PROPOSED RESIDENTIAL UNIT DEVELOPMENT

66 BURNETT ST
NORTH HOBART
FOR
HOBART PROPERTIES & SECURITIES PTY LTD

SIXTY SIX
NORTH HOBART

DRAWING SCHEDULE

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over

and+design
andrew mckellar design

62 hilton terrace
noosaville (07) 5449 9066
www.and-design.com.au
info@and-design.com.au

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
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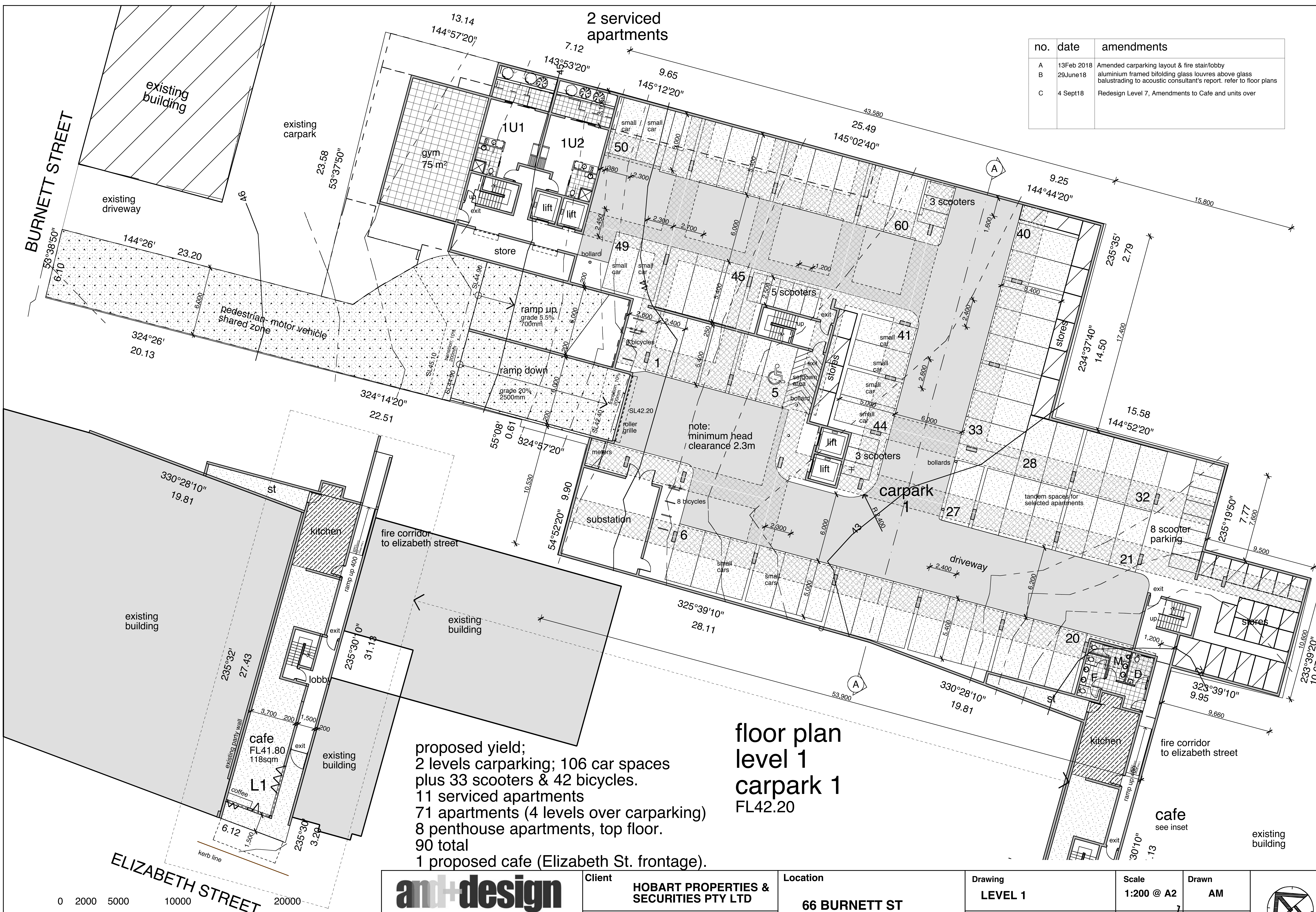

floor plan
level 1
carpark 1
FL42.20

proposed yield;
2 levels carparking; 106 car spaces
plus 33 scooters & 42 bicycles.
11 serviced apartments
71 apartments (4 levels over carparking)
8 penthouse apartments, top floor.
90 total
1 proposed cafe (Elizabeth St. frontage).

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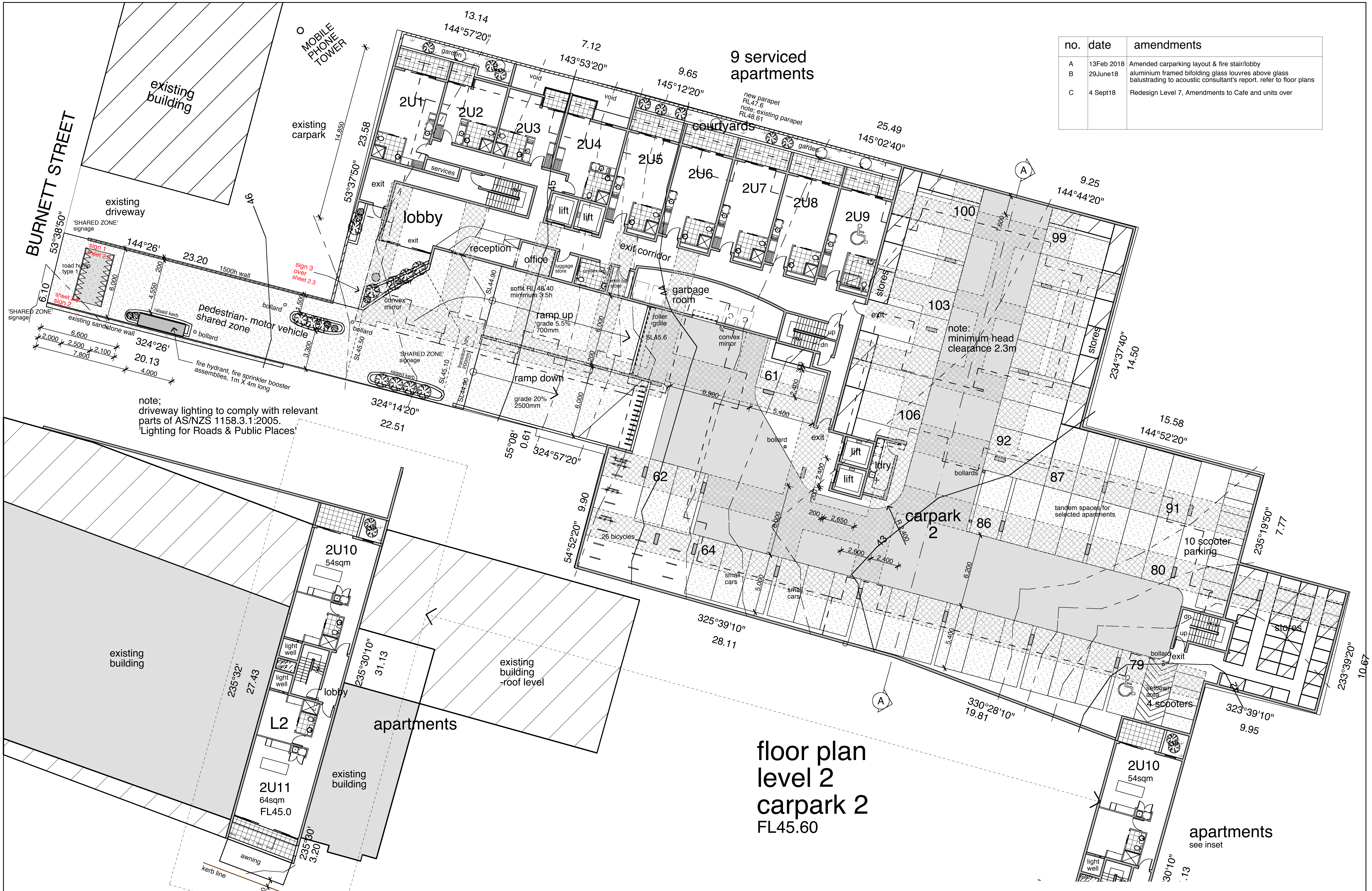
noosaville (07) 5449 9066
info@and-design.com.au QBSA reg. 65073

Client	Location	Drawing	Scale	Drawn
HOBART PROPERTIES & SECURITIES PTY LTD	66 BURNETT ST NORTH HOBART	LEVEL 1	1:200 @ A2	AM
Project		**Drawing no.**	**Date**	**Page**
PROPOSED RESIDENTIAL UNIT DEVELOPMENT		20.0717.1.1C	AUG 2017	1.1C



no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
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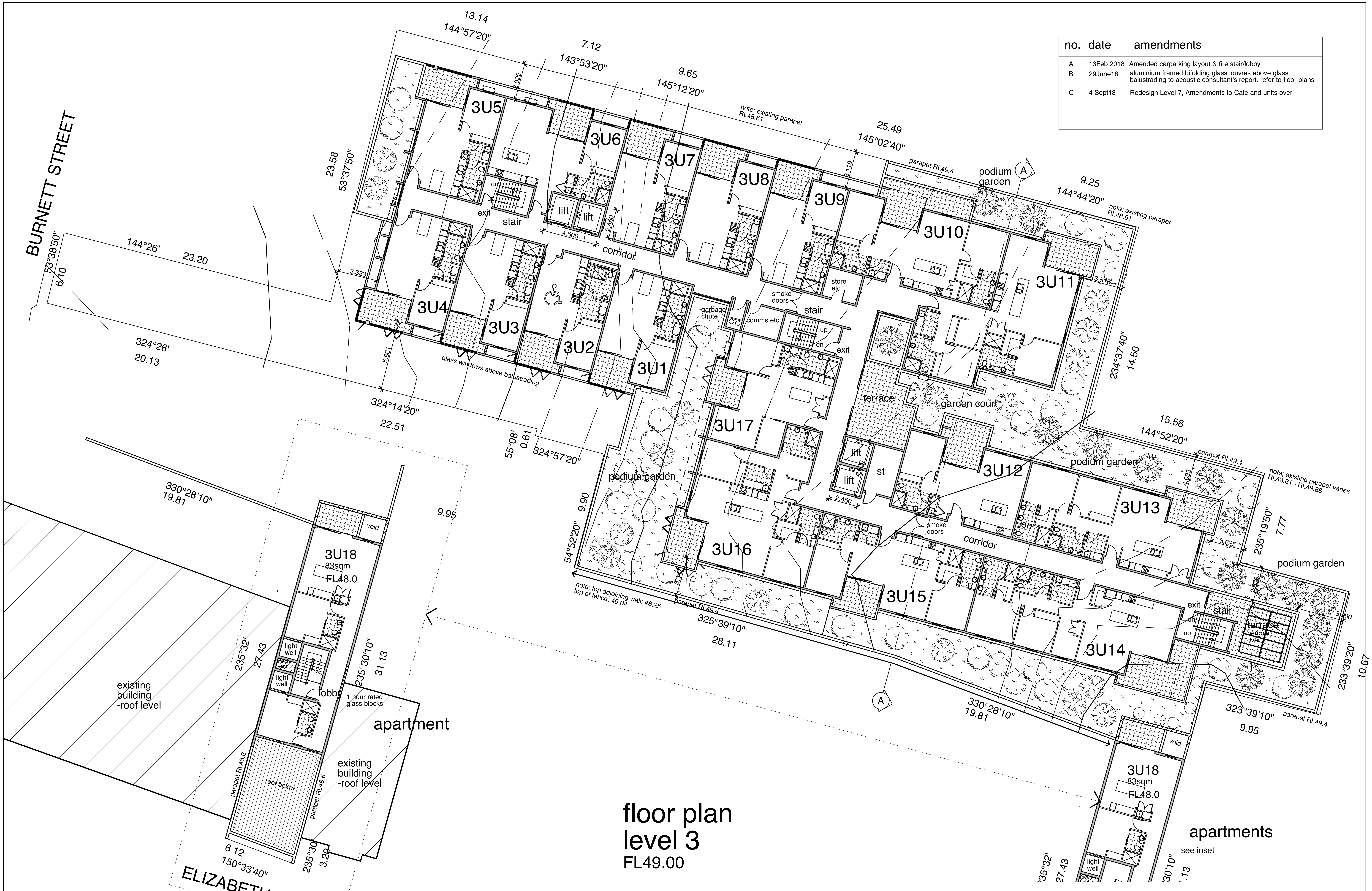
Client	Location	Drawing	Scale	Drawn
HOBART PROPERTIES & SECURITIES PTY LTD	66 BURNETT ST NORTH HOBART	LEVEL 2	1:200 @ A2	AM
Project		**Drawing no.**	**Date**	**Page**
PROPOSED RESIDENTIAL UNIT DEVELOPMENT		20.0717.1.2C	AUG 2017	1.2C



no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
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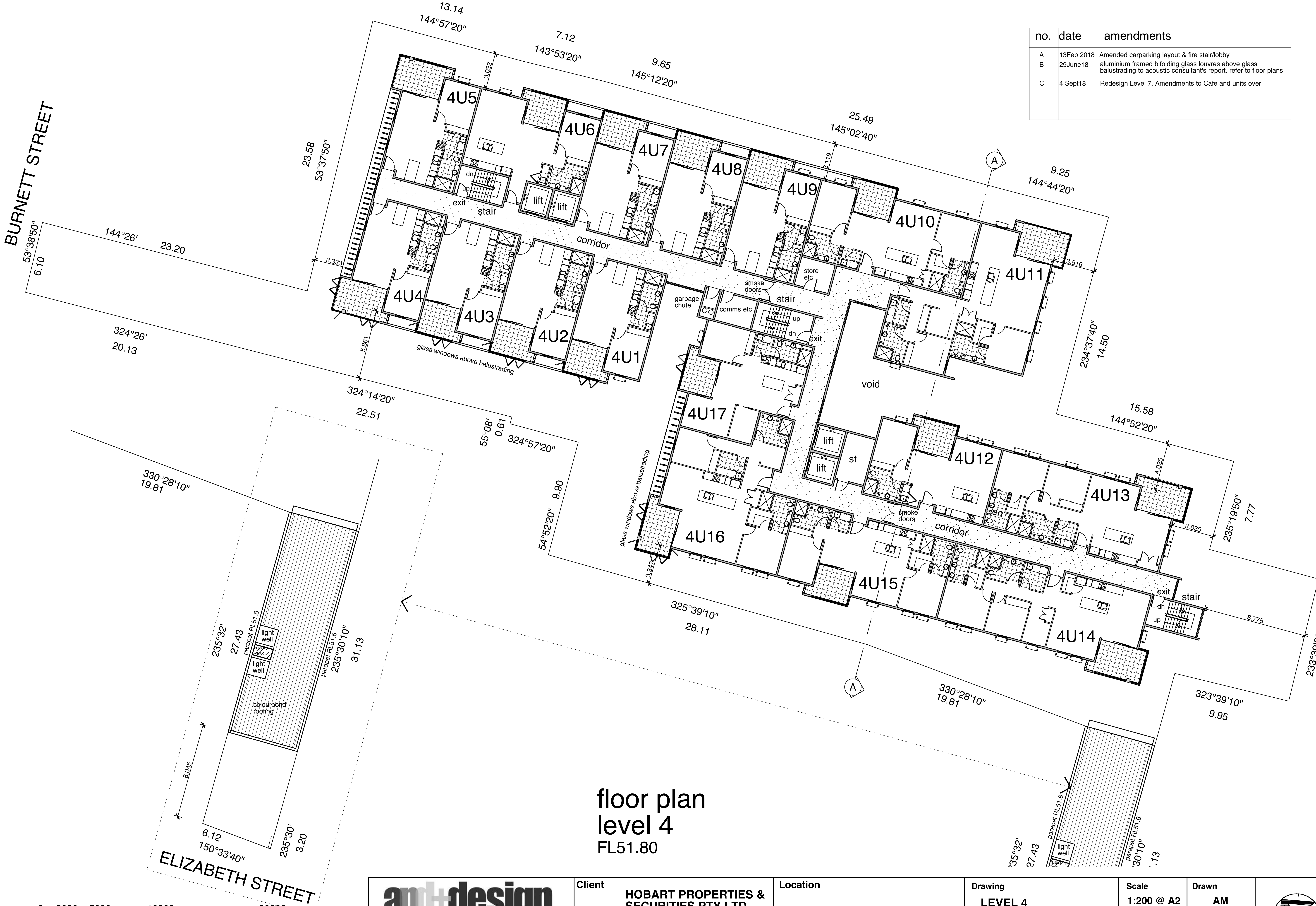
Client	HOBART PROPERTIES & SECURITIES PTY LTD
Project	PROPOSED RESIDENTIAL UNIT DEVELOPMENT
Location	66 BURNETT ST NORTH HOBART
Drawing	LEVEL 3
Drawing no.	20.0717.1.3C
Scale	1:200 @ A2
Date	AUG 2017
Drawn	AM
Page	1.3C

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over



floor plan
level 4
FL51.80

0 2000 5000 10000 20000
scale

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andrew mckellar design
62 hilton terrace
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info@and-design.com.au
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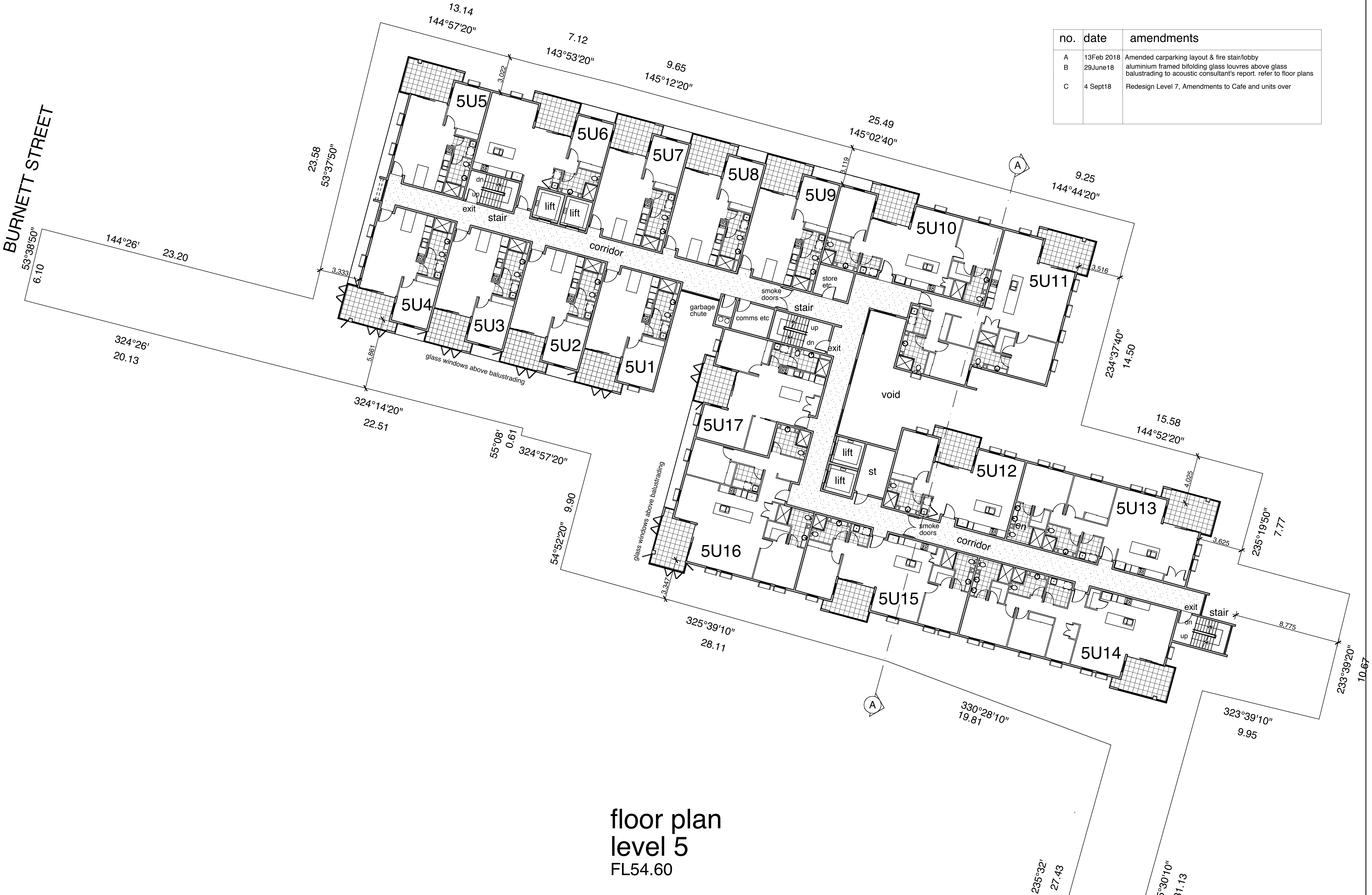
Client	Location	Drawing	Scale	Drawn
HOBART PROPERTIES & SECURITIES PTY LTD	66 BURNETT ST NORTH HOBART	LEVEL 4	1:200 @ A2	AM
Project		**Drawing no.**	**Date**	**Page**
PROPOSED RESIDENTIAL UNIT DEVELOPMENT		20.0717.1.4C	AUG 2017	1.4C



no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over

floor plan
level 5
FL54.60

0 2000 5000 10000 20000
scale

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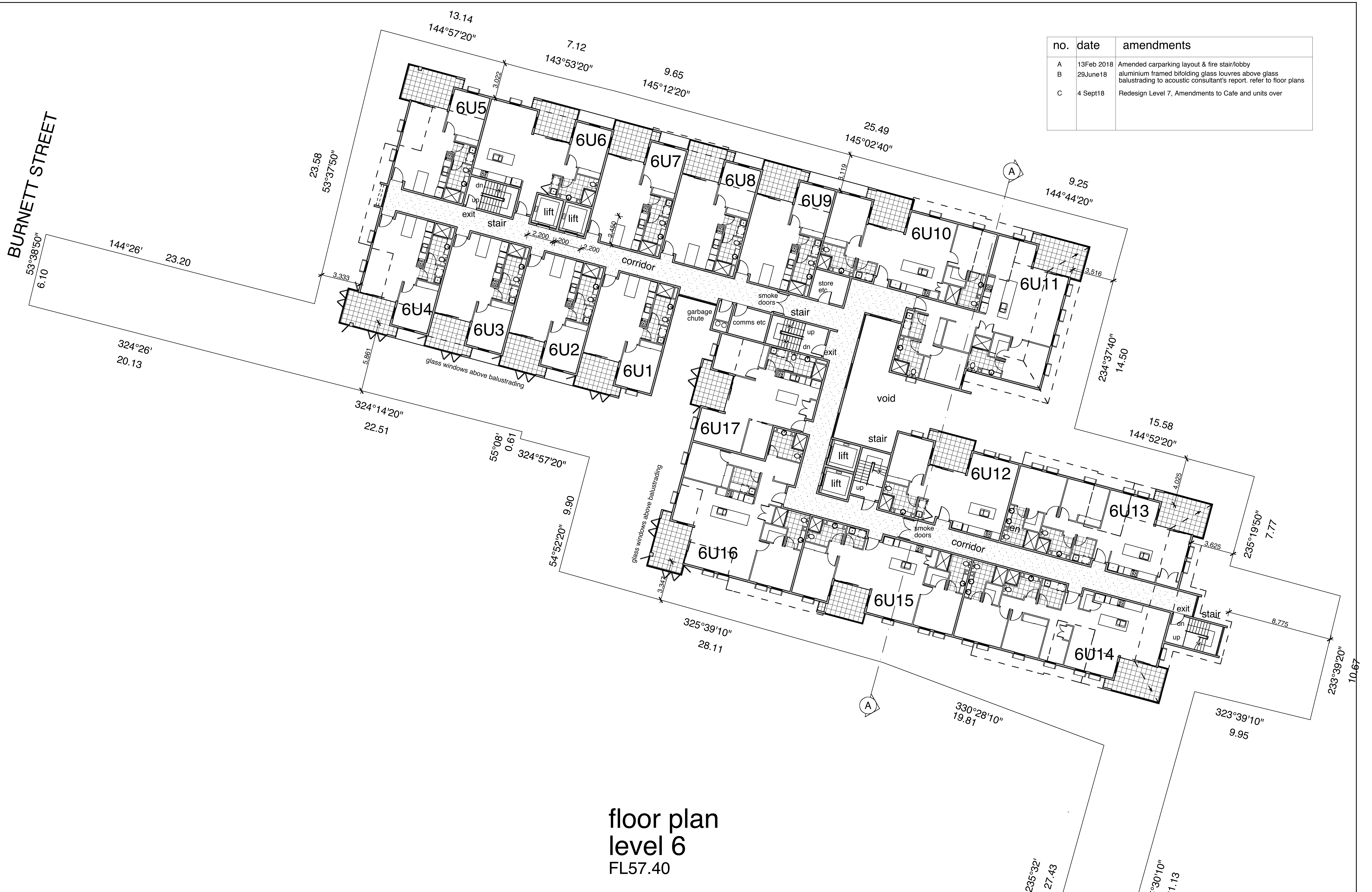
info@and-design.com.au
QBSA reg. 65073

Client HOBART PROPERTIES & SECURITIES PTY LTD	**Location** 66 BURNETT ST NORTH HOBART	**Drawing** LEVEL 5	**Scale** 1:200 @ A2	**Drawn** AM
Project PROPOSED RESIDENTIAL UNIT DEVELOPMENT		**Drawing no.** 20.0717.1.5C	**Date** AUG 2017	**Page** 1.5C



no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over

floor plan
level 6
FL57.40

0 2000 5000 10000 20000
scale

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andrew mckellar design
62 hilton terrace
noosaville (07) 5449 9066
info@and-design.com.au
QBSA reg. 65073

Client HOBART PROPERTIES & SECURITIES PTY LTD

Project PROPOSED RESIDENTIAL UNIT DEVELOPMENT

Location 66 BURNETT ST NORTH HOBART

Drawing LEVEL 6

Drawing no. 20.0717.1.6C

Scale 1:200 @ A2

Date AUG 2017

Drawn AM

Page 1.6C

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
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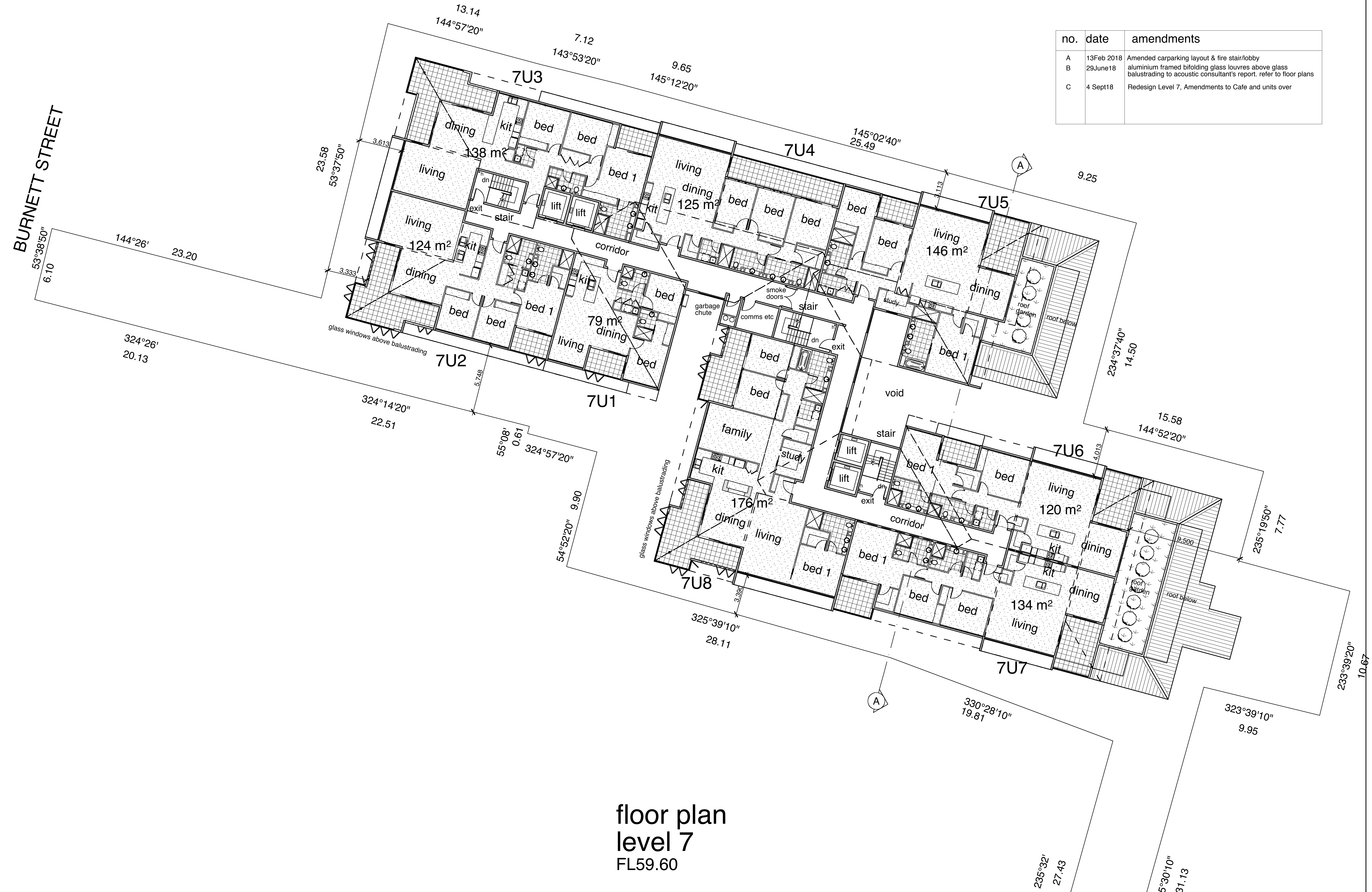

floor plan
level 7
FL59.60

0 2000 5000 10000 20000

scale

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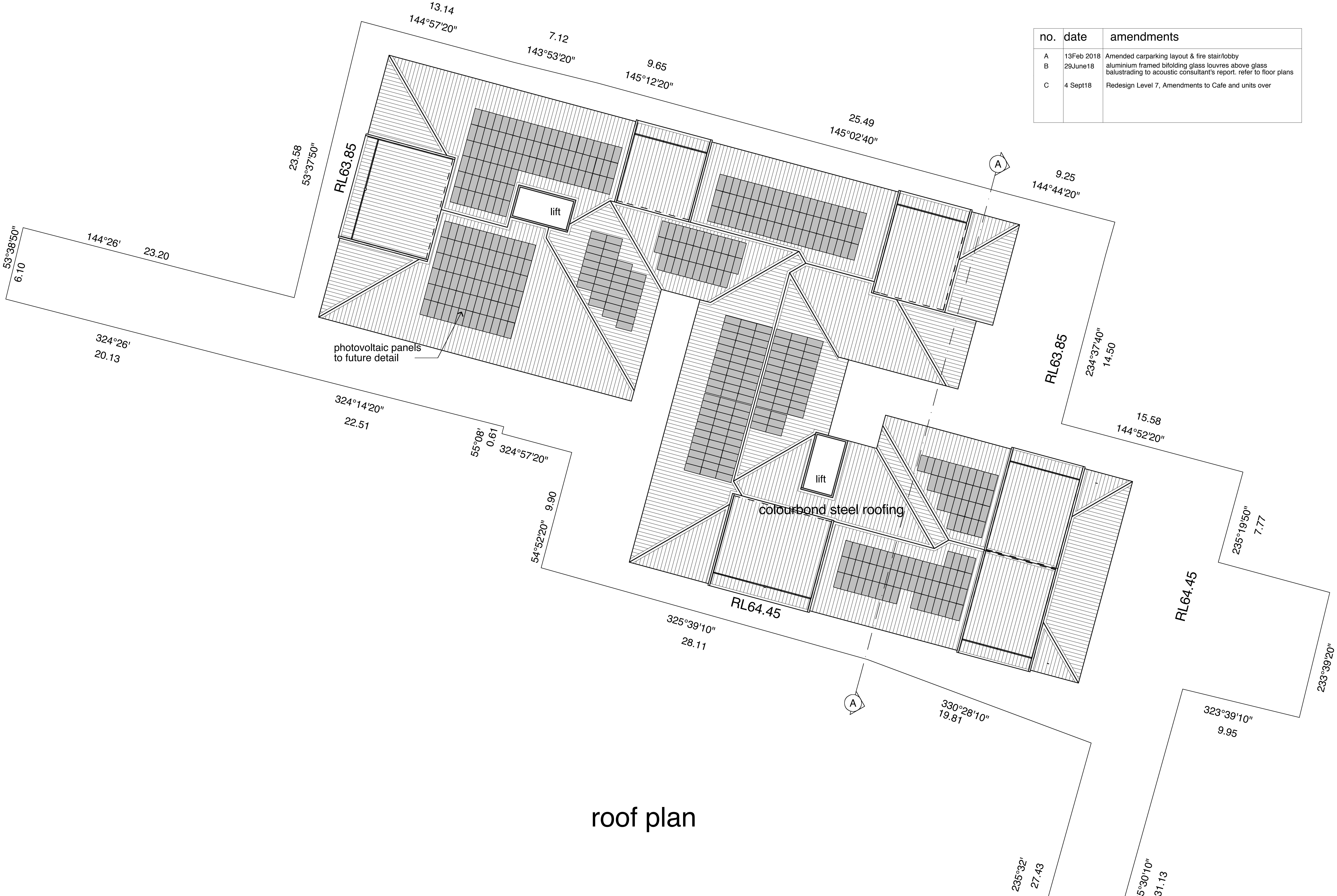
andrew mckellar design
62 hilton terrace
noosaville (07) 5449 9066
info@and-design.com.au
QBSA reg. 65073

Client	Location	Drawing	Scale	Drawn
HOBART PROPERTIES & SECURITIES PTY LTD	66 BURNETT ST NORTH HOBART	LEVEL 7	1:200 @ A2	AM
Project		**Drawing no.**	**Date**	**Page**
PROPOSED RESIDENTIAL UNIT DEVELOPMENT		20.0717.1.7C	AUG 2017	1.7C

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over



roof plan

0 2000 5000 10000 20000

scale

and+design

andrew mckellar design

62 hilton terrace
noosaville (07) 5449 9066
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Client	HOBART PROPERTIES & SECURITIES PTY LTD	Location	Drawing	ROOF PLAN	Scale 1:200 @ A2	Drawn AM
Project	PROPOSED RESIDENTIAL UNIT DEVELOPMENT	66 BURNETT ST NORTH HOBART	Drawing no.	20.0717.1.8C	Date AUG 2017	Page 1.8C

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
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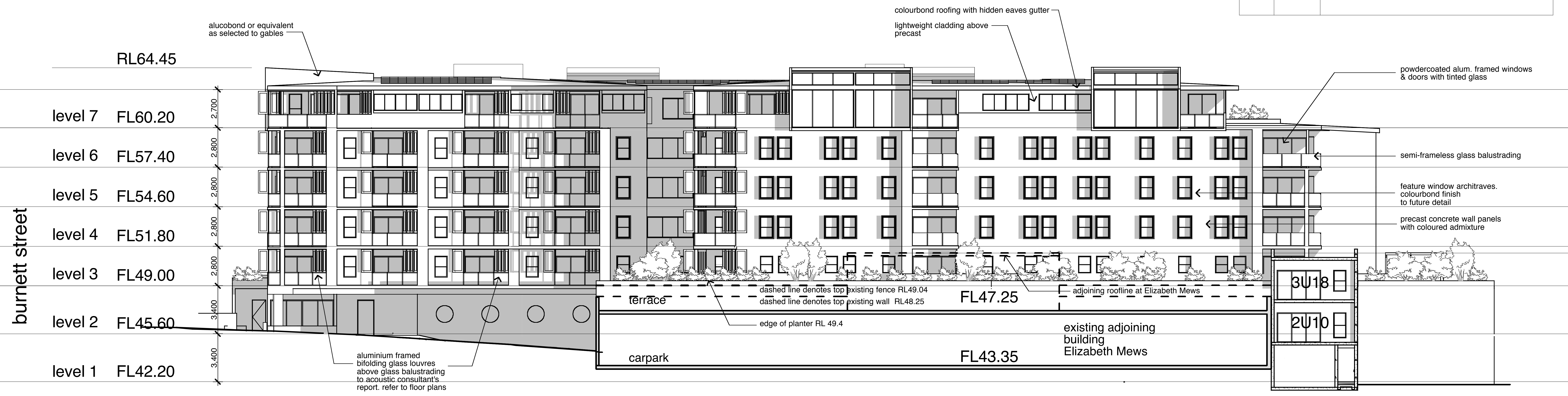
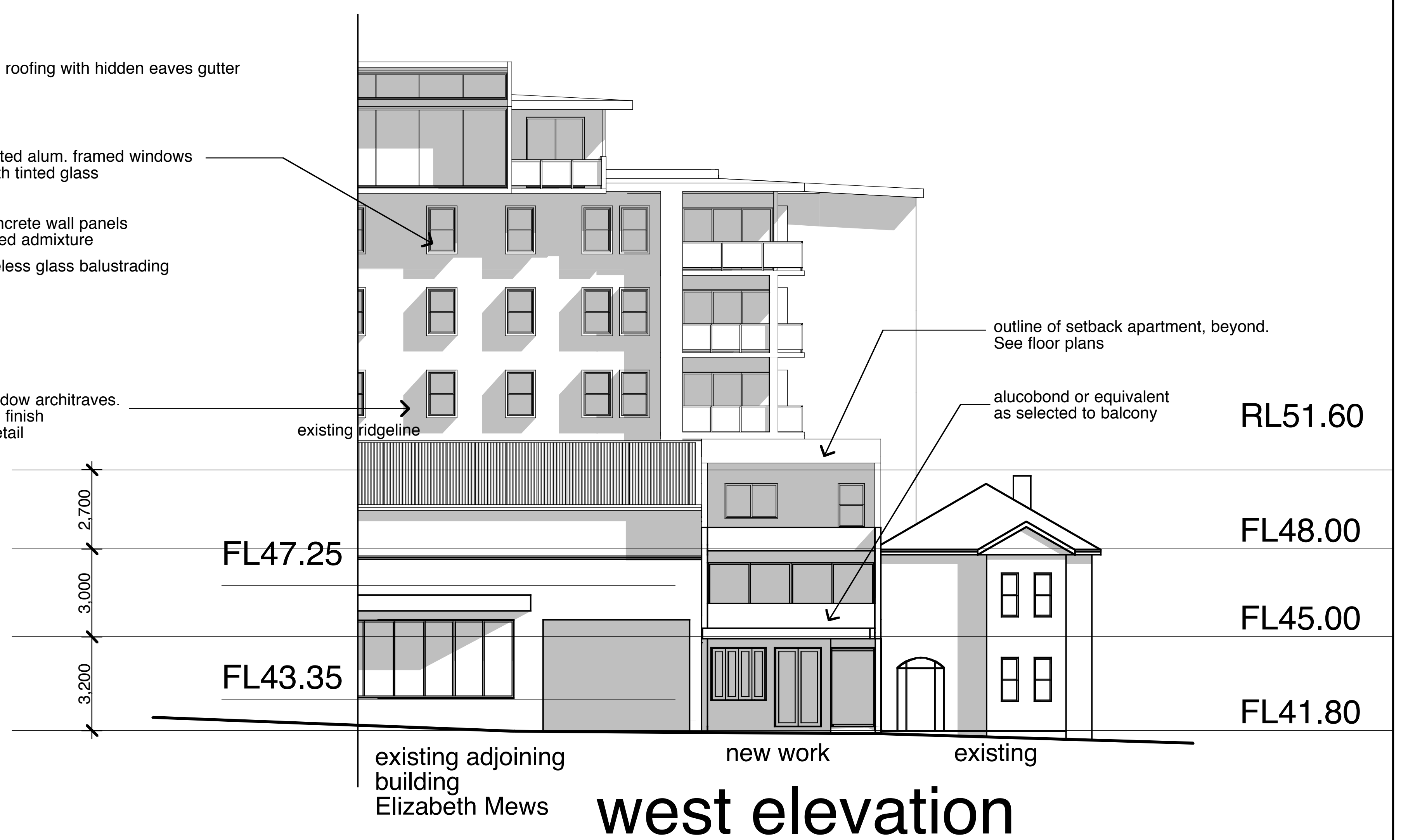


west elevation

north elevation



west elevation
elizabeth street

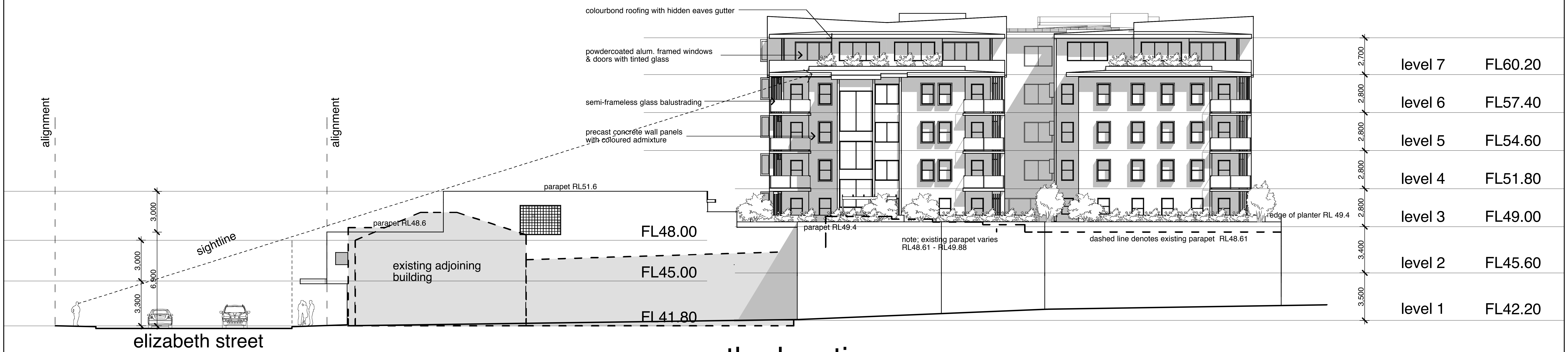
0 2000 5000 10000 20000
scale

and+design
andrew mckellar design
62 hilton terrace
noosaville (07) 5449 9066
info@and-design.com.au
QBSA reg. 65073

Client	Location	Drawing	Scale	Drawn
HOBART PROPERTIES & SECURITIES PTY LTD	66 BURNETT ST NORTH HOBART	ELEVATIONS 1	1:200 @ A2	AM
Project		**Drawing no.**	**Date**	**Page**
PROPOSED RESIDENTIAL UNIT DEVELOPMENT		20.0717.2.1C	AUG 2017	2.1C

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over

east elevation



south elevation

0 2000 5000 10000 20000

scale

and+design

andrew mckellar design

62 hilton terrace
noosaville (07) 5449 9066
info@and-design.com.au QBSA reg. 65073

Client	HOBART PROPERTIES & SECURITIES PTY LTD
Project	PROPOSED RESIDENTIAL UNIT DEVELOPMENT
Location	66 BURNETT ST NORTH HOBART
Drawing	ELEVATIONS 2
Drawing no.	20.0717.2.2C
Scale	1:200 @ A2
Drawn	AM
Date	AUG 2017
Page	2.2C

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
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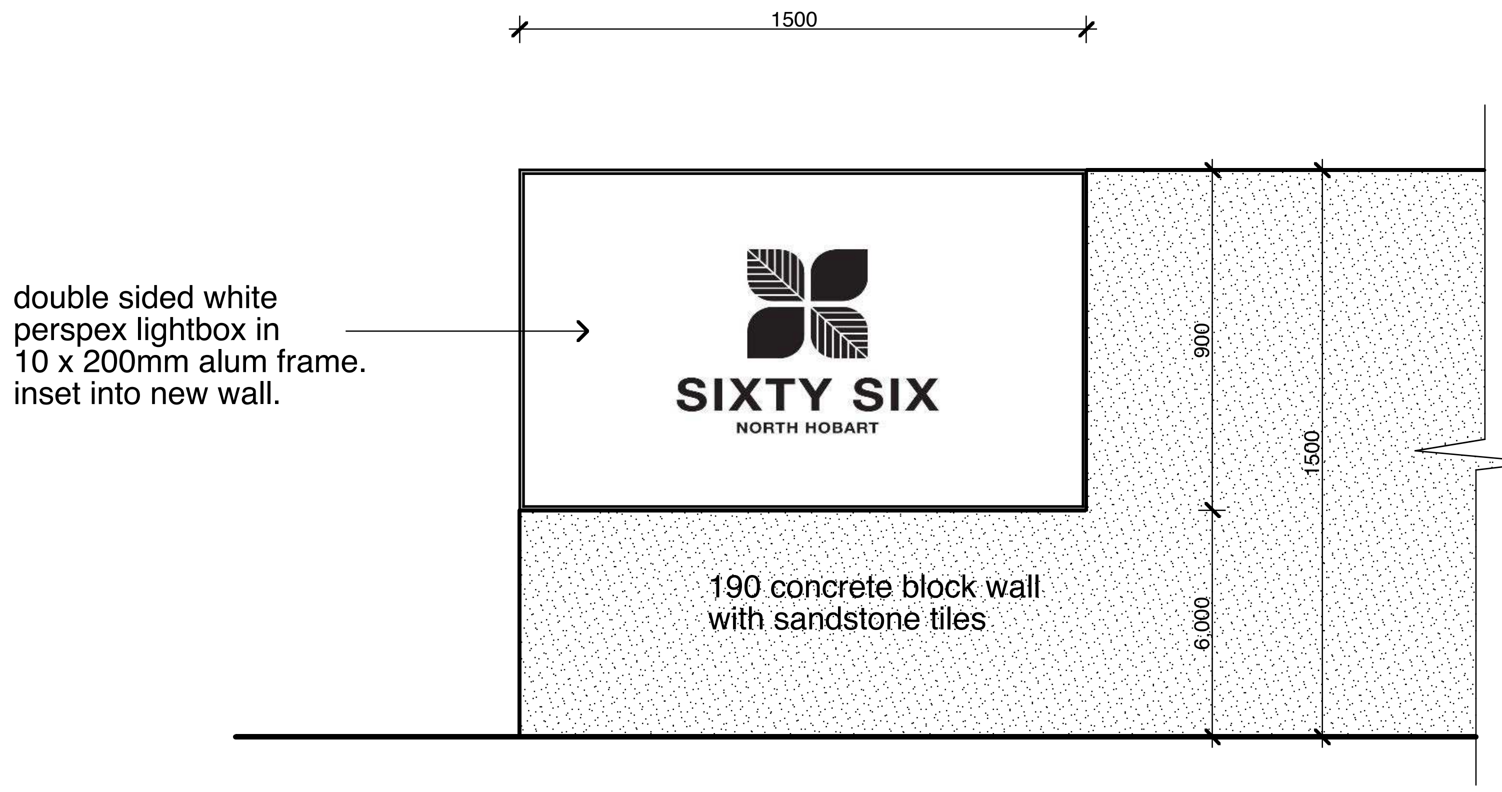
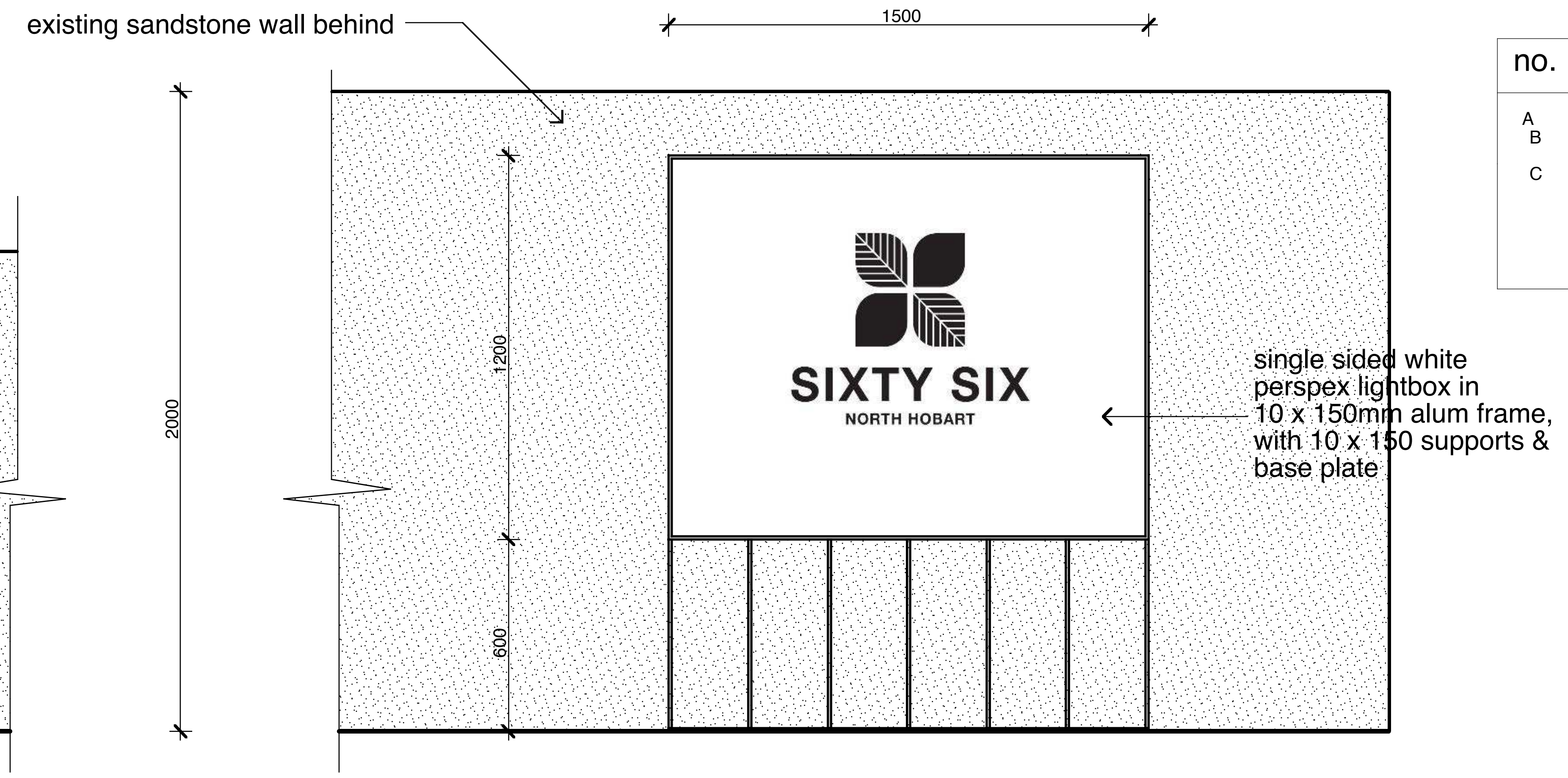


sign 1
at entry driveway;
see sheet 1.2
scale 1:20

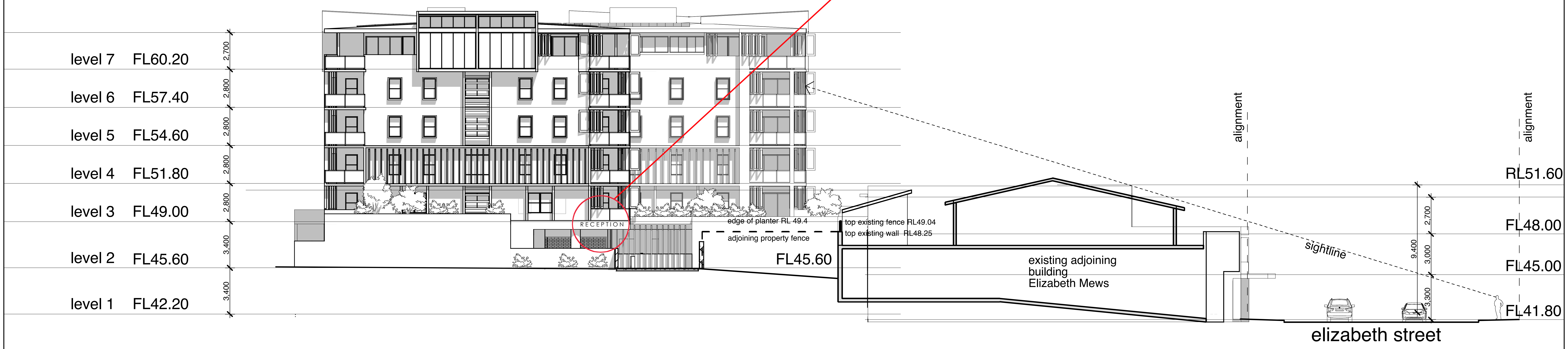


sign 2
at entry driveway;
see sheet 1.2
scale 1:20

R E C E P T I O N

individual letters ex 50x10,
fixed to concrete facade

sign 3
NTS



north elevation
elizabeth street building

0 2000 5000 10000 20000
scale

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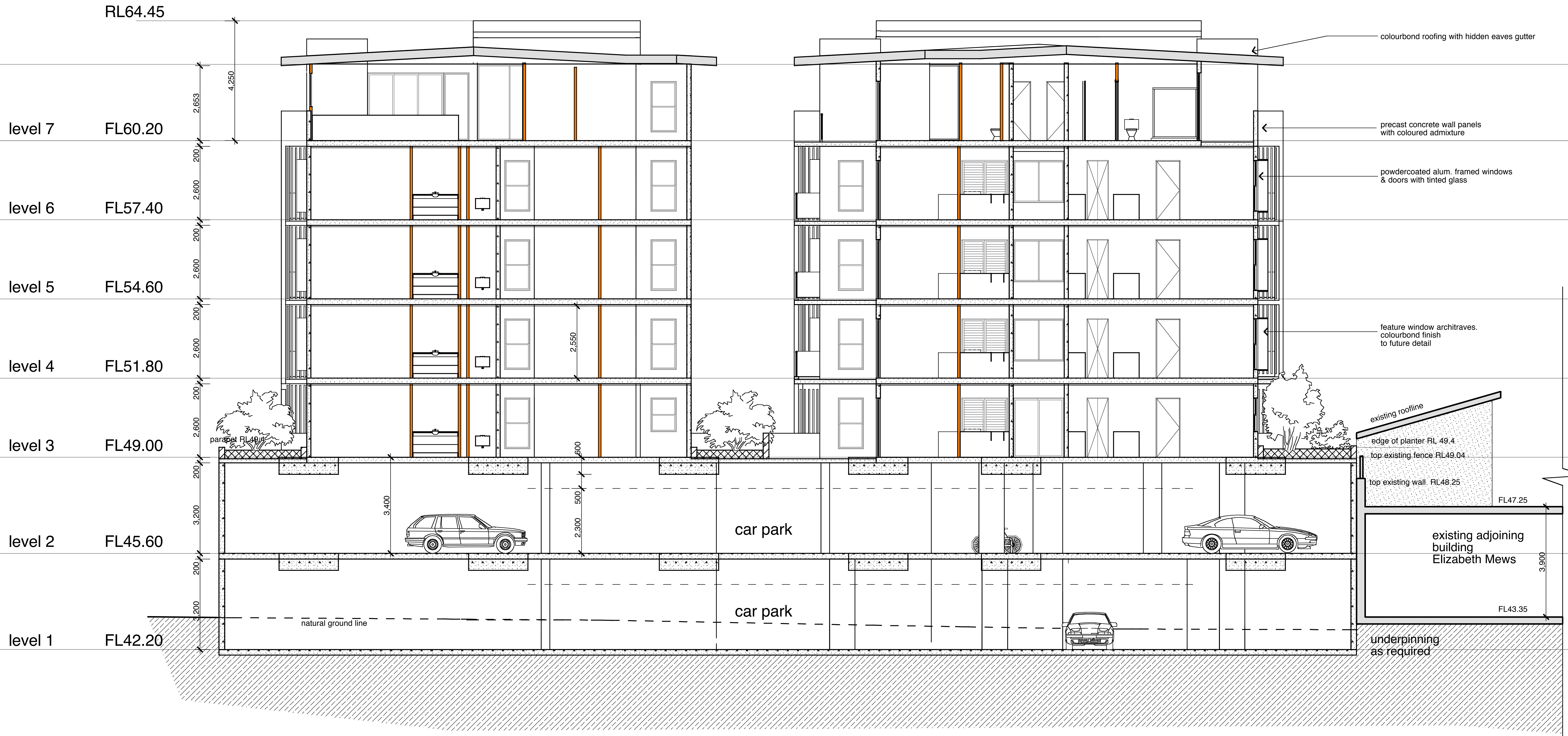
QBSA reg. 65073

Client: HOBART PROPERTIES & SECURITIES PTY LTD	Location: 66 BURNETT ST NORTH HOBART	Drawing: ELEVATIONS 3	Scale: 1:200 @ A2	Drawn: AM
Project: PROPOSED RESIDENTIAL UNIT DEVELOPMENT		Drawing no.: 20.0717.2.3C	Date: AUG 2017	Page: 2.3C



section A

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
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Client: HOBART PROPERTIES & SECURITIES PTY LTD	Location: 66 BURNETT ST NORTH HOBART	Drawing: SECTION A	Drawn: AM	Scale: 1:100 @ A2
Project: PROPOSED RESIDENTIAL UNIT DEVELOPMENT		Drawing no.: 20.0717.1.3.1C	Date: AUG 2017	3.1C

ireneinc & smithstreetstudio
PLANNING & URBAN DESIGN

25 September 2018

Mr Adam Smee
Planning Officer
Hobart City Council

Dear Adam

PLN-17-1066 – 66 BURNETT STREET, NORTH HOBART

Further to our previous discussions, the proposal plans for the proposed development have been amended and we have today finalised the revised set of documentation which, in addition to the revised plans, includes updates to the planning report and attachments.

For clarity we have submitted an entire set of all the relevant documents which incorporates all the previously submitted further information and therefore the information submitted today replaces all previously submitted material, as follows:

- 66 Burnett Street 01 - Plans (Rev C)
- 66 Burnett Street 02 - Planning Report (25 September 2018)
    - 66 Burnett Street 02A1 – Photos and Montages
    - 66 Burnett Street 02A2 – Shading Diagrams
- 66 Burnett Street 03 – Title
- 66 Burnett Street 04 – Land Owner Consent
- 66 Burnett Street 05 - Statement of Archaeological Potential
- 66 Burnett Street 06 - Environmental Site Assessment
- 66 Burnett Street 07 - Contamination Management Plan (Amended 29 March 2018)
- 66 Burnett Street 08 - Noise Assessment
- 66 Burnett Street 09 - Traffic Impact Assessment (31 May 2018)
- 66 Burnett Street 10 - Stormwater Services Report

If there are any queries in relation to any of the above or the accompanying documents please contact me on 03 6234 9281 or email on jacqui@ireneinc.com.au.

Yours sincerely

Jacqui Blowfield
Senior Planner
IRENEINC PLANNING

smithstreetstudio | ireneinc
49 Tasma St, North Hobart, TAS 7000
Tel (03) 6234 9281
Fax (03) 6231 4727
Mob 0418 346 283
Email planning@ireneinc.com.au

SEARCH OF TORRENS TITLE

VOLUME	FOLIO
26099	4
EDITION	DATE OF ISSUE
2	19-Jan-2004

SEARCH DATE : 19-Dec-2017
SEARCH TIME : 10.50 AM

DESCRIPTION OF LAND

City of HOBART
Lot 4 on Sealed Plan 26099
(Formerly Lots 1 & 2 on Sealed Plan 26099)
Derivation : Part of Location to James, Part of 2R-30Ps. Gtd. to R Frost, Part of 1R-25Ps. Gtd. to A M Chandler, Part of 1R-14Ps. Gtd. to J Brown and Part of 2R-34Ps. Gtd. to A Rheuben (Section L.2.)
Prior CT 4188/53

SCHEDULE 1

A456886 & A547754 DONALD GORRINGE RECONDITIONING AND SPARE PARTS PTY LTD

SCHEDULE 2

Reservations and conditions in the Crown Grant if any
SP 26099 EASEMENTS in Schedule of Easements
C506732 MORTGAGE to Commonwealth Bank of Australia Registered 19-Jan-2004 at noon

UNREGISTERED DEALINGS AND NOTATIONS

M665740 PRIORITY NOTICE reserving priority for 60 days TRANSFER DONALD GORRINGE RECONDITIONING AND SPARE PARTS PTY LTD TO HOBART PROPERTIES AND SECURITIES PTY LTD
MORTGAGE HOBART PROPERTIES AND SECURITIES PTY LTD TO WESTPAC BANKING CORPORATION LIMITED Lodged by ROBERTS AND PARTNERS on 13-Nov-2017 BP: M665740

OS-K 1110

$107 SP 26099

Owner: Donald Gorringe Reconditioning and Spare Parts Pty Ltd

Title Reference: Con 45-9087 & C.T. 3406-60

Grantee: Portions Of Loc. to James, 2R 30P Gtd to Robt Frost, 1R 25P Gtd to A. McChandler, 1R 14P Gtd to Jhn Brown & 2R 34P Gtd to Abraham Rheuben

PLAN OF SURVEY

by Surveyor N. D. Leary

of land situated in the

CITY OF HOBART

SEC. L 2

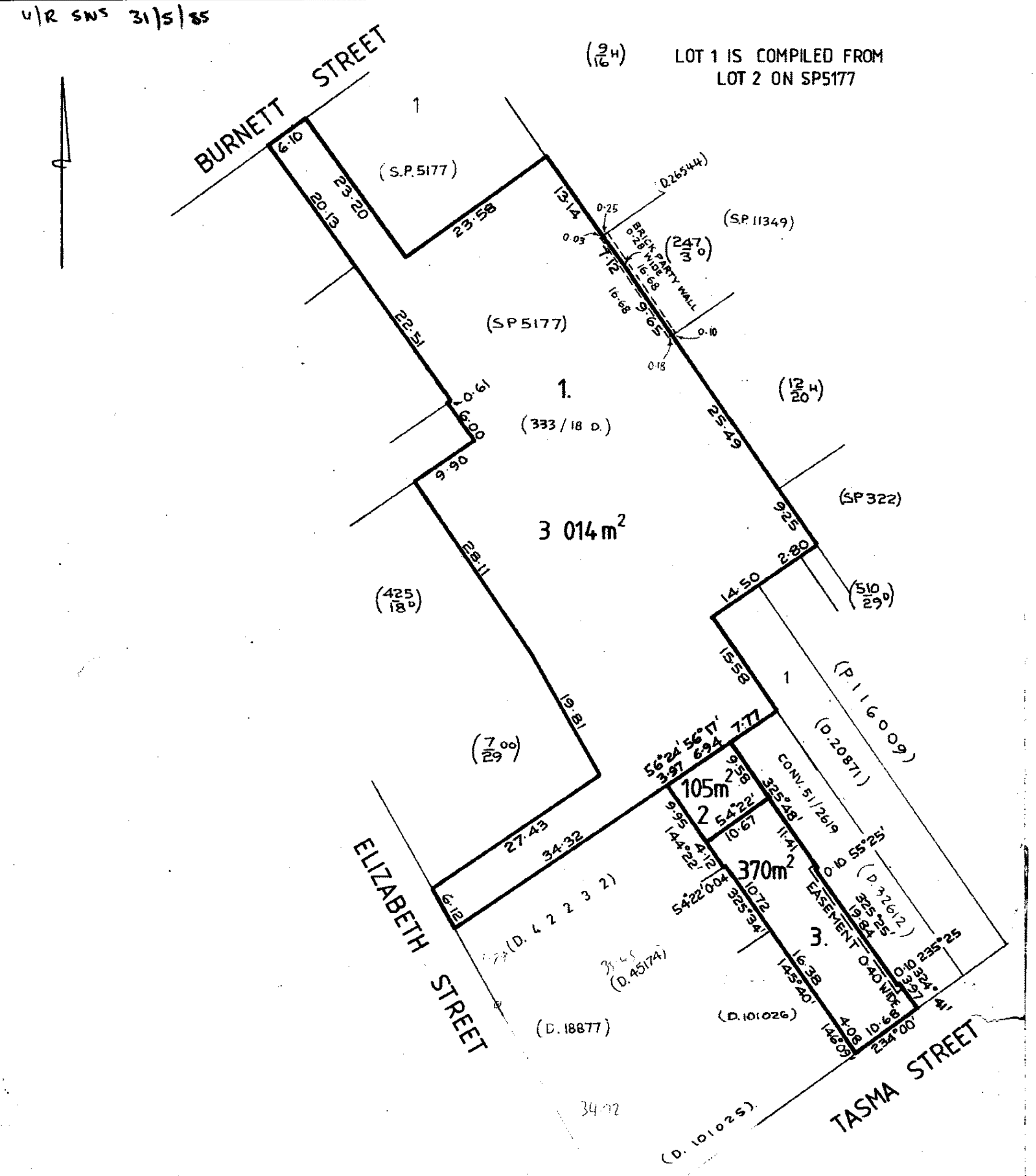
Scale 1: 500 Measurements in Metres

Registered Number: S.P 26099

Effective from: 8 AUG 1985

E. R. Thorp
Recorder of Titles

U/R SWS 31/5/85



LOT 2 TO BE ADDED TO LOT 1

LOT 1 AND LOT 2
TOGETHER FORM LOT 4
12 APR 1995

3A FWD. 31/5/85

RECORDER OF TITLES TASMANIA

SCHEDULE OF EASEMENTS

PLAN NO.

S. P26099

NOTE:—The Town Clerk or Council Clerk must sign the certificate on the back page for the purpose of identification.

The Schedule must be signed by the owners and mortgagees of the land affected. Signatures should be attested.

EASEMENTS AND PROFITS THIS COPY SCHEDULE CONSISTS OF 1 PAGE/S

Each lot on the plan is together with:—

(1) such rights of drainage over the drainage easements shewn on the plan (if any) as may be necessary to drain the stormwater and other surplus water from such lot; and

(2) any easements or profits à prendre described hereunder.

Each lot on the plan is subject to:—

(1) such rights of drainage over the drainage easements shewn on the plan (if any) as passing through such lot as may be necessary to drain the stormwater and other surplus water from any other lot on the plan; and

(2) any easements or profits à prendre described hereunder.

The direction of the flow of water through the drainage easements shewn on the plan is indicated by arrows.

The wall shown on the plan as "Brick Party Wall 0.28 wide" is a party wall as defined by Section 34B of the Conveyancing and Law of Property Act 1884 and Lot 1 and Certificate of Title Volume 3187 Folio 51 are affected by easements and rights as mentioned in that Section.

FENCING COVENANT: The owner of Lot 3 hereby covenants with the Vendor Donald Gorringe Reconditioning & Spare Parts Pty. Limited that the Vendor shall not be required to fence.

EASEMENTS: Lot 3 is subject to a right of projecting eaves and spouting and for a stormwater drain and other pipes as the same now exist over the Easement 0.40 metres wide shown on the plan appurtenant to the land described in Conveyance Registered Number 51/2619. as created by Conveyance No. No. 15/5482.

THE COMMON SEAL of DONALD GORRINGE RECONDITIONING & SPARE PARTS PTY. LIMITED was hereunto affixed in the presence of:)

Director:

Secretary:

GORRINGE RECONDITIONING & SPARE PARTS COMMON SEAL

This is the schedule of easements attached to the plan of DONALD GORRINGE RECONDITIONING
(Insert Subdivider's Full Name)

& SPARE PART PTY LTD affecting land in

CONV. 45-9087 & CT 3406-60
(Insert Title Reference)

Sealed by HOBART CITY COUNCIL on 24th MAY, 1985

Solicitor's Reference ....

~~Council Clerk~~/*Town Clerk*

OS-K 3134

City of HOBART

Enquiries to: Cindy Elder
☎: (03) 6238 836
✉: coh@hobartcity.com.au
Our Ref: PLN-17-1066
DA-18-8512

23 February 2018

Ms Jacqui Blowfield
Ireneinc Planning
Ireneinc & Smith Street Studio
49 Tasma Street
NORTH HOBART TAS 7000

Via Email: jacqui@ireneinc.com.au

Dear Ms Blowfield

NOTICE OF LAND OWNER CONSENT TO LODGE A PLANNING APPLICATION

Site Address:	**Elizabeth Street, North Hobart**
Description of Proposal:	**Awning over footpath, Elizabeth Street highway reservation at Elizabeth Street frontage of 66 Burnett Street, North Hobart**
Applicant Name:	**ireneinc & smith street studio**
PLN *(if applicable)*:	**PLN-17-1066**

I write to advise that pursuant to Section 52 of the *Land Use Planning and Approvals Act 1993*, I grant my consent on behalf of the Hobart City Council as the owner/administrator of the above land for you to make application to the City for a planning permit for the development described above and as per the attached documents.

Please note that the granting of the consent is only for the making of the application and in no way should such consent be seen as prejudicing any decision the Council is required to make as the statutory planning authority or as the owner/administrator of the land.

Yours faithfully

(N D Heath)
GENERAL MANAGER

Attachment: Land Owner Consent

City of HOBART

PLN-17-1066
DA-18-8512

LAND OWNER CONSENT TO LODGE A PLANNING APPLICATION

Site Address:	**Elizabeth Street, North Hobart**
Description of Proposal:	**Awning over footpath, Elizabeth Street Highway reservation at Elizabeth Street frontage of 66 Burnett Street, North Hobart**
Applicant Name:	**ireneinc & smith street studio**
PLN *(if applicable)*:	**PLN-17-1066**

The land indicated above is owned or is administered by the Hobart City Council.

The applicant proposes to lodge an application for a permit, pursuant to the *Land Use Planning and Approvals Act 1993,* in respect to the proposal described above.

Part or all of the application proposes use and/or development on land owned or administered by the City located at Awning over Elizabeth Street highway reservation (as shown on the attached plans).

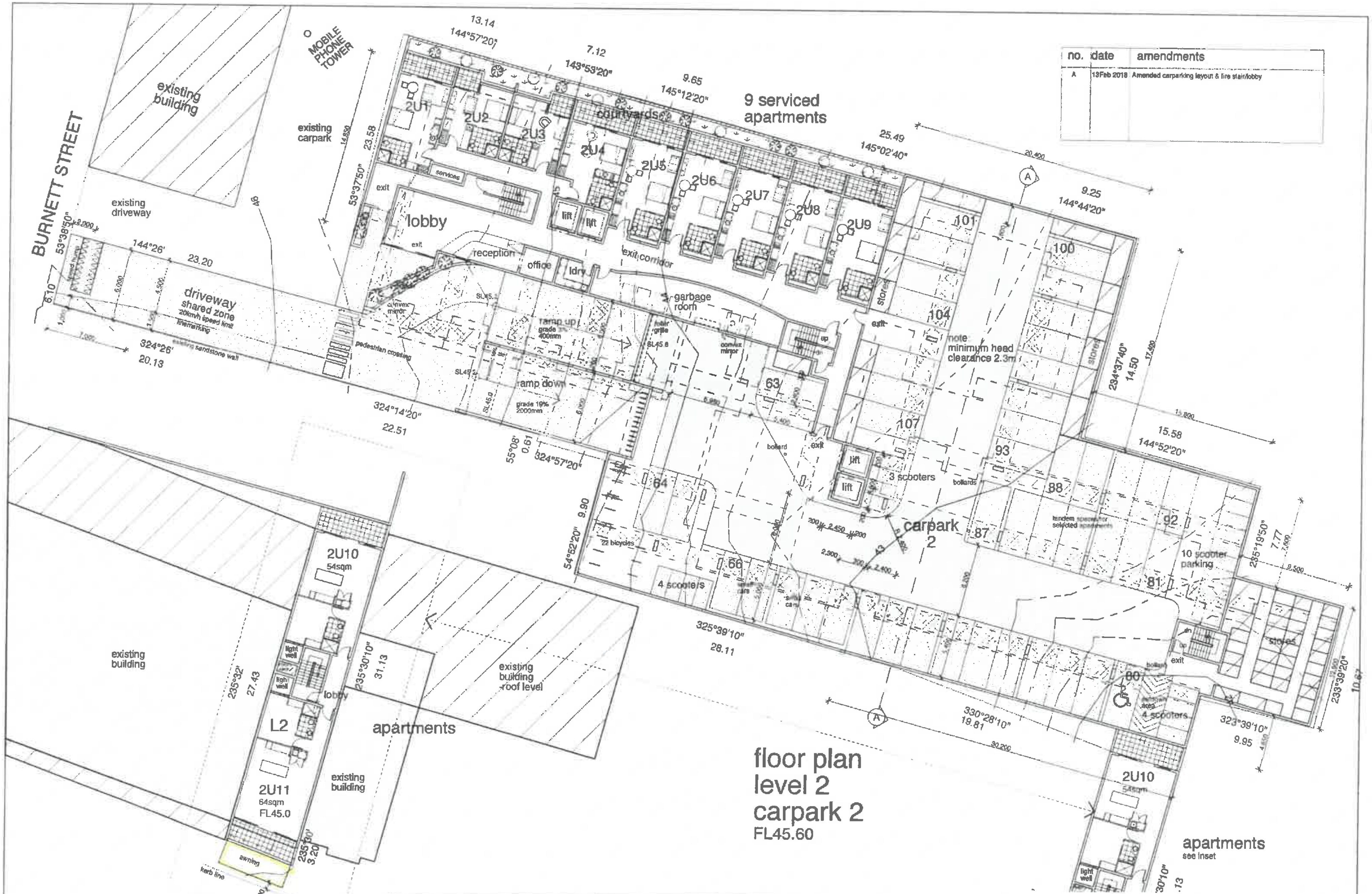
Being and as General Manager of the Hobart City Council, I provide written permission to the making of the application pursuant to Section 52(1B)(b) of the *Land Use Planning and Approvals Act 1993.*

(N D Heath)
GENERAL MANAGER

Date: 28/2/18

This consent is for the making of a planning application only, and does not constitute landlord consent for the development to occur.

Attachments/Plans: Plans (1.2A, 1.3A, 2.2A and 2.3A)

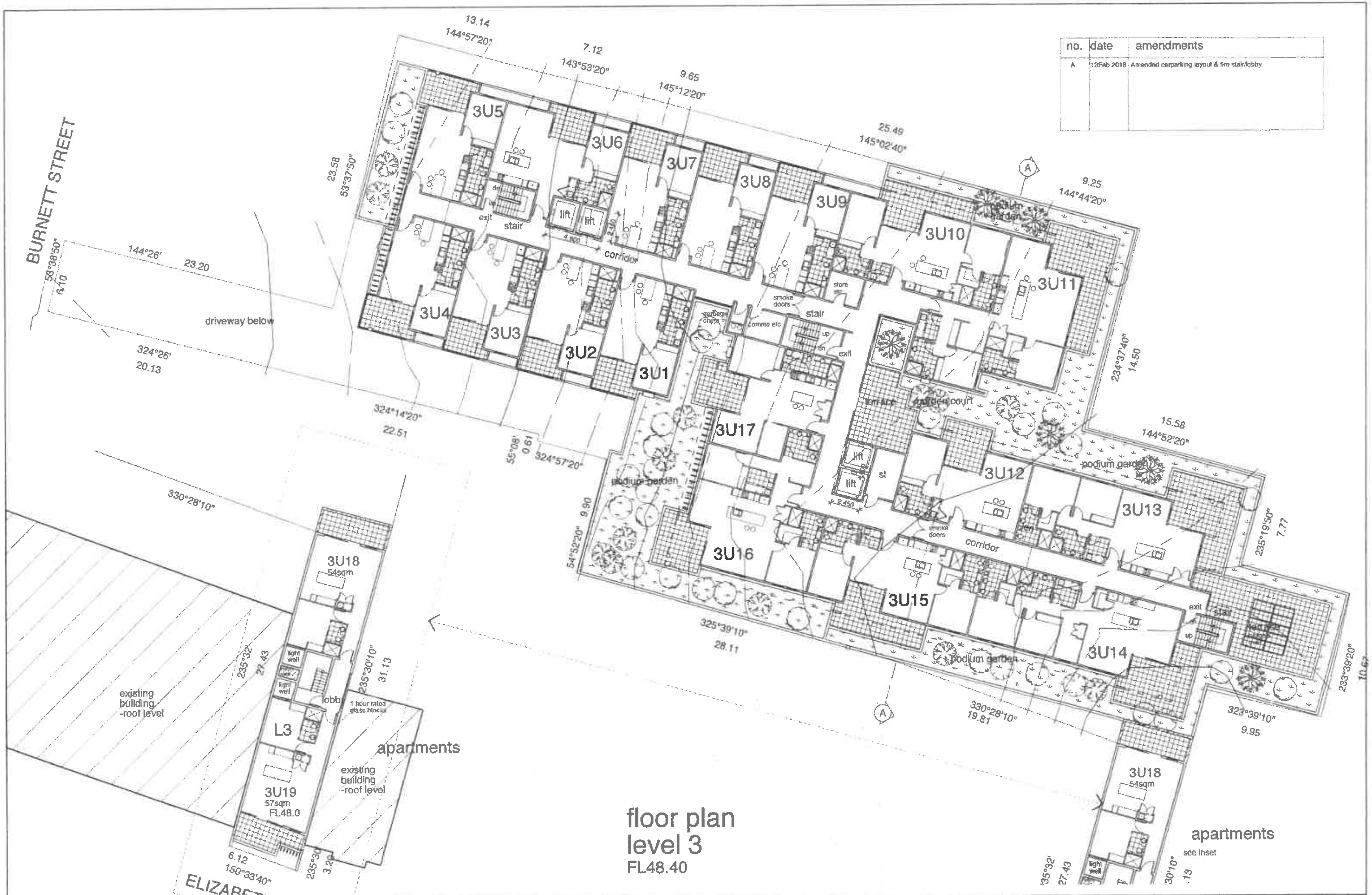


no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby

and design
andrew mckellar design
62 hilton terrace
noosaville (07) 5449 9066
info@and-design.com.au
QBSA reg. 65073

Client	HOBART PROPERTIES & SECURITIES PTY LTD	
Project	PROPOSED RESIDENTIAL UNIT DEVELOPMENT	
Location	66 BURNETT ST NORTH HOBART	
Drawing	LEVEL 2	
Drawing no.	20.0717.1.2A	
Scale	1:200 @ A2	
Drawn	AM	
Date	AUG 2017	
Page	1.2A	

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby

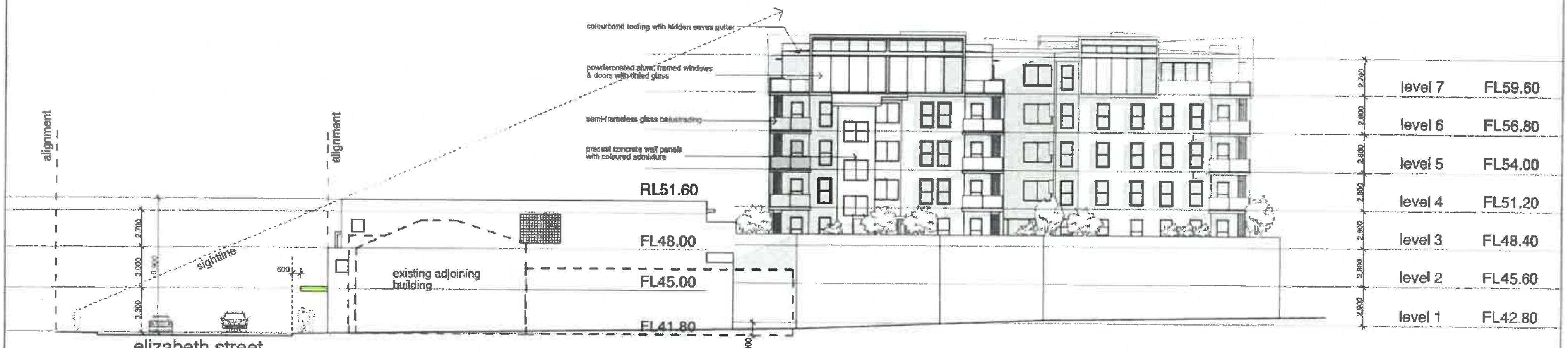


floor plan
level 3
FL48.40

and design andrew mckellar design 62 hilton terrace noosaville (07) 5449 8066 info@and-design.com.au QBSA reg. 65073	Client HOBART PROPERTIES & SECURITIES PTY LTD Project PROPOSED RESIDENTIAL UNIT DEVELOPMENT	Location 66 BURNETT ST NORTH HOBART	Drawing LEVEL 3 Drawing no. 20.0717.1.3A	Scale 1:200 @ A2 Date AUG 2017	Drawn AM Page 1.3A

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby

east elevation



south elevation

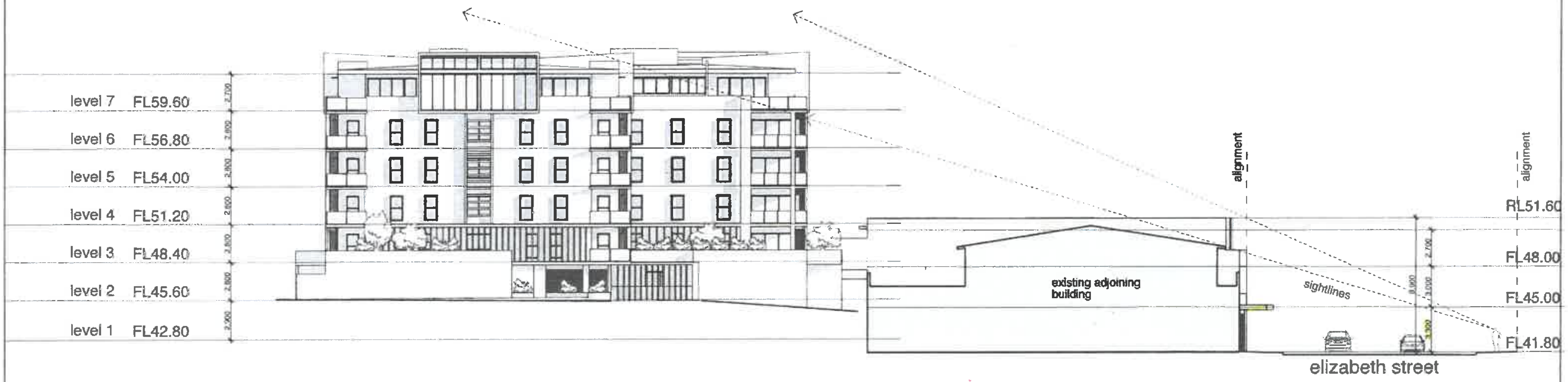
0 2000 5000 10000 20000

scale

an design
andrew mckellar design
62 hilton terrace
noosaville (07) 5449 9066
info@and-design.com.au QBSA reg. 85073

Client	Location	Drawing	Scale	Drawn
HOBART PROPERTIES & SECURITIES PTY LTD	66 BURNETT ST NORTH HOBART	ELEVATIONS 2	1:200 @ A2	AM
Project: PROPOSED RESIDENTIAL UNIT DEVELOPMENT		Drawing no. 20.0717.2.2A	Date AUG 2017	Page 2.2A

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby

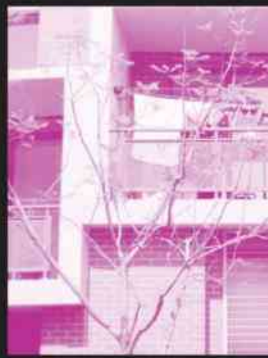


north elevation

elizabeth street building

0 2000 5000 10000 20000
scale

an design andrew mckellar design 62 hilton terrace noosaville (07) 5449 9066 info@and-design.com.au QBSA reg. 65073	Client: HOBART PROPERTIES & SECURITIES PTY LTD Project: PROPOSED RESIDENTIAL UNIT DEVELOPMENT	Location: 66 BURNETT ST NORTH HOBART	Drawing: ELEVATIONS 3 Drawing no.: 20.0717.2.3A	Scale: 1:200 @ A2 Date: AUG 2017	Drawn: AM Page: 2.3A



66 BURNETT STREET, NORTH HOBART

ireneinc & smithstreetstudio
PLANNING & URBAN DESIGN

66 BURNETT STREET, NORTH HOBART

Submission to the Hobart City Council

Planning Application for Use and Development

Last Updated – 25 September 2018

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ireneinc PLANNING

CONTENTS

1. INTRODUCTION

Ireneinc Planning have been engaged to prepare an application for use and development of the land at 66 Burnett Street, North Hobart, with part of the site including area for an awning within the Elizabeth Street road reservation. This report provides an assessment of the proposal against the provisions of the *Hobart Interim Planning Scheme 2015*.

