bold black text; those above assessment criteria are highlighted in bold red text.

- Human health assessment criteria and ecological screening levels were not exceeded in any samples.
- Freshwater Investigation levels were exceeded for lead in the groundwater.

Table 7 – Soil samples with depths 1-2m

Laboratory Report No. EM1612862			Sample ID			MWS - 1.0m	MWN - 1.0m
			Date Sampled			27/10/2016	27/10/2016
Analyte	Units	LOR	**HIL**	**HSL-D 1-2m**	**EIL / ESL-D**	SOIL	SOIL
Moisture Content (dried @ 103°C)	%	1				**22.1**	**21.9**
Lead	mg/kg	5	**1500**		**1800+**	9	11
TPH							
C_6 – C_9 Fraction	mg/kg	50				<10	<10
C_{10} – C_{14} Fraction	mg/kg	50				<50	<50
C_{15} – C_{28} Fraction	mg/kg	100				<100	<100
C_{29} – C_{36} Fraction	mg/kg	100				<100	<100
C_{10} – C_{36} Fraction (sum)	mg/kg	10				<50	<50
TRH							
C_6 – C_{10} Fraction	mg/kg	50				<10	<10
C_6 – C_{10} Fraction minus BTEX (F1)	mg/kg	50		**370**	**215**	<10	<10
>C_{10} – C_{16} Fraction	mg/kg	50				<50	<50
>C_{16} – C_{34} Fraction (F3)	mg/kg	100			**1700**	<100	<100
>C_{34} – C_{40} Fraction (F4)	mg/kg	100			**3300**	<100	<100
>C_{10} – C_{40} Fraction (sum)	mg/kg	10				<50	<50
>C_{10} – C_{16} Fraction minus Naphthalene (F2)	mg/kg	10			**170**	<50	<50
BTEXN							
Benzene	mg/kg	0.2		**3.0**	**75**	<0.2	<0.2
Toluene	mg/kg	0.5		**NL**	**135**	<0.5	<0.5
Ethylbenzene	mg/kg	0.5		**NL**	**165**	<0.5	<0.5
meta- & para-Xylene	mg/kg	0.5				<0.5	<0.5
ortho-Xylene	mg/kg	0.5				<0.5	<0.5
Sum of BTEX	mg/kg	0.2				<0.2	<0.2
Total Xylenes	mg/kg	0.5			**180**	<0.5	<0.5
Naphthalene	mg/kg	1		**NL**		<1	<1
PAH							
Sum of PAH	mg/kg	0.5				<0.5	<0.5

Table 8 – Soil samples with depths 4-8m

Laboratory Report No. EM1612862			Sample ID			MWS- 4m	MWS-6m	MWS-8m	MWN-4m	MWN-6m	MWN-8m	Duplicate
			Date Sampled			27/10/2016	27/10/2016	27/10/2016	27/10/2016	27/10/2016	27/10/2016	27/10/2016
Analyte	Units	LOR	**HIL**	**HSL-D 4-8m**	**EIL / ESL-D**	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Moisture Content (dried @ 103°C)	%	1				**12.7**	**12.7**	**20**	**25**	**17**	**26**	**26.6**
Lead	mg/kg	5	**1500**		**1800+**	**7**	**5**	**6**	**7**	**6**	**7**	**9**
TRH												
C6 – C10 Fraction	mg/kg	50				<10	<10	<10	<10	<10	<10	<10
C6 – C10 Fraction minus BTEX (F1)	mg/kg	50			215	<10	<10	<10	<10	<10	<10	<10
>C10 – C16 Fraction	mg/kg	50				<50	<50	<50	<50	<50	<50	<50
>C16 – C34 Fraction (F3)	mg/kg	100			1700	<100	<100	<100	<100	<100	<100	<100
>C34 – C40 Fraction (F4)	mg/kg	100			3300	<100	<100	<100	<100	<100	<100	<100
>C10 – C40 Fraction (sum)	mg/kg	10				<50	<50	<50	<50	<50	<50	<50
>C10 – C16 Fraction minus	mg/kg	10		NL	170	<50	<50	<50	<50	<50	<50	<50
BTEXN												
Benzene	mg/kg	0.2		**3.0**	**75**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	0.5		**NL**	**135**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	0.5		**NL**	**165**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	mg/kg	0.5				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	mg/kg	0.5				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sum of BTEX	mg/kg	0.2				<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Xylenes	mg/kg	0.5		**NL**	**180**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	mg/kg	1		**NL**		<1	<1	<1	<1	<1	<1	<1
PAH												
Sum of PAH	mg/kg	0.5				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table 9 – Groundwater

Laboratory Report No. EM1612862			Sample ID		MWN	MWS	Duplicate
			Date Sampled		27/10/2016	27/10/2016	27/10/2016
Analyte	Units	LOR	**GIL Fresh**	**HSL-D 4 – 8 m**			
Lead	µg/L	0.001	**3.4**		**21**	**7**	**7**
PAH	µg/L	0.5			<0.5	<0.5	**1.4**
TRH							
C_6 - C_{10} Fraction	µg/L	20			<20	<20	<20
C_6 - C_{10} Fraction minus BTEX (F1)	µg/L	20		**6000**	<20	<20	<20
>C_{10} - C_{16} Fraction	µg/L	100			<100	**120**	**110**
>C_{16} - C_{34} Fraction (F3)	µg/L	100			**760**	**2850**	**2550**
>C34 - C40 Fraction (F4)	µg/L	100			<100	<100	<100
>C10 - C40 Fraction (sum)	µg/L	100			**760**	**3000**	**2690**
>C10 - C16 Fraction minus Naphthalene (F2)	µg/L	100		**NL**	<100	**120**	**110**
BTEXN							
Benzene	µg/L	1	**950**	**5000**	<1	<1	<1
Toluene	µg/L	2		**NL**	<2	<2	<2
Ethylbenzene	µg/L	2		**NL**	<2	<2	<2
meta- & para-Xylene	µg/L	2	**200**		<2	<2	<2
ortho-Xylene	µg/L	2	**350**		<2	<2	<2
Total Xylenes	µg/L	2		**NL**	<2	<2	<2
Sum of BTEX	µg/L	1			<1	<1	<1
Naphthalene	µg/L	5	**16**	**NL**	<5	<5	<5

Table 10 – QA/QC

Laboratory Report No. EM1608685	Pair - Soil		RPD (%)	Pair - Groundwater		RPD (%)
	MWN-8 m	**Duplicate**		**MWS**	**Duplicate**	
Moisture Content (dried @ 103°C)	**26.0**	**20.6**	**20.7**	**-**	**-**	**-**
Lead	**7**	**9**	**22**	**7**	**7**	**0**
TRH						
$C_6 - C_{10}$ Fraction	<10	<10	**0**	<20	<20	**0**
$C_6 - C_{10}$ Fraction minus BTEX (F1)	<10	<10	**0**	**120**	**110**	**8.3**
$>C_{10} - C_{16}$ Fraction	<50	<50	**0**	**2850**	**2550**	**10.5**
$>C_{16} - C_{34}$ Fraction (F3)	<100	<100	**0**	<100	<100	**0**
$>C_{34} - C_{40}$ Fraction (F4)	<100	<100	**0**	**3000**	**2690**	**10.3**
$>C_{10} - C_{40}$ Fraction (sum)	<50	<50	**0**	**120**	**110**	**8.3**
$>C_{10} - C_{16}$ Fraction minus Naphthalene (F2)	<50	<50	**0**	<20	<20	**0**
BTEXN						
Benzene	<0.2	<0.2	**0**	<1	<1	**0**
Toluene	<0.5	<0.5	**0**	<2	<2	**0**
Ethylbenzene	<0.5	<0.5	**0**	<2	<2	**0**
meta- & para-Xylene	<0.5	<0.5	**0**	<2	<2	**0**
ortho-Xylene	<0.5	<0.5	**0**	<2	<2	**0**
Total Xylenes	<0.5	<0.5	**0**	<2	<2	**0**
Sum of BTEX	<0.2	<0.2	**0**	<1	<1	**0**
Naphthalene	<1	<1	**0**	<5	<5	**0**
PAH						
Sum of PAH	<0.5	<0.5	**0**	<0.5	<0.5	**0**

16 Discussion

16.1 Soil

Results show that there is no risk to human health from residual contamination in soil that was sampled from both bores.

Ecological screening levels were not exceeded in the soil.

Assessment was conducted to the most stringent levels, using sand and commercial / industrial levels rather than open space and clay soils.

16.2 Groundwater

Hydrocarbons were detected in groundwater, but not above human health criteria at either bore. The groundwater flows to the north / north west and so the two bores cover any potential flows of groundwater under the proposed development. According to NEPM, a distance of 8.0m can be applied to screen out risk to human receptors from vapour intrusion. Therefore, there is minimal risk to workers / subsurface workers due to the depth of the groundwater.

It should be noted that lead levels in the groundwater are above the groundwater investigation levels in both bores. This does not pose any risk to the development as there is no pathway from the groundwater to the workers. Council may wish to investigate the lead levels, but not in relation to this investigation.

A revised CSM is given in Figure 6.

17 Conclusions and Recommendations

A Contaminated Site Assessment (CSA) of Macquarie House in Civic Square Launceston determined that there is no risk from contamination as there is only very low levels of contamination in the site groundwater. History shows that the soil is not contaminated by the historic petrol station. There is no risk to the DA proposed by Launceston City Council LCC.

The development can be approved based on E2.5.1 and E2.6.2

E2.5.1 P1(b) – Land is suitable for the intended use, having regard to an environmental site assessment that demonstrates that the level of contamination does not present a risk to human health or the environment.

AND

E2.6.2 P1(b) – Excavation does not adversely impact on health and the environment, having regard to an environmental site assessment that demonstrates that the level of contamination does not present a risk to human health or the environment.

In consultation with the development manager it was decided that as the site has a history of hydrocarbon use it is prudent to have a standard management plan that requires monitoring for vapour during subsurface excavation. This procedure protects from any vapour or dermal contact during the implementation of the development. Previous work has already removed any risk of longer term vapour risk on or off the site. It should be noted that the management will not stop or impede progress of the development but allow risk monitoring.

Rod Cooper.

Certified Site Contamination Practitioner

18 Limitations

ES&D has prepared this report in accordance with the care and thoroughness of the consulting profession for Launceston City Council. It was based on accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined.

This report was prepared between October and November 2016 and is based on the conditions encountered and information reviewed at the time of preparation. ES&D disclaims the responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for any use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice.

Subsurface conditions can vary across a particular site and cannot be explicitly defined by these investigations. It is unlikely therefore that the results and estimations expressed in this report will represent the extreme conditions within the site.

The information in this report is considered to be accurate at the date of issue and is in accordance with conditions at the site at the dates sampled.

This document and the information contained herein should only be regarded as validly representing the site conditions at the time of the investigation unless otherwise explicitly stated in a preceding section of the report.

No warranty or guarantee of property conditions is given or intended.

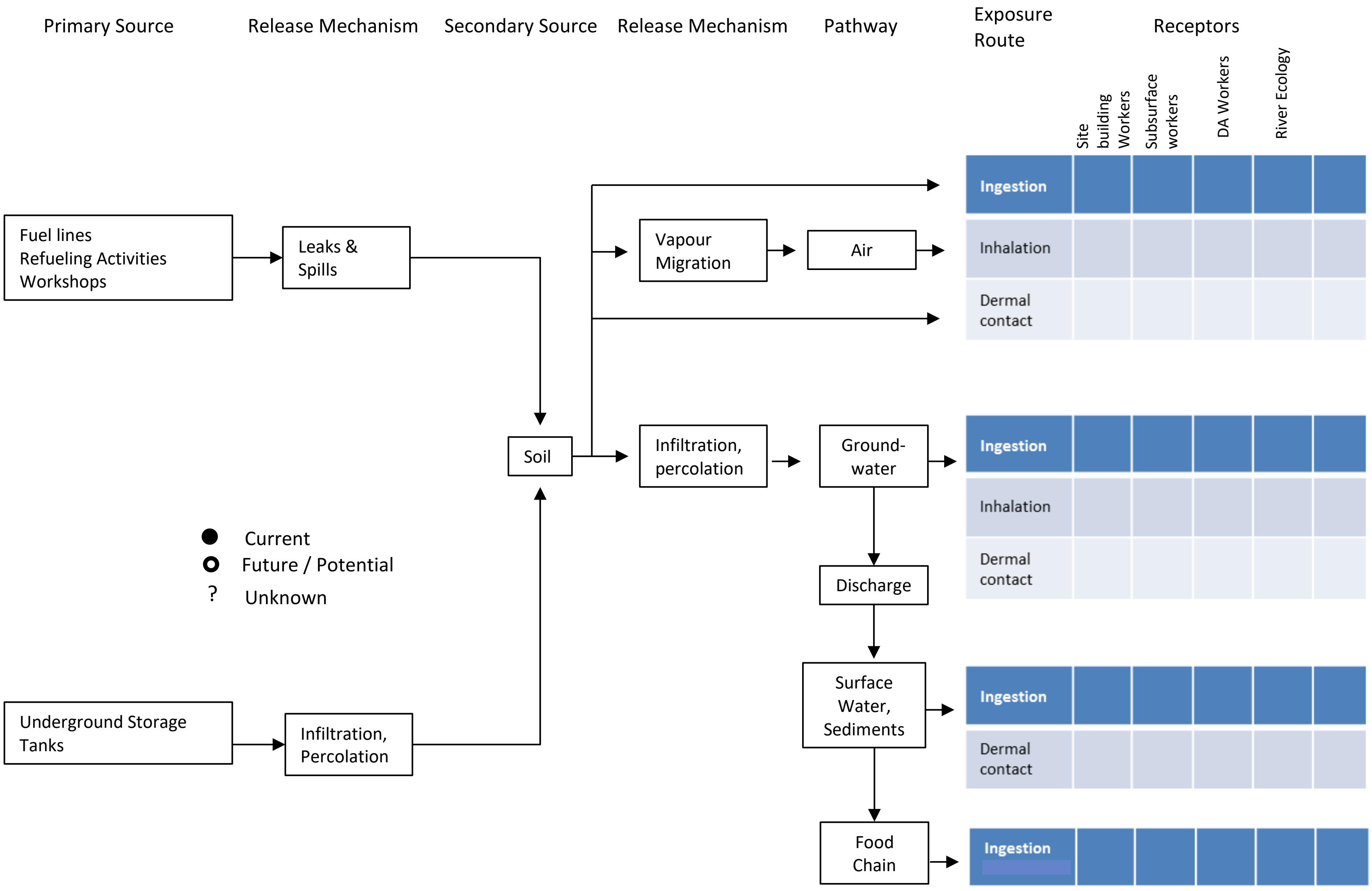
Primary Source
Release Mechanism
Secondary Source
Release Mechanism
Pathway
Exposure Route
Receptors
Site building Workers
Subsurface workers
DA Workers
River Ecology
Fuel lines
Refueling Activities
Workshops
Leaks & Spills
Soil
Vapour Migration
Air
Infiltration, percolation
Ground-water
Discharge
Surface Water, Sediments
Food Chain
Underground Storage Tanks
Infiltration, Percolation
Ingestion
Inhalation
Dermal contact
Ingestion
Inhalation
Dermal contact
Ingestion
Dermal contact
Ingestion
Current
Future / Potential
? Unknown

Figure 7 - Revised CSM

19 References

CRC CARE TR10 - CRC Care Technical Report No. 10 "Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater" (September, 2011)

EPA Tasmania Technical Guideline - UPSS1 - Decommissioning Report Requirements - v2 - June 2014

EPA Technical Guideline - Technical Guideline - UPSS2 - UPSS Decommissioning Assessment - Sampling and Risk Assessment Requirements - June 2014

National Environmental Protection (Assessment of Site Contamination) Measure, "Guideline on the Investigation Levels for Soil and Groundwater", Schedule B (1), 1999 (as amended 2013)

National Environmental Protection (Assessment of Site Contamination) Measure, "Guideline on Data Collection, Sample Design and Reporting", Schedule B (2), 1999 (as amended 2013)

AS 4482.1 (2005) Guide to the Sampling and Investigation of Potentially Contaminated Soil - Part 1: Non-Volatile and Semi Volatile Compounds

AS 4482.2 (1999) Guide to the Sampling and Investigation of Potentially Contaminated Soil – *Part 2: Volatile Substances*

AS 5667.1:1998, Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples

Tasmanian Government Land Information System - http:// www.thelist.tas.gov.au

Appendix 1: Workplace Standards Datal

Sent Separatly.

Appendix 2 Analytical Results.

Appendix 2 Management Plan

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1612862**	Page	: 1 of 9
Client	: **ENVIRONMENTAL SERVICE AND DESIGN PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR ROD COOPER	Contact	: Shirley LeCornu
Address	: 14 CATTLEY ST. PO BOX 651 BURNIE TASMANIA, AUSTRALIA 7320	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6442 4037	Telephone	: +61-3-8549 9630
Project	: LCC - City Square	Date Samples Received	: 28-Oct-2016 09:10
Order number	: ----	Date Analysis Commenced	: 28-Oct-2016
C-O-C number	: ----	Issue Date	: 31-Oct-2016 16:04
Sampler	: ROD COOPER		
Site	: LCC - City Square		
Quote number	: ----		
No. of samples received	: 12		
No. of samples analysed	: 12		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Andrew Lu	Organic Instrument Chemist	Melbourne Organics, Springvale, VIC
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075SIM: Pyrene LOR raised for samples EM1613862_10 ,11 due to matrix interferences.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Client sample ID	MWS 1.0m	MWS 4.0m	MWS 6.0m	MWS 8.0m	MWN 1.0m
				Client sampling date / time	27-Oct-2016 09:00	27-Oct-2016 09:15	27-Oct-2016 09:30	27-Oct-2016 09:45	27-Oct-2016 12:00
					EM1612862-001	EM1612862-002	EM1612862-003	EM1612862-004	EM1612862-005
					Result	Result	Result	Result	Result
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		**22.1**	**12.7**	**12.7**	**20.0**	**21.9**
EG005T: Total Metals by ICP-AES									
Lead	7439-92-1	5	mg/kg		**9**	**7**	**5**	**6**	**11**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg		**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg		**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MWS 1.0m	MWS 4.0m	MWS 6.0m	MWS 8.0m	MWN 1.0m
				Client sampling date / time	27-Oct-2016 09:00	27-Oct-2016 09:15	27-Oct-2016 09:30	27-Oct-2016 09:45	27-Oct-2016 12:00
Compound	CAS Number	LOR	Unit		EM1612862-001	EM1612862-002	EM1612862-003	EM1612862-004	EM1612862-005
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg		<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	1330-20-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		**84.3**	**92.0**	**85.3**	**89.1**	**78.5**
2-Chlorophenol-D4	93951-73-6	0.5	%		**98.5**	**102**	**99.4**	**98.0**	**86.8**
2.4.6-Tribromophenol	118-79-6	0.5	%		**67.7**	**68.8**	**70.8**	**63.9**	**57.0**
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		**116**	**112**	**118**	**119**	**102**
Anthracene-d10	1719-06-8	0.5	%		**113**	**120**	**113**	**114**	**103**
4-Terphenyl-d14	1718-51-0	0.5	%		**119**	**111**	**107**	**104**	**98.2**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**93.2**	**93.3**	**83.4**	**88.7**	**85.4**
Toluene-D8	2037-26-5	0.2	%		**89.7**	**88.4**	**76.4**	**81.5**	**80.1**
4-Bromofluorobenzene	460-00-4	0.2	%		**105**	**102**	**91.1**	**94.1**	**91.3**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	MWN 4.0m	MWN 6.0m	MWN 8.0m*	Duplicate*	----
				Client sampling date / time	27-Oct-2016 12:15	27-Oct-2016 12:30	27-Oct-2016 00:45	27-Oct-2016 17:00	----
Compound	CAS Number	LOR	Unit		EM1612862-006	EM1612862-007	EM1612862-008	EM1612862-009	--------
					Result	Result	Result	Result	----
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		25.0	17.0	26.0	20.6	----
EG005T: Total Metals by ICP-AES									
Lead	7439-92-1	5	mg/kg		7	6	7	9	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	----
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	----

Work Order : EM1612862
Client : ENVIRONMENTAL SERVICE AND DESIGN PTY LTD
Project : LCC - City Square

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	MWN 4.0m	MWN 6.0m	MWN 8.0m*	Duplicate*	----
Client sampling date / time				27-Oct-2016 12:15	27-Oct-2016 12:30	27-Oct-2016 00:45	27-Oct-2016 17:00	----
				EM1612862-006	**EM1612862-007**	**EM1612862-008**	**EM1612862-009**	--------
				Result	Result	Result	Result	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	----
^ **Total Xylenes**	1330-20-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**92.2**	**87.3**	**90.0**	**91.8**	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**104**	**97.6**	**99.0**	**103**	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**70.8**	**73.7**	**66.1**	**72.5**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**118**	**120**	**110**	**118**	----
Anthracene-d10	1719-06-8	0.5	%	**115**	**113**	**114**	**117**	----
4-Terphenyl-d14	1718-51-0	0.5	%	**119**	**119**	**107**	**107**	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**80.6**	**89.1**	**88.4**	**94.2**	----
Toluene-D8	2037-26-5	0.2	%	**73.9**	**82.5**	**83.0**	**92.2**	----
4-Bromofluorobenzene	460-00-4	0.2	%	**82.9**	**94.7**	**94.0**	**102**	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MWN	MWS#	Duplicate#	----	----
			Client sampling date / time	27-Oct-2016 18:00	27-Oct-2016 19:00	27-Oct-2016 20:00	----	----
Compound	CAS Number	LOR	Unit	EM1612862-010	EM1612862-011	EM1612862-012	--------	--------
				Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS								
Lead	7439-92-1	0.001	mg/L	**0.021**	**0.007**	**0.007**	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1	µg/L	<1.0	<1.0	**1.4**	----	----
Acenaphthylene	208-96-8	1	µg/L	<1.0	<1.0	<1.0	----	----
Acenaphthene	83-32-9	1	µg/L	<1.0	<1.0	<1.0	----	----
Fluorene	86-73-7	1	µg/L	<1.0	<1.0	<1.0	----	----
Phenanthrene	85-01-8	1	µg/L	<1.0	<1.0	<1.0	----	----
Anthracene	120-12-7	1	µg/L	<1.0	<1.0	<1.0	----	----
Fluoranthene	206-44-0	1	µg/L	<1.0	<1.0	<1.0	----	----
Pyrene	129-00-0	1	µg/L	<1.1	<1.1	<1.0	----	----
Benz(a)anthracene	56-55-3	1	µg/L	<1.0	<1.0	<1.0	----	----
Chrysene	218-01-9	1	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	<1.0	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	<1.0	<1.0	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	<0.5	**1.4**	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	<0.5	<0.5	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L	**780**	**2850**	**2550**	----	----
C29 - C36 Fraction	----	50	µg/L	**70**	**350**	**300**	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	**850**	**3200**	**2850**	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	**120**	**110**	----	----
>C16 - C34 Fraction	----	100	µg/L	**760**	**2880**	**2580**	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	**760**	**3000**	**2690**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	MWN	MWS#	Duplicate#	----	----
			Client sampling date / time	27-Oct-2016 18:00	27-Oct-2016 19:00	27-Oct-2016 20:00	----	----
Compound	CAS Number	LOR	Unit	EM1612862-010	EM1612862-011	EM1612862-012	--------	--------
				Result	Result	Result	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	**120**	**110**	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	----
^ Total Xylenes	1330-20-7	2	µg/L	<2	<2	<2	----	----
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1	%	**36.4**	**30.0**	**27.3**	----	----
2-Chlorophenol-D4	93951-73-6	1	%	**79.2**	**69.6**	**62.2**	----	----
2.4.6-Tribromophenol	118-79-6	1	%	**105**	**101**	**91.4**	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1	%	**95.6**	**86.7**	**75.0**	----	----
Anthracene-d10	1719-06-8	1	%	**98.3**	**90.0**	**79.6**	----	----
4-Terphenyl-d14	1718-51-0	1	%	**101**	**90.1**	**77.3**	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**100**	**97.9**	**97.8**	----	----
Toluene-D8	2037-26-5	2	%	**95.9**	**91.6**	**90.2**	----	----
4-Bromofluorobenzene	460-00-4	2	%	**108**	**104**	**100**	----	----