The site location is described in the following figure:

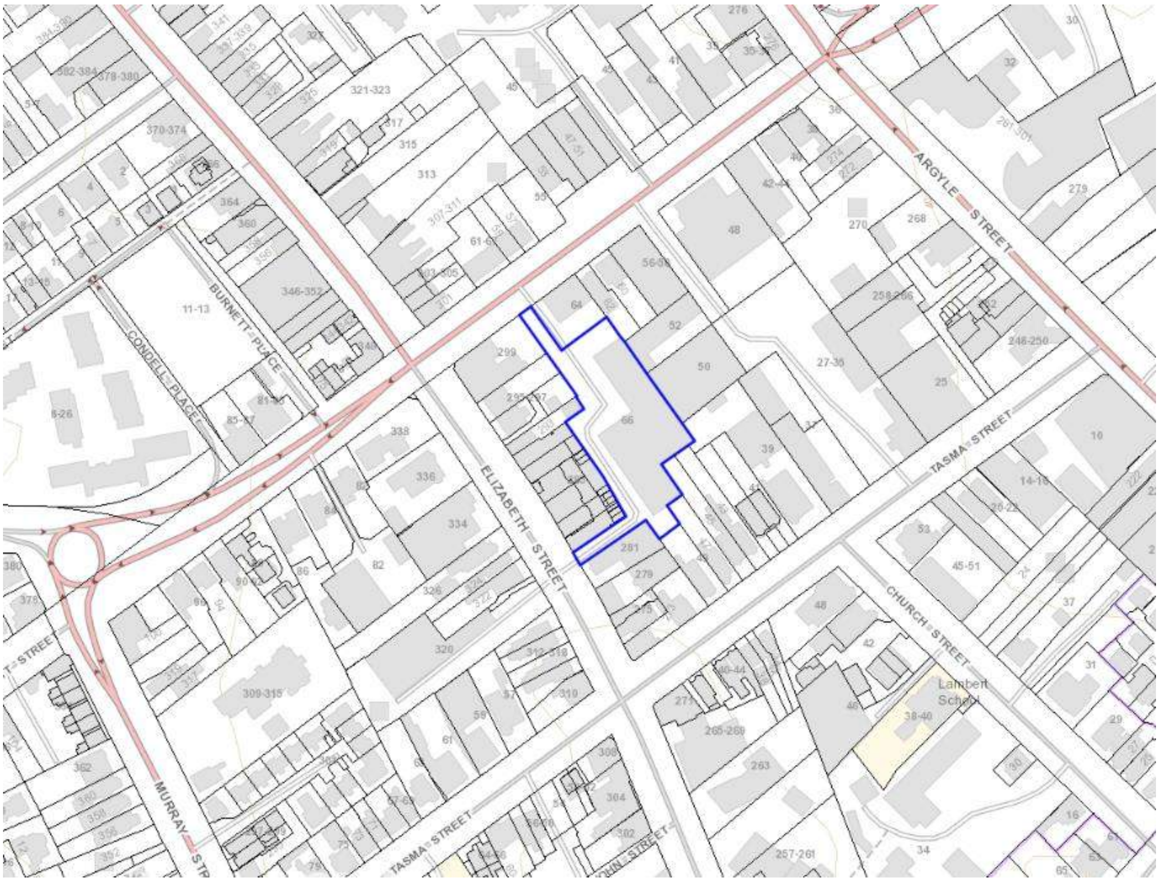

Figure 1:Location (Source: LISTMap)

1.1 SITE AND EXISTING DEVELOPMENT

The land comprising the site is as follows:

66 Burnett Street, is a 3014m^2 internal lot (Title ref: 26099/4) which contains large existing buildings previously operating as Donald Gorringe Reconditioning and Spare Parts Pty Ltd, an automotive repair centre and machining workshop. The proposal requires demolition of the existing development on this lot.

Being a large internal lot, the site has boundaries with a number of neighbouring properties however relatively few are residential however 65% of the shared site boundaries are with neighbouring commercial properties. The residential neighbours are limited to 3 dwellings in Tasma Street (number 43, 45 and 47), a shared boundary length of only 13.5%, and the 6 apartments within the mixed use residential and commercial Elizabeth Mews (285 Elizabeth Street) with a shared boundary of 21.5%.

The existing buildings on the subject site are currently built to the boundaries of 43, 45 and 45 Tasma Street with the height of these existing boundary walls varying from 5.4m to 6.7m. These Tasma Street dwellings are also substantially setback from their rear boundaries with large rear gardens separating the existing buildings.

Figure 2: Aerial Image (Source: LISTMap)

The site currently shares an access from Burnett Street with the property at 64 Burnett Street however this is an informal arrangement and this adjacent lot does not form part of the proposal.

The site also has an existing access lane from Elizabeth Street. The development will also include an awning over the Elizabeth Street footpath as part of the proposed building off Elizabeth Street and therefore includes Council land within the road reservation.

1.2 BACKGROUND

While this application includes demolition of the existing building on the site, a separate application (PLN-18-474) was also lodged which included the demolition and early works, this application has recently been approved by Council.

The current application for use and development of the site was originally submitted to Council some time ago, it was advertised for public comment in July. This report has been prepared to accompany amended plans which have been designed to respond to comments and issues provided by representors and also Council's Urban Design Advisory Panel.

The amendments incorporated include:

- Reduction in the floor plate of the uppermost floor level (Level 7) to step the development down the slope towards Tasma Street and provide a further transition in height from the upper level through the podium to the buildings to the south.
- A reduction in the upper level of the Elizabeth Street building to reduce the height at street level to 2 stories.
- Additional detailing of the Burnett Street access incorporating landscaping and signage to increase the visibility and legibility of the main access to the site, along with greater detailing of the proposed treatment of the access, described in the images below.
- Modifications to the café and pedestrian access at Elizabeth Street to accommodate the setback of the neighbouring building and to enhance the pedestrian entrance from Elizabeth Street for residents, also described in the images below.
- Additional setback of approximately 2.5m for Level 3 terraces (units 11, 13, 14 and 15) have been included providing for increased and enhanced landscape buffers around the podium to reduce visual impacts and increase privacy between these apartments and neighbouring residential properties.

Figure 3: Burnett Street frontage

2. PROPOSED DEVELOPMENT

The proposed use and development will provide a multistorey apartment building which will provide residential and visitor accommodation, part of the development will fill in the Elizabeth Street access with a 3 storey building with a ground floor café/bar/restaurant tenancy and two floors containing further accommodation. The development in North Hobart will be in close proximity to the amenities provided within both North Hobart and the City centre.

2.1 USE

2.1.1 CAFÉ/BAR/RESTAURANT

A commercial tenancy is proposed for the ground floor of the Elizabeth Street building intended to be a café/bar/restaurant business within the Food Services use class.

2.1.2 APARTMENTS

The buildings will provide 90 apartments for residential and visitor accommodation, along with ancillary parking, storage, reception and gym facility.

A total of 22 serviced apartments are proposed for visitor accommodation including:

- 2 apartments on Level 1 Burnett Street:
- 2 apartments on Level 2 Elizabeth Street; and
- 18 apartments in Level 2 & 3 Burnett Street (9 on each level).

The remaining 68 apartments are proposed to be residential.

2.1.3 PARKING AND STORAGE

Level 1 and 2 will contain parking and storage areas as follows:

Level	Storage	Bicycle	Motor-bike	Accessible Car Parks	Small Car Parks	Tandem Parks	Other Car Parks	Total Cars
1	33	16	19	1	14	10	35	**60**
2	50	28	14	1	6	10	29	**46**
Total	**83**	**44**	**33**	**2**	**20**	**20**	**64**	**106**

It is intended that the development will be strata titled to allow sale of individual apartments, parking and storage areas, so that future owners can choose to take up the various parking and storage options provided within the development.

This also allows for a greater level of affordability within the development as the smaller apartments will not all come with a car park. Although the lease arrangements retained for residents will allow flexibility in the parking allocated within the development over time, along with the scooter and bicycle parking options available through the overall parking strategy.

The onsite building management is also intended to include an electric share car, able to be booked by residents or visitors.

Some car parks will be installed with 15amp sockets to provide suitable charge spaces for both the share car and for individual apartments (which can be connected to the apartment's power supply).

Figure 4: Image – Parking internal

2.1.4 MANAGEMENT STRUCTURE

The developer/owner, Hobart Properties & Securities Pty Ltd, has experience in planning, designing, developing and managing mixed use commercial, residential and visitor accommodation projects and have provided the following detail of their proposed ownership/management structure.

- HP&S regularly retains a significant ownership level of strata units in their developments and as such maintain a vested interest in ensuring that the management, letting and maintenance is of a good standard.
- This is no different to any other buyers, except that HP&S understands that Buyers who buy into some project do so without a significant owner retaining sufficient ownership with the knowledge and interest in maintaining security and quality in the strata title property.
- It is intended that one of HP&S's companies, Escapes Resorts & Apartments P/L at the Escapes Resorts Trust C/- Sixty Six, 66 Burnett Street North Hobart, will enter into a Letting Agreement with the Body Corporate to provide the Letting Agent's Service. The letting Agent's Services will include:
  1. The letting or renting out of a Lot on the Strata Plan for any period of less than three months at a time;
  2. Taking bookings, collecting rents and bonds, ensuring compliance by tenants with all terms of any letting, ensuring compliance by tenants with the by-laws of the Body Corporate;

3. Ancillary services of hiring of chattels, cleaning laundry and room service facilities, provision of furniture and other equipment as required by the business of the Letting Agent;
4. The Letting Agreement will be for an initial term of 20 years with two options for renewal, each of 20 years.

- It is also intended that Escapes Resorts & Apartments P/L will enter into a Cleaning & Caretaking Agreement with the Body Corporate to provide the Cleaning & Caretaking Service. The Cleaning & Caretaking Services will include:
  1. Keeping the property clean and tidy;
  2. Performing minor repairs and maintenance to the property when necessary which do not require a skilled tradesman;
  3. Arranging and supervising repairs and maintenance to the property which are performed by contractors engaged by the Body Corporate, reporting to the Body Corporate anything needing repair or maintenance or replacement;
  4. Advising the Body Corporate on purchase of equipment in performance of Duties;
  5. Ensuring as far as reasonably possible that all fire safety has been met;
  6. Monitoring utility services;
  7. Monitoring compliance with by-laws;
  8. Gardening, if any;
  9. Waste removal & vermin control;
  10. Supervising parking;
  11. The Letting Agreement will be for an initial term of 20 years with two options for renewal, each of 20 years.

2.2 DEVELOPMENT

The building is designed working with the slope of the site with Levels 1 & 2 extending to site boundaries forming a podium for the upper apartment levels. Level 3 to 6 are provided with greater setback from boundaries with provisions for courtyard gardens and landscaping on the podium roof, with finally Level 7 with a further reduced floor plate and greater setback.

Acoustic privacy is provided in the design of windows and by the provision of bifold windows to protect outdoor spaces for north-west units (U1, U2, U3, U4, U16 and U17, on levels 3, 4, 5 and 6, plus U1, U2 and U8 on level 7), to protect from noise impacts from the neighbouring commercial premises (Republic Bar & Café).

The development includes seven levels as follows:

- Level 1 – Parking, 2 serviced apartments, gym, storage and plant as well as the Elizabeth Street café/bar/restaurant;
- Level 2 – Parking, storage, 9 serviced apartments in Burnett Street, visitor reception and administration, 2 serviced apartments in Elizabeth Street;
- Level 3 – 17 apartments (including differing layouts and sizes ranging from 1 bedroom, through to 2 bedrooms plus study), including the 9 x 1 bedroom serviced apartments for visitor accommodation (numbers 1 to 9), 1 further residential apartment in Elizabeth Street. This lave also contains large areas of podium gardens to be retained and managed by the body corporate, these gardens are not usable spaces with occupants retained within the paved individual terraces or shared terrace areas by balustrades. These usable terrace areas are therefore setback from the building edge with the landscaping forming a between building occupants and neighbouring properties.

- Levels 4, 5, 6 – 17 apartments per floor; and
- Level 7 – 8 apartments. This level also incorporates 2 roof top garden areas at the southern end of the development.
- Roof - The roof of the main building is designed to accommodate between 50 and 150kw of photovoltaic panels.

All the apartments are provided with outdoor areas on decks or courtyards of various sizes and configurations. The apartment sizes and formats are as follows:

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Total
Serviced	2	11	9					**22**
1 Bedroom			1	8	8	8		**25**
+ 1 Bedroom			1	2	2	2		**7**
1 Bedroom & Study			1	1	1	1		**4**
2 Bedroom			3	2	2	2	2	**11**
+ 2 Bedroom			1	1	1	1		**4**
2 Bedroom & Study			2	3	3	3		**11**
3 Bedroom							6	**6**
Level Totals	**2**	**11**	**18**	**17**	**17**	**17**	**8**	**90**

A typical floor plan describes the development below:

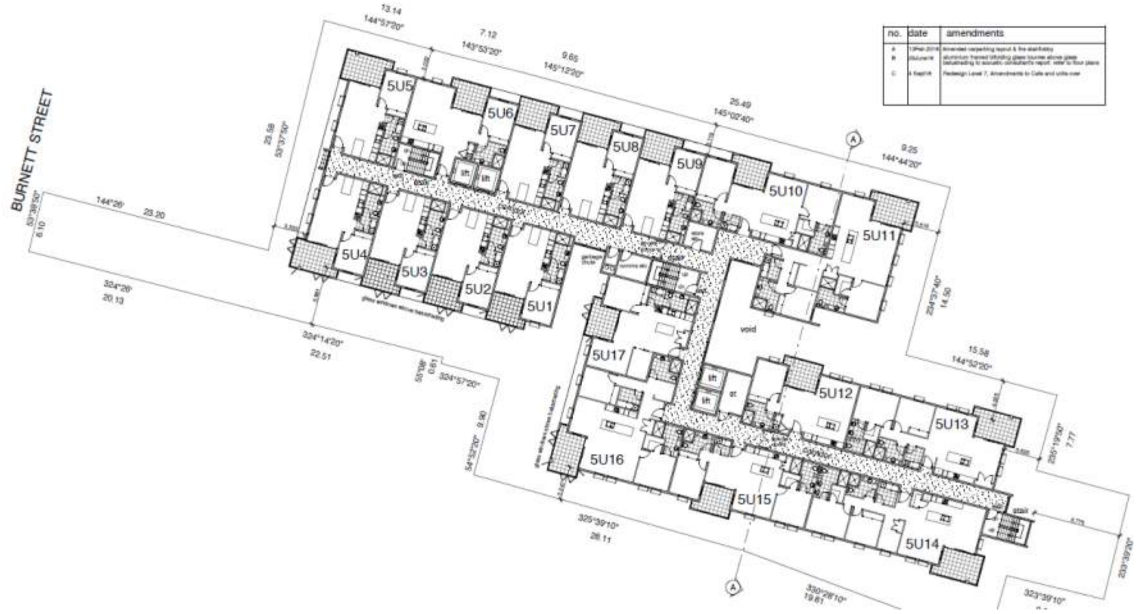

Figure 5: Extract Level 3 Floor plans – Andrew McKeller Designs

2.2.1 ENERGY EFFICIENCY

Project consultants, RED Sustainability Consultants, have provided detail in relation to the proposed roof top photovoltaic system and the assessed energy efficiency of the development.

The proposed roof top photovoltaic system will be connected to the "house" electrical system where the generated power will be preferentially utilised on site to supply the carpark lighting and ventilation services, common area lighting and vertical transportation systems when the PV supply is available. Where common area consumption on the site is not sufficient to fully consume the on-site generation, remaining energy will be sold into the distribution network.

Preliminary assessment of the units proposed for 66 Burnett St indicates:

- *Units on levels 2-6 are averaging well over 7 stars, with the aim being to ensure that each individual unit achieves at least 7 stars*

- *Units on level 7 (roof above) are rating between 5.5 and 7 stars with the aim to ensure that all units achieve a minimum of 7 stars through the specification of high-performance glazing for these top level units.*

To put these performance predictions into perspective it is instructive to compare the predicted heating and cooling energy consumption of the proposed apartments at 66 Burnett St to other potential housing scenarios. The NCC minimum requirement of 6 stars is = 155MJ/m2/year. The aim of minimum 7 star performance for 66 Burnett St = 113MJ/m2/year. This represents a 27% reduction in predicted heating and cooling energy on a m2 basis.

However, the predicted energy savings will be greater when examined on a per unit basis. The average apartment size for the 66 Burnett St project is 72m2. The average new apartment size for Tasmania is 129.8m2 (Commsec) and the average new detached house size for Tasmania is 195.5m2 (Commsec).

	Floor area	*Heating and Cooling Energy (MJ / m2 / year)*	*Total Heating and Cooling Energy (MJ/year)*	*Comparative saving predicted for the 66 Burnett St project*
66 Burnett St (7 star)	*72.0*	*113*	*8,136*	*----*
Average new apartment in Tasmania (6 star)	*129.8*	*155*	*20,119*	*59.5%*
Average new detached dwelling in Tasmania (6 star)	*195.5*	*155*	*30,302*	*73.1%*

Predicted savings on heating/cooling energy:

- *59.5% reduction compared to an average sized Tasmanian apartment built to NCC minimum standard.*
- *73.1% reduction compared to an average sized new Tasmanian detached home built to NCC minimum standard*

Passive Design/Heating/Cooling Energy Strategies employed:

- *Apartment construction generally is more conducive to energy efficient design in a cool climate such as Tasmania. This is because there are a lot of shared external walls, floors and roofs, between the apartments. With detached dwellings heat loss occurs through all external walls, floors and roofs. In an apartment, surrounded by other apartments, heat that is lost from one apartment through a wall, ceiling or roof adjoining another apartment, will be a heat gain for that neighbouring apartment.*
- *Utilisation of thermal mass through the concrete construction, helps to trap solar heat gain as well as acting to moderate internal temperatures through absorbing and releasing heat from the air, throughout the day.*
- *Compact unit designs mean the volume of internal space to be heated or cooled is reduced, thereby reducing the amount of energy required to achieve comfort.*
- *Double glazed windows throughout, with higher performing windows proposed for apartments on the upper level to compensate for additional heat loss through the roof of the building.*
- *Appropriate levels of insulation to external walls, underside of floors to the lower levels and to the roof of the upper level.*
- *Energy efficient heating through heat pump technology.*[1]

[1] Steve Watson, RED Sustainability Consultants, 66 Burnett Street – Energy Efficiency Assessment Report

2.2.2 BUILDING DESIGN & SIGNAGE

Signage has been incorporated in to the property entrance at Burnett Street and above the main visitor and pedestrian entrance. It is envisioned that some signage will also be provided as part of the commercial frontage in Elizabeth Street however this is not included in this application and will be subject to separate application.

Montages have also been prepared which detail how the development will sit within the various streetscapes from surrounding locations (set attached as Appendix B) including the following:

Figure 6: Montage – Burnett Street entry[2]

Figure 7: Montage – From Elizabeth Street[3]

[2] Note: the building mounted logo in montage is no longer proposed. For final signage details and size refer to architectural plans

[3] Note: Café signs for illustrative purposes only, any future signage will form part of separate application

3. PLANNING SCHEME PROVISIONS

The following provisions of the *Hobart Interim Planning Scheme 2015* are relevant to consideration of the proposal.

3.1 ZONING AND OVERLAYS

The figure below describes the subject site primarily within the Commercial (medium slate blue), with the Elizabeth Street access way being in the Urban Mixed Use Zone (silver). Surrounding zones include the General Business (royal blue) and Light Industry (fushia) on the northern side of Burnett Street.

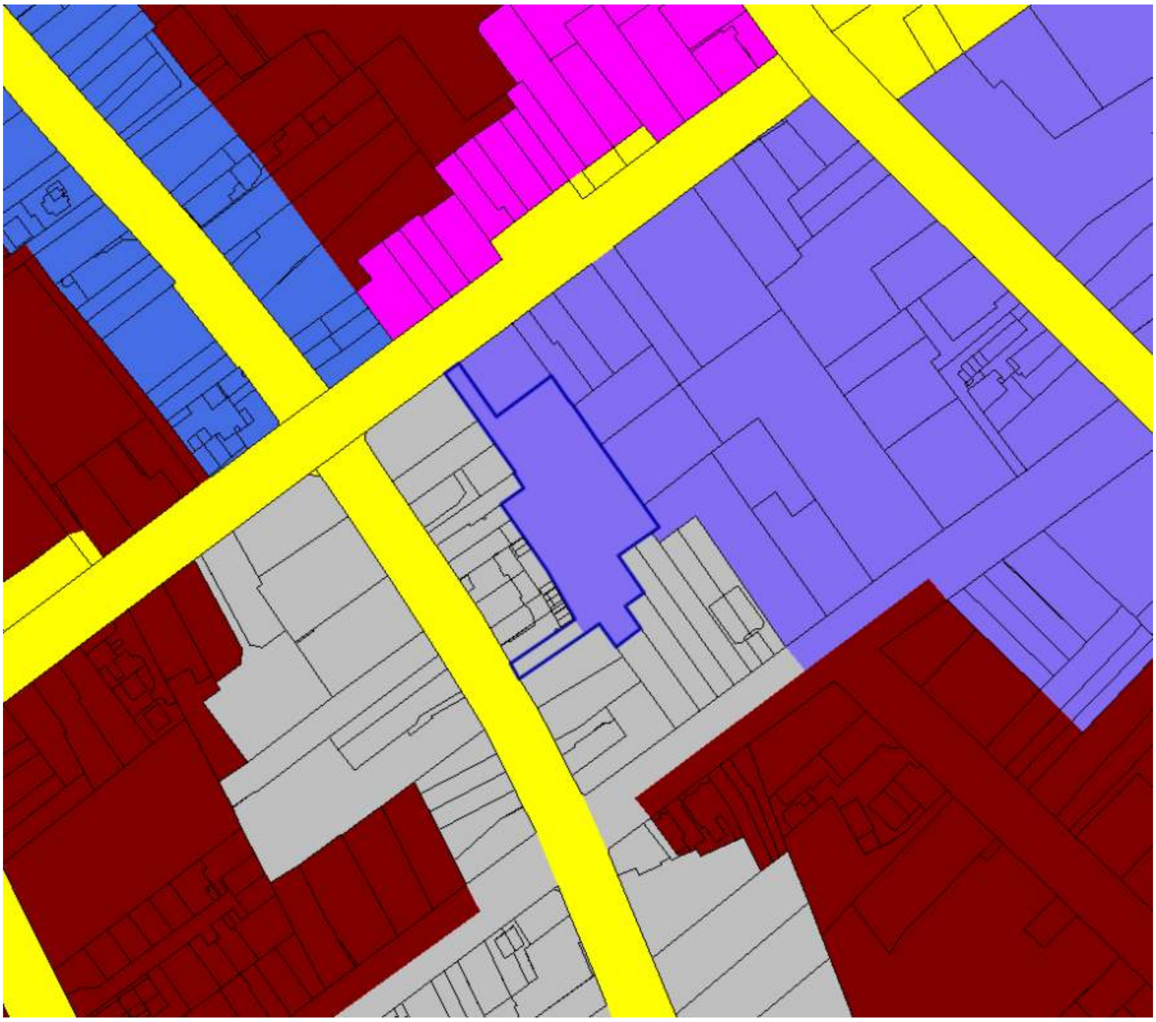

Figure 7: Zoning Plan (Source LISTMap)

The only mapped overlay which affects the site is the NH6 Heritage Precinct which applies to the Urban Mixed Use zoned part of the land, as follows:

Figure 8: Overlay Plan (Source LISTMap)

3.2 USE

The uses proposed are:

Food services	*use of land for preparing or selling food or drink for consumption on or off the premises. Examples include a cafe, restaurant and take-away food premises.*
Residential	*use of land for self contained or shared living accommodation. Examples include an ancillary dwelling, boarding house, communal residence, home-based business, hostel, residential aged care home, residential college, respite centre, retirement village and single or multiple dwellings.*
Vehicle parking	*use of land for the parking of motor vehicles. Examples include single and multi-storey car parks.*
Visitor Accommodation	*use of land for providing short or medium term accommodation, for persons away from their normal place of residence, on a commercial basis. Examples include a backpackers hostel, bed and breakfast establishment, camping and caravan park, holiday cabin, holiday unit, motel, overnight camping area, residential hotel and serviced apartment.*[4]

[4] Definition in accordance with Interim Planning Directive No. 2 – Exemption and Standards for Visitor Accommodation in Planning Schemes

3.3 COMMERCIAL ZONE PROVISIONS

3.3.1 USE TABLE

Clause 23.2 of the Scheme provides the Use Table for the Commercial Zone, within this table the proposed uses are as follows:

Permitted	
Use Class	***Qualification***
Residential	*Only if above ground level (except for access)*
Discretionary	
Use Class	***Qualification***
Residential	*Except if permitted*
Vehicle parking	
Visitor accommodation	

The residential use component of the proposal is therefore permitted while visitor accommodation and parking are discretionary.

3.3.2 USE STANDARDS

The following use standards apply to the proposal.

24.3.1 Hours of operation	
Objective: *To ensure that hours of operation do not have unreasonable impact on residential amenity on land within a residential zone.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Hours of operation of a use within 50m of a residential zone must be within:* *(a) 6.00 am to 10.00 pm Mondays to Saturdays inclusive;* *(b) 7.00 am to 9.00 pm Sundays and Public Holidays.* *except for office and administrative tasks.* ***P1*** *Hours of operation of a use within 50m of a residential zone must not have an unreasonable impact upon the residential amenity of land in a residential zone through commercial vehicle movements, noise or other emissions that are unreasonable in their timing, duration or extent.*	There are areas of Inner Residential Zone within 50m of the site boundaries (approx. 40 - 45m), however the only non-residential elements of the proposal are either the visitor accommodation which will operate in a way consistent with residential uses or are for reception type activity consistent with the acceptable solutions allowance for 'office and administrative' functions. The proposal is therefore considered to meet this standard.
24.3.2 Noise	
Objective: *To ensure that noise emissions do not cause environmental harm and do not have unreasonable impact on residential amenity on land within a residential zone.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**

A1 *Noise emissions measured at the boundary of a residential zone must not exceed the following:* *(a) 55dB(A) (LAeq) between the hours of 7.00 am to 7.00 pm;* *(b) 5dB(A) above the background (LA90) level or 40dB(A) (LAeq), whichever is the lower, between the hours of 7.00 pm to 7.00 am;* *(c) 65dB(A) (LAmax) at any time.* *Measurement of noise levels must be in accordance with the methods in the Tasmanian Noise Measurement Procedures Manual, … Noise levels are to be averaged over a 15minute time interval.*	As detailed previously the nearest residential zoned land is 40m or greater from the boundaries of the site/zone and the proposal does not include any noise generating activity. The proposal will therefore be consistent with the acceptable solution.
A2 *External amplified loud speakers or music must not be used within 50m of a residential zone.*	No external amplified loud speakers or music are associated with the non-residential use within the zone in accordance with this acceptable solution.
4.3.3 External lighting	
Objective: *To ensure that external lighting does not have unreasonable impact on residential amenity on land within a residential zone.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
P1 *External lighting within 50m of a residential zone must not adversely affect the amenity of adjoining residential areas, having regard to all of the following:* *(a) level of illumination and duration of lighting;* *(b) distance to habitable rooms in an adjacent dwelling.*	The nearest residential zoned land is over 40m from the site/zone boundaries and not in direst line of site with ground level entrances. All car parking areas which will be lit are within the building however the driveway lighting will be required to meet AS/NZS 1158.3.1:2005 and will operate overnight to serve the uses proposed (as opposed to commercial uses where lighting can be turned off outside of operating hours).  **Figure 9 Aerial describing nearby residential zones and indicating 50m from driveway**

	As described above there are no dwellings within the Inner Residential zoned are which are within 50m of the proposed driveway. While there are some dwellings within other zones which are within 50m of the driveway few have any view to the driveway. The level of illumination will be sufficient to meet the minimum requirements of the relevant parts of AS/NZS 1158.3.1:2005, as required by the planning scheme, to provide for the comfort and safety of users of pedestrians and vehicles using the driveway. The nearest habitable rooms for the building on the opposite side of Burnett Street are located 20m from the driveway entrance and viewed across the road reservation which is already lit by street lights. Having regard to the above the application will not affect the amenity of adjoining residential areas in accordance the performance criteria.
24.3.4 Commercial vehicle movements	
Objective: *To ensure that commercial vehicle movements not have unreasonable impact on residential amenity on land within a residential zone.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Commercial vehicle movements, (including loading and unloading and garbage removal) to or from a site within 50m of a residential zone must be within the hours of:* *(a) 6.00 am to 10.00 pm Mondays to Saturdays inclusive;* *(b) 7.00 am to 9.00 pm Sundays and Public Holidays.*	The proposed vehicle area at the Burnett Street access is marginally within 50m of a residential zone as the front boundary is site is 40m from the rear yard of 307-311A Elizabeth Street (although there is no residential development in this area). It is envisioned that the small numbers of commercial traffic generated by the development will be associated with occasional deliveries and waste collection that would be within these hours consistent with the acceptable solution.

3.3.3 DEVELOPMENT STANDARDS

The following use standards apply to the proposal.

23.4.1 Building Height
Objective: *To ensure that building height contributes positively to the streetscape and does not result in unreasonable impact on residential amenity of land in a residential zone.*

SCHEME PROVISION	DEVELOPMENT RESPONSE
***P1** Building height must satisfy all of the following:* *(a) be consistent with any Desired Future Character Statements provided for the area;* *(b) be compatible with the scale of nearby buildings;* *(c) not unreasonably overshadow adjacent public space;* *(d) allow for a transition in height between adjoining buildings, where appropriate;*	The proposed development is 7 storeys with a height of 18.85 at the north (Burnett Street) end, a maximum height of 22.1m, reducing to 18m at the southern end adjacent to the neighbouring Tasma Street properties. The application addresses the performance criteria as follows: a) There are no Desired Future Character Statements provided for this zone. b) The existing development in the surrounding area is mixed in age, style and use, including terrace style dwellings, traditional and more modern commercial properties and large warehouse style commercial to industrial style premises. The designed podium, with reduced apartment footprint above, provides a transition in height between the neighbouring buildings and the proposed. Additionally, the top storey of the building steps down at the southern end to further transition the height and to follow the slope of the site towards Tasma Street. The proposed development within the Commercial Zone will sit behind the 2-3 storey development which front the surrounding roads and in this way have minimal impact on streetscapes around the area providing a stepped transition in height from the edges to the centre and making it compatible with the scale of the area as detailed in the montages from Tasma and Burnett Streets included below (and within Appendix B) and the view lines detailed in the elevations. c) The only public space within proximity of the site is that within the surrounding public roads, Burnett Street to the northwest, Elizabeth Street to the west and southwest and Tasma Street to the southeast. As an internal lot these public areas are 30 – 40m from the upper levels of the proposed building and therefore of sufficient distance to not cause unreasonable overshadowing, as described in the accompanying shadow

	diagrams (Appendix C) detailing the limited extent of impact, even in midwinter. The development is therefore considered to meet performance criteria P1.

Figure 10: Montage – Development from Tasma Street

Figure 11: Montage – Development from Burnett Street

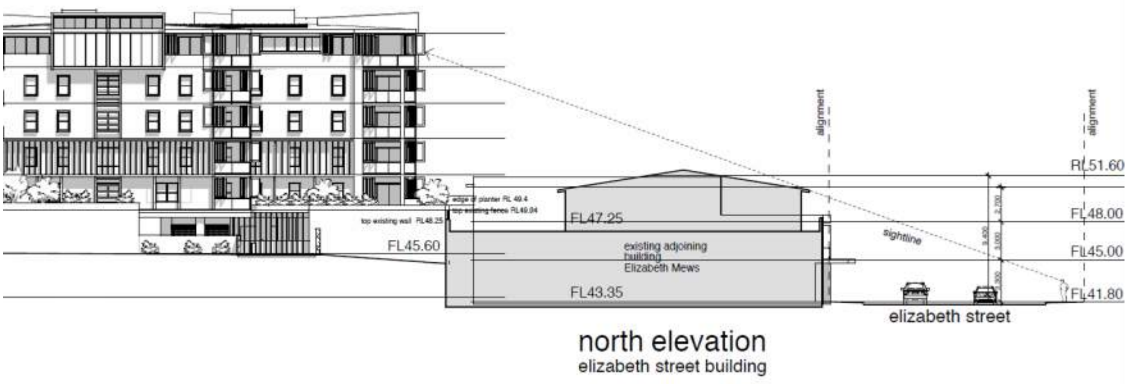

Figure 12: Extract North Elevation – Andrew McKeller Design

23.4.2 Setback	
Objective: *To ensure that building setback contributes positively to the streetscape and does not result in unreasonable impact on residential amenity of land in a residential zone.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Building setback from frontage must be parallel to the frontage and must be no less than:* *0m.*	The proposal is an internal lot and therefore the building line is setback within the body of the lot, acceptable solution is therefore met.
23.4.3 Design	
Objective: *To ensure that building design contributes positively to the streetscape, the amenity and safety of the public and adjoining land in a residential zone.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Building design must comply with all of the following:* *(a) provide the main pedestrian entrance to the building so that it is clearly visible from the road or publicly accessible areas on the site;* *(b) for new building … provide windows and door openings at ground floor level in the front façade no less than 40% of the surface area of the ground floor level facade;* *(c) for new building … ensure any single expanse of blank wall in the ground level front façade and facades facing other public spaces is not greater than 30% of the length of the facade;* *(d) screen mechanical plant and miscellaneous equipment such as heat pumps, air conditioning units,*	The proposal addresses the acceptable solution in the following ways: a) The development is designed so that the visitor accommodation reception entrance will be visible from the street. b) As an internal lot the development has no façade located in proximity to the front boundary within this zone, therefore no front façade as generally considered. The visitor accommodation entry, visible from the street, does however have windows and door openings consistent with this clause. c) There are no public facades to any other boundary within this zone, at ground level. d) mechanical plant is generally proposed to be screened. e) Roof top infrastructure and lifts have been considered in the design and are proposed to be incorporated along with other

switchboards, hot water units or similar from view from the street and other public spaces; *(e) incorporate roof-top service infrastructure, including service plants and lift structures, within the design of the roof;* *(f) provide awnings over the public footpath if existing on the site or on adjoining lots;* *(g) not include security shutters over windows or doors with a frontage to a street or public place.* ***P1** Building design must enhance the streetscape by satisfying all of the following:* *(a) provide the main access to the building in a way that addresses the street or other public space boundary;* *(b) provide windows in the front façade in a way that enhances the streetscape and provides for passive surveillance of public spaces;* *(c) treat large expanses of blank wall in the front façade and facing other public space boundaries with architectural detail or public art so as to contribute positively to the streetscape and public space;* *(d) ensure the visual impact of mechanical plant and miscellaneous equipment, such as heat pumps, air conditioning units, switchboards, hot water units or similar, is insignificant when viewed from the street;* *(e) ensure roof-top service infrastructure, including service plants and lift structures, is screened so as to have insignificant visual impact;* *(f) only provide shutters where essential for the security of the premises and other alternatives for ensuring security are not feasible;*	architectural features so that the various elements read as intentional designed elements which enhance rather than detract from the building design. f) There are no awnings on the subject site or adjacent properties in the Burnett Street frontage relevant to this zone. g) No security shutters are proposed. The development proposed is therefore considered to meet the performance criteria if the acceptable solution is considered not to be met.

(g) be consistent with any Desired Future Character Statements provided for the area.	
23.4.4 Passive Surveillance	
***Objective:** To ensure that building design provides for the safety of the public.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
***A1** Building design must comply with all of the following:* *(a) provide the main pedestrian entrance to the building so that it is clearly visible from the road or publicly accessible areas on the site;* *(b) for new buildings … provide windows and door openings at ground floor level in the front façade which amount to no less than 40% of the surface area of the ground floor level facade;* *(c) for new buildings … provide windows and door openings at ground floor level in the façade of any wall which faces a public space or a car park which amount to no less than 30% of the surface area of the ground floor level facade;* *(d) avoid creating entrapment spaces around the building site, such as concealed alcoves near public spaces;* *(e) provide external lighting to illuminate car parking areas and pathways;* *(f) provide well-lit public access at the ground floor level from any external car park.*	The proposal meets the acceptable solution in the following ways: a) Main pedestrian entrances are visible from the street. b) While no facades from the street, the facades which include the pedestrian entrances have sufficient openings at ground level. c) No facades at ground level face public or car parking areas. d) The building does not create any entrapment areas near entrances or public areas. e) and f) Car parking areas are all internal and therefore lit.
23.4.5 Landscaping	
***Objective:** To ensure that a safe and attractive landscaping treatment enhances the appearance of the site and if relevant provides a visual break from land in a residential zone.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
***A1** Landscaping along the frontage of a site is not required if all of the following apply:* *(a) the building extends across the width of the frontage, (except for vehicular access ways);* *(b) the building has a setback from the frontage of no more than 1m.*	The Burnett Street frontage is entirely required for the access and the building in Elizabeth Street is built to the front boundary. The proposed landscaping provided internally on the site, including substantial areas on the podium level. The application meets the acceptable solution

23.4.6 Outdoor Storage Areas	
Objective: *To ensure that outdoor storage areas for non-residential use do not detract from the appearance of the site or the locality.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Outdoor storage areas for non-residential uses must comply with all of the following:* *(a) be located behind the building line;* *(b) all goods and materials stored must be screened from public view;* *(c) not encroach upon car parking areas, driveways or landscaped areas.*	No outdoor storage is proposed.
23.4.7 Fencing	
Objective: *To ensure that fencing does not detract from the appearance of the site or the locality and provides for passive surveillance.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Fencing must comply with all of the following:* *(a) fences, walls and gates of greater height than 1.5m must not be erected within 10m of the frontage;* *(b) fences along a frontage must be at least 50% transparent above a height of 1.2m;…*	No fencing is proposed.

3.4 URBAN MIXED USE ZONE PROVISIONS

3.4.1 USE TABLE

Clause 15.2 of the Scheme provides the Use Table for the Urban Mixed Use Zone, within this table the proposed uses are as follows:

Permitted	
Use Class	***Qualification***
Food services	*Except if a take away food premises with a drive through facility.* *…*
Residential	*Except if no permit required*
Visitor Accommodation	*Any self-contained accommodation must not be located on the same site as a dwelling providing long-term residential accommodation, except for a caretakers dwelling.*
Discretionary	
Use Class	***Qualification***
Vehicle parking	

Visitor accommodation	*Except if permitted.* *… If for self-contained accommodation located on the same site as a dwelling providing long term residential accommodation, only if it has a separate ground level pedestrian access to a road or the site is mixed use. …*

The building within this zone contains the mixed-use components of the café/bar/restaurant, residential accommodation and the access for the car park and other apartments, it therefore complies with the qualification.

3.4.2 USE STANDARDS

15.3.1 Non-Residential Use	
Objective: *To ensure that non-residential use does not unreasonably impact residential amenity.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Hours of operation must be within:* *(a) 7.00 am to 9.00 pm Mondays to Fridays inclusive;* *(b) 8.00 am to 6.00 pm Saturdays;* *(c) 9.00 am to 5.00 pm Sundays and Public Holidays;* *except for office and administrative tasks or visitor accommodation.* ***P1*** *Hours of operation must not have an unreasonable impact upon the residential amenity through commercial vehicle movements, noise or other emissions that are unreasonable in their timing, duration or extent.*	The café/bar/restaurant may operate beyond the hours specified by A1, it is proposed to provide for the following operating hours: • 7.00am to 12.00am Monday - Friday; • 8.00am to 12.00am Saturday; • 9.00am to 9.00pm Sunday and Public Holidays; The proposal is therefore considered against the performance criteria. The proposed café/bar/restaurant will be located along a street where a number of existing establishments operate after 9pm and later in to the evening. The nearest residents will be those within the proposed development and the neighbouring mixed-use development. The proposed awning will provide a separation between the commercial activity at street level and the residential above, and in the context of the busy city street and surrounding commercial activities, will not result in the proposed operating hours unreasonably impacting on residential amenity.
A2 *Noise emissions measured at the boundary of the site must not exceed the following:* *(a) 55dB(A) (LAeq) between the hours of 8.00am to 6.00pm;*	There are no noise generating activities proposed however the café/bar/restaurant is proposed to operate after 6pm. While it is considered likely that it will meet the acceptable solution, this has not been assessed, and in accordance with the

(b) 5dB(A) above the background (LA90) level or 40dB(A) (LAeq), whichever is the lower, between the hours of 6.00pm to 8.00am; *(c) 65dB(A) (LAmax) at any time. …* ***P2** Noise emissions measured at the boundary of the site must not cause environmental harm.*	performance criteria use will be regulated to ensure that there is no environmental harm.
***A3** External lighting must comply with all of the following:* *(a) be turned off between 10:00 pm and 6:00 am, except for security lighting;* *(b) security lighting must be baffled to ensure they do not cause emission of light into adjoining private land.*	No external lighting is proposed within the zone which does not meet this acceptable solution.
***A4** Commercial vehicle movements, (including loading and unloading and garbage removal) to or from a site must be limited to within the hours of:* *(a) 7.00 am to 5.00 pm Mondays to Fridays inclusive;* *(b) 8.00 am to 5.00 pm Saturdays;* *(c) 9.00 am to 12 noon Sundays and Public Holidays.*	No commercial vehicles are proposed within this zoned area.

3.4.3 DEVELOPMENT STANDARDS FOR BUILDINGS AND WORKS

15.4.1 Building Height	
***Objective:** To ensure that building height contributes positively to the streetscape and does not result in unreasonable impact on residential amenity of land in the General Residential Zone or Inner Residential Zone.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
***A1** Building height must be no more than:* *10m.*	The height of building within this zone will be 9.8m and therefore meets the acceptable solution.
15.4.2 Setback	
***Objective:** To ensure that building setback contributes positively to the streetscape and does not result in unreasonable impact on residential amenity of land in a residential zone.*	

<table>
<tr><th>SCHEME PROVISION</th><th>DEVELOPMENT RESPONSE</th></tr>
<tr><td>A1 Building setback from frontage must be parallel to the frontage and must be no more than:
1m from the median street setback of all existing buildings on the same side of the street within 100m of the site.</td><td>The building proposed for the Elizabeth Street frontage is parallel and located on the front boundary. The setback of buildings in the vicinity are as follows:
Street Address — Front Setback (m)
265 - 269 Elizabeth — 0
271 Elizabeth — 0
273 Elizabeth — 0
275 - 277 Elizabeth — 0
279 Elizabeth — 0
285 Elizabeth — 0
293 Elizabeth — 0
299 Elizabeth — 0
281 Elizabeth — 2.2
295 - 297 Elizabeth — 2.9
The median is 0m and the proposal therefore meets A1.</td></tr>
<tr><td colspan="2">15.4.3 Design</td></tr>
<tr><td colspan="2">Objective: To ensure that building design for non-residential uses contributes positively to the streetscape, the amenity and safety of the public and adjoining land in a residential zone.</td></tr>
<tr><td>SCHEME PROVISION</td><td>DEVELOPMENT RESPONSE</td></tr>
<tr><td>A1 Building design for non-residential use must comply with all of the following:
(a) provide the main pedestrian entrance to the building so that it is clearly visible from the road or publicly accessible areas on the site;
(b) for new building … provide windows and door openings at ground floor level in the front façade no less than 40% of the surface area of the ground floor level facade;
(c) for new building … ensure any single expanse of blank wall in the ground level front façade and facades facing other public spaces is not greater than 30% of the length of the facade;
(d) screen mechanical plant and miscellaneous equipment such as heat pumps, air conditioning units, switchboards, hot water units or similar</td><td>The Elizabeth Street building within this zone meets the requirements of the acceptable solution as follows:
a) Pedestrian entrance to this part of the building is at the frontage.
b) The ground floor café tenancy has full height glazing across the front façade.
c) there is no blank façade facing the public street.
d) Mechanical plant will be screened.
e) Roof top service infrastructure is not proposed.
f) an awning is proposed over the Elizabeth Street footpath consistent with adjoining and nearby development.
g) security shutters are not proposed.
The development proposed is therefore considered to meet the acceptable solution.</td></tr>
</table>

from view from the street and other public spaces; *(e)* *incorporate roof-top service infrastructure, including service plants and lift structures, within the design of the roof;* *(f)* *provide awnings over the public footpath if existing on the site or on adjoining lots;* *(g)* *not include security shutters over windows or doors with a frontage to a street or public place.*	
A2 *Walls of a building facing the General Residential Zone or Inner Residential Zone must be coloured using colours with a light reflectance value not greater than 40 percent.*	There is no General Residential Zone or Inner Residential Zone land adjacent to the site and the nearest land within these zones is 50 to 60m away and separated by roads and other buildings and as such this provision does not apply. Notwithstanding, the sandstone and terracotta colour palate is generally consistent with this requirement.
15.4.4 Passive Surveillance	
Objective: *To ensure that building design for non-residential uses provides for the safety of the public.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Building design for non-residential uses must comply with all of the following:* ***A1*** *Building design for non-residential uses must comply with all of the following:* *(a)* *provide the main pedestrian entrance to the building so that it is clearly visible from the road or publicly accessible areas on the site;* *(b)* *for new buildings … provide windows and door openings at ground floor level in the front façade which amount to no less than 40 % of the surface area of the ground floor level facade;* *(c)* *for new buildings … provide windows and door openings at ground floor level in the façade of any wall which faces a public space or a car park which amount to no less than 30% of the surface area of the ground floor level facade;*	The development meets the acceptable solution as follows: a) The main entrance to the café and the apartments above are located directly from the front of the building. b) The front ground level façade has full glazed windows. c) There is no other façade facing public areas or a car park. d) The building takes up the entirety of the site within this zone and therefore does not create entrapment spaces. e) & f) The car parking and access to parking is internal and therefore all lit.

(d) avoid creating entrapment spaces around the building site, such as concealed alcoves near public spaces; *(e) provide external lighting to illuminate car parking areas and pathways;* *(f) provide well-lit public access at the ground floor level from any external car park.*	
15.4.5 Landscaping	
Objective: *To ensure that a safe and attractive landscaping treatment enhances the appearance of the site and if relevant provides a visual break from land in a residential zone.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Landscaping along the frontage of a site is not required if all of the following apply:* *(a) the building extends across the width of the frontage, (except for vehicular access ways);* *(b) the building has a setback from the frontage of no more than 1m.*	The Elizabeth Street building extend the width of the frontage and is located on the front boundary and therefore meets the acceptable solution.

3.5 POTENTIALLY CONTAMINATED LAND CODE

3.5.1 USE STANDARDS

Objective: *To ensure that potentially contaminated land is suitable for the intended use*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
P1 *Land is suitable for the intended use, having regard to:* *(a) an environmental site assessment that demonstrates there is no evidence the land is contaminated; or* *(b) an environmental site assessment that demonstrates that the level of contamination does not present a risk to human health or the environment; or* *(c) a plan to manage contamination and associated risk to human health or the environment that includes:* *(i) an environmental site assessment;* *(ii) any specific remediation and protection measures required to be implemented before any use commences; and*	A report including an environmental site assessment accompanies the application which demonstrates the performance criteria can be met.

(iii) a statement that the land is suitable for the intended use.	

3.5.2 DEVELOPMENT STANDARDS

E2.6.2 Excavation	
Objective: *To ensure that works involving excavation of potentially contaminated land does not adversely impact on human health or the environment.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
P1 *Excavation does not adversely impact on health and the environment, having regard to:* *(a) an environmental site assessment that demonstrates there is no evidence the land is contaminated; or* *(b) a plan to manage contamination and associated risk to human health and the environment that includes:* *(i) an environmental site assessment;* *(ii) any specific remediation and protection measures required to be implemented before excavation commences; and* *(iii) a statement that the excavation does not adversely impact on human health or the environment.*	The report, which includes an environmental site assessment, accompanying the application demonstrates the performance criteria can be met.

3.6 ROAD AND RAILWAY ASSETS CODE

3.6.1 USE STANDARDS

5.5.1 Existing road accesses and junctions - use standards	
Objective: *To ensure that the safety and efficiency of roads is not reduced by increased use of existing accesses and junctions.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A3 *The annual average daily traffic (AADT) of vehicle movements, to and from a site, using an existing access or junction, in an area subject to a speed limit of 60km/h or less, must not increase by more than 20% or 40 vehicle movements per day, whichever is the greater.* *P3 Any increase in vehicle traffic at an existing access or junction in an area subject*	The proposal is considered against the performance criteria. The proposal will meet the performance criteria by providing a safe access for traffic which does not unreasonably impact on the efficiency of the road as follows: a) the increase in traffic caused by the use; b) the majority of the traffic generated by the proposal will be cars with commercial traffic

to a speed limit of 60km/h or less, must be safe and not unreasonably impact on the efficiency of the road, having regard to: *(a) the increase in traffic caused by the use;* *(b) the nature of the traffic generated by the use;* *(c) the nature and efficiency of the access or the junction;* *(d) the nature and category of the road;* *(e) the speed limit and traffic flow of the road;* *(f) any alternative access to a road;* *(g) the need for the use;* *(h) any traffic impact assessment; and* *(i) any written advice received from the road authority.*	limited generally to waste collection and occasionally deliveries. c) the proposal includes removal of the existing access to Elizabeth Street which will provide a positive enhancement for the high numbers of pedestrians with use Elizabeth Street. The proposal retains access to Burnett Street with a similar arrangement but realignment to the existing access. d) Burnett Street is controlled at the Elizabeth Street intersection with traffic lights and the existing control of the road only provides for left hand in and out flow of traffic, ensuring that there will be no conflict for users crossing traffic lanes associated with using the access. e) The road is within the urban speed limit and as discussed above is controlled at the nearby intersection by traffic lights. f) with the removal of the Elizabeth Street access no alternative access exists. g) The proposed mixed use is consistent with the purpose of the zones. h) The traffic impact assessment undertaken provides detailed assessment of the access and vehicular traffic arrangements proposed and concludes that the access and traffic movements meet required standards subject to a number of recommendations.

3.6.2 DEVELOPMENT STANDARDS

E5.6.2 Road accesses and junctions	
Objective: *To ensure that the safety and efficiency of roads is not reduced by the creation of new accesses and junctions.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A2 *No more than one access providing both entry and exit, or two accesses providing separate entry and exit, to roads in an area subject to a speed limit of 60km/h or less.*	The development proposes one access providing entry and exit in accordance with this acceptable solution.
E5.6.4 Sight distance at accesses, junctions and level crossings	
Objective: *To ensure that accesses, junctions and level crossings provide sufficient sight distance between vehicles and between vehicles and trains to enable safe movement of traffic.*	

SCHEME PROVISION	DEVELOPMENT RESPONSE
A1 *Sight distances at:* *(a) an access or junction must comply with the Safe Intersection Sight Distance shown in Table E5.1; …*	The TIA confirms that the sight distances meet the requirements of the standard.

3.7 PARKING AND ACCESS CODE

3.7.1 USE STANDARDS

E6.6.1 Number of Car Parking Spaces	
Objective: *To ensure that:* *(a) there is enough car parking to meet the reasonable needs of all users of a use or development, taking into account the level of parking available on or outside of the land and the access afforded by other modes of transport.* *(b) a use or development does not detract from the amenity of users or the locality by:* *(i) preventing regular parking overspill;* *(ii) minimising the impact of car parking on heritage and local character.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *The number of on-site car parking spaces must be:* *(a) no less than and no greater than the number specified in Table E6.1;* *…* ***P1*** *The number of on-site car parking spaces must be sufficient to meet the reasonable needs of users, having regard to all of the following:* *(a) car parking demand;* *(b) the availability of on-street and public car parking in the locality;* *(c) the availability and frequency of public transport within a 400m walking distance of the site;* *(d) the availability and likely use of other modes of transport;* *(e) the availability and suitability of alternative arrangements for car parking provision;* *(f) any reduction in car parking demand due to the sharing of car parking spaces by multiple uses, either because of variation of car parking demand over time or because of efficiencies gained from the consolidation of shared car parking spaces;* *(g) any car parking deficiency or surplus associated with the existing use of the land;*	The number of on-site car parking spaces required by Table E6.1 are described in the table below, with the total being 165. The proposal includes a total of 106 car parking spaces. As the car parking spaces proposed are less than that specified, the performance criteria is required to be considered. The table below provides an indication of the proposed allocation and management of the proposed car parking spaces. The proposal meets the performance criteria as follows: (a) car parking demand – the 104 car parking spaces (plus 2 accessible) will include allocation to some individual parts of the development, but the retention of a pool of parking which will be available through lease arrangements to allow greater flexibility for ongoing management within the development than if all were separately purchased. This arrangement will result in future residents understanding what parking arrangement is able to be purchased along with flexibility in to the future for occupancy changes over time. (b) on-street and public car – while there is on street and public parking in the vicinity this is all controlled through much of the week meaning that residents will not impact in any significant way on the existing parking in the area.

(h) any credit which should be allowed for a car parking demand deemed to have been provided in association with a use which existed before the change of parking requirement, except in the case of substantial redevelopment of a site; *(i) the appropriateness of a financial contribution in lieu of parking towards the cost of parking facilities or other transport facilities, where such facilities exist or are planned in the vicinity;* *(j) any verified prior payment of a financial contribution in lieu of parking for the land;* *(k) any relevant parking plan for the area adopted by Council;* *(l) the impact on the historic cultural heritage significance of the site if subject to the Local Heritage Code;* *(m) whether the provision of the parking would result in the loss, directly or indirectly, of one or more significant trees listed in the Significant Trees Schedule.*	(c) public transport – the site is located on the frequently serviced bus route in Elizabeth Street and will therefore be well located for use of public transport. (d) other modes of transport – the site is well located for walkable access to the City centre as well as the provision of both motorbike and bicycle parking within the development which will provide encouragement for alternative transport use. (e) not directly relevant to current application. (f) reduction in car parking demand due to the sharing of car parking spaces by multiple uses - the café/bar/restaurant tenancy proposed is small and unlikely to be a use which would generate traffic in its own right but rather likely that people already in North Hobart would frequent the use, this sharing of car parking in North Hobart occurs due to the range of uses and services which attract people generally to the area. (g), (h), (i), (j), (k), (l) and (m) - not relevant to current application.

As detailed previously 104 car spaces (plus 2 accessible spaces) are provided, along with 33 motor bike (scooter) and 44 bicycle spaces. The proposal generates car parking in accordance with Table E6.1 as follows:

Type	Number	Parking generated
1 Bedroom	32	32
2 or more Bedroom (including 1 bedroom & Study)	36	72
Visitor (for residential)		23
Studio / Serviced Apartments	22	22
café/bar/restaurant @ 105m2 (15 for each 100m2 of floor area or 1 space for each 3 seats, whichever is the greater)	1	16
Total	**91**	**165**

The parking spaces are proposed to be allocated and managed as follows:

- The parking allocation proposed to some of the serviced apartments and to the larger residential apartments to be available for purchase.
- Some remaining parking and any additional not taken up by allocated apartments will be available to purchase through a ballot system.
- An additional pool of spaces is proposed to be retained so that they can be managed in a more flexible arrangement through leasing or for the accommodation (rather than purchase).
- The smaller 1-bedroom apartments, not allocated a car space, will be allocated a scooter and bicycle space.

This parking arrangement is further detailed as follows:

	1 Car space available	2 Car spaces available	Reserve in ballot for 1 space	Reserve in ballot for 2nd space	Scooter space available	Bicycle space available
Serviced	17					
1 Bedroom			24		24	24
+ 1 Bedroom	7					
1 Bedroom & Study	4					
2 Bedroom	9			9		
+ 2 Bedroom	4			4		
2 Bedroom & Study	12			12		
3 Bedroom		14				
VA Staff	2					
café/bar/ restaurant	2					
Reserved lease pool	20					
Totals	**91**		**49 apartments will have possibility in a ballot to purchase remaining spaces.**		**44 apartments will have possibility in a ballot to purchase 1 of the 9 Scooter spaces or 20 bicycle spaces.**	

E6.6.2 Number of Accessible Car Parking Spaces for People with a Disability

Objective: *To ensure that a use or development provides sufficient accessible car parking for people with a disability.*

SCHEME PROVISION	DEVELOPMENT RESPONSE
A1 *Car parking spaces provided for people with a disability must:* *(a) satisfy the relevant provisions of the Building Code of Australia;* *(b) be incorporated into the overall car park design;* *(c) be located as close as practicable to the building entrance.*	An accessible space is included within the parking layout, and in accordance with A1.

E6.6.3 Number of Motorcycle Parking Spaces

Objective: *To ensure enough motorcycle parking is provided to meet the needs of likely users of a use or development.*

SCHEME PROVISION	DEVELOPMENT RESPONSE
A1 *The number of on-site motorcycle parking spaces provided must be at a rate of 1 space to each 20 car parking spaces after the first 19 car parking spaces … (rounded to the nearest whole number). …*	The acceptable solution requires 5 spaces for motorcycles and 33 are proposed therefore meeting A1.

E6.6.4 Number of Bicycle Parking Spaces	
Objective: *To ensure enough bicycle parking is provided to meet the needs of likely users and by so doing to encourage cycling as a healthy and environmentally friendly mode of transport for commuter, shopping and recreational trips.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *The number of on-site bicycle parking spaces provided must be no less than the number specified in Table E6.2.*	Minimal bike parking is required for the proposed combination of residential and visitor apartments (only 1 per 40 rooms for visitor accommodation) an only 1 is required for the café. Notwithstanding, the proposal includes a total of 44 bicycle spaces as part of the overall transport strategy adopted for the development with some spaces to be allocated to apartments and others retained for shared use. Most of the bike parking is within the enclosed car park so would therefore be consistent with Class 2 (Locked compounds with communal access using duplicate keys). The proposal therefore complies with this acceptable solution.

3.7.2 DEVELOPMENT STANDARDS

The following Development Standards Are relevant:

E6.7.1 Number of vehicle accesses	
Objective: *To ensure that:* *(a) safe and efficient access is provided to all road network users, including, but not limited to: drivers, passengers, pedestrians, and cyclists, by minimising:* *(i) the number of vehicle access points; and* *(ii) loss of on-street car parking spaces;* *(b) vehicle access points do not unreasonably detract from the amenity of adjoining land uses;* *(c) vehicle access points do not have a dominating impact on local streetscape and character.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *The number of vehicle access points provided for each road frontage must be no more than 1 or the existing number of vehicle access points, whichever is the greater.*	The site currently has 2 vehicular accesses, the proposal intends to rely on the one to Burnett Street only and therefore meets A1.
E6.7.2 Design of Vehicular Accesses	
Objective: *To ensure safe and efficient access for all users, including drivers, passengers, pedestrians and cyclists by locating, designing and constructing vehicle access points safely relative to the road network.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
P1 *Design of vehicle access points must be safe, efficient and convenient, having regard to all of the following:*	As detailed in the accompanying TIA the combined vehicular and pedestrian access from Burnett Street has been designed in keeping with woonerf principles to achieve a

(a) avoidance of conflicts between users including vehicles, cyclists and pedestrians; *(b) avoidance of unreasonable interference with the flow of traffic on adjoining roads;* *(c) suitability for the type and volume of traffic likely to be generated by the use or development;* *(d) ease of accessibility and recognition for users.*	low speed shared traffic zone which not only provides safely for internal issuers creates a slow speed transition to the traffic network and public footpath crossing. Based on the assessment and recommendations of the TIA the development is considered to meet the performance criteria by providing for users, avoiding conflict between different users and avoidance of interference with Burnett Street traffic.
E6.7.3 Vehicular passing areas along an access	
Objective: *To ensure that:* *(a) the design and location of access and parking areas creates a safe environment for users by minimising the potential for conflicts involving vehicles, pedestrians and cyclists;* *(b) use or development does not adversely impact on the safety or efficiency of the road network as a result of delayed turning movements into a site.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
P1 *Vehicular passing areas must be provided in sufficient number, dimension and siting so that the access is safe, efficient and convenient, having regard to all of the following:* *(a) avoidance of conflicts between users including vehicles, cyclists and pedestrians;* *(b) avoidance of unreasonable interference with the flow of traffic on adjoining roads;* *(c) suitability for the type and volume of traffic likely to be generated by the use or development;* *(d) ease of accessibility and recognition for users.*	The access and parking layout provide for suitable passing in accordance with the standard as detailed within the TIA.
E6.7.4 On-site turning	
Objective: *To ensure safe, efficient and convenient access for all users, including drivers, passengers, pedestrians and cyclists, by generally requiring vehicles to enter and exit in a forward direction.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *On-site turning must be provided to enable vehicles to exit a site in a forward direction, …*	The proposed parking layout provides for onsite turning for vehicles within the car park circulation layout, the acceptable solution will therefore be met.
E6.7.5 Layout of parking areas	
Objective: *To ensure that parking areas for cars (including assessable parking spaces), motorcycles and bicycles are located, designed and constructed to enable safe, easy and efficient use.*	

SCHEME PROVISION	DEVELOPMENT RESPONSE
A1 *The layout of car parking spaces, access aisles, circulation roadways and ramps must be designed and constructed to comply with section 2 "Design of Parking Modules, Circulation Roadways and Ramps" of AS/NZS 2890.1:2004 Parking Facilities Part 1: Off-street car parking and must have sufficient headroom to comply with clause 5.3 "Headroom" of the same Standard.*	The layout of parking areas described on the plans is designed and comply the standard in accordance with A1.
E6.7.6 Surface treatment of parking areas	
Objective: *To ensure that parking spaces and vehicle circulation roadways do not detract from the amenity of users, adjoining occupiers or the environment by preventing dust, mud and sediment transport.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Parking spaces and vehicle circulation roadways must be in accordance with all of the following;* *(a) paved or treated with a durable all-weather pavement where within 75m of a property boundary or a sealed roadway;* *(b) drained to an approved stormwater system,* *unless the road from which access is provided to the property is unsealed.*	The proposal is designed to meet this acceptable solution.
E6.7.7 Lighting of parking areas	
Objective: *To ensure parking and vehicle circulation roadways and pedestrian paths used outside daylight hours are provided with lighting to a standard which:* *(a) enables easy and efficient use;* *(b) promotes the safety of users;* *(c) minimises opportunities for crime or anti-social behaviour; and* *(d) prevents unreasonable light overspill impacts.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Parking and vehicle circulation roadways and pedestrian paths serving 5 or more car parking spaces, used outside daylight hours, must be provided with lighting in accordance with clause 3.1 "Basis of Design" and clause 3.6 "Car Parks" in AS/NZS 1158.3.1:2005 Lighting for roads and public spaces Part 3.1: Pedestrian area (Category P) lighting.*	All parking and circulation areas are within the building and will therefore be lit in accordance with the BCA requirements and thereby meet this standard. It is proposed that the driveway to Burnett Street will be lit in accordance with the relevant clauses of AS/NZS 1158.3.1:2005 and therefore will comply with A1.
E6.7.8 Landscaping of parking areas	
Objective: *To ensure that large parking and circulation areas are landscaped to:* *(a) relieve the visual impact on the streetscape of large expanses of hard surfaces;* *(b) screen the boundary of car parking areas to soften the amenity impact on neighbouring properties;* *(c) contribute to the creation of vibrant and liveable places;*	

(d) reduce opportunities for crime or anti-social behaviour by maintaining clear sightlines.	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Landscaping of parking and circulation areas must be provided where more than 5 car parking spaces are proposed. This landscaping must be no less than 5 percent of the area of the car park, ….*	All parking is within the building and it is therefore considered that this standard is not relevant to the proposal.
E6.7.9 Design of Motorcycle Parking Areas	
Objective*: To ensure that motorcycle parking areas are located, designed and constructed to enable safe, easy and efficient use.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *The design of motorcycle parking areas must comply with all of the following:* *(a) be located, designed and constructed to comply with section 2.4.7 "Provision for Motorcycles" of AS/NZS 2890.1:2004 Parking Facilities Part 1: Off-street car parking;* *(b) be located within 30m of the main entrance to the building.*	The proposed parking meets this acceptable solution.
E6.7.10 Design of Bicycle Parking Facilities	
Objective*: To encourage cycling as a healthy and environmentally friendly mode of transport for commuter, shopping and recreational trips by providing secure, accessible and convenient bicycle parking spaces.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *The design of bicycle parking facilities must comply with all the following;* *(a) be provided in accordance with the requirements of Table E6.2;* *(b) be located within 30m of the main entrance to the building.* ***P1*** *The design of bicycle parking facilities must provide safe, obvious and easy access for cyclists, having regard to all of the following:* *(a) minimising the distance from the street to the bicycle parking area;* *(c) providing clear sightlines from the building or the public road to provide adequate passive surveillance of the parking facility and the route from the parking facility to the building;* *(d) avoiding creation of concealment points to minimise the risk.*	The parking proposed is in excess of that required and most will be located in the secure car park in accordance with the Class of facilities required by the Table. Additionally, outdoor spaces at the Burnett Street entrance are within 30m of the visitor accommodation reception area and all spaces provided within the parking areas of Levels 1 & 2 are within 30m of lift or doorway entrances to apartment levels. While the required employee space for the café would be located in the carpark but beyond 30m distance from the café this arrangement is considered to meet the performance criteria. The development is therefore considered to meet this standard.
A2 *The design of bicycle parking spaces must be to the class specified in table 1.1 of AS2890.3-1993 Parking facilities Part 3: Bicycle parking facilities in compliance with section 2 "Design of Parking Facilities" and*	The bicycle parking proposed is intended to meet required standards.

clauses 3.1 "Security" and 3.3 "Ease of Use" of the same Standard. ***P2*** *The design of bicycle parking spaces must be sufficient to conveniently, efficiently and safely serve users without conflicting with vehicular or pedestrian movements or the safety of building occupants.*	
E6.7.13 Facilities for commercial vehicles	
Objective: *To ensure that facilities for commercial vehicles are provided on site, as appropriate.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Commercial vehicle facilities for loading, unloading or manoeuvring must be provided on-site in accordance with Australian Standard for Off-street Parking, Part 2: Commercial. Vehicle Facilities AS 2890.2:2002, unless:* *(a) the delivery of all inward bound goods is by a single person from a vehicle parked in a dedicated loading zone within 50m of the site;* *(b) the use is not primarily dependent on outward delivery of goods from the site.* ***P1*** *Commercial vehicle arrangements for loading, unloading or manoeuvring must not compromise the safety and convenience of vehicular traffic, cyclists, pedestrians and other road users.*	The café/bar/restaurant tenancy is within 50m of a loading zone in Tasma Street and no significant inward delivery of goods is required for the residential/visitor apartments. Additionally, none of the proposed uses are reliant on outward delivery of goods. The development is therefore consistent with the acceptable solution. Notwithstanding the above, waste collection is proposed for the development through private contractor arrangement and will be undertaken at times where other traffic utilising the access is limited and would interrupt other users for only short periods (5 minutes approximately) and therefore be in accordance with the performance criteria if not considered to be in accordance with the acceptable solution.
E6.7.14 Access to a road	
Objective: *To ensure that access to the road network is provided appropriately.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Access to a road must be in accordance with the requirements of the road authority.*	The proposal does not include a new access.

3.8 STORMWATER MANAGEMENT CODE

3.8.1 DEVELOPMENT STANDARDS

E7.7.1 Stormwater Drainage and Disposal	
Objective: To ensure that stormwater quality and quantity is managed appropriately.	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *Stormwater from new impervious surfaces must be disposed of by gravity to public stormwater infrastructure.*	Stormwater is proposed to be connected to public infrastructure by gravity in accordance with this acceptable solution.

A2 *A stormwater system for a new development must incorporate water sensitive urban design principles for the treatment and disposal of stormwater if any of the following apply:* (a) *the size of new impervious area is more than 600m2;* *(b) new car parking is provided for more than 6 cars;* *(c) a subdivision is for more than 5 lots.*	The site is currently entirely covered in either buildings or paved areas and therefore the development proposed does not provide for any additional paved areas. New parking is provided, however this is entirely within the proposed building and no subdivision is proposed. The podium level landscaping proposed will add some stormwater use on to the site above that of the existing site development, consistent with water sensitive urban design principles. It is considered on this basis that the acceptable solution is met.
A3 *A minor stormwater drainage system must be designed to comply with all of the following:* (a) *be able to accommodate a storm with an ARI of 20 years in the case of non-industrial zoned land…, when the land serviced by the system is fully developed;* *(b) stormwater runoff will be no greater than pre-existing runoff or any increase can be accommodated within existing or upgraded public stormwater infrastructure.*	The stormwater system is to be designed to meet the acceptable solution.

3.9 HISTORIC HERITAGE CODE

As detailed previously the Elizabeth Street (existing access) area of the site is within the NH6 – Elizabeth Street Heritage Precinct, while the rest of the site (excepting the Elizabeth Street access) is within the Archaeological Potential area.

3.9.1 DEVELOPMENT STANDARDS FOR HERITAGE PRECINCTS

The Elizabeth Street accessway which is proposed to be developed with the 3 storey Café and visitor accommodation building (as well as pedestrian access to the remainder of the development) is within the NH6 precinct.

Table E13.2 Heritage Precincts includes the following in relation to the subject precinct:

Ref. No.	***Name of Precinct***	***Statement of Historic Cultural Heritage Significance***
NH6	*Elizabeth Street*	*This precinct is significant for reasons including:* *1. The fine quality and quantity of Old Colonial, mid to late Victorian, Federation and Inter War commercial/residential buildings demonstrate its original mixed use nature* *2. Intact individual houses that are representative examples of Old Colonial and Federation residential architecture.* *3. The continuous two storey (mostly brick) facades, general uniformity of form and scale together with a distinctive*

		nineteenth century subdivision pattern that create a consistent and impressive streetscape. 4. The front gardens of a few properties south of Burnett Street, and more recent street art are important aesthetic features that reinforce its mixed use character.

The area of the site within the precinct is described in the following:

Figure 13: Existing Elizabeth Street access

The following standard are relevant to the development proposed which is located within the precinct.

E13.8.1 Demolition	
Objective: *To ensure that demolition in whole or in part of buildings or works within a heritage precinct does not result in the loss of historic cultural heritage values unless there are exceptional circumstances.*	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *No Acceptable Solution.* ***P1*** *Demolition must not result in the loss of any of the following:* *(a) buildings or works that contribute to the historic cultural heritage significance of the precinct;* *(b) fabric or landscape elements, including plants, trees, fences, paths, outbuildings and other items, that*	The site does not contain any heritage listed fabric, additionally there is no existing building, trees, fences etc in the accessway which is within the heritage precinct as detailed below. The development therefore meets this performance criteria.

<table>
<tr><td>contribute to the historic cultural heritage significance of the precinct;…</td><td></td></tr>
<tr><td colspan="2">E13.8.2 Buildings and Works other than Demolition</td></tr>
<tr><td colspan="2">Objective: To ensure that development undertaken within a heritage precinct is sympathetic to the character of the precinct.</td></tr>
<tr><td colspan="2">
Figure 14: Elizabeth Street building</td></tr>
<tr><td>SCHEME PROVISION</td><td>DEVELOPMENT RESPONSE</td></tr>
<tr><td>P1 Design and siting of buildings and works must not result in detriment to the historic cultural heritage significance of the precinct, as listed in Table E13.2.</td><td>The part of the site located within the precinct has for many years been a vehicular access to the remainder of the site, located further to the rear. This access has been located directly between the early to mid-century 2 storey dwelling now used as an office, and a more recent mixed-use development which replaces a previous service station.

This specific part of Elizabeth Street which includes the subject site, has previously not had a continuity of built form evident in other parts of the precinct. However, the replacement of the service station with the neighbouring mixed-use development at 285 Elizabeth has filled the streetscape on the north side of the subject land and the proposed development will likewise replace the vehicular access with a building form to the street edge in a way which in consistent with the general pattern of other buildings (detailed in the figure above).

The width of the frontage will be filled entirely with the new building replicating the traditional lot arrangement along the street.

The proposed building will be built to the street edge, except for the upper level which</td></tr>
</table>

	is setback so the building reads as 2 storey from the street. Again this is consistent with the traditional pattern (including provision of an awning over the footpath), notwithstanding the adjacent building at 281 Elizabeth which is a little setback from the street edge (the front yard of which is paved and used occasionally as a parking space) which is more the exception than the rule along the street in a wider sense, however the ground floor entrance area has also been setback to reflect the location of the adjacent building. The width of the new building, at approximately 6m, creates a vertical façade which replicates the dimension and rhythm of the traditional streetscape and is similar to the neighbouring property at 281 Elizabeth. The proposed development will contain a mix of uses consistent with other parts of the precinct with commercial on the ground floor and accommodation above. While the predominate pattern is for 2 storey buildings along, there is the occasional building with a third habitable floor as well as many where their height is sufficient to accommodate 3 storeys and therefore their visual scale and relationship with the public realm of the street is consistent with that proposed by the 3-storey form (with the additional setback of the upper level) proposed within the precinct. For the above reasons it is considered that the development proposed will not impact upon the historic cultural heritage significance of the precinct.
P2 *Design and siting of buildings and works must comply with any relevant design criteria / conservation policy listed in Table E13.2, except if a heritage place of an architectural style different from that characterising the precinct.*	There are no design criteria or conservation policy listed in Table E13.2 for the precinct and the site does not contain a heritage place.
P3 *Extensions to existing buildings must not detract from the historic cultural heritage significance of the precinct.*	No extension to existing buildings are proposed.
A4 *New front fences and gates must accord with original design, based on photographic, archaeological or other historical evidence.*	No fences or gates are proposed.
A5 *Areas of landscaping between a dwelling and the street must be retained.*	There is no existing landscaping.

3.9.2 DEVELOPMENT STANDARDS FOR PLACES OF ARCHAEOLOGICAL POTENTIAL

The body of the lot (site excluding the Elizabeth Street accessway) is mapped within the area of archaeological potential. Separate accompanying reports provides a detailed history and assessment of the site and detail how the relevant performance criteria are addressed.

3.10 SIGNS CODE

This application includes 3 signs. All the proposed signs are located within the Commercial Zone and none are located within a Heritage Precinct.

The proposed signs are as follows:

Description	Size	Code Definition	
Two entrance signs reading *'66 Burnett St.'* including logo, located either side of driveway to identify entrance for traffic and pedestrians traveling in either direction in Burnett Street.	Sign 1 - Double sided sign on east side is 0.9m x 1.5m, mounted in the wall with maximum height of 1.5m. Sign 2 - Single sided sign on west side 1.2m x 1.5m frame mounted with maximum height 1.8m	*Ground Based Sign*	*means a sign permanently attached to the ground on its own supportive structure, independent of any building, primarily intended to identify the premises or its access on arrival and not be seen from a distance. Does not include a pole or pylon sign or ground based panel sign.*
One *'Reception'* – sign mounted over main entrance to building and accommodation management to assist guest wayfinding.	Sign 3 - Individual letters fixed to façade, approx. overall size 0.3m x 3.0m	*Wall Sign*	*means a sign painted on or attached parallel to the wall of a building or fence surrounding a building.*

3.10.1 USE STANDARDS

E17.6.1 Use of Signs	
Objective: To ensure that the use of signs complements or enhances the built or natural environment in which they are located.	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *A sign must be a permitted sign in Table E.17.3.*	All the signs are permitted in the Zone in Table E.17.3 in accordance with A1.
A2 *A sign associated with the sale of goods or services must relate directly to the use of the building or site to which it is affixed.*	The signage meets this acceptable solution.
A3 *A sign must not contain flashing lights, moving parts or moving or changing messages or graphics, except if a Statutory Sign.*	The signage meets this acceptable solution.
P4 *An illuminated sign within 30 metres of a residential use must not have an unreasonable impact upon the residential amenity of that use caused by light shining into windows of habitable rooms.*	The signs are mounted close to the ground and do not face nearby residential dwellings, they are also internally illuminated rather than being lit by external directional lighting. They will therefore not impact upon residential

	amenity in accordance with this performance criteria.

3.10.2 DEVELOPMENT STANDARDS

E17.7.1 Standards for Signs	
Objective: To ensure that the design and siting of signs complement or enhance the characteristics of the natural and built environment in which they are located.	
SCHEME PROVISION	**DEVELOPMENT RESPONSE**
A1 *A sign must comply with the standards listed in Table E.17.2 and be a permitted sign in Table E17.3.*	The signs comply with standards of Table E.17.2 and are permitted in Table E.17.3. The signs therefore comply with A1.
P2 *The number of signs per business per street frontage must:* *(a) minimise any increase in the existing level of visual clutter in the streetscape; and where possible, shall reduce any existing visual clutter in the streetscape by replacing existing signs with fewer, more effective signs;* *(b) reduce the existing level of visual clutter in the streetscape by replacing, where practical, existing signs with fewer, more effective signs;* *(c) not involve the repetition of messages or information.*	Of the signs proposed 2 are located at the frontage facing in different directions to ensure the property can be located from both directions in Burnett Street, the remaining sign, identifying reception is located significantly within the property and does not therefore add to visual clutter on the street. The signage is designed to provide clear and identifiable wayfinding for visitors and guests rather than advertising. The signage proposed is therefore in accordance with the performance criteria.
A3 *Signs must not obscure or prevent or delay a driver from seeing a Statutory Sign or a Tourist Information Sign.*	The signs meet this acceptable solution.
A4 *Signs must not resemble Statutory Signs because of the same or similar shape, size, design, colour, letter size or lighting.*	The signage meets this acceptable solution.

Table E17.2 Sign Standards

Sign Type	*Sign Standards*
Ground Base Sign	*(a) Height above the ground no more than 2400mm;* *(b) Area of each face is no more than 2.5m2;* *(c) Does not encroach on any road or other public reservation.*
Wall Sign	*(a) Message on the front face only;* *(b) Projection from the face of the wall or fence no more than 450mm;* *(c) Does not extend laterally beyond the wall or above the top of the wall to which it is attached;*

	(d) Area of sign no more than 2m2.

Table E17.3 Status of Signs in Zones

Sign Type	*Commercial Zone*
Ground Base Sign	*P*
Wall Sign	*P*

4. CONCLUSION

It is proposed to redevelop land at 66 Burnett Street, North Hobart for the purposes of a mixed use development which includes residential and visitor accommodation apartments and a new café/bar/restaurant on Elizabeth Street.

The development will replace the automotive repair business and all existing building on the site. The site is an internal lot which currently has 2 separate access strips fronting both Elizabeth Street and Burnett Street. The development proposes retaining access to Burnett Street and construction of a new building form to fill the existing gap between existing buildings in the streetscape.

The use and development proposed meet all the relevant provisions of the *Hobart Interim Planning Scheme 2015* which apply to the land, although relying on some performance criteria to do so.

The proposed development includes provision of car parking as well as significant amounts of bicycle and motor bike parking which given it inner urban location will provide for the anticipated demand given the close proximity to both North Hobart central and the City. The apartments proposed will significantly add to the market for housing in the local area as well as the availability of this alternative housing type in the city.

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APPENDIX A – MONTAGES

APPENDIX B – SHADING DIAGRAMS

Figure 1: Photo - Burnett Street frontage (Taken by Locky Gardner at eye height, 17/10/17 11:59am, 35mm focal length 20mm, f/2.8, 1/8000)

Figure 2: Montage - Burnett Street frontage (includes some perspective correction from original image)

Figure 3: Photo - Elizabeth Street frontage (Taken by Locky Gardner at eye height, 17/10/17 12:07pm, 35mm focal length 20mm, f/2.8, 1/8000)


Figure 4: Montage - Elizabeth Street frontage (includes some perspective correction and sky change from original image)

Figure 5: Photo - View north from intersection of Elizabeth Street and Tasma Street (Taken by Locky Gardner at eye height, 17/10/17 12:09pm, 35mm focal length 20mm, f/2.8, 1/8000)

Figure 6: Montage - View north from intersection of Elizabeth Street and Tasma Street (no alteration to original image)

Figure 7: Photo - View west from intersection of Tasma Street and Church Street (Taken by Jacqui Blowfield at 1600mm height, 7/9/18 12:46pm, 35mm focal length 27mm, f/8, 1/160)

Figure 8: Montage - View west from intersection of Tasma Street and Church Street (no alteration to original image)

Figure 9: Photo - View southwest from Burnett Street (Taken by Locky Gardner at eye height, 17/10/17 12:16pm, 35mm focal length 20mm, f/2.8, 1/8000)

Figure 10: Montage - View southwest from Burnett Street (no alteration to original image)

Figure 11: Photo - View east from intersection of Elizabeth Street and Burnett Street (Taken by Locky Gardner at eye height, 6/12/17 9:26am, 35mm focal length 20mm, f/2.8, 1/8000)

Figure 12: Montage - View east from intersection of Elizabeth Street and Burnett Street (includes minor perspective correction from original image)

WINTER SOLSTICE – EXISTING AND PROPOSED

Figure 1: 9am Existing – 21 June

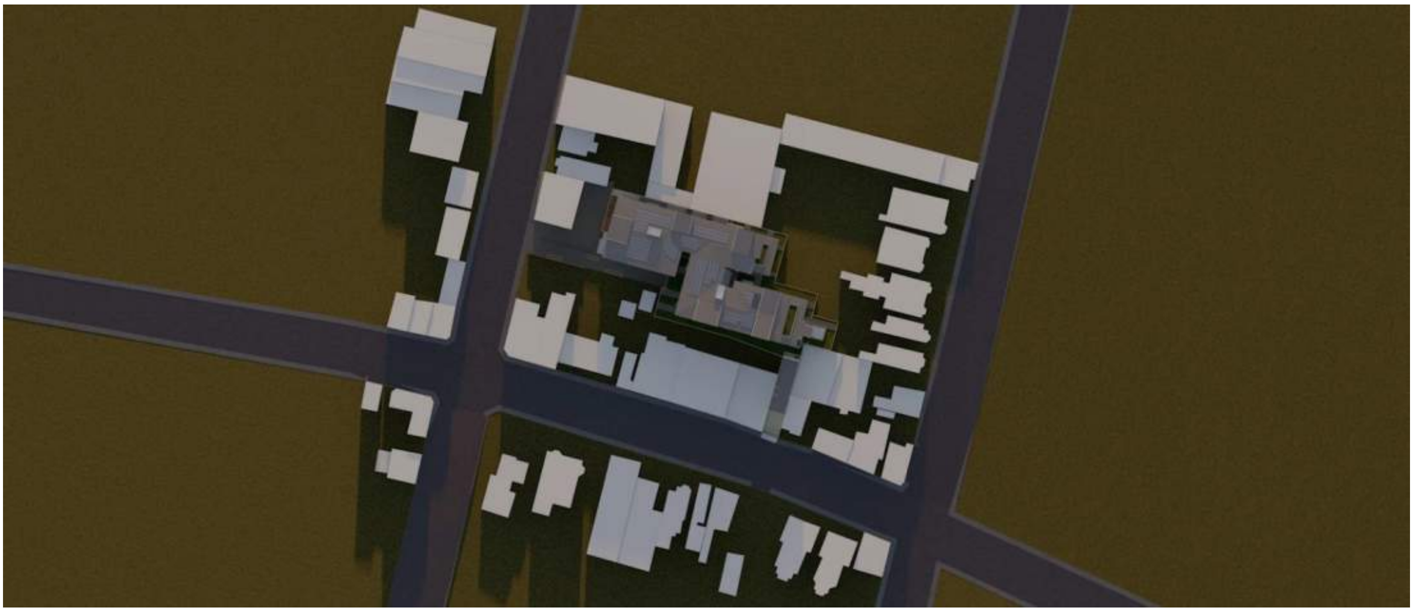

Figure 2: 9am Proposed– 21 June

Figure 3: 10am Existing– 21 June

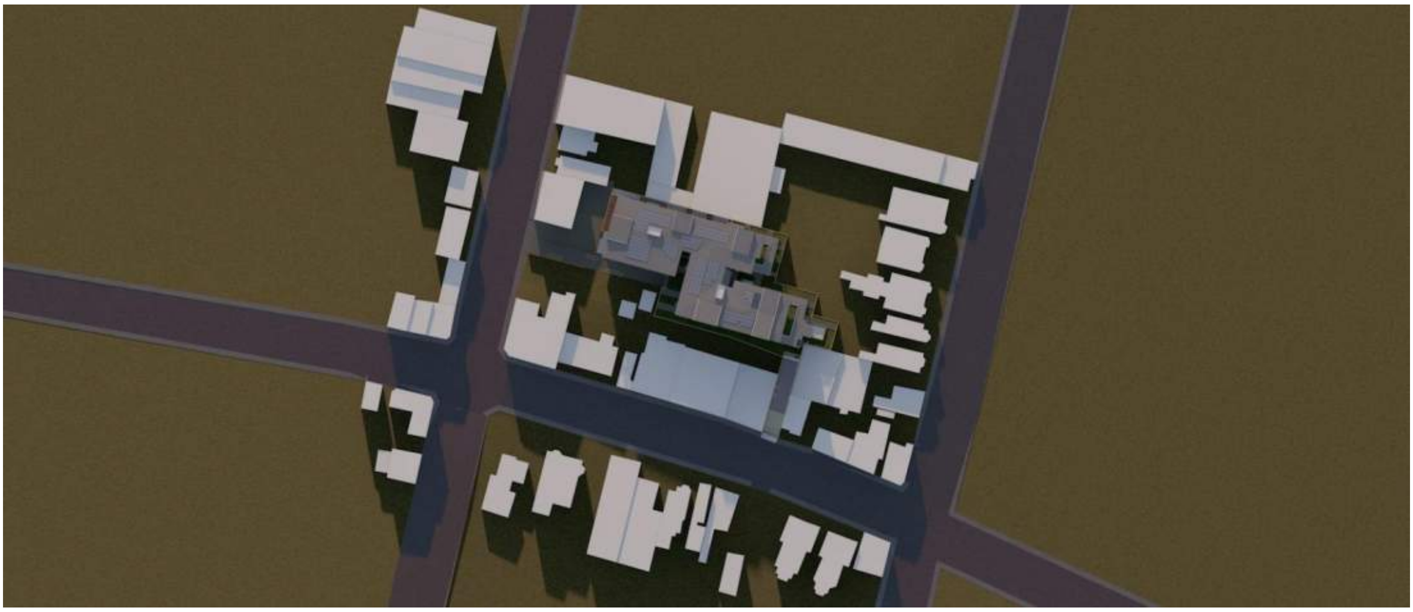

Figure 4: 10am Proposed– 21 June

Figure 5: 11am Existing– 21 June

Figure 6: 11am Proposed– 21 June

Figure 7: 12pm Existing– 21 June

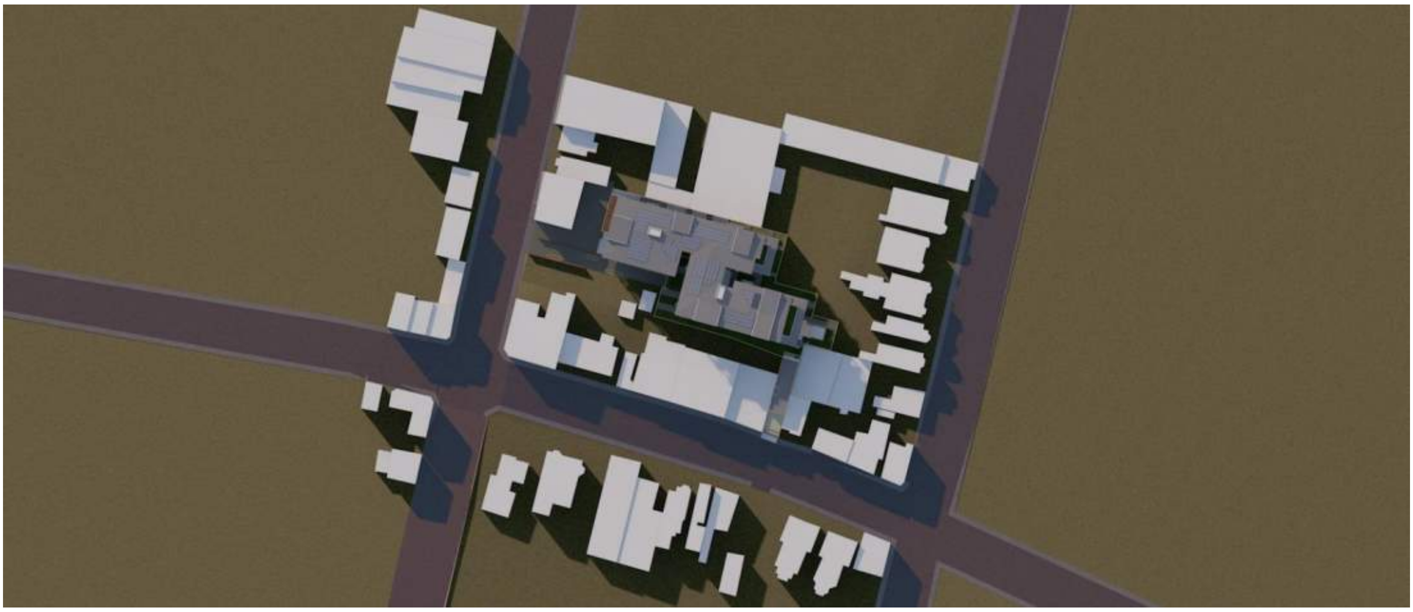

Figure 8: 12pm Proposed– 21 June


Figure 9: 1pm Existing– 21 June

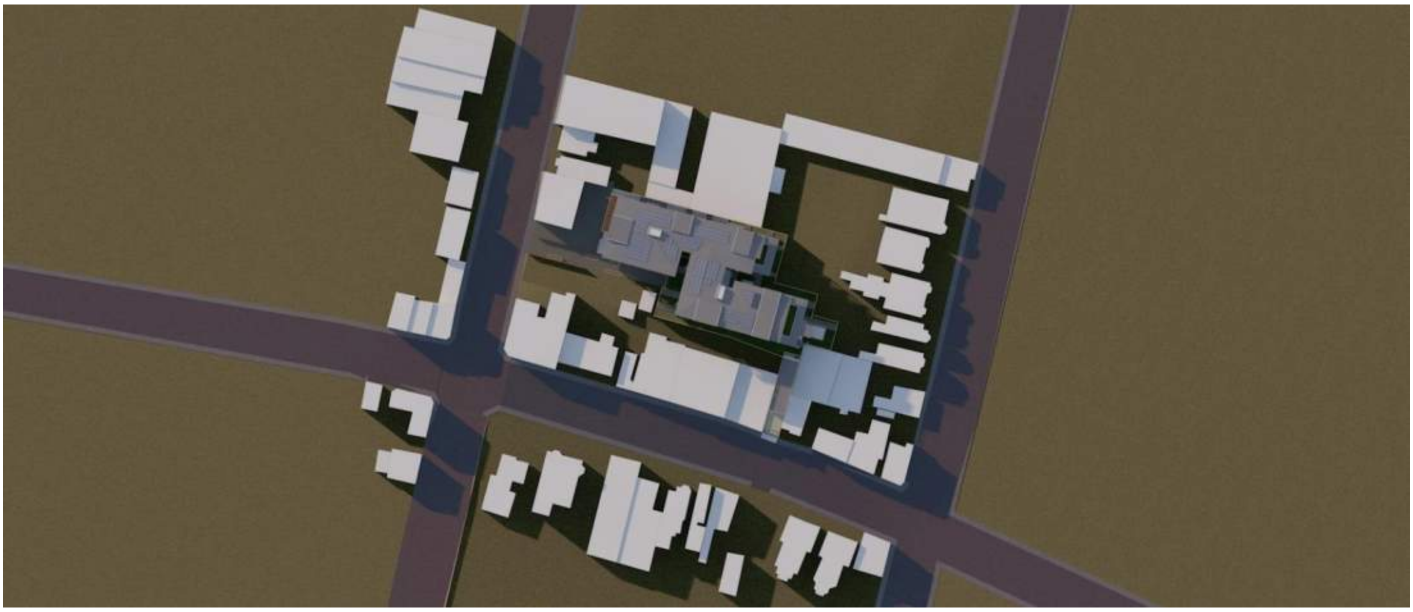
Figure 10: 1pm Proposed– 21 June

Figure 11: 2pm Existing– 21 June

Figure 12: 2pm Proposed– 21 June

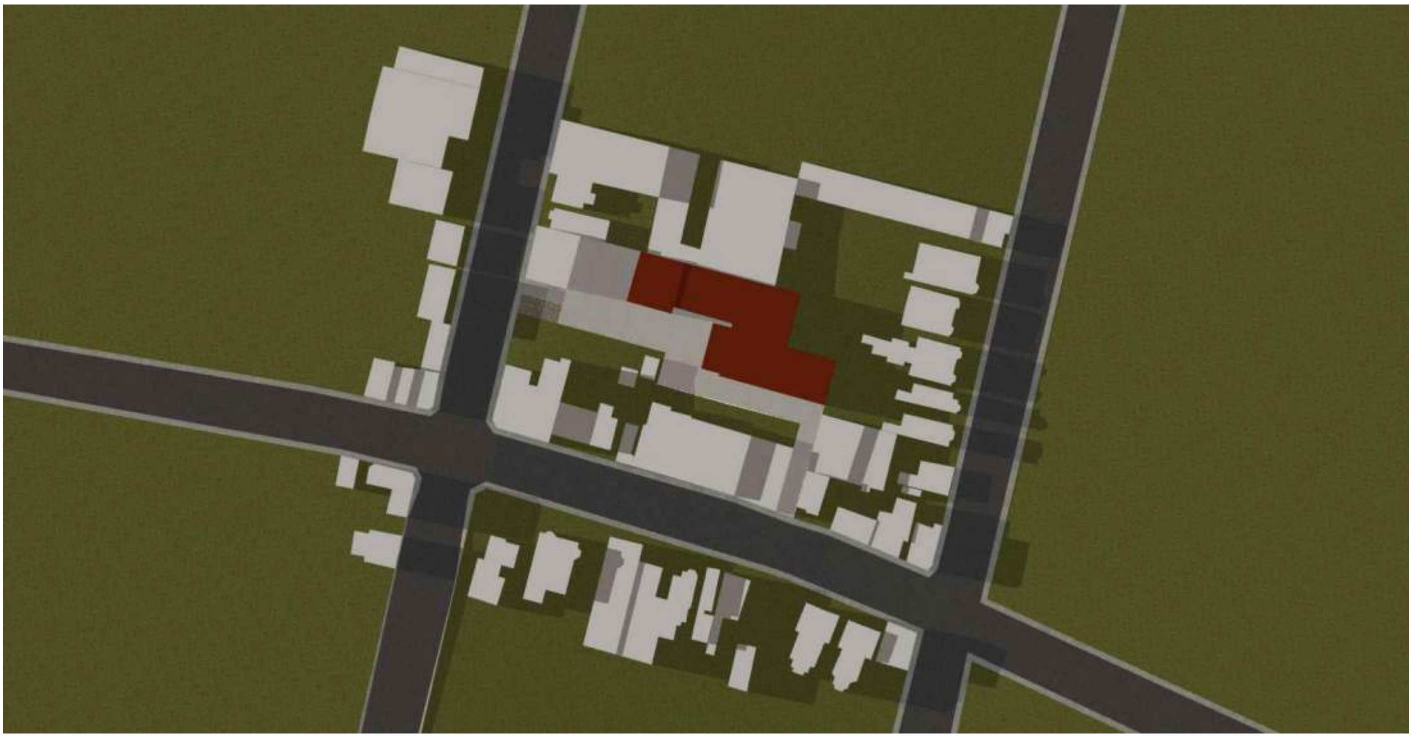

Figure 13: 3pm Existing– 21 June

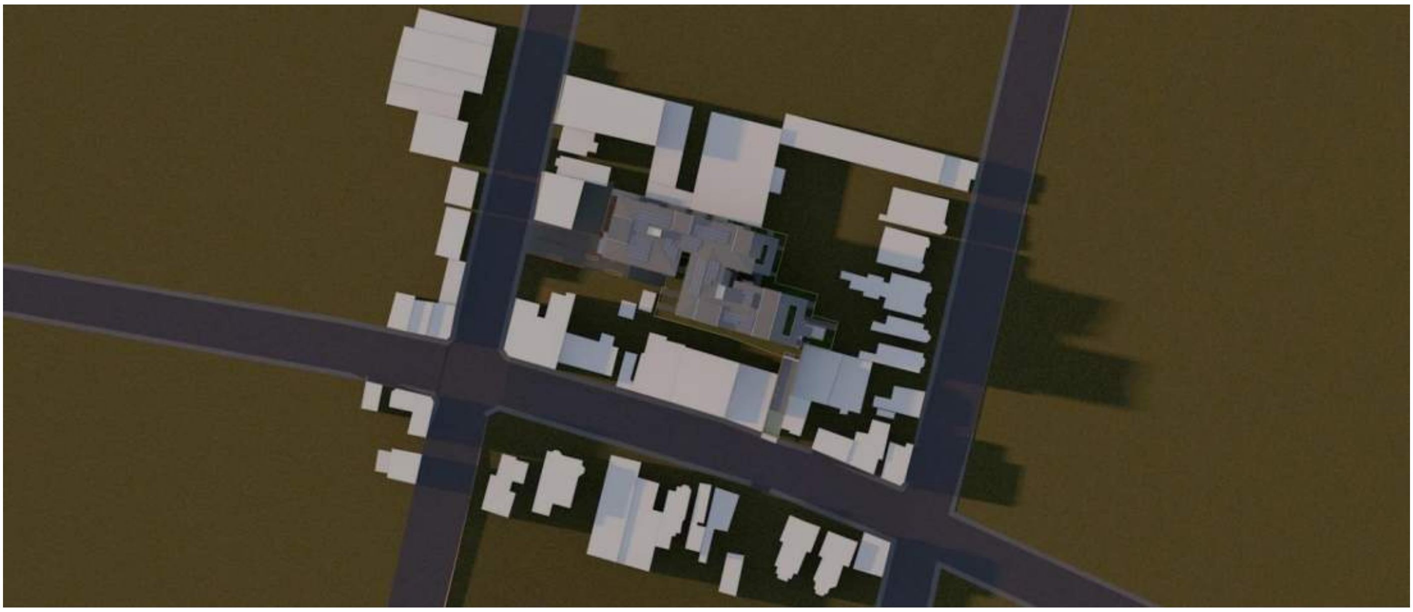

Figure 14: 3pm Proposed– 21 June

SUMMER SOLSTICE - PROPOSED

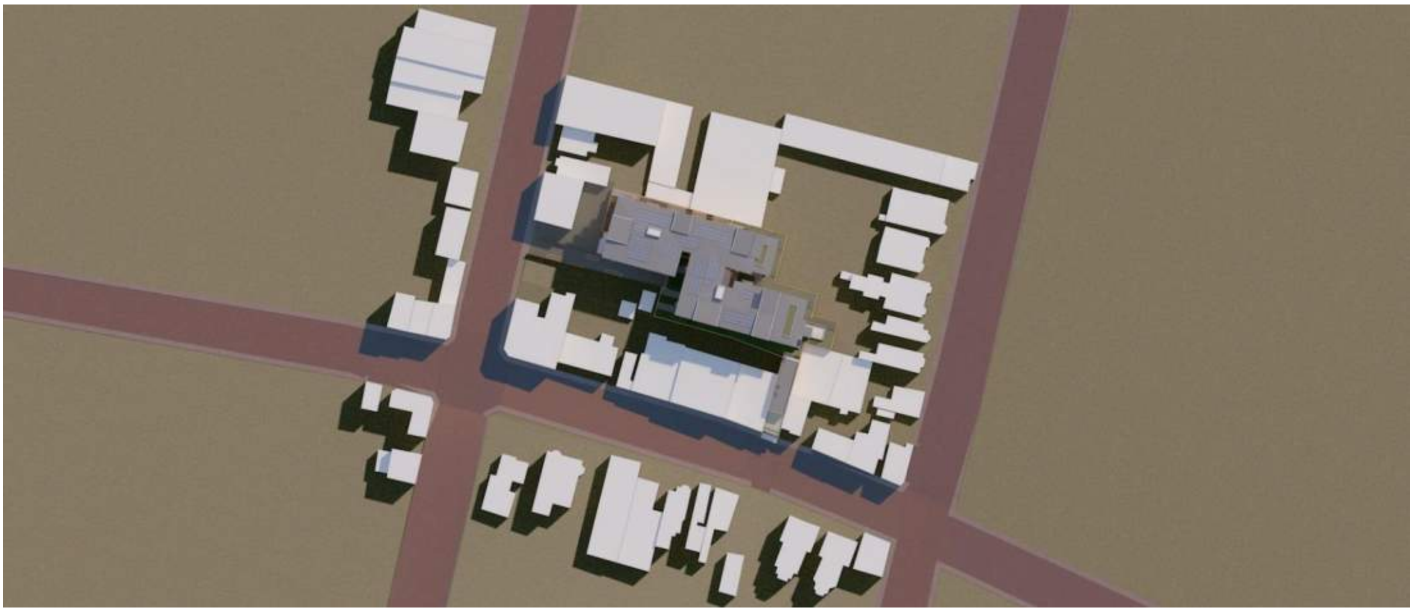

Figure 15: 8am Proposed– 22 December

Figure 16: 9am Proposed– 22 December

Figure 17: 10am Proposed– 22 December

Figure 18: 11am Proposed– 22 December

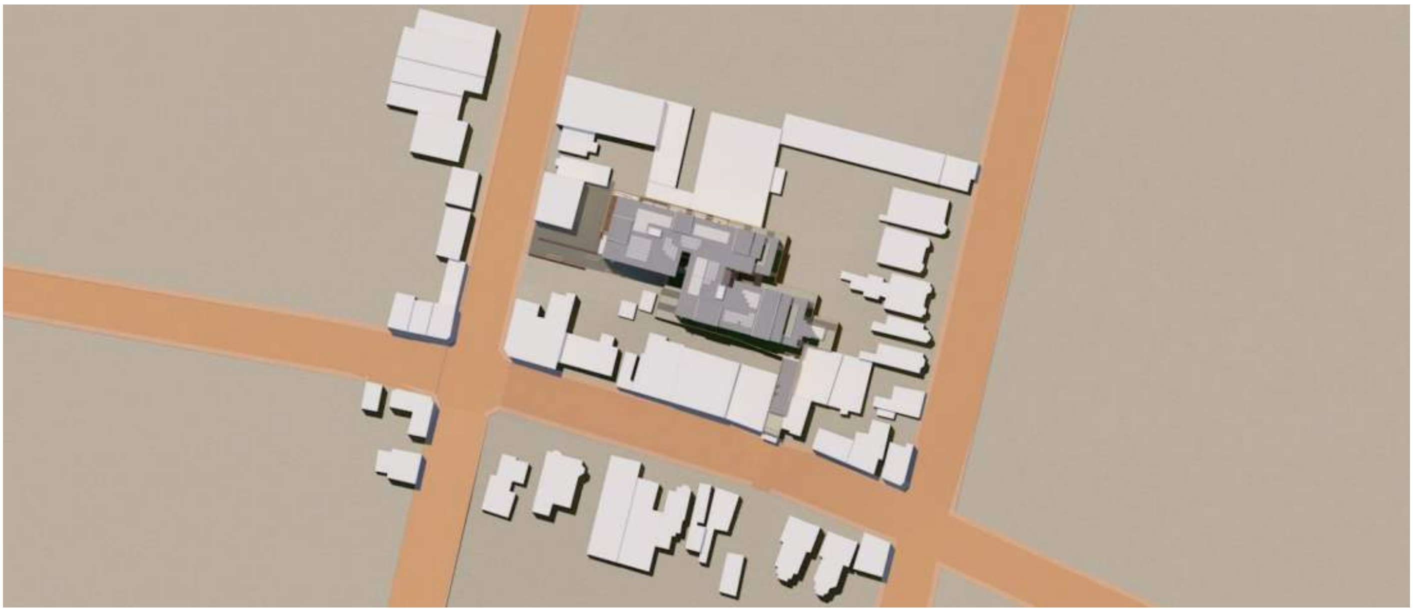

Figure 19: 12pm Proposed– 22 December

Figure 20: 1pm Proposed– 22 December

Figure 21: 2pm Proposed– 22 December

Figure 22: 3pm Proposed– 22 December

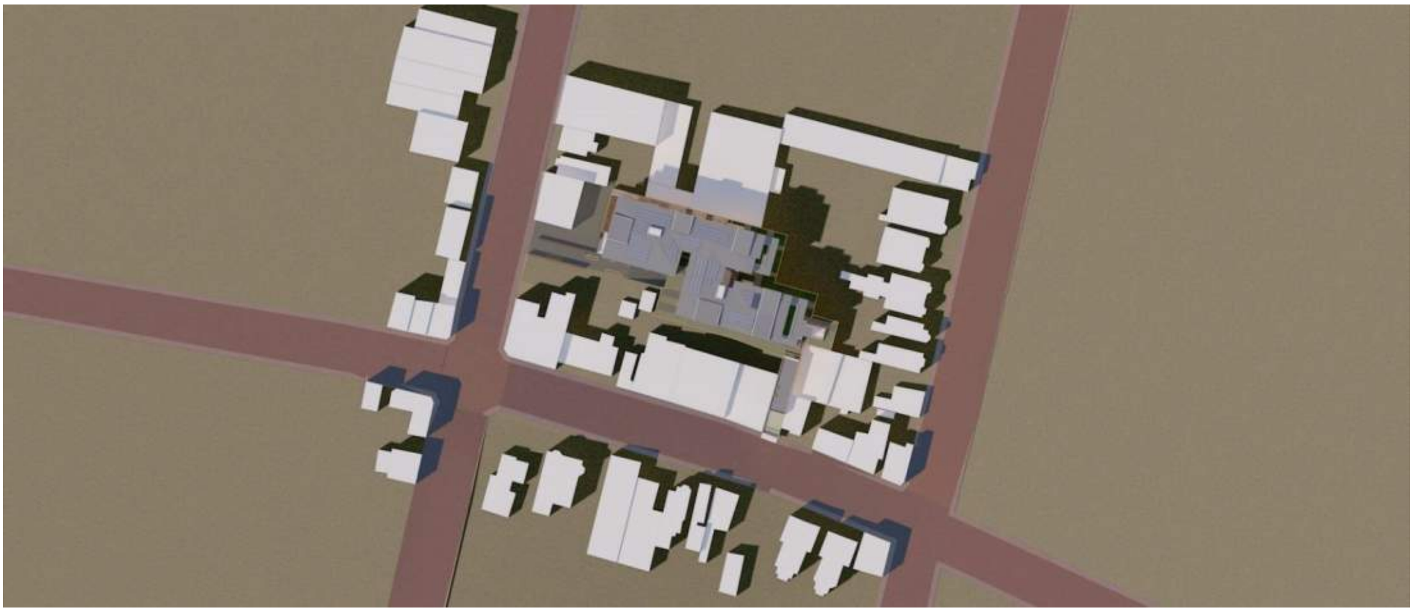

Figure 23: 4pm Proposed– 22 December

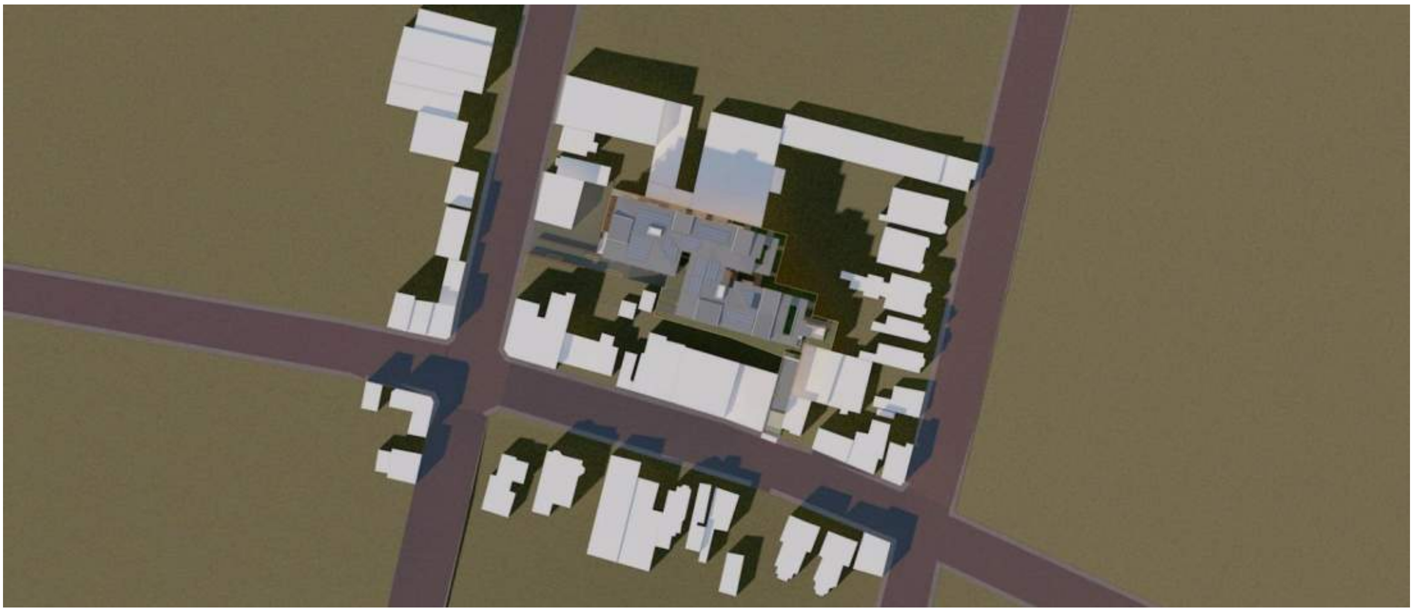

Figure 24: 5pm Proposed– 22 December

TASARC

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STATEMENT OF ARCHAEOLOGICAL POTENTIAL & ARCHAEOLOGICAL METHOD STATEMENT

66 BURNETT STREET, NORTH HOBART

Report prepared for Hobart Properties & Securities Pty Ltd
By IRENE INC. & TASARC
5th June 2018

CONTENTS

PART 1. STATEMENT OF ARCHAEOLOGICAL POTENTIAL

PART 2. ARCHAEOLOGICAL METHOD STATEMENT

PART 1 STATEMENT OF ARCHAEOLOGICAL POTENTIAL

5.0 HISTORIC STRUCTURAL DEVELOPMENTS

This section seeks to summarise the known physical developments on the subject site including all known structures throughout the known period of historical occupancy. A site plan overleaf shows the locations of these structures.

5.1 Pre-1830's

There do not appear to have been any permanent structures erected on the site prior to the mid to late 1830's which is consistent with the known site history of the bulk of the North Hobart area. At this time, only the frontages onto major thoroughfares such as Elizabeth Street were being developed leaving areas to the rear structurally empty.

5.2 Late 1830's

The land settlement pattern in north Hobart started to change however in the late 1830's as properties rearward of street side allotments were taken up as semi-rural venues for the purposes of food production or light industry. The land comprising the subject area was a beneficiary of this expansion as street side properties on Elizabeth street saw the construction of more infrastructure such as sheds and cottages to the rear of the main street. These now encroached and occupied the western edge of the subject area. However, at the same time the bulk of the property remained the domain of orchards and market gardens.

5.3 1850's-1900

This period was one of intensification whereby yet more buildings were added to the western periphery of the subject site. Older out-buildings and cottages dating from the pre-1840's were demolished and new additions erected in their stead. But the bulk of the site remained planted with various food stuffs.

5.4 Post 1900

The first half of the 20th century saw limited developments occur on the previously un-utilised farm lands. These were limited to sheds providing additional storage capacity for grown products and related equipment. However, from the 1950's the previously empty farmland allotments were acquired and developed by industry, most notably Gorringe's Garage complex. The arrival of industry also required the demolition of the rearward historic features related to the Elizabeth Street allotments for more substantive vehicle access. The present day structural landscape is a direct reflection of this period with no subsequent developments evident.

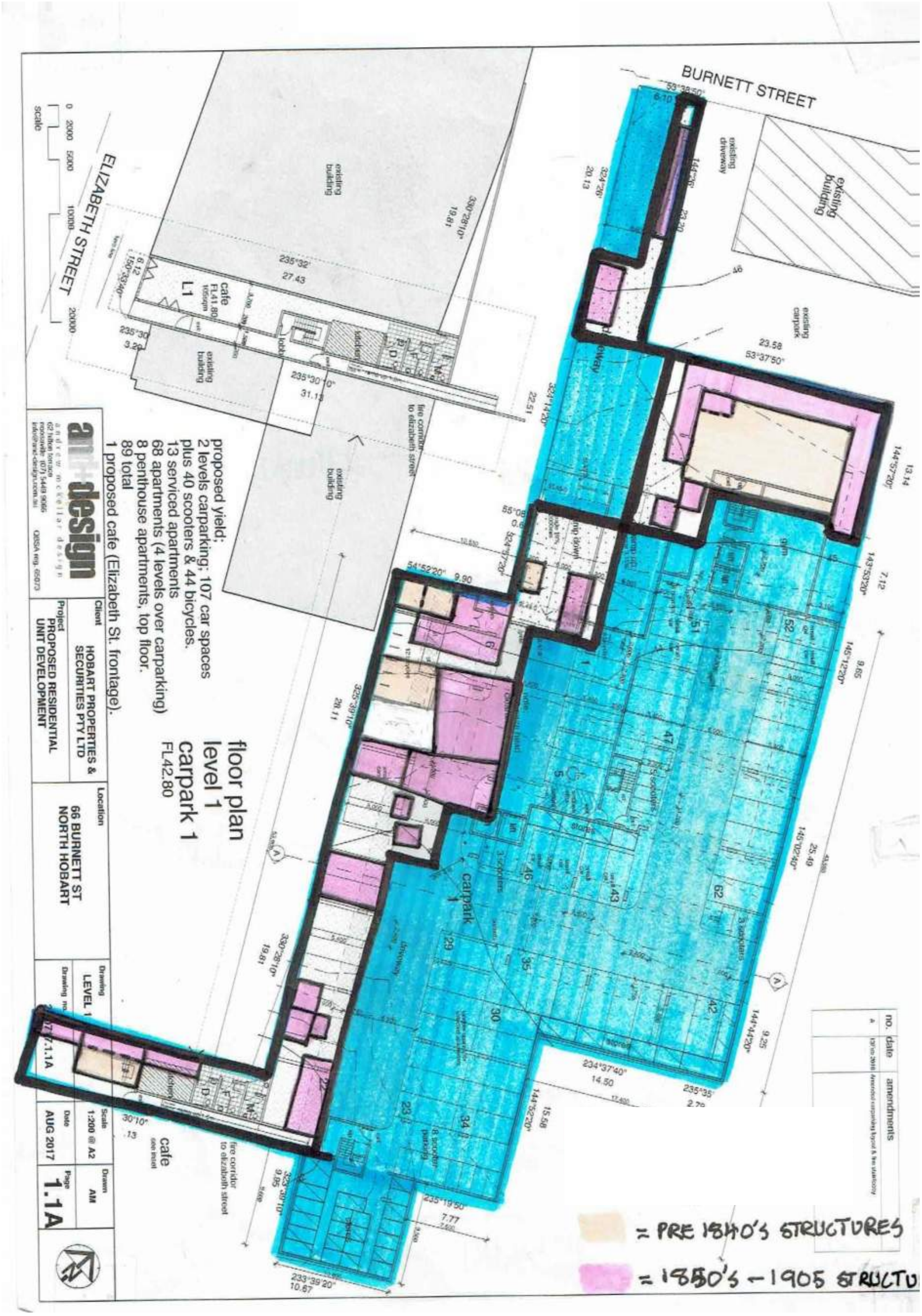

FIGURE 1. SITE PLAN SHOWING LOCATIONS AND EXTENT OF KNOWN HISTORIC FEATURES

6.0 HISTORICAL ARCHAEOLOGICAL POTENTIAL ZONING

This section seeks to summarise the various zones of archaeological potential within the subject property based on:

- Areas of known historic (19th century) structural occupancy
- Areas of known mid-20th century industrial structural occupancy
- The probability that resident historic structures and features have survived mid-20th century re-developments throughout the subject area

Two differing zone types have been adopted for the subject area. These have been based on the fact the site only exhibits two distinct areas of historic land usage:

1) The western periphery where culturally significant developments related to those properties on Elizabeth Street occurred between the late 1830's and 1900 (Section 6.1 below).

2) The remainder of the site where food production activities and associated lack of structural development prevailed until the 1950's when culturally insignificant industrial activities moved in (Section 6.2 below).

6.1 Medium to High Archaeological potential

This area encompasses the western periphery of the subject area that accommodated a large number of out-buildings and small cottage-based domiciles related to adjacent properties on Elizabeth Street which they former a part of. These were erected between the late 1830's and 1900 and potentially consist of two generations of layered structural occupancy; hence its rating as an area of MEDIUM/HIGH Archaeological potential.

6.2 Minimal to Low Archaeological potential

This area encompasses those parts of the subject area that hosted only open area agricultural pursuits between the early 19th and mid-20th centuries. Such areas comprise the greater bulk of the subject area (in excess of 55%). Because very little building related activity occurred here (in favour of planted food crops), this zone has been deemed to be of MINIMAL/LOW Archaeological potential.

Both zones are defined overleaf in Figure 2.

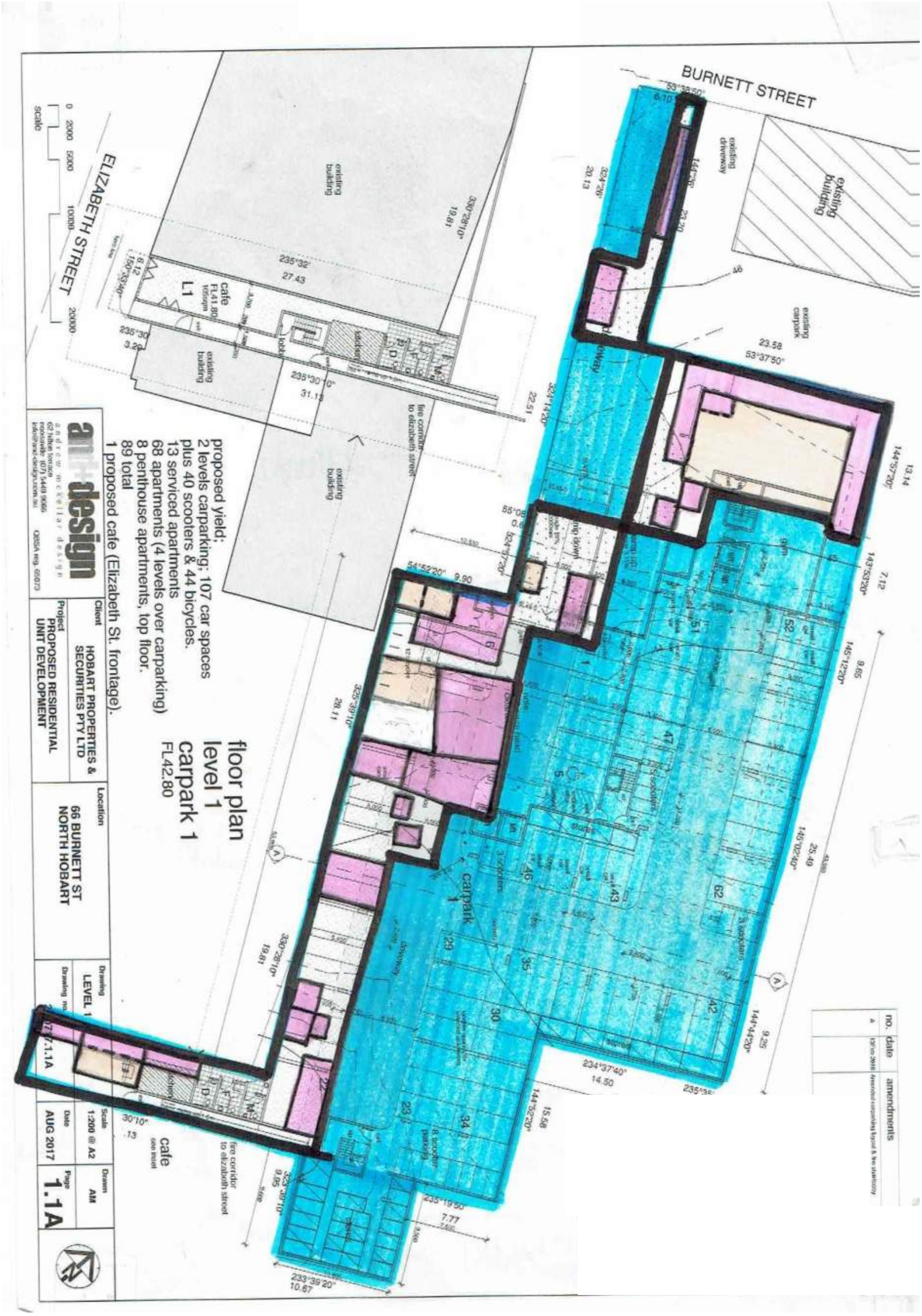

FIGURE 2. SITE PLAN SHOWING ARCHAEOLOGICAL POTENTIAL ZONES WITHIN SUBJECT AREA

Aqua blue solid areas are Minimal/Low potential zones requiring no additional works

Clear areas defined by solid black outlines are Medium/High potential zones requiring excavation

7.0 TYPICAL TYPES OF HISTORICAL ARCHAEOLOGY ENCOUNTERED IN URBAN CONTEXTS

This section seeks to clarify the types of archaeological features likely to be encountered within the area of Medium to High Archaeological Significance.

7.1 Structural footings

These features typically consist of the stone or brick footings of buildings that have survived the demolition process. Although all fabric from the roof line down to the wall bases was generally demolished, any trenched or otherwise buried features such as footings were generally left *in situ* and a new construction level laid down over these remains as a labour-saving device. This method prevailed until mechanisation allowed machinery to remove elements of the building landscape more efficiently.

7.2 Sub-floor archaeological deposits

During occupancy, detritus inevitably slipped through the timber floors of that period and gathered beneath alongside the bearers. This material included those items associated with the actual construction (worker's items) but more commonly the occupants. These deposits survived because they occurred at the same lower level as the adjacent building footings (7.1). Deposited contents include personal items such as women's personal items (jewellery, buttons, beads) children's toys (ceramic dolls, game tokens, marbles) and men's effects such as gambling items, smoking paraphernalia and concealed alcohol or pharmaceutical elixirs.

7.3 Cellars

Underground cellars and basements occurring on sloping ground are often revealed in association with dwellings, public houses and public buildings. Demolition works tended to merely backfill these with resident soils and rubbish. As such their excavation often reveals information about the surrounding building fabric and style that is not revealed at the ground level.

7.4 Privy cesspits

Although ostensibly serving as utilitarian toilet venues, these pits also offered a good locale to dispose of unwanted rubbish. Rubbish disposal often included items such as contraband, things specific to the resident trade or business, and treasured items that had become broken; hence their untimely disposal. These features inevitably survive because they too were sub-surface features.

7.5 Rubbish pits

Because rubbish disposal had not yet become a civic responsibility, any opportunity was taken to dispose of unwanted items including kitchen rubbish. Although unwanted at the time these things often help in better understanding the lifestyles and personalities of the residents. Once again, as sub-surface features these pits tended to survive the historic demolition process.

7.6 Hard landscaped areas

In addition to the structures erected on an allotment, adjacent yard-spaces were laid out to accommodate garden areas or high traffic thoroughfares involving carts, coaches and horses. These areas were often defined by paved sandstone and brick, compacted surfaces (crushed shell, ash, timber) or cobbling. As flat surfaces these features also generally survived the demolition process and serve to better define the location of historic activities on site.

7.7 Drainage features

Historic attempts to better drain the Hobartian landscape often involved very labour intensive and exotic solutions involving underground engineering and use of all manner of materials. Once described and mapped these features can even assist in the dating of the site if all other indicators have been removed by demolition works.

8.0 ABORIGINAL ARCHAEOLOGY

The presence of Aboriginal archaeological remnants is not overly anticipated at the subject site due to:

- The expected intensity of disturbance between the current ground level and the historic layers beneath

- The absence of landscape components such as water sources and promontories that might have made the subject area attractive to Aboriginal occupancy

However, protocols related to the discovery of Aboriginal archaeological discoveries are emplaced in the attached Archaeological Method Statement (Part 2).

9.0 RECOMMENDATIONS

The results of this desk top investigation recommend that:

- Construction proceed in all areas deemed to be of **Minimal/Low Archaeological potential** without previous archaeological investigation. However, the discovery of any archaeological features during said activities should be reported to the consultant archaeologist for immediate assessment and mitigation.

- Areas deemed to be of **Medium/High Archaeological potential** be subject to a pre-determined archaeological excavation strategy involving ground clearance and excavation of exposed historic features as defined in the attached 'Archaeological Method Statement' (Part 2).

Both these areas are delineated in Figure 2.

PART 2 ARCHAEOLOGICAL METHOD STATEMENT

This document seeks to provide both a justification and methodology for the safe and ethical excavation of archaeological elements situated within the subject area.

10.0 STATUTORY COMPLIANCE

In association with the attached Statement of Archaeological Potential (SOAP), this Method Statement must form part of the relevant Development Application to the Hobart City Council (HCC). No construction or archaeological based works should occur without a permit.

11.0 CLIENT RESPONSIBILITIES

Unless otherwise negotiated the client is responsible for the provision of the following:

- On site running water
- Perimeter fencing around the defined subject area
- Results from any and all engineering assessments of the site's sub-surface
- All 'Dial and Dig' data pertaining to the location and disposition of all services
- The safe demolition of all requisite above ground features without impacting on the sub-surface that may contain sensitive archaeology
- Any traffic management responses
- A safe and currently rated mechanised excavator of no less than 5-ton capacity
- The engagement of a suitably qualified surveyor to locate and record the locations of all significant archaeological features
- Payment for on site excavation works and 'post dig' analysis, report authorship and printing

12.0 ARCHAEOLOGICAL CONSULTANCY RESPONSIBILITIES

Unless otherwise negotiated the Archaeological consultant is responsible for the provision of the following:

- A licenced excavator operator to undertake mechanised excavation at the archaeologist's discretion
- The preparation of a Safe Work Method Statement (SWMS) addressing responsible and safe work practices for the consultancy's management and staff
- Archaeological excavation works as recommended in this report or subsequent negotiations based on up-dated construction-based information

13.0 JOB VARIATIONS/CONSTRAINTS

The following factors are considered 'circumstances beyond the legal control of the archaeological consultant' and may result in the calendrical or financial alteration of the negotiated contract.

- Inclement weather that prevents safe or professionally responsible excavation activities
- Alteration to the existing excavation footprint by third parties
- Contamination issues relating to any evident chemical/bio hazards based on site-based evidence or prior advisement
- The discovery of Aboriginal materials that may require consultation with the relevant statutory body (Aboriginal Heritage Tasmania) or its nominees

- The discovery of any unanticipated (extraordinary discoveries) will require the immediate notification of the appropriate authorities
- The discovery of any human forensic remains will likewise require the immediate notification of the Tasmanian Police and the State Coroner

14.0 SITE RESEARCH DESIGN

The excavation of archaeological sites not only expose physical fabric and artefacts. The disposition of both entities offers additional information about the physical development of the site that may assist in providing further information on the following:

- The urban development of Hobart (Town) during the 19th century
- The development of North Hobart as a satellite suburb of Hobart during the first generations of European settlement
- The nature of occupancy of the resident buildings within the subject area
- The nature and identities of the occupants themselves
- The professional activities that may have occurred on the site that are not evident in the historic record

The recovery of such information may also have broader implications for other research fields.

15.0 SITE BASED METHODOLOGY

In order to most efficiently expose, excavate, record and recover portable items of significance from the subject area, the following activities will be undertaken:

- A mechanical excavator will be used to strip all existing hard surfaces and overburden above the archaeological layers and deposits
- Any archaeological features and deposits will be hand stripped and excavated
- All features will be recorded in a field note book and digitally photographed
- The location and extent of all features will be recorded by a licenced surveyor
- All excavated artefacts will be bagged according to location and removed off site for analysis (See Section 16.0 below)

16.0 ANALYSIS OF RECOVERED ARTEFACTS

After recovery, all artefacts will be assessed for their capacity to impart information about their identity and relevance to the site. Unrevealing (non-diagnostic) artefacts will be discarded leaving a core collection that will undergo a cleaning and analysis process which will:

- attempt to identify and date the artefacts
- draw meaning from their presence on site
- explain their ultimate relevance to the site and the historic activities undertaken there

17.0 COMPLETION OF FINAL REPORT

The results of the historical research, on-site excavation and artefact analysis will be combined to best explain the nature and contents of the subject area's archaeology. This will be collectively written up in a report that will be distributed to all interested parties.

18.0 POTENTIAL FOR ON SITE INTERPRETATION OF ARCHAEOLOGICAL DISCOVERIES

Some of Hobart's recent private and public building developments now include displays relating to the resident archaeological investigations undertaken there. These displays include:

- Interesting artefacts that may uniquely relate to the site or the history of Hobart
- Text and images explaining the historical/physical development of the site
- Biographical 'cameos' of interesting persons and/or activities known to have occurred at the site

Such a display would be housed sympathetically within a publicly accessible area within the development. It would also be designed and displayed in a professional manner.

19.0 POTENTIAL FOR I*N SITU* PRESERVATION OF ARCHAEOLOGICAL DISCOVERIES

In the event that sub-surface remains discovered during the archaeological excavation are found to be sufficiently unusual or interesting to the broader community, consideration should be given to their retention and ultimate display within the new development.

20.0 APPENDIX

20.1 Site History report

66 BURNETT STREET, NORTH HOBART

Site History Report

Last Updated – 19 December 2017

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ireneinc PLANNING & URBAN DESIGN

CONTENTS

1. INTRODUCTION

1.1 SCOPE

Ireneinc Planning have been engaged to prepare a report which details the history of the subject land in light of the proposed development at 66 Burnett Street, North Hobart.

1.2 SITE AND EXISTING DEVELOPMENT

The land comprising the site is 66 Burnett Street (Title ref: 26099/4).

This property currently contains large existing buildings currently operating as Donald Gorringe Reconditioning and Spare Parts Pty Ltd, an automotive repair centre and machining workshop. The proposal will include demolition of the existing buildings.

1.3 PROPOSED DEVELOPMENT

The proposed use and development will provide a multistorey apartment building which will provide residential and visitor accommodation and include a 3 storey building in the Elizabeth Street access which will include a ground commercial, and residential accommodation above.

The main part of the development will be comprised of a 2 level podium with parking, storage, visitor accommodation and gym, above this there will be 5 levels of apartments.

The development will include some extent of site excavation for approximately 1/3 the site area with a depth between 1-2m, with the maximum cut required in the area of the L1 Gym to approximately 2.5m as detailed in the architectural plans.

2. SITE DESCRIPTION

Figure 1: Topographic Plan with site highlighted (LISTMap)

Figure 2: Aerial Plan with site highlighted (LISTMap)

The following images provide a description of the site, its existing development and surrounds.


Figure 3: Elizabeth Street accessway from entry


Figure 4: from inside site viewing southeast along boundary with 285 Elizabeth Street


Figure 5: from inside site viewing north, to 64 Burnet Street office building and beyond, to buildings located opposite in Burnett Street

Figure 6: from inside site viewing along rear boundary of 285 Elizabeth Street southeast towards Tasma Street


Figure 7: from inside site viewing northwest towards rear of 297 Elizabeth Street & Republic including sandstone wall along boundary


Figure 8: Burnett St accessway, showing existing shared access and parking area

3. STATUTORY CONTROLS

3.1 TASMANIAN HERITAGE REGISTER

The area around the site contains a substantial number of heritage listed places (mapped in the figure below), the subject land is not listed. The nearest built fabric of heritage significance, is the rear boundary wall of 299 Elizabeth Street (the Republic Bar & Café, formally the Empire Hotel) which is located adjacent to the access to the subject land.

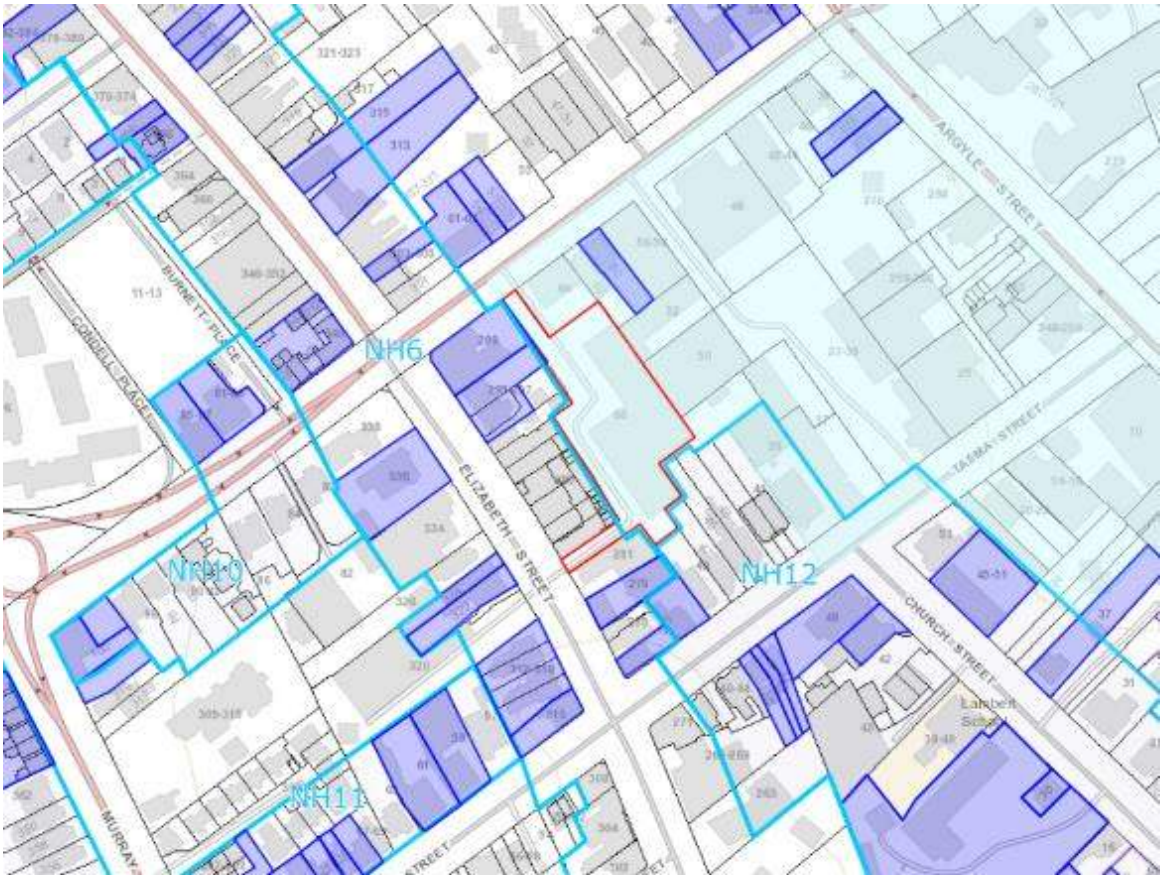

Figure 9: The subject land is outlined in red, THC listed places outlined in dark blue, HIPS Heritage Places are shaded in dark blue, HIPS Heritage Precincts are outlined in mid blue and HIPS Places of Archaeological Potential shaded in light blue.

3.2 HOBART INTERIM PLANNING SCHEME 2015

The Historic Heritage Code of the *Hobart Interim Planning Scheme 2015* contains provisions related to Heritage Places, Heritage Precincts, Cultural Landscape Precincts and Places of Archaeological Potential.

The preceding figure identifies the various listed places (including the THC listed places) in and around the subject land.

The Purpose of the Historic Heritage Code is:

E13.1.1 To recognise and protect the historic cultural heritage significance of places, precincts, landscapes and areas of archaeological potential by regulating development that may impact on their values, features and characteristics.

The subject land is not a Heritage Place. The adjacent sandstone wall at the rear of the Republic (previously Empire Hotel) is, however the proposal does not intend buildings or works which would impact on the heritage fabric, as the area adjacent to this boundary is being retained as access utilising the existing crossover.

The majority of the subject land is not within a Heritage Precinct, the exception being the access strip from Elizabeth Street which is within the NH6 -Elizabeth Street - Precinct.

The majority of the site (all area except the Elizabeth Street access area) is at the north-eastern edge of the mapped area of Archaeological Potential, also as detailed in the preceding figure.

3.2.1 DEVELOPMENT STANDARDS FOR PLACES OF ARCHAEOLOGICAL POTENTIAL

The following provisions are relevant to the site, except the Elizabeth Street access strip which falls outside.

E13.10.1 Building, Works and Demolition	
Objective: *To ensure that building, works and demolition at a place of archaeological potential is planned and implemented in a manner that seeks to understand, retain, protect, preserve and otherwise appropriately manage significant archaeological evidence.*	
A1 *Building and works do not involve excavation or ground disturbance.*	***P1*** *Buildings, works and demolition must not unnecessarily impact on archaeological resources at places of archaeological potential, having regard to:* *(a) the nature of the archaeological evidence, either known or predicted;* *(b) measures proposed to investigate the archaeological evidence to confirm predictive statements of potential;* *(c) strategies to avoid, minimise and/or control impacts arising from building, works and demolition;* *(d) where it is demonstrated there is no prudent and feasible alternative to impacts arising from building, works and demolition, measures proposed to realise both the research potential in the archaeological evidence and a meaningful public benefit from any archaeological investigation;* *(e) measures proposed to preserve significant archaeological evidence 'in situ'.*

4. SITE HISTORY

4.1 HISTORY OF SETTLEMENT IN THE AREA

The history of the area is detailed in *North Hobart Heritage Areas – A detailed Assessment*, Prepared by Katheryn Bennett for Hobart City Council:

> *The section of Elizabeth Street that crosses this part of North Hobart was laid out by 1828, as were the intersecting cross streets of Warwick, Burnett, and Colville Streets.[33] It was in the later years of the nineteenth century that Tasma, Pitt, Lefroy, and Swan Streets were created.*
>
> *Development along Elizabeth Street appears to have been considerably advanced by the late 1830s, particularly between Warwick Street and Arthur Street (which was the northern town boundary). The importance of Elizabeth Street grew as it became the 'Road to the Interior", for it was by this road that places further north could be reached …*
>
> *Despite this development, land further north between Arthur and Federal Streets was still largely rural in function by the 1840s. William Shoobridge's farm, part of which fronted onto Elizabeth Street, was established in 1822, and operated until the 1860s. There were also several dairies within the area, one was located at the corner of Elizabeth and Burnett Streets in the 1830s. Market gardens and orchards were also established in the early years. In the 1820s, for example, the licensee of the Dallas Arms Inn (now 313A Elizabeth Street) applied for a further three acres to enable him to establish a market garden.[35]*
>
> *Numerous industries were established from the early days. In the 1820s, Henry Condell established a brewery at a site now occupied by Condell Place. A plough manufactory run by Mr Holdship was operating from what is now 279 Elizabeth Street in the 1830s; and a blacksmith's shop was started by Benjamin Holroyd at 350 Elizabeth Street in the 1860s[36]. …*
>
> *In the 1890s, the area became increasingly built up due to the introduction of a tram service to the area, the main line ran along Elizabeth Street. By the early 1900s, both sides of Elizabeth Street were substantially built upon, and had become a densely packed commercial/residential strip. Stores were to be found on nearly every corner, and family businesses, such as Soundy's Department Store (established in 1883), were regularly patronised by the locals.*
>
> ---
>
> *33 Vincent, R., 1999, North Hobart Heritage Study, p38.*
> *35 Vincent, R., 1999, North Hobart Heritage Study, pp41-42.*
> *36 Ibid, pp48-49.*

The site originally formed part of a number of grants, to Robert Frost, Ann Maria Chandler, John Brown and Abraham Rheuben as detailed in the following extract from the former Lands

Department Town Grant Charts:

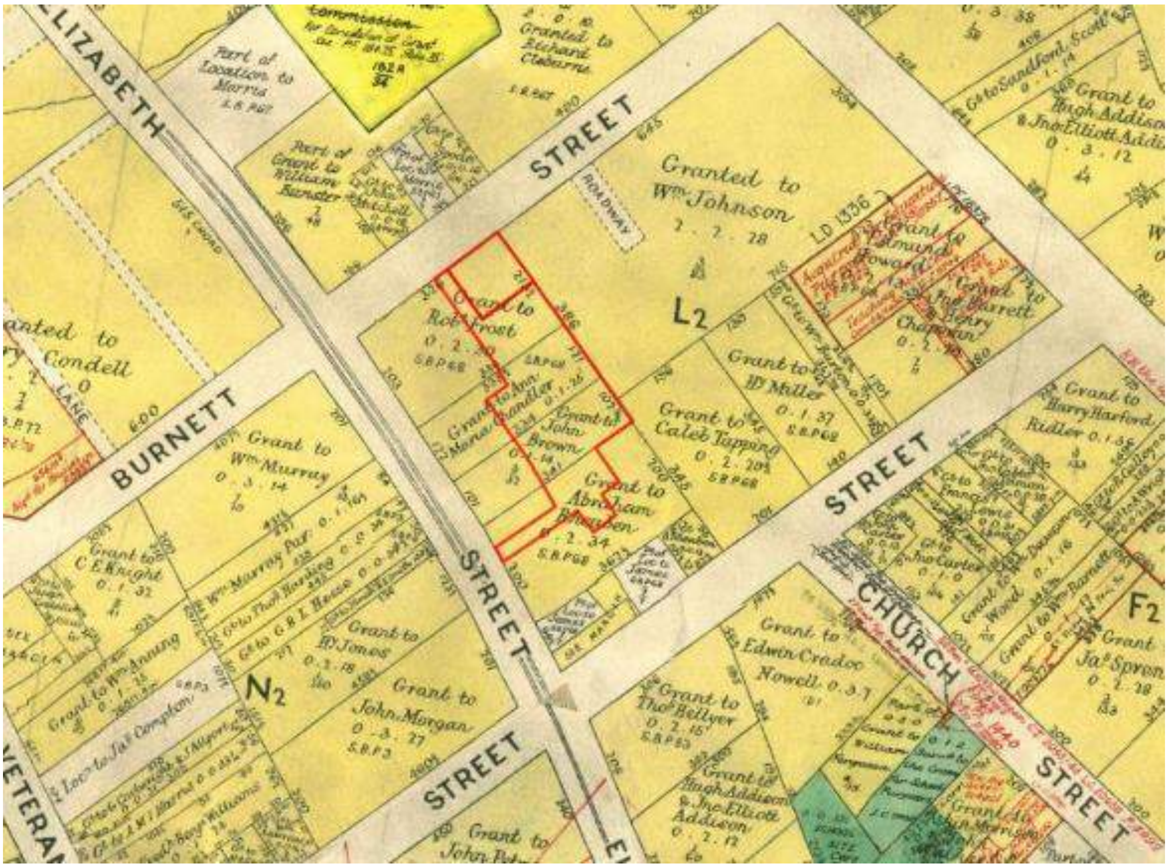

Figure 10: Town Grants Chart with subject land outlined in red (LISTMap)

The pattern of development for the area is also described in Sprent's Book of the 1840's described in the following figures:

Figure 11: Sprents Book with subject land outlined in red (LISTMap)

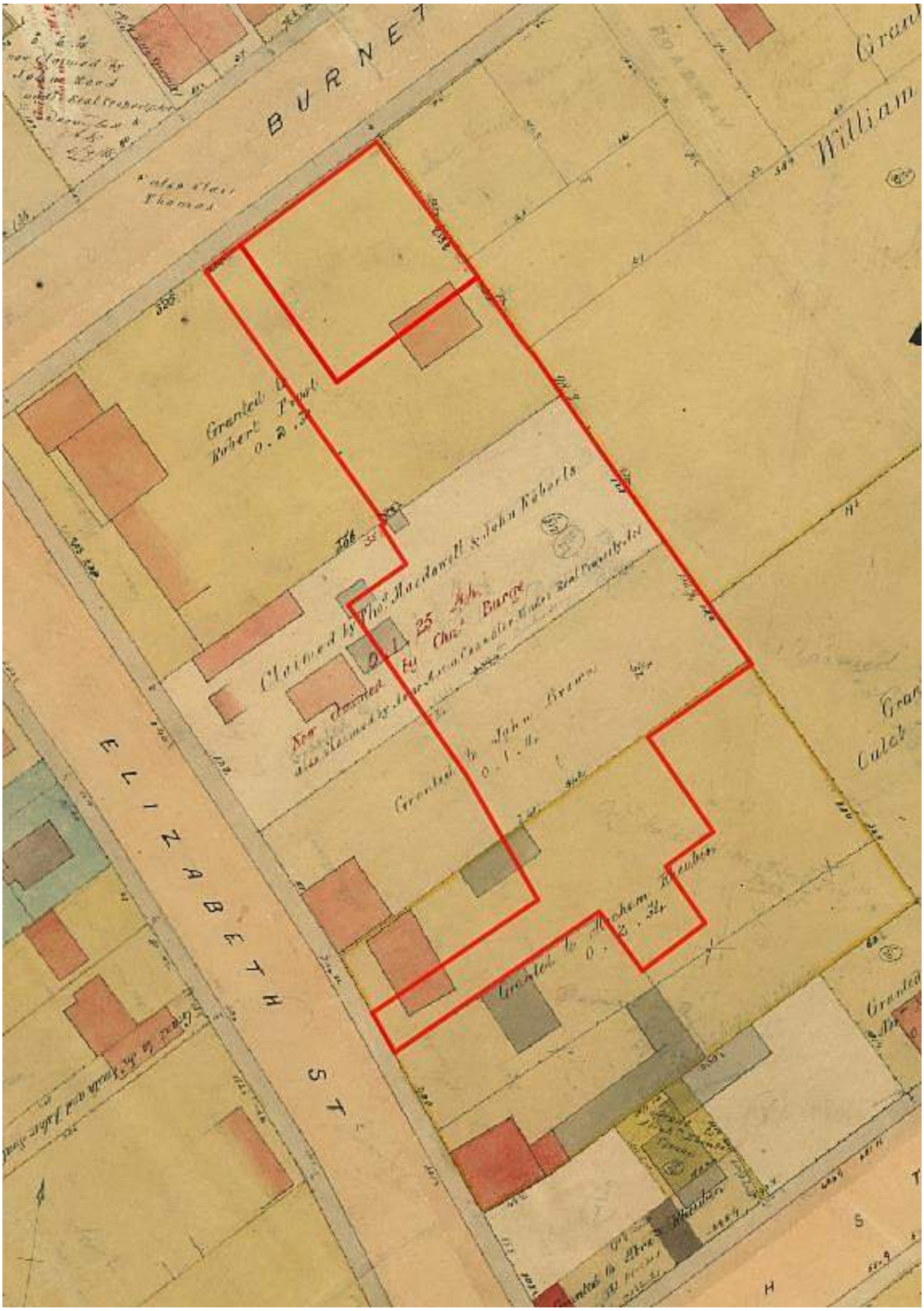

Figure 12: Sprents Book with subject land outlined in red (LISTMap)

The above figure describes the subject land located aligning with the rear of boundary of the 4 grant lots with buildings largely clustered towards Elizabeth Street, although there is a building indicated which may have been a cottage located at the boundary of 64 & 66 Burnett Street.

4.2 HISTORICAL PHASES

In George Frankland's 1836 Plan of Hobart, with the town boundary extending north to Arthur Street, the streets surrounding the subject land are laid out and buildings are evident along the Elizabeth Street, Tasma Street (then High Street) and Argyle Street edges, with no structures indicated within the central area of the block, as described in the following figure:

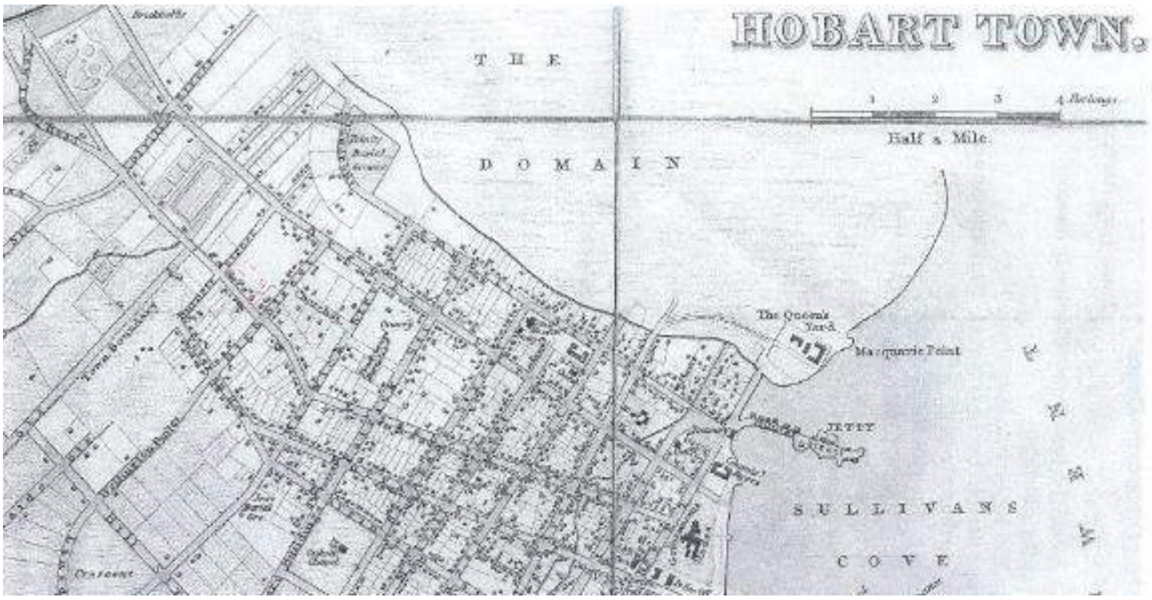

Figure 13: Extract from Hobart Town Plan, George Frankland Surveyor General C.1836-7

Figure 14: Extract with indicative site location, from Hobart Town Plan, George Frankland Surveyor General C.1836-7

A slightly later Frankland Map (1838) further describes the development of the town including the block containing the subject land, as follows:

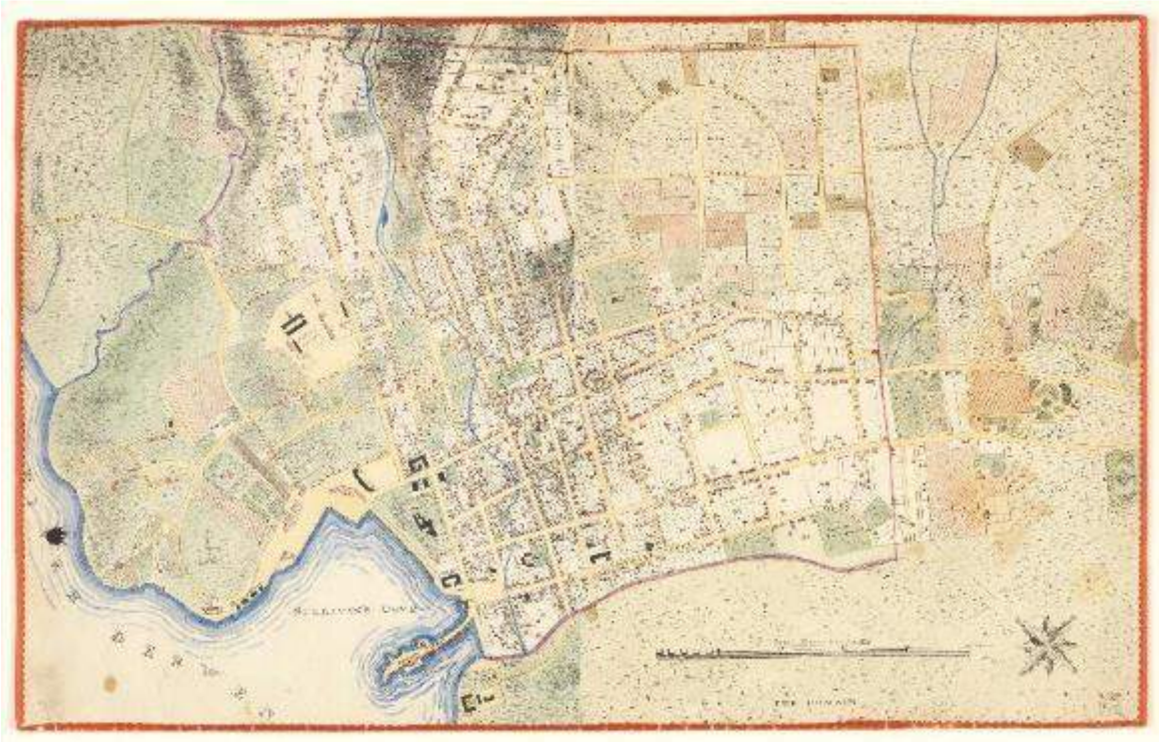

Figure 15: Hobart Town Plan, George Frankland 1838

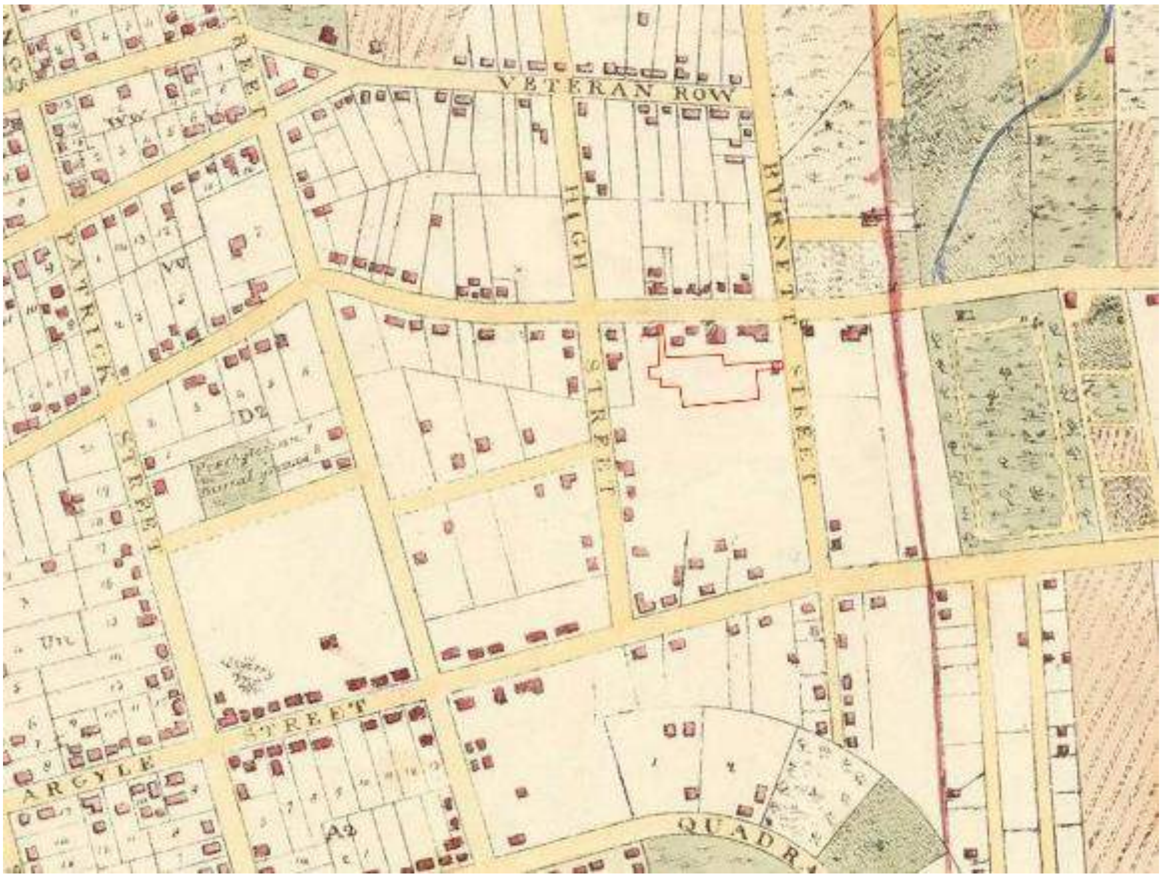

Figure 16: Extract - Hobart Town Plan, George Frankland 1838

Figure 17 & 18: Aerial of existing site development and overlay with Sprents Book (LISTMap)

No buildings identified in Sprents Book are located under the existing buildings on the site. The building which was located across the boundary of 64 & 66 Burnett is located in part of the site which forms part of the paved areas surrounding the existing buildings used to park and store vehicles.

The other buildings described are what appear as small outbuilding and a dwelling across the shared boundaries with 285 Elizabeth Street which has been redeveloped in recent years.

To the north west of the subject land the warehouse development apparent today to a great degree aligns with lot boundaries detailed by Sprent of the original grant to William Johnson. This historic layout includes reference to a roadway which remains the access to these lots presently.

A little later with the town expanding north development was increasing in North Hobart as described in Richard Jarman's plan of 1858, as follows:

Figure 19: extract from Map of Hobart Town, Richard Jarman 1858

The following figure describes the Metropolitan Drainage Board Detail Plan for the block in 1905-10.

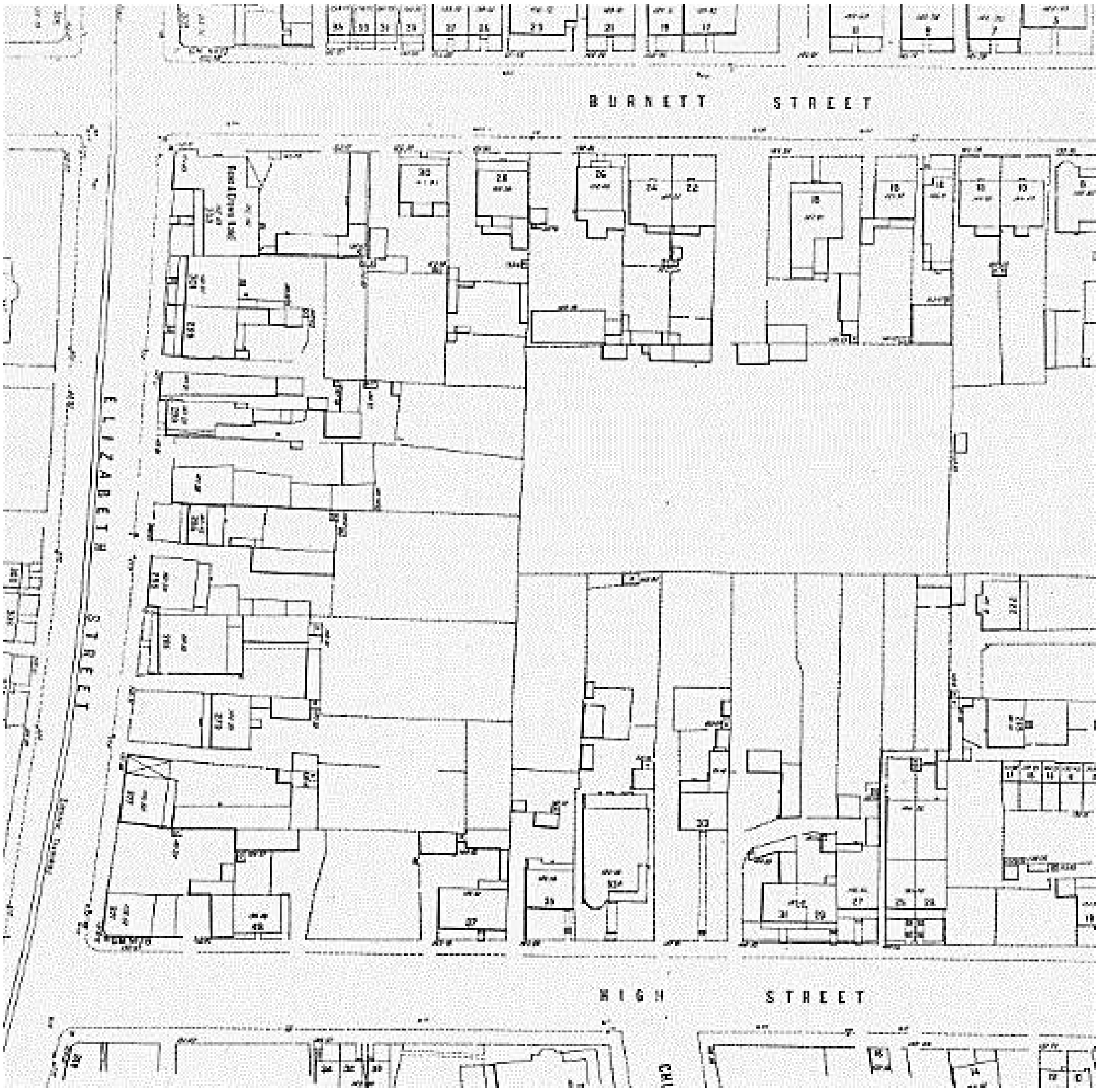

Figure 20: extract Hobart Detail Plan No. 20, Metropolitan Drainage Board c1905-10

At this date this above plan indicates the subject land still largely vacant with the exception of some outbuilding in the rear yards of the Elizabeth Street properties and 2 dwellings at the front of what would now be 64 Burnett Street.