Work Order : EM1612862

Client : ENVIRONMENTAL SERVICE AND DESIGN PTY LTD

Project : LCC - City Square

ALS

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	*CAS Number*	*Recovery Limits (%)* Low	*Recovery Limits (%)* High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: **WATER**

Compound	*CAS Number*	*Recovery Limits (%)* Low	*Recovery Limits (%)* High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	46
2-Chlorophenol-D4	93951-73-6	23	104
2.4.6-Tribromophenol	118-79-6	28	130
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	114
Anthracene-d10	1719-06-8	51	119
4-Terphenyl-d14	1718-51-0	49	127
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1612862**	Page	: 1 of 7
Client	: **ENVIRONMENTAL SERVICE AND DESIGN PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR ROD COOPER	Contact	: Shirley LeCornu
Address	: 14 CATTLEY ST. PO BOX 651 BURNIE TASMANIA, AUSTRALIA 7320	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6442 4037	Telephone	: +61-3-8549 9630
Project	: LCC - City Square	Date Samples Received	: 28-Oct-2016
Order number	: ----	Date Analysis Commenced	: 28-Oct-2016
C-O-C number	: ----	Issue Date	: 31-Oct-2016
Sampler	: ROD COOPER		
Site	: LCC - City Square		
Quote number	: ----		
No. of samples received	: 12		
No. of samples analysed	: 12		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Andrew Lu	Organic Instrument Chemist	Melbourne Organics, Springvale, VIC
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA055: Moisture Content (QC Lot: 634421)									
EM1612862-001	MWS 1.0m	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	22.1	22.0	0.606	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 634409)									
EM1612862-001	MWS 1.0m	EG005T: Lead	7439-92-1	5	mg/kg	9	9	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 634407)									
EM1612862-001	MWS 1.0m	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 634405)									
EM1612862-001	MWS 1.0m	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 634408)									

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 634408) - continued									
EM1612862-001	MWS 1.0m	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 634405)									
EM1612862-001	MWS 1.0m	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 634408)									
EM1612862-001	MWS 1.0m	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 634405)									
EM1612862-001	MWS 1.0m	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020T: Total Metals by ICP-MS (QC Lot: 634369)									
EM1612774-021	Anonymous	EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
EM1612852-001	Anonymous	EG020A-T: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 634344)									
EM1612862-010	MWN	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 634344)									
EM1612862-010	MWN	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 634344)									
EM1612862-010	MWN	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 634409)								
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	93.8	85	107
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 634407)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	110	80	121
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	107	70	130
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	111	80	120
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	79.4	70	124
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	114	80	122
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	120	80	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	118	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	107	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	117	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	118	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	108	70	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	114	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	102	65	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	103	65	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	108	65	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	101	65	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 634405)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	94.9	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 634408)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	751 mg/kg	103	65	131
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3103 mg/kg	101	70	126
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1482 mg/kg	102	70	122
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 634405)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	91.2	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 634408)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1135 mg/kg	99.3	68	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	4080 mg/kg	95.6	72	116
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	162 mg/kg	105	38	132
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 634405)								

Work Order : EM1612862

Client : ENVIRONMENTAL SERVICE AND DESIGN PTY LTD

Project : LCC - City Square

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 634405) - continued								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	98.1	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	104	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	103	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	105	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	107	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	108	66	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 634369)								
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	94.6	88	113
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 634375)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	92.4	39	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	92.1	40	124
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	100	47	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	98.8	51	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	100	53	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	106	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	102	59	123
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	110	58	123
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	103	52	126
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	107	55	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	99.0	52	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	108	57	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	103	56	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	102	53	123
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	102	53	125
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	103	53	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 634344)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	99.6	67	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 634376)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	3368 µg/L	87.0	53	123
EP071: C15 - C28 Fraction	----	100	µg/L	<100	14735 µg/L	94.9	57	133
EP071: C29 - C36 Fraction	----	50	µg/L	<50	7856 µg/L	85.7	55	141
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 634344)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	98.0	65	125

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 634376)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	5225 µg/L	90.4	54	122
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	19994 µg/L	88.6	56	132
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1449 µg/L	80.8	51	137
EP080: BTEXN (QCLot: 634344)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	98.2	76	120
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	101	76	124
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	100	72	124
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	107	72	130
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	108	78	128
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	92.9	71	129

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 634409)							
EM1612862-002	MWS 4.0m	EG005T: Lead	7439-92-1	50 mg/kg	93.9	76	124
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 634407)							
EM1612862-003	MWS 6.0m	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	101	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	102	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 634405)							
EM1612862-002	MWS 4.0m	EP080: C6 - C9 Fraction	----	28 mg/kg	79.6	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 634408)							
EM1612862-002	MWS 4.0m	EP071: C10 - C14 Fraction	----	751 mg/kg	96.8	53	123
		EP071: C15 - C28 Fraction	----	3103 mg/kg	94.0	70	124
		EP071: C29 - C36 Fraction	----	1482 mg/kg	95.0	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 634405)							
EM1612862-002	MWS 4.0m	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	77.2	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 634408)							
EM1612862-002	MWS 4.0m	EP071: >C10 - C16 Fraction	----	1135 mg/kg	92.3	65	123
		EP071: >C16 - C34 Fraction	----	4080 mg/kg	88.6	67	121
		EP071: >C34 - C40 Fraction	----	162 mg/kg	98.2	44	126

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
EP080: BTEXN (QCLot: 634405)							
EM1612862-002	MWS 4.0m	EP080: Benzene	71-43-2	2 mg/kg	95.2	50	136
		EP080: Toluene	108-88-3	2 mg/kg	97.2	56	139

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
EG020T: Total Metals by ICP-MS (QCLot: 634369)							
EM1612774-021	Anonymous	EG020A-T: Lead	7439-92-1	1 mg/L	88.9	83	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 634344)							
EM1612862-011	MWS#	EP080: C6 - C9 Fraction	----	280 µg/L	76.8	43	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 634344)							
EM1612862-011	MWS#	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	75.6	44	122
EP080: BTEXN (QCLot: 634344)							
EM1612862-011	MWS#	EP080: Benzene	71-43-2	20 µg/L	82.4	68	130
		EP080: Toluene	108-88-3	20 µg/L	84.2	72	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM1612862**	Page	: 1 of 8
Client	: **ENVIRONMENTAL SERVICE AND DESIGN PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR ROD COOPER	Telephone	: +61-3-8549 9630
Project	: LCC - City Square	Date Samples Received	: 28-Oct-2016
Site	: LCC - City Square	Issue Date	: 31-Oct-2016
Sampler	: ROD COOPER	No. of samples received	: 12
Order number	: ----	No. of samples analysed	: 12

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	3	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	3	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	3	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	3	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation* Date extracted	Due for extraction	Evaluation	*Analysis* Date analysed	Due for analysis	Evaluation
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103)							
MWS 1.0m, MWS 4.0m, MWS 6.0m, MWS 8.0m, MWN 1.0m, MWN 4.0m, MWN 6.0m, MWN 8.0m*, Duplicate*	**27-Oct-2016**	**----**	----	----	**28-Oct-2016**	10-Nov-2016	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
MWS 1.0m, MWS 4.0m, MWS 6.0m, MWS 8.0m, MWN 1.0m, MWN 4.0m, MWN 6.0m, MWN 8.0m*, Duplicate*	**27-Oct-2016**	**28-Oct-2016**	25-Apr-2017	✓	**31-Oct-2016**	25-Apr-2017	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
MWS 1.0m, MWS 4.0m, MWS 6.0m, MWS 8.0m, MWN 1.0m, MWN 4.0m, MWN 6.0m, MWN 8.0m*, Duplicate*	**27-Oct-2016**	**28-Oct-2016**	10-Nov-2016	✓	**28-Oct-2016**	07-Dec-2016	✓

Work Order : EM1612862
Client : ENVIRONMENTAL SERVICE AND DESIGN PTY LTD
Project : LCC - City Square

ALS

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) MWS 1.0m, MWS 4.0m, MWS 6.0m, MWS 8.0m, MWN 1.0m, MWN 4.0m, MWN 6.0m, MWN 8.0m*, Duplicate*	**27-Oct-2016**	**28-Oct-2016**	10-Nov-2016	✓	**28-Oct-2016**	10-Nov-2016	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) MWS 1.0m, MWS 4.0m, MWS 6.0m, MWS 8.0m, MWN 1.0m, MWN 4.0m, MWN 6.0m, MWN 8.0m*, Duplicate*	**27-Oct-2016**	**28-Oct-2016**	10-Nov-2016	✓	**28-Oct-2016**	10-Nov-2016	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) MWS 1.0m, MWS 4.0m, MWS 6.0m, MWS 8.0m, MWN 1.0m, MWN 4.0m, MWN 6.0m, MWN 8.0m*, Duplicate*	**27-Oct-2016**	**28-Oct-2016**	10-Nov-2016	✓	**28-Oct-2016**	10-Nov-2016	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) MWN, MWS#, Duplicate#	**27-Oct-2016**	**28-Oct-2016**	25-Apr-2017	✓	**28-Oct-2016**	25-Apr-2017	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) MWN, MWS#, Duplicate#	**27-Oct-2016**	**28-Oct-2016**	03-Nov-2016	✓	**28-Oct-2016**	07-Dec-2016	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) MWN, MWS#, Duplicate#	**27-Oct-2016**	**28-Oct-2016**	03-Nov-2016	✓	**28-Oct-2016**	07-Dec-2016	✓
Amber VOC Vial - Sulfuric Acid (EP080) MWN, MWS#, Duplicate#	**27-Oct-2016**	**28-Oct-2016**	10-Nov-2016	✓	**28-Oct-2016**	10-Nov-2016	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
MWN, Duplicate# MWS#,	**27-Oct-2016**	**28-Oct-2016**	03-Nov-2016	✓	**28-Oct-2016**	07-Dec-2016	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
MWN, Duplicate# MWS#,	**27-Oct-2016**	**28-Oct-2016**	10-Nov-2016	✓	**28-Oct-2016**	10-Nov-2016	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
MWN, Duplicate# MWS#,	**27-Oct-2016**	**28-Oct-2016**	10-Nov-2016	✓	**28-Oct-2016**	10-Nov-2016	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055-103	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	3	0.00	10.00	×	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	3	0.00	10.00	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	3	33.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Total Metals by ICP-MS - Suite A	EG020A-T	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	3	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	3	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM (2013) Schedule B(3)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for sparging.

Excavation Management Plan 92 Cameron Street

Excavation procedure

Project No: 5757

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DRAFT 1	Mitchell Atkinson	ES&D	23/02/2017
FINAL	Rod Cooper	ES&D	24/02/2017

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Contents

1 Risk Identification

Potential contaminants include: Diesel, super and unleaded petroleum fuel components such as heavy metals and hydrocarbons

2 Risk Assessment

During the works to be carried out there are likely to be potential risks in the soil, these include the following.

- Contact with contaminates
- Inhalation of vapor
- Ingestion of contaminates

These risks are addressed in this procedure.

3 Health Risk Controls

3.1 Workers

This plan is to be used in conjunction with Workplace Standards Tasmania Codes applicable to excavation works.

Extra protection needs to be available for workers to protect themselves from hydrocarbon vapors and contaminated soil exposure.

Potentially contaminated soil (PCS) requires the following protective equipment/safety knowledge to ensure safety for all workers.

- PPE – Gloves, covered shoes, long pants and long sleeved shirt
- Gas level meter.
- Hand washing facilities
- No eating, drinking or smoking in the work area.

The gas level meter is to be used by a suitable qualified person who must be on site before excavation can begin. Gas levels in soil are most accurate when monitored when excavation commences, using a PID. Delays in monitoring can give false readings.

Work is to stop if PID readings exceed 300 ppm, workers are then to stand upwind of the worksite until PID readings are below 200ppm.

3.2 Excavation and soil management procedure

- The supervisor of the site will work closely with the environmental consultant to have the works planned before commencing. Included in this planning should be short term bunding for potentially contaminated soil.

- A suitably qualified person must be present on site before excavation commences to ensure the gas is monitored and to ensure all work completed with potentially contaminated soil is done is accordance with EPA Tasmania requirements.

- If observations and PID readings indicate that the soil is potentially contaminated, then it will need to be stored on site in an appropriate bunded area and sampled for analysis. The soil will need to be left there until laboratory results return and disposed of in accordance with EPA Tasmania: Bulletin 105

- Clean, uncontaminated soil will be able to be transported off site and potentially used as level 1 fill material

- The potentially contaminated soil, stockpiled into the bund, will be contained to prevent run off during rain events and covered during periods of high wind

- All workers must wear the specified PPE found in section 3.1 of this procedure.

- Gas monitoring as outlined in section 3.1 must also be followed.

3.3 On site soil containment

Soil that is excavated will need to be reused on site or stockpiled ready for offsite disposal. Soil is to be separated into 'clean' and 'potentially contaminated' piles. Soil will be stockpiled in a bunded area and covered to prevent runoff of soil contamination by rain and wind effects. A suitable location for these stockpiles will be determined before any work proceeds.

3.4 Soil disposal / reuse

Clean uncontaminated soil, which has no use onsite, will be removed from site for transport to either a landfill or another site that can use clean fill.

Contaminated soil will be disposed of in accordance with EPA Tasmania – Bulletin 105. Any samples taken to determine contamination levels will be sent to a NATA certified laboratory.

4 Projection of services

The services near the site, such as storm water drains, will need to be protected to ensure that no contaminated soil can enter the system. Protecting these areas will be done utilizing sand bags or another similar item.

5 Legal reporting requirements

If, through observations or laboratory analysis, the site is found to contain contaminated soil then the land owner must immediately inform the Launceston City Council and EPA. Any documentation supporting the finding must be provided to both parties.

M A C Q U A R I E   H O U S E   D E V E L O P M E N T

CIVIC SQUARE, LAUNCESTON, TASMANIA

HBV ARCHITECTS

DRAWING: SK 01 COVER PAGE
SCALE: NTS
DRAWN: KK, NH

16.01 MACQUARIE HOUSE
CIVIC SQUARE, LAUNCESTON, TASMANIA.

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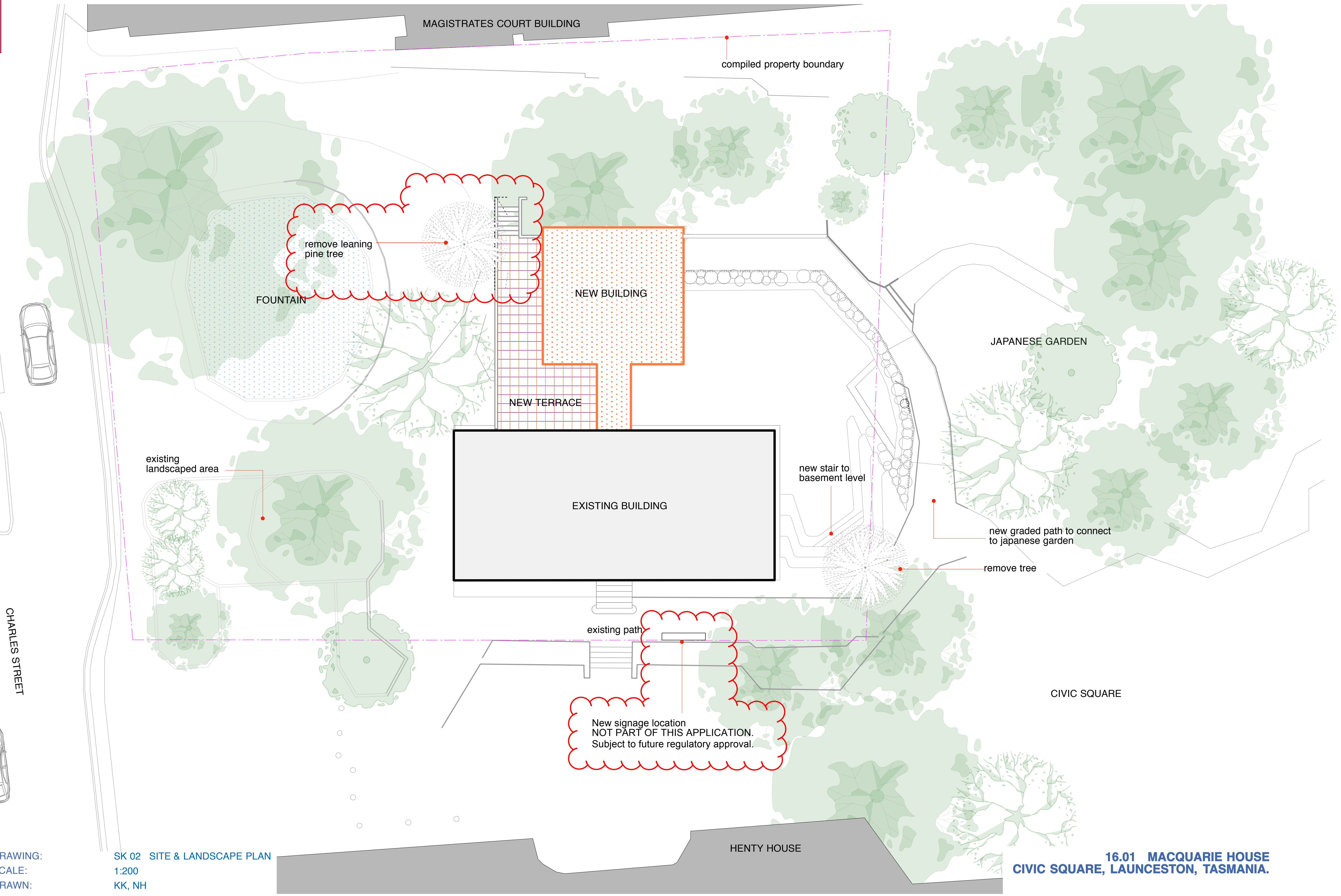

DRAWING: SK 02 SITE & LANDSCAPE PLAN
SCALE: 1:200
DRAWN: KK, NH

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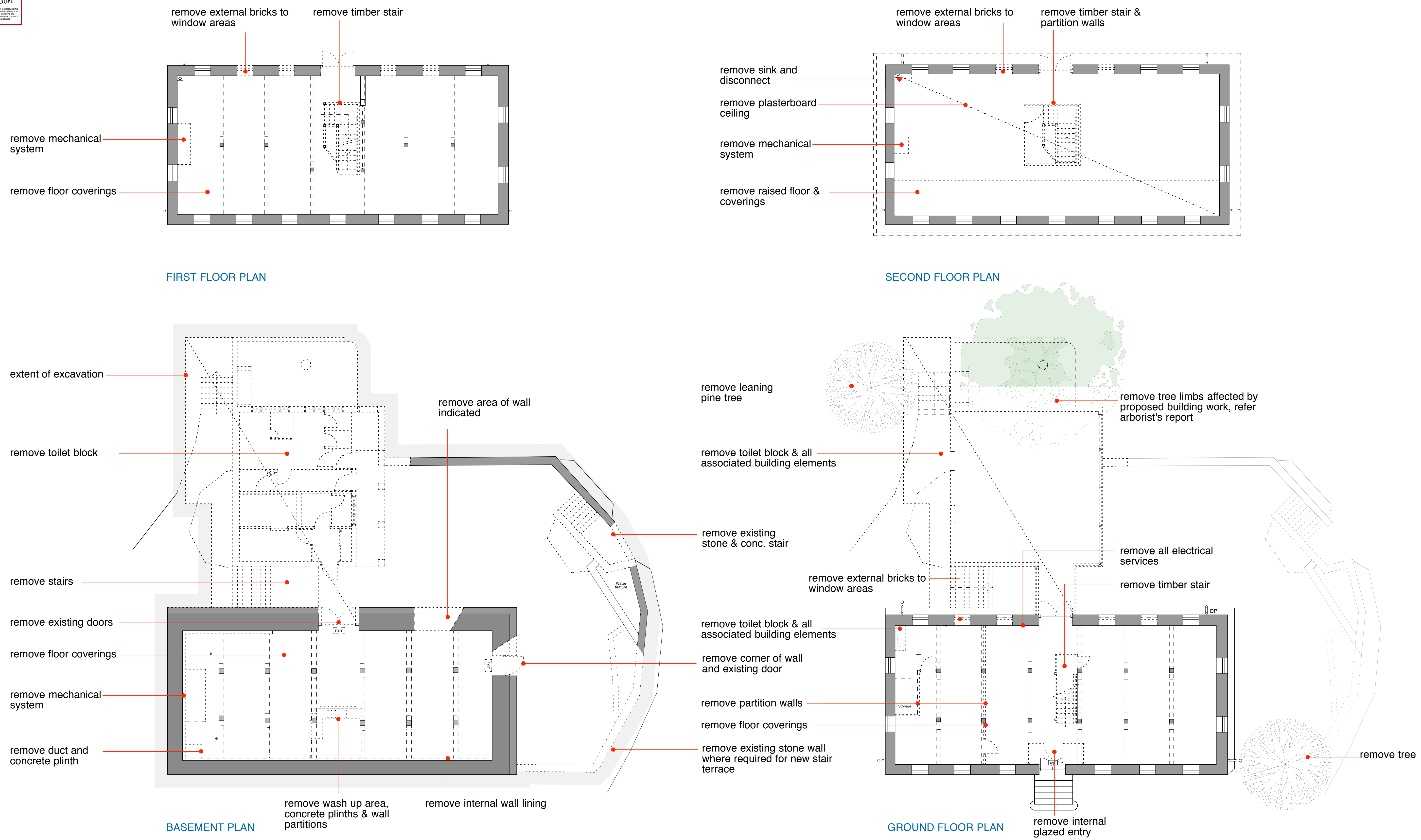