Additionally, in the above plan the area where a building was indicated on the Sprent plan, at the rear of 64 Burnett (across the boundary with 66 Burnett) is no longer shown indicating it had already been demolished. For garden and outbuildings for these 2 houses.

Through the 1900's the area of the site and surrounds went through a number of developments and redevelopments as various commercial businesses, including Gorringe's on the subject land and the previous service station on Elizabeth Street, were established and further developed.

These phases are detailed in the aerial photo history of the area collated from DPIPWE, the following diagrams are from the report *'Preliminary Environmental Site Assessment'* by Geo-Environmental Solutions.

Figure 21: Plate 3 Historical Aerial Photograph, The Site 1946 (Geo Environmental Solutions)

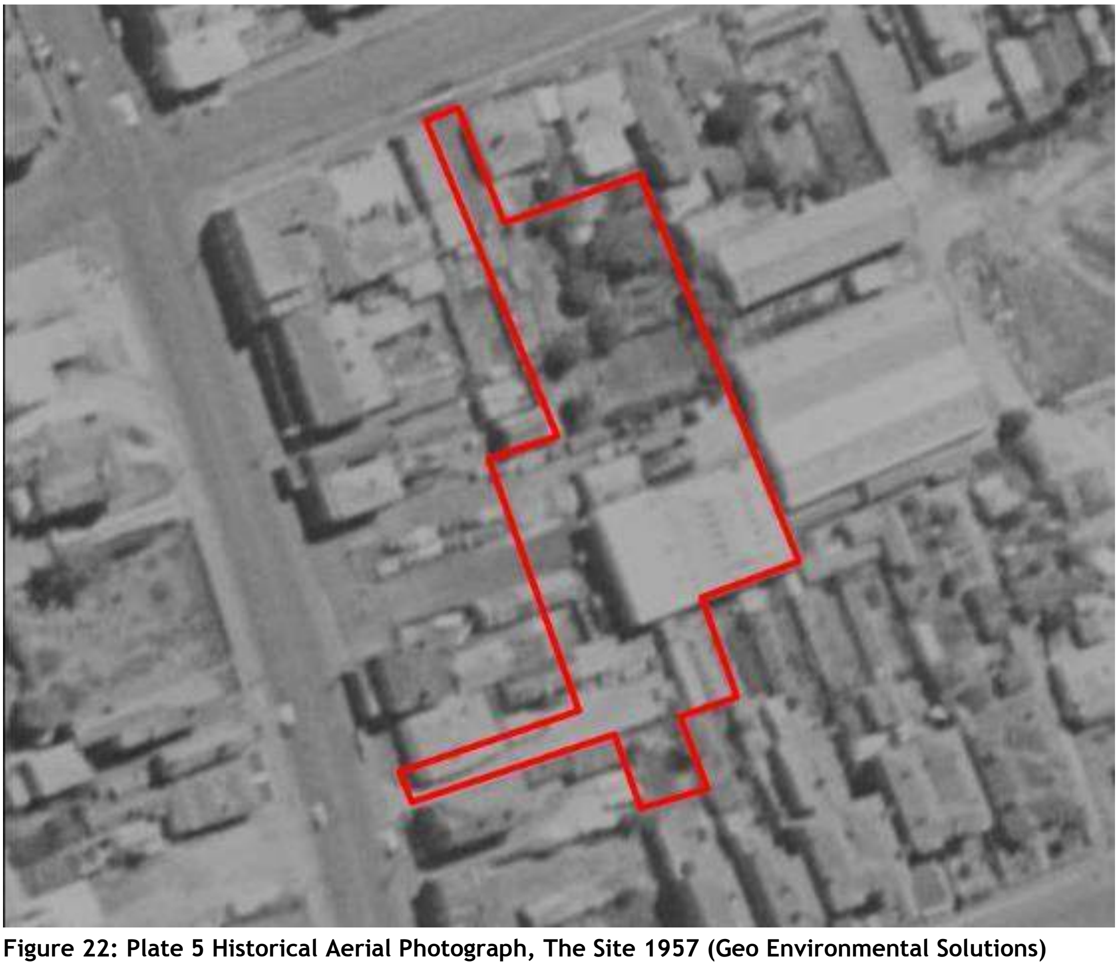

Figure 22: Plate 5 Historical Aerial Photograph, The Site 1957 (Geo Environmental Solutions)

Figure 23: Plate 7 Historical Aerial Photograph, The Site 1965 (Geo Environmental Solutions)

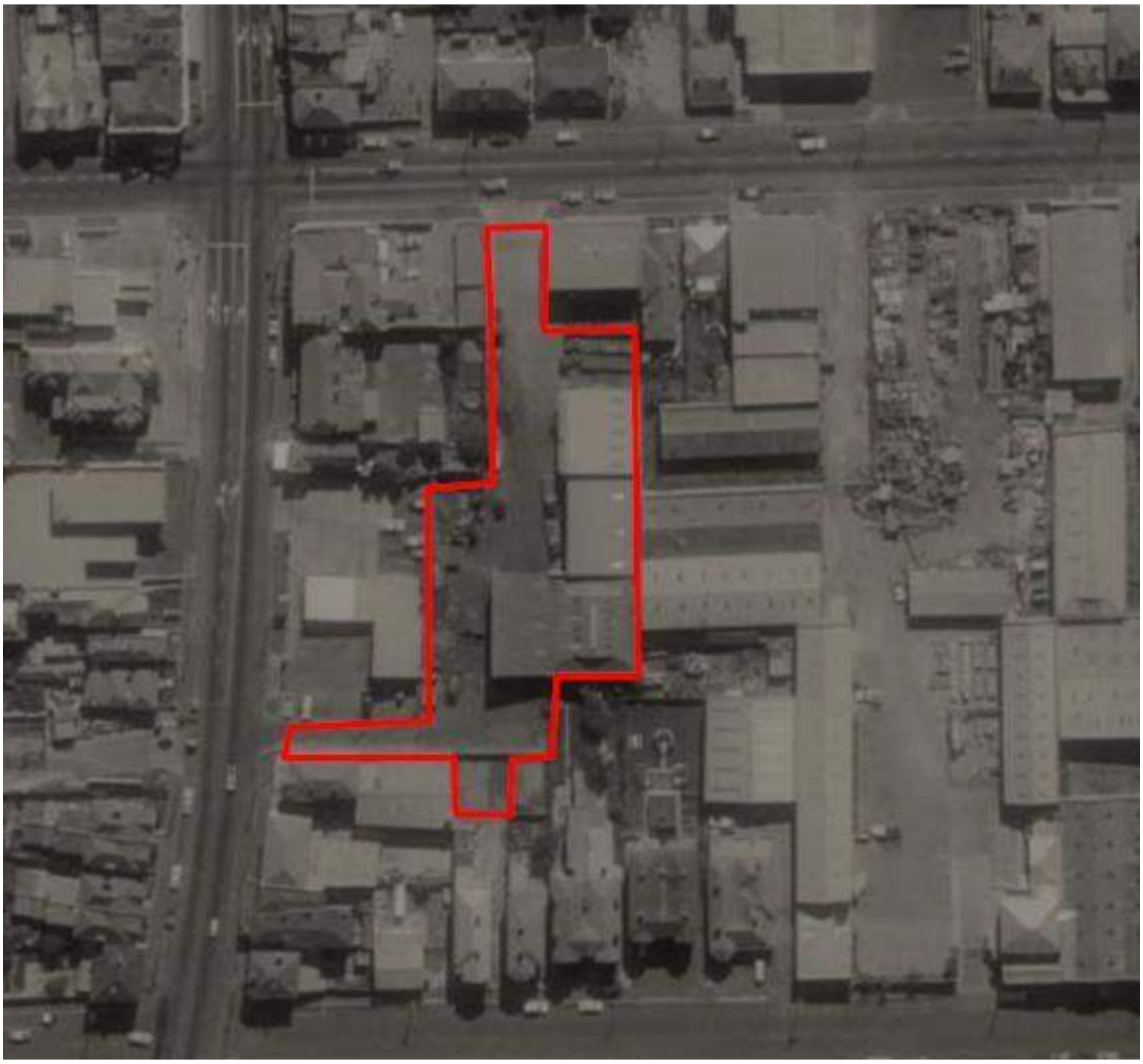

Figure 24: Plate 9 Historical Aerial Photograph, The Site 1973 (Geo Environmental Solutions)

4.3 DISTURBANCE HISTORY

As detailed in the above history the disturbance to building in and around the subject land includes:

- The demolition of a previous earlier building, construction of 2 dwellings located on lots now 64 Burnett and entry to 66 Burnett (along with small associated outbuildings) and their subsequent demolition for the current office building at 64 Burnett Street between 1965 and 1969.
- Demolition of buildings within 5 properties which now form 285 Elizabeth Street, sometime between 1957 and 1965 for the development of the service station, then the more recent demolition site decontamination and redevelopment for the existing Elizabeth Mews mixed use development in 2012.
- Demolition at 281 Elizabeth Street of an original building (from Sprents 1940's plan) and construction after 1905-10 of a dwelling and later rear warehouse.
- Demolition and replacement of the hotel (originally Rose and Crown, licenced in 1930 name changed to Empire Hotel in 1921) at 299 Elizabeth Street in 1938, now the Republic. The redevelopment in 1938 retained the sandstone yard wall adjacent to the subject land.

4.4 ARCHAEOLOGICAL SIGNIFICANCE AND POTENTIAL

Based on the history of the site and surrounds, which show limited if any development of the main body of the lot through earlier settlement phases through the 1800's, it appears there is a very low likelihood of important archaeological evidence being located within the body of the lot and developable area within the mapped potential area.

It is also appears that, given the extensive development and redevelopment of both the subject land and neighbouring land along the road frontages through the 1900's there is a high potential that any previous earlier archaeological evidence from the previous rear yards and outbuildings would have been removed or significantly disturbed through these development phases.

5. CONCLUSION

5.1.1 DEVELOPMENT STANDARDS FOR PLACES OF ARCHAEOLOGICAL POTENTIAL

The proposed development is required to meet the following standard:

> ***E13.10.1 Building, Works and Demolition***
>
> ***P1*** *Buildings, works and demolition must not unnecessarily impact on archaeological resources at places of archaeological potential, having regard to:*
>
> *(a) the nature of the archaeological evidence, either known or predicted;*
>
> *(b) measures proposed to investigate the archaeological evidence to confirm predictive statements of potential;*
>
> *(c) strategies to avoid, minimise and/or control impacts arising from building, works and demolition;*
>
> *(d) where it is demonstrated there is no prudent and feasible alternative to impacts arising from building, works and demolition, measures proposed to realise both the research potential in the archaeological evidence and a meaningful public benefit from any archaeological investigation;*
>
> *(e) measures proposed to preserve significant archaeological evidence 'in situ'.*

As detailed in the history and chronology of the development of the area of both the subject land and surrounds the site and proposed development meet this standard as follows:

a) The subject land is adjacent to Elizabeth Street which formed an early development corridor northward out of the early settlement area of Hobart towards the interior and further to Launceston. There is therefore reasonable documented history of the development of the area.
   Much of the early development of the area was for agriculture and later for residential buildings with accompanying services aimed at travellers heading out of town. Later phases then became more used for industrial and warehousing activities.
   The sequence of maps through the history of Hobart's development describe the land and detail how most of the build development remained along the road frontages not extending back in to the area of the existing building on the site.

b) Given the history it is not considered that any specific measures are necessary to investigate archaeological evidence within the development area.

c) The development area avoids previously documented areas of significant heritage fabric within the mapped potential area and therefore the site minimises the potential for impact on archaeology.

d) Any material or artefacts discovered in the demolition and excavation phase of the development could be retained for research purposes.

e) No measures are considered necessary to preserve 'in situ' archaeology given the history undertaken indicated a very low likelihood of built heritage within the development area.

GEO-ENVIRONMENTAL

SOLUTIONS

ENVIRONMENTAL SITE ASSESSMENT

66 BURNETT STREET

DECEMBER 2017

1 EXECUTIVE SUMMARY

This report builds on the findings from the *Preliminary Environmental Site Assessment* and presents the findings from the current invasive soil and soil vapour investigation. Geo-Environmental Solutions Pty. Ltd. (GES) was commissioned to conduct this work by Hobart Properties & Securities Pty Ltd, for the site located at 66 Burnett Street, North Hobart - hereby referred to as 'The Site' and formally referred to as 281a Elizabeth Street.

The purpose of this Environmental Site Assessment is to meet planning requirements for redevelopment of the site from a commercial garage and workshop to residential apartments. The *Preliminary Environmental Site Assessment* was written with the assumption that the land use was remaining unchanged, all results from the *Preliminary Environmental Site Assessment* will be assessed against appropriate guidelines for the redevelopment.

The objective of this environmental site assessment was to satisfy the planning requirement for the proposed site redevelopment, which involves the construction of a 7-level residential unit development that includes 2 levels of carparking with 96 parking spaces, 13 serviced apartments, 68 smaller apartments, 8 penthouse apartments and a proposed café shop front on Elizabeth Street. GES was required to determine the suitability of the site for the intended use and considered the following;

- Is the site suitable for residential apartments;
- Are there any contaminants of Potential Concern present;
- Is there a human health risk to current or future site users or trench workers;
- Is there an ecological health risk to offsite receptors;
- Identify any environmental site assessment data gaps;
- Provide recommendations on what measures may need to be put in place to address any potential data gaps and to further assess contamination remediation and/or management (if required).
- Provide a separate document, a Contamination Management Plan which outlines contamination management during the redevelopment phase of works.

The scope of works of this environmental site assessment was to:

- Conduct an invasive investigation in areas where site development is proposed;
- Review soil sample information (21 sample from 11 boreholes) from the previous investigation to compared against revised development works;
- Drill an additional ten (10) soil bores and collect 17 primary samples at the site in areas where data gaps were determined to further identify potential human health and ecosystem risk to onsite receptors from potentially contamination soil;
- Installation of 4 passive soil vapour samplers (plus a duplicate), Waterloo Membrane Samplers to confirm if there is a vapour risk present at the site.
- Soil samples were sent with quality assurance/ quality control samples for analysis to a National Association of Testing Authorities accredited laboratory;
- Compare soil analytical results against the NEPM 2013 guidelines and CRC CARE Technical Report 10 guidelines;
- Determine the absence or presence and if present the level of site contamination;
- Report in an environmental site assessment:
    - document the findings of the *Preliminary Environmental Site Assessment* and current site investigation;
    - present recommendations for remediation and protection measures during development and for future land users and
    - update the conceptual site model from *Preliminary Environmental Site Assessment* and contamination management recommendations.
- If contamination impact is identified at the site, advise on the preparation of a Contamination Management Plan which outlines contamination management during the redevelopment phase of works.

The following conclusions can be made from the invasive soil assessment.

- Site contamination findings are summarised:
    - Shallow soil impact has been identified in fill throughout the site within the top 0.3 to 0.4 m of the soil profile. Most of the identified impact is proposed to be excavated with a smaller amount to remain which is predominantly within guideline limits:
        - ESL exceedances have been identified based on a residential setting comprising benzo(a)pyrene and heavy oil compounds. Eight (8) exceedances are in the proposed excavation areas and three (3) which are to remain at the site beneath the new slab. Provided management measures are put in place, there is a LOW risk that the soil will present an environmental hazard;
        - EIL exceedances have been identified based on a residential setting comprising copper, nickel, zinc and lead. Ten (10) exceedances are in the proposed excavation areas and seven (7) which are to remain at the site beneath the new slab. Soil which is to remain at the site exceeds guidelines for copper and zinc. Provided management measures are put in place, there is a LOW risk that the soil will present an environmental hazard;
        - HIL B guidelines for assessing soil ingestion and dust inhalation risk are exceeded in six (6) samples at the site for assessing risk to future site users, of which all samples are proposed to be excavated except for BH4 0.5 m near the interceptor trap which exceeds HIL D. If the areas around the interceptor trap are excavated, there is an exposure risk to commercial workers, however based on available information, a risk to ongoing site users will be mitigated;
        - HSL D guidelines for assessing dermal contact risk to commercial workers have been identified in BH4 0.5 m near the interceptor trap (the same HIL D exceedance). Provided this impacted soil is removed, risk to future trench workers can be mitigated.
    - **Investigation Area A** – Other than the identified site fill, no impact has been identified in the truck service area nor around underground storage tanks T3 and T4;
    - **Investigation Area B -** Other than the identified site fill, and impact around the interceptor trap, no impact has been identified. There remain data gaps in this Area B. Areas around former underground storage tanks T1 and T2 as well as the nearby former bowser area have not been investigated given the presence of the building obstructions;
    - **Investigation Area C -** has not been investigated given the presence of the building and infrastructure obstructions; and
    - **Investigation Area D** – no soil impact has been identified in this area.
    - Areas where data gaps have been identified will need to be addressed in a site contamination management plan;

It has been identified that the bulk of the proposed excavated material averages out to Level 2 based on IB105 due to barium, lead, zinc and benzo(a)pyrene in the proposed excavation material. Barium is likely to be an artefact of background soils in the area and not a contaminant of concern at the site which may deem it as being classified Level 2. The bulk of the impact occurs in shallow fill material at the site, and care should be taken to scraping the top 0.3 m from the site and stockpiling is separately from the remaining deep excavations. This is likely to bring the bulk excavations below 0.3 m BGS to Level 1.

GES are not aware of any tank decommissioning and it needs to be assumed that all tanks (identified or not identified) remain at the site.

When redevelopment work commences for the site, GES recommends that the following actions should be undertaken:

- A Contamination Management Plan will be required
- Further Environmental Site Assessment which should include but not be limited to;
    - All four underground storage tanks should be formally decommissioned and tank pits should be validated.
    - The interceptor trap should be removed, and remaining soil should be validated; and
    - Further investigations will be required under the footprint of the buildings, at a minimum in Area C for contamination.
- All excavated soil at the site should be stockpiled and assessed against IB105 guidelines

- GES recommends separating stockpiles; and keeping the shallow material 0.0-0.4 m bgs separate. All remaining material is likely to be classified as Level 1 clean fill (with proof of analytical results).

In summary, if recommendations herein are implemented, based on the adopted land used class, there is a low risk that soil at the site will present a risk to human health or the environment

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Tables

2 ABREVIATIONS

AEC	Areas of Environmental Concern
AHD	Australian Height Datum
ALS	Analytical Laboratory Services
ANZECC	Australia and New Zealand Environment and Conservation Council
BGS	Below Ground Surface
BH	Borehole
BTEX	Benzene Toluene Ethylbenzene Xylene
COA	Certificate of Analysis
COC	Chain of Custody
COPC	Chemical of Potential Concern
CRC CARE	Corporative Research Centre for Contamination Assessment and Remediation of the Environment
CSM	Conceptual Site Model
DA	Development Application
DQO	Data Quality Objectives
DWS	Depth Water Struck
EPA	Environmental Protection Authority
ESA	Environmental Site Assessment
GES	Geo-Environmental Solutions Pty. Ltd.
HIL	Health Investigation Levels
HSL	Health Screening Levels
IL	Investigation Levels
LOR	Limits of Reporting
NATA	National Association of Testing Authorities
NEPM	National Environmental Protection Measure
NHMRC	National Health and Medical Research Council
NRMMC	Natural Resource Management Ministerial Council
NL	Non Limiting
NRMMC	Natural Resource Management Ministerial Council
PESA	Preliminary Environmental Site Assessment
PAH	Poly-Aromatic Hydrocarbons
PCP	Physico-Chemical Parameters
PEV	Protected Environmental Values
PHC	Petroleum Hydrocarbons
PPA	Preferential (PVI) Pathways Assessment
PVI	Petroleum Vapour Intrusion
SCA	Site Contamination Assessment
SCM	Site Contamination Model
SGS	Specialist Laboratory Services
TPH	Total Petroleum Hydrocarbons

TRH	Total Recoverable Hydrocarbons
USCS	Unified Soil Classification System
WMS	Waterloo Membrane Samplers

3 INTRODUCTION

3.1 General

This report builds on the findings from the *Preliminary Environmental Site Assessment* (PESA; GES, July 2017) and presents the findings from the current invasive soil and soil vapour investigation. Geo-Environmental Solutions Pty. Ltd. (GES) was commissioned to conduct this work by Hobart Properties & Securities Pty Ltd, for the site located at 66 Burnett Street, North Hobart - hereby referred to as 'The Site' and formally referred to as 281a Elizabeth Street (GES 2017). The site location is presented in **Figure** 1 and **Figure** 2.

The purpose of this Environmental Site Assessment (ESA) is to meet planning requirements for redevelopment of the site from a commercial garage and workshop to residential apartments. The *PESA* was written with the assumption that the land use was remaining unchanged, all results from the PESA will be assessed against appropriate guidelines for the redevelopment.

The ESA has been prepared by a suitably qualified and experience practitioner in accordance with procedures and practices detailed in National Environmental Protection Measure (NEPM, 2013) guidelines and key regulations and policies identified in the References section of this document. Personnel engaged in preparing this ESA are listed in Appendix 1 along with their relevant qualifications and years of experience.

Figure 1 Site Location, 20m scale, image sourced from the LIST. Site outlined in red

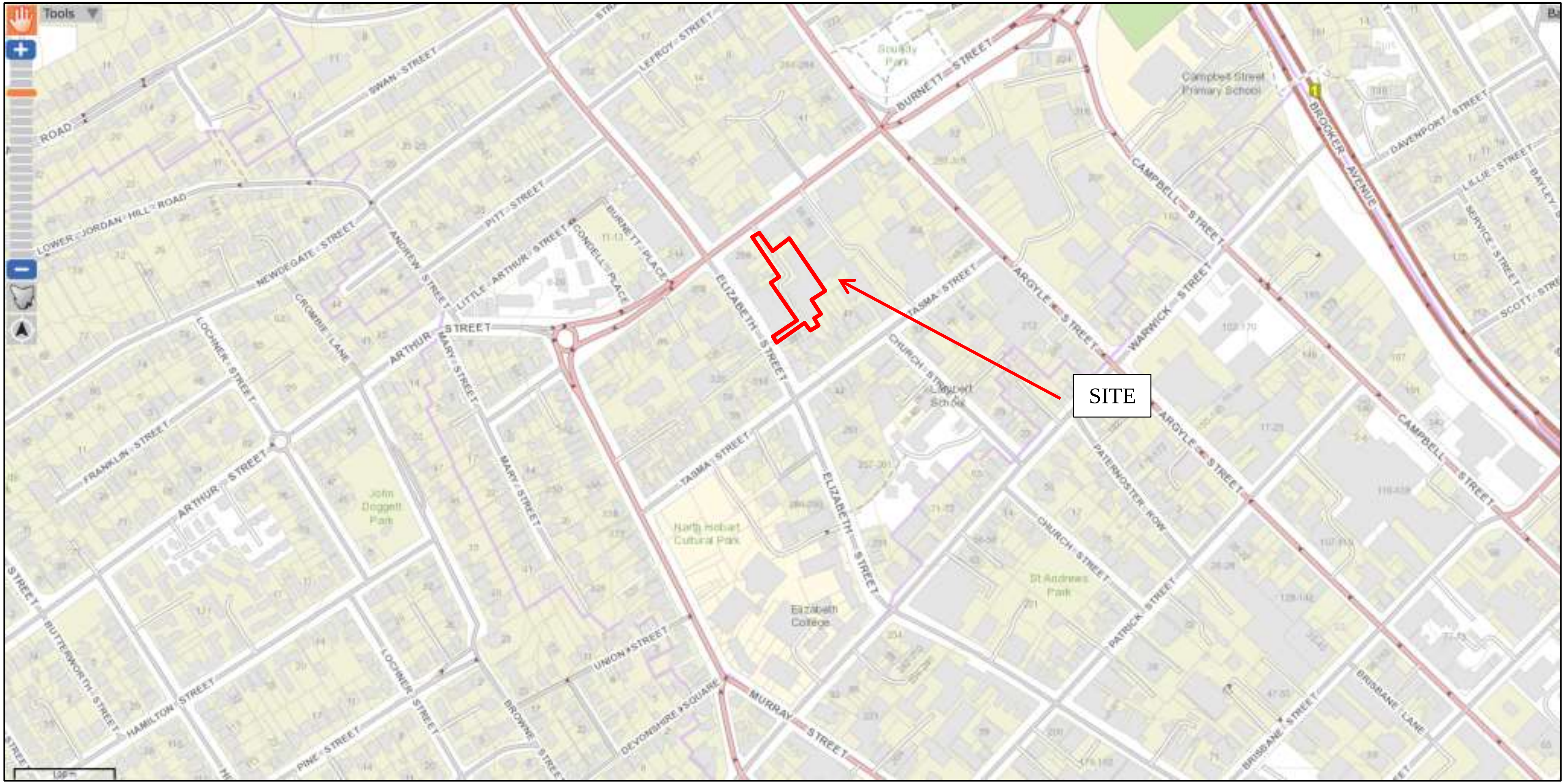


Figure 2 Site Location, 100m scale, image sourced from the LIST

3.2 Site Details

Site details are presented in Table 1 and Plate 1 shows the office and one of the workshops on site.

Table 1 Site Details

SITE LOCATION: 66 Burnett Street, North Hobart. Identified as 281a Elizabeth Street, North Hobart in the PESA (GES 2017)
INVESTIGATION AREA 281a Elizabeth Street which has a second entrance at 66 Burnett Street. Limits approximately defined by borehole extent
SITE ELEVATION & GRADIENT 41.7 to 46.2 m Australian Height Datum (AHD) over 110m with a 2.5º or 4.5% increase to the northern end of the site.
SITE SURFACING The surface of the site is 95 % concrete and 5% gravel fill.
TITLE REFERENCES The investigation area includes the following title reference for 66 Burnett Street, North Hobart: CT 26099/4
SITE OWNER Hobart Properties & Securities Pty Ltd
PREVIOUS LANDUSE Residential Properties
SITE SURROUNDING LAND ZONING Tasmanian Interim Planning Scheme 2015 The majority of the site is zone '23.0 Commercial' Drive way from Elizabeth Street is Zoned '15.0 Urban Mixed Use'
SITE LAND USE Commercial Land Use for the maintenance and repairs of a range of cars and trucks
PROPOSED LAND USE Unknown
SURROUNDING LAND USE: NE: Commercial Properties; SE to NW: Mixed Urban use – Café's and Restaurants; N Light Industrial premises.

Plate 1 The Site, 66 Burnett Street; Street View looking in a Southeasterly direction.

3.3 Investigation Objectives

The objective of this ESA was to satisfy the planning requirement for the proposed site redevelopment, which involves the construction of a 7-level residential unit development that includes 2 levels of carparking with 96 parking spaces, 13 serviced apartments, 68 smaller apartments, 8 penthouse apartments and a proposed café shop front on Elizabeth Street. GES was required to determine the suitability of the site for the intended use and considered the following;

- Is the site suitable for residential apartments;
- Are there any contaminants of Potential Concern (COPC's) present;
- Is there a human health risk to current or future site users or trench workers;
- Is there an ecological health risk to offsite receptors;
- Identify any data gaps;
- Provide recommendations on what measures may need to be put in place to address any potential data gaps and to further assess contamination remediation and/or management (if required).
- Provide a separate document, a Contamination Management Plan which outlines contamination management during the redevelopment phase of works.

3.4 Scope of Works

The scope of works of this ESA was to:

- Conduct an invasive investigation in areas where site development is proposed;
- Review soil sample information (21 sample from 11 boreholes) from the previous investigation to compared against revised development works;
- Drill an additional ten (10) soil bores and collect 17 primary samples at the site in areas where data gaps were determined to further identify potential human health and ecosystem risk to onsite receptors from potentially contamination soil;
- Installation of 4 passive soil vapour samplers (plus a duplicate), Waterloo Membrane Samplers (WMS) to confirm if there is a vapour risk present at the site.
- Soil samples were sent with quality assurance/ quality control (QA/QC) samples for analysis of total recoverable hydrocarbons (TRH) Benzene Toluene Ethylbenzene Xylene (BTEX), Polynuclear Aromatic Hydrocarbons (PAH) and Heavy Metals to a National Association of Testing Authorities (NATA) accredited laboratory;
- Compare soil analytical results against the NEPM 2013 guidelines and CRC CARE Technical Report 10 guidelines (Friebel & Nadebaum 2011);
- Determine the absence or presence and if present the level of site contamination;
- Report in an ESA:
    - document the findings of the PESA and current site investigation;
    - present recommendations for remediation and protection measures during development and for future land users and
    - update the conceptual site model (CSM) from PESA (GES 2017) and contamination management recommendations.
- If contamination impact is identified at the site, advise on the preparation of a Contamination Management Plan which outlines contamination management during the redevelopment phase of works.

4 PLANNING

4.1 Site Zoning

The site is currently zoned Commercial under the Tasmanian Interim Planning Scheme 2015 (Figure 3), except for the driveway on Elizabeth Street which is zoned Urban Mixed Use. It is expected that if the proposed residential unit development proceeds a change of use will be required.

The land use surrounding the site is consistent with the zoning; the land east of the site is largely Commercial, the properties along Elizabeth Street are zoned Urban Mixed use, northwest of the intersection of Elizabeth Street and Burnett Street Elizabeth Street is General Business and there is a small strip along Burnett Street that is zone Light Industrial. More broadly the site is surrounded by Inner Residential and the major roads in the area are zoned Utilities.

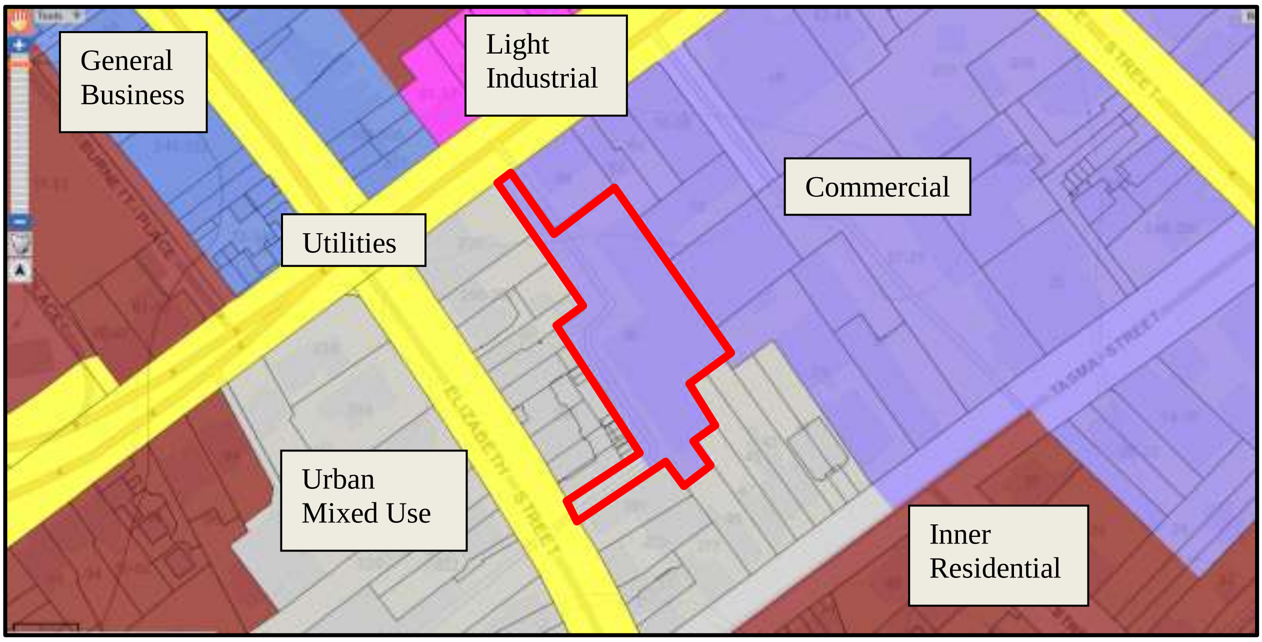


Figure 3 Tasmanian Interim Planning Scheme Zoning (2015), site outlined in red

4.2 Existing Site Layout

A schematic of the existing site layout is presented in Figure 4. A driveway runs the length of the site from 66 Burnett Street exiting at 281a Elizabeth Street. There are five workshop buildings and one office building.

4.3 Proposed Site Development Works

At the time the PESA (GES 2017) was written GES was unaware of any changes to use of the site. However, since the PESA was written, GES has been provided with Development Application (DA) plans that include a multistory residential unit development, designed by Andrew and Mckellar design, Noosaville, Queensland (August 2017). See Appendix 2 for the proposed design. The following is proposed for the site:

- Level 1 – Carparking, gym and storage and a separate café with kitchen and washroom facilities;
- Level 2 – Carparking, storage and 11 serviced apartments; 2 apartments will be located on the current ground floor level in the northern edge of the building and 2 apartments will be built above the café;
- Level 3 – 19 apartments, including 2 above the café (final level on café building);
- Level 4 – 17 apartments;
- Level 5 – 17 apartments;
- Level 6 – 17 apartments;
- Level 7 – 8 penthouse apartments.

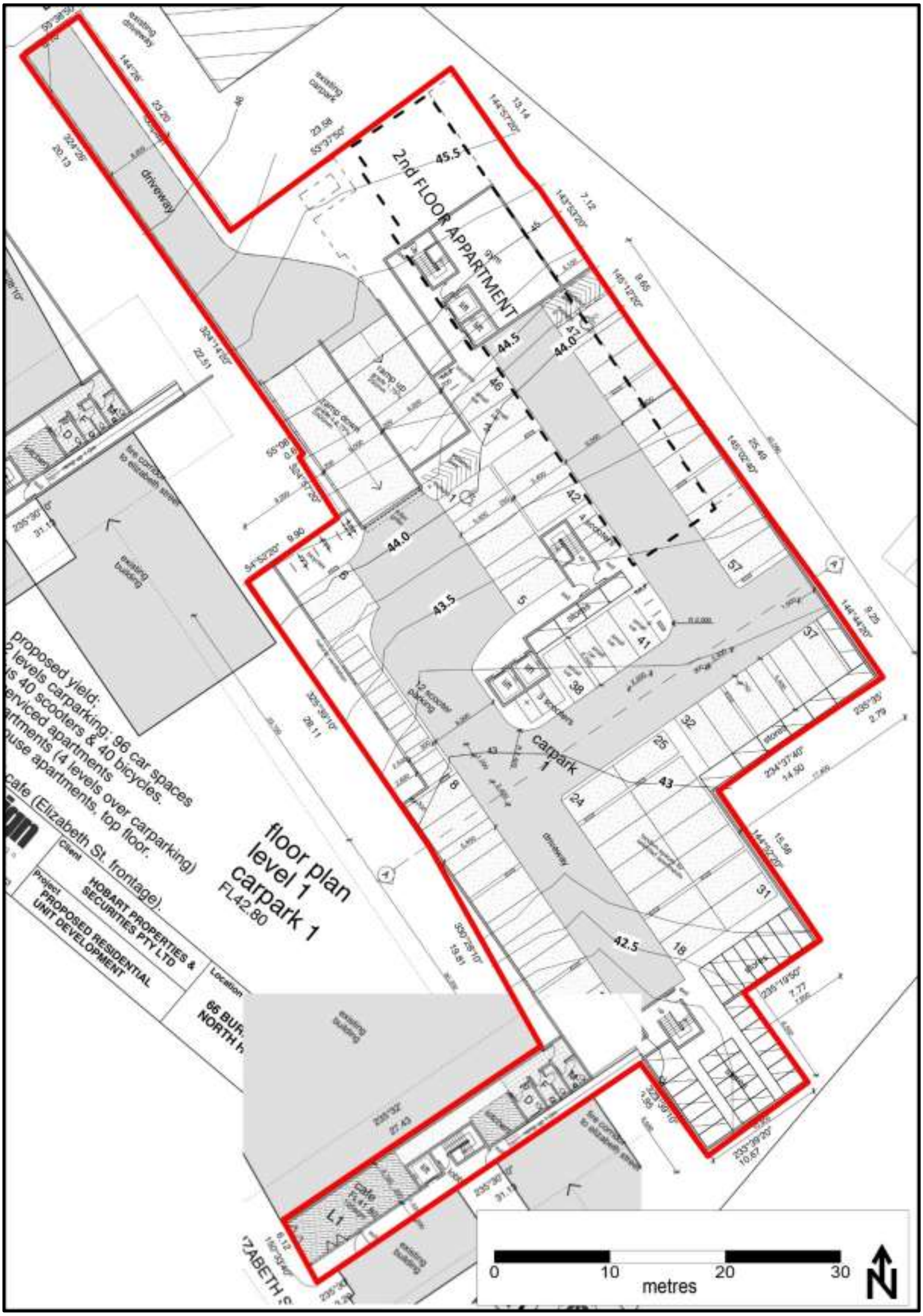


Figure 4 Proposed Site Layout

The risk assessment herein depends on likely soil and/ or vapour exposure pathways based on:

- Present site conditions;
- Proposed development site layout and building construction; and
- Site earthworks

4.4 Assessment Trigger

The need for this assessment has been triggered by the following:

- The ESA is a requirement for the proposed Sale of Land.
- The site falls within the Hobart City Council contaminated site overlay and need to be assessed in accordance with the following interim planning scheme code:
    - *E2.5 Use Standards*
    - *E2.6.2 Excavation*.
- Given that there is proposed ***excavation works*** at the site, there are no acceptable solutions to proposed works, and therefore E2.6.2 P1 performance criteria are to be addressed
- Given that there is a proposed ***change of use*** at the site *The Director, or a person approved by the Director for the purpose of this Code:*
    a) certifies that the land is suitable for the intended use; or
    b) approves a plan to manage contamination and associated risk to human health or the environment that will ensure the land is suitable for the intended use.

4.5 Performance Criteria

Excavation does not adversely impact on health and the environment, having regard to:

(a) an environmental site assessment that demonstrates there is no evidence the land is contaminated; or

(b) a plan to manage contamination and associated risk to human health and the environment that includes:

i. an environmental site assessment;
ii. any specific remediation and protection measures required to be implemented before excavation commences; and
iii. a statement that the excavation does not adversely impact on human health or the environment.

Land is suitable for the intended use, having regard to:

(a) an environmental site assessment that demonstrates there is no evidence the land is contaminated; or

(b) an environmental site assessment that demonstrates that the level of contamination does not present a risk to human health or the environment; or

(c) a plan to manage contamination and associated risk to human health or the environment that includes:

i. an environmental site assessment;
ii. (any specific remediation and protection measures required to be implemented before any use commences; and
iii. a statement that the land is suitable for the intended use.

5 DESKTOP STUDY

Please see the desk top study from the PESA (GES, 2017) for details on the following:

- Site walkover conducted on the 17 June
- MRT Geology Mapping
- Site Topography, Drainage & Hydrogeology
- Historical Aerial Photography Interpretation
- Dangerous Goods Records (Work Standards Tasmania)
- Environmental Protection Authority (EPA) Property Information Request

5.1 Conceptual Site Model – From PESA

5.1.1 Areas of Potential Concern

The following areas of potential concern (AOPC) have been identified and illustrated in Figure 5.

Area A: contains two underground storage tanks (USTs), T2 and T3, historical bowser location and associated fuel lines, a truck service pit in a workshop and a large area in front of the office building where the ground appears stained in the historical aerial photographs.

Area B: contains UST - T1, historical bowser location and associated fuel lines and the interceptor trap plus probably associated pipework. Potential contamination from neighboring historical service station site is also possible in this area.

Area C: appeared to have dark staining on the ground in the 1965 historical aerial photograph.

Area D: appeared to have dark staining on the ground in the 1965 historical aerial photograph and the surface is soil and gravel. This location has had a lot of vehicles parked on it overtime and during the site walkover it was identified as an area where potentially hazardous material is stored.

General potential contamination across the site includes the following:

- Historical vehicle wash-down bay
- Oil/ fuel and hazardous chemical dump points, piping to the interceptor trap
- Battery and oil storage areas
- Corrosion of metal from cars and buildings

There may be other areas on the site where potentially contaminating activities have occurred, but historical links have not been identified.

Contaminants of potential concern (COPC) include the following:

- Total Petroleum/Recoverable Hydrocarbons (TPH/TRH);
- Mono Aromatic hydrocarbons: Benzene, Toluene, Ethylbenzene, Xylene (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Lead from unleaded fuel and battery acid and
- Heavy Metals in possible site fill.

5.1.2 Confirmed Areas of Contamination

The following contamination has been confirmed:

- There is localised surface contamination around T3 and T4
- There is localised surface contamination around the interceptor trap, and
- Elevated levels of Lead contamination across the site.

5.1.3 Receptors

After conducting the PESA the following conclusions were made about the potential receptors and the complete contamination exposure pathways:

- Ecosystems – ecosystem impact was ruled as there are not ecosystems within 100m.
- Offsite receptors – exposure may result from
- Trenchworks – during the development and future trench workers
- Indoor inhabitants – on site, current and future.

5.1.4 Data Gaps from PESA

Areas that require further investigations regarding contamination include the following;

- UST T1 and T2 plus Area C – unknown levels of contamination
- Interceptor trap and Tank pit – once this infrastructure and associated pipework has been removed, the remaining soil around the excavated sites will need to be sampled, analysised and validation to confirm that remaining material on site is within guidelines limits for human health and ecosystem protection.
- Vapour risk to ground floor users – the proposed location of the café on Elizabeth Street.

- Changes of land use – all analytical results from the PESA were compared against the HSL/HIL D guideline for Commercial Land use. Given that some of the proposed apartments will be on ground floor level the results need to be compared against HSLB.

Tank	Product	Volume (gln)	Commissioned	Decomissioned	Comments
T1	Distillate	1000	approx 1957	unknown	Covered by new building in 1977
T2	Petrol	2000	10/05/1965	unknown	Covered by new building in 1977
T3	Petrol	3000	24/01/1966	unknown	
T4	Distillate	2000	24/01/1966	unknown	

Figure 5 Locations of underground storage tanks and Areas of Potential Concern

6 FIELD INVESTIGATION PROCEDURES

6.1 Works Summary

Site investigation work was conducted on the 17 June 2017 and the 11 December 2017, details of the investigation are included in Table 2. All soil bore and soil vapour sampling locations are presented in Figure 6.

Table 2 Summary of Site Investigations

Hole ID	SB Drilled & Samples	Soil Vapour sampled
BH1 – BH11	17 June 2017	-
BH12 – BH21	11 December 2017	-
VP1-VP4 (BH13, BH16, BH20 & BH21)	11 December 2017	11-14 December 2017

The following boreholes BH1, BH2, BH15 and BH21 were drilled in area D to assess for potential contaminates from storage of materials and parking of vehicles. Bore hole BH3 and BH20 were drilled in the driveway to assess any potential contamination from the former upgradient BP service station and/ or the site, and BH4 was drilled adjacent to the interceptor trap. Bore holes BH6 to BH9 were drilling surrounding the two UST's on site. BH10 and BH17 were drilled in the open unpaved parking area and BH11 was drilled in the base of the service pit. BH12, BH13 and BH14 were drilled under the existing building to identify any soil contamination under the existing buildings.

6.2 Soil Investigation

6.2.1 Borehole Drilling

At each of the soil bore locations, the following precautions were put in place to avoid disrupting underground service assets:

- Dial Before You Dig plans were obtained;
- Archers Underground Service were engaged; and
- Where practical, the first meter of the bore was cleared with a hand auger.

Concrete coring was undertaken through bitumen or concrete at each drilling location as required.

A total of ten (10) 65 mm diameter soil bores were drilled for assessing site geology and sampling for contamination impact. The bores were drilled by GES using a hand auger and or the industry recognized Geoprobe direct push drilling system. The selected drilling method involved using a Geoprobe dual tube to retain wall integrity and eliminates risk of profile collapse whilst allowing extraction of 1.0 m length sample cores.

Figure 6 Borehole (BH1 to BH21) Investigation Areas

6.2.2 Soil Sampling

Soil bore soil sampling was conducted per the National Environmental Protection Measure (NEPM 2013) and AS4482 sampling guidelines. Table 3 presents a summary of the soil assessment methodology adopted at the site.

Table 3 Summary of Soil Sampling Methods

Activity	Details / Comments
Drilling Method	Soil bores were drilled: • Hand auger over the first meter to clear for services, and grab sampling; • Hollow stem auger until refusal depth and split spoon sampling; • Percussion drilling in rock and grab samples were collected from air blasted cuttings
Soil Logging	Logging the soil was conducted in accordance with the unified soil classification system (USCS) as detailed in AS1726 (1993).
Decontamination of Sampling Equipment	Quantum Clean Laboratory Detergent (R213) was used to decontaminate reusable sampling equipment.
Laboratory Soil Sample Collection	In accordance with AS4482.2. All samples were collected using disposable nitrile gloves. Samples were selected for laboratory analysis: • at least every metre; • select samples were collected from representative horizons and submitted for analysis. A minimum number of samples were carefully selected which would provide sufficient information to delineate hydrocarbon contamination in soils.
Sample preservation	Samples were placed into a jar for laboratory analysis. Soil jars were placed in a pre-chilled cool box with ice bricks.
Sample holding times	Sample holding times were within acceptable range (based on NEPM B3-2013) from collection to extraction.

6.2.3 Soil Analysis

Primary and QC samples were submitted to Analytical Laboratory Services (ALS) Springvale Avenue in Melbourne for analysis. Of the 17 primary samples collected, 17 were selected for analysis. Chain of Custody (COC) documentation was completed and is provided in Appendix 5. Table 4 presents a summary of the laboratory analyses undertaken.

Table 4 Overview of Soil Analysis and Quality Control

Analytes	Primary Soil Samples	Duplicates[a]	Rinse Blank[b]	Trip Blank[c]
TPH/TRH	17	1	1	-
BTEX	17	1	1	-
PAH*	17	1	1	-

Sampling Quality Control Standards (AS4482):
a – One (1) in twenty (20) duplicate samples
b - Single rinse sample per piece of equipment per day

Given that a full 15 metal suite was analysed, there was requirement to assess the following soil physical properties to determine soil threshold investigation levels:

- Soil grain class (sand/silt or clay)
- % Clay content;
- Cation exchange capacity; and
- Soil pH

The soil physical properties were assessed through site assessment and chemical properties were based on knowledge of similar soil types encountered around Hobart.

6.3 Soil Vapor Investigation

The objective of the soil vapour assessment was to confirm if there is a risk to future site users. Waterloo Membrane Samplers(WMS) were used to semi quantitatively assess vapour intrusion risk.

A total of four (4) 65 mm diameter soil bores were drilled and adopted for the installation of the WMS to assessing soil vapour conditions. Vapour sampling probes were installed in each hole VP1-VP4, plus a duplicate in adjacent to VP4 hole. The passive sampler ID numbers and deployment locations are also summarised in Table 5 and presented in Figure 6.

Table 5 Summary of Passive VOC Sampler ID Numbers, Deployment Locations

Soil Bores for WMS	Corresponding Borehole	Installation depth (m)	Details
VP1	BH20	1.1	Southwestern laneway that enters Elizabeth Street, which will be the location of the proposed Café.
VP2	BH21	1.1	Southern corner of the apartment complex, located in the *'stores'* areas of the ground floor.
VP3	BH13	0.55	Eastern corner of the apartment complex, located in the driveway of the ground floor carpark between parking spaces 41, 35 and 57.
VP4	BH16	3.4	Northern end of the Apartment complex, site for the ground floor Gym, soil vapour duplicate placed here

WMS were installed as per the deployment methods outlined in the Waterloo Membrane Sampler – Installation Methodology (SGS, 2017) guide. Standard procedures for passive sampler deployment, collection and dispatch are detailed in Table 6.

Table 6 Summary of Ambient Passive VOC Sampling Procedures using the Waterloo Membrane Sampler

Activity	Procedure Details
Ambient Probe Deployment	For each sampling location, the following sampling method for deployment was as follows: • Each hole was hand augered and/ or drilled to the required depth, maximum 1.2m bgs. • WMS in a wire casing was lowered into hole with a fishing line • The foam plug inside the ridged plastic sleeve was installed in the borehole with the assistance of a PVC pipe. • PVC pipe was then removed • The borehole was covered with a aluminum foil to protect from precipitation entering the how.
Sampling Duration	To achieve to achieve the desired LOR's and the full sampling requirement for F2 (C^9 to C^{16}) the samples were in situ for three days, 11th to 14th December 2017. The following was undertaken in collecting the samples after the appropriate sample exposure time as lapsed: • A note is taken of the date and time of the end of exposure. • The reverse to the installation was conducted, the cartridge was removed from the borehole and placed into the glass tube that it was deployed from.
Field Observations	Passive vapour sampling field observations included the following information: • Location, Time & Date, Relative humidity and Ambient temperature.
Field Quality Control Sampling	Sample QC are based on AS5667.1 and AS5667.11 QC procedures. The following quality control measures are put in place: • A single duplicate sample was collected simultaneously with the primary sample.
Sample preservation	The primary and QC samplers were removed from their deployment locations, sealed in their original glass tube and delivered to the Nata Accredited laboratory for analysis.
Sample holding times	The sample holding times for the WMS is 14 days and 14 days following extraction.
WMS Analysis	The Primary and duplicate samples were submitted to NATA certified laboratory, Specialist Laboratory Services (SGS) for analysis.
Calculations	Standard procedures are available for converting passive sample adsorbed concentrations expressed in ug into ug/m3. Input parameters include average barometric pressure, temperature, sampler sampling rates, laboratory extraction efficiency, minutes sampling duration and analyte molecular weight.

7 QUALITY CONTROL

All Field and laboratory Quality Assurance and Quality Control (QA/QC) details are presented in Appendix 6.

7.1 Field

It is standard to expect up to 10% error in field duplication and up to 10% laboratory error. Therefore, in theory up to 20% error can be assumed on duplicate analysis. Some variation may exist in soil and groundwater because even though all efforts are made to split samples homogeneously, fragments of materials may bias samples in certain elements.

Relative Percentage Differences (RPDs) for the duplicate and triplicate samples where applicable are calculated using the method outlined below.

The acceptance criteria used for the RPDs depend on the levels of contaminants detected and the laboratory's Method Detection Limits. The closer the levels detected are to the MDL the greater the acceptable RPD. RPDs are calculated as follows:

- RPD <50% for low level results (<20 * MDL)
- RPD <30% for medium level results (20-100 * MDL)
- RPD <15% for high level results (>100 * MDL)
- No limit applies at <2 * MDL (Method Detection Limit)

Field QA/QC procedures and compliance are summarised in Table 7

7.1.1 Soil

Table 7 Soil Field QA/QC procedures and Compliance

QA/QC Requirement	Completed	Comments
Appropriate sampling strategy used and representative samples collected	Yes	Sampling program was undertaken in accordance with AS4482.1-2005
Appropriate and well documented sample collection, handling, logging and transportation procedures.	Yes	Appropriate and well documented
Decontamination	Yes	Appropriate decontamination such as cleaning tools before sampling and between sample locations was undertaken
Chain-of-custody documentation completed	Yes	COC were completed in accordance with NEPM Schedule B2, Section 5.4.5 and transported under strict COC procedures. The signed COC documents are included in this report, which includes the condition report on arrival of samples to the Laboratory, cross checking of sample identification and paperwork and preservation method.
Required number of duplicate samples collected (1:20)	Yes	A single duplicate from 10 primary samples
QA/QC samples reported method detection limits within indicated guidelines.	No	Noncompliance for Co, Ni, Pb, PAH – Phenanthrene and the sum of PAHs
Required numbers of field and rinse blank samples collected	No	One rinse blank was collected. As one rinsate is required per day of sampling.
Samples delivered to the laboratory within sample holding times and with correct preservative	Yes	All samples were sent to the laboratory within holding times and correct preservative.

7.1.2 Soil Vapour

Soil vapour field QA/QC procedures and compliance are included in Table 8.

Table 8 Soil Vapour Field QA/QC procedures and Compliance

QA/QC Requirement	Completed	Comments
Appropriate sampling strategy used and representative samples collected	Yes	SGS was consulted in detail on best installation, sampling and WMS collection practices. Standard sampling practices such as wearing nitrile gloves and changing between sampling locations was undertaken.
Appropriate and well documented sample collection, handling, logging and transportation procedures.	Yes	Appropriate and well documented
Chain-of-custody documentation completed	Yes	All samples were transported under strict COC procedures and signed COC documents are included in this report.
Required number of duplicate samples collected (1:20)	Yes	4 Primary samples and 1 duplicate
Acceptable duplicated comparison results	Yes	Both the duplicate and the primary sample were reported below detection limits, and therefore a reasonable comparison could not be made between the duplicate pair.
Samples delivered to the laboratory within sample holding times and with correct preservative	Yes	All samples were sent to the laboratory within holding times and correct preservative.

7.2 Laboratory

7.2.1 Soil

Soil laboratory QA/QC procedures and compliance are summarised in Table 9.

Table 9 Soil Laboratory QA/QC Procedures and Compliance

QA/QC Requirement	Compliance	Comments
All analyses NATA accredited	Yes	ALS Laboratories is NATA Accredited.
Appropriate analytical methods used, in accordance with Schedule B(3) of the NEPM	Yes	
Acceptable laboratory limits of reporting (LORs) adopted.	Yes	
Method Blanks: zero to <Practical Quantitation Limit (PQL)	Yes	There were no method blank value outliners.
Duplicate Samples:<30% to 50% RPD.	Yes	There were no Duplicate outliners.
Control Samples: 70% to 130% recovery for soil; or 80% to 120% recovery for waters;	Yes	There were no Laboratory Control outliners.
Matrix spikes: 70% to 130% recovery for organics or 80%-120% recovery for inorganics	Yes	There were no matrix spike outliners.
	No	Duplicate: Mn
Surrogates: 70% to 130% recovery	Yes	There were no surrogate recovery outliners.
Analysis holding time outliers	Yes	No hold-time outliners exist.
Quality Control Sample Frequency Outliers	No	Water rinsate – laboratory duplicates TRH did not meet QC NEPM 2013 B3 or ALS Standard. Water rinsate – Matrix spikes for TRH did not meet QC NEPM 2013 B3 or ALS Standard.
	No	Soil matrix spikes for soils did not meet QC NEPM 2013 B3 or ALS Standard.

7.2.2 Soil Vapour

Soil vapour laboratory QA/QC procedures and compliance are summarised in Table 10.

Table 10 Soil Vapour Laboratory QA/QC Procedures and Compliance

QA/QC Requirement	Completed	Comments
Appropriately selected NATA Accredited Laboratory	Yes	Parent Company SGS Australia Pty Ltd, has a quality system certified to ISO:9001 and all Laboratories maintain ISO/IEC 17025:2005 accreditation. SGS is an independent testing service.
Appropriate analytical methods used, in accordance with Schedule B(3) of the NEPM	Yes	MA- 5.WL.04 Volatile Organics MA- 5.WL.03 Volatile Organics MA- 30.AIR.04 Total Recoverable Hydrocarbons
Acceptable laboratory limits of reporting (LORs) adopted.	Yes	
Chain of custody – Mandatory	Yes	
Timeframes	Yes	All samples were given sufficient duration in the ground in accordance with CRC CARE Technical Report 23
Method Blanks: zero to <Practical Quantitation Limit (PQL)	Yes	No detect (nd) within the PQL limits
Sufficient sample to preform analysis	Yes	
Analysis holding time	Yes	OK

8 FIELD INVESTIGATION FINDINGS

8.1 Soil Bores

8.1.1 Geological Interpretation

The geology of the site is summarised in Table 11 and soil bore logs are presented in Appendix 7, the PESA and current logs have been included. The majority of the site is paved with approximately 100-200 mm of concrete. Below the concrete is a clayey SAND to silty CLAY that ranges in colours from orange, light brown to brown and sometimes stained grey, it is firm to stiff and generally has high plasticity. Bedrock was not encountered.

Table 11 Stratigraphy at the Site (depths indicate base of horizon)

Investigation Holes	Fill Composition	Fill Base (m)	Natural Soil Composition	Natural Soil Base Top of Rock (m)	Rock Composition	Hole Depth (m)
BH1	Sandy GRAVEL	0.6	Sandy CLAY	1	-	1.0
BH2	Sandy GRAVEL; Clayey SAND & Sandy CLAY	0.6	Sandy CLAY	1	-	1.0
BH3	CONCRETE over Clayey GRAVEL	0.6	Silty CLAY Silty GRAVEL	2.3 2.9	-	2.9
BH4	CONCRETE over Clayey GRAVEL	0.9	Silty CLAY	2.0	-	2.0
BH5	Sandy GRAVEL, Gravelly CLAY	0.6	Silty CLAY Silty Sandy CLAY	2.9	-	2.9
BH6	CONCRETE Clayey SAND Silty Sandy CLAY	0.6	Silty CLAY	1.5	-	3.0
BH7	CONCRETE Clayey SAND Silty Sandy CLAY	0.6	Silty CLAY	3.0	-	3.0
BH8	CONCRETE TO 0.2 SAND some clay	1.7	Silty CLAY	3.0	-	3.0
BH9	CONCRETE TO 0.2 Clayey SAND	0.5	Silty CLAY Silty Sandy CLAY Silty CLAY FILL – SAND some clay Silty CLAY	2.9	-	2.9
BH10	GRAVEL	0.2	Sandy Silty CLAY	1.0	-	1.0
BH11	CONCRETE	0.1	Silty CLAY	0.15	-	0.15
BH12	CONCRETE Clayey GRAVEL	0.3	Sandy SILTY CLAY Silty CLAY	-	-	1.2
BH13	CONCRETE	0.25	-	0.25	Extremely weathered SILTSTONE	0.55
BH14	CONCRETE GRAVEL Sandy CLAY	0.6	Sandy SILTY CLAY Silty CLAY	-	-	1.4
BH15	CONCRETE SAND Clayey GRAVEL	-	Refusal at 0.6m bgs	-	-	0.6
BH16	CONCRETE GRAVEL Gravelly CLAY Silty CLAY	0.9	Silty clayey GRAVEL Silty gravelly CLAY Gravelly silty CLAY	-	-	3.4
BH17	Sandy GRAVEL Gravelly clayey SAND	0.5	Silty CLAY	1.1	Extremely weathered SANDSTONE / SILTSTONE	2.6
BH18	CONCRETE	0.2	Silty CLAY Sandy Silty CLAY Silty gravelly CLAY Silty CLAY	-	-	1.9
BH19	CONCRETE GRAVEL	0.3	Silty CLAY	-	-	1.9
BH20	CONCRETE Clayey GRAVEL	0.6	Silty CLAY	-	-	1.1
BH21	Sandy GRAVEL GRAVEL	0.6	Mixed clayey SAND & Sandy CLAY	-	-	1.1

8.1.2 Soil Grain Class Interpretation

Grain size classifications are applied to all soils at the site to determine threshold screening level concentrations for hydrocarbons (and chromium) to assess soil ecological and human health risks.

Grain class threshold values are determined based on either the:

- sample grain size (in the case of ecological screening levels or chromium limits); or
- average grain class overlying the sample point (when assessing petroleum vapour screening levels).

When assessing petroleum vapour intrusion health screening levels (HSL's), where soil is proposed to be excavated from the site, the excavated material is excluded from the grain class averaging. The corresponding depth class from which the sample is collected is also shallowed based on the renewed basement depth.

Table 12 provides a summary of the grain class averages for material overlying the sample (excluding the excavated materials). Where the fields are left blank, a class is not assigned given the sample was collected from within the proposed excavation. Pavement is assigned a clay class by default.

Table 12 Summary of Soil Grain Class Averaging Based on USCS Classification

Sample	Excavation (m)	Soil Grain Class Averaging Above Soil Sample															Rock (R)	Pavement (P)	New SLAB	Petroleum Vapour Intrusion HSL Grain Class*	SAMPLE USCS
		GW	GP	GM	GC	SW	SP	SM	SC	ML	CL	OL	MH	CH	OH	CI					
BH1 0.10m	0.0																		0.1	CLAY	GW
BH1 0.9m	0.0	0.3									0.5								0.1	CLAY	CL
BH2 0.1m	0.0																		0.1	CLAY	GW
BH2 0.9m	0.0	0.3									0.5								0.1	CLAY	CL
BH3 0.5m	0.0				0.2													0.2	0.1	CLAY	GC
BH3 2.3m	0.0				0.4									1.6				0.2	0.1	CLAY	CH
BH4 0.5m	0.0				0.3													0.2	0.1	CLAY	GC
BH4 1.0m	0.0				0.8													0.2	0.1	SAND	CH
BH5 0.1m	0.1																		0.1	CLAY	GW
BH5 3.0m	0.1	0.1									0.8			1.9					0.1	CLAY	CL
BH6 0.2m	1.5																		0.1	CLAY	SC
BH6 2.0m	1.5													0.4					0.1	CLAY	CH
BH6 3.0m	1.5													1.4					0.1	CLAY	CH
BH7 0.2m	1.6																		0.1	CLAY	SC
BH7 1.0m	1.6																		0.1	CLAY	CH
BH7 3.0m	1.6													1.3					0.1	CLAY	CH
BH8 1.0m	1.8																		0.1	CLAY	SC
BH8 0.5m	1.8																		0.1	CLAY	SC
BH9 0.2m	1.8																		0.1	CLAY	P
BH9 3.0m	1.8								0.3		0.3			0.5					0.1	CLAY	CH
BH10 0.1m	2.7																		0.1	CLAY	GW
BH10 1.0m	2.7																		0.1	CLAY	CL
BH11 0.1m	1.1																		0.1	CLAY	P
DUP	0.0								0.2		0.3			2.3				0.2	0.1	CLAY	CH
BH12 0.5m	0.9																		0.1	CLAY	CI
BH12 1.0m	0.9																		0.1	CLAY	CH
BH13 0.4-0.5m	0.5																		0.1	CLAY	ML
BH14 0.3-0.4m	0.4																		0.1	CLAY	CI
BH14 1.0-1.1m	0.4													0.1		0.5			0.1	CLAY	CH
BH15 0.5-0.6m	0.0				0.3	0.1												0.2	0.1	CLAY	GC
BH16 1.0-1.1m	2.2																		0.1	CLAY	GC
BH16 2.0-2.1m	2.2																		0.1	CLAY	CL
BH16 2.9-3.0m	2.2				1.0						0.2								0.1	SAND	CL
BH17 0.5-0.6m	2.7																		0.1	CLAY	CH
BH17 1.9-2.0m	2.7																		0.1	CLAY	R
BH18 0.2-0.3m	1.0																		0.1	CLAY	CH
BH18 0.9-1.0m	1.0																		0.1	CLAY	CH
BH19 0.2-0.3m	1.3																		0.1	CLAY	GW
BH19 0.9-1.0m	1.3																		0.1	CLAY	CH
BH20 0.5m	0.0				0.2													0.2	0.1	CLAY	GC
BH21 0.5m	0.0	0.3									0.1								0.1	SAND	CL
BH10 0.1m	0.0																		0.1	CLAY	GW
BH10 1.0m	0.0	0.2									0.7								0.1	CLAY	CL
BH16 1.0-1.1m	0.0	0.2			0.1									0.8		0.4		0.4	0.1	CLAY	GC
BH16 2.0-2.1m	0.0	0.2			0.7						0.4			0.8		0.4		0.4	0.1	CLAY	CL
BH16 2.9-3.0m	0.0	0.2			1.9						0.7			0.8		0.4		0.4	0.1	CLAY	CL
BH17 0.5-0.6m	0.0	0.4							0.6										0.1	SAND	CH
BH17 1.9-2.0m	0.0	0.4							0.6					0.6			0.8		0.1	CLAY	R

* Grain class may be modified if overlying slab is present. Concrete is interpreted to have similar vapour intrusion properties to clay and is therefore designated as CLAY within the averaging assessment.

8.2 Passive Soil Vapour Assessment

8.2.1 Soil Grain Class Interpretation

When assessing petroleum vapour intrusion health screening levels (HSL's), where soil is proposed to be excavated from the site, the excavated material is excluded from the grain class averaging. The corresponding depth class from which the sample is collected is also shallowed based on the renewed basement depth.

Table 13 provides a summary of the grain class averages for material overlying the sample (excluding the excavated materials). Where the fields are left blank, a class is not assigned given the sample was collected from within the proposed excavation. Pavement is assigned a clay class by default.

Table 13 Summary of Soil Grain Class Averaging Based on USCS Classification

Sample	Excavation (m)	Soil Grain Class Averaging Above Vapour Point																		Petroleum Vapour Intrusion HSL Grain Class*
		GW	GP	GM	GC	SW	SP	SM	SC	ML	CL	OL	MH	CH	OH	CI	Rock (R)	Pavement (P)	New SLAB	
VP1	0.0				0.4									0.4				0.2	0.1	CLAY
VP2	0.0	0.3									0.3					0.4			0.1	CLAY
VP3	0.4									0.1									0.1	CLAY
VP4	2.3				0.8						0.7								0.1	SAND
VP4	0.0	0.2			1.9						1.2			0.8		0.4		0.4	0.1	CLAY
Dup	2.3				0.8						0.7								0.1	SAND

* Grain class may be modified if overlying slab is present. Concrete is interpreted to have similar vapour intrusion properties to clay and is therefore designated as CLAY within the averaging assessment.

9 SOIL ECOLOGICAL IMPACT ASSESSMENT

9.1 Protected Environmental Values

The requirement for protecting soil from contaminated activities in Tasmania is managed under the Environmental Management and Pollution Control Act 1994 (EMPCA) which states in Part 5A:

(2) An area of land is a contaminated site if –

(a) there is in, on or under that area of land a pollutant in a concentration that –

(i) is above the background concentration; and

(ii) is causing or is likely to be causing serious or material environmental harm or environmental nuisance, or is likely to cause serious or material environmental harm or environmental nuisance in the future if not appropriately managed;

Potential soil impact at the site is assessed through application of the following environmental investigation guidelines.

9.2 NEPM (2013) Guidelines

The following ecological investigation guidelines are to be addressed in order to assess acceptable levels of risk to terrestrial ecosystems:

- NEPM (2013) Ecological Investigation Levels (EIL's) – have been developed for selected metal and organic substances. EIL's depend on specific soil and physicochemical properties and land use scenarios and generally apply to the top two (2) metres of the soil profile (NEPM 2013);
- NEPM (2013) Ecological Screening Levels (ESL's) – have been developed for selected petroleum hydrocarbon compounds and total petroleum hydrocarbon fractions. ESL's broadly apply to coarse

and fine grained soils and various land use scenarios within the top two (2) metres of the soil profile (NEPM 2013).

Soil analytical results are compared against Ecological Screening Levels (ESL's) and Ecological Investigation Levels (EIL's) limits presented in Table 14.

Table 14 Summary of Soil Investigation Limits Considered at the Site based in NEPM (2013) ASC

<table>
<tr><th rowspan="3">Investigation Levels (IL)</th><th colspan="7">Analytes Investigated</th></tr>
<tr><th colspan="4">Hydrocarbons</th><th colspan="2">Metals</th><th rowspan="2">DDT</th></tr>
<tr><th>BTEX</th><th>TRH (F1 to F4)</th><th>Benzo(a) pyrene (PAH)</th><th>Naphthalene (PAH)</th><th>Zn, Cu, Cr(III), Ni & As</th><th>Lead</th></tr>
<tr><td>ESL's</td><td>Analysed</td><td>Analysed</td><td>Analysed</td><td></td><td></td><td></td><td></td></tr>
<tr><td>EIL's</td><td></td><td></td><td></td><td>Analysed</td><td>Analysed</td><td>Analysed</td><td>Not Analysed</td></tr>
</table>

9.3 Guidelines

9.3.1 Ecological Screening Levels

The following compounds were compared against NEPM (2013) Ecological Screening Levels (ESL's):

- BTEX;
- F1 to F4 TRH; and
- Benzo(a)pyrene

Selection of ESL threshold investigation limits are set out in the NEPM (2013) guidelines and require classification of the soil according to:

- Land use sensitivity:
    - Areas of ecological significance
    - Urban residential and public open space; and
    - Commercial and industrial.
- Dominant particle size passing through a 2 mm sieve into:
    - Coarse – sand sizes and greater; and
    - Fine – clay and silt sizes.

Adopted NEPM (2013) soil and land use classifications are presented below.

9.3.2 Ecological Investigation Levels

There was a requirement to classify the soil according to physicochemical properties given that the above listed compounds. Adopted physicochemical parameters are presented in the results tables.

Selection of EIL threshold investigation limits are set out in the NEPM (2013) guidelines and require classification of the soil per specific soil and physicochemical properties which are presented in the results tables. The adopted land use scenarios presented in Table 15.

Table 15 Adopted Land Use Scenario For the Various Soil Bores

Land Use Scenario	Applicable Soil Bores
Areas of Ecological Significance	
Urban Residential & Public Open Space	All soil bores
Commercial & Industrial	

9.4 Findings

9.4.1 Ecological Screening Levels

Laboratory analytical results are presented in Appendix 5. Table 16compares soil analytical results for residual samples (non-excavated soil which is to remain at the site) against relevant NEPM ESL's. Concentrations which exceeded laboratory levels of reporting (LOR) are highlighted in bold, ESL exceedances are highlighted with a colored cell, and samples within the proposed excavation zone are marked with an X.

Of the 40 samples analysised, 12 had detections above the laboratory LOR and of these, 11 samples had exceedences above the ESL B guidelines for Urban residential and public opens space for Benzo(a)pyrene (B(a)p), TRH $C^6 – C^{10}$, $C^{10} – C^{16}$, and/ or $C^{16} – C^{34}$. All samples with exceedances were collected from shallow locations ranging from 0.1-0.2 m bgs, 0.3-0.4m bgs and 0.4-0.5m bgs.

8 out of the 11 exceedances are within the proposed excavation zone.

9.4.2 Ecological Investigation Levels

Laboratory analytical results are presented in Appendix 5. Table 17 compares soil analytical results for residual samples (non-excavated soil which is to remain at the site) against relevant ecological investigation limits (EIL's). Concentrations which exceeded laboratory LOR are highlighted indicated in bold, EIL exceedances are highlighted with a colored cell, and samples within the proposed excavation zone are marked with an X.

Of the 40 samples analysised, 15 samples had exceedances above the NEPM (2013) EIL threshold investigation limits for copper, nickel, zinc and lead for Urban residential and public opens space. All samples with exceedances were collected from shallow locations ranging from 0.1-0.2 m bgs, 0.3-0.4m bgs, 0.4-0.5m bgs and 1.0-1.1m bgs.

10 out of the 17 exceedances are within the proposed excavation zone.

Table 16 Summary of Soil Analytical Results Compared with ESL's

NEPM Ecological Screening Levels for Soil				BTEX				PAH	TRH			
Bold - Indicates LOR Exceedances X - Indicates Sample Within Proposed Excavation Zone Colour Shading - Indicates ESL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x				Benzene	Toluene	Ethylbenzene	Xylenes	Benzo(a)pyrene	F1 (C6 - C10)	F2 (>C10 - C16)	F3 (>C16 - C34)	F4 (>C34 - C40)
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	Sample Date	Soil Texture Class	Land Use	LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 0.5	LOR 10	LOR 50	LOR 100	LOR 100
BH1 0.10m	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	**0.8**	<10	<50	**250**	<100
BH1 0.9m	17/6/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH2 0.1m	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	**100**	<100
BH2 0.9m	17/6/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH3 0.5m	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH3 2.3m	17/6/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH4 0.5m	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	**2.2***	**256**	**1780****	**6380*****	**2200**
BH4 1.0m	17/6/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH5 0.1m X	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	**3.6****	<10	**50**	**640***	**240**
BH5 3.0m	17/6/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH6 0.2m X	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	**3.5***	<10	<50	**460**	<100
BH6 2.0m	17/6/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH6 3.0m	17/6/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH7 0.2m X	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	**3.8****	<10	<50	**280**	<100
BH7 1.0m X	17/6/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH7 3.0m	17/6/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH8 1.0m X	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH8 0.5m X	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH9 0.2m X	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	**2.3***	<10	<50	**140**	<100
BH9 3.0m	17/6/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH10 0.1m X	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	**1**	<10	<50	<100	<100
BH10 1.0m X	17/6/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH11 0.1m X	17/6/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	**360**	<100
BH12 0.5m X	12/12/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH12 1.0m	12/12/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH13 0.4-0.5m X	12/12/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH14 0.3-0.4m X	12/12/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	**5.2****	<10	<50	**370**	**110**
BH14 1.0-1.1m	12/12/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH15 0.5-0.6m	12/12/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH16 1.0-1.1m X	12/12/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH16 2.0-2.1m X	12/12/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH16 2.9-3.0m	12/12/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH17 0.5-0.6m X	12/12/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH17 1.9-2.0m X	12/12/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH18 0.2-0.3m X	12/12/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH18 0.9-1.0m X	12/12/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH19 0.2-0.3m X	12/12/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	**3.6****	<10	<50	**530**	**160**
BH19 0.9-1.0m X	12/12/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH20 0.5m	12/12/17	COARSE	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH21 0.5m	12/12/17	FINE	URBAN	<0.2	<0.5	<0.5	<0.5	**2.8***	<10	<50	**140**	<100

Table 17 Soil Analytical Results Compared Against Ecological Investigation Levels

NEPM Ecological Investigation Levels for Soil

Bold - Indicates LOR Exceedances
X - Indicates Sample Within Proposed Excavation Zone

Colour Shading - Indicates ESL Exceedances:
>1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x

Sample ID	Sample Date	EIL Land Use Sensitivity Class	Soil CEC (cmolc/kg)	Soil pH	Soil Grain Class	Copper (CEC)	Copper (pH)	Nickel	Zinc	Chromium III	Lead	Arsenic	Naphthalene
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH1 0.10m	17/06/2017	URBAN	10	4.5 (3)	COARSE	172	172	28	390	30	362	<5	<1
BH1 0.9m	17/06/2017	URBAN	35	4.5 (3)	FINE	16	16	6	17	7	26	<5	<1
BH2 0.1m	17/06/2017	URBAN	10	4.5 (3)	COARSE	53	53	22	329	23	364	<5	<1
BH2 0.9m	17/06/2017	URBAN	35	4.5 (3)	FINE	20	20	6	26	5	359	<5	<1
BH3 0.5m	17/06/2017	URBAN	20	4.5 (3)	COARSE	83	83	9	36	4	9	<5	<1
BH3 2.3m	17/06/2017	URBAN	45	4.5 (3)	FINE	16	16	20	65	8	11	<5	<1
BH4 0.5m	17/06/2017	URBAN	20	4.5 (3)	COARSE	116	116	16	473	10	4570	17	7
BH4 1.0m	17/06/2017	URBAN	45	4.5 (3)	FINE	17	17	8	25	13	16	<5	<1
BH5 0.1m X	17/06/2017	URBAN	10	4.5 (3)	COARSE	69	69	18	184	16	208	<5	<1
BH5 3.0m	17/06/2017	URBAN	35	4.5 (3)	FINE	8	8	6	24	23	13	18	<1
BH6 0.2m X	17/06/2017	URBAN	20	4.5 (3)	COARSE	122	122	20	941	20	1430	8	<1
BH6 2.0m	17/06/2017	URBAN	45	4.5 (3)	FINE	8	8	11	23	13	11	6	<1
BH6 3.0m	17/06/2017	URBAN	45	4.5 (3)	FINE	8	8	4	33	10	12	16	<1
BH7 0.2m X	17/06/2017	URBAN	20	4.5 (3)	COARSE	101	101	18	614	16	1140	8	<1
BH7 1.0m X	17/06/2017	URBAN	45	4.5 (3)	FINE	28	28	50	47	15	16	<5	<1
BH7 3.0m	17/06/2017	URBAN	45	4.5 (3)	FINE	<5	<5	3	13	6	5	<5	<1
BH8 1.0m X	17/06/2017	URBAN	20	4.5 (3)	COARSE	<5	<5	7	18	14	<5	<5	<1
BH8 0.5m X	17/06/2017	URBAN	20	4.5 (3)	COARSE	<5	<5	3	28	13	<5	<5	<1
BH9 0.2m X	17/06/2017	URBAN	0	4.5 (3)	COARSE	76	76	16	588	17	852	10	<1
BH9 3.0m	17/06/2017	URBAN	45	4.5 (3)	FINE	5	5	3	13	8	<5	<5	<1
BH10 0.1m X	17/06/2017	URBAN	10	4.5 (3)	COARSE	90	90	11	99	5	60	<5	<1
BH10 1.0m X	17/06/2017	URBAN	35	4.5 (3)	FINE	19	19	28	23	11	9	6	<1
BH11 0.1m X	17/06/2017	URBAN	0	4.5 (3)	COARSE	27	27	30	79	11	17	7	<1
BH12 0.5m X	12/12/2017	URBAN	35	6 (3)	FINE	32	32	14	28	18	10	5	<1
BH12 1.0m	12/12/2017	URBAN	45	4.5 (3)	FINE	39	39	72	45	16	11	8	<1
BH13 0.4-0.5m X	12/12/2017	URBAN	20	4.5 (3)	COARSE	16	16	13	53	7	<5	<5	<1
BH14 0.3-0.4m X	12/12/2017	URBAN	35	6 (3)	FINE	80	80	22	728	20	314	35	<1
BH14 1.0-1.1m	12/12/2017	URBAN	45	4.5 (3)	FINE	17	17	13	14	14	11	<5	<1
BH15 0.5-0.6m	12/12/2017	URBAN	20	4.5 (3)	COARSE	57	57	15	34	11	<5	<5	<1
BH16 1.0-1.1m X	12/12/2017	URBAN	20	4.5 (3)	COARSE	67	67	100	13	<4	<5	<5	<1
BH16 2.0-2.1m X	12/12/2017	URBAN	35	4.5 (3)	FINE	46	46	18	48	4	8	9	<1
BH16 2.9-3.0m	12/12/2017	URBAN	35	4.5 (3)	FINE	<5	<5	3	13	6	<5	<5	<1
BH17 0.5-0.6m X	12/12/2017	URBAN	45	4.5 (3)	FINE	24	24	16	32	17	12	<5	<1
BH17 1.9-2.0m X	12/12/2017	URBAN	10	4.5 (3)	COARSE	32	32	38	75	16	6	<5	<1
BH18 0.2-0.3m X	12/12/2017	URBAN	45	4.5 (3)	FINE	72	72	14	104	10	144	<5	<1
BH18 0.9-1.0m X	12/12/2017	URBAN	45	4.5 (3)	FINE	15	15	29	30	13	<5	<5	<1
BH19 0.2-0.3m X	12/12/2017	URBAN	10	4.5 (3)	COARSE	44	44	12	227	21	341	<5	<1
BH19 0.9-1.0m X	12/12/2017	URBAN	45	4.5 (3)	FINE	13	13	19	17	11	14	<5	<1
BH20 0.5m	12/12/2017	URBAN	20	4.5 (3)	COARSE	10	10	4	12	12	9	<5	<1
BH21 0.5m	12/12/2017	URBAN	35	4.5 (3)	FINE	49	49	15	157	12	238	6	<1
BH10 0.1m	17/06/2017	URBAN	10	4.5 (3)	COARSE	90	90	11	99	5	60	<5	<1
BH10 1.0m	17/06/2017	URBAN	35	4.5 (3)	FINE	19	19	28	23	11	9	6	<1
BH16 1.0-1.1m	12/12/2017	URBAN	20	4.5 (3)	COARSE	67	67	100	13	<4	<5	<5	<1
BH16 2.0-2.1m	12/12/2017	URBAN	35	4.5 (3)	FINE	46	46	18	48	4	8	9	<1
BH16 2.9-3.0m	12/12/2017	URBAN	35	4.5 (3)	FINE	<5	<5	3	13	6	<5	<5	<1
BH17 0.5-0.6m	12/12/2017	URBAN	45	4.5 (3)	FINE	24	24	16	32	17	12	<5	<1
BH17 1.9-2.0m	12/12/2017	URBAN	10	4.5 (3)	COARSE	32	32	38	75	16	6	<5	<1

10 SOIL HUMAN HEALTH DIRECT CONTACT ASSESSMENT

10.1 Guidelines

Guidelines presented herein are based on potential exposure of human receptors to soil impact which may include:

- Trench workers repairing or building services, typically to 1 m below ground surface (BGS). This classification is not dependent on the land use class.
- Onsite inhabitants which may be exposed to potential shallow soil impact in non-paved areas of the site; and
- Onsite excavation works which may include potential swimming pools (up to 3 m BGS); basement carparks; and deep foundations.

10.1.1 Land Use Classification

The NEPM (2013) guidelines have been referenced to ensure that the correct land use and density category has been adopted for the site and the surrounding properties (where applicable). As per NEPM 2013 guidelines, the adopted land use class is dependent on the building density and the opportunity for soil access by site occupants (exposure to potentially impacted soil). Aspects needing to be considered include:

- Whether the site is of sensitive land use such as a childcare center, preschool, primary school or aged care facility in which case land use Class A is applicable;
- The percentage of paved area to determine direct contact exposure risk and therefore classification as low or high density; and
- Classification based on residential, recreational or commercial/industrial setting.

10.1.2 Adopted Land Use Classification

The adopted land use class is presented in Table 18. Land use class is based on the opportunity for soil access as per NEPM 2013 guidelines.

A land use class D has been applied to all soil samples which is consistent with site commercial worker exposure to impacted soil and future trenching works after the development has been established.

Although soil exposure is unlikely a conservative approach has been applied to results where ground floor apartments are proposed: land use class B has been applied to the entire site.

Table 18 Summary of Land Use Setting and Density for Determining Exposure Risk

Location	Land Use Class	Land Use Density	Paved Area	Sensitive Land Use
Al soil bores	D	high	Presumed 100%	No
All soil bores	B	high	Presumed 100%	No

Table 19 summarises the areas of the site in which the soil analytical results are expected to be relevant as well as the applicable land use class for defining the threshold limits.

Table 19 Summary of Land Use Class Adopted for Defining Soil Analysis Threshold Limits

Soil Bores	Relevant Scenario	Adopted Land Use Class
All soil bores	Site development works and future trenching works	D
All soil bores	Future site users	B

10.1.3 Health Investigation & Screening Levels

The main exposure pathways and methods for assessing short term heath risk from contaminated soils are presented in Table 20. Vapour inhalation risk is addressed in Section 12 of this report.