DRAWING:	SK 03 DEMOLITION PLANS
SCALE:	1:200
DRAWN:	KK, NH

16.01 MACQUARIE HOUSE
CIVIC SQUARE, LAUNCESTON, TASMANIA.

0 2 4 6 8 10m

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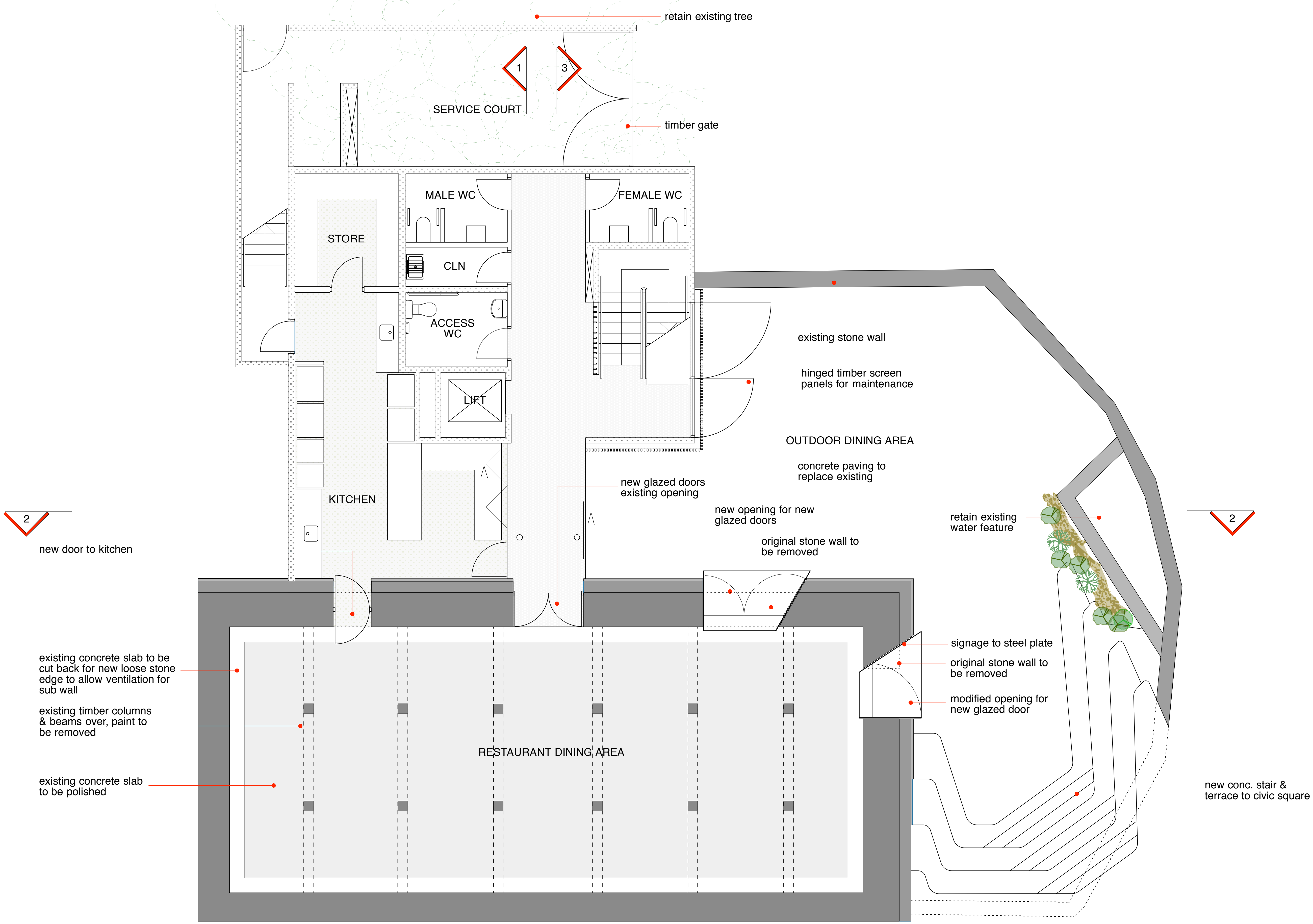

DRAWING: SK 04 BASEMENT PLAN
SCALE: 1:100
DRAWN: KK, NH

16.01 MACQUARIE HOUSE
CIVIC SQUARE, LAUNCESTON, TASMANIA.

0 1 2 3 4 5m

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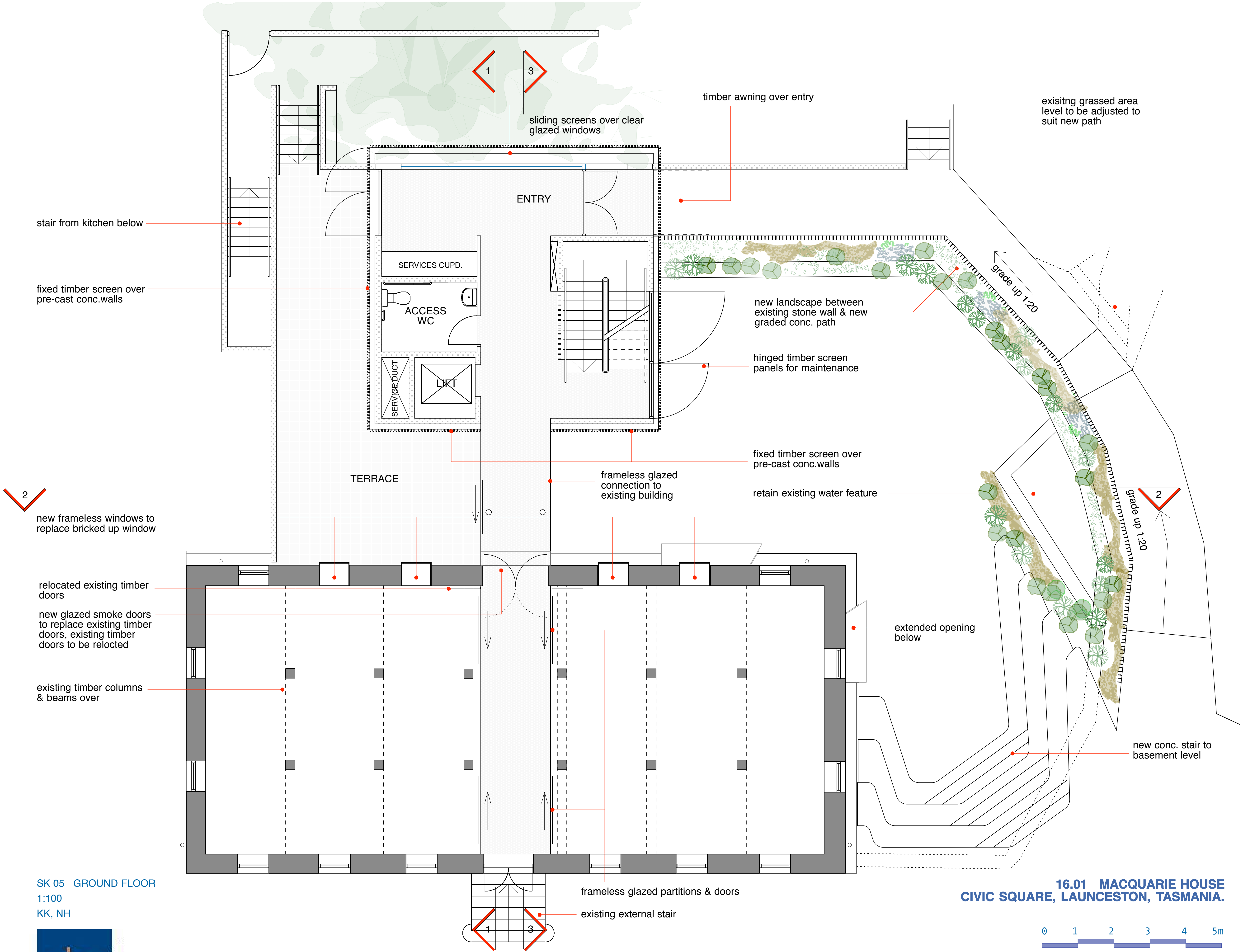

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DRAWN: KK, NH

16.01 MACQUARIE HOUSE
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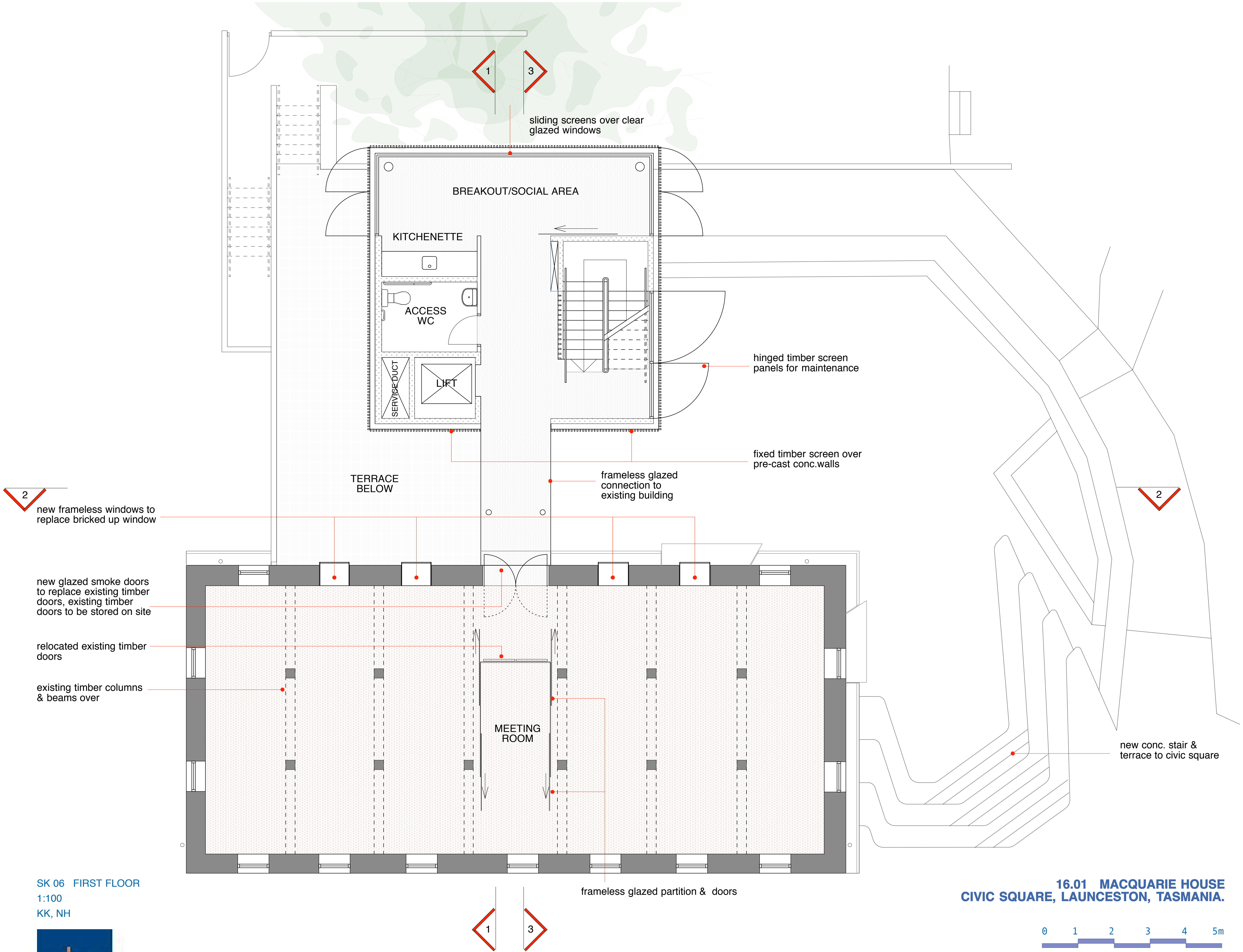

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DRAWN: KK, NH

16.01 MACQUARIE HOUSE
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0 1 2 3 4 5m

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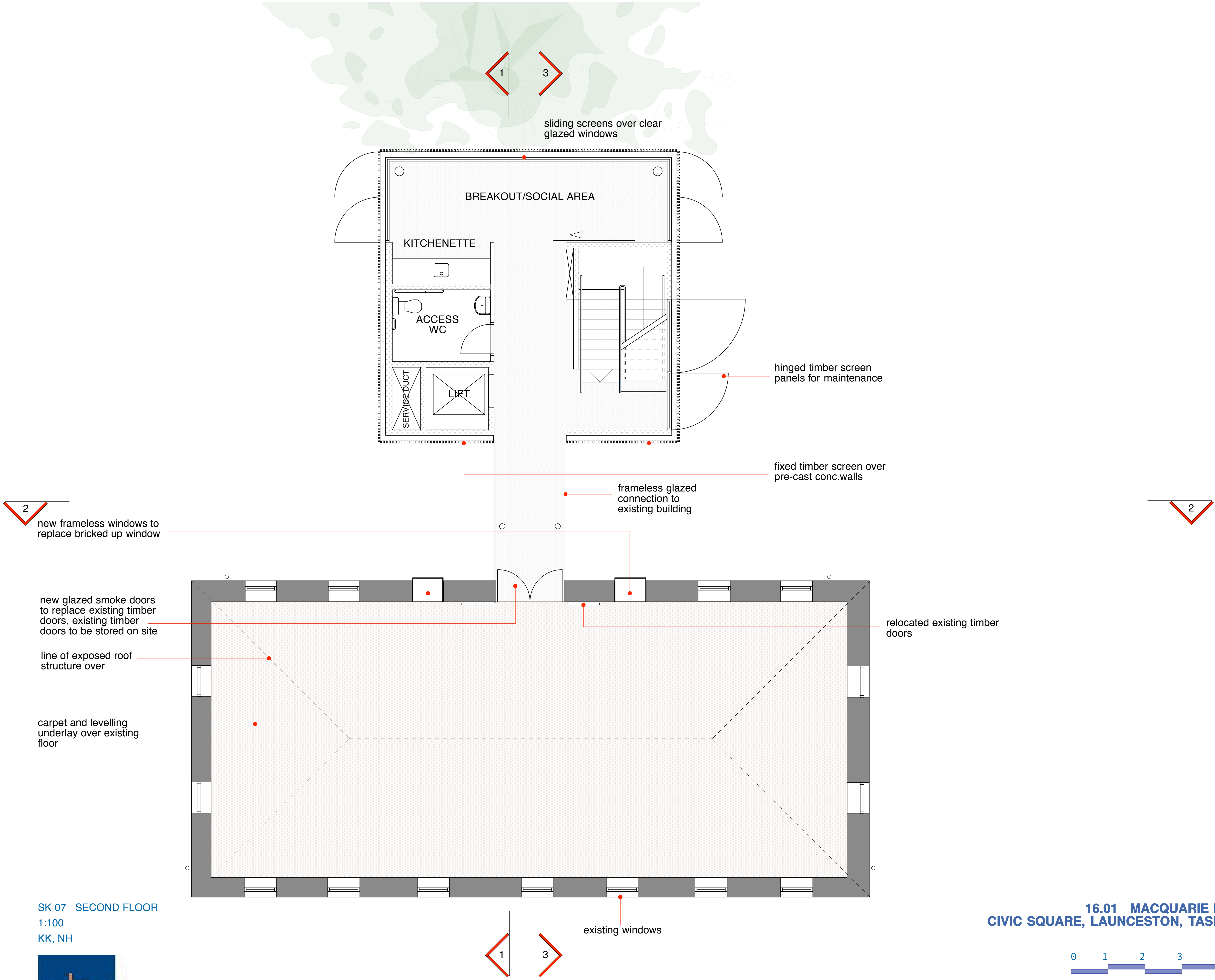

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DRAWN: KK, NH

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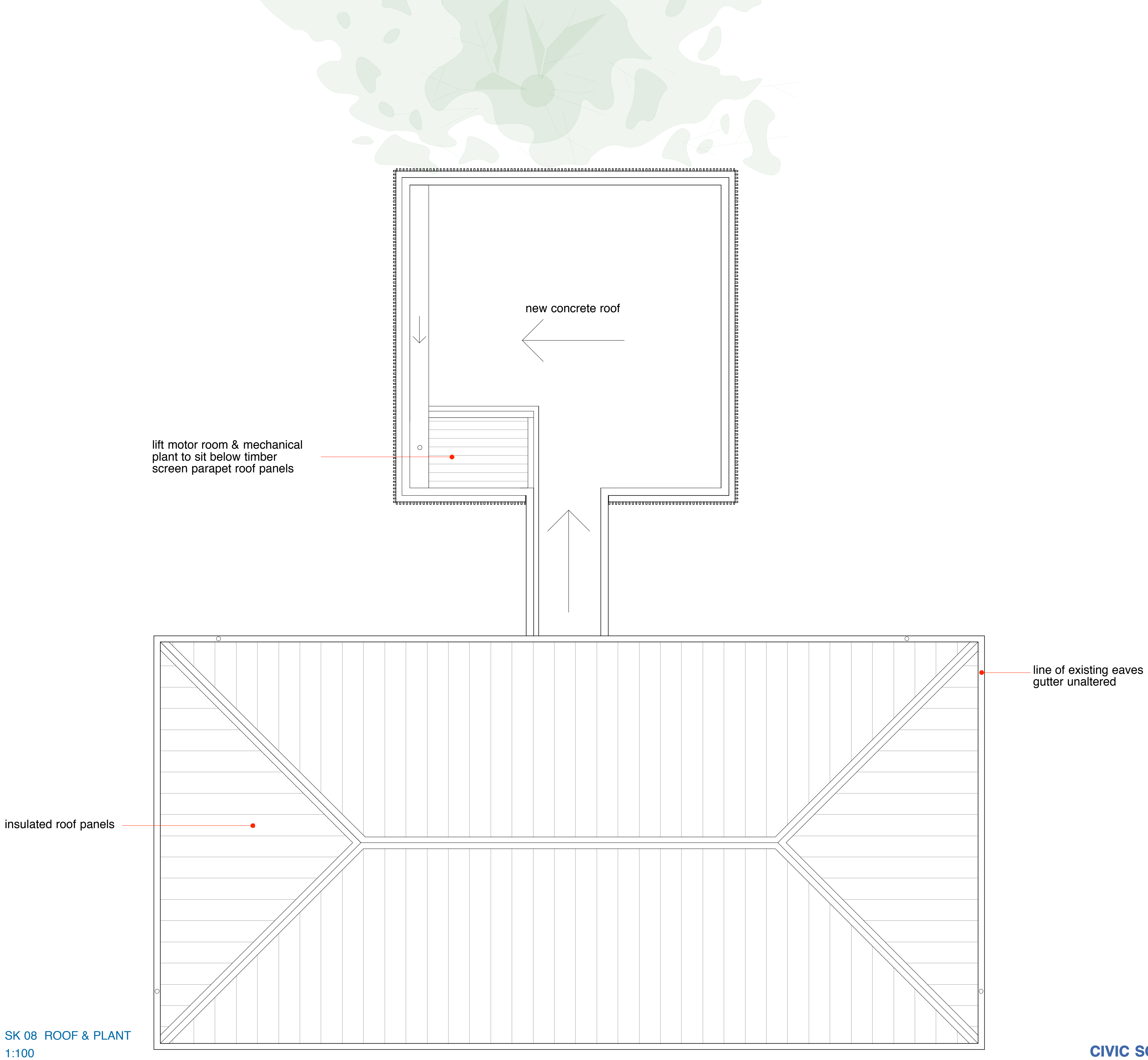

DRAWING: SK 08 ROOF & PLANT
SCALE: 1:100
DRAWN: KK, NH

16.01 MACQUARIE HOUSE
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0 1 2 3 4 5m

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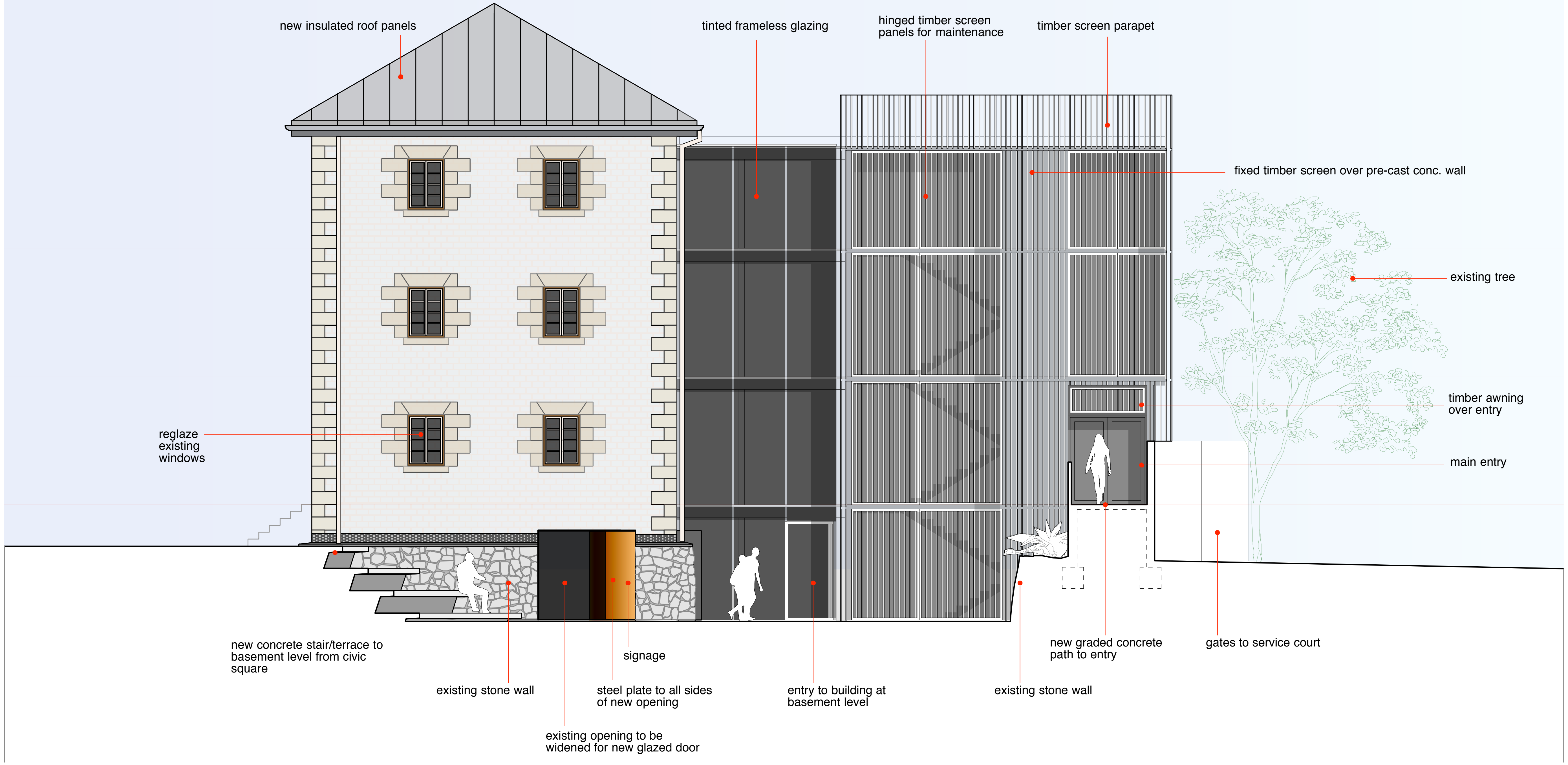