Table 20 Summary of Exposure Pathways and Preliminary (Tier 1) Methods for Assessing Human Exposure Risk

Exposure Scenario	Contaminant Type	Tier 1 Assessment Method	Reference
Vapour Inhalation – Indoor (PVI)	Petroleum Hydrocarbons	HSLs (addressed in PVI sections)	NEPM (2013)
Vapour Inhalation – Trench (PVI)			CRC CARE (Friebel & Nadebaum, 2011)
Dermal Contact		HSLs	
Dust Inhalation	Metals PAHs Organochlorides Phenols Herbicides Other Pesticides	Health Investigation Levels (HILs)	NEPM (2013)
Soil Ingestion			

PVI – Petroleum Vapour Intrusion

10.2 Findings

10.2.1 Dermal Contact - Petroleum Hydrocarbons

Laboratory analytical results are presented in Appendix 5. Table 21 presents soil hydrocarbon analytical results compared against CRC CARE (Friebel & Nadebaum, 2011) HSL guidelines for assessing dermal contact risk. Concentrations which exceeded laboratory LOR are highlighted in bold, and HSL exceedances are highlighted with a colored cell indicating the highest HSL land used class which is exceeded.

Of the 40 samples analysed 11 had detections above the laboratory LOR and was one exceedance of HSL B guidelines for High Density Residential in BH4 0.5 of TPH C^{16} – C^{34}. BH4 is located near the historical interceptor trap.

Table 21 Soil Analytical Results Compared Against CRC CARE (Friebel & Nadebaum, 2011) Guidelines for Dermal Contact

CRC CARE Health Screening Level **Dermal Contact Hazard from Soil Hydrocarbons'**		EP080: BTEXN					EP080/071: TRH			
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.2	0.5	0.5	0.5	1	10	50	100	100
HSL A Low Density Residential		100	14000	4500	12000	1400	4400	3300	4500	6300
HSL B High Density Residential		140	21000	5900	17000	2200	5600	4200	5800	8100
HSL C Recreational		120	18000	5300	15000	1900	5100	3800	5300	7400
HSL D Commercial/Industrial		430	99000	27000	81000	11000	26000	20000	27000	38000
Intrusive Maintenance Worker		1100	120000	85000	130000	29000	82000	62000	85000	120000
Date	Sample									
17/06/2017	BH1 0.10m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**250**	<100
17/06/2017	BH1 0.9m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH2 0.1m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**100**	<100
17/06/2017	BH2 0.9m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH3 0.5m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH3 2.3m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH4 0.5m	<0.2	<0.5	<0.5	<0.5	**7**	**256**	**1790**	**6380**	**2200**
17/06/2017	BH4 1.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH5 0.1m	<0.2	<0.5	<0.5	<0.5	<1	<10	**50**	**640**	**240**
17/06/2017	BH5 3.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH6 0.2m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**460**	<100
17/06/2017	BH6 2.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH6 3.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH7 0.2m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**280**	<100
17/06/2017	BH7 1.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH7 3.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH8 1.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH8 0.5m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH9 0.2m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**140**	<100
17/06/2017	BH9 3.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH10 0.1m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH10 1.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
17/06/2017	BH11 0.1m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**360**	<100
12/12/2017	BH12 0.5m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH12 1.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH13 0.4-0.5m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH14 0.3-0.4m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**370**	**110**
12/12/2017	BH14 1.0-1.1m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH15 0.5-0.6m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH16 1.0-1.1m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH16 2.0-2.1m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH16 2.9-3.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH17 0.5-0.6m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH17 1.9-2.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH18 0.2-0.3m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH18 0.9-1.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH19 0.2-0.3m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**530**	**160**
12/12/2017	BH19 0.9-1.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH20 0.5m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH21 0.5m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**140**	<100

10.2.2 Dust Inhalation & Soil Ingestion

Combined dust inhalation and soil ingestion risk is assessed through the application of NEPM (2013) HIL's for exposure to soil contaminants. Laboratory analytical results are presented in Appendix 5. Soil analytical results are compared against the HIL's presented in Table 22. PAH concentrations which exceeded laboratory LOR are highlighted in bold, and for all results the HIL exceedances are highlighted with a colored cell indicating the highest HIL land used class which is exceeded, and samples within the proposed excavation zone are marked with an X.

All samples exceeding HIL B guideline limits are within the proposed excavation areas with the exception for the following:

- There was a single HIL D exceedance of Lead based on guidelines for *commercial land use*. At BH4 this sample was collected from 0.5m bgs. This sample is located next to the interceptor trap area.

Table 22 Soil Analytical Results Compared Against NEPM (2013) Health Investigation Limit Guidelines

Bold - Indicates LOR Exceedance in Non Metalic Compounds

NEPM Health Investigation Levels (HIL's)

Dust Inhalation and Soil Ingestion Assessment

X - Indicates Sample Within Proposed Excavation Zone

		EA055: Moisture Content	EG005T: Total Metals by ICP-AES														T: Total Recov
		Moisture Content (dried @ 103°C)	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Mercury
Units		%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		1	5	10	1	50	1	2	2	5	5	5	2	5	5	5	0.1
HIL A Low Density Residential			100		60	4500	20		100	6000	300	3800	400	200		7400	40
HIL B High Density Residential			500		90	40000	150		600	30000	1200	14000	1200	1400		60000	120
HIL C Recreational			300		90	20000	90		300	17000	600	19000	1200	700		30000	80
HIL D Comercial/Industrial			3000		500	3E+05	900		4000	2E+05	1500	60000	6000	10000		4E+05	730
Sample date:	Sample ID																
17/06/2017	BH1 0.10m	12.2	<5	80	<1	<50	18	30	13	172	362	275	28	<5	41	390	0.6
17/06/2017	BH1 0.9m	25	<5	50	<1	<50	<1	7	4	16	26	148	6	<5	33	17	0.2
17/06/2017	BH2 0.1m	15.1	<5	140	<1	<50	<1	23	6	53	364	176	22	<5	29	329	0.2
17/06/2017	BH2 0.9m	23.4	<5	80	<1	<50	<1	5	6	20	359	256	6	<5	23	26	0.9
17/06/2017	BH3 0.5m	14.2	<5	40	<1	<50	<1	4	21	83	9	262	9	<5	67	36	<0.1
17/06/2017	BH3 2.3m	16.5	<5	170	1	<50	<1	8	19	16	11	125	20	<5	29	65	<0.1
17/06/2017	BH4 0.5m	33.7	17	400	1	<50	<1	10	13	116	4570	512	16	<5	28	473	1
17/06/2017	BH4 1.0m	26.6	<5	120	1	<50	<1	13	6	17	16	80	8	<5	51	25	<0.1
17/06/2017	BH5 0.1m X x	13.1	<5	80	<1	<50	1	16	8	69	208	217	18	<5	30	184	0.5
17/06/2017	BH5 3.0m	19.3	18	10	<1	<50	<1	23	4	8	13	554	6	<5	54	24	<0.1
17/06/2017	BH6 0.2m X x	34.6	8	900	<1	<50	2	20	11	122	1430	248	20	<5	28	941	1.5
17/06/2017	BH6 2.0m	21.8	6	30	<1	<50	<1	13	8	8	11	1680	11	<5	31	23	<0.1
17/06/2017	BH6 3.0m	21.8	16	<10	<1	<50	<1	10	<2	8	12	70	4	<5	48	33	0.3
17/06/2017	BH7 0.2m X x	31.4	8	820	<1	<50	1	16	10	101	1140	213	18	<5	31	614	2.1
17/06/2017	BH7 1.0m X x	26.7	<5	1090	5	<50	<1	15	67	28	16	198	50	<5	40	47	0.1
17/06/2017	BH7 3.0m	22.8	<5	10	<1	<50	<1	6	3	<5	5	121	3	<5	24	13	1
17/06/2017	BH8 1.0m X x	17.9	<5	20	<1	<50	<1	14	3	<5	<5	37	7	<5	50	18	<0.1
17/06/2017	BH8 0.5m X x	12.8	<5	10	<1	<50	<1	13	2	<5	<5	51	3	<5	42	28	<0.1
17/06/2017	BH9 0.2m X x	24.2	10	500	1	<50	<1	17	17	76	852	366	16	<5	43	588	1.6
17/06/2017	BH9 3.0m	26.4	<5	30	<1	<50	<1	8	4	5	<5	55	3	<5	14	13	0.1
17/06/2017	BH10 0.1m X x	5.5	<5	30	<1	<50	<1	5	15	90	60	279	11	<5	58	99	0.1
17/06/2017	BH10 1.0m X x	20.6	6	110	1	<50	<1	11	32	19	9	1490	28	<5	41	23	<0.1
17/06/2017	BH11 0.1m X x	25.3	7	50	1	<50	<1	11	32	27	17	2260	30	<5	46	79	<0.1
12/12/2017	BH12 0.5m X x	22	5	220	1	<50	<1	18	13	32	10	116	14	<5	85	28	<0.1
12/12/2017	BH12 1.0m	19.5	8	660	4	<50	<1	16	368	39	11	1690	72	<5	65	45	<0.1
12/12/2017	BH13 0.4-0.5m X x	14.3	<5	20	1	<50	<1	7	6	16	<5	268	13	<5	23	53	<0.1
12/12/2017	BH14 0.3-0.4m X x	28.9	35	180	<1	<50	<10	20	12	80	314	825	22	<5	61	728	0.8
12/12/2017	BH14 1.0-1.1m	23.2	<5	480	1	<50	<1	14	14	17	11	54	13	<5	59	14	<0.1
12/12/2017	BH15 0.5-0.6m	6	<5	10	<1	<50	<1	11	13	57	<5	350	15	<5	39	34	<0.1
12/12/2017	BH16 1.0-1.1m X x	18.5	<5	230	<4	<50	<2	<4	33	67	<5	1050	100	<5	69	13	<0.1
12/12/2017	BH16 2.0-2.1m X x	27	9	90	1	<50	<1	4	13	46	8	760	18	<5	66	48	<0.1
12/12/2017	BH16 2.9-3.0m	16.7	<5	<10	<1	<50	<1	6	<2	<5	<5	10	3	<5	10	13	<0.1
12/12/2017	BH17 0.5-0.6m X x	23.2	<5	50	1	<50	<1	17	16	24	12	115	16	<5	70	32	<0.1
12/12/2017	BH17 1.9-2.0m X x	18.1	<5	220	<1	<50	<1	16	45	32	6	2410	38	<5	61	75	<0.1
12/12/2017	BH18 0.2-0.3m X x	22.1	<5	130	1	<50	<1	10	14	72	144	167	14	<5	53	104	1
12/12/2017	BH18 0.9-1.0m X x	17.3	<5	180	<5	<50	<3	13	17	15	<5	1100	29	<5	43	30	<0.1
12/12/2017	BH19 0.2-0.3m X x	19	<5	220	<1	<50	<1	21	9	44	341	208	12	<5	29	227	1.5
12/12/2017	BH19 0.9-1.0m X x	19.6	<5	2770	3	<50	<1	11	37	13	14	255	19	<5	43	17	<0.1
12/12/2017	BH20 0.5m	22.1	<5	40	<1	<50	<1	12	3	10	9	59	4	<5	48	12	<0.1
12/12/2017	BH21 0.5m	20.1	6	170	<1	<50	<1	12	11	49	238	301	15	<5	29	157	0.8
17/06/2017	BH10 0.1m	5.5	<5	30	<1	<50	<1	5	15	90	60	279	11	<5	58	99	0.1
17/06/2017	BH10 1.0m	20.6	6	110	1	<50	<1	11	32	19	9	1490	28	<5	41	23	<0.1
12/12/2017	BH16 1.0-1.1m	18.5	<5	230	<4	<50	<2	<4	33	67	<5	1050	100	<5	69	13	<0.1
12/12/2017	BH16 2.0-2.1m	27	9	90	1	<50	<1	4	13	46	8	760	18	<5	66	48	<0.1
12/12/2017	BH16 2.9-3.0m	16.7	<5	<10	<1	<50	<1	6	<2	<5	<5	10	3	<5	10	13	<0.1
12/12/2017	BH17 0.5-0.6m	23.2	<5	50	1	<50	<1	17	16	24	12	115	16	<5	70	32	<0.1
12/12/2017	BH17 1.9-2.0m	18.1	<5	220	<1	<50	<1	16	45	32	6	2410	38	<5	61	75	<0.1

		EP075(SIM)B: Polynuclear Aromatic Hydrocarbons																	
		Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	PAHs	Benzo(a)pyrene TEQ (WHO)
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
HIL A Low Density Residential																		300	3
HIL B High Density Residential																		400	4
HIL C Recreational																		300	3
HIL D Comercial/Industrial																		4000	40
Sample date:	Sample ID																		
17/06/2017	BH1 0.10m	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	**1.4**	**1.4**	**0.8**	**0.7**	**0.9**	<0.5	**0.8**	<0.5	<0.5	**0.5**	**7.1**	**1**
17/06/2017	BH1 0.9m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH2 0.1m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH2 0.9m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH3 0.5m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH3 2.3m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH4 0.5m	**4.9**	<0.5	<0.5	<0.5	**1.1**	<0.5	**2.2**	**2.6**	**1.7**	**1.5**	**2.3**	**0.9**	**2.2**	**1.3**	<0.5	**1.6**	**22.3**	**2.8**
17/06/2017	BH4 1.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH5 0.1m X x	<0.5	<0.5	<0.5	<0.5	**5.2**	**1.3**	**9.2**	**8.7**	**3.3**	**2.9**	**3.8**	**1.4**	**3.6**	**2.1**	<0.5	**2.7**	**44.2**	**4.7**
17/06/2017	BH5 3.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH6 0.2m X x	<0.5	**0.7**	<0.5	<0.5	**1.7**	**0.7**	**5.2**	**5.5**	**3.2**	**3.0**	**4.0**	**1.4**	**3.5**	**2.0**	<0.5	**2.4**	**33.3**	**4.6**
17/06/2017	BH6 2.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH6 3.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH7 0.2m X x	<0.5	**0.7**	<0.5	<0.5	**2.4**	**0.9**	**6.0**	**6.3**	**3.7**	**3.4**	**4.1**	**1.6**	**3.8**	**2.0**	**0.5**	**2.4**	**37.8**	**5.5**
17/06/2017	BH7 1.0m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH7 3.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH8 1.0m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH8 0.5m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH9 0.2m X x	<0.5	<0.5	<0.5	<0.5	**1.8**	**0.7**	**4.1**	**4.2**	**2.3**	**2.1**	**2.5**	**1.1**	**2.3**	**1.2**	<0.5	**1.4**	**23.7**	**3**
17/06/2017	BH9 3.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH10 0.1m X x	<0.5	<0.5	<0.5	<0.5	**0.5**	<0.5	**1.9**	**2.0**	**0.8**	**0.6**	**1.0**	<0.5	**1.0**	**0.7**	<0.5	**1.0**	**9.5**	**1.3**
17/06/2017	BH10 1.0m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	BH11 0.1m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH12 0.5m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH12 1.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH13 0.4-0.5m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH14 0.3-0.4m X x	<0.5	**0.6**	<0.5	<0.5	**2.5**	**0.8**	**5.1**	**5.9**	**3.3**	**3.1**	**5.4**	**1.8**	**5.2**	**3.1**	**0.9**	**4.4**	**42.1**	**7.5**
12/12/2017	BH14 1.0-1.1m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH15 0.5-0.6m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH16 1.0-1.1m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH16 2.0-2.1m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH16 2.9-3.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH17 0.5-0.6m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH17 1.9-2.0m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH18 0.2-0.3m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH18 0.9-1.0m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH19 0.2-0.3m X x	<0.5	**0.5**	<0.5	<0.5	**1.7**	**1.0**	**6.1**	**6.6**	**2.9**	**2.7**	**4.1**	**1.4**	**3.6**	**1.9**	<0.5	**2.6**	**35.1**	**4.7**
12/12/2017	BH19 0.9-1.0m X x	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH20 0.5m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH21 0.5m	<0.5	<0.5	<0.5	<0.5	**1.5**	<0.5	**3.5**	**3.7**	**2.6**	**2.1**	**3.4**	**1.1**	**2.8**	**1.5**	<0.5	**1.8**	**24.0**	**3.7**
17/06/2017	BH10 0.1m	<0.5	<0.5	<0.5	<0.5	**0.5**	<0.5	**1.9**	**2.0**	**0.8**	**0.6**	**1.0**	<0.5	**1.0**	**0.7**	<0.5	**1.0**	**9.5**	**1.3**
17/06/2017	BH10 1.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH16 1.0-1.1m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH16 2.0-2.1m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH16 2.9-3.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH17 0.5-0.6m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH17 1.9-2.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

11 INDOOR INHABITANT PVI ASSESSMENT – HSL's

This PVI assessment has been conducted in accordance with relevant CRC CARE Technical Documentation and NEPM 2013 guidelines presented in references section of this report. The HSL assessment approach is generally the first (Tier 1) investigation phase adopted for assessing PVI risk at petroleum hydrocarbon (PHC) impacted sites. HSL guidelines have been applied for samples collected from the site to account for risks that may be associated with volatile hydrocarbon vapour intrusion into confined spaces where there may be an inhalation risk through longer term exposure. This does not constitute a full vapour risk assessment but provides additional information from which to further quantify any risk.

A detailed investigation (Tier 2 to 3) is recommended over an HSL assessment where an acute risk has been identified at the site (CRC CARE 2013) because of:

- Migrating product on surface soils beneath buildings;
- Strong PHC odors;
- Flammable risk in confined spaces; and/or
- Health complaints from occupants.

Based on the site visits, none of the above conditions have been identified at the site. If the outcome of this Tier 1 assessment reveals HSL exceedances for hydrocarbon vapour intrusion, a more detailed (Tier 2) assessment will be required to further evaluate the human health risk.

PVI risk is initially interpreted through the development of HSL threshold limits from the following classifications:

- The geology and or hydrogeology of the investigation point; and
- Land use sensitivity:

The resulting HSL threshold limits are compared with laboratory analytical results.

11.1 Selected Media for Assessing PVI Risk

Table 23 presents a summary of the preferred HSL approach to assessing PVI risk.

Table 23 Preferred Methods for Determining Site PVI Risk

Media Analysed	Method	Limitations	Order of Preference
Soil Gas	Concentrations of a soil gas through a soil vapor probe	This approach provides the most reliable data in interpreting PVI risk, although direct modelling should be applied if concentrations exceed HSL threshold limits.	Primary
Groundwater	Concentrations of PHC in groundwater through deployment of monitoring wells	Determining PVI risk based on groundwater is inherently conservative when interpreting vapour risk to account for not readily discernable preferential pathways. Reference may be drawn to alternative assessment approaches: 1) Application of site specific conditions to the CRC CARE model for assessing PVI risk 2) Soil gas interpretation for areas where a PVI risk is identified from groundwater analysis.	Secondary
Soil	Concentrations of PHC in soil	Concentrations in soil may be subject variability due to soil moisture, organic content and oxygen ingress all which create significant bias in threshold values. Reliance is place on utilizing groundwater analysis over soil.	Tertiary

11.2 Land Use Class

For surrounding properties, the potential PVI risk is characterized through application of CRC CARE HSL's for each individual properties based on their existing land use (NEPM 2013; Friebel & Nadebaum 2010). The CRC CARE guidelines have been referenced to ensure that the correct land use and density category has been adopted for surrounding land use to ensure health risks are consistent with the HSL models. Aspects considered include the:

- Sensitivity of the existing or potential land use;
- Percentage of paved area for defining potential vapour migration risk;
- Type of basement garage which may influence the confinement of PHC vapors;
- Presence of a slab or cavity for discerning vapour intrusion risk.

If hydrocarbon impacted soil is discerned at the site, consideration is given to downgradient receptors. Where applicable, land use class therefore considers:

- Downgradient receptors where onsite HSL exceedances have been identified in soil; and
- Variations in land use for different parts of the proposed development.

The following land use classes are applied:

- *HSL D for all commercial spaces including the proposed Level 1 gym area, car parking and café areas;*
- *HSL D for all residential development above the Level 1 carpark (as per NEPM 2013) which identifies need for adequate ventilation in the basement which attenuates the hazard to residential spaces above the carpark; and*
- *HSL B for apartments located directly on bare earth to the north of the site.*

11.3 Vapour Barrier Assessment

Soil and soil vapour HSL's are specific to each sample location and involves characterisation based on the following variables:

- Land use class;
- Average grain size class of material above the sample point based on USCS partitioning into either sand, silt or clay and making adjustment to the grain class according to the following:
    - Excluding the proposed excavated material;
    - Including the dominant grain class of any backfill; and
    - Making allowance for a slab vapour barrier which is considered to have equivalent vapour barrier qualities to clay material.
- Sample depths are defined by the final finished floor level at that location relative to the:
    - Soil - above the soil sample;
    - Soil vapour - above the passive sampler borehole vapour barrier;
- Classifying vapour intrusion risk based on depth ranges:
    - Soil - 0 to 1 m; 1 to 2 m; 2 to 4 m; greater than 4 m; and
    - Soil vapour - 0 to 1 m; 1 to 2 m; 2 to 4 m; 4 to 8, greater than 8 m

Table 24 summarises soil and soil vapour bores and land use classification used to characterise PVI risk for various properties near the site.

Table 24 Classification Used to Assess Petroleum Vapour Intrusion Risk to Local Receptors from Soil

Location	Soil Bores	Soil Vapour	Land Use Class
Level 1 car Park Basement, Gym & Cafe	All Soil Bores	VP1 to VP4	D
Apartment on Level 2	BH10, BH16 & BH17	VP4	B

11.4 Soil Assessment Findings

Soil sampling results, Certificate of Analysis is presented in Appendix 5. Soil samples have been assessed against the elected NEPM (2013) HSL D (Table 25) and HSL B (Table 26) to determine potential hydrocarbon vapour risk to site users. Specific grain, depth and land use classes are presented in both tables.

Specific grain, depth and land use classes are presented with the tables. Concentrations which exceeded laboratory LOR are highlighted in bold, and HSL exceedances are highlighted with a colored cell. Samples within the excavation do not have a depth class and have been leveled 'Excavate".

There no HSL D or HSL B exceedances in any of the soil samples for indoor vapour assessment.

Table 25 Soil Analytical Results Compared Against HSL D

Soil Hydrocarbon HSL's for Assessing Indoor Vapour Intrusion (NEPM 2013) Soil Sample Analysis					EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances Colour Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x					Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	F1	F2
Sample ID	Sample Date	Depth Class	Grain Class	HSL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
					LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH1 0.10m	17/06/2017	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH1 0.9m	17/06/2017	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH2 0.1m	17/06/2017	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH2 0.9m	17/06/2017	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH3 0.5m	17/06/2017	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH3 2.3m	17/06/2017	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH4 0.5m	17/06/2017	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	**7**	**256**	**1780**
BH4 1.0m	17/06/2017	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH5 0.1m	17/06/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	**50**
BH5 3.0m	17/06/2017	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH6 0.2m	17/06/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH6 2.0m	17/06/2017	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH6 3.0m	17/06/2017	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH7 0.2m	17/06/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH7 1.0m	17/06/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH7 3.0m	17/06/2017	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH8 1.0m	17/06/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH8 0.5m	17/06/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH9 0.2m	17/06/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH9 3.0m	17/06/2017	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10 0.1m	17/06/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10 1.0m	17/06/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH11 0.1m	17/06/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
DUP	17/06/2017	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12 0.5m	12/12/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12 1.0m	12/12/2017	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH13 0.4-0.5m	12/12/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH14 0.3-0.4m	12/12/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH14 1.0-1.1m	12/12/2017	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH15 0.5-0.6m	12/12/2017	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 1.0-1.1m	12/12/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.0-2.1m	12/12/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.9-3.0m	12/12/2017	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 0.5-0.6m	12/12/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 1.9-2.0m	12/12/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 0.2-0.3m	12/12/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 0.9-1.0m	12/12/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH19 0.2-0.3m	12/12/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH19 0.9-1.0m	12/12/2017	EXCAVATE	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH20 0.5m	12/12/2017	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 0.5m	12/12/2017	0 - 1	SAND	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

Table 26 Soil Analytical Results Compared Against HSL B

Soil Hydrocarbon HSL's for Assessing Indoor Vapour Intrusion (NEPM 2013) Soil Sample Analysis					EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances Colour Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x					Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	F1	F2
Sample ID	Sample Date	Depth Class	Grain Class	HSL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
					LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH10 0.1m	17/06/2017	0 - 1	CLAY	B	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10 1.0m	17/06/2017	0 - 1	CLAY	B	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 1.0-1.1m	12/12/2017	1 - 2	CLAY	B	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.0-2.1m	12/12/2017	2 - 4	CLAY	B	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.9-3.0m	12/12/2017	2 - 4	CLAY	B	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 0.5-0.6m	12/12/2017	0 - 1	SAND	B	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 1.9-2.0m	12/12/2017	1 - 2	CLAY	B	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

11.5 Soil Vapour Assessment Findings

Soil vapour intrusion risk to indoor receptors is best characterised through installation of soil vapour probes. Soil vapour analytical results are presented in Appendix 9. Soil samples have been assessed against the elected NEPM (2013) HSL D and HSL B

Table 27 to determine potential hydrocarbon vapour risk to site users. Specific grain, depth and land use classes are presented in both tables. Detected results are presented in, guideline exceedances are represented in a coloured cell and samples results that were non-detect but above the HSL guideline are bold.

All soil vapour samples collected from the selected depths do not exceed the NEPM HSL guidelines for PHC vapour exposure risk to indoor vapour intrusion risk.

Table 27 Soil Vapour Analytical Results Compared Against NEPM HSLs for Assessing Petroleum Vapour Intrusion Risk (NEPM2013)

Soil Hydrocarbon Vapour HSL's for Assessing Indoor Vapour Intrusion (NEPM 2013) Passive Soil Vapour Analysis						EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances Colour Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x						Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	F1	F2
Sample ID	Sample Date	Depth Class	Grain Class	HSL	Deployment Duration (hours)	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3
						LOR 0.019	LOR 0.013	LOR 0.01	LOR 0.01	LOR 0.012	LOR 2.5	LOR 1
VP1	11/12/2017	1 - 2	CLAY	D	69.33	<0.019	**0.017**	<0.01	**0.017**	<0.012	<2.5	<1.0
VP2	11/12/2017	1 - 2	CLAY	D	68.83	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0
VP3	11/12/2017	0 - 1	CLAY	D	68.17	<0.019	**0.014**	**0.047**	**0.131**	<0.012	**13**	**2.4**
VP4	11/12/2017	1 - 2	SAND	D	67.75	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0
VP4	11/12/2017	2 - 4	CLAY	B	67.75	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0
Dup	11/12/2017	1 - 2	SAND	D	67.95	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0

12 TRENCH WORKER PVI ASSESSMENT – HSL's

12.1 Classification

The following Health Screening Assessment is based on hydrocarbon vapour intrusion risk to subsurface excavation workers within excavations. This is assessed through analysis of vapors from soil and soil vapours. Groundwater is generally not used to assess risk as threashold limits for all depth and grain classes are non-limiting. Land use classes are not applicable when assessing vapour intrusion into trenches.

Soil and soil vapour HSL's for assessing hydrocarbon risk to maintenance workers are based on CRC CARE Technical Report 10 guidelines (Friebel & Nadebaum 2011) and the following variables:

- Average grain size class of material above the sample point based on USCS partitioning into either sand, silt or clay;
- Sample depths are defined by proposed elevation of the development ground surface at that location relative to the:
  - Soil sample depth
  - Soil vapour point depth
- Classifying vapour intrusion risk based on depth ranges:
  - Soil - 0 to 1 m; 1 to 2 m; 2 to 4 m; greater than 4 m; and
  - Soil vapour - 0 to 1 m; 1 to 2 m; 2 to 4 m; 4 to 8, greater than 8 m

12.2 Soil Assessment Findings

Laboratory analytical results are presented in Appendix 5. Table 28 compares soil analytical results for residual samples (non-excavated soil which is to remain at the site) against relevant CRC CARE HSLs for shallow intrusive maintenance workers. Concentrations which exceeded laboratory LOR are highlighted in bold, and ESL exceedances are highlighted with a colored cell, and soil proposed to be excavated from the site are marked "Excavate".

None of the soil samples collected at the site exceeds the hydrocarbon HSL's for shallow intrusive maintenance workers.

Table 28 Summary of Soil Analytical Results Compared against HSL's for Assessing PVI Risk to Trench Workers

CRC CARE Health Screening Level Assessment for PHC Inhalation Risk To Trench Workers From Soil Sample Analysis				EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances / Dark Grey Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x				Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction
Sample ID	Sample Date	Depth Class	Grain Class	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH1 0.10m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH1 0.9m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH2 0.1m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH2 0.9m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH3 0.5m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH3 2.3m	17/06/2017	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH4 0.5m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	**7**	**256**	**1790**
BH4 1.0m	17/06/2017	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH5 0.1m	17/06/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	**50**
BH5 3.0m	17/06/2017	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH6 0.2m	17/06/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH6 2.0m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH6 3.0m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH7 0.2m	17/06/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH7 1.0m	17/06/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH7 3.0m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH8 1.0m	17/06/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH8 0.5m	17/06/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH9 0.2m	17/06/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH9 3.0m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10 0.1m	17/06/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10 1.0m	17/06/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH11 0.1m	17/06/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12 0.5m	12/12/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH12 1.0m	12/12/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH13 0.4-0.5m	12/12/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH14 0.3-0.4m	12/12/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH14 1.0-1.1m	12/12/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH15 0.5-0.6m	12/12/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 1.0-1.1m	12/12/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.0-2.1m	12/12/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.9-3.0m	12/12/2017	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 0.5-0.6m	12/12/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 1.9-2.0m	12/12/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 0.2-0.3m	12/12/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH18 0.9-1.0m	12/12/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH19 0.2-0.3m	12/12/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH19 0.9-1.0m	12/12/2017	EXCAVATE	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH20 0.5m	12/12/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH21 0.5m	12/12/2017	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10 0.1m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH10 1.0m	17/06/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 1.0-1.1m	12/12/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.0-2.1m	12/12/2017	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.9-3.0m	12/12/2017	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 0.5-0.6m	12/12/2017	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 1.9-2.0m	12/12/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

12.3 Soil Vapour Assessment Findings

Laboratory analytical results are presented in Appendix 9. Table 29 compares soil vapour analytical results against relevant CRC CARE HSLs for shallow intrusive maintenance workers. Concentrations which exceeded laboratory LOR are highlighted in bold, and ESL exceedances are highlighted with a colored cell. All soil vapour samples collected from the selected depths do not exceed the CRC CARE (Friebel & Nadebaum, 2011) guidelines for PHC vapour exposure risk to trench workers (Table 29).

Table 29 Soil Vapour Analytical Results Compared Against CRC CARE Guidelines for Assessing Petroleum Vapour Intrusion Risk to Trench Workers (CRC CARE - Friebel & Nadebaum, 2011)

CRC CARE Health Screening Level Assessment for PHC Inhalation Risk To Trench Workers Passive Soil Vapour Analysis				EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances **Dark Grey Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x**				Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction
				mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3
Sample ID	Sample Date	Depth Class	Grain Class	LOR 0.019	LOR 0.013	LOR 0.01	LOR 0.01	LOR 0.012	LOR 2.5	LOR 1
VP1	11/12/2017	0 to 2m	CLAY	<0.019	**0.017**	<0.01	**0.017**	<0.012	<2.5	<1.0
VP2	11/12/2017	0 to 2m	CLAY	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0
VP3	11/12/2017	0 to 2m	CLAY	<0.019	**0.014**	**0.047**	**0.131**	<0.012	**13**	**2.4**
VP4	11/12/2017	0 to 2m	SAND	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0
VP4	11/12/2017	2 to 4m	CLAY	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0
Dup	11/12/2017	0 to 2m	SAND	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0

13 SOIL DISPOSAL ASSESSSMENT

13.1 Guidelines

Soil which is excavated from the site for landfill disposal is to be assessed against Information Bulletin 105 (IB105) for Classification and Management of Contaminated Soil for Disposal. The EPA uses 4 categories to classify contaminated soil as per Table 30:

- (Level 1) Fill Material;
- (Level 2) Low Level Contaminated Soil;
- (Level 3) Contaminated Soil; and
- (Level 4) Contaminated Soil.

Fixed numerical values are presented for soil concentrations and leachable fraction concentrations.

13.2 Findings

The soil samples have been compared against IB105 guidelines for soil disposal see Table 31 and Table 32.. On average, the proposed excavated soil is classified as Level 2 contaminated based on barium, lead, zinc & benzo(a)pyrene. Most of this impact occurs at a shallow depth at the site. Barium is likely to be an artefact of background soils in the area and not a contaminant of concern at the site which may deem it as being classified Level 2.

The bulk of the impact occurs in shallow fill material at the site, and care should be taken to scraping the top 0.3 m from the site and stockpiling is separately from the remaining deep excavations. This is likely to bring the bulk excavations below 0.3 m BGS to Level 1.

Elevated lead concentrations in BH4 0.5 bring the soil classification to Level 4 (Table 31). However, when all soil hydrocarbon concentrations are averaged, the soil is reduced to level 2 classification. GES therefore recommends that any soil excavated at the site is stockpiled, sampled, analysised and transported to a licensed storage and handling facility for management of contaminated soil.

Table 30 Summary of IB105 Classification Guidelines

	Classification (with reference to Table 2)	Controlled Waste[1]	Comments
Fill Material[2] **(Level 1)**	Soil that exhibits levels of contaminants below the limits defined under *Fill Material* in Table 2.	Unlikely	Soil classified as *Fill Material* can still be a 'pollutant' under the *Environmental Management and Pollution Control Act 1994* and needs to be responsibly managed.
Low Level Contaminated Soil (Level 2)	Soil that exhibits levels of contaminants above the limits defined under *Fill Material* but below the limits defined under *Low Level Contaminated Soil* in Table 2.	Likely	Where leachable concentrations have not been prescribed, maximum total concentrations will be used to classify the soil.
Contaminated Soil (Level 3)	Soil that exhibits levels of contaminants above the limits defined under *Low Level Contaminated Soil* but below the limits defined under *Contaminated Soil* in Table 2.	Yes	Where leachable concentrations have not been prescribed, maximum total concentrations will be used to classify the soil.
Contaminated Soil for Remediation (Level 4)	Soil that exhibits levels of contaminants above the limits defined under *Contaminated Soil* in Table 2 (regardless of the maximum total concentrations) is generally ***not*** considered acceptable for off-site disposal without prior treatment.	Yes	Soil that contains contaminants that do not have criteria for leachable concentrations (*e.g.* petroleum hydrocarbons), and the levels of contaminants exceed the maximum total concentrations listed in *Contaminated Soil*, are generally classified as *Contaminated Soil for Remediation*.

[1] Controlled Waste is defined in the *Environmental Management and Pollution Control Act 1994*.
[2] Criteria for *Fill Material* are the limits set by the Director for the purposes of R.9(2)(a)(ii) in the *Regulations*.

Table 31 All Soil Analytical Results Compared Against IB105 Investigation Limits for soil Disposal

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal X - Below Proposed Finished Floor Level		EG005T: Total Metals by ICP-AES											EG035T	EP075(SIM)A		EP080: BTEX				EP080/071: TRH	
		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Benzo(a)pyrene	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes	C6 - C9 Fraction	C10 - C36 Fraction (sum)
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		5	10	1	1	2	2	5	5	5	2	5	0.1	0.5	0.5	0.2	0.5	0.5	0.5	10	50
Investigation Level Selected																					
IB105 Level 1		20	300	2	3	50	100	100	300	500	60	200	1	0.08	20	1	1	3	14	65	1000
IB105 Level 2		200	3000	40	40	500	200	2000	1200	5000	600	14000	30	2	40	5	100	100	180	650	5000
IB105 Level 3		750	30000	400	400	5000	1000	7500	3000	25000	3000	50000	110	20	200	50	1000	1080	1800	1000	10000
IB105 Level 4		>750	>30000	>400	>400	>5000	>1000	>7500	>3000	>25000	>3000	>50000	>110	>20	>200	>50	>1000	>1080	>1800	>1000	>10000
17/06/2017	BH1 0.10m	<5	80	<1	18	30	13	172	362	275	28	390	0.6	0.8	7.1	<0.2	<0.5	<0.5	<0.5	<10	300
17/06/2017	BH1 0.9m	<5	50	<1	<1	7	4	16	26	148	6	17	0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH2 0.1m	<5	140	<1	<1	23	6	53	364	176	22	329	0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH2 0.9m	<5	80	<1	<1	5	6	20	359	256	6	26	0.9	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH3 0.5m	<5	40	<1	<1	4	21	83	9	262	9	36	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH3 2.3m	<5	170	1	<1	8	19	16	11	125	20	65	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH4 0.5m	17	400	1	<1	10	13	116	4570	512	16	473	1	2.2	22.3	<0.2	<0.5	<0.5	<0.5	132	9550
17/06/2017	BH4 1.0m	<5	120	1	<1	13	6	17	16	80	8	25	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH5 0.1m X	<5	80	<1	1	16	8	69	208	217	18	184	0.5	3.6	44.2	<0.2	<0.5	<0.5	<0.5	<10	770
17/06/2017	BH5 3.0m	18	10	<1	<1	23	4	8	13	554	6	24	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH6 0.2m X	8	900	<1	2	20	11	122	1430	248	20	941	1.5	3.5	33.3	<0.2	<0.5	<0.5	<0.5	<10	540
17/06/2017	BH6 2.0m	6	30	<1	<1	13	8	8	11	1680	11	23	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH6 3.0m	16	<10	<1	<1	10	<2	8	12	70	4	33	0.3	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH7 0.2m X	8	820	<1	1	16	10	101	1140	213	18	614	2.1	3.8	37.8	<0.2	<0.5	<0.5	<0.5	<10	310
17/06/2017	BH7 1.0m X	<5	1090	5	<1	15	67	28	16	198	50	47	0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH7 3.0m	<5	10	<1	<1	6	3	<5	5	121	3	13	1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH8 1.0m X	<5	20	<1	<1	14	3	<5	<5	37	7	18	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH8 0.5m X	<5	10	<1	<1	13	2	<5	<5	51	3	28	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH9 0.2m X	10	500	1	<1	17	17	76	852	366	16	588	1.6	2.3	23.7	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH9 3.0m	<5	30	<1	<1	8	4	5	<5	55	3	13	0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH10 0.1m X	<5	30	<1	<1	5	15	90	60	279	11	99	0.1	1	9.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH10 1.0m X	6	110	1	<1	11	32	19	9	1490	28	23	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH11 0.1m X	7	50	1	<1	11	32	27	17	2260	30	79	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	380
12/12/2017	BH12 0.5m X	5	220	1	<1	18	13	32	10	116	14	28	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH12 1.0m	8	660	4	<1	16	368	39	11	1690	72	45	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH13 0.4-0.5m X	<5	20	1	<1	7	6	16	<5	268	13	53	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH14 0.3-0.4m X	35	180	<1	<10	20	12	80	314	825	22	728	0.8	5.2	42.1	<0.2	<0.5	<0.5	<0.5	<10	420
12/12/2017	BH14 1.0-1.1m	<5	480	1	<1	14	14	17	11	54	13	14	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH15 0.5-0.6m	<5	10	<1	<1	11	13	57	<5	350	15	34	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 1.0-1.1m X	<5	230	<4	<2	<4	33	67	<5	1050	100	13	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 2.0-2.1m X	9	90	1	<1	4	13	46	8	760	18	48	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 2.9-3.0m	<5	<10	<1	<1	6	<2	<5	<5	10	3	13	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH17 0.5-0.6m X	<5	50	1	<1	17	16	24	12	115	16	32	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH17 1.9-2.0m X	<5	220	<1	<1	16	45	32	6	2410	38	75	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH18 0.2-0.3m X	<5	130	1	<1	10	14	72	144	167	14	104	1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH18 0.9-1.0m X	<5	180	<5	<3	13	17	15	<5	1100	29	30	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH19 0.2-0.3m X	<5	220	<1	<1	21	9	44	341	208	12	227	1.5	3.6	35.1	<0.2	<0.5	<0.5	<0.5	<10	610
12/12/2017	BH19 0.9-1.0m X	<5	2770	3	<1	11	37	13	14	255	19	17	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH20 0.5m	<5	40	<1	<1	12	3	10	9	59	4	12	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH21 0.5m	6	170	<1	<1	12	11	49	238	301	15	157	0.8	2.8	24	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH10 0.1m	<5	30	<1	<1	5	15	90	60	279	11	99	0.1	1	9.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH10 1.0m	6	110	1	<1	11	32	19	9	1490	28	23	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 1.0-1.1m	<5	230	<4	<2	<4	33	67	<5	1050	100	13	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 2.0-2.1m	9	90	1	<1	4	13	46	8	760	18	48	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 2.9-3.0m	<5	<10	<1	<1	6	<2	<5	<5	10	3	13	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH17 0.5-0.6m	<5	50	1	<1	17	16	24	12	115	16	32	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH17 1.9-2.0m	<5	220	<1	<1	16	45	32	6	2410	38	75	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50

Table 32 Proposed excavated Soil Analytical Results only Compared Against IB105 Investigation Limits for soil Disposal With Averages Included

Information Bulletin 105 **Classification and Management of Contaminated Soil For Disposal** **X - Below Proposed Finished Floor Level**		**EG005T: Total Metals by ICP-AES**											**EG035T**	**EP075(SIM)A**		**EP080: BTEX**				**EP080/071: TRH**	
		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Benzo(a)pyrene	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes	C6 - C9 Fraction	C10 - C36 Fraction (sum)
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		5	10	1	1	2	2	5	5	5	2	5	0.1	0.5	0.5	0.2	0.5	0.5	0.5	10	50
Investigation Level Selected																					
IB105 Level 1		20	300	2	3	50	100	100	300	500	60	200	1	0.08	20	1	1	3	14	65	1000
IB105 Level 2		200	3000	40	40	500	200	2000	1200	5000	600	14000	30	2	40	5	100	100	180	650	5000
IB105 Level 3		750	30000	400	400	5000	1000	7500	3000	25000	3000	50000	110	20	200	50	1000	1080	1800	1000	10000
IB105 Level 4		>750	>30000	>400	>400	>5000	>1000	>7500	>3000	>25000	>3000	>50000	>110	>20	>200	>50	>1000	>1080	>1800	>1000	>10000
17/06/2017	BH5 0.1m X	<5	80	<1	1	16	8	69	208	217	18	184	0.5	3.6	44.2	<0.2	<0.5	<0.5	<0.5	<10	770
17/06/2017	BH6 0.2m X	8	900	<1	2	20	11	122	1430	248	20	941	1.5	3.5	33.3	<0.2	<0.5	<0.5	<0.5	<10	540
17/06/2017	BH7 0.2m X	8	820	<1	1	16	10	101	1140	213	18	614	2.1	3.8	37.8	<0.2	<0.5	<0.5	<0.5	<10	310
17/06/2017	BH7 1.0m X	<5	1090	5	<1	15	67	28	16	198	50	47	0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH8 1.0m X	<5	20	<1	<1	14	3	<5	<5	37	7	18	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH8 0.5m X	<5	10	<1	<1	13	2	<5	<5	51	3	28	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH9 0.2m X	10	500	1	<1	17	17	76	852	366	16	588	1.6	2.3	23.7	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH10 0.1m X	<5	30	<1	<1	5	15	90	60	279	11	99	0.1	1	9.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH10 1.0m X	6	110	1	<1	11	32	19	9	1490	28	23	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH11 0.1m X	7	50	1	<1	11	32	27	17	2260	30	79	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	380
12/12/2017	BH12 0.5m X	5	220	1	<1	18	13	32	10	116	14	28	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH13 0.4-0.5m X	<5	20	1	<1	7	6	16	<5	268	13	53	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH14 0.3-0.4m X	35	180	<1	<10	20	12	80	314	825	22	728	0.8	5.2	42.1	<0.2	<0.5	<0.5	<0.5	<10	420
12/12/2017	BH16 1.0-1.1m X	<5	230	<4	<2	<4	33	67	<5	1050	100	13	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 2.0-2.1m X	9	90	1	<1	4	13	46	8	760	18	48	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH17 0.5-0.6m X	<5	50	1	<1	17	16	24	12	115	16	32	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH17 1.9-2.0m X	<5	220	<1	<1	16	45	32	6	2410	38	75	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH18 0.2-0.3m X	<5	130	1	<1	10	14	72	144	167	14	104	1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH18 0.9-1.0m X	<5	180	<5	<3	13	17	15	<5	1100	29	30	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH19 0.2-0.3m X	<5	220	<1	<1	21	9	44	341	208	12	227	1.5	3.6	35.1	<0.2	<0.5	<0.5	<0.5	<10	610
12/12/2017	BH19 0.9-1.0m X	<5	2770	3	<1	11	37	13	14	255	19	17	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
Averaging		4	321	0.8	0.3	14	18	48	312	479	19	225	0.5	1.2	12.4	0.0	0.0	0.0	0.0	0	167

14 CONCEPTUAL SITE MODEL

14.1 Potential & Identified Sources of Contamination

14.1.1 Potential Primary Sources

The primary potential sources of contamination impact at the site includes:

- Heavy metal and hydrocarbon impacted fill from historical site activities. Despite residential use, many older building sites around Hobart have background zinc, lead and PAH contamination;
- UST T1, T2, T3 and T4 and associated bowsers and fuel lines;
- Truck service pits within workshop;
- Interceptor trap and associated pipework;
- Vehicle wash-down areas; and
- Potential historical industrial activities occurring at the site including metalworks, and possible use of the site for servicing and storage of vehicles.

There may be other unknown potential sources of onsite or offsite impact (outside of the sampling areas) which GES are unaware of and therefore have not been investigated within this assessment.

Contaminates of potential concern associated with these potential sources have already been identified in a previous section.

14.1.2 Identified Primary Sources

Identified primary sources include:

- Soil impact has been identified around the historical interceptor trap which is no longer in use but was in use until recently (within last 5 years);
- GES are not aware of any site tank decommissioning and it needs to be assumed that all tanks (identified or not identified) remain at the site. The tanks may present geotechnical hazards with ground instability issues if they are to remain, and therefore the UST's should be formally decommissioned.
- UST T1, T2 and the former bowser in Area B as well as Area C have not been investigated given the presence of the building obstructions. These are not an identified primary source and data gaps remain for this area of the site; and
- Heavy metal and hydrocarbon impacted fill has been identified within the upper 0.4 m of the site.

14.1.3 Identified Secondary Sources

The following contaminants have been identified in soil at the site:

- Heavy metal and hydrocarbon impacted fill to depths of 0.4 m BGS; and
- Heavy metal and hydrocarbon impacted fill around the interceptor trap.
- There may be secondary soil impact around UST T1 and T2, as well as in Area C. This needs to be further investigated whilst the site is being excavated.

14.2 Potential Receptors

The following presents a summary of all potential receptors considered in the assessment.

14.2.1 Potential Future Onsite Receptors

Potential future onsite receptors including slab demolition, earth removal, development and occupancy stages are presented in Table 33.

Table 33 Summary of Potential Future Onsite Receptors

Medium	Specific Onsite Receptor
Soil	Site earthworks including soil removal
	Future trench workers
	Onsite inhabitants which may be exposed to: • Excavated soil during trenching works; • Petroleum vapours sourcing from impacted soil
Groundwater/Vapour	Onsite inhabitants which may be exposed to petroleum vapours sourcing from impacted groundwater

14.2.2 Potential Offsite Receptors

Heavy metal impacted groundwater may only pose a risk if it:

- Shallows and discharge into an inhabitable area where people may be in direct contact with it. Given groundwater is unlikely to shallow within 500 m of the site, this risk is considered low;
- Is used as a drinking water sourced which has been ruled out based on PEV's and higher salinity groundwater typical within the identified geological units;
- If it is to discharge into a nearby ecosystem. Given there are no nearby sensitive ecosystems within a 500m radius of the site, provided that a soil and water is managed during development works, there is a low risk that heavy metal and hydrocarbon impacted soil identified by EIL's and ESL exceedances will present a risk to ecosystem receptors.

Hydrocarbons may present a risk to offsite receptors if the hydrocarbons present a vapour intrusion risk.

Hydrocarbon or heavy metal impacted soil may present a risk to offsite receptors if it is not managed appropriately and allowed to erode from the site. The heavy metals, are unlikely to concentrate to the extent that they will cause heightened risk to receptors beyond what has been identified within this ESA.

Table 34 presents a summary of potential offsite receptors

Table 34 Summary of Potential Offsite Receptors

Medium	Specific Offsite Receptor
Groundwater	PVI risk in downgradient first floor residential units
	PVI risk in downgradient ground floor commercial spaces
	Shallowing into backyards downgradient
	Drinking water use
	Ecosystem
Soil	Ecosystem impact from erosion and stormwater runoff

14.3 Transport Mechanisms and Exposure Routes

14.3.1 Incomplete Contaminant Exposure Pathways

Incomplete contaminant exposure pathways relate to present unmanaged risk. Table 35 presents a summary of potential receptors identified in desktop assessment of the site, with incomplete exposure pathways deducted based on the soil investigations. All offsite exposure pathways have been ruled out.

Table 35 Summary of Incomplete Contaminant Exposure Pathways

Medium	Specific Receptor	Pathways Ruled Out	Basis
Groundwater	Onsite residential and commercial receptors	Vapour inhalation sourcing from the site	PVI risk not identified in passive vapour samplers
	Downgradient residential	Shallowing into backyards	No shallowing groundwater within 500 m radius
	Human health	Drinking groundwater	Typical salinity values and reticulated water rule out groundwater as a drinking water PEV
	Ecosystem	Shallowing into nearby rivulet	No ecosystem receptors identified at least within 500 m of the site
Soil	Onsite residential and commercial receptors	Vapour inhalation sourcing from the site	PVI risk not identified in passive vapour samplers

14.3.2 Potential Pathways

Potential and plausible transport mechanisms and exposure routes are presented in Table 36 and Figure 7 model. Incomplete exposure pathways are not included in Figure 7.

Although potential onsite receptors to petroleum vapour intrusion risk have been ruled out, a vapour intrusion risk to offsite receptors cannot be ruled out on the basis that:

- It is not known if there is impact sourcing from UST T1 & T2; and
- Onsite and offsite groundwater has not been investigated.

Table 36 Summary of Potential Complete Contaminant Exposure Pathways

Medium	Specific Pathway	Receptors
Soil	Dust inhalation, soil ingestion & dermal contact	Construction workers*
		Onsite residential inhabitants*
		Future trench workers*
	Soil erosion and stormwater transport during construction phase	Marine ecosystem*
Groundwater	Indoor vapour intrusion	Downgradient residential or commercial receptors

* See Recommendations for Managed Risk Options

14.3.3 Plausible Contaminant Exposure Pathway Details

Provided that the soil is adequately managed as indicated in the recommendations, plausible exposure pathways are not identified at the site.

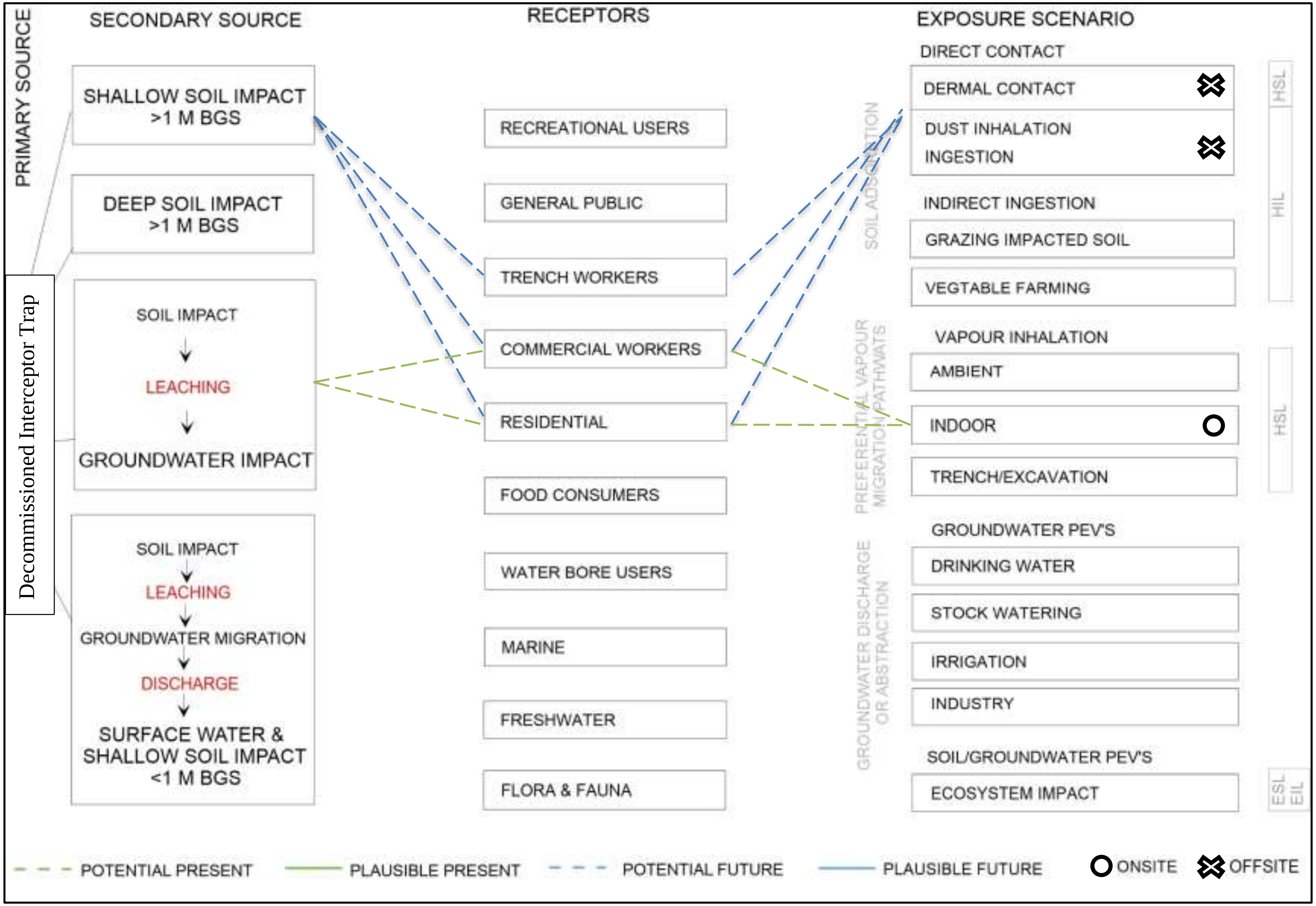


Figure 7 Conceptual Site Model Identifying Contamination Source, Receptors and Transport Mechanisms/Exposure Routes

15 CONCLUSIONS

15.1 Adopted Land Use Settings

The following investigation limits were adopted for the site:

- Ecosystem – Residential land use;
- Future land users soil direct contact risk– limited soil access (all paved) therefore:
    - HIL B for soil ingestion and dust inhalation risk to residence;
    - HIL D for soil ingestion and dust inhalation risk to commercial workers
- Future land users vapour inhalation risk –
    - HSL D for Level 1 commercial workers
    - HSL D for residence living above Level 1 carpark
    - HSL B for residence living on Level 2 built on ground surface
- Site development works and future (post development) trench workers:
    - Standard guidelines for assessing trench worker vapour intrusion risk;
    - Standard guidelines for assessing dermal contact risk; and
    - HIL D for assessing dust inhalation and soil ingestion risk

15.2 Invasive Soil Assessment

The following conclusions can be made from the invasive soil assessment.

- GES are not aware of any tank decommissioning and it needs to be assumed that all tanks (identified or not identified) remain at the site.
- Site contamination findings are summarised:
    - Shallow soil impact has been identified in fill throughout the site within the top 0.3 to 0.4 m of the soil profile. Most of the identified impact is proposed to be excavated with a smaller amount to remain which is predominantly within guideline limits:
        - ESL exceedances have been identified based on a residential setting comprising benzo(a)pyrene and heavy oil compounds. Eight (8) exceedances are in the proposed excavation areas and three (3) which are to remain at the site beneath the new slab. Provided management measures are put in place, there is a LOW risk that the soil will present an environmental hazard;
        - EIL exceedances have been identified based on a residential setting comprising copper, nickel, zinc and lead. Ten (10) exceedances are in the proposed excavation areas and seven (7) which are to remain at the site beneath the new slab. Soil which is to remain at the site exceeds guidelines for copper and zinc. Provided management measures are put in place, there is a LOW risk that the soil will present an environmental hazard;
        - HIL B guidelines for assessing soil ingestion and dust inhalation risk are exceeded in six (6) samples at the site for assessing risk to future site users, of which all samples are proposed to be excavated except for BH4 0.5 m near the interceptor trap which exceeds HIL D. If the areas around the interceptor trap are excavated, there is an exposure risk to commercial workers, however based on available information, a risk to ongoing site users will be mitigated;
        - HSL D guidelines for assessing dermal contact risk to commercial workers have been identified in BH4 0.5 m near the interceptor trap (the same HIL D exceedance). Provided this impacted soil is removed, risk to future trench workers can be mitigated.
    - **Investigation Area A** – Other than the identified site fill, no impact has been identified in the truck service area nor around UST T3 and T4;
    - **Investigation Area B -** Other than the identified site fill, and impact around the interceptor trap, no impact has been identified. There remain data gaps in this Area B. Areas around former UST T1 and T2 as well as the nearby former bowser area have not been investigated given the presence of the building obstructions;

  - **Investigation Area C -** has not been investigated given the presence of the building and infrastructure obstructions; and
  - **Investigation Area D** – no soil impact has been identified in this area.
  - Areas where data gaps have been identified will need to be addressed in a site contamination management plan (CMP);
- It has been identified that the bulk of the proposed excavated material averages out to Level 2 based on IB105 due to barium, lead, zinc and benzo(a)pyrene in the proposed excavation material. Barium is likely to be an artefact of background soils in the area and not a contaminant of concern at the site which may deem it as being classified Level 2. The bulk of the impact occurs in shallow fill material at the site, and care should be taken to scraping the top 0.3 m from the site and stockpiling is separately from the remaining deep excavations. This is likely to bring the bulk excavations below 0.3 m BGS to Level 1.

15.3 Potentially Contaminated Land Code

2015 Interim Statewide Planning Scheme codes for assessing development on contaminated site have been assessed.

15.3.1 Change of Use Standards

A contamination management plan (CMP) must be developed to manage contamination and associated risk to human health or the environment that will ensure the land is suitable for the intended use. Table 38 presents change of use standard performance criteria codes for assessing the proposed change of use from a commercial/industrial site to a residential development.

Table 37 Interim Planning Scheme Development Standard Codes for Proposed Site Excavation Works

Performance Criteria E2.5 P1 **Land is suitable for the intended use, having regard to:**	**Relevance**	**Management Options**	**Risk**
(a) an environmental site assessment that demonstrates there is no evidence the land is contaminated; or	Given management measures, the subject land is not deemed to present a contamination risk .	Management options are presented in a separated contamination management plan (CMP) document.	LOW
(b) an environmental site assessment that demonstrates that the level of contamination does not present a risk to human health or the environment; or	An ESA document has been produced which has adequately addressed all foreseeable data gaps relating to site contamination impact on human health or the environment.	Risks are identified as being LOW provided that the CMP is followed.	LOW
(c) a plan to manage contamination and associated risk to human health and the environment that includes:			
(i) an environmental site assessment;	Recommendations herein and a formalized contamination management plan	The CMP is to address potential environmental and human health risks	LOW
(ii) any specific remediation and protection measures required to be implemented before excavation commences; and	No specific remediation measures are recommended. Protection measures identified in the CMP.	Appropriate excavation management, protection measures and soil erosion controls identified in CMP.	LOW
(iii) a statement that the excavation does not adversely impact on human health or the environment.	Proposed excavation works will not adversely impact on human health or the environment given CMP management recommendations.	Excavation stormwater runoff and erosion control measures are presented within the CMP.	LOW

15.3.2 Development Standards

There are no acceptable solutions to developing on potentially contaminated lands. Table 38 presents development standard performance criteria codes for assessing proposed site excavation works.

Table 38 Interim Planning Scheme Development Standard Codes for Proposed Site Excavation Works

Performance Criteria E2.6.2 P1 **Excavation does not adversely impact on health and the environment, having regard to:**	**Relevance**	**Management Options**	**Risk**
(a) an environmental site assessment that demonstrates there is no evidence the land is contaminated; or	Given management measures, the subject land is not deemed to present a contamination risk.	Management options are presented in a separated contamination management plan (CMP) document.	LOW
(b) a plan to manage contamination and associated risk to human health and the environment that includes:			
(i) an environmental site assessment;	Recommendations herein and a formalized contamination management plan	The CMP is to address potential environmental and human health risks	LOW
(ii) any specific remediation and protection measures required to be implemented before excavation commences; and	No specific remediation measures are recommended. Protection measures identified in the CMP.	Appropriate excavation management, protection measures and soil erosion controls identified in CMP.	LOW
(iii) a statement that the excavation does not adversely impact on human health or the environment.	Proposed excavation works will not adversely impact on human health or the environment given CMP management recommendations.	Excavation stormwater runoff and erosion control measures are presented within the CMP.	LOW

16 RECOMMENDATIONS

When redevelopment work commences for the site, GES recommends that the following actions should be undertaken:

- A Contamination Management Plan will be required for the site to manage any potential risks during site works and should comply with the Hobart Interim Planning scheme.
- Further site assessment which should include but not be limited to;
  - All four USTs should be formally decommissioned as the USTs may present geotechnical hazards with ground instability issues if they remain. The removal of the USTs must comply with workplace standards and EPA reporting requirements. Note: The tank location plans should be used as a guide only and tank locations may be discerned by looking for signs of fill (sand or gravel), used to pack around the USTs;
  - Once USTs, associated infrastructure and surrounding soil have been removed the tank pits should be validated.
  - The interceptor trap should be removed, and remaining soil should be validated; and
  - Further investigations will be required under the footprint of the buildings, at a minimum in Area C for contamination.
- All excavated soil at the site should be stockpiled and assessed against IB105 guidelines for Classification and Management of Contaminated Soil for Disposal before it is transported to a licensed storage and handling facility for managing contaminated soil.
- Note the bulk of the contaminated soil impact occurs in shallow fill material. GES recommends separating stockpiles; and keeping the shallow material 0.0-0.4 m bgs separate. All remaining material is likely to be classified as Level 1 clean fill (with proof of analytical results).

Yours faithfully,

Sarah Joyce BSc (Hons)

Environmental Geologist

REFERENCES

Andrew and Mckellar design, 2017. Proposed Residential Unit Development – 66 Burnett Street, North Hobart for Hobart Properties & Securities Pty Ltd. And + design, Noosaville, Queensland (Aug, 2017).

ANZECC, 1992. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.

ANZECC, 2000. *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*. Australian and New Zealand Environment and Conservation Council and National Health and Medical Research Council.

AS/NZS 1726:1993. Geotechnical Site Investigations. Standards Australia, 1993.

AS 4482:2005 Guide to the sampling and investigation of potentially contaminated soil – Part 1: Non-volatile and semi-volatile compounds, Standards Australia, 2005.

AS/NZS 5667.1:1998 Water quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples, Standards Australia, 1998.

AS/NZS 5667.11:1998 Water quality – Sampling, Part 11: *Guidance on the sampling of groundwater*, Standards Australia, 1998.

CRC CARE 2013, Petroleum Petroleum Vapour Intrusion assessment: Australian guidance, CRC CARE Technical Report no. 23, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

Davis, GB, Merrick, NP & McLaughlan, RG 2006, Protocols and techniques for characterising sites with subsurface petroleum hydrocarbons – a review, Technical Report no. 2, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

Davis, GB, Patterson, BM & Trefry, MG 2009a, Biodegradation of petroleum hydrocarbon vapours, Technical Report no. 12, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

Davis, GB, Wright, J & Patterson, BM 2009, Field assessment of vapours, CRC CARE Technical Report no. 13, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

Enrisks 2013. Review of Site Investigation Reports for 66 Regent Street, Sandy Bay. Environmental Risk Sciences. November 2013.

Freeze, R.A., and Cherry, J.A., 1979, Groundwater: Englewood Cliffs, NJ, Prentice-Hall, 604 p.

Friebel, E & Nadebaum, 2011, 'Health screening levels for petroleum hydrocarbons in soil and groundwater. Part 1: Technical development document', CRC for Contamination Assessment and Remediation of the Environment, CRC CARE Technical Report no. 10, Adelaide.

GES 2017. *Preliminary Environmental Site Assessment* 281a Elizabeth Street, North Hobart. Geo-Environmental Solutions. July 2017.

NEPC, 1999. Guideline on Data Collection, Sample Design and Reporting Schedule B (2), National Environmental Protection Measure (Assessment of Site Contamination), National Environment Protection Council, 1999. Measures as amended, taking into account amendments up to National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)

NEPM, 1999.Guideline on Investigation Levels for Soil and Groundwater, Schedule B (1), National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council, 1999. Measures as amended, taking into account amendments up to National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)

Queensland Government Natural Resources and Water 'Land Series' bulletin, Measuring Salinity. 2007. Managing Queensland's natural resources for today and tomorrow.

SGS, 2017: Waterloo Membrane Sampler *Installation Methodology*. SGS Environment, Health and Safety: www.sgs.com.au. December 2017.

LIMITATIONS STATEMENT

This monitoring Report has been prepared in accordance with the scope of services between Geo-Environmental Solutions Pty. Ltd. (GES) and Hobart Properties & Securities Pty Ltd ('the Client'). To the best of GES's knowledge, the information presented herein represents the Client's requirements at the time of printing of the Report. However, the passage of time, manifestation of latent conditions or impacts of future events may result in findings differing from that described in this Report. In preparing this Report, GES has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations referenced herein. Except as otherwise stated in this Report, GES has not verified the accuracy or completeness of such data, surveys, analyses, designs, plans and other information.

The scope of this study does not allow for the review of every possible soil and groundwater contaminant over the whole area of the site. Samples collected from the investigation area are assumed to be representative of the areas from where they were collected and indicative of the contamination status of the site at that point in time. The conclusions described within this report are based on these samples, the results of their analysis and an assessment of their contamination status.

This report does not purport to provide legal advice. Readers of the report should engage professional legal practitioners for this purpose as required.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose by third party.

Appendix 1 GES Staff

Geo-Environmental Solutions (GES) is a specialist geotechnical and environmental consultancy providing advice on all aspects of soils, geology, hydrology, and soil and groundwater contamination across a diverse range of industries.

Geo Environmental Solutions Pty Ltd:

- ACN – 115 004 834
- ABN – 24 115 004 834

GES STAFF - ENGAGED IN SITE INVESTIGATION WORKS

Dr John Paul Cumming B.Agr.Sc (Hons) Phd CPSS GAICD

- Principle Author and Principle Environmental Consultant
- PhD in Environmental Soil Chemistry from the University of Tasmania in 2007
- 15 years' experience in environmental contamination assessment and site remediation.

Ms Sarah Joyce BSc (Hons)

- Senior Environmental Scientist
- Honours in Geography and Environmental Science at the University of Tasmania in 2003;
- Undergraduate Degree Double Major in Geology and Geography & Environmental Science
- 15 years professional work experience and six years contaminated site assessment

Mr Kris Taylor Bsc (Hons)

- Senior Environmental & Engineering Geologist
- Honours in Environmental Geology at the University of Tasmania in 1998
- 15 years' experience in environmental contamination assessments and hydrogeology (including honours in mine site tailing pollution assessment)

Mr Aaron Plummer(Cert. IV)

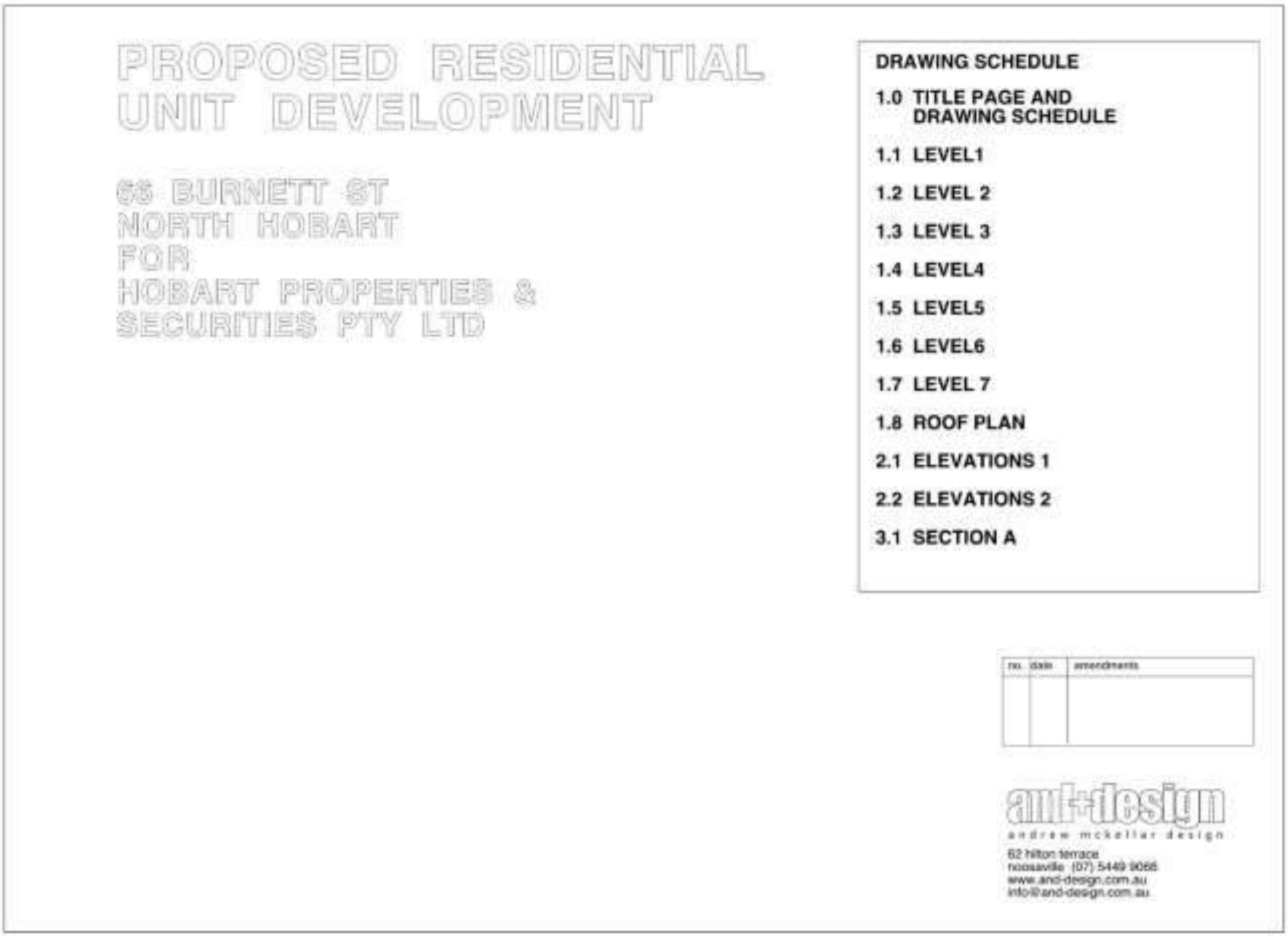
- Soil Technician
- 3 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

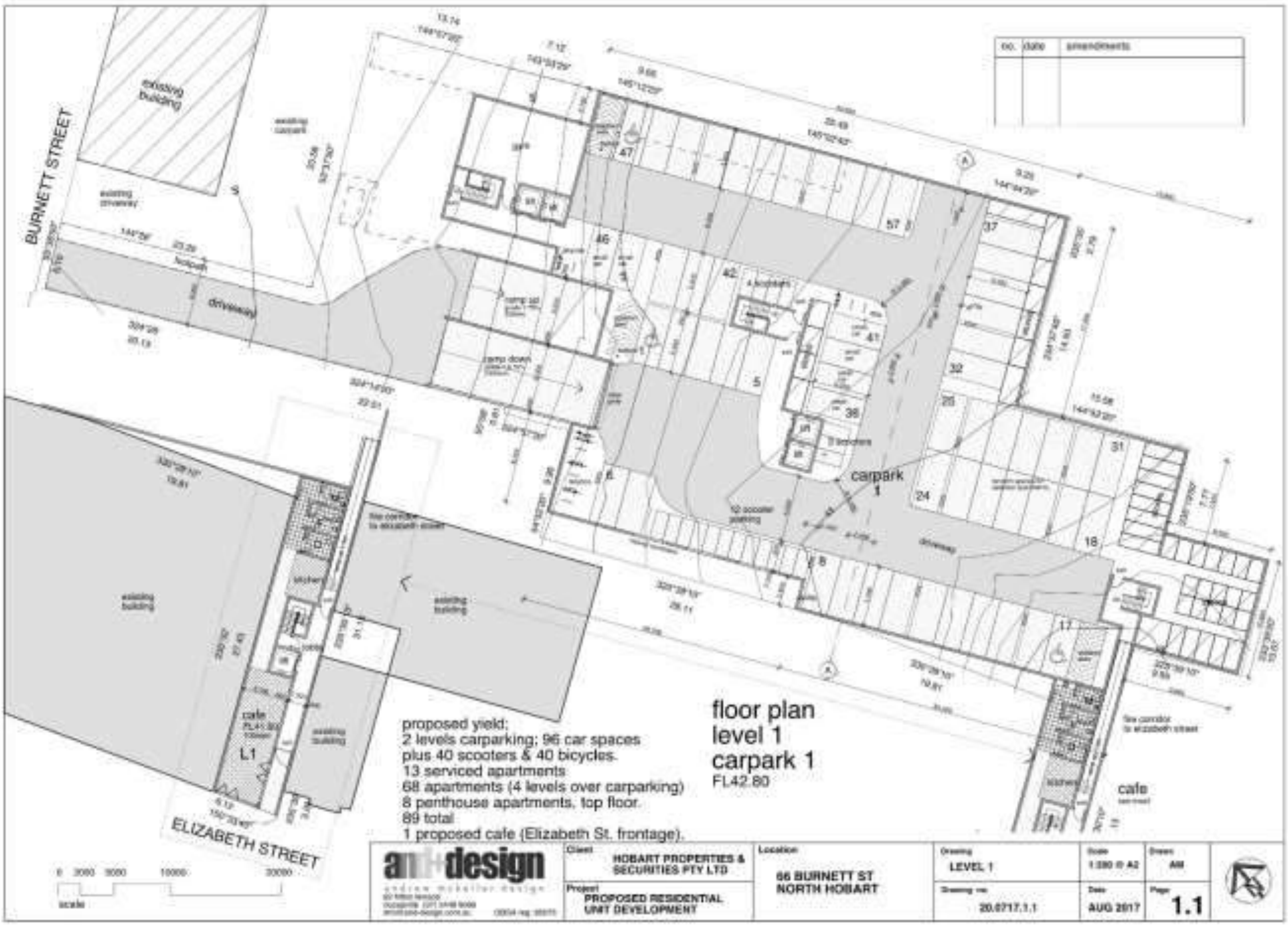
GES STAFF – WITH CONTAMINATED SITES EXPERIENCE

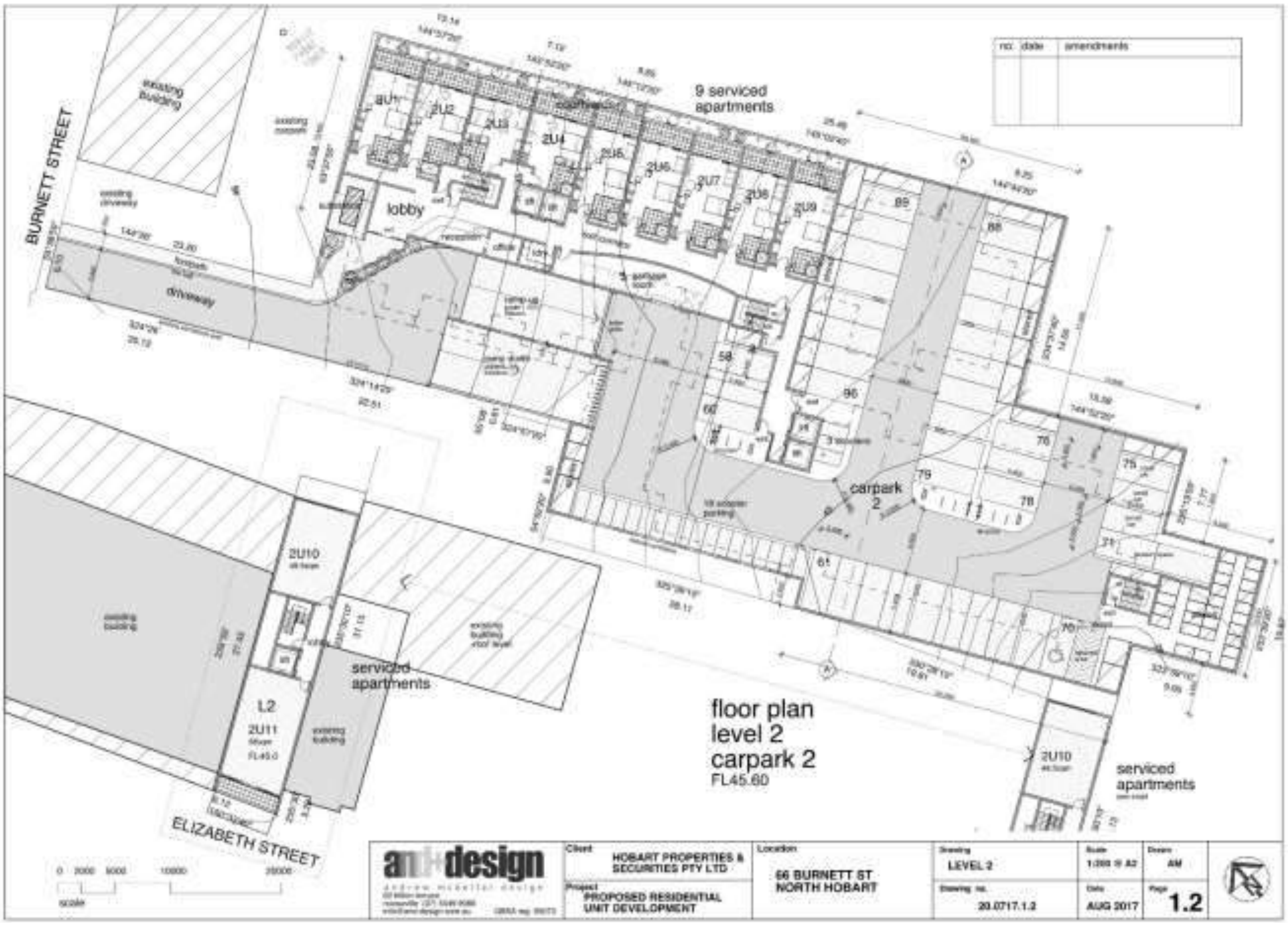
Mr Grant McDonald (Adv. cert. hort.)