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DRAWN: KK, NH

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0 1 2 3 4 5m

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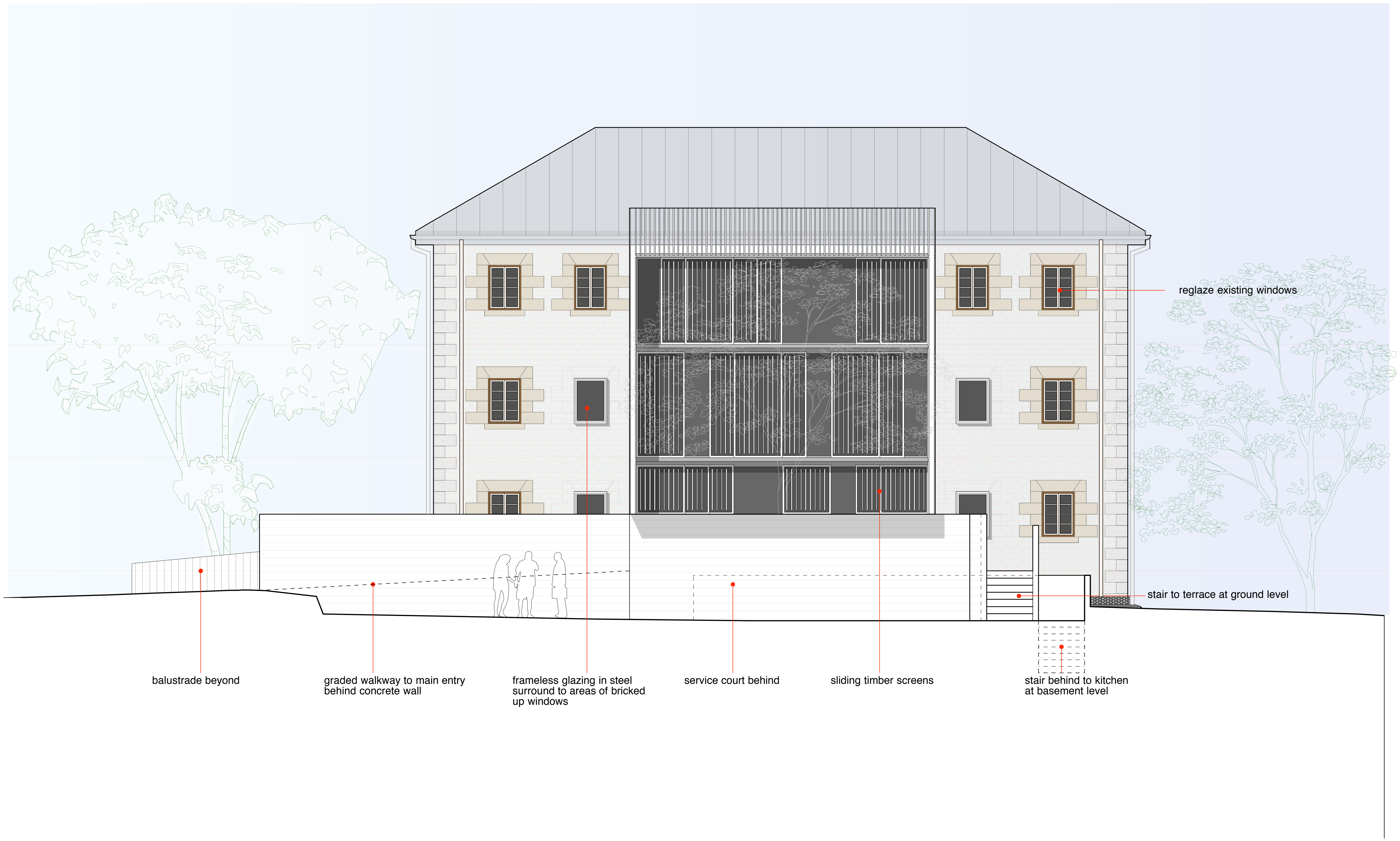

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16.01 MACQUARIE HOUSE
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0 1 2 3 4 5m

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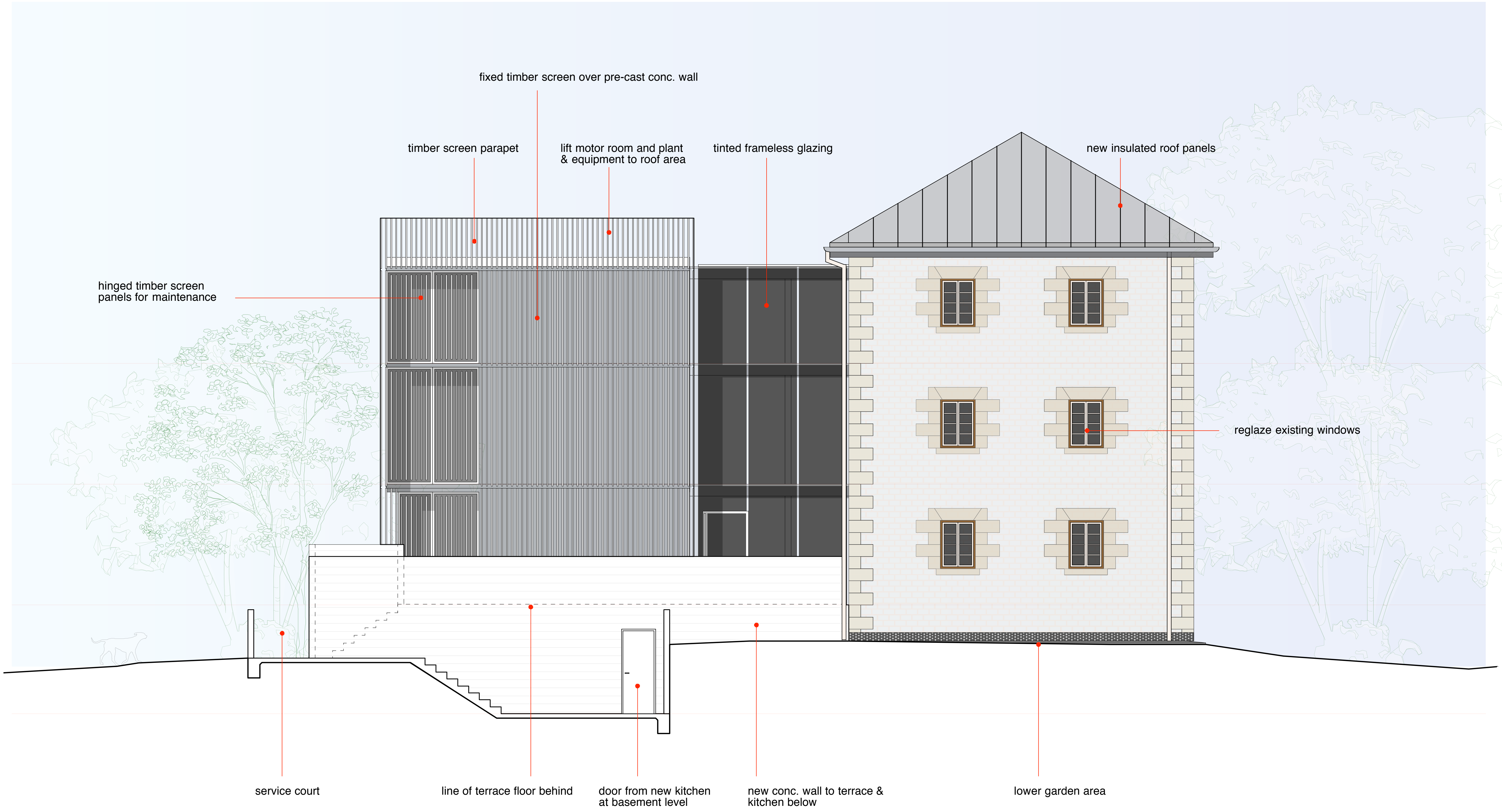

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0 1 2 3 4 5m

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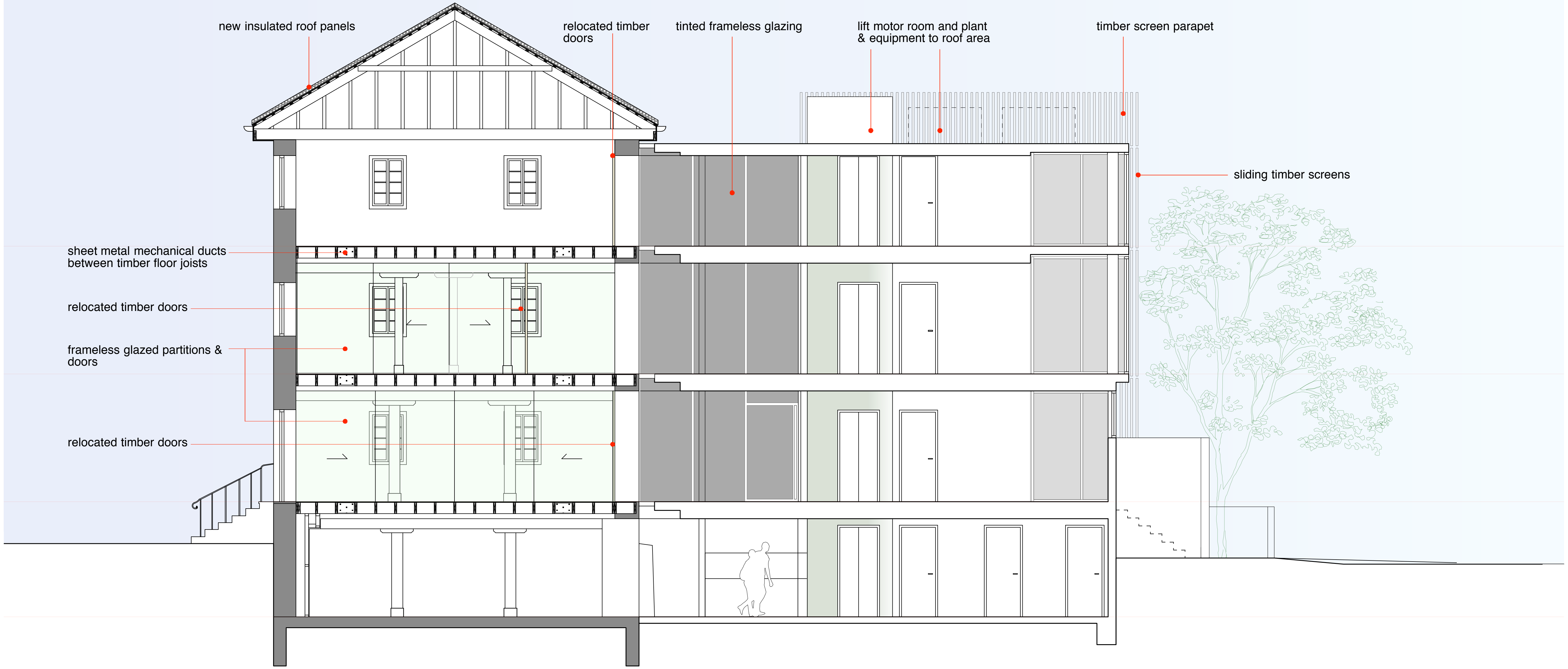

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0 1 2 3 4 5m

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DRAWN: KK, NH

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0 1 2 3 4 5m

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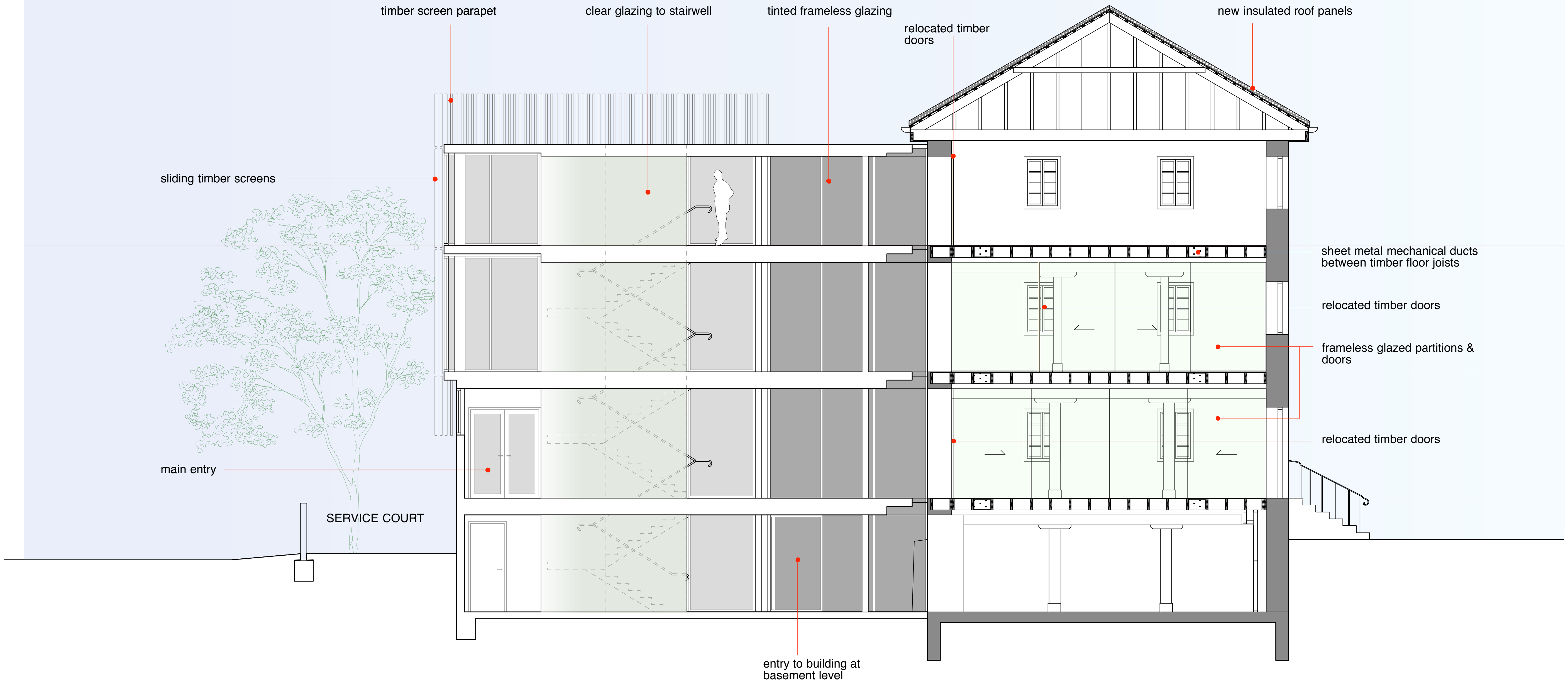