- Soil Technician
- 6 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

Appendix 2 Proposed Residential Unit Development Plans



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an+design
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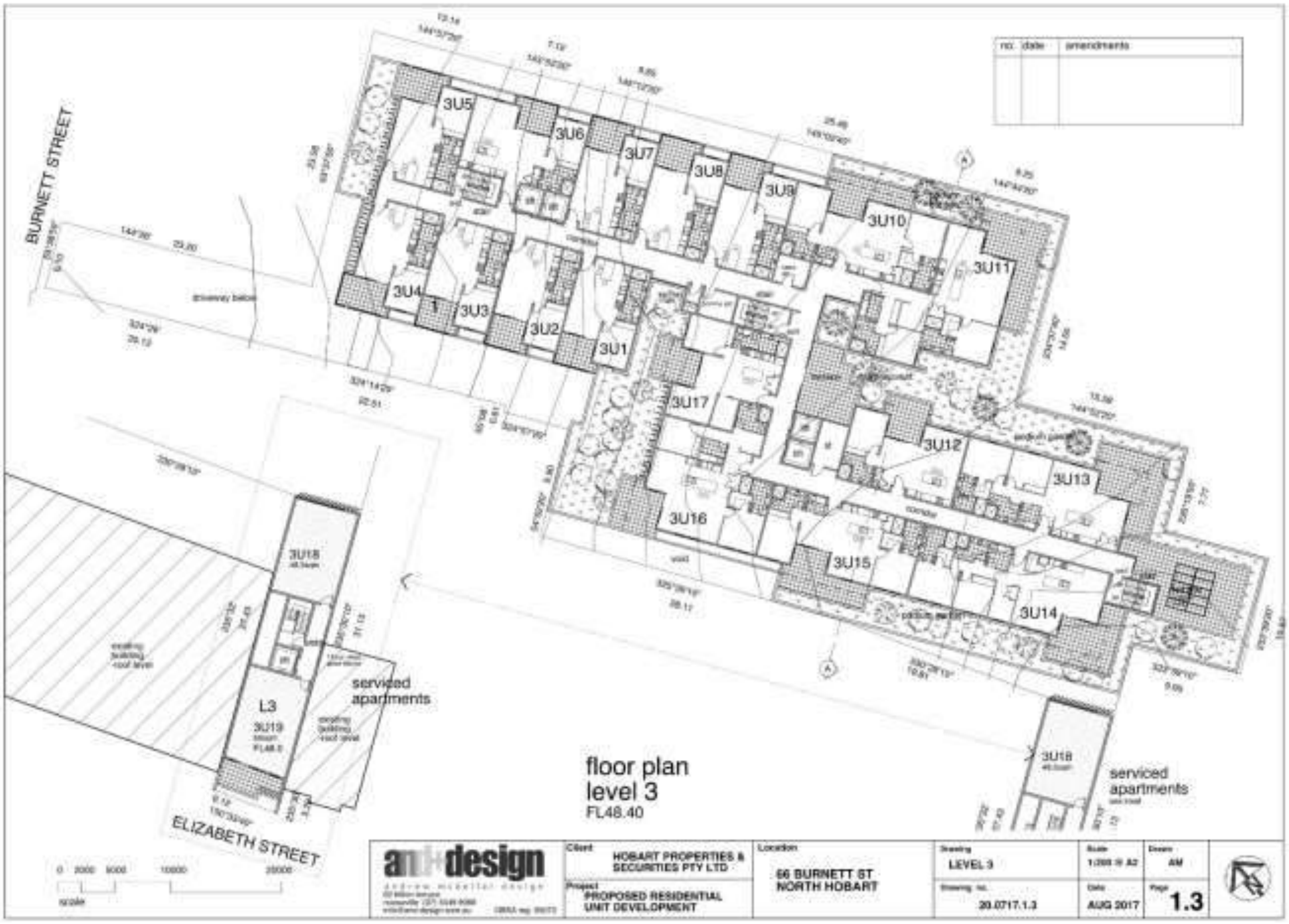
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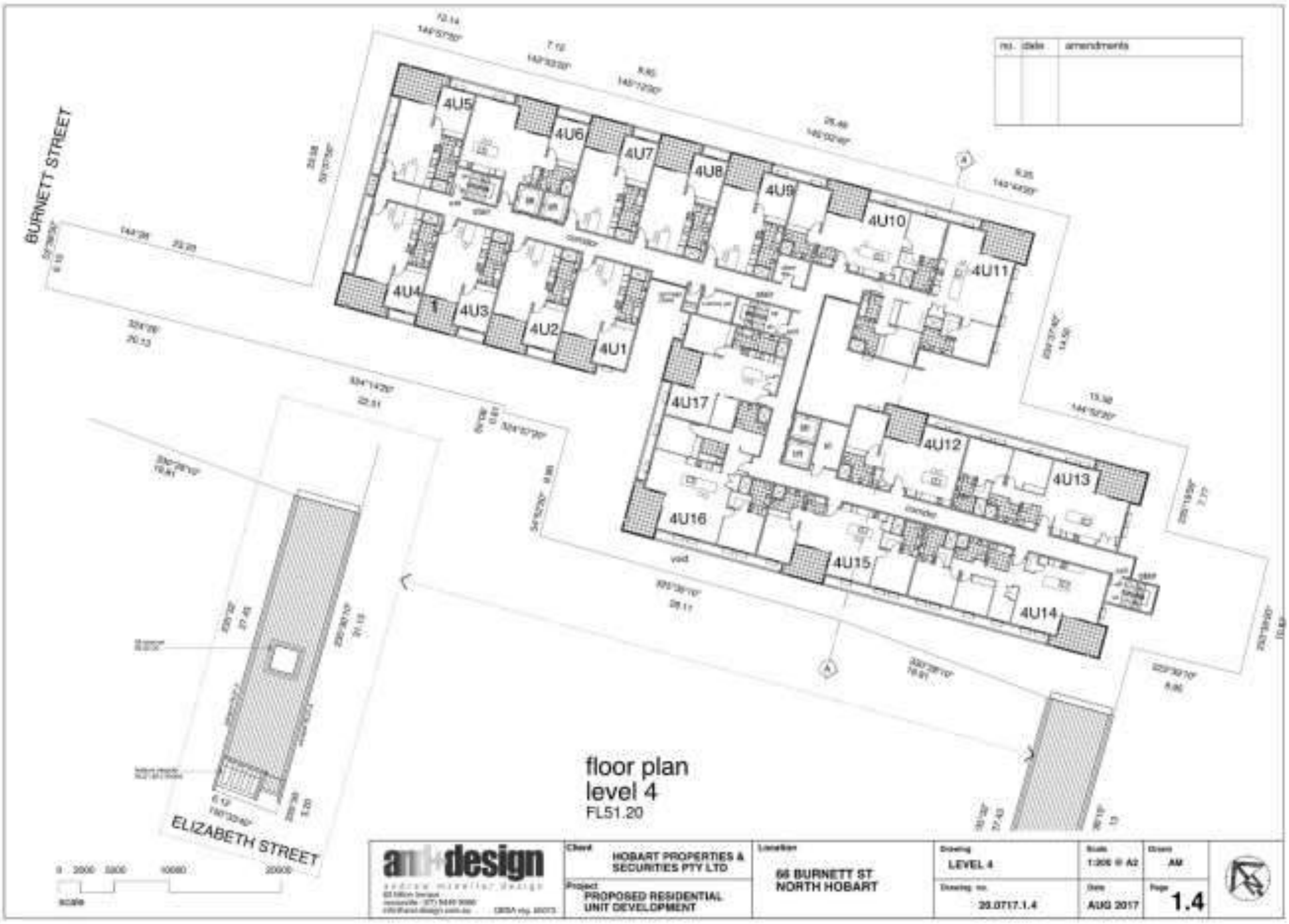

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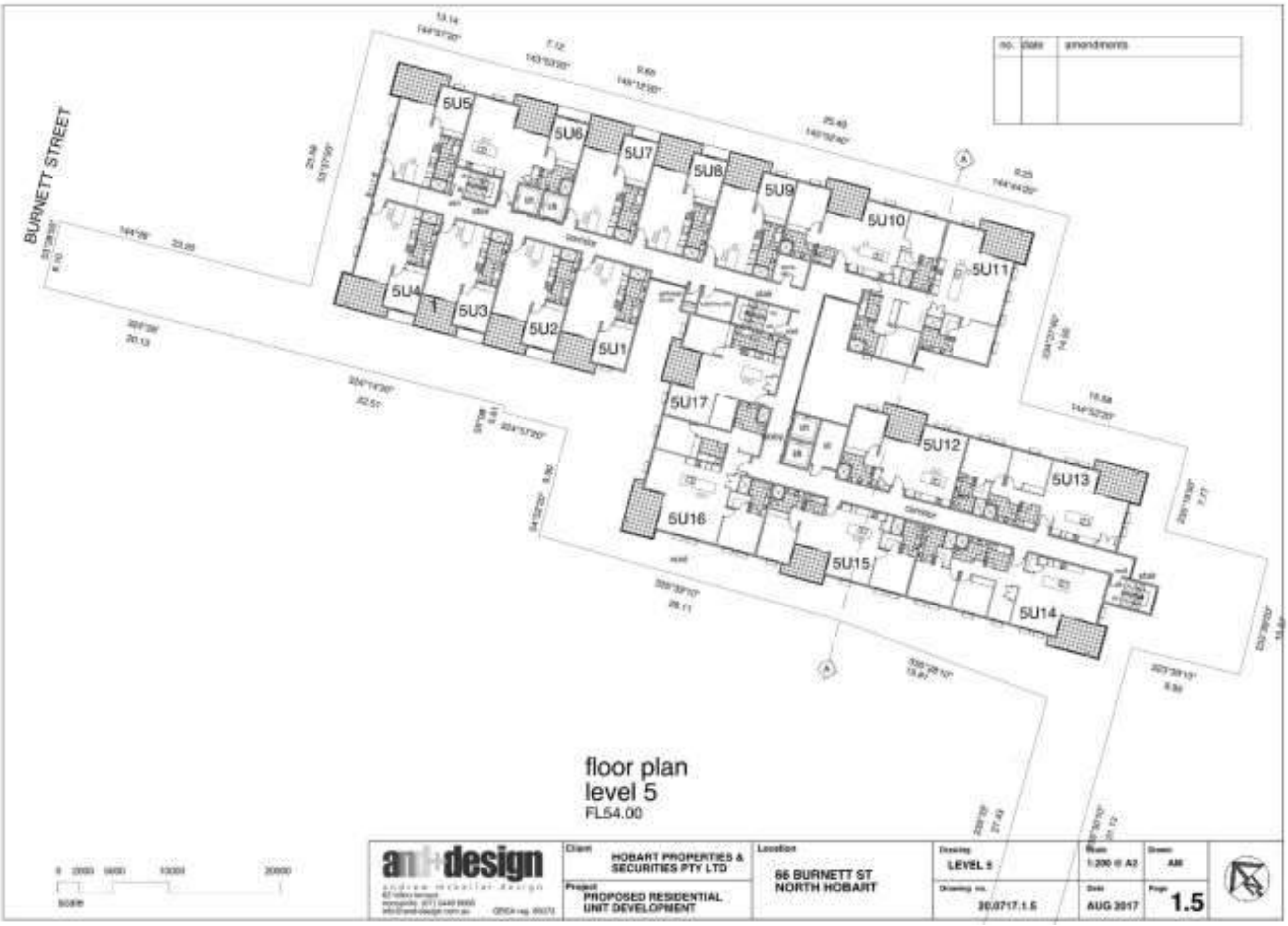

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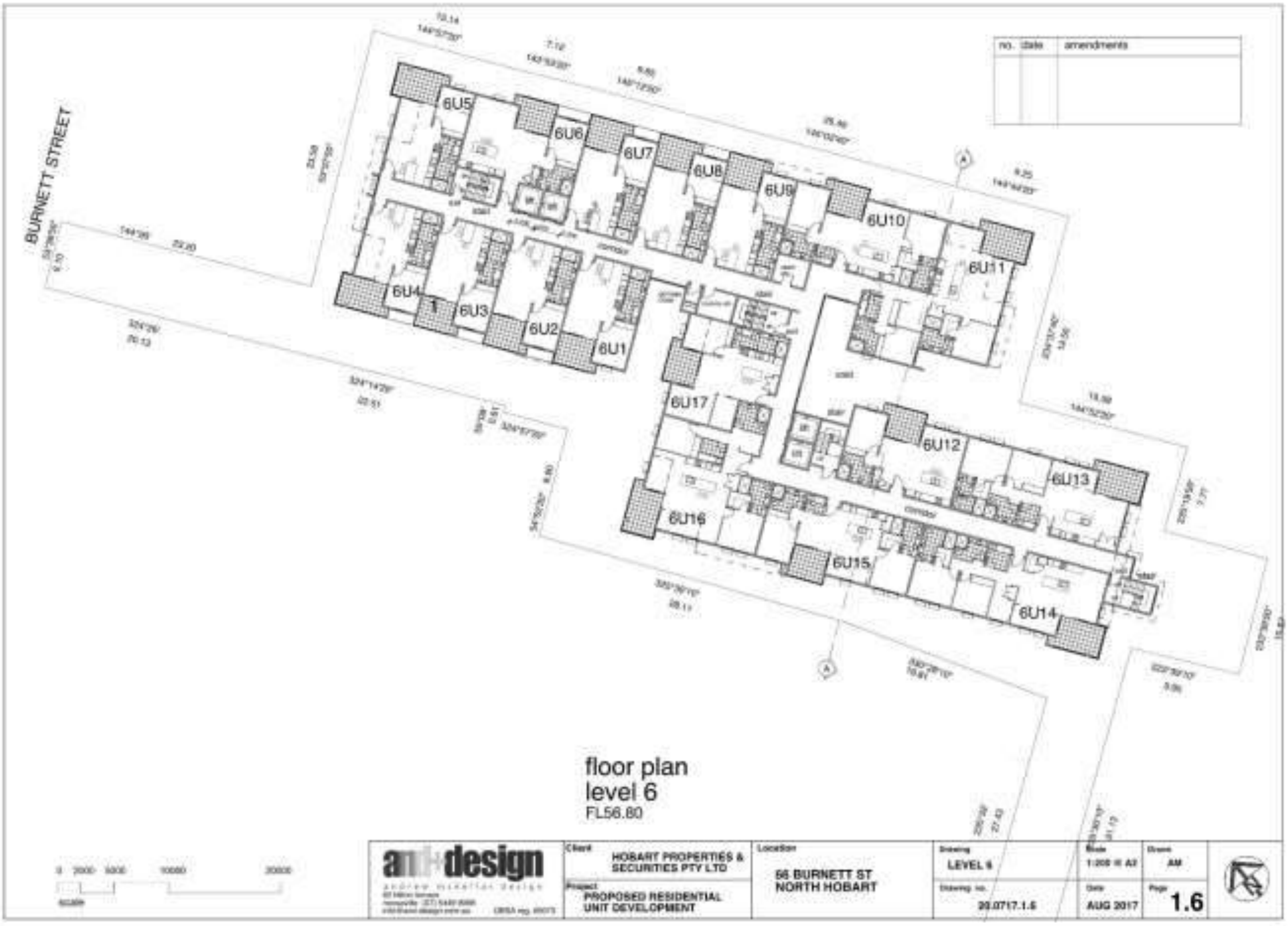
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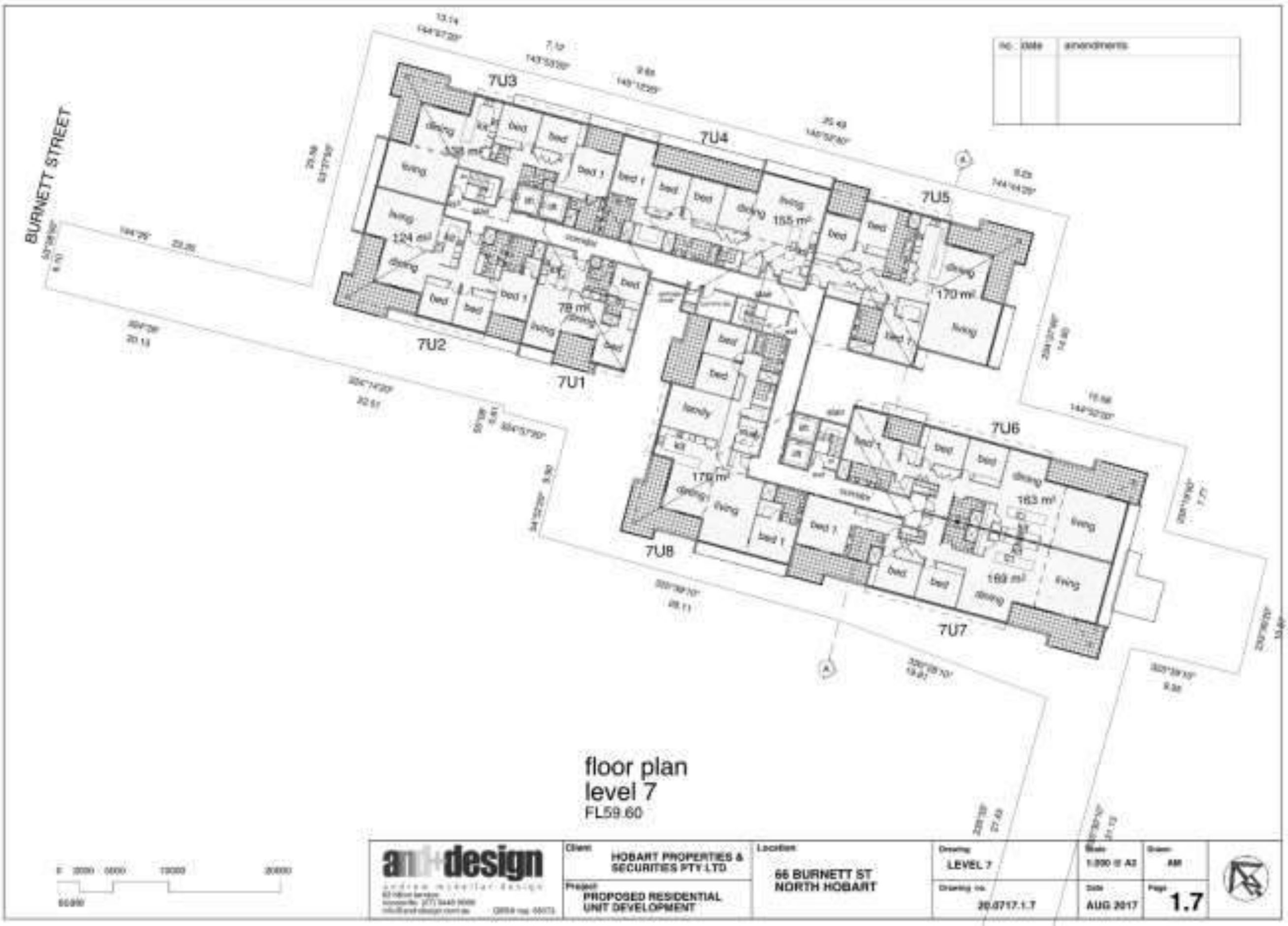
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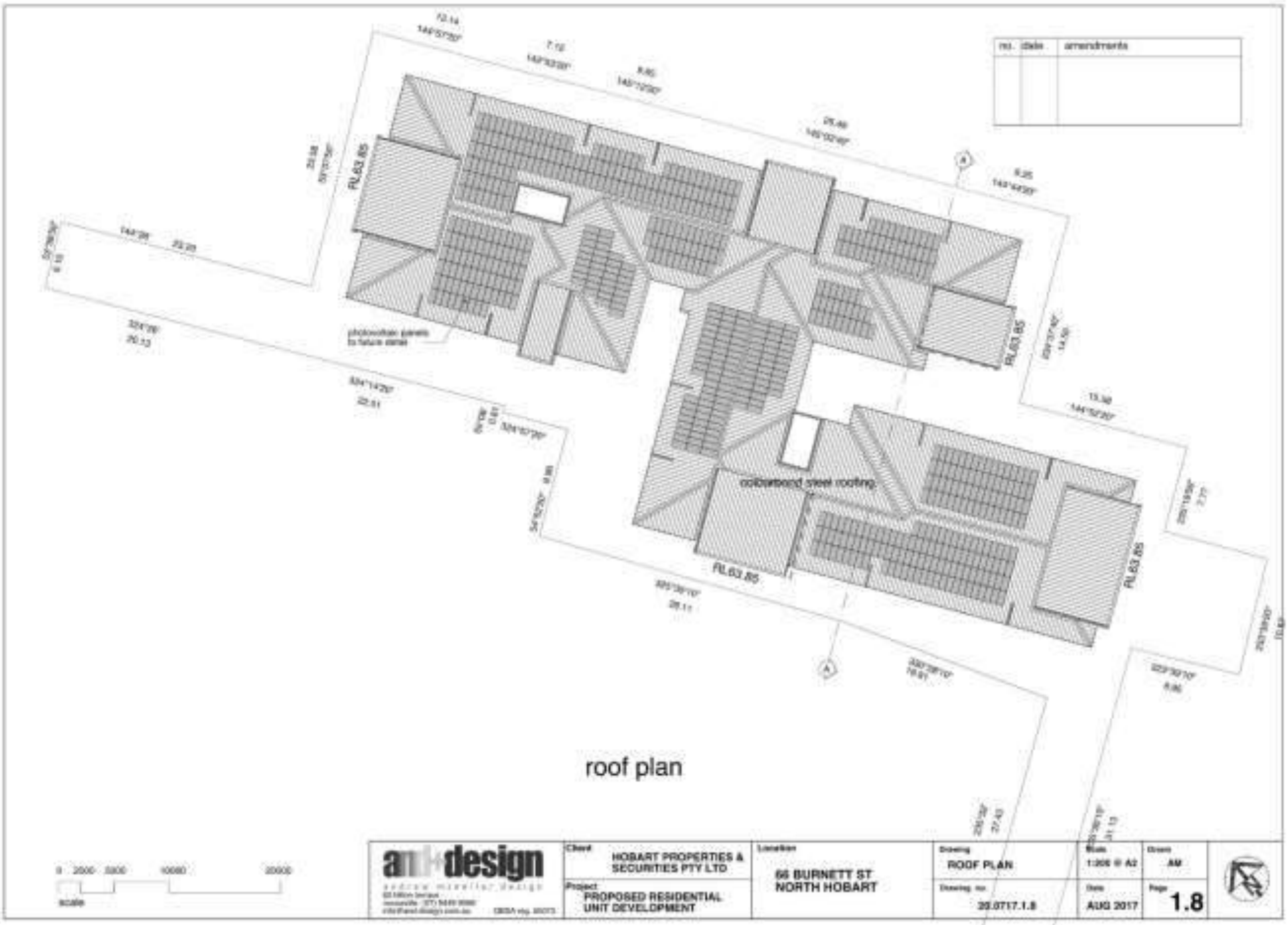
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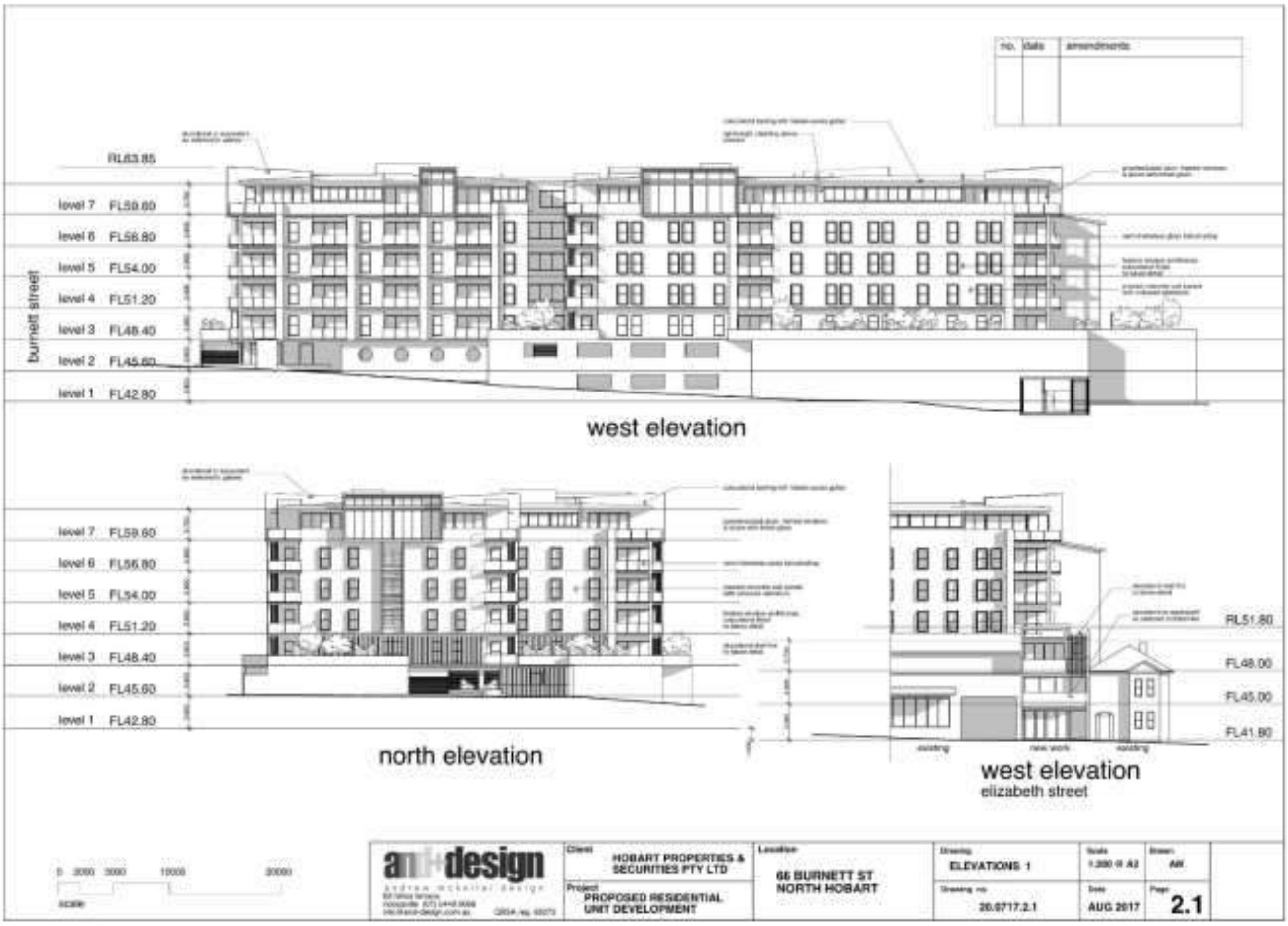
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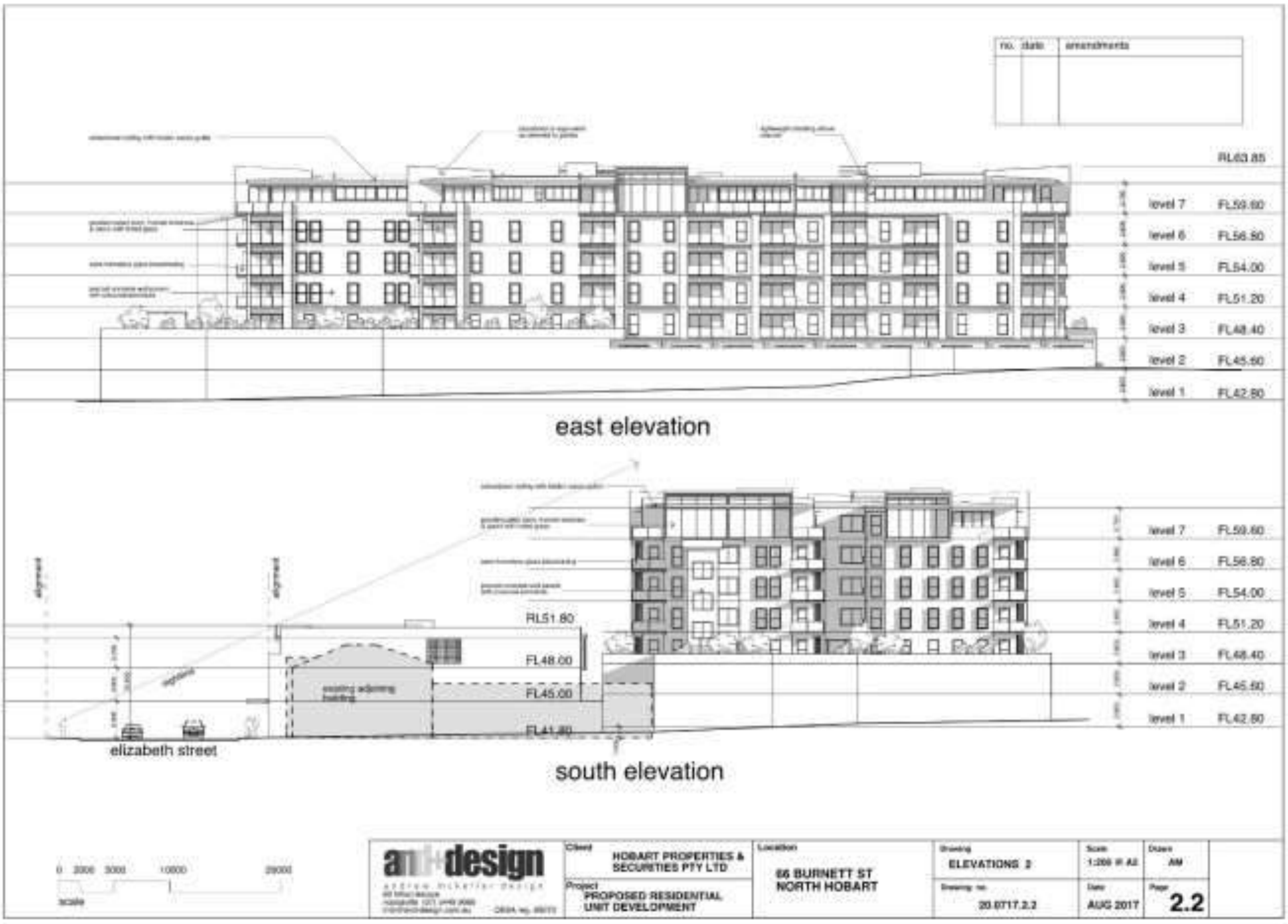
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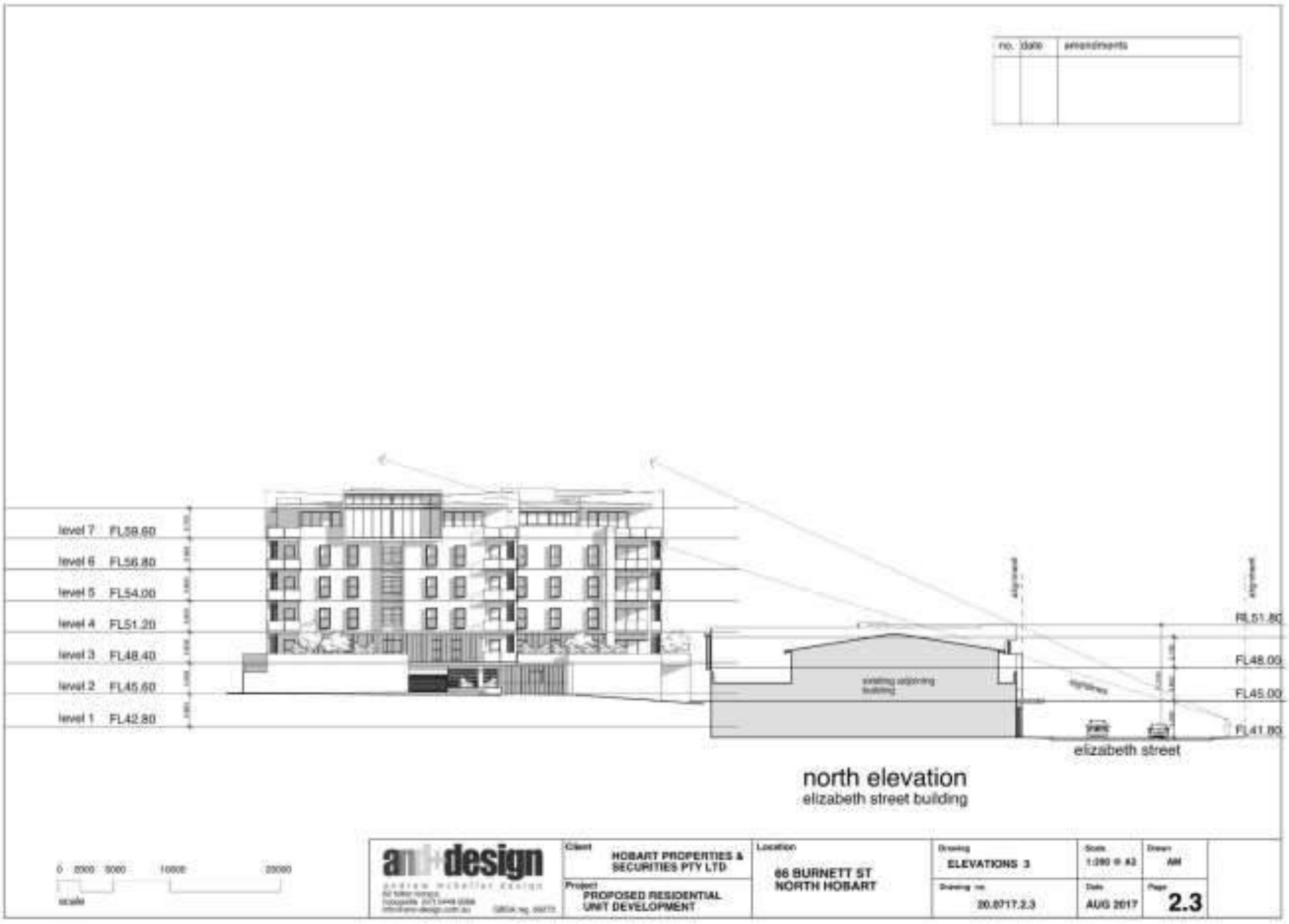
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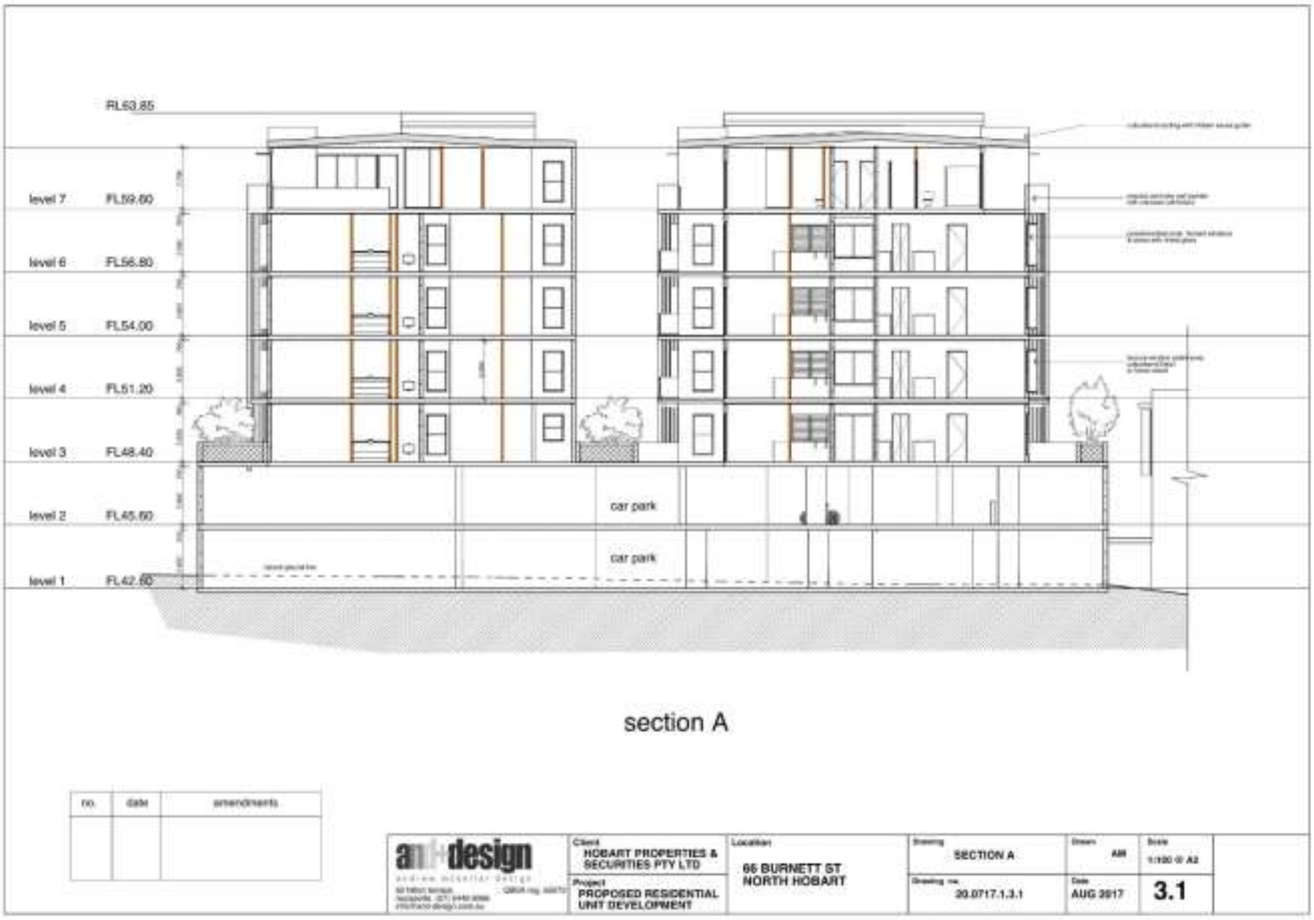
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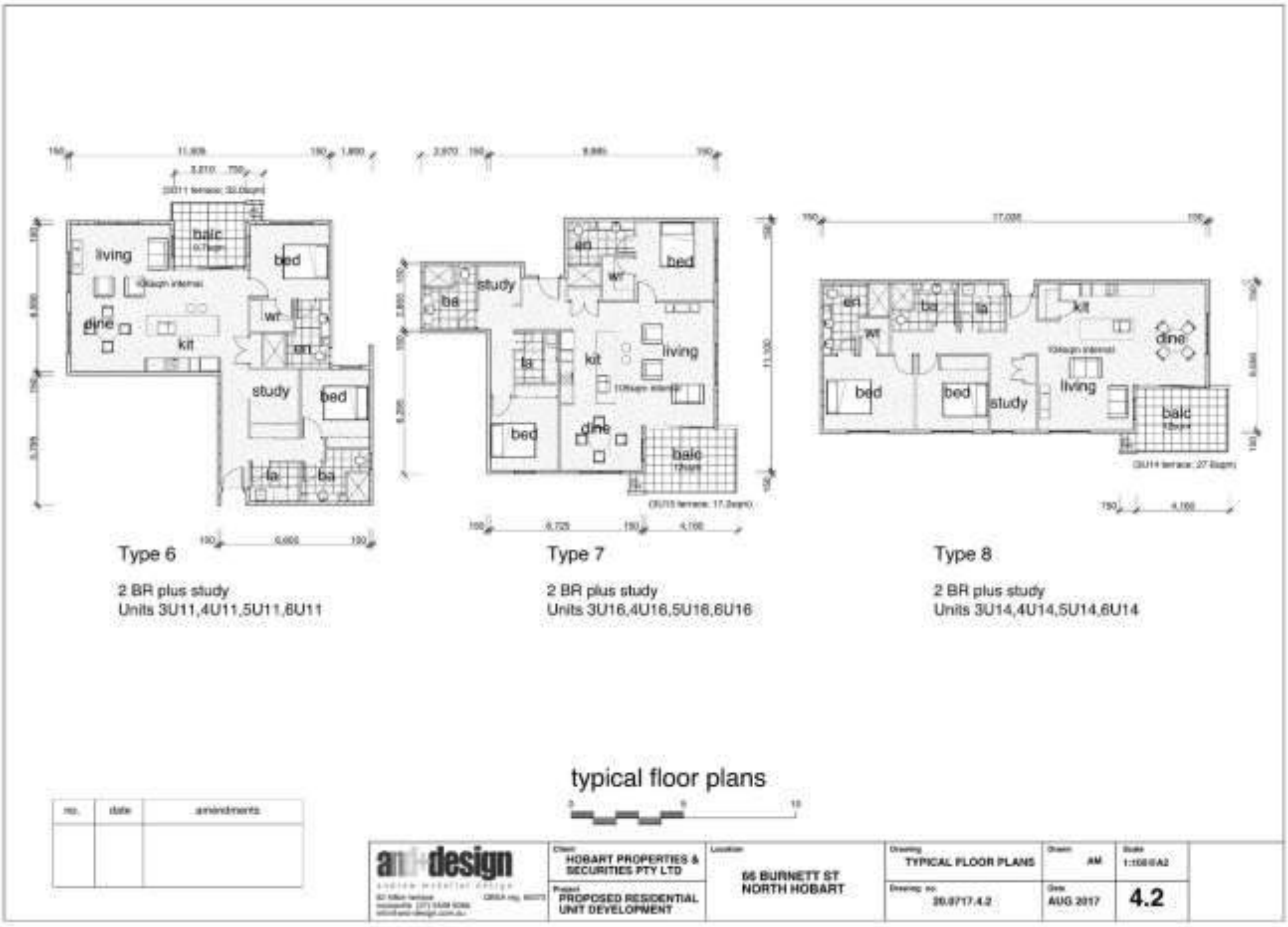
Units 3U17,4U17, 5U17,6U17
Type 4
2 BR
Units 3U10,3U15,4U10,4U15 5U10,5U15,6U10,6U15
Type 2B
1 BR plus
Units 3U12,4U12, 5U12,6U12
typical floor plans
Type 5
2 BR plus
Units 3U13,4U13,5U13,6U13
no. date amendments
HOBART PROPERTIES & SECURITIES PTY LTD
PROPOSED RESIDENTIAL UNIT DEVELOPMENT
66 BURNETT ST NORTH HOBART
TYPICAL FLOOR PLANS
AUG 2017
4.1



Type 6
2 BR plus study
Units 3U11,4U11,5U11,6U11
Type 7
2 BR plus study
Units 3U16,4U16,5U16,6U16
Type 8
2 BR plus study
Units 3U14,4U14,5U14,6U14
typical floor plans
no. date amendments
HOBART PROPERTIES & SECURITIES PTY LTD
PROPOSED RESIDENTIAL UNIT DEVELOPMENT
66 BURNETT ST NORTH HOBART
TYPICAL FLOOR PLANS
AUG 2017
4.2

Appendix 3 Site Photographs

Location of BH2

Location of BH1

Location of BH3

Interceptor Trap

Interceptor Trap

View north, adjacent to office building, location of BH adjacent interceptor trap

Location of USTs – T3 and T4

Location of BH10

Location of BH10

Site Office

View South from Interceptor Trap

Workshop

Workshop

Vehicle Service Pit, Location of BH11

Appendix 4 Laboratory Chain of Custody (COC) and Sample Receipt Notification

CHAIN OF CUSTODY

ALS Laboratory: please tick →

FREIGHT

URGENT

CLIENT:	Geoenvironmental Solutions	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☒ Standard TAT (List due date): 3 days ☐ Non Standard or urgent TAT (List due date):
OFFICE:	29 Kirksway Place, Battery Point, 7004		
PROJECT:	Gorringe	ALS QUOTE NO.:	N/A
ORDER NUMBER:		COC SEQUENCE NUMBER (Circle)	COC: 1 2 3 4 5 6 7 / OF: 1 2 3 4 5 6 7
PROJECT MANAGER:	Kris Taylor ~~Sarah Joyce~~	CONTACT PH:	0438255259
SAMPLER:	Aaron Plummer	SAMPLER MOBILE:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to:	sjoyce@geosolutions.net.au jcumming@geosolutions.net.au ktaylor@geosolutions.net.au		
Email Invoice to:	jcumming@geosolutions.net.au; miran@geosolutions.net.au, sjoyce@geosolutions.net.au		

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
SJ/AP			Marcu (AM)
DATE/TIME: 11/12/17	DATE/TIME:	DATE/TIME:	DATE/TIME: 12/12, 10:10

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TPH/BTEX/PAH	15 Metals	Hold	Extract & Hold
1	BH12 0.5m	11/12/17	Soil	jar	1	/	/		
2	BH12 1.0m				1	/	/		
3	BH13 0.4-0.5m				1	/	/		
4	BH14 0.3-0.4m				1	/	/		
5	BH14 1.0-1.1m				1	/	/		
6	BH15 0.5-0.6m				1	/	/		
7	BH16 1.0-1.1m				1	/	/		
8	BH16 2.0-2.1m				1	/	/		
9	BH16 2.9-3.0m					/	/		
10	BH17 0.5-0.6m				1	/	/		
11	BH17 1.9-2.0m				1	/	/		
12	BH18 0.2-0.3m				1	/	/		
				TOTAL	12				

ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price). Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).

Additional Information: Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.

Environmental Division Melbourne
Work Order Reference
EM1717027
Telephone: + 61-3-8549 9600

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass.
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

CLIENT:	Geoenvironmental Solutions	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	★ Standard TAT (List due date): 3 days ☐ Non Standard or urgent TAT (List due date):
OFFICE:	29 Kirksway Place, Battery Point, 7004	ALS QUOTE NO.:	N/A
PROJECT:	gom-se	COC SEQUENCE NUMBER (Circle)	COC: 1 2 3 4 5 6 7
ORDER NUMBER:			OF: 1 2 3 4 5 6 7
PROJECT MANAGER:	Kris Taylor	CONTACT PH:	0438255259
SAMPLER:	Aaron plummer	SAMPLER MOBILE:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to:	sjoyce@geosolutions.net.au jcumming@geosolutions.net.au		
Email Invoice to:	jcumming@geosolutions.net.au; miran@geosolutions.net.au, sjoyce@geosolutions.net.au		

FOR LABORATORY USE ONLY (Circle)

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY: Pania (ALS)
DATE/TIME:	DATE/TIME:	DATE/TIME:	DATE/TIME: 12/12 10-20

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TPH/BTEX/PAH	15 Metals						Hold	Extract & Hold	Additional Information: Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	BH18 0.9-1.0m	11/12/17	Soil	Jar	1	✓	✓								
14	BH19 0.2-0.3m	|	|	|	1	✓	✓								
15	BH19 0.9-1.0m	|	|	|	1	✓	✓								
16	BH20 0.5m	|	|	|	1	✓	✓								
17	BH26 0.5m	|	|	|	1	✓	✓								
18	Duplicate	|	|		1	✓	✓								
19	Mdsate	↓	water	2SAV; 1AG; 1P	4	✓	✓								
				TOTAL											

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass.
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Rebatch

Client / Client code: Geo Environmental Solutions
Project: Gorringe
Project Manager: Kris Taylor / Sarah Joyce
Date /time sample rec: Tuesday, 12 December 2017
Date/time Instructions rec: 15/12/17 @ 3:45pm
Due date: Tuesday 19th December
Due date surcharge: 2 day TAT - approved by Sam

CS Contact: **C.Walsh**
Additional Information:
sample 17 (BH21 0.5m) is sample ID but for rebatch client requested it be called Duplicate. Client is aware that volatile TPH may be compromised

URGENT

New Lab ID	Client ID	Sampling Date / Time	Previous Work Order Reference	Previous ALS ID	Tray Number(s)	Container	Number of Containers	S3 (15 metals)	S7 (TPH/BTEX/PAH)									Shortest Holding time expiry
	Sample information							Analysis: Standard					Analysis: Leach					
	Duplicate	12/12/2017 0:00	EM1717027	17	MS: 4424-4425	250ml Jar	1	X	X									26-Dec-17
							1											

Environmental Division
Melbourne
Work Order Reference
EM1717330

Telephone : +61-3-8549 9600

MEFM (47/3)

Page 1 of 1

Approved Date: 01/02/2016

COC Melbourne

From:	Carol Walsh
Sent:	Friday, 15 December 2017 4:28 PM
To:	COC Melbourne
Subject:	Re-batch RE: EM1717027 - GEOENVSOL - Gorringe - 2 day TAT
Attachments:	EM1717027 - REBATCH.xlsm
Importance:	High

SR

Please organise attached rebatch

Regards

Carol

From: Sarah Joyce [mailto:sjoyce@geosolutions.net.au]
Sent: Friday, 15 December 2017 3:45 PM
To: Carol Walsh <Carol.Walsh@alsglobal.com>
Cc: JP Cumming <jcumming@geosolutions.net.au>; Kris Taylor <ktaylor@geosolutions.net.au>
Subject: re-batch RE: EM1717027 - GEOENVSOL - Gorringe

Hi Carol,

As discussed, please collect a second sample from BH21 0.5m, your ID EM171027017 and rename it Duplicate.

As per the primary sample please analyse for TPH/BTEX/PAH and 15 Metals.

As will the primary samples, we need a quick turnaround. Please provide results as soon as practically possible. I understand there will be an additional charge associated with a rapid turnaround.

Thanks very much for your help.

Kind Regards,

Sarah Joyce
GEO-ENVIRONMENTAL SOLUTIONS P/L
29 Kirksway Place, Battery Point, 7004
P: 0362231839
E: sjoyce@geosolutions.net.au

From: Carol Walsh [mailto:Carol.Walsh@alsglobal.com]
Sent: Friday, 15 December 2017 3:15 PM
To: Sarah Joyce <sjoyce@geosolutions.net.au>
Subject: FW: EM1717027 - GEOENVSOL - Gorringe

1

Joyce

Please find attached updated COC showing Duplicate samples was "not received".

Kind regards,

Carol Walsh
Senior Client Services, Environmental

Springvale - Victoria

T +61 3 8549 9600 D +61 3 8549 9608
F +61 3 8549 9626
carol.walsh@alsglobal.com
4 Westall Road
Springvale VIC 3171
AUSTRALIA

MANAGING PROJECTS OVER THE CHRISTMAS PERIOD – CLICK FOR MORE DETAILS
Please note there is some variations to hours, sample and reporting times, and regional laboratories during Christmas/New Year.

We are keen for your feedback! Please click here for your 1 question survey

EnviroMail™ 114 – Asbestos Fibre Identification by SEM/EDS
EnviroMail™ 113 – Amoeba Confirmation PCR
EnviroMail™ 112 – Algal Capabilities
EnviroMail™ 111 – Analysis of VOCs by Thermal Desorption Analysis
EnviroMail™ 110 - Identifying Hidden PFAS Chemicals in Environmental Samples and Firefighting Foams
EnviroMail™ 00 – Summary of all EnviroMails™ by Category

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From: Isaac Banko
Sent: Tuesday, 12 December 2017 11:53 AM
To: Shirley LeCornu <shirley.lecornu@alsglobal.com>
Cc: Samples Melbourne <Samples.Melbourne@alsglobal.com>
Subject: EM1717027 - GEOENVSOL - Gorringe

Hi Shirley,

Just a quick FYI regarding the attached batch – sample "Duplicate" was not received.

Regards,

Isaac Banko
Sample Receipt Officer – Springvale
Environmental

ALS

T +61 3 8549 9600 D +61 3 8549 9633
F +61 3 8549 9626
isaac.banko@alsglobal.com

2

2-4 Westall Rd
Springvale Vic 3171
Australia

We are keen for your feedback! Please click here for your 1 question survey

EnviroMail™ 113 – Amoeba Confirmation PCR
EnviroMail™ 112 – Algal Capabilities
EnviroMail™ 111 – Analysis of VOCs by Thermal Desorption Analysis
EnviroMail™ 110 – Identifying Hidden PFAS Chemicals in Environmental Samples and Firefighting Foams
EnviroMail™ 00 – Summary of all EnviroMails™ by Category

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3

SGS

Chain of Custody Record

Dispatch samples to: Unit 10/585 Blackburn Road, Notting Hill, Victoria 3168, Australia

Attn: Sample Reception - Contact Ph: +613 9574 3311 Email: au.samplereceipt.melbourne@sgs.com

Sheet 1 of 1

CLIENT NAME: CES

CLIENT ADDRESS: 29 Kirksway Place Battery Point

CONTACT: Sarah Joyce

PROJECT REF. Cornings - 66 Burnett St

PURCHASE ORDER No:

CONTACT PHONE No: 62231839

SAMPLED BY: Aaron Plummer

RESULTS REQUIRED BY: 48 hour turn around @ 50% surcharge

EMAIL ADDRESS: s.joyce@geosolutions.net.au; jcumming@geosolutions.net.au; Miran@geosolutions.net.au (invoice)

ABN: 24 115 004 834

LAB QUOTE NUMBER:

Containers/Preservation (please mark with X) (G=glass, P=plastic)

Analyses Required (Analyte + Method Code)

Client Sample ID	Date Sampled	Matrix: Soil	Matrix: Water	Matrix: Other (Soil Vapour)	0.1-1L Jar(G) n.a.	0.1-1.0 litre(G) Nat.	0.1-1.0 litre(P) Nat.	40ml Vial(G) Nat.	40ml Vial(G) H2SO4	01-1L (P) H2SO4	125mL (P) HCl acid washed	125mL (P) Zn Ace. NaOH	125mL (P) Filtered Yes/No HNO3	125mL (P) NaOH	0.1-1.0 litre (P) sterilised	NEPM Hydrocarbon
VP1 (1730-AN-LU-067)	11-14 Dec			✓												✓
VP2 (1730-AN-LU-070)	"			✓												✓
VP3 (1730-AN-LU-066)	"			✓												✓
VP4 (1730-AN-LU-068)	"			✓												✓
Dup (1730-AN-LU-069)	"			✓												✓
Totals:																

CHAIN OF CUSTODY RECORD

Chill method used for transport (sender to complete): Not Chilled.

RELEASED BY: (Name) Sarah Joyce (Signature) (Date / Time) 14-12-17 1230

RECEIVED BY: (Name) Benedict Robinson (Signature) (Date / Time) 15/12/17 9:00am

Temperature on sample receipt: °C Custody Seals Intact? Y/N

Chill method used for transport (sender to complete):

RELEASED BY: (Name) (Signature) (Date / Time)

RECEIVED BY: (Name) (Signature) (Date / Time)

Temperature on sample receipt: °C Custody Seals Intact? Y/N

Please Note: Dissolved metals require filtering in the field.

Comments: (eg. Highly contaminated samples, reporting requirements etc)

Notes: NEPM Hydrocarbon: BTEX, Naphthalene TPH F1 + F2 Fractions

Container 1 x waterloo Membrane Sampler per sample.

PF-AU-ENV-NHC-QU-007.xlsx / Ver 5 / 08.02.2017 / Page 1 of 1

A.B.N. 44 000 964 278
10 / 585 Blackburn Road
Notting Hill, Vic, 3168
Telephone: (03) 9574 3200

A.B.N. 44 000 964 278

Sample Receipt Acknowledgement

To:	Sarah Joyce	From:	Sample Reception
Fax:		Pages:	(1) including this page
Co:	Geo-Environmental Solutions	Date:	15/12/2017
Email	sjoyce@geosolutions.net.au	Ref:	M171189

SGS has received your samples from the project listed below. If you have any enquiries please contact us quoting our reference number.

Project/Reference No.:	Supply & Analysis of WMS
Our Reference Number:	**M171189**
Date Received:	15-Dec-2017
Estimated date of report:	19-Dec-2017

This work is subject to COD terms. The report will not be released until payment has been received

Additional Information:

Samples received after 4 pm are considered as received on the next working day for turnaround purposes.
Samples with a 24hr or 48hr TAT are considered as received on the next working day if received after 2:30pm.
Surcharges for urgent turnaround requests may apply.
All analytical work is conducted at our Melbourne office.
Sample Storage - All aqueous samples are stored for **two weeks** after reporting.
- All soils and other samples are stored for **one month** after reporting.

Please direct any technical or turnaround queries to Adam Atkinson at our Melbourne office.

NATA
WORLD RECOGNISED ACCREDITATION

SGS

Specialist Laboratory Services

Website: www.sgs.com.au
Email: AU.SampleReceipt.Melbourne@sgs.com

PF-AU-ENV-NHC-QU-018.rpt / Ver 6 / 26.07.2017 / Page 1 of 1

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EM1717027**		
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: KRIS TAYLOR	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: ktaylor@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9601
Project	: Gorringe	Page	: 1 of 3
Order number	: ----	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: AARON PLUMMER		

Dates

Date Samples Received	: 12-Dec-2017 10:10	Issue Date	: 12-Dec-2017
Client Requested Due Date	: 15-Dec-2017	Scheduled Reporting Date	: **15-Dec-2017**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 10.1°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 18 / 18

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

RIGHT SOLUTIONS | RIGHT PARTNER

Issue Date	: 12-Dec-2017
Page	: 2 of 3
Work Order	: EM1717027 Amendment 0
Client	: GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1717027-001	12-Dec-2017 00:00	BH12 0.5m	✓	✓	✓
EM1717027-002	12-Dec-2017 00:00	BH12 1.0m	✓	✓	✓
EM1717027-003	12-Dec-2017 00:00	BH13 0.4-0.5m	✓	✓	✓
EM1717027-004	12-Dec-2017 00:00	BH14 0.3-0.4m	✓	✓	✓
EM1717027-005	12-Dec-2017 00:00	BH14 1.0-1.1m	✓	✓	✓
EM1717027-006	12-Dec-2017 00:00	BH15 0.5-0.6m	✓	✓	✓
EM1717027-007	12-Dec-2017 00:00	BH16 1.0-1.1m	✓	✓	✓
EM1717027-008	12-Dec-2017 00:00	BH16 2.0-2.1m	✓	✓	✓
EM1717027-009	12-Dec-2017 00:00	BH16 2.9-3.0m	✓	✓	✓
EM1717027-010	12-Dec-2017 00:00	BH17 0.5-0.6m	✓	✓	✓
EM1717027-011	12-Dec-2017 00:00	BH17 1.9-2.0m	✓	✓	✓
EM1717027-012	12-Dec-2017 00:00	BH18 0.2-0.3m	✓	✓	✓
EM1717027-013	12-Dec-2017 00:00	BH18 0.9-1.0m	✓	✓	✓
EM1717027-014	12-Dec-2017 00:00	BH19 0.2-0.3m	✓	✓	✓
EM1717027-015	12-Dec-2017 00:00	BH19 0.9-1.0m	✓	✓	✓
EM1717027-016	12-Dec-2017 00:00	BH20 0.5m	✓	✓	✓
EM1717027-017	12-Dec-2017 00:00	BH21 0.5m	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - W-03 15 Metals (NEPM Suite)	WATER - W-07 TRH/BTEXN/PAH
EM1717027-019	11-Dec-2017 00:00	Rinsate	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
KRIS TAYLOR		
- *AU Certificate of Analysis - NATA (COA)	Email	ktaylor@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ktaylor@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ktaylor@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ktaylor@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	ktaylor@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	ktaylor@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	ktaylor@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EM1717330**		
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: KRIS TAYLOR	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: ktaylor@geosolutions.net.au	E-mail	: shirley.lecornu@Alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9601
Project	: Gorringe	Page	: 1 of 3
Order number	: ----	Quote number	: EB2017GEOENVSOL0001 (EN/222/17)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: AARON PLUMMER		

Dates

Date Samples Received	: 12-Dec-2017 10:10	Issue Date	: 15-Dec-2017
Client Requested Due Date	: 19-Dec-2017	Scheduled Reporting Date	: **19-Dec-2017**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- **This is a rebatch of EM1717027**

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Issue Date	: 15-Dec-2017
Page	: 2 of 3
Work Order	: EM1717330 Amendment 0
Client	: GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: SOIL

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM1717330-001	12-Dec-2017 00:00	Duplicate	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	jcumming@geosolutions.net.au
KRIS TAYLOR		
- *AU Certificate of Analysis - NATA (COA)	Email	ktaylor@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ktaylor@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ktaylor@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ktaylor@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	ktaylor@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	ktaylor@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	ktaylor@geosolutions.net.au
M IRAN		
- *AU Certificate of Analysis - NATA (COA)	Email	miran@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	miran@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	miran@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	miran@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	miran@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	miran@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - XTab (XTAB)	Email	sjoyce@geosolutions.net.au

Vapour Laboratory Chain of Custody (COC) and Sample Receipt Notification

Appendix 5 Soil Quality Control Documentation

Quality Control Blanks		EG020F: Dissolved Metals by ICP-MS														EP080					EP080/071					EP080/071																											
		Arsenic	Beryllium	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Boron	EP080: BTEXN	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	0	EP080/071: Total Petroleum Hydrocarbons	C6 - C9 Fraction	C10 - C14 Fraction	C10 - C36 Fraction (sum)	0	EP080/071: Total Recoverable Hydrocarbons -	C6 - C10 Fraction	C6 - C10 Fraction minus BTEX (F1)	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	>C10 - C16 Fraction minus Naphthalene (F2)	Naphthalene	Acenaphthylene	Acenaphthene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b+j)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	Sum of polycyclic aromatic hydrocarbons	Benzo(a)pyrene TEQ (zero)	0	EP068A: Organochlorine Pesticides (OC)	alpha-BHC	Hexachlorobenzene (HCB)
Unit		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	0	µg/L	µg/L	µg/L	µg/L	0	0	µg/L	µg/L	µg/L	0	0	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	0	0	mg/kg	mg/kg
LOR		0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.01	0.005	0.05	0	2	2	2	2	0	0	20	50	50	0	0	20	20	100	100	100	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	0.5	0.5	0	0	0.05	0.05
Date	Sample																																																				
17/06/2017	Rinsate	<0.001	<0.001	<0.001	0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0(	<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5
11/12/2017	Rinsate	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	0.017	<0.05	<0.0(	<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5

Duplicate Comparrison		EA055: Moisture Content	EG005T: Total Metals by ICP-AES												EG035T
		Moisture Content (dried @ 103°C	Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Vanadium	Zinc	Mercury
17/06/2017	BH7 3.0m	22.8	<5	10	<1	<1	6	3	<5	5	121	3	24	13	1
17/06/2017	DUP	22.2	<5	<10	<1	<1	6	6	5	7	98	5	24	13	1
Relative Percentage Difference (RPD) %		2.7	NA	NA	NA	NA	0.0	66.7	NA	33.3	21.0	50.0	0.0	0.0	0.0
Method Detection Limit (MDL)		100	NA	NA	NA	NA	40	40	NA	NA	500	40	100	100	2
MDL Class		MED	NONE	NONE	NONE	NONE	LOW	LOW	NONE	NONE	MED	LOW	LOW	LOW	LOW
RPD Compliance With MDL?		YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
Deviation from MDL (%)		27	NONE	NONE	NONE	NONE	50	-17	NONE	NONE	9	0	50	50	50
12/12/2017	BH21 0.5m	20.1	6	170	<1	<1	12	11	49	238	301	15	29	157	0.8
12/12/2017	Duplicate	20.5	7	140	<1	<1	13	16	35	166	320	19	22	173	0.7
Relative Percentage Difference (RPD) %		2.0	15.4	19.4	NA	NA	8.0	37.0	33.3	35.6	6.1	23.5	27.5	9.7	13.3
Method Detection Limit (MDL)		100	100	1000	NA	NA	40	40	100	500	500	40	100	500	2
MDL Class		MED	LOW	MED	NONE	NONE	LOW	LOW	LOW	MED	MED	LOW	LOW	MED	LOW
RPD Compliance With MDL?		YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES
Deviation from MDL (%)		28	35	11	NONE	NONE	42	13	17	-6	24	26	23	20	37

Duplicate Comparrison		EP075(SIM)B: Polynuclear Aromatic Hydrocarbons																	
		Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	Sum of polycyclic aromatic hydro	Benzo(a)pyrene TEQ (WHO)
17/06/2017	BH7 3.0m	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
17/06/2017	DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Relative Percentage Difference (RPD) %		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Method Detection Limit (MDL)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL Class		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
RPD Compliance With MDL?		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Deviation from MDL (%)		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
12/12/2017	BH21 0.5m	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	3.5	3.7	2.6	2.1	3.4	1.1	2.8	1.5	<0.5	1.8	24	3.7
12/12/2017	Duplicate	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	2.4	2.7	1.8	1.6	2.2	1	1.8	1	<0.5	1.1	16.4	2.4
Relative Percentage Difference (RPD) %		NA	NA	NA	NA	60.9	NA	37.3	31.3	36.4	27.0	42.9	9.5	43.5	40.0	NA	48.3	37.6	42.6
Method Detection Limit (MDL)		NA	NA	NA	NA	10	NA	10	10	10	10	10	10	10	10	NA	10	50	10
MDL Class		NONE	NONE	NONE	NONE	LOW	NONE	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW	NONE	LOW	MED	LOW
RPD Compliance With MDL?		YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES
Deviation from MDL (%)		NONE	NONE	NONE	NONE	-11	NONE	13	19	14	23	7	40	7	10	NONE	2	-8	7

Duplicate Comparrison		EP080: BTEX					EP080: BTEXN			EP080/071: Total Petroleum Hydrocarb				
		Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Sum of BTEX	Total Xylenes	Naphthalene	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
17/06/2017	BH7 3.0m	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50
17/06/2017	DUP	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50
Relative Percentage Difference (RPD) %		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Method Detection Limit (MDL)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL Class		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
RPD Compliance With MDL?		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Deviation from MDL (%)		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
12/12/2017	BH21 0.5m	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50
12/12/2017	Duplicate	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50
Relative Percentage Difference (RPD) %		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Method Detection Limit (MDL)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL Class		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
RPD Compliance With MDL?		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Deviation from MDL (%)		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE

Duplicate Comparrison		EP080/071: Total Recoverable Hydrocarbons - NEPM 2010 Draft											EP004: Organic Matter
		C6 - C10 Fraction	F1	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	Aliphatic > C35	Aromatic C16-C35	Aromatic > C35	2-Bromonaphthalene	2-Fluorobiphenyl	Total Organic Carbon
17/06/2017	BH7 3.0m	<10	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
17/06/2017	DUP	<10	<10	<50	<100	<100	<50	<0.2	<0.5	<0.5	<0.5	<0.5	<1
Relative Percentage Difference (RPD) %		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Method Detection Limit (MDL)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MDL Class		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
RPD Compliance With MDL?		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Deviation from MDL (%)		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
12/12/2017	BH21 0.5m	<10	<10	<50	140	<100	140	<0.2	<0.5	<0.5	<0.5	<0.5	<1
12/12/2017	Duplicate	<10	<10	<50	120	<100	120	<0.2	<0.5	<0.5	<0.5	<0.5	<1
Relative Percentage Difference (RPD) %		NA	NA	NA	15.4	NA	15.4	NA	NA	NA	NA	NA	NA
Method Detection Limit (MDL)		NA	NA	NA	NA	NA	1000	NA	NA	NA	NA	NA	NA
MDL Class		NONE	NONE	NONE	NONE	NONE	LOW	NONE	NONE	NONE	NONE	NONE	NONE
RPD Compliance With MDL?		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Deviation from MDL (%)		NONE	NONE	NONE	NONE	NONE	35	NONE	NONE	NONE	NONE	NONE	NONE

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1717027**	Page	: 1 of 11
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: KRIS TAYLOR	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Gorringe	Date Samples Received	: 12-Dec-2017
Order number	: ----	Date Analysis Commenced	: 12-Dec-2017
C-O-C number	: ----	Issue Date	: 15-Dec-2017
Sampler	: AARON PLUMMER		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 18		
No. of samples analysed	: 18		

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
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

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 higt

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 (Dried @ 105-110°C) (QC Lot: 1308993)									
EM1717027-001	BH12 0.5m	EA055: Moisture Content	----	1	%	22.0	22.3	1.61	0% - 20%
EM1717027-011	BH17 1.9-2.0m	EA055: Moisture Content	----	1	%	18.1	19.4	6.99	0% - 50%
EG005T: Total Metals by ICP-AES (QC Lot: 1308787)									
EM1716985-001	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	50	50	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	13	13	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	2	2	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	5	5	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	6	6	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	11	11	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	41	41	0.00	No Limit
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	37	37	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	16	16	0.00	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM1717027-007	BH16 1.0-1.1m	EG005T: Beryllium	7440-41-7	1	mg/kg	<4	<4	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<2	<2	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	230	230	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<4	<4	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	33	33	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	100	102	1.98	0% - 20%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	67	69	3.05	0% - 50%

Page	: 3 of 11
Work Order	: EM1717027
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Gorringe

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 (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 1308787) - continued									
EM1717027-007	BH16 1.0-1.1m	EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	1050	1080	2.64	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	7	29.3	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	69	71	2.70	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	13	13	0.00	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1308788)									
EM1716985-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM1717027-007	BH16 1.0-1.1m	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1308779)									
EM1717027-001	BH12 0.5m	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
EM1717027-011	BH17 1.9-2.0m	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

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 (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1308779) - continued									
EM1717027-011	BH17 1.9-2.0m	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: 1308575)									
EM1717027-001	BH12 0.5m	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1717027-011	BH17 1.9-2.0m	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1308778)									
EM1717027-001	BH12 0.5m	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
EM1717027-011	BH17 1.9-2.0m	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: 1308575)									
EM1717027-001	BH12 0.5m	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1717027-011	BH17 1.9-2.0m	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: 1308778)									
EM1717027-001	BH12 0.5m	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
EM1717027-011	BH17 1.9-2.0m	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: 1308575)									
EM1717027-001	BH12 0.5m	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
EM1717027-011	BH17 1.9-2.0m	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

Work Order : EM1717027
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Gorringe

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: BTEXN (QC Lot: 1308575) - continued									
EM1717027-011	BH17 1.9-2.0m	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 (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 1308955)									
EM1717028-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.005	0.005	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.022	0.023	0.00	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.013	0.013	0.00	0% - 50%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.010	0.011	0.00	0% - 50%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.046	0.049	6.56	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EM1716909-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.031	0.032	3.47	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.088	0.089	0.00	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.029	0.031	7.12	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.018	0.017	0.00	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	3.71	3.76	1.31	0% - 20%
EG035F: Dissolved Mercury by FIMS (QC Lot: 1308954)									
EM1716909-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EM1717033-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1309271)									
EM1716909-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1309271) - continued									
EM1717034-005	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 1309271)									
EM1716909-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EM1717034-005	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.00	No Limit
EP080: BTEXN (QC Lot: 1309271)									
EM1716909-001	Anonymous	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
EM1717034-005	Anonymous	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: 1308787)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	94.9	79	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	96.9	79	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	112	85	120
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	102	82	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	98.5	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	103	83	109
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	107	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	101	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	94.9	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	98.7	82	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	104	82	111
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	98.7	93	109
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	103	80	109
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	103	82	111
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1308788)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	98.4	77	104
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1308779)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	97.4	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	94.5	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	99.3	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	99.0	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	103	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	1.5 mg/kg	103	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	101	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	104	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	87.8	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	106	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	86.3	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	84.5	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	93.6	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	94.8	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	95.0	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	94.9	68	127

Sub-Matrix: **SOIL**

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 Petroleum Hydrocarbons (QCLot: 1308575)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	92.6	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1308778)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	107	65	131
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	109	70	126
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	104	70	122
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1308575)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	92.7	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1308778)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	109	68	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	108	72	116
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	93.9	38	132
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 1308575)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	87.7	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	99.0	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	92.7	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	103	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	106	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	94.7	66	130

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
EG020F: Dissolved Metals by ICP-MS (QCLot: 1308955)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	100	91	107
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	101	82	113
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	98.2	84	106
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	101	84	104
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	96.6	83	103
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	96.2	83	106
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	97.2	82	103
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	97.4	83	105
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	98.0	83	105
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	93.8	82	106
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	96.3	82	109
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	97.3	83	106
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	99.1	85	109

Sub-Matrix: **WATER**

				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*
EG020F: Dissolved Metals by ICP-MS (QCLot: 1308955) - continued								
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	102	84	116
EG035F: Dissolved Mercury by FIMS (QCLot: 1308954)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	93.3	81	114
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1309020)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	10 µg/L	90.7	48	110
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	10 µg/L	100	49	124
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	10 µg/L	95.6	53	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	10 µg/L	101	54	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	10 µg/L	101	57	119
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	86.5	51	113
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	10 µg/L	96.2	59	123
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	10 µg/L	89.0	58	123
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	10 µg/L	87.5	52	126
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	10 µg/L	95.8	55	123
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	10 µg/L	93.1	52	131
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	10 µg/L	92.4	57	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	10 µg/L	85.2	56	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	10 µg/L	95.2	53	123
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	10 µg/L	96.7	53	125
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	10 µg/L	93.2	53	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1309021)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	3368 µg/L	58.1	58	134
EP071: C15 - C28 Fraction	----	100	µg/L	<100	14735 µg/L	68.0	60	133
EP071: C29 - C36 Fraction	----	50	µg/L	<50	7856 µg/L	66.3	54	137
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1309271)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	80.9	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1309021)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	5225 µg/L	63.7	58	122
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	19994 µg/L	66.7	56	132
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1449 µg/L	67.8	58	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1309271)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	77.3	66	123
EP080: BTEXN (QCLot: 1309271)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	87.1	74	123
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	87.7	77	128
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	82.9	73	126

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: BTEXN (QCLot: 1309271) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	85.8	72	131
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	84.0	74	131
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	90.0	74	124

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: 1308787)							
EM1716985-002	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	87.6	78	124
		EG005T: Barium	7440-39-3	50 mg/kg	100	71	135
		EG005T: Beryllium	7440-41-7	50 mg/kg	103	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	94.7	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	89.3	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	95.1	82	124
		EG005T: Lead	7439-92-1	50 mg/kg	90.1	76	124
		EG005T: Manganese	7439-96-5	50 mg/kg	78.8	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	95.4	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	85.8	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	82.1	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	92.3	74	128
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1308788)							
EM1716985-002	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	93.5	76	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1308779)							
EM1717027-003	BH13 0.4-0.5m	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	95.9	67	117
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	104	52	148
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1308575)							
EM1717027-002	BH12 1.0m	EP080: C6 - C9 Fraction	----	28 mg/kg	83.0	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1308778)							
EM1717027-002	BH12 1.0m	EP071: C10 - C14 Fraction	----	806 mg/kg	116	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	118	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	112	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1308575)							

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1308575) - continued							
EM1717027-002	BH12 1.0m	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	81.5	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1308778)							
EM1717027-002	BH12 1.0m	EP071: >C10 - C16 Fraction	----	1160 mg/kg	117	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	116	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	101	44	126
EP080: BTEXN (QCLot: 1308575)							
EM1717027-002	BH12 1.0m	EP080: Benzene	71-43-2	2 mg/kg	85.4	50	136
		EP080: Toluene	108-88-3	2 mg/kg	94.9	56	139

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EG020F: Dissolved Metals by ICP-MS (QCLot: 1308955)							
EM1716909-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	111	85	131
		EG020A-F: Beryllium	7440-41-7	0.2 mg/L	90.2	73	141
		EG020A-F: Barium	7440-39-3	0.2 mg/L	107	75	127
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	101	81	133
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	99.2	71	135
		EG020A-F: Cobalt	7440-48-4	0.2 mg/L	107	78	132
		EG020A-F: Copper	7440-50-8	0.2 mg/L	101	76	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	100	75	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	97.4	64	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	102	73	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	101	73	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	97.1	75	131
EG035F: Dissolved Mercury by FIMS (QCLot: 1308954)							
EM1716914-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	93.2	70	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1309271)							
EM1717005-001	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	60.8	43	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1309271)							
EM1717005-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	58.3	44	122
EP080: BTEXN (QCLot: 1309271)							
EM1717005-001	Anonymous	EP080: Benzene	71-43-2	20 µg/L	76.3	68	130
		EP080: Toluene	108-88-3	20 µg/L	80.0	72	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1717027	Page	: 1 of 9
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: KRIS TAYLOR	Telephone	: +61-3-8549 9630
Project	: Gorringe	Date Samples Received	: 12-Dec-2017
Site	: ----	Issue Date	: 15-Dec-2017
Sampler	: AARON PLUMMER	No. of samples received	: 18
Order number	: ----	No. of samples analysed	: 18

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.**

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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	7	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	7	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	7	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	7	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 (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH12 0.5m,	BH12 1.0m,	12-Dec-2017	----	----	----	12-Dec-2017	26-Dec-2017	✓
BH13 0.4-0.5m,	BH14 0.3-0.4m,							
BH14 1.0-1.1m,	BH15 0.5-0.6m,							
BH16 1.0-1.1m,	BH16 2.0-2.1m,							
BH16 2.9-3.0m,	BH17 0.5-0.6m,							
BH17 1.9-2.0m,	BH18 0.2-0.3m,							
BH18 0.9-1.0m,	BH19 0.2-0.3m,							
BH19 0.9-1.0m,	BH20 0.5m,							
BH21 0.5m								
EG005T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH12 0.5m,	BH12 1.0m,	12-Dec-2017	12-Dec-2017	10-Jun-2018	✓	13-Dec-2017	10-Jun-2018	✓
BH13 0.4-0.5m,	BH14 0.3-0.4m,							
BH14 1.0-1.1m,	BH15 0.5-0.6m,							
BH16 1.0-1.1m,	BH16 2.0-2.1m,							
BH16 2.9-3.0m,	BH17 0.5-0.6m,							
BH17 1.9-2.0m,	BH18 0.2-0.3m,							
BH18 0.9-1.0m,	BH19 0.2-0.3m,							
BH19 0.9-1.0m,	BH20 0.5m,							
BH21 0.5m								

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
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH12 0.5m,	BH12 1.0m,	12-Dec-2017	12-Dec-2017	09-Jan-2018	✓	13-Dec-2017	09-Jan-2018	✓
BH13 0.4-0.5m,	BH14 0.3-0.4m,							
BH14 1.0-1.1m,	BH15 0.5-0.6m,							
BH16 1.0-1.1m,	BH16 2.0-2.1m,							
BH16 2.9-3.0m,	BH17 0.5-0.6m,							
BH17 1.9-2.0m,	BH18 0.2-0.3m,							
BH18 0.9-1.0m,	BH19 0.2-0.3m,							
BH19 0.9-1.0m,	BH20 0.5m,							
BH21 0.5m								
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH12 0.5m,	BH12 1.0m,	12-Dec-2017	12-Dec-2017	26-Dec-2017	✓	13-Dec-2017	21-Jan-2018	✓
BH13 0.4-0.5m,	BH14 0.3-0.4m,							
BH14 1.0-1.1m,	BH15 0.5-0.6m,							
BH16 1.0-1.1m,	BH16 2.0-2.1m,							
BH16 2.9-3.0m,	BH17 0.5-0.6m,							
BH17 1.9-2.0m,	BH18 0.2-0.3m,							
BH18 0.9-1.0m,	BH19 0.2-0.3m,							
BH19 0.9-1.0m,	BH20 0.5m,							
BH21 0.5m								
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071)								
BH12 0.5m,	BH12 1.0m,	12-Dec-2017	12-Dec-2017	26-Dec-2017	✓	13-Dec-2017	21-Jan-2018	✓
BH13 0.4-0.5m,	BH14 0.3-0.4m,							
BH14 1.0-1.1m,	BH15 0.5-0.6m,							
BH16 1.0-1.1m,	BH16 2.0-2.1m,							
BH16 2.9-3.0m,	BH17 0.5-0.6m,							
BH17 1.9-2.0m,	BH18 0.2-0.3m,							
BH18 0.9-1.0m,	BH19 0.2-0.3m,							
BH19 0.9-1.0m,	BH20 0.5m,							
BH21 0.5m								
Soil Glass Jar - Unpreserved (EP080)								
BH12 0.5m,	BH12 1.0m,	12-Dec-2017	12-Dec-2017	26-Dec-2017	✓	14-Dec-2017	26-Dec-2017	✓
BH13 0.4-0.5m,	BH14 0.3-0.4m,							
BH14 1.0-1.1m,	BH15 0.5-0.6m,							
BH16 1.0-1.1m,	BH16 2.0-2.1m,							
BH16 2.9-3.0m,	BH17 0.5-0.6m,							
BH17 1.9-2.0m,	BH18 0.2-0.3m,							
BH18 0.9-1.0m,	BH19 0.2-0.3m,							
BH19 0.9-1.0m,	BH20 0.5m,							
BH21 0.5m								

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
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP071)								
BH12 0.5m,	BH12 1.0m,	12-Dec-2017	12-Dec-2017	26-Dec-2017	✓	13-Dec-2017	21-Jan-2018	✓
BH13 0.4-0.5m,	BH14 0.3-0.4m,							
BH14 1.0-1.1m,	BH15 0.5-0.6m,							
BH16 1.0-1.1m,	BH16 2.0-2.1m,							
BH16 2.9-3.0m,	BH17 0.5-0.6m,							
BH17 1.9-2.0m,	BH18 0.2-0.3m,							
BH18 0.9-1.0m,	BH19 0.2-0.3m,							
BH19 0.9-1.0m,	BH20 0.5m,							
BH21 0.5m								
Soil Glass Jar - Unpreserved (EP080)								
BH12 0.5m,	BH12 1.0m,	12-Dec-2017	12-Dec-2017	26-Dec-2017	✓	14-Dec-2017	26-Dec-2017	✓
BH13 0.4-0.5m,	BH14 0.3-0.4m,							
BH14 1.0-1.1m,	BH15 0.5-0.6m,							
BH16 1.0-1.1m,	BH16 2.0-2.1m,							
BH16 2.9-3.0m,	BH17 0.5-0.6m,							
BH17 1.9-2.0m,	BH18 0.2-0.3m,							
BH18 0.9-1.0m,	BH19 0.2-0.3m,							
BH19 0.9-1.0m,	BH20 0.5m,							
BH21 0.5m								
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
BH12 0.5m,	BH12 1.0m,	12-Dec-2017	12-Dec-2017	26-Dec-2017	✓	14-Dec-2017	26-Dec-2017	✓
BH13 0.4-0.5m,	BH14 0.3-0.4m,							
BH14 1.0-1.1m,	BH15 0.5-0.6m,							
BH16 1.0-1.1m,	BH16 2.0-2.1m,							
BH16 2.9-3.0m,	BH17 0.5-0.6m,							
BH17 1.9-2.0m,	BH18 0.2-0.3m,							
BH18 0.9-1.0m,	BH19 0.2-0.3m,							
BH19 0.9-1.0m,	BH20 0.5m,							
BH21 0.5m								

Matrix: **WATER**

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
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)							
Rinsate	11-Dec-2017	----	----	----	13-Dec-2017	09-Jun-2018	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)							
Rinsate	11-Dec-2017	----	----	----	13-Dec-2017	08-Jan-2018	✓

Matrix: **WATER**

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

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
Rinsate	11-Dec-2017	12-Dec-2017	18-Dec-2017	✓	13-Dec-2017	21-Jan-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
Rinsate	11-Dec-2017	12-Dec-2017	18-Dec-2017	✓	13-Dec-2017	21-Jan-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
Rinsate	11-Dec-2017	13-Dec-2017	25-Dec-2017	✓	13-Dec-2017	25-Dec-2017	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
Rinsate	11-Dec-2017	12-Dec-2017	18-Dec-2017	✓	13-Dec-2017	21-Jan-2018	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
Rinsate	11-Dec-2017	13-Dec-2017	25-Dec-2017	✓	13-Dec-2017	25-Dec-2017	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080)							
Rinsate	11-Dec-2017	13-Dec-2017	25-Dec-2017	✓	13-Dec-2017	25-Dec-2017	✓

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	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	**5.88**	**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)							
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	8	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	7	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	7	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**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 Control Samples (LCS) - Continued							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	7	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	7	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	19	**5.26**	**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	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 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)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. 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. Compliant with NEPM amended 2013.
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. Compliant with NEPM amended 2013.
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. 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.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
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)

Analytical Methods	Method	Matrix	Method Descriptions
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.
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.
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.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM1717330**	Page	: 1 of 7
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: KRIS TAYLOR	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Gorringe	Date Samples Received	: 12-Dec-2017
Order number	: ----	Date Analysis Commenced	: 12-Dec-2017
C-O-C number	: ----	Issue Date	: 19-Dec-2017
Sampler	: AARON PLUMMER		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

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 (Dried @ 105-110°C) (QC Lot: 1323072)									
EM1717330-001	Duplicate	EA055: Moisture Content	----	1	%	20.5	19.8	3.64	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 1322930)									
EM1717311-011	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	60	50	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	20	20	0.00	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	6	6	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	8	8	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	14	14	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	36	32	12.9	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	58	55	5.30	0% - 50%
		EG005T: Manganese	7439-96-5	5	mg/kg	208	223	6.72	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	24	23	5.05	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	194	213	9.41	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 1322931)									
EM1717311-011	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1322995)									
EM1717330-001	Duplicate	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	0.8	0.6	21.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 1322995) - continued									
EM1717330-001	Duplicate	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	2.4	1.9	23.5	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	2.7	2.1	25.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	1.8	1.3	27.5	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	1.6	1.2	29.6	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	2.2	1.7	25.3	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.0	0.6	41.1	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.8	1.3	32.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	1.0	0.7	35.4	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	1.1	0.8	31.7	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1320673)									
EM1716847-048	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EM1717328-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 1322994)									
EM1717330-001	Duplicate	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: 1320673)									
EM1716847-048	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EM1717328-001	Anonymous	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: 1322994)									
EM1717330-001	Duplicate	EP071: >C16 - C34 Fraction	----	100	mg/kg	120	<100	14.5	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	120	<50	82.4	No Limit
EP080: BTEXN (QC Lot: 1320673)									
EM1716847-048	Anonymous	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
EM1717328-001	Anonymous	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

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 (%)
EP080: BTEXN (QC Lot: 1320673) - continued									
EM1717328-001	Anonymous	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

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: 1322930)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	86.4	79	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	143 mg/kg	83.4	79	110
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	5.63 mg/kg	92.5	85	120
EG005T: Boron	7440-42-8	50	mg/kg	<50	33.2 mg/kg	96.8	82	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	94.3	85	109
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	90.7	83	109
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	16 mg/kg	86.4	78	112
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	82.9	78	108
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	88.7	78	106
EG005T: Manganese	7439-96-5	5	mg/kg	<5	130 mg/kg	86.3	82	107
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	88.4	82	111
EG005T: Selenium	7782-49-2	5	mg/kg	<5	5.37 mg/kg	96.8	93	109
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	29.6 mg/kg	84.9	80	109
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	87.6	82	111
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1322931)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	83.6	77	104
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 1322995)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	96.4	75	131
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	97.6	70	132
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	98.4	80	128
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	108	70	128
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	104	80	128
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	1.5 mg/kg	110	72	126
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	111	70	128
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	115	80	125
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	100	70	130
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	106	80	126
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	92.5	71	124
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	103	75	125
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	84.5	70	125
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	85.2	71	128
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	89.8	72	126
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	81.0	68	127

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
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1320673)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	86.8	70	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1322994)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	806 mg/kg	95.1	80	120
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	3006 mg/kg	98.2	84	115
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1584 mg/kg	98.9	80	112
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1320673)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	84.6	68	125
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1322994)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1160 mg/kg	96.8	83	117
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3978 mg/kg	99.1	82	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	313 mg/kg	100	73	115
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 1320673)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	88.1	74	124
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	88.9	77	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	85.8	73	125
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	89.7	77	128
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	92.9	81	128
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	81.0	66	130

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

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1322930)							
EM1717330-001	Duplicate	EG005T: Barium	7440-39-3	50 mg/kg	80.4	71	135
		EG005T: Lead	7439-92-1	50 mg/kg	94.5	76	124
EM1717330-001	Duplicate	EG005T: Arsenic	7440-38-2	50 mg/kg	96.6	78	124
		EG005T: Beryllium	7440-41-7	50 mg/kg	101	85	125
		EG005T: Cadmium	7440-43-9	50 mg/kg	92.4	84	116
		EG005T: Chromium	7440-47-3	50 mg/kg	100	79	121
		EG005T: Copper	7440-50-8	50 mg/kg	94.4	82	124

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 1322930) - continued							
EM1717330-001	Duplicate	EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	68	136
		EG005T: Nickel	7440-02-0	50 mg/kg	90.4	78	120
		EG005T: Selenium	7782-49-2	50 mg/kg	88.8	71	125
		EG005T: Vanadium	7440-62-2	50 mg/kg	94.7	76	124
		EG005T: Zinc	7440-66-6	50 mg/kg	84.6	74	128
EG035T: Total Recoverable Mercury by FIMS (QCLot: 1322931)							
EM1717330-001	Duplicate	EG035T: Mercury	7439-97-6	5 mg/kg	97.6	76	116
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1320673)							
EM1716847-050	Anonymous	EP080: C6 - C9 Fraction	----	28 mg/kg	67.8	42	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 1322994)							
EM1717330-001	Duplicate	EP071: C10 - C14 Fraction	----	806 mg/kg	95.7	53	123
		EP071: C15 - C28 Fraction	----	3006 mg/kg	97.1	70	124
		EP071: C29 - C36 Fraction	----	1584 mg/kg	97.0	64	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1320673)							
EM1716847-050	Anonymous	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	64.5	39	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 1322994)							
EM1717330-001	Duplicate	EP071: >C10 - C16 Fraction	----	1160 mg/kg	97.2	65	123
		EP071: >C16 - C34 Fraction	----	3978 mg/kg	97.6	67	121
		EP071: >C34 - C40 Fraction	----	313 mg/kg	94.4	44	126
EP080: BTEXN (QCLot: 1320673)							
EM1716847-050	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	81.2	50	136
		EP080: Toluene	108-88-3	2 mg/kg	85.7	56	139

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM1717330	Page	: 1 of 5
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: KRIS TAYLOR	Telephone	: +61-3-8549 9630
Project	: Gorringe	Date Samples Received	: 12-Dec-2017
Site	: ----	Issue Date	: 19-Dec-2017
Sampler	: AARON PLUMMER	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **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 : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EM1717330--001	Duplicate	Manganese	7439-96-5	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Matrix Spikes (MS)					
PAH/Phenols (SIM)	0	1	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	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) Duplicate	12-Dec-2017	----	----	----	18-Dec-2017	26-Dec-2017	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) Duplicate	12-Dec-2017	18-Dec-2017	10-Jun-2018	✓	18-Dec-2017	10-Jun-2018	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) Duplicate	12-Dec-2017	18-Dec-2017	09-Jan-2018	✓	18-Dec-2017	09-Jan-2018	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) Duplicate	12-Dec-2017	18-Dec-2017	26-Dec-2017	✓	18-Dec-2017	27-Jan-2018	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) Duplicate	12-Dec-2017	12-Dec-2017	26-Dec-2017	✓	14-Dec-2017	26-Dec-2017	✓
Soil Glass Jar - Unpreserved (EP071) Duplicate	12-Dec-2017	18-Dec-2017	26-Dec-2017	✓	18-Dec-2017	27-Jan-2018	✓

Page	: 3 of 5
Work Order	: EM1717330
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Gorringe

Matrix: **SOIL**

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

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) Duplicate	12-Dec-2017	12-Dec-2017	26-Dec-2017	✓	14-Dec-2017	26-Dec-2017	✓
Soil Glass Jar - Unpreserved (EP071) Duplicate	12-Dec-2017	18-Dec-2017	26-Dec-2017	✓	18-Dec-2017	27-Jan-2018	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) Duplicate	12-Dec-2017	12-Dec-2017	26-Dec-2017	✓	14-Dec-2017	26-Dec-2017	✓

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	1	1	100.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	1	100.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	2	50.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	2	50.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	2	50.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	0	1	0.00	5.00	×	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	2	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	17	5.88	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	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 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)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. 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. Compliant with NEPM amended 2013.
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. Compliant with NEPM amended 2013.