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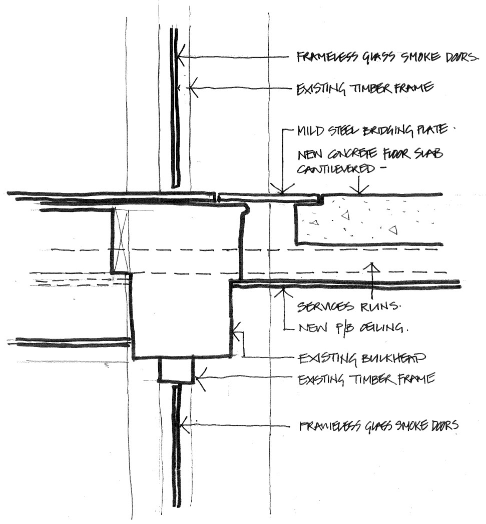
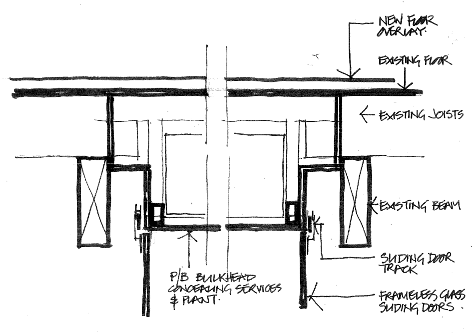


SECTION - THRESHOLD BRIDGE CONNECTION



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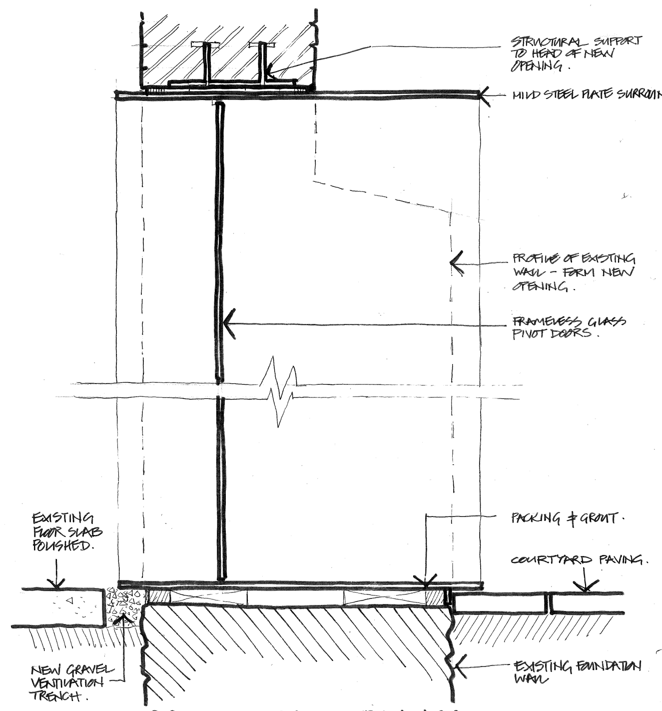

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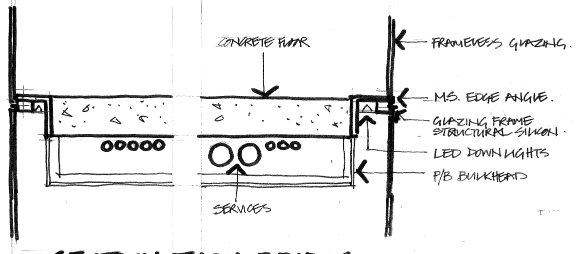
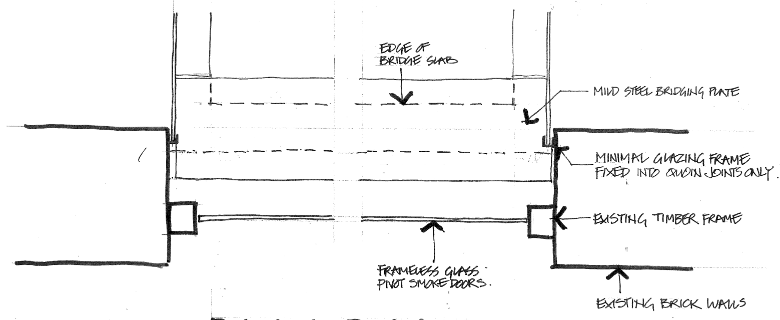
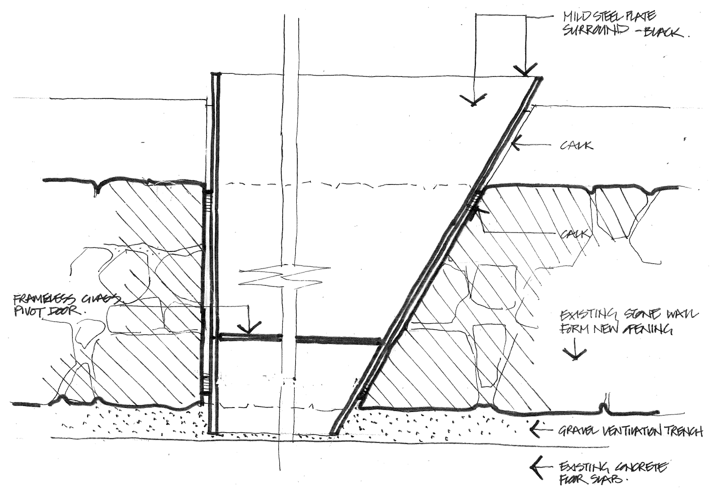
BASEMENT



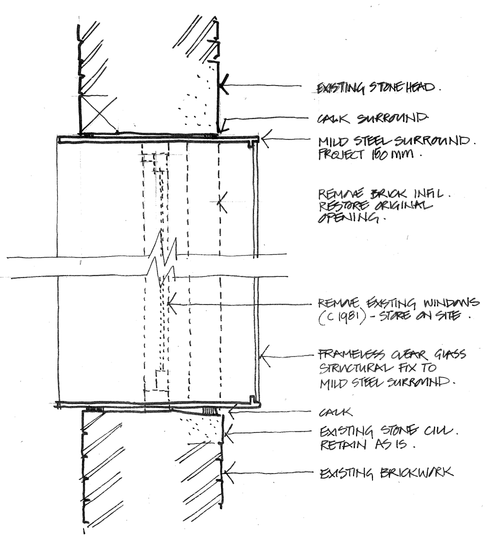
SECTION THRU BRIDGE



PLAN - DOORWAY AT BRIDGE CONNECTION



PLAN SECTION.
NEW OPENINGS
BASEMENT.



DETAIL SECTION
RE-OPENED WINDOWS
UPPER FLOORS.

DRAWING: SK 15 DETAILS
SCALE: NTS
DRAWN: JB

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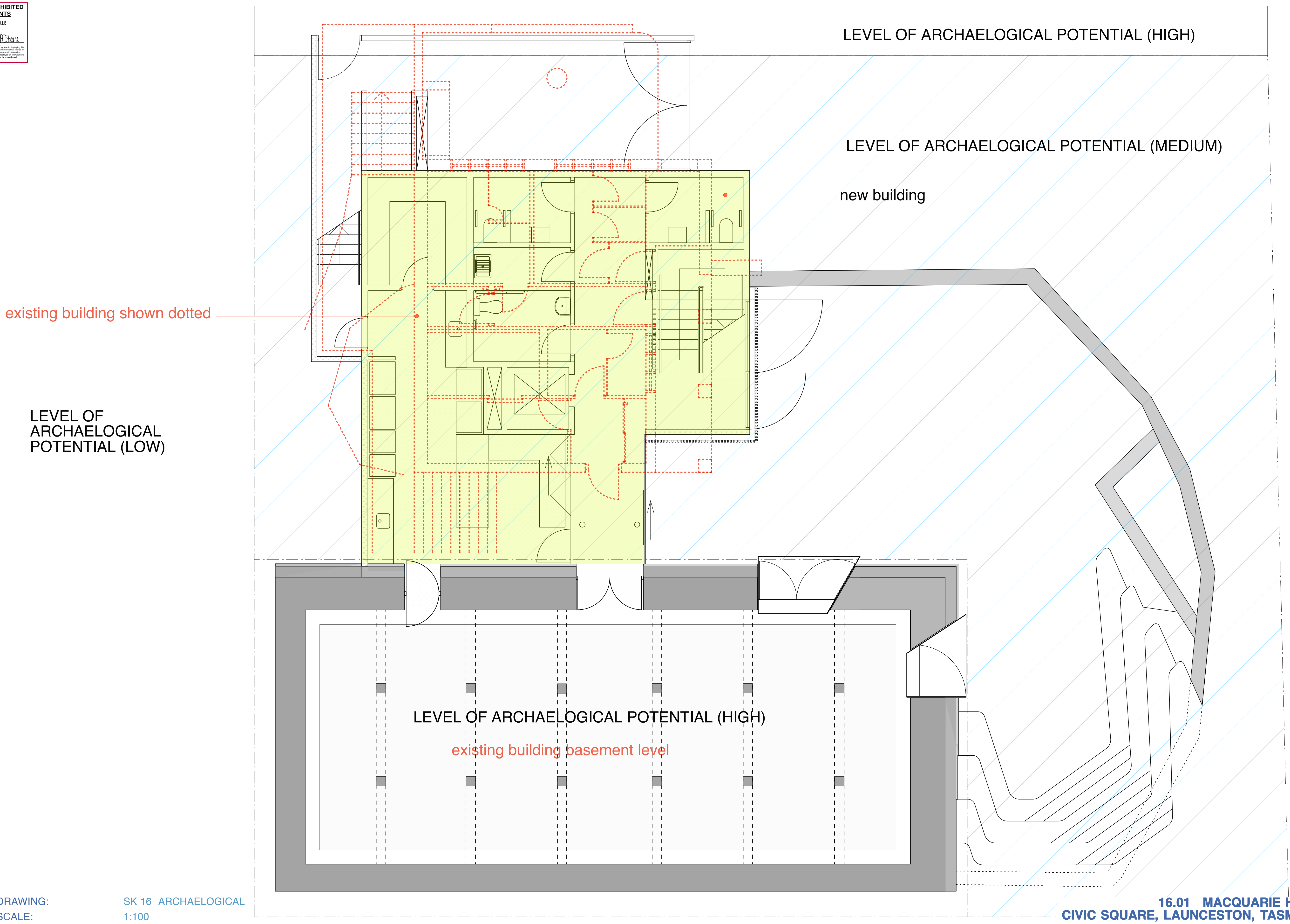

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DRAWN: PC

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