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.
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.

Appendix 6 Soil Vapour Quality Control Documentation

SGS

Report N°: M171189

QUALIFIERS / NOTES FOR REPORTED RESULTS

PQL	Practical Quantitation Limit
nd	Not Detected – The analyte was not detected above the reported PQL.
IS	Insufficient Sample to perform this analysis.
T	Tentative identification based on computer library search of mass spectra.
NC	Not calculated and/or Results below PQL
NV	No Vacuum. Canister received above standard atmospheric pressure
nr	Not Requested for analysis.
R	Rejected Result – results for this analysis failed QC checks.
SQ	Semi-Quantitative result – quantitation based on a generic response factor for this class of analyte.
IM	Inappropriate method of analysis for this compound
II	Unable to provide Quality Control data – high levels of compounds in sample interfered with analysis of QC results.
UF	Unable to provide Quality Control data- Surrogates failed QC checks due to sample matrix effects
L	Analyte detected at a level above the linear response of calibration curve.
E	Estimated result. NATA accreditation does not cover estimated results.
CE	These compounds co-elute.
--	Parameter Not Determined
CT	Elevated concentration. Results reported from carbon tube analysis
**	Sample shows non-petroleum hydrocarbon profile

Appendix 7 Soil Bore logs

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH1**
CLIENT: Hobart Properties & Securities	EASTING: 526000 **GDA94**	NORTHING: 5252993 **GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart		ELEVATION AND DATUM: 42.2 **m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 1
EQUIPMENT/METHOD: Direct Push Core	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Core	DATE: 17/06/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL - Sandy GRAVEL: dark brown, slighty moist, medium dense to dense	M	GW	BH1 0.10m		2 (Cadmium), 2 (Copper), 2 (Lead), 2 (Zinc), 2 (Benzo(a)pyrene)		42.2–42.1
0.1–0.3	FILL - GRAVEL & assorted debris, brown/grey, slightly moist, dense, many red brick fragments	SM	GW					42.1–41.9
0.3–0.6	FILL - Mixed Clayey SAND & Sandy CLAY: brown/grey, moist, stiff, low plasticity overall (Clay fraction has medium plasticity)	M	CL					41.9–41.6
0.6–1.0	Sandy CLAY: grey/brown, moist, stiff, medium plasticity, common fine charcoal fragment, some shell grit. No Refusal	M	CL	BH1 0.9m		Level 1		41.6–41.2

IB105 analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH2**
CLIENT: Hobart Properties & Securities	EASTING: 525998	**GDA94**
	NORTHING: 5252990	**GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 42.1	**m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1	
EQUIPMENT/METHOD: Direct Push Core — LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Core — DATE: 17/06/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL - Sandy GRAVEL: dark brown, slighty moist, medium dense to dense	M	GW	BH2 0.1m		Lead: 2; Zinc: 2		42.1–42.0
0.1–0.3	FILL - GRAVEL & assorted debris, brown/grey, slightly moist, dense, many red brick fragments	SM	GW					42.0–41.8
0.3–0.6	FILL - Mixed Clayey SAND & Sandy CLAY: brown/grey, moist, stiff, low plasticity overall (Clay fraction has medium plasticity)	M	CL					41.8–41.5
0.6–1.0	Sandy CLAY: grey/brown, moist, stiff, medium plasticity, common fine charcoal fragment, some shell grit. No Refusal	M	CL	BH2 0.9m		Lead: 2		41.5–41.1

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH3**
CLIENT: Hobart Properties & Securities	EASTING: 525984	GDA94
	NORTHING: 5252989	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 41.5	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 3	
EQUIPMENT/METHOD: Direct Push Core	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Core	DATE: 17/06/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	FILL - Concrete		P					41.5
0.2	FILL - Clayey GRAVEL: grey/brown, slightly moist, medium dense	SM	GC	BH3 0.5m				41.3
0.6	Silty CLAY: dark grey-brown, moist, stiff, high plasticity	M	CH					40.9
1.0	Silty CLAY: pale brown, moist, stiff, high plasticity - plasticity decreasing with depth	M	CH	BH3 2.3m				40.5
2.3	Silty GRAVEL: yellow/pale brown, dry, very dense, weathered silt/mudstone. No Refusal	D	GM					39.2

IB105 Analyte IL Exceedances columns: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH4**
CLIENT: Hobart Properties & Securities	EASTING: 525982	GDA94
	NORTHING: 5253010	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 42.8	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 2	
EQUIPMENT/METHOD: Direct Push Core; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Core; DATE: 17/06/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL - Concrete		P					42.8–42.7
0.1–0.9	FILL - Clayey GRAVEL: grey/brown, slightly moist, medium dense, many red brick fragments	SM	GC	BH4 0.5m		Barium 2; Copper 2; Lead 4; Manganese 2; Zinc 2; Mercury 2; Benzo(a)pyrene 3; PAH Sum 2; TPH C6 - C9 2; TPH C10 - C36 3		42.7–41.9
0.9–1.4	Silty CLAY: dark grey-brown, moist, firm to stiff, high plasticity	M	CH	BH4 1.0m				41.9–41.4
1.4–2.0	Silty CLAY: pale brown, moist, stiff, high plasticity. No Refusal	M	CH					41.4–40.8

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, EthylBenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4; SAMPLE IN EXCAVATION; X APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH5**	
CLIENT: Hobart Properties & Securities		EASTING: 525979	GDA94
		NORTHING: 5253010	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart		ELEVATION AND DATUM: 42.9	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 3	
EQUIPMENT/METHOD: Direct Push Core	LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Core	DATE: 17/06/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - Sandy GRAVEL: brown/grey, slighty moist, medium dense to dense, some small brick fragments	M	GW	BH5 0.1m		Benzo(a)pyrene: 3; PAH Sum: 3		42.9–42.7
0.2–0.6	FILL - Gravelly CLAY: dark brown/black, moist, stiff, medium plasticity	M	CL					42.7–42.3
0.6–1.4	Silty CLAY: pale brown, moist, stiff, high plasticity	M	CH					42.3–41.5
1.4–2.5	Silty CLAY: red/orange, moist, stiff, high plasticity	M	CH					41.5–40.4
2.5–3.0	Silty Sandy CLAY: red/orange/yellow, moist, very stiff, medium plasticity. No Refusal	M	CL	BH5 3.0m		Manganese: 2		40.4–39.9

IB105 Analyte IL Exceedances columns: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA

CLIENT: Hobart Properties & Securities

Log of BH6

EASTING:	525966	GDA94
NORTHING:	5253047	GDA94
ELEVATION AND DATUM:	44.3	m AHD
TOTAL DEPTH (m):	3	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: 66 Burnett Street, North Hobart

DRILLING CONTRACTOR: Geo-Environmental Solutions

EQUIPMENT/METHOD: Direct Push Core

LOGGED BY: A. Plummer

SAMPLING: Core

DATE: 17/06/2017

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL - Concrete		P				44.3–44.2
0.1–0.3	FILL - Clayey SAND: dark brown/black, moist, medium dense	M	SC	BH6 0.2m			44.2–44.0
0.3–0.6	FILL - Silty Sandy CLAY: dark brown/black, moist, stiff, medium plasticity, 10% fine gravel & brick fragments	M	CL				44.0–43.7
0.6–1.0	Silty CLAY: brown, moist, firm, high plasticity	M	CH				43.7–43.3
1.0–3.0	Silty CLAY: mottled pale brown/grey/red, moist, stiff, high plasticity, lense of fine Quartz gravel from 1.95-2.0m containing f	M	CH	BH6 2.0m; BH6 3.0m			43.3–41.3

Approximate groundfloor level marked at 1.5 m depth (42.8 m elevation).

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Chromium VI	PCB's	Aldrin+Dieldrin	DDT etc	Phenol	Benzo(a)pyrene	PAH Sum	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPH C6 - C9	TPH C10 - C36	To Be Excavated
BH6 0.2m		2					2	3			2	2						3	2							
BH6 2.0m									2																	
BH6 3.0m																										

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4; SAMPLE IN EXCAVATION; ✖ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		Log of BH7
CLIENT: Hobart Properties & Securities		EASTING: 525973 GDA94
		NORTHING: 5253042 GDA94
BORING LOCATION: 66 Burnett Street, North Hobart		ELEVATION AND DATUM: 44.4 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 3
EQUIPMENT/METHOD: Direct Push Core	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Core	DATE: 17/06/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL - Concrete		P					44.4–44.3
0.15–0.3	FILL - Clayey SAND: dark brown/black, moist, medium dense	M	SC	BH7 0.2m		2 2 2 2 2 3 2		44.2
0.3–0.6	FILL - Silty Sandy CLAY: dark brown/black, moist, stiff, medium plasticity, 10% fine gravel & brick fragments	M	CL					44.1–43.8
0.6–1.5	Silty CLAY: brown, moist, stiff, high plasticity	M	CH	BH7 1.0m		2 2		43.8–42.9
1.5–3.0	Silty CLAY: mottled pale brown/grey/red, moist, stiff, high plasticity. No Refusal	M	CH	BH7 3.0m		2		42.9–41.4

IB105 analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, 19 Bs Exceeded

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA

CLIENT: Hobart Properties & Securities

Log of BH8

EASTING: 525969	GDA94	
NORTHING: 5253040	GDA94	
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 44.6	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 3	
EQUIPMENT/METHOD: Direct Push Core	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Core	DATE: 17/06/2017	

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - Concrete		P				44.6–44.4
0.2–1.7	FILL - SAND some clay (Packing/Fat Sand), orange/grey-brown, moist, medium dense	M	SC	BH8 0.5m; BH8 1.0m			44.4–42.9
1.7–3.0	Silty CLAY: mottled pale brown/grey/red, moist, stiff, high plasticity. No Refusal	M	CH				42.9–41.6

Tas EPA IB105 CLASSIFICATION: ☐ Level 1 [2] Level 2 [3] Level 3 [4] Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH9**
CLIENT: Hobart Properties & Securities	EASTING: 525965	GDA94
	NORTHING: 5253042	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 44.6	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 3	
EQUIPMENT/METHOD: Direct Push Core; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Core; DATE: 17/06/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	ELEVATION (metres)
0.0–0.2	FILL - Concrete		P	BH9 0.2m		44.6–44.4
0.2–0.5	FILL - Clayey SAND: dark brown/black, moist, medium dense	M	SC			44.4–44.1
0.5–1.0	Silty CLAY: brown, moist, stiff, high plasticity	M	CH			44.1–43.6
1.0–2.1	Silty Sandy CLAY: pale brown, moist, very stiff, medium plasticity, 20% fine to coarse gravel	M	CL			43.6–42.5
2.1–2.5	Silty CLAY: mottled pale brown/grey/red, moist, stiff, high plasticity	M	CH			42.5–42.1
2.5–2.8	FILL - SAND some clay (Packing/Fat Sand), orange/grey-brown, moist, medium dense. Side wall of Tank Pit has been scalloped out	M	SC			42.1–41.8
2.8–3.0	Silty CLAY: mottled pale brown/grey/red, moist, stiff, high plasticity. No Refusal	M	CH	BH9 3.0m		41.8–41.6

Approximate groundfloor level marked at 1.8 m depth (42.8 m elevation).

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Chromium VI	PCB's	Aldrin+Dieldrin	DDT etc	Phenol	Benzo(a)pyrene	PAH Sum	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPH C6 - C9	TPH C10 - C36	To Be Excavated
BH9 0.2m		2						2			2	2						3	2							
BH9 3.0m																										

MONITORING WELL

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH10**
CLIENT: Hobart Properties & Securities		EASTING: 525970 **GDA94**
		NORTHING: 5253045 **GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart		ELEVATION AND DATUM: 45.5 **m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 1
EQUIPMENT/METHOD: Direct Push Core	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Core	DATE: 17/06/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - GRAVEL: brown/grey, slightly moist, dense	SM	GW	BH10 0.1m		2		45.5–45.3
0.2–1.0	Sandy Silty CLAY: brown, moist, very stiff, medium plasticity	M	CL	BH10 1.0m		2		45.3–44.5

IB105 analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✖ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS	PROJECT: Gorringe ESA	**Log of BH11**
	CLIENT: Hobart Properties & Securities	EASTING: 525967 **GDA94**
		NORTHING: 5253067 **GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart		ELEVATION AND DATUM: 43.9 **m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 0.15
EQUIPMENT/METHOD: Direct Push Core	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Core	DATE: 17/06/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	FILL - Concrete		P	BH11 0.1m		Manganese: 2		
0.1	Silty CLAY: yellow/orange/brown, moist, stiff, medium to high plasticity. Sudden Refusal	M	CH					43.8

IB105 Analyte IL Exceedances columns:

Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Chromium VI	PCB's	Aldrin+Dieldrin	DDT etc	Phenol	Benzo(a)pyrene	PAH Sum	Benzene	Toluene	EthylBenzene	Total Xylenes	TPH C6 - C9	TPH C10 - C36	To Be Excavated
								2																	

Tas EPA IB105 CLASSIFICATION: ☐ Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA	**Log of BH12**	
CLIENT: Hobart Properties & Securities	EASTING: 525994	GDA94
	NORTHING: 5253042	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 43.7	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.2	
EQUIPMENT/METHOD: Geoprobe 540UD LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 11/12/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	FILL - Concrete Slab		P					
0.1								43.6
0.2	FILL - CLAYEY GRAVEL: brown/grey, slightly moist, dense	SM	GC					43.5
0.3	Sandy SILTY CLAY: brown/grey/orange, moist, stiff, medium plasticity	M	CI					43.4
0.4				BH12 0.5m				43.3
0.5	SILTY CLAY: brown/grey, moist, stiff, high plasticity. End	M	CH					43.2
0.6								43.1
0.7								43.0
0.8								42.9
0.9								42.8
1.0				BH12 1.0m		Barium 2; Beryllium 2; Cobalt 3; Manganese 2; Nickel 2		42.7
1.1								42.6
1.2								42.5

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✗ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH13**
CLIENT: Hobart Properties & Securities		EASTING: 526000 GDA94
		NORTHING: 5253030 GDA94
BORING LOCATION: 66 Burnett Street, North Hobart		ELEVATION AND DATUM: 43.3 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 0.55
EQUIPMENT/METHOD: Geoprobe 540UD	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 11/12/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances (Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated)	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - Concrete Slab		P					43.2 / 43.1
0.3–0.5	Extremely Weathered SILTSTONE (Clayey SILT): orange/trace pale purple mottles, dry to slightly moist, dense, very low rock stre	SM	ML	BH13 0.4-0.5m				43.0 / 42.9 / 42.8

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✗ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH14**
CLIENT: Hobart Properties & Securities	EASTING: 525987	GDA94
	NORTHING: 5253023	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 43.2	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.5	
EQUIPMENT/METHOD: Geoprobe 540UD; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 11/12/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.25	FILL - Concrete Slab		P				43.2–42.95
0.25–0.35	FILL - GRAVEL: blue/grey, slightly moist, loose, medium to coarse (20-40mm) clean angular Dolerite gravel	SM	GW				
0.35–0.6	FILL - SANDY CLAY: dark brown, moist, stiff, medium plasticity, few fine gravels	M	CI	BH14 0.3-0.4m			
0.6–0.9	Sandy SILTY CLAY: mottled dark brown/orange, moist, stiff, medium plasticity	M	CI				
0.9–1.5	SILTY CLAY: olive-brown, moist, firm to stiff, high plasticity. END	M	CH	BH14 1.0-1.1m			–41.7

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Chromium VI	PCB's	Aldrin+Dieldrin	DDT etc	Phenol	Benzo(a)pyrene	PAH Sum	Benzene	Toluene	EthylBenzene	Total Xylenes	TPH C6 - C9	TPH C10 - C36	To Be Excavated
BH14 0.3-0.4m	2							2	2		2							3	3							
BH14 1.0-1.1m		2																								

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4; SAMPLE IN EXCAVATION; ✖ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH15**
CLIENT: Hobart Properties & Securities	EASTING: 525995	GDA94
	NORTHING: 5252997	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 42.25	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 0.6	
EQUIPMENT/METHOD: Geoprobe 540UD; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 11/12/2017		

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0	FILL - Concrete Slab		P				42.2
0.2	FILL - SAND: yellow-grey, slightly moist, loose		SW				42.0
0.3	FILL - CLAYEY GRAVEL: yellow-brown/grey, slightly moist, dense. Refusal	SM	GC	BH15 0.5-0.6m			41.9
0.6							41.7

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA

CLIENT: Hobart Properties & Securities

Log of BH16

EASTING:	525979	GDA94
NORTHING:	5253059	GDA94
ELEVATION AND DATUM:	45	m AHD
TOTAL DEPTH (m):	3.5	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: 66 Burnett Street, North Hobart

DRILLING CONTRACTOR: Geo-Environmental Solutions

EQUIPMENT/METHOD: Geoprobe 540UD LOGGED BY: A. Plummer

SAMPLING: Direct Push DATE: 11/12/2017

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - Concrete Slab		P					45.0–44.8
0.2–0.3	FILL - GRAVEL (FCR): brown-grey, slightly moist, medium dense	SM	GW					44.8–44.7
0.3–0.5	FILL - GRAVELLY CLAY: dark grey-brown, moist, stiff, medium plasticity	M	CI					44.7–44.5
0.5–0.9	SILTY CLAY: pale olive-grey, moist, stiff, high plasticity	M	CH					44.5–44.1
0.9–1.6	Silty CLAYEY GRAVEL: pale yellow/grey, dry, dense	D	GC	BH16 1.0-1.1m		2 2		44.1–43.4
1.6–2.1	Silty GRAVELLY CLAY: orange/yellow, slightly moist, very stiff, low plasticity	SM	CL	BH16 2.0-2.1m		2		43.4–42.9
2.1–2.7	Silty CLAYEY GRAVEL: pale yellow/grey, dry, dense	D	GC					42.9–42.3
2.7–3.5	Gravelly SILTY CLAY: pale yellow-grey/red, moist, stiff, low to medium plasticity. END	M	CL	BH16 2.9-3.0m				42.3–41.5

IB105 analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, 19 Be Exceeded

✗ 2.2 (42.8)

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✗ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA

CLIENT: Hobart Properties & Securities

Log of BH17

EASTING:	525973	GDA94
NORTHING:	5253069	GDA94
ELEVATION AND DATUM:	45.5	m AHD
TOTAL DEPTH (m):	2.7	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: 66 Burnett Street, North Hobart

DRILLING CONTRACTOR: Geo-Environmental Solutions

EQUIPMENT/METHOD: Geoprobe 540UD LOGGED BY: A. Plummer

SAMPLING: Direct Push DATE: 11/12/2017

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - SANDY GRAVEL: grey/brown, slightly moist, dense	SM	GW					45.5–45.3
0.2–0.5	FILL - Gravelly CLAYEY SAND: dark brown, slightly moist, medium dense	SM	SC					45.3–45.0
0.5–1.1	SILTY CLAY: olive brown/orange/trace red, moist, stiff, high plasticity	M	CH	BH17 0.5-0.6m				45.0–44.4
1.1–2.7	Extremely Weathered SANDSTONE/SILTSTONE (banded): yellow/orange, slightly moist, dense, lense of medium plasticity clay at 1.8	SM		BH17 1.9-2.0m		2		44.4–42.8

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA

CLIENT: Hobart Properties & Securities

Log of BH18

EASTING:	525981	GDA94	
NORTHING:	5253041	GDA94	
BORING LOCATION:	66 Burnett Street, North Hobart	ELEVATION AND DATUM:	43.8 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions	TOTAL DEPTH (m):	2
EQUIPMENT/METHOD:	Geoprobe 540UD	LOGGED BY:	A. Plummer
NATURAL (m):		WATER TABLE (m):	
SAMPLING:	Direct Push	DATE:	11/12/2017

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - Concrete Slab		P					43.8–43.6
0.2–0.6	SILTY CLAY: dark grey/black, moist, stiff, high plasticity	M	CH	BH18 0.2-0.3m		2		43.6–43.2
0.6–1.0	Sandy SILTY CLAY: dark brown, moist, very stiff, high plasticity	M	CH	BH18 0.9-1.0m		2		43.2–42.8
1.0–1.7	Silty GRAVELLY CLAY: pale yellow-grey, slightly moist, very stiff, low to meidum plasticity	M	CI					42.8–42.1
1.7–2.0	SILTY CLAY: orange/yellow/grey, moist, very stiff, medium plasticity, high silt content. END	M	CI					42.1–41.8

IB105 analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, 19 Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH19**
CLIENT: Hobart Properties & Securities		EASTING: 525964 **GDA94**
		NORTHING: 5253033 **GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart		ELEVATION AND DATUM: 44.1 **m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 2
EQUIPMENT/METHOD: Geoprobe 540UD	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 11/12/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	FILL - Concrete Slab		P					44.1
0.2	FILL - GRAVEL: dark brown-grey, moist, dense	M	GW	BH19 0.2-0.3m		Lead 2; Zinc 2; Mercury 2; Benzo(a)pyrene 3; PAH Sum 2		43.9
0.3	SILTY CLAY: olive-brown, moist, stiff, high plasticity	M	CH					43.8
0.9				BH19 0.9-1.0m		Arsenic 2; Barium 2		43.2
1.0	SILTY CLAY: orange/red, moist, stiff, high plasticity. END	M	CH					43.1
1.3 ✕								42.8 ✕
2.0								42.1

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA	**Log of BH20**	
CLIENT: Hobart Properties & Securities	EASTING: 525973	GDA94
	NORTHING: 5252982	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 42	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.1	
EQUIPMENT/METHOD: Geoprobe 540UD LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push DATE: 11/12/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0 – 0.2	FILL - Concrete		P					42 – 41.8
0.2 – 0.6	FILL - Clayey GRAVEL: grey/brown, slightly moist, medium dense	SM	GC	BH20 0.5m				41.8 – 41.4
0.6 – 1.1	Silty CLAY: dark grey-brown, moist, stiff, high plasticity	M	CH					41.4 – 40.9

IB105 Analyte IL Exceedances columns: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | X APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH21**
CLIENT: Hobart Properties & Securities		EASTING: 526002 GDA94
		NORTHING: 5252990 GDA94
BORING LOCATION: 66 Burnett Street, North Hobart		ELEVATION AND DATUM: 42.7 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 1.1
EQUIPMENT/METHOD: Geoprobe 540UD	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 11/12/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL - Sandy GRAVEL: dark brown, slighty moist, medium dense to dense	M	GW					42.7–42.6
0.1–0.3	FILL - GRAVEL & assorted debris, brown/grey, slightly moist, dense, many red brick fragments	SM	GW					
0.3–0.6	FILL - Mixed Clayey SAND & Sandy CLAY: brown/grey, moist, stiff, low plasticity overall (Clay fraction has medium plasticity)	M	CL	BH21 0.5m		3 2		
0.6–1.1	Sandy CLAY: grey/brown, moist, stiff, medium plasticity, common fine charcoal fragment, some shell grit. No Refusal	M	CI					41.6

IB105 analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, (9 Be Excavated)

Depth scale (m): 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1

Elevation scale (m): 42.6, 42.5, 42.4, 42.3, 42.2, 42.1, 42.0, 41.9, 41.8, 41.7, 41.6

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

Appendix 8 Soil Analytical Results - Certificate of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	EM1717027	Page	1 of 18
Client	GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	Environmental Division Melbourne
Contact	KRIS TAYLOR	Contact	Shirley LeCornu
Address	29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	4 Westall Rd Springvale VIC Australia 3171
Telephone	+61 03 6223 1839	Telephone	+61-3-8549 9630
Project	Gorringe	Date Samples Received	12-Dec-2017 10:10
Order number	----	Date Analysis Commenced	12-Dec-2017
C-O-C number	----	Issue Date	15-Dec-2017 13:29
Sampler	AARON PLUMMER		
Site	----		
Quote number	EN/222/17		
No. of samples received	18		
No. of samples analysed	18		

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
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

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.

- EG005T:EM1717027_004, 007 and 013 have been diluted prior to metal analysis due to sample matrix. LORs have been raised for Beryllium, Cadmium and Chromium
- EG020F: Zinc results for EM1717027-019 have been confirmed by re-preparation and re-analysis.
- 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)			Client sample ID	BH12 0.5m	BH12 1.0m	BH13 0.4-0.5m	BH14 0.3-0.4m	BH14 1.0-1.1m
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00
Compound	CAS Number	LOR	Unit	EM1717027-001	EM1717027-002	EM1717027-003	EM1717027-004	EM1717027-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**22.0**	**19.5**	**14.3**	**28.9**	**23.2**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**5**	**8**	<5	**35**	<5
Barium	7440-39-3	10	mg/kg	**220**	**660**	**20**	**180**	**480**
Beryllium	7440-41-7	1	mg/kg	**1**	**4**	**1**	<1	**1**
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<10	<1
Chromium	7440-47-3	2	mg/kg	**18**	**16**	**7**	**20**	**14**
Cobalt	7440-48-4	2	mg/kg	**13**	**368**	**6**	**12**	**14**
Copper	7440-50-8	5	mg/kg	**32**	**39**	**16**	**80**	**17**
Lead	7439-92-1	5	mg/kg	**10**	**11**	<5	**314**	**11**
Manganese	7439-96-5	5	mg/kg	**116**	**1690**	**268**	**825**	**54**
Nickel	7440-02-0	2	mg/kg	**14**	**72**	**13**	**22**	**13**
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	**85**	**65**	**23**	**61**	**59**
Zinc	7440-66-6	5	mg/kg	**28**	**45**	**53**	**728**	**14**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	**0.8**	<0.1
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	**0.6**	<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	**2.5**	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	**0.8**	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	**5.1**	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	**5.9**	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	**3.3**	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	**3.1**	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	**5.4**	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	**1.8**	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	**5.2**	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	**3.1**	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	**0.9**	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH12 0.5m	BH12 1.0m	BH13 0.4-0.5m	BH14 0.3-0.4m	BH14 1.0-1.1m
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00
Compound	CAS Number	LOR	Unit	EM1717027-001	EM1717027-002	EM1717027-003	EM1717027-004	EM1717027-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	**4.4**	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	<0.5	**42.1**	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	<0.5	**7.5**	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**7.5**	**0.6**
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**7.5**	**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	**210**	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	**210**	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	<50	**420**	<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
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	**370**	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	**110**	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	<50	**480**	<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	----	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	%	**87.4**	**84.6**	**87.9**	**75.4**	**102**
2-Chlorophenol-D4	93951-73-6	0.5	%	**74.5**	**76.8**	**80.8**	**71.1**	**88.0**
2.4.6-Tribromophenol	118-79-6	0.5	%	**55.5**	**51.6**	**51.7**	**62.3**	**64.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH12 0.5m	BH12 1.0m	BH13 0.4-0.5m	BH14 0.3-0.4m	BH14 1.0-1.1m
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00
Compound	CAS Number	LOR	Unit	EM1717027-001	EM1717027-002	EM1717027-003	EM1717027-004	EM1717027-005
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	79.3	78.4	80.3	87.6	92.2
Anthracene-d10	1719-06-8	0.5	%	107	110	113	92.7	91.1
4-Terphenyl-d14	1718-51-0	0.5	%	107	106	109	103	117
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	79.6	73.7	77.5	82.1	75.3
Toluene-D8	2037-26-5	0.2	%	78.6	82.0	78.7	90.4	87.0
4-Bromofluorobenzene	460-00-4	0.2	%	99.7	105	94.6	103	110

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	BH15 0.5-0.6m	BH16 1.0-1.1m	BH16 2.0-2.1m	BH16 2.9-3.0m	BH17 0.5-0.6m
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00
Compound	CAS Number	LOR	Unit	EM1717027-006	EM1717027-007	EM1717027-008	EM1717027-009	EM1717027-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**6.0**	**18.5**	**27.0**	**16.7**	**23.2**
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	**9**	<5	<5
Barium	7440-39-3	10	mg/kg	**10**	**230**	**90**	<10	**50**
Beryllium	7440-41-7	1	mg/kg	<1	<4	**1**	<1	**1**
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<2	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**11**	<4	**4**	**6**	**17**
Cobalt	7440-48-4	2	mg/kg	**13**	**33**	**13**	<2	**16**
Copper	7440-50-8	5	mg/kg	**57**	**67**	**46**	<5	**24**
Lead	7439-92-1	5	mg/kg	<5	<5	**8**	<5	**12**
Manganese	7439-96-5	5	mg/kg	**350**	**1050**	**760**	**10**	**115**
Nickel	7440-02-0	2	mg/kg	**15**	**100**	**18**	**3**	**16**
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	**39**	**69**	**66**	**10**	**70**
Zinc	7440-66-6	5	mg/kg	**34**	**13**	**48**	**13**	**32**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
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

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH15 0.5-0.6m	BH16 1.0-1.1m	BH16 2.0-2.1m	BH16 2.9-3.0m	BH17 0.5-0.6m
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00
Compound	CAS Number	LOR	Unit	EM1717027-006	EM1717027-007	EM1717027-008	EM1717027-009	EM1717027-010
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
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
>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	----	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	%	**87.4**	**87.1**	**83.5**	**78.2**	**82.4**
2-Chlorophenol-D4	93951-73-6	0.5	%	**80.4**	**77.7**	**78.0**	**69.6**	**82.6**
2.4.6-Tribromophenol	118-79-6	0.5	%	**65.0**	**49.6**	**56.1**	**54.2**	**55.5**

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Work Order : EM1717027
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Gorringe

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH15 0.5-0.6m	BH16 1.0-1.1m	BH16 2.0-2.1m	BH16 2.9-3.0m	BH17 0.5-0.6m
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00
Compound	CAS Number	LOR	Unit	EM1717027-006	EM1717027-007	EM1717027-008	EM1717027-009	EM1717027-010
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	80.3	81.2	87.3	84.7	81.1
Anthracene-d10	1719-06-8	0.5	%	85.8	82.5	99.4	110	106
4-Terphenyl-d14	1718-51-0	0.5	%	108	111	107	103	112
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	87.0	78.7	80.5	83.7	81.9
Toluene-D8	2037-26-5	0.2	%	91.5	75.6	89.7	88.5	90.7
4-Bromofluorobenzene	460-00-4	0.2	%	111	91.6	105	106	106

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH17 1.9-2.0m	BH18 0.2-0.3m	BH18 0.9-1.0m	BH19 0.2-0.3m	BH19 0.9-1.0m
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00
Compound	CAS Number	LOR	Unit	EM1717027-011	EM1717027-012	EM1717027-013	EM1717027-014	EM1717027-015
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	18.1	22.1	17.3	19.0	19.6
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	220	130	180	220	2770
Beryllium	7440-41-7	1	mg/kg	<1	1	<5	<1	3
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<3	<1	<1
Chromium	7440-47-3	2	mg/kg	16	10	13	21	11
Cobalt	7440-48-4	2	mg/kg	45	14	17	9	37
Copper	7440-50-8	5	mg/kg	32	72	15	44	13
Lead	7439-92-1	5	mg/kg	6	144	<5	341	14
Manganese	7439-96-5	5	mg/kg	2410	167	1100	208	255
Nickel	7440-02-0	2	mg/kg	38	14	29	12	19
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	61	53	43	29	43
Zinc	7440-66-6	5	mg/kg	75	104	30	227	17
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	1.0	<0.1	1.5	<0.1
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	1.7	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	1.0	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	6.1	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	6.6	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	2.9	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	2.7	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	4.1	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	1.4	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	3.6	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	1.9	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH17 1.9-2.0m	BH18 0.2-0.3m	BH18 0.9-1.0m	BH19 0.2-0.3m	BH19 0.9-1.0m
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00
Compound	CAS Number	LOR	Unit	EM1717027-011	EM1717027-012	EM1717027-013	EM1717027-014	EM1717027-015
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	**2.6**	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	**35.1**	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	**4.7**	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**4.9**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**5.2**	**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	**310**	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	**300**	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	**610**	<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
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	**530**	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	**160**	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	**690**	<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**	----	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	%	**85.2**	**99.4**	**93.4**	**95.5**	**87.3**
2-Chlorophenol-D4	93951-73-6	0.5	%	**84.6**	**86.3**	**81.1**	**81.5**	**80.1**
2.4.6-Tribromophenol	118-79-6	0.5	%	**58.0**	**69.9**	**64.2**	**76.2**	**61.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH17 1.9-2.0m	BH18 0.2-0.3m	BH18 0.9-1.0m	BH19 0.2-0.3m	BH19 0.9-1.0m
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00	12-Dec-2017 00:00
Compound	CAS Number	LOR	Unit	EM1717027-011	EM1717027-012	EM1717027-013	EM1717027-014	EM1717027-015
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	88.2	87.1	89.5	86.7	82.2
Anthracene-d10	1719-06-8	0.5	%	81.7	92.6	82.3	93.1	82.9
4-Terphenyl-d14	1718-51-0	0.5	%	111	106	106	103	98.1
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	80.9	72.5	78.3	82.9	77.2
Toluene-D8	2037-26-5	0.2	%	86.8	76.1	86.7	90.9	81.3
4-Bromofluorobenzene	460-00-4	0.2	%	106	93.3	105	109	103

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH20 0.5m	BH21 0.5m	----	----	----
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1717027-016	EM1717027-017	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	22.1	20.1	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	6	----	----	----
Barium	7440-39-3	10	mg/kg	40	170	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	----	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	12	12	----	----	----
Cobalt	7440-48-4	2	mg/kg	3	11	----	----	----
Copper	7440-50-8	5	mg/kg	10	49	----	----	----
Lead	7439-92-1	5	mg/kg	9	238	----	----	----
Manganese	7439-96-5	5	mg/kg	59	301	----	----	----
Nickel	7440-02-0	2	mg/kg	4	15	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	48	29	----	----	----
Zinc	7440-66-6	5	mg/kg	12	157	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.8	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	1.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	3.7	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	2.6	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	2.1	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3.4	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	1.1	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	2.8	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	1.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH20 0.5m	BH21 0.5m	----	----	----
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EM1717027-016	EM1717027-017	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	1.8	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	24.0	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	3.7	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	3.9	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	4.2	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	140	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	140	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	89.3	85.4	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	80.5	73.1	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	68.0	71.6	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**BH20 0.5m**	**BH21 0.5m**	----	----	----
			Client sampling date / time	12-Dec-2017 00:00	12-Dec-2017 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1717027-016**	**EM1717027-017**	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**83.6**	**83.4**	----	----	----
Anthracene-d10	1719-06-8	0.5	%	**82.7**	**91.7**	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	**101**	**102**	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**93.4**	**73.0**	----	----	----
Toluene-D8	2037-26-5	0.2	%	**106**	**82.5**	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**123**	**98.9**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate	----	----	----	----
			Client sampling date / time	11-Dec-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1717027-019	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	----	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.017**	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate	----	----	----	----
			Client sampling date / time	11-Dec-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1717027-019	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L	<0.5	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	30.6	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	70.7	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	74.4	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	80.6	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	85.4	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	83.6	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	Rinsate	----	----	----	----
			Client sampling date / time	11-Dec-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1717027-019	--------	--------	--------	--------
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**102**	----	----	----	----
Toluene-D8	2037-26-5	2	%	**103**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	**104**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*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**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*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

CERTIFICATE OF ANALYSIS

Work Order	: **EM1717330**	Page	: 1 of 6
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: KRIS TAYLOR	Contact	: Shirley LeCornu
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61-3-8549 9630
Project	: Gorringe	Date Samples Received	: 12-Dec-2017 10:10
Order number	: ----	Date Analysis Commenced	: 12-Dec-2017
C-O-C number	: ----	Issue Date	: 19-Dec-2017 15:12
Sampler	: AARON PLUMMER		
Site	: ----		
Quote number	: EN/222/17		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

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.

- This is a rebatch of EM1717027
- 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.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Duplicate	----	----	----	----
			Client sampling date / time	12-Dec-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1717330-001	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	20.5	----	----	----	----
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	7	----	----	----	----
Barium	7440-39-3	10	mg/kg	140	----	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	----	----	----	----
Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	13	----	----	----	----
Cobalt	7440-48-4	2	mg/kg	16	----	----	----	----
Copper	7440-50-8	5	mg/kg	35	----	----	----	----
Lead	7439-92-1	5	mg/kg	166	----	----	----	----
Manganese	7439-96-5	5	mg/kg	320	----	----	----	----
Nickel	7440-02-0	2	mg/kg	19	----	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
Vanadium	7440-62-2	5	mg/kg	22	----	----	----	----
Zinc	7440-66-6	5	mg/kg	173	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.7	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	0.8	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	2.4	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	2.7	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	1.8	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	1.6	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	2.2	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.8	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Duplicate	----	----	----	----
			Client sampling date / time	12-Dec-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1717330-001	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	1.1	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	16.4	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	2.4	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	2.7	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	2.9	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	120	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	120	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	89.7	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	85.3	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	75.6	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Duplicate	----	----	----	----
			Client sampling date / time	12-Dec-2017 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM1717330-001	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	110	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%	113	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	110	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	73.0	----	----	----	----
Toluene-D8	2037-26-5	0.2	%	82.5	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	98.9	----	----	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	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

Appendix 9 Soil Vapour Analytical Results

A.B.N. 44 000 964 278
10 / 585 Blackburn Road
Notting Hill, Vic, 3168
Telephone: (03) 9574 3200

Chartered Chemists

19-Dec-2017

REPORT NUMBER: M171189

Site/Client Ref: Supply & Analysis of WMS

Geo-Environmental Solutions

86 Queen Street
Sandy Bay
TAS 7005
Attention: Sarah Joyce

CERTIFICATE OF ANALYSIS

SAMPLES:	Five samples were received for analysis
DATE RECEIVED:	**15-Dec-2017**
DATE COMMENCED:	**15-Dec-2017**
METHODS:	See Attached Results
RESULTS:	Please refer to attached pages for results.

Note: Results are based on samples as received at SGS laboratories
Results in airbourne concentrations are calculated using data provided by the client

REPORTED BY:

Majid Abdolali
Chemist

NATA Accredited Laboratory Number: 2562
Corporate Site Number: 14420
Accredited for compliance
with ISO/IEC 17025.

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SGS

Report N°: M171189

ANALYTICAL RESULTS

Matrix: Passive Sampler
Method: MA-5.WL.04 Volatile Organics
Sample units are expressed in µg/m³ — Test Started: 15/12/2017

Analyte Name	Leeder ID / Client ID / Sampled Date / PQL	2017016059 VP1 1730-AN-LU-067 14/12/2017	2017016060 VP2 1730-AN-LU-070 14/12/2017	2017016061 VP3 1730-AN-LU-066 14/12/2017	2017016062 VP4 1730-AN-LU-068 14/12/2017	2017016063 Dup 1730-AN-LU-069 14/12/2017
Benzene		<19	<19	<18	<19	<18
Ethylbenzene		<10	<10	47	<10	<9.9
Naphthalene		<13	<12	<12	<13	<12
Toluene		17	<13	14	<13	<12
o-Xylene		<10	<10	21	<10	<10
m&p-Xylenes		17	<10	110	<10	<10

Matrix: Passive Sampler
Method: MA-5.WL.03 Volatile Organics
Sample units are expressed in µg total — Test Started: 15/12/2017

Analyte Name	Leeder ID / Client ID / Sampled Date / PQL	2017016064 Method Blank
Benzene	0.05	nd
Ethylbenzene	0.05	nd
Naphthalene	0.05	nd
Toluene	0.05	nd
o-Xylene	0.05	nd
m&p-Xylenes	0.05	nd

Matrix: Passive Sampler
Method: MA-30.AIR.04 Total Recoverable Hydrocarbons
Sample units are expressed in mg/m³ — Test Started: 15/12/2017

Analyte Name	Leeder ID / Client ID / Sampled Date / PQL	2017016059 VP1 1730-AN-LU-067 14/12/2017	2017016060 VP2 1730-AN-LU-070 14/12/2017	2017016061 VP3 1730-AN-LU-066 14/12/2017	2017016062 VP4 1730-AN-LU-068 14/12/2017	2017016063 Dup 1730-AN-LU-069 14/12/2017
C6-C10		<2.5	<2.5	14	<2.5	<2.5
C6-C10 (ex BTEX)		<2.5	<2.5	13	<2.5	<2.5
>C10-C16		<1.0	<1.0	2.4	<1.0	<1.0
>C10-C16 (less Naphthalene)		<1.0	<1.0	2.4	<1.0	<1.0

Report N°: M171189

ANALYTICAL RESULTS

Matrix: Passive Sampler
Method: MA-30.AIR.03 Total Recoverable Hydrocarbons
Sample units are expressed in µg total

Test Started: 15/12/2017

	Leeder ID	2017016064
	Client ID	Method
Analyte Name	**Sampled Date**	
	PQL	Blank
C6-C10	5	nd
C6-C10 (ex BTEX)	5	nd
>C10-C16	5	nd
>C10-C16 (less Naphthalene)	5	nd

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SGS

Report N°: M171189

QA/QC RESULTS

Matrix: Passive Sampler
Method: MA-5.WL.03 Volatile Organics
Quality Control Results are expressed in Percent Recovery of expected result

Test Started: 15/12/2017

	Leeder ID	2017016065	2017016066
	Client ID	Method	Method
Analyte Name	**Sampled Date**		
	PQL	Spike	Spike Dup
Benzene		114	113
Ethylbenzene		100	96
Toluene		106	104
o-Xylene		100	98
m&p-Xylenes		102	99

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SGS

Report N°: M171189

QUALIFIERS / NOTES FOR REPORTED RESULTS

PQL	Practical Quantitation Limit
nd	Not Detected – The analyte was not detected above the reported PQL.
is	Insufficient Sample to perform this analysis.
T	Tentative identification based on computer library search of mass spectra.
NC	Not calculated and/or Results below PQL
NV	No Vacuum, Canister received above standard atmospheric pressure
nr	Not Requested for analysis.
R	Rejected Result – results for this analysis failed QC checks.
SQ	Semi-Quantitative result – quantitation based on a generic response factor for this class of analyte.
IM	Inappropriate method of analysis for this compound
U	Unable to provide Quality Control data – high levels of compounds in sample interfered with analysis of QC results.
UF	Unable to provide Quality Control data- Surrogates failed QC checks due to sample matrix effects
L	Analyte detected at a level above the linear response of calibration curve.
E	Estimated result. NATA accreditation does not cover estimated results.
C1	These compounds co-elute.
--	Parameter Not Determined
CT	Elevated concentration. Results reported from carbon tube analysis
**	Sample shows non-petroleum hydrocarbon profile

SGS

APPENDIX ONE.

CHAIN OF CUSTODY DOCUMENT

SGS

Chain of Custody Record

Dispatch samples to: Unit 10/585 Blackburn Road, Notting Hill, Victoria 3168, Australia

Attn: Sample Reception - Contact Ph: +613 9574 3311 Email: au.samplereceipt.melbourne@sgs.com

Sheet 1 of 1

CLIENT NAME: GES
CLIENT ADDRESS: 29 Kirksway Place
Battery Point
CONTACT: Sarah Joyce
PROJECT REF. Corringe - 66 Burnett St
PURCHASE ORDER No:

CONTACT PHONE No: 62231839
SAMPLED BY: Aaron Plummer
RESULTS REQUIRED BY: 48 hour turn around @ 50% surcharge
EMAIL ADDRESS: s.joyce@geosolutions.net.au; jcumming@geosolutions.net.au; Miran@geosolutions.net.au (invoice)

ABN: 24 115 004 834
LAB QUOTE NUMBER:

Containers/Preservation (please mark with X) (G=glass, P=plastic)

Analyses Required (Analyte + Method Code)

Client Sample ID	Date Sampled	Matrix: Soil	Matrix: Water	Matrix: Other Soil Vapour	0.1-1L Jar(G) n.a.	0.1-1.0 litre(G) Nat.	0.1-1.0 litre(P) Nat.	40ml Vial(G) Nat.	40ml Vial(G) H2SO4	01-1L (P) H2SO4	125mL (P) HCl acid washed	125mL (P) Zn Ace. NaOH	125mL (P) Filtered Yes/No HNO3	125mL (P) NaOH	0.1-1.0 litre (P) sterilised	NEPM Hydro-carbon
VP1 (1730-AN-LU-067)	11-14 Dec			✓												✓
VP2 (1730-AN-LU-070)	"			✓												✓
VP3 (1730-AN-LU-066)	"			✓												✓
VP4 (1730-AN-LU-068)	"			✓												✓
Dup (1730-AN-LU-069)	"			✓												✓
Totals:																

CHAIN OF CUSTODY RECORD

Chill method used for transport (sender to complete): Not chilled.

RELEASED BY: (Name) Sarah Joyce (Signature) (Date / Time) 14-12-17 1230

RECEIVED BY: (Name) Benedict Robinson (Signature) (Date / Time) 15/12/17 9:00am

Temperature on sample receipt: ___°C Custody Seals Intact? Y/N

Chill method used for transport (sender to complete):

RELEASED BY: (Name) (Signature) (Date / Time)

RECEIVED BY: (Name) (Signature) (Date / Time)

Temperature on sample receipt: ___°C Custody Seals Intact? Y/N

Please Note: Dissolved metals require filtering in the field.

Comments: (eg. Highly contaminated samples, reporting requirements etc)

Notes: NEPM Hydrocarbon : BTEX, Naphthalene
TPH F1 + F2 Fractions
Container 1 x water-loo Membrane Sampler per sample.

PF-AU-ENV-NHC-QU-007.xlsx / Ver 5 / 08.02.2017 / Page 1 of 1

GES
GEO-ENVIRONMENTAL
SOLUTIONS

9 October 2018

Jacqui Blowfield
Ireneinc Planning & Urban Design
49 Tasma Street,
North Hobart
Tel 03 6234 9281

RE: Technical Advice on *Environmental Site Assessment 66 Burnett Street, North Hobart*

Dear Jacqui,

This letter report contains GES's response to the Hobart City Councils query, on the 5 October 2018 which in summary was to:

> *"Obtain written confirmation from GES (who completed the Environmental Site Assessment for the original plans, that the conclusions and recommendations contained in the Environmental Site Assessment (which are based upon adopted land use criteria) remain relevant and accurate for the amended plans, which include residential units on Level 1. The applicant should also confirm with GES whether or not any part of the site will have access to soil or will be 100% paved (as per assumptions made in the Environmental Site Assessment report)".*

GES has reviewed the analytical results from the sampling conducted on the 17 June 2017 and 11 December 2017 and can confirm that there were no detections of hydrocarbons in the samples from the area where the two new ground floor apartments are proposed (*BH16* and *BH17* and vapour sampler *VP4).* See Figure 1 Borehole Plan and Vapour sampling holes and the analytical data in Appendix 1 and the amened Level 1 apartment design in Appendix 2.

GES can confirm; that there was no contamination identified in this area that may negatively impact human health. The conclusions in the report still stand.

GES obtained written confirmation via email from *Ireneinc*, that there will be no opportunity for site users to have contact with the soil. The site will be 100% paved as per the amended ESA report dated the 11 January 2018.

Conclusions and Recommendations

- Based on the results, it can be concluded that the site is suitable for a its intended use.
- If the design plans are altered, additional analysis of results or additional soil/ groundwater or soil vapour maybe be required.

Please do not hesitate to call if you have any questions.

Yours faithfully,

Dr John Paul Cumming B.Agr.Sc (Hons) PhD CPSS
Environmental Soil Scientist

Figure 1 Borehole Plan and Vapour sampling holes

Appendix 1 Tabulated Results compared against relevant guidelines

CRC CARE Health Screening Level Dermal Contact Hazard from Soil Hydrocarbons'		EP080: BTEXN					EP080/071: TRH			
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.2	0.5	0.5	0.5	1	10	50	100	100
HSL A Low Density Residential		100	14000	4500	12000	1400	4400	3300	4500	6300
HSL B High Density Residential		140	21000	5900	17000	2200	5600	4200	5800	8100
HSL C Recreational		120	18000	5300	15000	1900	5100	3800	5300	7400
HSL D Commercial/Industrial		430	99000	27000	81000	11000	26000	20000	27000	38000
Intrusive Maintenance Worker		1100	120000	85000	130000	29000	82000	62000	85000	120000
Date	Sample									
12/12/2017	BH16 1.0-1.1m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH16 2.0-2.1m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH16 2.9-3.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH17 0.5-0.6m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
12/12/2017	BH17 1.9-2.0m	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100

Soil Health Screening Levels for Direct Contact, Commercial/ Residential Use

Soil Hydrocarbon HSL's for Assessing Indoor Vapour Intrusion (NEPM 2013) Soil Sample Analysis					EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances Colour Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x					Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	F1	F2
Sample ID	Sample Date	Depth Class	Grain Class	HSL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
					LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH16 1.0-1.1m	12/12/2017	1 - 2	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.0-2.1m	12/12/2017	2 - 4	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.9-3.0m	12/12/2017	2 - 4	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 0.5-0.6m	12/12/2017	0 - 1	SAND	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 1.9-2.0m	12/12/2017	1 - 2	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

Soil Hydrocarbon Vapour HSL's for Assessing Indoor Vapour Intrusion (NEPM 2013) Passive Soil Vapour Analysis						EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances Colour Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x						Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	F1	F2
Sample ID	Sample Date	Depth Class	Grain Class	HSL	Deployment Duration (hours)	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3
						LOR 0.019	LOR 0.013	LOR 0.01	LOR 0.01	LOR 0.012	LOR 2.5	LOR 1
VP4	11/12/2017	1 - 2	SAND	D	67.75	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0
VP4	11/12/2017	2 - 4	CLAY	B	67.75	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0

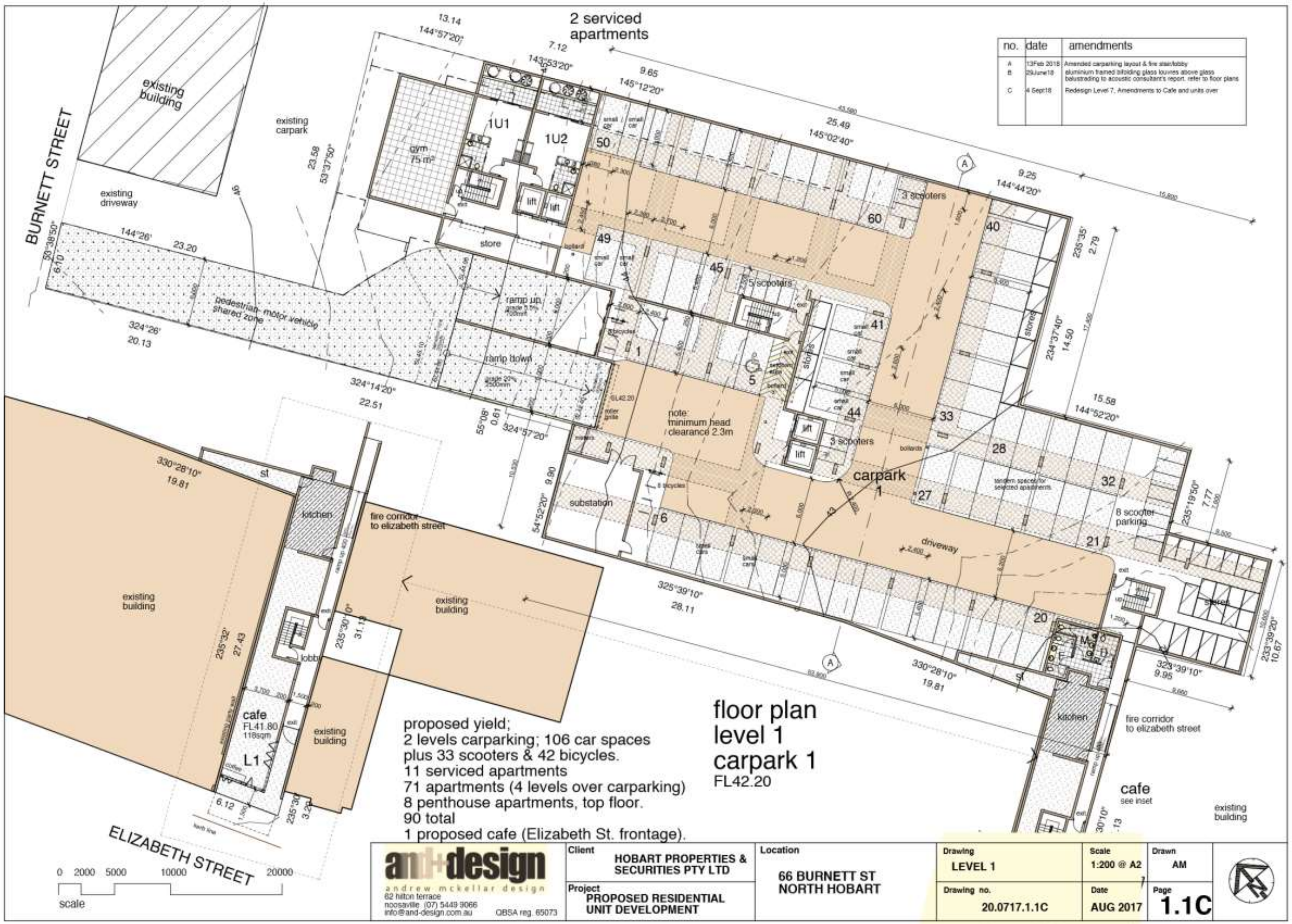
CRC CARE Health Screening Level Assessment for PHC Inhalation Risk To Trench Workers From Soil Sample Analysis				EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances **Dark Grey Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x**				Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction
Sample ID	Sample Date	Depth Class	Grain Class	mg/kg LOR 0.2	mg/kg LOR 0.5	mg/kg LOR 0.5	mg/kg LOR 0.5	mg/kg LOR 1	mg/kg LOR 10	mg/kg LOR 50
BH16 1.0-1.1m	12/12/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.0-2.1m	12/12/2017	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH16 2.9-3.0m	12/12/2017	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 0.5-0.6m	12/12/2017	0 to 2m	SAND	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH17 1.9-2.0m	12/12/2017	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

CRC CARE Health Screening Level Assessment for PHC Inhalation Risk To Trench Workers Passive Soil Vapour Analysis				EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances **Dark Grey Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x**				Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction
Sample ID	Sample Date	Depth Class	Grain Class	mg/m3 LOR 0.019	mg/m3 LOR 0.013	mg/m3 LOR 0.01	mg/m3 LOR 0.01	mg/m3 LOR 0.012	mg/m3 LOR 2.5	mg/m3 LOR 1
VP4	11/12/2017	0 to 2m	SAND	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0
VP4	11/12/2017	2 to 4m	CLAY	<0.019	<0.013	<0.01	0.01	<0.012	<2.5	<1.0

Bold - Indicates LOR Exceedance in Non Metalic Compounds		EA055: Moisture Content	EG005T: Total Metals by ICP-AES														EG035T: Total Recoverable Mercury by FIMS	EP075(SIM)B: Polynuclear Aromatic Hydrocarbons																	
NEPM Health Investigation Levels (HIL's) **Dust Inhalation and Soil Ingestion Assessment** X - Indicates Sample Within Proposed Excavation Zone		Moisture Content (dried @ 103°C)	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Mercury	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	PAHs	Benzo(a)pyrene TEQ (WHO)
Units		%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		1	5	10	1	50	1	2	2	5	5	5	2	5	5	5	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
HIL A Low Density Residential			100		60	4500	20		100	6000	300	3800	400	200		7400	40																	300	3
HIL B High Density Residential			500		90	40000	150		600	30000	1200	14000	1200	1400		60000	120																	400	4
HIL C Recreational			300		90	20000	90		300	17000	600	19000	1200	700		30000	80																	300	3
HIL D Comercial/Industrial			3000		500	3E+05	900		4000	2E+05	1500	60000	6000	10000		4E+05	730																	4000	40
Sample date:	Sample ID																																		
12/12/2017	BH16 1.0-1.1m	18.5	<5	230	<4	<50	<2	<4	33	67	<5	1050	100	<5	69	13	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH16 2.0-2.1m	27	9	90	1	<50	<1	4	13	46	8	760	18	<5	66	48	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH16 2.9-3.0m	16.7	<5	<10	<1	<50	<1	6	<2	<5	<5	10	3	<5	10	13	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH17 0.5-0.6m	23.2	<5	50	1	<50	<1	17	16	24	12	115	16	<5	70	32	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
12/12/2017	BH17 1.9-2.0m	18.1	<5	220	<1	<50	<1	16	45	32	6	2410	38	<5	61	75	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Soil Health Screening Levels for Direct Contact, Commercial/ Residential Land Use

Appendix 2 Architects amended design (September 2018)



CONTAMINATION MANAGEMENT PLAN

66 BURNETT STREET

NORTH HOBART

DECEMBER 2017 (AMENDED 29 MARCH 2018)

GEO-ENVIRONMENTAL

SOLUTIONS

Geo-Environmental Solutions P/L 29 Kirksway Place, Battery Boint7005. Ph 6223 1839 Fax 6223 4539

1 Introduction

This Contamination Management Plan (CMP) is written for the proposed redevelopment of the property at 66 Burnett Street, North Hobart, Hobart - hereby referred to as ‘The Site’ (Figure 1). Geo-Environmental Solutions Pty. Ltd. (GES) were engaged to prepare a site the CMP. A copy of the document should be accessible by the project manager at all times during site development work.

This CMP has been prepared by a suitably qualified and experience practitioner in accordance with procedures and practices detailed in NEPM (2013) guidelines and key regulations and policies identified in the References section of this document.

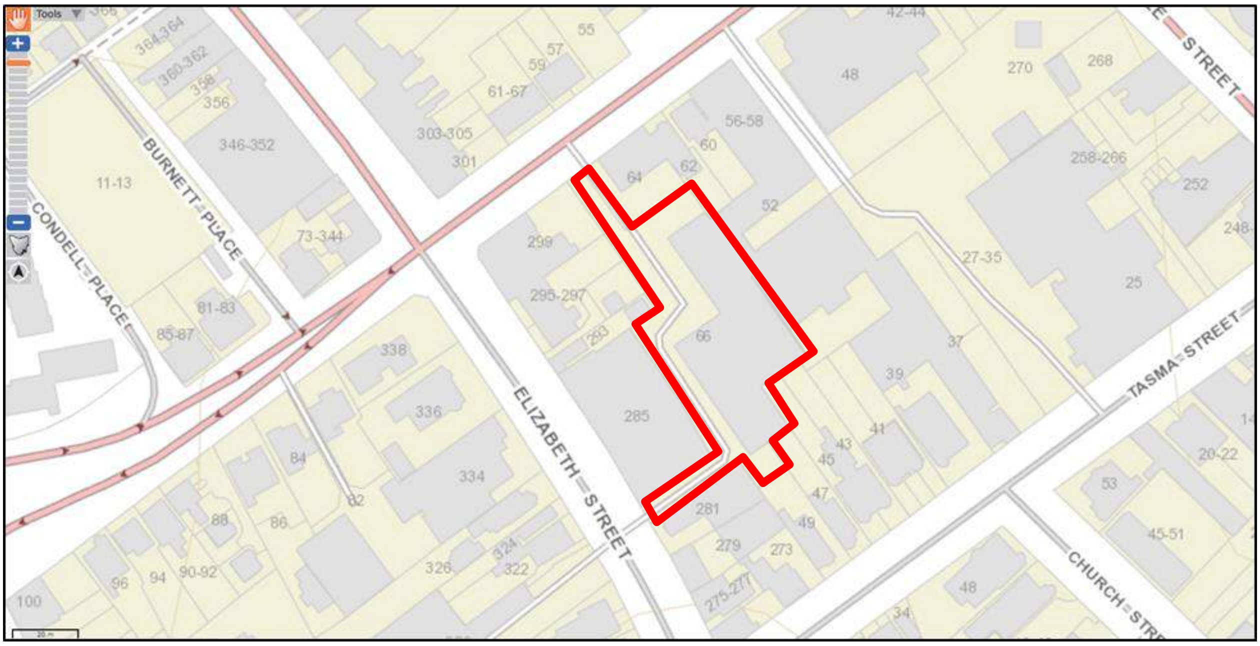


Figure 1-The LISTMap showing the location of the site, site outlined in Red.

1.1 Site Details

Site details are presented in Table 1.

Table 1 Site Details

SITE LOCATION: 66 Burnett Street, North Hobart. Identified as 281a Elizabeth Street, North Hobart in the PESA (GES 2017)
INVESTIGATION AREA 281a Elizabeth Street which has a second entrance at 66 Burnett Street. Limits approximately defined by borehole extent
SITE ELEVATION & GRADIENT 41.7 to 46.2 m Australian Height Datum (AHD) over 110m with a 2.5º or 4.5% increase to the northern end of the site.
SITE SURFACING The surface of the site is 95 % concrete and 5% gravel fill.
TITLE REFERENCES The investigation area includes the following title reference for 66 Burnett Street, North Hobart: CT 26099/4
SITE OWNER Hobart Properties & Securities Pty Ltd
PREVIOUS LANDUSE Residential Properties
SITE SURROUNDING LAND ZONING Tasmanian Interim Planning Scheme 2015 The majority of the site is zone ‘23.0 Commercial’ Drive way from Elizabeth Street is Zoned ‘15.0 Urban Mixed Use’
SITE LAND USE Commercial Land Use for the maintenance and repairs of a range of cars and trucks
SURROUNDING LAND USE: NE: Commercial Properties; SE to NW: Mixed Urban use – Café’s and Restaurants; N Light Industrial premises.

1.2 Background

GES completed a *Preliminary Environmental Site Assessment* (PESA) in July 2017 (GES 2017a) and an *Environmental Site Assessment* (ESA) in December 2017 (GES, 2017b) at the site which included a Tier 1 Health Risk Assessment (HRA) to assess any potential soil contamination risks which may arise due to proposed site building development works.

The ESA assessed the site based on its sensitive land use and concluded that the proposed works are acceptable and will not adversely impact upon human health or the environment provisional to implementation of measures identified within this CMP.

The following recommendations were presented in the original ESA document:

When redevelopment work commences for the site, GES recommends that the following actions should be undertaken:

- A Contamination Management Plan will be required
- Further Environmental Site Assessment which should include but not be limited to;
    - All four underground storage tanks (confirmed and suspected) should be formally decommissioned and tank pits should be validated.
    - The interceptor trap should be removed, and remaining soil should be validated; and
    - Further investigations will be required under the footprint of the buildings, at a minimum in Area C for contamination.
- All excavated soil at the site should be stockpiled and assessed against IB105 guidelines
- GES recommends separating stockpiles; and keeping the shallow material 0.0-0.4 m bgs separate. All remaining material is likely to be classified as Level 1 clean fill (with proof of analytical results).

1.3 Objectives

The purpose of this CMP is to identify the site hazards associated with residual contamination from soil, minimise risks to site workers and the environment, and advise of safety measures to implement during any future excavation or construction works that may occur at the site.

The CMP includes information and guidance in relation to:

- Identifying measures to minimise human health hazards and potential environmental impacts during site excavation works.
- Outlining procedures to be followed relating to excavation during construction or maintenance works.
- Providing information relating to management of exposed soil surfaces and off-site soil disposal.

1.4 Implementing the Contamination Management Plan

It will be the responsibility of the owner(s) of the site to implement of this CMP. The owner(s) of the site may at times expressly delegate responsibility for site management as appropriate. The site owner(s) retains overall responsibility for implementation of this CMP and any modifications required should site conditions change.

The owner(s) of the site are responsible for the distribution of this CMP to any building or development contractors working on site and these contractors must also comply with the requirements of this CMP.

To manage potential health risks, the advice stipulated in this CMP should be followed by all persons involved in works or other activities at the site that may result in the disturbance and/or excavation of soil within the ESA investigation areas.

Tank	Product	Volume (gln)	Commissioned	Decomissioned	Comments
T1	Distillate	1000	approx 1957	unknown	Covered by new building in 1977
T2	Petrol	2000	10/05/1965	unknown	Covered by new building in 1977
T3	Petrol	3000	24/01/1966	unknown	
T4	Distillate	2000	24/01/1966	unknown	

Figure 2 Site Plan

2 Soil Contamination Assessment

Given that petroleum hydrocarbons are a contaminate of concern at the site, Health Screening Level (HSL) limits were applicable to the assessment in addition to Health Investigation levels (HIL's) for heavy metals.

There was no observed tiles or asbestos sheeting fragments within the soils which may have warranted the need to collect samples for asbestos analysis.

2.1 Assessment Criteria

The reported soil analytical results were compared to the following relevant investigation guidelines suitable for assessment of soil contamination:

NEPM (2013) Schedule B1, Guideline on Investigation Levels for Soil.

- Health Screening Levels (HSL's) –setting D for current commercial use and for mixed use with ground floor parking/commercial space and setting B residential for a small area of the proposed development;
- Health Investigation Limit (HIL B) – residential with full paving;
- Environmental Investigation Levels (EIL's) - have been developed for selected metal and organic substances in an urban residential and public open space setting based on the following soil properties:
    - Fine grained soil class
    - Soil pH of 6.0
    - Cation Exchange Capacity of 25 cmol/kg
    - 30% Clay

EPA Tasmania (2010) Information Bulletin 105 (IB105) – Classification and Management of Contaminated Soil for Disposal, November 2010.

2.2 Soil Assessment Results

2.2.1 Health Investigation Levels

Soil samples were collected during borehole drilling works across the site. A total of 20 primary samples were collected from locations across the site and submitted to a National Association of Testing Authorities (NATA) registered laboratory for analysis of identified contaminants of potential concern (COPC) which included the following.

Soil analytical results are compared against the HIL's.

- There was one exceedance of HIL B guidelines for hydrocarbons for High Density Residential in BH4 0.5 of TPH $C^{16} – C^{34}$. BH4 is located near the historical interceptor trap.
- Several samples exceed HIL B guidelines for heavy metals and B(a)P for High Density Residential use and one sample exceeded HIL D

Mitigation measures relating to the identified risks are detailed in Section 3 & 4.

2.2.2 Health Screening Levels

Soil hydrocarbon analytical results were compared against CRC CARE HSL guidelines for assessing dermal contact hazard as per guidelines for intrusive maintenance workers and HSL B guidelines for residential use.

None of the soil samples collected at the site exceeds the hydrocarbon HSL's for assessing vapour intrusion risk to shallow intrusive maintenance workers or site inhabitants.

2.2.3 IB105 Investigation Limits for Soil Disposal

The soil samples have been compared against IB105 guidelines for soil disposal. Elevated lead & TPH, and B(a)P concentrations on site in a number of samples show level 2 & 3 contaminated material (Table 2). The bulk of the impact occurs in shallow fill material at the site, and care should be taken to excavate the top 0.3 m from the site and stockpiling separately from the remaining deep excavations. This is likely to bring the bulk excavations below 0.3 m BGS to Level 1. GES therefore recommends that all soil excavated at the site is sorted, stockpiled, and transported to a licensed storage and handling facility for managing contaminated soil as required.

The borehole logs in appendix 1 highlight the depths of contaminates detected and the material consistency, type and colour to aid identification on site.

Information Bulletin 105 Classification and Management of Contaminated Soil For Disposal X - Below Proposed Finished Floor Level		EG005T: Total Metals by ICP-AES											EG035T	EP075(SIM)A		EP080: BTEX				EP080/071: TRH	
		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Benzo(a)pyrene	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes	C6 - C9 Fraction	C10 - C36 Fraction (sum)
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		5	10	1	1	2	2	5	5	5	2	5	0.1	0.5	0.5	0.2	0.5	0.5	0.5	10	50
Investigation Level Selected																					
IB105 Level 1		20	300	2	3	50	100	100	300	500	60	200	1	0.08	20	1	1	3	14	65	1000
IB105 Level 2		200	3000	40	40	500	200	2000	1200	5000	600	14000	30	2	40	5	100	100	180	650	5000
IB105 Level 3		750	30000	400	400	5000	1000	7500	3000	25000	3000	50000	110	20	200	50	1000	1080	1800	1000	10000
IB105 Level 4		>750	>30000	>400	>400	>5000	>1000	>7500	>3000	>25000	>3000	>50000	>110	>20	>200	>50	>1000	>1080	>1800	>1000	>10000
17/06/2017	BH1 0.10m	<5	80	<1	18	30	13	172	362	275	28	390	0.6	0.8	7.1	<0.2	<0.5	<0.5	<0.5	<10	300
17/06/2017	BH1 0.9m	<5	50	<1	<1	7	4	16	26	148	6	17	0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH2 0.1m	<5	140	<1	<1	23	6	53	364	176	22	329	0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH2 0.9m	<5	80	<1	<1	5	6	20	359	256	6	26	0.9	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH3 0.5m	<5	40	<1	<1	4	21	83	9	262	9	36	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH3 2.3m	<5	170	1	<1	8	19	16	11	125	20	65	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH4 0.5m	17	400	1	<1	10	13	116	4570	512	16	473	1	2.2	22.3	<0.2	<0.5	<0.5	<0.5	132	9550
17/06/2017	BH4 1.0m	<5	120	1	<1	13	6	17	16	80	8	25	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH5 0.1m X	<5	80	<1	1	16	8	69	208	217	18	184	0.5	3.6	44.2	<0.2	<0.5	<0.5	<0.5	<10	770
17/06/2017	BH5 3.0m	18	10	<1	<1	23	4	8	13	554	6	24	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH6 0.2m X	8	900	<1	2	20	11	122	1430	248	20	941	1.5	3.5	33.3	<0.2	<0.5	<0.5	<0.5	<10	540
17/06/2017	BH6 2.0m	6	30	<1	<1	13	8	8	11	1680	11	23	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH6 3.0m	16	<10	<1	<1	10	<2	8	12	70	4	33	0.3	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH7 0.2m X	8	820	<1	1	16	10	101	1140	213	18	614	2.1	3.8	37.8	<0.2	<0.5	<0.5	<0.5	<10	310
17/06/2017	BH7 1.0m X	<5	1090	5	<1	15	67	28	16	198	50	47	0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH7 3.0m	<5	10	<1	<1	6	3	<5	5	121	3	13	1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH8 1.0m X	<5	20	<1	<1	14	3	<5	<5	37	7	18	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH8 0.5m X	<5	10	<1	<1	13	2	<5	<5	51	3	28	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH9 0.2m X	10	500	1	<1	17	17	76	852	366	16	588	1.6	2.3	23.7	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH9 3.0m	<5	30	<1	<1	8	4	5	<5	55	3	13	0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH10 0.1m X	<5	30	<1	<1	5	15	90	60	279	11	99	0.1	1	9.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH10 1.0m X	6	110	1	<1	11	32	19	9	1490	28	23	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH11 0.1m X	7	50	1	<1	11	32	27	17	2260	30	79	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	380
12/12/2017	BH12 0.5m X	5	220	1	<1	18	13	32	10	116	14	28	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH12 1.0m	8	660	4	<1	16	368	39	11	1690	72	45	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH13 0.4-0.5m X	<5	20	1	<1	7	6	16	<5	268	13	53	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH14 0.3-0.4m X	35	180	<1	<10	20	12	80	314	825	22	728	0.8	5.2	42.1	<0.2	<0.5	<0.5	<0.5	<10	420
12/12/2017	BH14 1.0-1.1m	<5	480	1	<1	14	14	17	11	54	13	14	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH15 0.5-0.6m	<5	10	<1	<1	11	13	57	<5	350	15	34	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 1.0-1.1m X	<5	230	<4	<2	<4	33	67	<5	1050	100	13	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 2.0-2.1m X	9	90	1	<1	4	13	46	8	760	18	48	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 2.9-3.0m	<5	<10	<1	<1	6	<2	<5	<5	10	3	13	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH17 0.5-0.6m X	<5	50	1	<1	17	16	24	12	115	16	32	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH17 1.9-2.0m X	<5	220	<1	<1	16	45	32	6	2410	38	75	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH18 0.2-0.3m X	<5	130	1	<1	10	14	72	144	167	14	104	1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH18 0.9-1.0m X	<5	180	<5	<3	13	17	15	<5	1100	29	30	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH19 0.2-0.3m X	<5	220	<1	<1	21	9	44	341	208	12	227	1.5	3.6	35.1	<0.2	<0.5	<0.5	<0.5	<10	610
12/12/2017	BH19 0.9-1.0m X	<5	2770	3	<1	11	37	13	14	255	19	17	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH20 0.5m	<5	40	<1	<1	12	3	10	9	59	4	12	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH21 0.5m	6	170	<1	<1	12	11	49	238	301	15	157	0.8	2.8	24	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH10 0.1m	<5	30	<1	<1	5	15	90	60	279	11	99	0.1	1	9.5	<0.2	<0.5	<0.5	<0.5	<10	<50
17/06/2017	BH10 1.0m	6	110	1	<1	11	32	19	9	1490	28	23	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 1.0-1.1m	<5	230	<4	<2	<4	33	67	<5	1050	100	13	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 2.0-2.1m	9	90	1	<1	4	13	46	8	760	18	48	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH16 2.9-3.0m	<5	<10	<1	<1	6	<2	<5	<5	10	3	13	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH17 0.5-0.6m	<5	50	1	<1	17	16	24	12	115	16	32	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50
12/12/2017	BH17 1.9-2.0m	<5	220	<1	<1	16	45	32	6	2410	38	75	<0.1	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<10	<50

Table 2 – All soil results compared to IB105 for disposal

3 Minimization of Potential Environmental Impacts

Potential health exposure risks during any excavations or subsurface works may be associated with:

- Soil excavation and management
- Movement of soil
- Stormwater management and sedimentation

To minimise potential environmental impacts, all work must be conducted in accordance with the guidance set out in this plan as well as any relevant EPA Tasmania guidelines. A site specific soil and water management plan has also been prepared by the building designer for the site.

3.1 Soil Excavation and Management

The following procedures must be carried out prior to, during and following the completion of any soil excavation and/or surface cover disturbance at the site.

3.1.1 Prior to Commencement

- Contractors and workers must be made aware of the potential soil contamination and be familiar with the requirements of the CMP.
- Contractors must prepare a site-specific Health and Safety Plan covering their workers at the site for any anticipated risks.

3.1.2 During Excavation Works – Stockpile Management

Soil from the site must be managed so as not to cause environmental harm in accordance with the Environmental Management and Pollution Control (Waste Management) Regulations, 2000 and the Environmental Management and Pollution Control Act (EMPCA, 1994). Harm can be caused from contaminated soils leaching further underground, leaving the site through wind (as dust) or carried off site with rain (as runoff stormwater).

It will be necessary for the soil to be classified for disposal or reuse in accordance with *IB 105* (EPA Tasmania, 2010). The initial soil laboratory results (Table 2) indicate that the material is Level 2 to 3 material and suitable for remediation and disposal at a licensed facility;

To prevent contaminated soil leaving the site (by wind or water), excavated soil, if being stored for greater than 12 hours, must be stockpiled in or on an impervious surface or in a water tight skip bin and covered with an impermeable layer (such as PVC plastic 2mm thick).

Alternately if soil is to be removed off site to an approved storage and handling facility, it should only be done by a licensed contractor.

Site Operator should consider separating the most contaminated soil (0.0 to 0.3m bgs from across the entire site plus the soil around the historical interceptor trap) during excavation works to limit the cost of soil disposal and/or remediation required.

3.1.3 Dust Control

Generation of dust can spread contaminated soil or create a nuisance. Measures that can be undertaken to assist in minimising the generation of dust include:

- Minimise movement of equipment on the site.
- Minimise excavation and movement of soils.
- Use a water spray only as required to dampen work areas if excess dust is generated.
- Use a water spray only as required to dampen soil prior to and during excavation if excess dust is generated.
- Avoid soil excavations that create dust on windy days.

- Keep soil stockpiles covered at all times possible, with an impermeable membrane (eg. plastic sheeting) to minimise generation of dust and to limit runoff of sediment.
- Avoid extended stockpiling of soil.

3.2 Stormwater Management and Sediment Control

Measures to minimise the potential for contamination of stormwater and migration of contaminants include:

- Install drainage and/or grade soil surfaces to minimise pooling of water on exposed soils. Exposed surfaces should ideally be covered with clean aggregate to minimize trafficking of mud, vehicle washdown procedures, reduce soil erosion, and general site disturbance.
- Place sediment control devices around stormwater drains and stockpiles as required.
- Ensure vehicles and equipment are free from excess soil when leaving the site, to avoid tracking soil off-site.
- Establish an equipment wash down area if necessary.
- Keep stockpiles covered and sealed at all times possible
- Avoid extended stockpiling of soil.
- Clean up any soil spilt on roads adjoining the site.
- Avoid conducting vehicle or machinery maintenance on-site.
- Ensure any fuel, oil or other chemicals are stored safely and securely and are prevented from leaking.
- Repair or remove any leaking containers or machinery from the site.
- Clean up any spilt fuel, oil or other chemicals as soon as possible.
- Check sediment control measures regularly (at least daily) and clean and maintain as necessary.
- Inspect sediment control measures more frequently during rain periods, to check they are adequate for site conditions.

4 Minimization of Potential Health Risks

Work procedures conducted on the site must be in accordance with relevant Occupational Health and Safety (OH&S) Regulations. It is the responsibility of the principal contractor that site workers are made aware of the OH&S issues at the site.

Engaged companies/contractors must prepare a site-specific Health and Safety Plan covering their workers at the site.

4.1 Exposure Routes

Potential hazards for site workers associated with the presence of contaminants in isolated areas of soil which may be encountered during excavation or construction works must be considered as part of the overall Health and Safety Plan for the site, including:

- Ingestion of contaminated soil.
- Inhalation of dust or vapours.
- Dermal (skin) contact.

4.2 Control Measures

Personnel working at or visiting the site during any construction (including demolition and excavation) works must be provided with an induction briefing, based on the example Site Induction Record provided in Appendix 2. This induction record may be incorporated into the general site induction procedure. The principal contractor may delegate responsibility for the induction briefing to their environmental consultant.

Measures that must be undertaken to manage exposure of site workers to contaminants include:

- Avoid handling of potentially contaminated soil and/or water.
- Wash hands before eating, drinking or smoking.
- Avoid activities that may introduce soil and/or water to the mouth, such as nail biting.
- Remove soiled clothing and footwear before entering a designated clean area and before leaving the site.
- Use personal protective equipment (PPE) as required. In addition to hard hats, safety boots, safety glasses and hearing protection, this equipment may include:
    - Long sleeved shirt and long trousers
    - Dust masks

The principal contractor must ensure that site workers and visitors are provided with:

- Site safety induction briefing.
- Adequate hand washing facilities.
- A designated clean area for storage and consumption of food and drink.

All excavations in the area of underground fuel infrastructure must be screened with a LEL meter and/or PID to screen the area for explosive and potentially harmful hydrocarbon vapours. No hot works are permitted on site without clearance by a suitability qualified person that the area or infrastructure is free of vapours.

LIMITATIONS STATEMENT

This Management Plan has been prepared in accordance with the scope of services between Geo-Environmental Solutions Pty. Ltd. (GES) and Hobart Properties & Securities ('the Client'). To the best of GES's knowledge, the information presented herein represents the Client's requirements at the time of printing of the Report. However, the passage of time, manifestation of latent conditions or impacts of future events may result in findings differing from that described in this Report. In preparing this Report, GES has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations referenced herein. Except as otherwise stated in this Report, GES has not verified the accuracy or completeness of such data, surveys, analyses, designs, plans and other information.

The scope of this study does not allow for the review of every possible soil and groundwater contaminant over the whole area of the site. Soil samples collected from the investigation area are assumed to be representative of the areas from where they were collected and indicative of the contamination status of the site. The conclusions described within this report are based on these samples, the results of their analysis and an assessment of their contamination status.

This report does not purport to provide legal advice. Readers of the report should engage professional legal practitioners for this purpose as required.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose by third party.

REFERENCES

Key regulations, legislation and policies considered most applicable to soil and groundwater management during any intrusive site works (excavation, construction or maintenance) include:

Australian Standard: AS 4482.1-2005 Guide to the investigation and sampling of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds

Australian Standard: AS 4482.2-1999 Guide to the sampling and investigation of potentially contaminated soil. Part 2: Volatile substances

CRC CARE 2013, Petroleum Petroleum Vapour Intrusion assessment: Australian guidance, CRC CARE Technical Report no. 23, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

DPIWE (1997) – State Policy on Water Quality Management, 1997.

Environmental Management and Pollution Control (Waste Management) Regulations 2000.

Environmental Management and Pollution Control Act (1994).

Friebel, E & Nadebaum, 2011, 'Health screening levels for petroleum hydrocarbons in soil and groundwater. Part 1: Technical development document', CRC for Contamination Assessment and Remediation of the Environment, CRC CARE Technical Report no. 10, Adelaide.

Geo-Environmental Solutions (2017a). Preliminary Environmental Site Assessment. 281a Elizabeth Street, North Hobart. Geo Environmental Solutions, 86 Queen Street, Sandy Bay, 7005. July 2017.

Geo-Environmental Solutions (2017b). Environmental Site Assessment. 66 Burnett Street, North Hobart. Geo Environmental Solutions, 29 Kirskway Place, Battery Point, 7004. December 2017.

Information Bulletin 105: Classification and Management of Contaminated Soil for Disposal (November 2010), EPA Tasmania.

NEPM, 1999. Guideline on Investigation Levels for Soil and Groundwater, Schedule B (1), National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council, 1999. Measures as amended, taking into account amendments up to National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)

APPENDIX 1 Borehole Logs

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		Log of BH1
CLIENT: Hobart Properties & Securities	EASTING: 526000	GDA94
	NORTHING: 5252993	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 42.2	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1	
EQUIPMENT/METHOD: Direct Push Core	LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Core	DATE: 17/06/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL - Sandy GRAVEL: dark brown, slighty moist, medium dense to dense	M	GW	BH1 0.10m		Cadmium 2; Copper 2; Lead 2; Zinc 2; Benzo(a)pyrene 2		42.1
0.1–0.3	FILL - GRAVEL & assorted debris, brown/grey, slightly moist, dense, many red brick fragments	SM	GW					42.0, 41.9
0.3–0.6	FILL - Mixed Clayey SAND & Sandy CLAY: brown/grey, moist, stiff, low plasticity overall (Clay fraction has medium plasticity)	M	CL					41.8, 41.7, 41.6
0.6–1.0	Sandy CLAY: grey/brown, moist, stiff, medium plasticity, common fine charcoal fragment, some shell grit. No Refusal	M	CL	BH1 0.9m				41.5, 41.4, 41.3, 41.2

IB105 Analyte IL Exceedances columns: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✗ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH2**
CLIENT: Hobart Properties & Securities	EASTING: 525998	**GDA94**
	NORTHING: 5252990	**GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 42.1	**m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1	
EQUIPMENT/METHOD: Direct Push Core; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Core; DATE: 17/06/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL - Sandy GRAVEL: dark brown, slighty moist, medium dense to dense	M	GW	BH2 0.1m		Lead: 2; Zinc: 2		42.1–42.0
0.1–0.3	FILL - GRAVEL & assorted debris, brown/grey, slightly moist, dense, many red brick fragments	SM	GW					42.0–41.8
0.3–0.6	FILL - Mixed Clayey SAND & Sandy CLAY: brown/grey, moist, stiff, low plasticity overall (Clay fraction has medium plasticity)	M	CL					41.8–41.5
0.6–1.0	Sandy CLAY: grey/brown, moist, stiff, medium plasticity, common fine charcoal fragment, some shell grit. No Refusal	M	CL	BH2 0.9m		Lead: 2		41.5–41.1

IB105 Analyte IL Exceedances columns: Arsenic, Barium, Berylium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA	Log of BH3
CLIENT: Hobart Properties & Securities	EASTING: 525984 GDA94
	NORTHING: 5252989 GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 41.5 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 3
EQUIPMENT/METHOD: Direct Push Core; LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Core; DATE: 17/06/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	ELEVATION (metres)
0.0	FILL - Concrete		P			41.5
0.2	FILL - Clayey GRAVEL: grey/brown, slightly moist, medium dense	SM	GC	BH3 0.5m		41.3
0.6	Silty CLAY: dark grey-brown, moist, stiff, high plasticity	M	CH			40.9
1.0	Silty CLAY: pale brown, moist, stiff, high plasticity - plasticity decreasing with depth	M	CH	BH3 2.3m		40.5
2.3	Silty GRAVEL: yellow/pale brown, dry, very dense, weathered silt/mudstone. No Refusal	D	GM			39.2

IB105 Analyte IL Exceedances: Arsenic, Barium, Berylium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

MONITORING WELL

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT:	Gorringe ESA
CLIENT:	Hobart Properties & Securities
Log of BH4	
EASTING:	525982 GDA94
NORTHING:	5253010 GDA94
BORING LOCATION:	66 Burnett Street, North Hobart
ELEVATION AND DATUM:	42.8 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	2
EQUIPMENT/METHOD:	Direct Push Core
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Core
DATE:	17/06/2017

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.15	FILL - Concrete		P				42.8–42.65
0.15–0.9	FILL - Clayey GRAVEL: grey/brown, slightly moist, medium dense, many red brick fragments	SM	GC	BH4 0.5m			42.65–41.9
0.9–1.4	Silty CLAY: dark grey-brown, moist, firm to stiff, high plasticity	M	CH	BH4 1.0m			41.9–41.4
1.4–2.0	Silty CLAY: pale brown, moist, stiff, high plasticity. No Refusal	M	CH				41.4–40.8

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Chromium VI	PCB's	Aldrin+Dieldrin	DDT etc	Phenol	Benzo(a)pyrene	PAH Sum	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPH C6 - C9	TPH C10 - C36	To Be Excavated
BH4 0.5m		2					2	4	2		2	2						3	2					2	3	
BH4 1.0m																										

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA

CLIENT: Hobart Properties & Securities

Log of BH5

EASTING: 525979 GDA94

NORTHING: 5253010 GDA94

BORING LOCATION: 66 Burnett Street, North Hobart

ELEVATION AND DATUM: 42.9 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions

TOTAL DEPTH (m): 3

EQUIPMENT/METHOD: Direct Push Core

LOGGED BY: A. Plummer

NATURAL (m):

WATER TABLE (m):

SAMPLING: Core

DATE: 17/06/2017

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - Sandy GRAVEL: brown/grey, slighty moist, medium dense to dense, some small brick fragments	M	GW	BH5 0.1m		Benzo(a)pyrene: 3; PAH Sum: 3		42.8
0.2–0.6	FILL - Gravelly CLAY: dark brown/black, moist, stiff, medium plasticity	M	CL					42.7–42.3
0.6–1.4	Silty CLAY: pale brown, moist, stiff, high plasticity	M	CH					42.3–41.5
1.4–2.5	Silty CLAY: red/orange, moist, stiff, high plasticity	M	CH					41.5–40.4
2.5–3.0	Silty Sandy CLAY: red/orange/yellow, moist, very stiff, medium plasticity. No Refusal	M	CL	BH5 3.0m		Manganese: 2		40.4–39.9

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH6**
CLIENT: Hobart Properties & Securities	EASTING: 525966	**GDA94**
	NORTHING: 5253047	**GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 44.3	**m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 3	
EQUIPMENT/METHOD: Direct Push Core	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Core	DATE: 17/06/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	ELEVATION (metres)
0.0–0.1	FILL - Concrete		P			44.3–44.2
0.15–0.3	FILL - Clayey SAND: dark brown/black, moist, medium dense	M	SC	BH6 0.2m		
0.3–0.6	FILL - Silty Sandy CLAY: dark brown/black, moist, stiff, medium plasticity, 10% fine gravel & brick fragments	M	CL			
0.6–1.0	Silty CLAY: brown, moist, firm, high plasticity	M	CH			
1.0–3.0	Silty CLAY: mottled pale brown/grey/red, moist, stiff, high plasticity, lense of fine Quartz gravel from 1.95-2.0m containing f	M	CH	BH6 2.0m; BH6 3.0m		43.3–41.3

Approximate groundfloor level marked at 1.5 m depth (42.8 m elevation).

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Berylium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Chromium VI	PCB's	Aldrin+Dieldrin	DDT etc	Phenol	Benzo(a)pyrene	PAH Sum	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPH C6 - C9	TPH C10 - C36	To Be Excavated
BH6 0.2m		2					2	3			2	2						3	2							
BH6 2.0m									2																	
BH6 3.0m																										

MONITORING WELL

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH7**	
CLIENT: Hobart Properties & Securities		EASTING: 525973	**GDA94**
		NORTHING: 5253042	**GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart		ELEVATION AND DATUM: 44.4	**m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 3	
EQUIPMENT/METHOD: Direct Push Core	LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Core	DATE: 17/06/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0–0.15	FILL - Concrete		P				44.4–44.25
0.15–0.3	FILL - Clayey SAND: dark brown/black, moist, medium dense	M	SC	BH7 0.2m			44.25–44.1
0.3–0.6	FILL - Silty Sandy CLAY: dark brown/black, moist, stiff, medium plasticity, 10% fine gravel & brick fragments	M	CL				44.1–43.8
0.6–1.5	Silty CLAY: brown, moist, stiff, high plasticity	M	CH	BH7 1.0m			43.8–42.9
1.5–3.0	Silty CLAY: mottled pale brown/grey/red, moist, stiff, high plasticity. No Refusal	M	CH	BH7 3.0m			42.9–41.4

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Berylium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Chromium VI	PCB's	Aldrin+Dieldrin	DDT etc	Phenol	Benzo(a)pyrene	PAH Sum	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPH C6 - C9	TPH C10 - C36	To Be Excavated
BH7 0.2m		2					2	2			2	2						3	2							
BH7 1.0m		2	2																							
BH7 3.0m												2														

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		Log of BH8
CLIENT: Hobart Properties & Securities	EASTING: 525969	GDA94
	NORTHING: 5253040	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 44.6	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 3	
EQUIPMENT/METHOD: Direct Push Core; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Core; DATE: 17/06/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	FILL - Concrete		P					
0.2	FILL - SAND some clay (Packing/Fat Sand), orange/grey-brown, moist, medium dense	M	SC	BH8 0.5m; BH8 1.0m				44.4
1.7	Silty CLAY: mottled pale brown/grey/red, moist, stiff, high plasticity. No Refusal	M	CH					42.9
3.0								41.6

IB105 analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; Level 2; Level 3; Level 4; SAMPLE IN EXCAVATION; ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT:	Gorringe ESA
CLIENT:	Hobart Properties & Securities
BORING LOCATION:	66 Burnett Street, North Hobart
DRILLING CONTRACTOR:	Geo-Environmental Solutions
EQUIPMENT/METHOD:	Direct Push Core
LOGGED BY:	A. Plummer
SAMPLING:	Core
DATE:	17/06/2017

Log of BH9

EASTING:	525965	GDA94
NORTHING:	5253042	GDA94
ELEVATION AND DATUM:	44.6	m AHD
TOTAL DEPTH (m):	3	
NATURAL (m):		
WATER TABLE (m):		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	FILL - Concrete		P	BH9 0.2m		Arsenic 2; Copper 2; Nickel 2; Zinc 2; Benzo(a)pyrene 3; PAH Sum 2		44.6
0.2	FILL - Clayey SAND: dark brown/black, moist, medium dense	M	SC					44.4
0.5	Silty CLAY: brown, moist, stiff, high plasticity	M	CH					44.1
1.0	Silty Sandy CLAY: pale brown, moist, very stiff, medium plasticity, 20% fine to coarse gravel	M	CL					43.6
2.1	Silty CLAY: mottled pale brown/grey/red, moist, stiff, high plasticity	M	CH					42.5
2.5	FILL - SAND some clay (Packing/Fat Sand), orange/grey-brown, moist, medium dense. Side wall of Tank Pit has been scalloped out	M	SC					42.1
2.8	Silty CLAY: mottled pale brown/grey/red, moist, stiff, high plasticity. No Refusal	M	CH	BH9 3.0m				41.8

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Approximate groundfloor level: 1.8 m depth (42.8 m elevation)

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH10**
CLIENT: Hobart Properties & Securities	EASTING: 525970	**GDA94**
	NORTHING: 5253045	**GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 45.5	**m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1	
EQUIPMENT/METHOD: Direct Push Core; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Core; DATE: 17/06/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - GRAVEL: brown/grey, slightly moist, dense	SM	GW	BH10 0.1m		Benzo(a)pyrene: 2		45.5–45.3
0.2–1.0	Sandy Silty CLAY: brown, moist, very stiff, medium plasticity	M	CL	BH10 1.0m		Manganese: 2		45.3–44.5

IB105 Analyte IL Exceedances columns: Arsenic, Barium, Berylium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA

CLIENT: Hobart Properties & Securities

Log of BH11

EASTING:	525967	GDA94
NORTHING:	5253067	GDA94

BORING LOCATION: 66 Burnett Street, North Hobart

ELEVATION AND DATUM: 43.9 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions

TOTAL DEPTH (m): 0.15

EQUIPMENT/METHOD: Direct Push Core

LOGGED BY: A. Plummer

NATURAL (m):

WATER TABLE (m):

SAMPLING: Core

DATE: 17/06/2017

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	FILL - Concrete		P	BH11 0.1m		Manganese: 2		
0.1	Silty CLAY: yellow/orange/brown, moist, stiff, medium to high plasticity. Sudden Refusal	M	CH					43.8

IB105 Analyte IL Exceedances columns: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH12**
CLIENT: Hobart Properties & Securities	EASTING: 525994	**GDA94**
	NORTHING: 5253042	**GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 43.7	**m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.2	
EQUIPMENT/METHOD: Geoprobe 540UD; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 11/12/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - Concrete Slab		P					43.7–43.5
0.2–0.3	FILL - CLAYEY GRAVEL: brown/grey, slightly moist, dense	SM	GC					43.5–43.4
0.3–0.5	Sandy SILTY CLAY: brown/grey/orange, moist, stiff, medium plasticity	M	CI	BH12 0.5m				43.4–43.2
0.5–1.2	SILTY CLAY: brown/grey, moist, stiff, high plasticity. End	M	CH	BH12 1.0m		2 2 3 2 2		43.2–42.5

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA

CLIENT: Hobart Properties & Securities

Log of BH13

EASTING:	526000	GDA94
NORTHING:	5253030	GDA94

BORING LOCATION: 66 Burnett Street, North Hobart

ELEVATION AND DATUM: 43.3 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions

TOTAL DEPTH (m): 0.55

EQUIPMENT/METHOD: Geoprobe 540UD

LOGGED BY: A. Plummer

NATURAL (m):

WATER TABLE (m):

SAMPLING: Direct Push

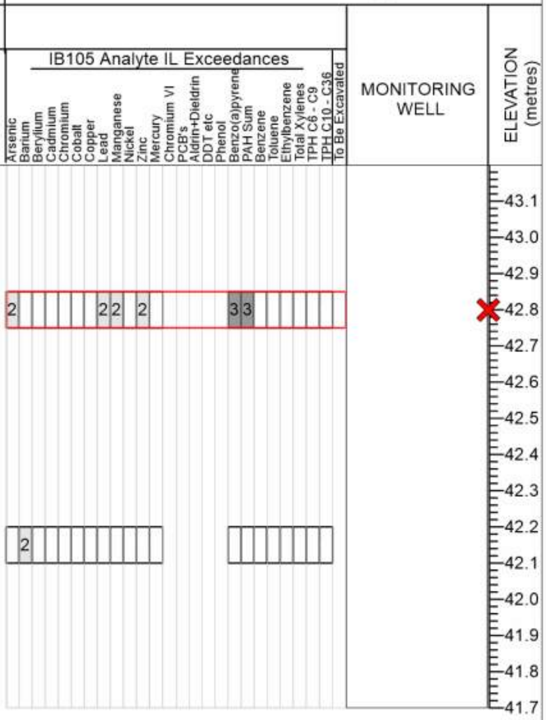
DATE: 11/12/2017

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances (Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated)	MONITORING WELL	ELEVATION (metres)
0.0–0.25	FILL - Concrete Slab		P					43.2, 43.1
0.25–0.55	Extremely Weathered SILTSTONE (Clayey SILT): orange/trace pale purple mottles, dry to slightly moist, dense, very low rock stre	SM	ML	BH13 0.4-0.5m				43.0, 42.9, 42.8

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS	PROJECT: Gorringe ESA	Log of BH14	
	CLIENT: Hobart Properties & Securities	EASTING: 525987	GDA94
		NORTHING: 5253023	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart		ELEVATION AND DATUM: 43.2	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions		TOTAL DEPTH (m): 1.5	
EQUIPMENT/METHOD: Geoprobe 540UD	LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push	DATE: 11/12/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)
0.0	FILL - Concrete Slab		P		
0.3	FILL - GRAVEL: blue/grey, slightly moist, loose, medium to coarse (20-40mm) clean angular Dolerite gravel	SM	GW	BH14 0.3-0.4m	
0.4	FILL - SANDY CLAY: dark brown, moist, stiff, medium plasticity, few fine gravels	M	CI		
0.6	Sandy SILTY CLAY: mottled dark brown/orange, moist, stiff, medium plasticity	M	CI		
0.9	SILTY CLAY: olive-brown, moist, firm to stiff, high plasticity. END	M	CH	BH14 1.0-1.1m	



Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT:	Gorringe ESA
CLIENT:	Hobart Properties & Securities
	Log of BH15
EASTING:	525995 **GDA94**
NORTHING:	5252997 **GDA94**
BORING LOCATION:	66 Burnett Street, North Hobart
ELEVATION AND DATUM:	42.25 **m AHD**
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	0.6
EQUIPMENT/METHOD:	Geoprobe 540UD
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	11/12/2017

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - Concrete Slab		P					42.2 – 42.1
0.2–0.3	FILL - SAND: yellow-grey, slightly moist, loose		SW					42.0
0.3–0.6	FILL - CLAYEY GRAVEL: yellow-brown/grey, slightly moist, dense. Refusal	SM	GC	BH15 0.5-0.6m				41.9 – 41.7

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH16**
CLIENT: Hobart Properties & Securities	EASTING: 525979	**GDA94**
	NORTHING: 5253059	**GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 45	**m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 3.5	
EQUIPMENT/METHOD: Geoprobe 540UD	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 11/12/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	ELEVATION (metres)
0.0–0.2	FILL - Concrete Slab		P			45.0–44.8
0.2–0.3	FILL - GRAVEL (FCR): brown-grey, slightly moist, medium dense	SM	GW			44.8–44.7
0.3–0.5	FILL - GRAVELLY CLAY: dark grey-brown, moist, stiff, medium plasticity	M	CI			44.7–44.5
0.5–0.9	SILTY CLAY: pale olive-grey, moist, stiff, high plasticity	M	CH			44.5–44.1
0.9–1.6	Silty CLAYEY GRAVEL: pale yellow/grey, dry, dense	D	GC	BH16 1.0-1.1m		44.1–43.4
1.6–2.1	Silty GRAVELLY CLAY: orange/yellow, slightly moist, very stiff, low plasticity	SM	CL	BH16 2.0-2.1m		43.4–42.9
2.1–2.7	Silty CLAYEY GRAVEL: pale yellow/grey, dry, dense	D	GC			42.9–42.3
2.7–3.5	Gravelly SILTY CLAY: pale yellow-grey/red, moist, stiff, low to medium plasticity. END	M	CL	BH16 2.9-3.0m		42.3–41.5

Approximate groundfloor level: 2.2 m depth (42.8 m elevation).

IB105 Analyte IL Exceedances (Arsenic, Barium, Berylium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated)

Sample	Manganese	Nickel	Sample in excavation
BH16 1.0-1.1m	2	2	Yes
BH16 2.0-2.1m	2		Yes
BH16 2.9-3.0m			

MONITORING WELL

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✖ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA

CLIENT: Hobart Properties & Securities

Log of BH17

EASTING:	525973	GDA94
NORTHING:	5253069	GDA94
ELEVATION AND DATUM:	45.5	m AHD
TOTAL DEPTH (m):	2.7	
NATURAL (m):		WATER TABLE (m):

BORING LOCATION: 66 Burnett Street, North Hobart

DRILLING CONTRACTOR: Geo-Environmental Solutions

EQUIPMENT/METHOD: Geoprobe 540UD LOGGED BY: A. Plummer

SAMPLING: Direct Push DATE: 11/12/2017

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - SANDY GRAVEL: grey/brown, slightly moist, dense	SM	GW					45.5–45.3
0.2–0.5	FILL - Gravelly CLAYEY SAND: dark brown, slightly moist, medium dense	SM	SC					45.3–45.0
0.5–1.1	SILTY CLAY: olive brown/orange/trace red, moist, stiff, high plasticity	M	CH	BH17 0.5-0.6m				45.0–44.4
1.1–2.7	Extremely Weathered SANDSTONE/SILTSTONE (banded): yellow/orange, slightly moist, dense, lense of medium plasticity clay at 1.8	SM		BH17 1.9-2.0m		Nickel: 2		44.4–42.8

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✗ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH18**
CLIENT: Hobart Properties & Securities	EASTING: 525981	**GDA94**
	NORTHING: 5253041	**GDA94**
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 43.8	**m AHD**
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 2	
EQUIPMENT/METHOD: Geoprobe 540UD	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 11/12/2017	

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - Concrete Slab		P					43.8–43.6
0.2–0.6	SILTY CLAY: dark grey/black, moist, stiff, high plasticity	M	CH	BH18 0.2-0.3m		2 (Mercury)		43.6–43.2
0.6–1.0	Sandy SILTY CLAY: dark brown, moist, very stiff, high plasticity	M	CH	BH18 0.9-1.0m		2 (Manganese)		43.2–42.8
1.0–1.7	Silty GRAVELLY CLAY: pale yellow-grey, slightly moist, very stiff, low to meidum plasticity	M	CI					42.8–42.1
1.7–2.0	SILTY CLAY: orange/yellow/grey, moist, very stiff, medium plasticity, high silt content. END	M	CI					42.1–41.8

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES
GEO-ENVIRONMENTAL SOLUTIONS

Log of BH19

PROJECT:	Gorringe ESA
CLIENT:	Hobart Properties & Securities
EASTING:	525964 GDA94
NORTHING:	5253033 GDA94
BORING LOCATION:	66 Burnett Street, North Hobart
ELEVATION AND DATUM:	44.1 m AHD
DRILLING CONTRACTOR:	Geo-Environmental Solutions
TOTAL DEPTH (m):	2
EQUIPMENT/METHOD:	Geoprobe 540UD
LOGGED BY:	A. Plummer
NATURAL (m):	
WATER TABLE (m):	
SAMPLING:	Direct Push
DATE:	11/12/2017

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	MONITORING WELL	ELEVATION (metres)
0.0	FILL - Concrete Slab		P				44.1
0.2	FILL - GRAVEL: dark brown-grey, moist, dense	M	GW	BH19 0.2-0.3m			43.9
0.3	SILTY CLAY: olive-brown, moist, stiff, high plasticity	M	CH	BH19 0.9-1.0m			43.8
1.0	SILTY CLAY: orange/red, moist, stiff, high plasticity. END	M	CH				43.1

IB105 Analyte IL Exceedances

Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Chromium VI	PCB's	Aldrin+Dieldrin	DDT etc	Phenol	Benzo(a)pyrene	PAH Sum	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPH C6 - C9	TPH C10 - C36	To Be Excavated
BH19 0.2-0.3m								2			2	2						3	2							
BH19 0.9-1.0m		2	2																							

Depth scale: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9

Elevation scale: 44.0, 43.9, 43.8, 43.7, 43.6, 43.5, 43.4, 43.3, 43.2, 43.1, 43.0, 42.9, 42.8, 42.7, 42.6, 42.5, 42.4, 42.3, 42.2, 42.1

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		**Log of BH20**
CLIENT: Hobart Properties & Securities	EASTING: 525973	GDA94
	NORTHING: 5252982	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 42	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.1	
EQUIPMENT/METHOD: Geoprobe 540UD; LOGGED BY: A. Plummer	NATURAL (m):	WATER TABLE (m):
SAMPLING: Direct Push; DATE: 11/12/2017		

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.2	FILL - Concrete		P					42.0–41.8
0.2–0.6	FILL - Clayey GRAVEL: grey/brown, slightly moist, medium dense	SM	GC	BH20 0.5m				41.8–41.4
0.6–1.1	Silty CLAY: dark grey-brown, moist, stiff, high plasticity	M	CH					41.4–40.9

IB105 Analyte IL Exceedances: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Gorringe ESA		Log of BH21
CLIENT: Hobart Properties & Securities	EASTING: 526002	GDA94
	NORTHING: 5252990	GDA94
BORING LOCATION: 66 Burnett Street, North Hobart	ELEVATION AND DATUM: 42.7	m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions	TOTAL DEPTH (m): 1.1	
EQUIPMENT/METHOD: Geoprobe 540UD	LOGGED BY: A. Plummer	NATURAL (m): WATER TABLE (m):
SAMPLING: Direct Push	DATE: 11/12/2017	

DEPTH (metres)	MATERIAL DESCRIPTION	Moisture	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0–0.1	FILL - Sandy GRAVEL: dark brown, slighty moist, medium dense to dense	M	GW					42.7–42.6
0.1–0.3	FILL - GRAVEL & assorted debris, brown/grey, slightly moist, dense, many red brick fragments	SM	GW					42.6–42.4
0.3–0.6	FILL - Mixed Clayey SAND & Sandy CLAY: brown/grey, moist, stiff, low plasticity overall (Clay fraction has medium plasticity)	M	CL	BH21 0.5m		Benzo(a)pyrene: 3; PAH Sum: 2		42.4–42.1
0.6–1.1	Sandy CLAY: grey/brown, moist, stiff, medium plasticity, common fine charcoal fragment, some shell grit. No Refusal	M	CI					42.1–41.6

IB105 Analytes: Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Mercury, Chromium VI, PCB's, Aldrin+Dieldrin, DDT etc, Phenol, Benzo(a)pyrene, PAH Sum, Benzene, Toluene, Ethylbenzene, Total Xylenes, TPH C6 - C9, TPH C10 - C36, To Be Excavated

Tas EPA IB105 CLASSIFICATION: Level 1; 2 Level 2; 3 Level 3; 4 Level 4 | SAMPLE IN EXCAVATION | ✕ APPROXIMATE GROUNDFLOOR LEVEL

APPENDIX 2 – Site Induction Form

66 Burnett Street, North Hobart

I ……………………………………………….…. of ……………………………………..…… have been inducted to the site at 66 Burnett Street, Hobart Tasmania and have been informed of the CMP and its contents on …………………………………...(date)

I have been informed of the contents of the CMP and the responsibilities I have in ensuring that the CMP is adhered to relating to the following issues:

- Understanding the site contamination status
- Understanding the potential health impacts for site workers associated with site contamination
- Understanding the potential environmental impacts associated with site contamination
- Understanding how to reduce the risks to human health and the environment
- Maintaining documentation related to upholding the CMP

SOIL MANAGEMENT

- Excavation and stockpiling of soil at the site
- Movement of soil around the site
- Off-site disposal of soil
- Import of fill to the site
- Dust control

WATER MANAGEMENT

- • Stormwater management and sediment control

I HEREBY ACCEPT THESE RESPONSIBILITIES.

NAME: ……………………………………………COMPANY:……………..……….…….

SIGNED ……………………………..…………DATE ……………………..……

INDUCTED BY: …………………………………DATE …………………………

RECORD OF SITE INDUCTION AND APPRECIATION OF CMP

Please sign on once you have read the CMP

Date	Name/ Company	Signature

NVC

NOISE VIBRATION CONSULTING

Irene Inc.
49 Tasma Street
North Hobart, TAS 7000

3 July 2018

5702_03.docx

Attention: Jacqui Blowfield

66 BURNETT STREET – NOISE ASSESSMENT

A multi-residential development is proposed for a site at 66 Burnett Street, North Hobart, which is in proximity to a late-night music venue. Council has requested an assessment of the development against the Planning Scheme, specifically the attenuation code in relation to the proximity to said late-night music venue; The Republic Bar & Café (RBC). NVC has been engaged to complete this work, the results of which are detailed in this letter.

SITE DESCRIPTION

The site and surrounds are shown in Figure 1, below. The site (yellow in figure) is an internal lot at 66 Burnett Street, North Hobart. It is located in a Commercial zone, with an Urban Mixed-Use zone to the west and south. RBC (red in figure) is adjacent to the site, on the western boundary. Also to the west of the site (south of RBC) is a multi-residential building, with general business on the ground floor. Further residences are located to the south of the site, and commercial businesses to the east.

Figure 1: Site and surroundings

RBC is located in the Urban Mixed-Use zone, and comprises a restaurant, bar, function room, music room and outdoor courtyard. The main restaurant, bar and music room are inside the front of the venue, on the south-western end of the site. A large outdoor courtyard is located at the rear of the venue, comprising predominantly undercover seating, with a smoker's area adjacent to Burnett Street. The outdoor area is surrounded by stone wall approximately 3m high on the north-east and south-east sides, with a 1.5m stone wall and a large steel mesh gate on the north-west side (Burnett St.). Approximately two thirds of the courtyard is covered, however the lightweight plastic/canvas cover is deemed to offer negligible noise attenuation. The function room and an additional proposed outdoor seating area are located on the upper level. The building is predominantly brick construction, with several walls between the music room and the proposed development, offering effective screening from this noise.

The RBC is one of Hobart's main live music venues with gigs most nights of the week comprising local bands and touring acts. Its hours of operation are:

Monday/Tuesday:	1500 – 0000 hours
Wednesday/Thursday:	1200 – 0030 hours
Friday/Saturday:	1200 – 0300 hours
Sunday:	1200 – 0000 hours

Music and associated patron noise from the RBC is then likely to be a frequent occurrence and extend late into the night.

PROPOSED RESIDENTIAL DEVELOPMENT

The proposed development extends the full length of the site, and comprises car parking on the lower levels with residential units from levels 3 through 7. Figure 2 shows the view of the development from Burnett Street and indicates that all levels look at or into the RBC courtyard, with units at the north-western end closest to the RBC, Figure 3. Unit 4 on each level is the closest to the courtyard with 4U4 some 21m from the centre of it and with direct view into it.

The units facing the RBC have outdoor balconies, and on L3 there is an outdoor podium garden facing the RBC and some 45m from it. The balconies are enclosed using Elevate™ Series 411 Bi-fold windows ontop a Harkk Rect 86 Balustrade, and use 6mm laminated glazing. The outdoor living space therefore has the option to be fully enclosed (bifolds closed).

The facade of those units facing the RBC is constructed of 120mm concrete panel and glazing units.

Figure 2: Burnett Street Frontage

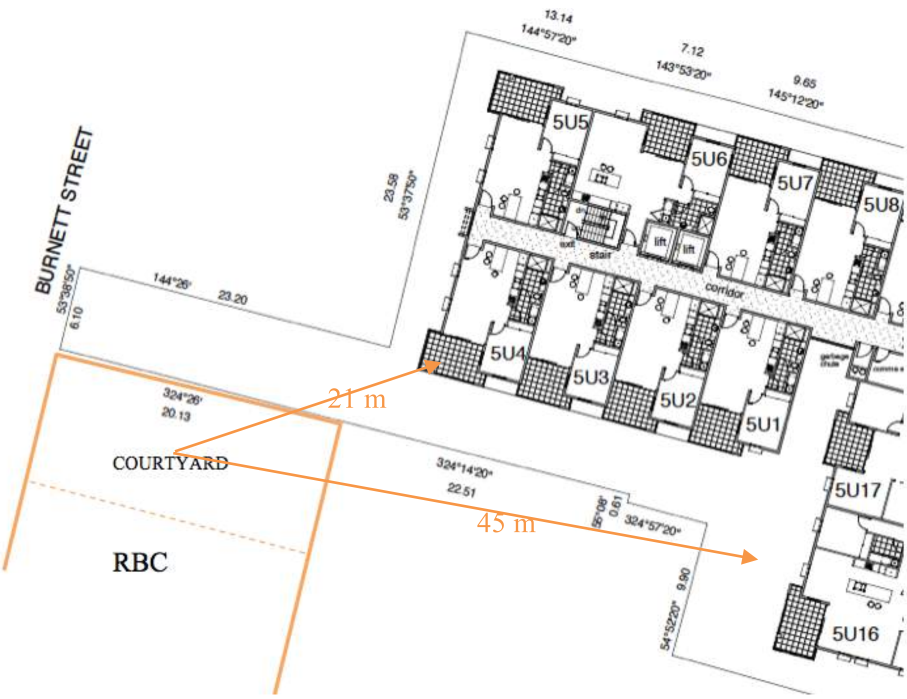


Figure 3: Plan view of proposed development and RBC

NOISE MEASUREMENTS

Ambient noise levels were measured on two occasions, initially over a 5 day period from the 19th to the 24th April 2017 at location A in Figure 1, and over the night time on the 30th March 2018 at location B. The first set described typical ambient noise levels in the area, while the second set described noise associated with a touring act performing at RBC. A Svan Type 1 sound level meter was used for continuous logging of overall noise levels in A-weighted decibels and stored statistical and spectral data at 10 minute intervals. The microphone was 1.5m above ground for the first data set so was well screened from the RBC courtyard by the sandstone wall, while at location B the microphone was 4.3m above ground so had direct view of the RBC courtyard (approximate position of a unit window on L3 of the proposed development).

The measured data is summarised in Table 1, with the following notes relevant:

- Traffic noise was consistently audible and generally dominated the ambient noise. It was noted from the measurement data that the minimum noise levels recorded overnight were around 42 dBA, indicating that it is unlikely traffic was inaudible during any 10 minute period.
- Location A was well screened from both Elizabeth and Burnett Streets, and as such the presented noise levels may be considered a minimum for ambient noise levels in the area.
- For the night when a touring band performing at RBC, patron noise from the rear courtyard was completely dominant at locations A and B. Its level varied from 65 dBA at location B to 56 dBA further down the site in line with location A.
- The strong patron noise was consistent over a long period (measured over 3.5 hours and may be assumed to be longer as measurements only started at 2230 hours).

Table 1: Measured Noise Levels

		Sound Pressure Level, dBA		
		L10	**L90**	**Leq**
Location A	Day Time *	52	48	51
	Night Time *	51	47	49
Location B	Night Time **no RBC** noise	55	42	53
	Night Time **RBC** noise	67	60	65

* Day time 0800 – 1800 hours, Night time 1800 – 0800 hours.

CRITERIA

The Attenuation Code E9.7.2 of the Hobart Interim Planning Scheme 2015 provides criteria for the development for sensitive use in proximity to use with potential to cause environmental harm. There is no acceptable solution, only a performance criteria viz:

> *"**Objective:** To ensure that new sensitive use does not conflict with, interfere with or constrain uses with potential to cause environmental harm.*
>
> ***Performance Criteria P1:***
>
> *Development for sensitive use…must not result in potential to be impacted by environmental harm from use with potential to cause environmental harm, having regard to all of the following:*
>
> *(a) the nature of the use with potential to cause environmental harm; including:*
> *i. operational characteristics;*
> *ii. scale and intensity;*
> *iii. degree of hazard of pollution that may be emitted from the activity;*
>
> *(b) the degree of encroachment by the sensitive use into the Attenuation Area of the attenuation distance;*
>
> *(c) measures in the design, layout and construction of the development for the sensitive use to eliminate, mitigate of manage effects of emissions."*

The stated attenuation distance for a late night live music venue under Table E9.1 is 200 m.

In order to define criteria below which it is deemed the development is unlikely to be impacted by environmental harm, the following relevant documents are referred to:

HOBART INTERIM PLANNING SCHEME 2015

Section D15.3.1.A2 of the gives a typical set of conditions that define acceptable residential noise levels viz:

"Noise emissions measured at the boundary of the site must not exceed the following:
(a) 55 dBA (Leq) between the hours of 8:00 am and 6:00 pm;
(b) 5 dBA above the background (L90) level or 40 dBA (Leq), whichever is the lower, between the hours of 6:00 pm and 8:00 am;
(c) 65 dBA (Lmax) at any time"

From the measurements the L90 at night is 42 dBA, so the night time criteria then 40 dBA.

THE TASMANIAN ENVIRONMENTAL PROTECTION POLICY (NOISE) 2009

Guidelines given for the prevention of sleep disturbance as follows:

Inside bedrooms, night time (inside value)	*30 dBA, Leq,8hr*
Outside bedrooms, window open (outdoor value)	*45 dBA, Leq,8hr*

AUSTRALIAN STANDARD AS/NZS 2107:2016

Lists the following criteria for internal design sound levels (Leq) in:

Houses and apartments in inner city areas or entertainment districts or near major roads – Sleeping areas (night time) – 35-40 dBA
Living areas 35-45 dBA

By adding the typical noise reduction across a facade with a partially open window of 12 dB to these levels the outdoor criteria may be obtained.

THE NSW NOISE POLICY FOR INDUSTRY

States, at section 2.3, intrusiveness of a noise is generally acceptable if noise from the source does not exceed the background + 5 dB. At night this would imply a noise criteria of 48 dBA.

These guidelines are then summarised in Table 2.

Table 2: Summary of External Noise Criteria – Open Window / Bifold

REFERENCE	PROTECTED ACTIVITY	EXTERNAL NOISE LEVEL, LEQ, dBA Day Time 0800 and 1800 hrs	Night Time 2200 – 0600 hrs
Planning Scheme	Outdoor amenity	55	40
NSW Noise Policy for Ind.	Outdoor intrusiveness	53	48
Tas EPP (Noise)	Sleep disturbance	55	45
AS2107	Sleep disturbance	47 - 57	47 - 52

From the Table the criteria for acceptable external and internal noise levels is 48 dBA measured outside a window or on a balcony. This assumes a partially open window. If the window is closed a higher external level at night is possible while maintaining protection of sleep.

ASSESSMENT

The assessment is concerned only with the RBC noise impact on the development and therefore it focuses on the night time period as the criteria are tightest then, the background is quietest and RBC at its loudest. Further, units 1 to 4, 16, and 17, on levels 3 to 6 are the most effected having clear view of the RBC and are then the focus of the assessment.

Using the measured level at location B the external noise levels on site due to RBC are listed in Table 3 and shows noise levels external to the apartments will be in the range 56 – 63 dBA during large music events at RBC.

Table 3: Noise Levels Outside Apartments

	APARTMENT # 3U4	3U2	3U17	6U4
Leq10 dBA	63	56	56	61
Criteria dBA	48			

The noise criteria for outdoor activity are therefore exceeded if tenants wish to use their outdoor balconies with the bifolds open. However with the balcony bifolds closed the balcony noise levels are acceptable.

If partially open windows are used, noise criteria for indoor activity are also exceeded for units 1 to 4, 16, and 17, on levels 3 to 6. However, if windows are closed the criteria for indoor activity may be met for all units.

The noise criteria are therefore met if the balcony bifold windows and living space windows are closed for units 1 to 4, 16, and 17, on levels 3 to 6. The following requirements apply for these apartments:

- Windows be inoperable where possible.
- Where operable windows are necessary, use casement or awning windows only (except for balcony bi-folds), with good acoustic seals on the entire perimeter, that are positively engaged when shut.
- Glazing should be minimum 6/12/6 with laminated panes or 6mm laminated for the balcony.

CONCLUSION

A multi-residential development (i.e. development for sensitive use), is proposed adjacent to a late-night music venue (Republic Bar & Cafe, RBC). As the development is within the attenuation distance specified in the Hobart Interim Planning Scheme, the scheme requires it be demonstrated that the new sensitive use does not conflict with, interfere with, or constrain the RBC operations.

To achieve this, noise measurements have been made within the site during a large gig at RBC to establish the noise the proposed units are exposed to. The levels range from 56 to 63 dBA and are due solely to patron noise from the rear courtyard of RBC.

A reasonable outdoor noise level has then been determined from local and interstate regulations that protects both outdoor and indoor amenity. The level so determined being 48 dBA.

The only outdoor living spaces are the unit balconies and the L3 outdoor podium garden.

The assessment of these noise levels then concludes:

- RBC noise may be adequately attenuated for the outdoor spaces (balconies), provided the bi-fold window system is closed on the balcony of units 1 to 4, 16 and 17, on levels 3 to 6.
- RBC noise emissions may be adequately attenuated by the residential building facade such that reasonable criteria for internal noise levels are achieved, provided units 1 to 4, 16 and 17, on levels 3 to 6 have:
  - Windows and external sliding doors closed.
  - Windows (excluding bi-folds) of casement or awning type with good acoustic seals fitted.
  - Double glazing (6/12/6) with laminated panes, in all windows and doors.

With these actions implemented, the noise levels from the RBC will meet the planning scheme performance criteria.

Should you have any queries, please do not hesitate to call this office directly.

Yours faithfully

Bill Butler

NOISE VIBRATION CONSULTING

REPORT

66 Burnett St, North Hobart- Stormwater Services Report

July 2018

Engineers & Planners
Your Vision is Our Mission

Engineers & Planners
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Johnstone McGee and Gandy Pty Ltd

incorporating Dale P Luck & Associates
(trading as JMG Engineers and Planners)
ABN 76 473 834 852 ACN 009 547 139

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JMG Project No. J1177CH

Document Issue Status								
Ver.	**Issue Date**	**Description**	**Originator**		**Checked**		**Approved**	
1	2.07.2018	For Approval	RG		GLA		GLA	

TABLE OF CONTENTS

1. Introduction

This report identifies the stormwater service requirements for the proposed apartment development at 66 Burnett Street North Hobart. The development consists of 89 proposed units, 105 car spaces over 2 levels, 33 scooter and 42 bicycle spaces.

The existing site is approximately 3120m^2 and has frontage to Burnett and Elizabeth Streets. It slopes from a high point at the Burnett Street road frontage at around 46.2m AHD to a low point of around 41.7m AHD at the Elizabeth Street road frontage. Currently the site contains a single level commercial building of approximately 1450m^2. The remaining 1670m^2 is hardstand area currently used as vehicle access and parking. Approximately 100% of the existing site is impervious surface.

2. Existing Stormwater System

The current stormwater runoff from the site is divided into two catchments. The majority of stormwater runoff consisting of all hardstand area and approximately 85% of roof area is directed to Council's stormwater piped network in Elizabeth Street through a DN225 uPVC connection. The connection point is in the laneway fronting Elizabeth Street and has an invert level of approximately 40.28m AHD.

The remaining roof area (most northern portion) is directed to Council's kerb and channel in Burnett Street through DN150 earthenware pipework. This pipework passes under the building on the property of 64 Burnett Street. It is unknown if this stormwater connection also services 64 Burnett Street.

The overland flow path for the site originates from the property boundary at Burnett Street and extends through the site and into laneway onto Elizabeth Street. The site does not provide an overland flow path for upstream stormwater catchments.

3. Stormwater System and Capacity Analysis

It is proposed that the site be serviced by renewing the existing connection on Elizabeth St. and replacing the section of DN225 pipe to a DN375 main from the existing property connection to the MH on Elizabeth Street. This will provide the stormwater drainage system with capacity for rainfall events of 1% AEP as there is no overland flow path available for this event.

The sites IFD data was obtained from the Bureau of Meteorology and the rational method was used, in accordance with AR&R 1987, to calculate the pre-development flow rate from the site.

The impermeable area of the site was determined from survey drawings to be 100%, resulting in a C_{10} value of 0.9. For an event of 5% AEP the maximum pre-developed site runoff was determined to be 0.076m^3/sec for a minimum Time of Concentration of 6 minutes, a value typically adopted for small catchments.

Design drawings indicate the post-developed site to also have 100% impermeability resulting in a C_{10} value of 0.9, and a corresponding runoff of 0.186m^3/sec for the 1% AEP inclusive of vertical wall area contribution.

The major change between pre and post development is the 15% of the catchment which currently discharges via a DN150 to the Burnett St Stormwater pipe. Therefore this 15% increase will be directed into the DN375 on Elizabeth Street. An additional catchment area has been calculated in accordance with AS3500.3 Section 3.4.4.1 to allow for the vertical face of the building during rainfall.

4. Overland Flow Paths

The existing overland flow discharges to Elizabeth Street via the existing carpark. Overland flow after the development will not be possible, as the drainage path will be blocked by the proposed café. To compensate for this the pipework has been sized to handle the 1% AEP event as would be required for overland flow situation.

5. Stormwater Quality

The quality of the existing driveway/carpark area runoff will improve as a result of the development, as the carpark will be covered, and the existing carpark built out. The runoff from the carpark will be treated via an Ecosol treatment unit to meet the requirements of the planning scheme. Roof runoff will bypass the Ecosol unit as it is clean.

6. Planning Scheme Requirements

The following information and design elements were requested as per Council letter dated 28th March 2018 Application No. PLN-17-1066. This section is intended to demonstrate the design meeting the requirements listed in this letter. These are specifically listed below.

Sw 1 A site plan to demonstrate how stormwater from the proposed development

(including roofed areas and impervious surfaces driveways etc) will be disposed of via gravity to public stormwater infrastructure with sufficient receiving capacity.

Clearly distinguish between existing and proposed, and public and private.

Please note Council records show the existing DN225 connection to Elizabeth St drainage is located within the property boundary please show where the connection will be relocated to, to be clear of the building, and that it is possible given intervening services.

Response

See attached plan outlining how the site will be serviced for stormwater and discharged to Council infrastructure. The existing property connection is located within the area outside the building structure. A new property connection will be created as per the attached plan in Appendix A.

Sw 5 *A concept stormwater treatment report, including associated plans and calculations, demonstrating that the proposed stormwater system will achieve the State Stormwater Strategy targets. If this treatment cannot be achieved, demonstrate why it is not feasible. Council notes carpark treatment should target fine sediments and hydrocarbons.*

Response

The intention of this report is to detail the concept design for the stormwater for the 66 Burnett St site. As mentioned previously within this report the existing stormwater quality will be improved as the carpark is undercover and most of the site is now built out. Runoff from the car parking and external pavement areas will also be treated by an Ecosol or similar unit to meet the parameters sets in the State Stormwater Strategy. Even with no treatment system, the quality of runoff from the site will improve from the existing situation.

Sw 6 *A Concept stormwater drainage report, including associated plans and calculations, prepared by a suitably qualified person discussing the altered flow regime from the site with regard to the receiving capacity of Council infrastructure for the 20yr ARI rainfall event. This report must demonstrate that either stormwater runoff will be no greater than preexisting runoff or any increase can be accommodated within existing or upgraded public stormwater infrastructure.*

Please note Council records show the existing connection to Elizabeth St drainage is only DN225, joining with the neighbour's connection to a DN300.

Response

The intention of this report is to detail the concept design for the stormwater for the 66 Burnett St site. As the site is currently 100% impervious, there is no net increase in runoff from the site, there will as noted above, be a redirection of part of the site which currently drains to Burnett Street into the Elizabeth Street system. The site will have a new connection of DN375 to the existing DN450mm on the opposite side of Elizabeth St. The connection to 285 Elizabeth St will remain unchanged.

Sw 7 *A stormwater drainage design prepared by a suitable qualified person which demonstrates it is designed to accommodate the 1% ARI event (including climate change loading). Council infrastructure has limited receiving capacity. Show any required measures (such as surcharge points, flow paths, detention) to ensure the flows from the site can be safely managed.*

Response

The intention of this report is to detail the concept design for the stormwater for the 66 Burnett St site. Appendix B shows the sizing calculations for Burnett St Apartments for a 1% ARI event. Allowance has been made for a surcharge pit to ensure that water does not surcharge the private system when the council infrastructure is limited in its overall capacity.

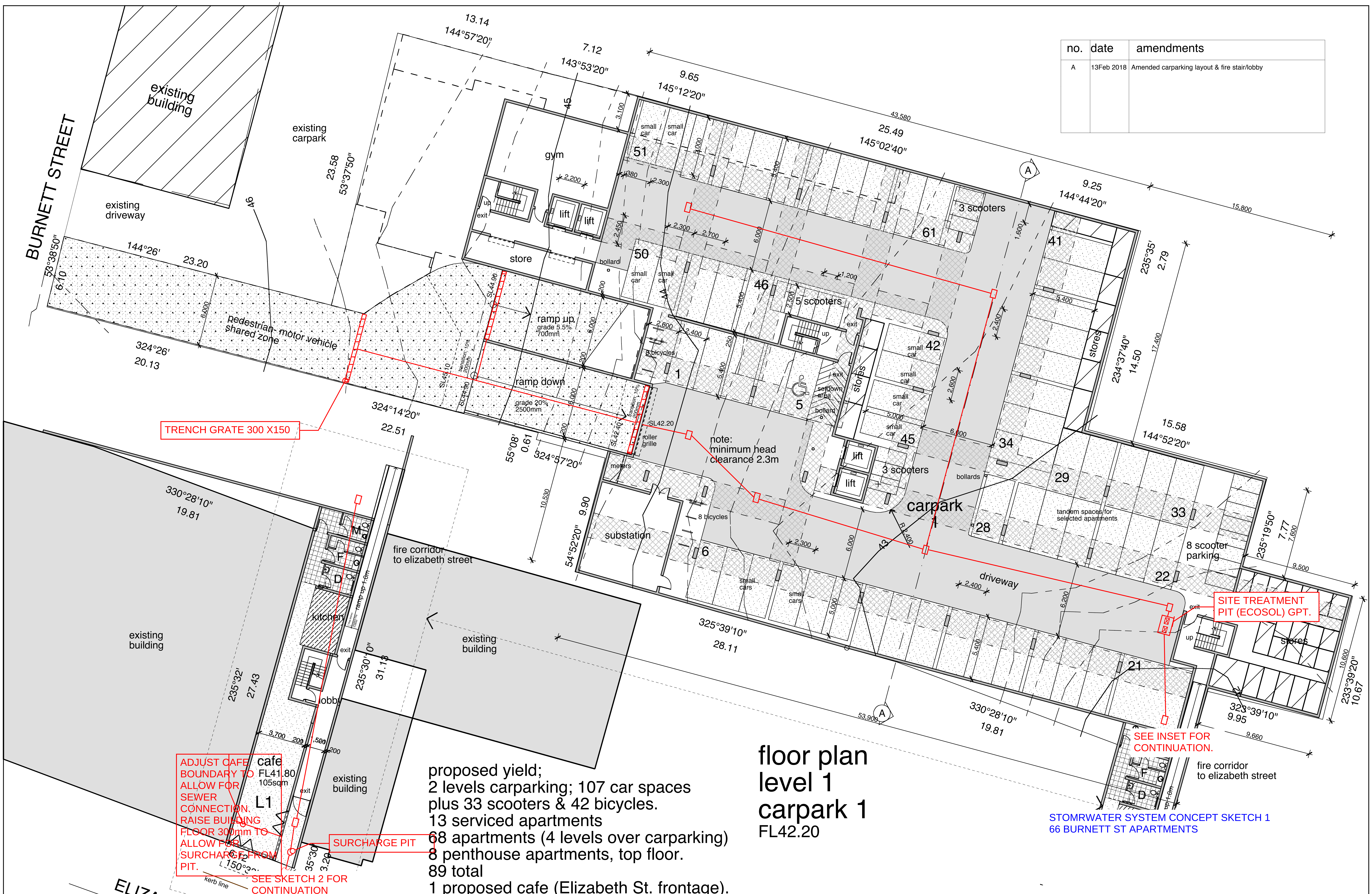
7. Conclusion

The stormwater connection for the 66 Burnett St Apartments will need to be upgraded to a DN375 main. This will require the current property connection to the existing DN225 to be made redundant. The connection for 285 Elizabeth St will remain unchanged.

A surcharge pit will be installed in the lane way outside the café.

APPENDIX A

CONCEPT SKETCHS



no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby

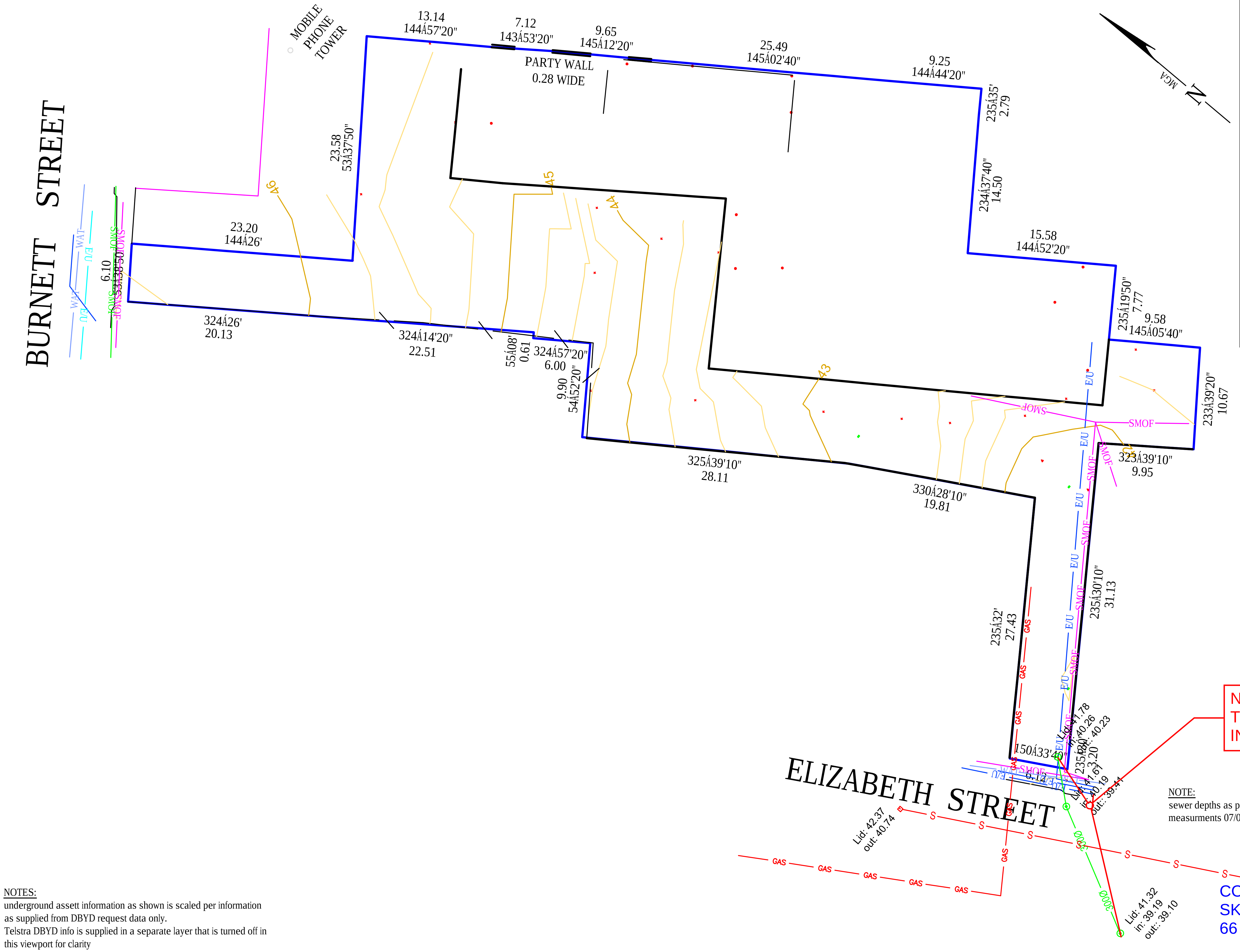
proposed yield;
2 levels carparking; 107 car spaces
plus 33 scooters & 42 bicycles.
13 serviced apartments
68 apartments (4 levels over carparking)
8 penthouse apartments, top floor.
89 total
1 proposed cafe (Elizabeth St. frontage).

floor plan level 1 carpark 1

FL42.20

and+design
andrew mckellar design
62 hilton terrace
noosaville (07) 5449 9066
info@and-design.com.au
QBSA reg. 65073

Client	HOBART PROPERTIES & SECURITIES PTY LTD
Project	PROPOSED RESIDENTIAL UNIT DEVELOPMENT
Location	66 BURNETT ST NORTH HOBART
Drawing	LEVEL 1
Drawing no.	20.0717.1.1A
Scale	1:200 @ A2
Date	AUG 2017
Drawn	AM
Page	1.1A



NOTES:

While all reasonable effort has been made to locate all visible above ground services, there may be other services which were not located during the field survey.

The title boundaries as shown on this plan were not marked at the time of the survey and have been determined by existing title dimensions and occupation (where available) only and not by field survey, and as a result are considered approximate only. This plan should not be used for building to boundary. or to prescribed set-backs, without further survey.

Prior to any demolition, excavation, final design or construction on this site, a full site inspection should be completed by the relevant engineers.

All survey data is 3D. The level (z-value) of any specific feature can be interrogated with a suitable CAD package. Spot heights of all features, including pipe inverts, are included in the model space but are not displayed on the PDF. Spot heights are organised into appropriate layers, and can be displayed as required.

DATUM - Vertical : AHD per SPM56 with reputed AHD level of 39.791 from SURCOM on 17/07/17

At the time of this survey, CT.26099 / 4 was owned by DONALD GORRINGE RECONDITIONING AND SPARE PARTS PTY LTD
Date of Survey : 17/07/17

NEW CONNECTION TO COUNCIL INFRASTRUCTURE

NOTE:
sewer depths as provided by Stanton Roberts from measurments 07/06/18

CONCEPT STORMWATER SERVICES
SKETCH 2
66 BURNETT ST APARTMENTS

NOTES:
underground assett information as shown is scaled per information as supplied from DBYD request data only.
Telstra DBYD info is supplied in a separate layer that is turned off in this viewport for clarity

AMENDMENTS

No.	Revision/Issue	Date
a	SW info (Elizabeth St) added	31/5
b	Sewer info (Elizabeth St) added	07/06

LEARY&COX
LAND & ENGINEERING SURVEYORS
Unit G04 40 Molle Street,
HOBART TAS 7000
P 03 6118 2030
E admin@learyandcox.com

Project Name and Address	66 BURNETT STREET NORTH HOBART 7000
Drawing Title	DETAIL PLAN
Client	IAN ROBERTS CT.26099/4
SCALE	0 5 10 15 — 1:400 at A3
Contour Interval	0.200 m
Date	31 / 05 / 18
SHEET	1 of 1
DRAWN	ML
CHK'D	ML
FILE REF:	9893
Geocivil Ref	989301
AutoCAD Ref	989301-rev A
DATUM Horz:	MGA
DATUM Vert:	AHD

APPENDIX B

STORMWATER CALCULATIONS

J171177CH - Burnett Street - Stormwater Service Report

Pre Development Flows - Catchment 1

TC Calculation

A=	0.00312	Km^2
S_e=	N/A	m/Km
L=	N/A	Km
t_c=	#VALUE!	mins
	6.00	**mins**

Existing Roof & Hardstand Area (approx) = 3120 m2

Total Area = 3120

Fraction Impervious = 1.00

Runoff Coefficient

Fraction impervious =	100%	
C1,10 =	0.1	*Refer ARR Book VIII*
C10 =	**0.90**	

Frequency Conversion Factors

ARI (years)	1	2	5	10	20	40	60	80	100	50
Factor, F_y	0.8	0.85	0.95	1	1.05	1.2	1.17	1.19	1.2	1.15
					0.945					

Peak Flows For Catchment For Given ARI

ARI (years)	$I_{tc,Y}$ (mm/h)	Flow (m^3/s)
1	29.77	0.019
2	40.75	0.027
5	60.11	0.045
10	74.23	0.058
20	92.80	0.076
50	120.66	0.108
100	144.58	0.135

IFD Data - Bom Website

Coefficients

ARI in years	A	B	C	D	E	F	G	loge(I)	I (mm/hr)
1	2.373886	-5.29E-01	-1.61E-02	1.01E-02	-1.87E-03	-6.71E-04	1.24E-04	3.39	29.77
2	2.634665	-5.40E-01	-5.89E-03	9.51E-03	-2.69E-03	-5.24E-04	1.21E-04	3.71	40.75
5	2.886975	-5.68E-01	1.77E-02	8.31E-03	-4.46E-03	-2.31E-04	1.23E-04	4.10	60.11
10	3.021065	-5.83E-01	3.04E-02	6.82E-03	-5.21E-03	3.64E-05	9.63E-05	4.31	74.23
20	3.178175	-5.97E-01	4.25E-02	6.49E-03	-6.21E-03	1.51E-04	1.07E-04	4.53	92.80
50	3.362282	-6.13E-01	5.60E-02	5.48E-03	-7.14E-03	3.70E-04	9.41E-05	4.79	120.66
100	3.489629	-6.24E-01	6.52E-02	4.80E-03	-7.78E-03	5.13E-04	8.76E-05	4.97	144.58

e=	2.72
tc (mins)=	6.00
tc (hrs) =	0.10

10 year ARI, 1 hour rainfall Intensity 25 *mm/hr*

DURATION (hrs)	DURATION (mins)	ARI (years) 1	2	5	10	20	50	100
0.08	5	31.70	43.40	64.20	79.30	99.30	129.00	155.00
0.10	6	29.80	40.80	60.10	74.20	92.80	121.00	145.00
0.17	10	24.80	33.60	48.30	58.70	72.50	92.90	110.00
0.33	20	18.60	24.70	33.60	39.70	47.80	59.40	69.10
0.50	30	15.30	20.10	26.70	31.10	36.90	45.20	51.90
1.00	60	10.70	13.90	17.90	20.50	24.00	28.90	32.80
2.00	120	7.41	9.58	12.20	13.90	16.20	19.40	21.90
3.00	180	5.95	7.71	9.86	11.20	13.10	15.70	17.80
6.00	360	4.07	5.31	6.87	7.87	9.25	11.20	12.70
12.00	720	2.74	3.59	4.70	5.43	6.42	7.81	8.93
24.00	1440	1.77	2.33	3.07	3.57	4.24	5.18	5.95
48.00	2880	1.09	1.42	1.91	2.23	2.66	3.27	3.77
72.00	4320	0.80	1.05	1.43	1.68	2.02	2.49	2.89

Contribution Areas

Discharge Area Description		
Roof	2779	m2
Pedestrian Ramp	320	m2
Driveway	313	m2
Adjoining Property Elizabeth St	19	m2
Vertiical Face Allowance (AS3500.3 Section 3.4.4.1)	843.2	m2
Total	4274	m2

J171177CH - Burnett Street - Stormwater Service Report

Post Development Flows - Catchment 1

TC Calculation

A=	0.00427	Km^2
S_e=	N/A	m/Km
L=	N/A	Km
t_c=	#VALUE!	mins
	6.00	**mins**

New Roof & Hardstand Area (approx) = 3120 m2

Total Area = 3120

Fraction Impervious = 1.00

Runoff Coefficient

Fraction impervious =	100%	
C1,10 =	0.1	*Refer ARR Book VIII*
C10 =	**0.90**	

Frequency Conversion Factors

ARI (years)	1	2	5	10	20	40	60	80	100	50
Factor, F_y	0.8	0.85	0.95	1	1.05	1.2	1.17	1.19	1.2	1.15

0.945

Peak Flows For Catchment For Given ARI

ARI (years)	$I_{tc,Y}$ (mm/h)	Flow (m^3/s)
1	29.77	0.025
2	40.75	0.037
5	60.11	0.061
10	74.23	0.079
20	92.80	0.104
50	120.66	0.148
100	144.58	0.186

IFD Data - Bom Website

Coefficients

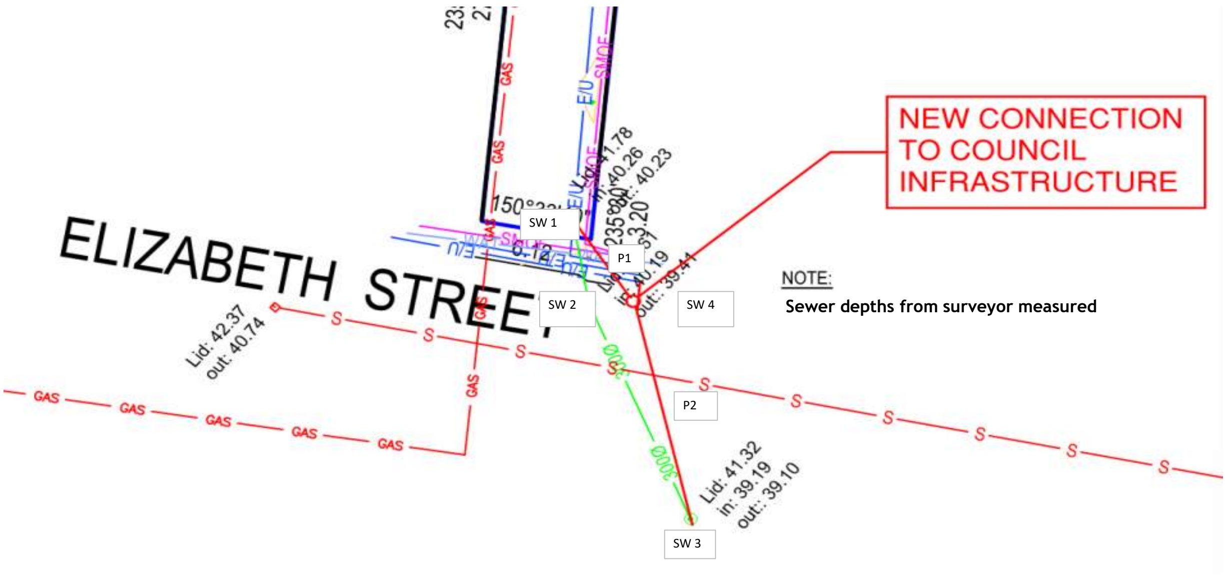
ARI in years	A	B	C	D	E	F	G	loge(I)	I (mm/hr)
1	2.373886	-5.29E-01	-1.61E-02	1.01E-02	-1.87E-03	-6.71E-04	1.24E-04	3.39	29.77
2	2.634665	-5.40E-01	-5.89E-03	9.51E-03	-2.69E-03	-5.24E-04	1.21E-04	3.71	40.75
5	2.886975	-5.68E-01	1.77E-02	8.31E-03	-4.46E-03	-2.31E-04	1.23E-04	4.10	60.11
10	3.021065	-5.83E-01	3.04E-02	6.82E-03	-5.21E-03	3.64E-05	9.63E-05	4.31	74.23
20	3.178175	-5.97E-01	4.25E-02	6.49E-03	-6.21E-03	1.51E-04	1.07E-04	4.53	92.80
50	3.362282	-6.13E-01	5.60E-02	5.48E-03	-7.14E-03	3.70E-04	9.41E-05	4.79	120.66
100	3.489629	-6.24E-01	6.52E-02	4.80E-03	-7.78E-03	5.13E-04	8.76E-05	4.97	144.58

e=	2.72
tc (mins)=	6.00
tc (hrs) =	0.10

10 year ARI, 1 hour rainfall Intensity 25 *mm/hr*

DURATION (hrs)	DURATION (mins)	ARI (years) 1	2	5	10	20	50	100
0.08	5	31.70	43.40	64.20	79.30	99.30	129.00	155.00
0.10	6	29.80	40.80	60.10	74.20	92.80	121.00	145.00
0.17	10	24.80	33.60	48.30	58.70	72.50	92.90	110.00
0.33	20	18.60	24.70	33.60	39.70	47.80	59.40	69.10
0.50	30	15.30	20.10	26.70	31.10	36.90	45.20	51.90
1.00	60	10.70	13.90	17.90	20.50	24.00	28.90	32.80
2.00	120	7.41	9.58	12.20	13.90	16.20	19.40	21.90
3.00	180	5.95	7.71	9.86	11.20	13.10	15.70	17.80
6.00	360	4.07	5.31	6.87	7.87	9.25	11.20	12.70
12.00	720	2.74	3.59	4.70	5.43	6.42	7.81	8.93
24.00	1440	1.77	2.33	3.07	3.57	4.24	5.18	5.95
48.00	2880	1.09	1.42	1.91	2.23	2.66	3.27	3.77
72.00	4320	0.80	1.05	1.43	1.68	2.02	2.49	2.89

J171177CH - Burnett Street - Stormwater Service Report
Replcement connection sizing



Inverts on current MHs

SW1		40.23	m
SW2		39.41	m
SW3		39.19	m
SW4		39.41	m
Replacement DN375 Length	SW1 to SW4	14.94	m
Replacement DN375 Length	SW4 to SW3	35.2	m
Grade P1		0.023295	m/m
	1 in	42.92683	m
Grade P2		9.443902	m/m
	1 in	0.105888	m
Design Flow		185.5389	L/s

According to Mannings formula for stormwater pipe the DN375 pipe at 1 in 3m grade will be acceptable.

$$Q = \frac{4000}{n}\pi\left(\frac{d}{4}\right)^{8/3} S^{1/2}$$

d	0.375	m
n	0.008	
S	0.023295455	m/m
Q P1	434.8560753	L/s
Required flow	185.5388759	L/s

Therefore DN375 is acceptable for P1

d	0.375	m
n	0.008	
S	0.10588843	m/m
Q P2	927.1162676	L/s
Required flow	185.5388759	L/s

Therefore DN375 is acceptable for P2

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TRAFFIC IMPACT ASSESSMENT

RESIDENTIAL AND VISITOR APARTMENT DEVELOPMENT

66 BURNETT STREET

NORTH HOBART

SEPTEMBER 2018

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TRAFFIC IMPACT ASSESSMENT

PROPOSED

RESIDENTIAL AND VISITOR APARTMENT DEVELOPMENT

66 BURNETT STREET

NORTH HOBART

SEPTEMBER 2018

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CONTENTS

REFERENCES:

- Australian Standard AS 1742.2-2009 – Manual of uniform traffic control devices Part 2: Traffic control devices for general use
- AUSTROADS – Guide to Road Safety Part 6: Road Safety Audit
- AUSTROADS – Guide to Road Design Part 4: Intersections and Crossings General (2017)
- AUSTROADS – Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (2017)
- AUSTROADS – Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings
- Road Traffic Authority NSW – Guide to Traffic Generating Developments, 2002
- Road and Maritime Services (Transport) - Guide to Traffic Generating Developments; Updated traffic surveys (August 2013)
- Australian Standard AS 2890 – Parking Facilities, Part 1 – Off-street car parking
- Australian Standard AS 2890 – Parking Facilities, Part 2 – Off-street commercial vehicle facilities
- Australian Standard AS 2890 – Parking Facilities, Part 3 – Bicycle parking facilities
- Australian Standard AS 2890 – Parking Facilities, Part 6 – Off-street parking for people with disabilities
- Hobart Interim Planning Scheme 2015

1. INTRODUCTION

A development application has been lodged with the Hobart City Council for a 90 residential and visitor accommodation apartment development at 66 Burnett Street in North Hobart.

This Traffic Impact Assessment (TIA) report has been prepared in support of the proposed development.

The TIA report considers the existing road and traffic characteristics along Burnett Street in the area of the development site. An assessment is made of the traffic activity that the residential apartment development will generate and the effect that this traffic will have on Burnett Street.

Consideration is given to the required access arrangements and available sight distances along Burnett Street at the junction of the driveway to the development site. An assessment is also made of the access arrangements, internal pedestrian and vehicle traffic circulation and parking provisions within the development site having regard to current applicable Australian Standards and Hobart Interim Planning Scheme (2015) requirements.

The report is based on the Department of State Growth (DSG) - Traffic Impact Assessment Guidelines. The techniques used in the investigation and assessment incorporate best practice road safety and traffic management principles.

2. SITE DESCRIPTION

The proposed development site is located on the southern side of Burnett Street, between Elizabeth Street and Argyle Street.

The site lies within the General Business zone that lines each side of Argyle Street from Melville Street to Burnett Street and along the southern side of Burnett Street from Argyle Street to the development site.

The surrounding buildings along Burnett Street have a commercial use but mixed with an occasional residential dwelling.

The location of the development site has been highlighted on the extract from the street atlas for this area, seen in Figure 2.1.

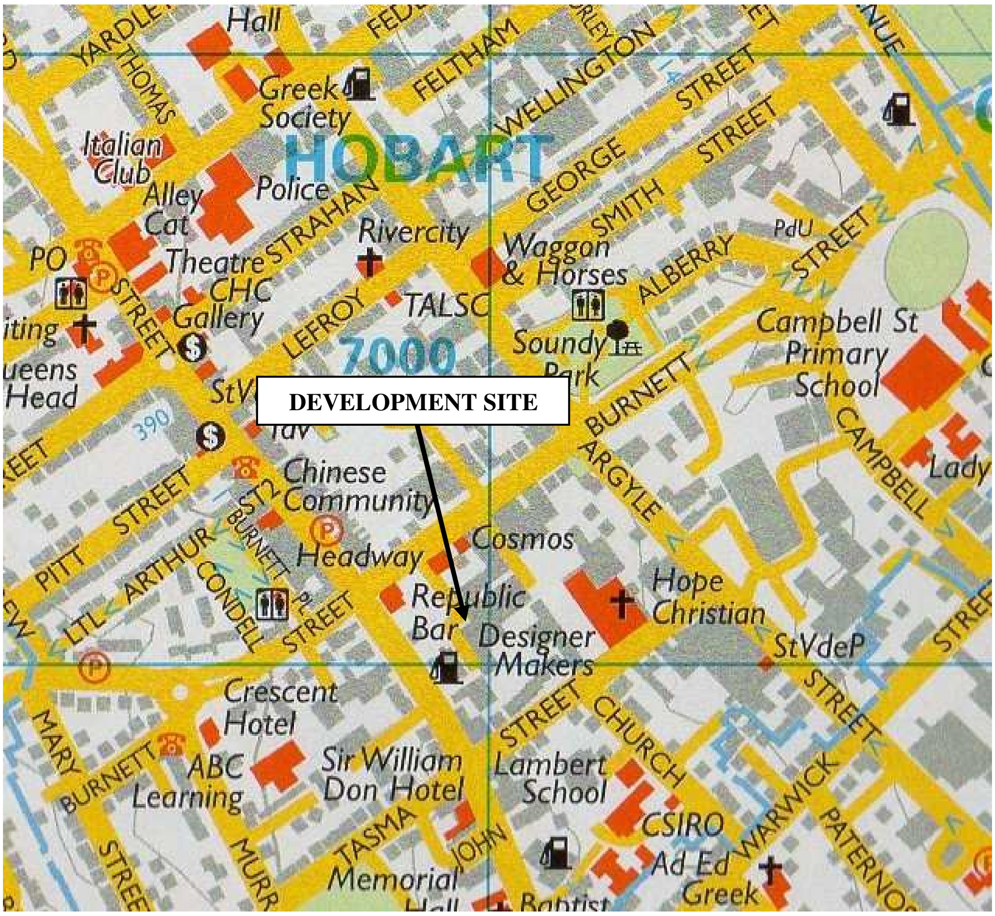


Figure 2.1: Extract of street atlas showing location of proposed residential apartment development site

3. DEVELOPMENT PROPOSAL

The proposed development at 66 Burnett Street is for the construction of 90 residential and visitor accommodation apartments as well as a café fronting onto Elizabeth Street.

The existing buildings on the site are currently occupied by Donald Gorringe and an automotive service business. These will be demolished, and a new building will be constructed on the site to accommodate the proposed apartments.

The building will have seven levels with the following

- 32 one-bedroom apartments;
- 36 two or more-bedroom apartments (including study);
- 22 serviced (visitor accommodation) apartments;
- 105m^2 café fronting Elizabeth Street;
- 106 car parking spaces (including two disabled car park and 20 small car spaces with 10 spaces to be jockey spaces);
- 33 motorbike parking spaces and 44 bicycle parking spaces.

Currently the existing two-way driveway to the site is shared with the adjacent development at 64 Burnett Street through informal arrangements.

The driveway will be reconstructed to function as a separate driveway to the development site and will include 'local area traffic management' design features for it function as a slow speed area where there will be a mix of pedestrians and vehicles in a 'woonerf' type environment which will be signed as a 'shared zone'.

Views of the development site from Burnett Street and along the existing driveway are seen in Photographs 3.1 and 3.2.

Design drawings of the proposed development site layout are included with this report as Attachment A.

Photograph 3.1: View of driveway to development site from Burnett Street

Photograph 3.2: View of development site from driveway off Burnett Street

4. EXISTING ROAD AND TRAFFIC ENVIRONMENT

4.1 Road Characteristics

The one road of relevance to the proposed residential apartment development under consideration is Burnett Street.

Burnett Street has a straight alignment on a slight downgrade to the east. Road markings along Burnett Street define two traffic lanes for each direction of travel. The kerbside lanes become operational during peak traffic periods through clearway restrictions that apply 7:30am-9:00am and 4:30pm-6:00pm along both sides of the road.

At other times of the day during business hours there are half hour and one hour time limited parking restrictions as well as a Metro bus stop along both sides of the road.

The 50km/h urban speed limit applies to Burnett Street.

Views of the geometric character of Burnett Street in the area of the development site are seen in Photographs 4.1 and 4.2.

Photograph 4.1: View to west along Burnett Street with development site driveway ahead on left

Photograph 4.2: View to east along Burnett Street with development site driveway ahead on right (beyond stone wall)

4.2 Traffic Activity

In order to have knowledge of the current passing traffic volume along Burnett Street, peak hour turning traffic volume surveys were undertaken during the 4:30pm – 5:30pm period on Tuesday 31 October 2017 and 8:00am – 9:00am on Wednesday 1 November 2017.

The results from these surveys have been summarised in Figures 4.1 and 4.2.

The survey data indicates the peak hour traffic volume along this section of Burnett Street is around 1,200 vehicles/hour or around 12,000 vehicles/day.

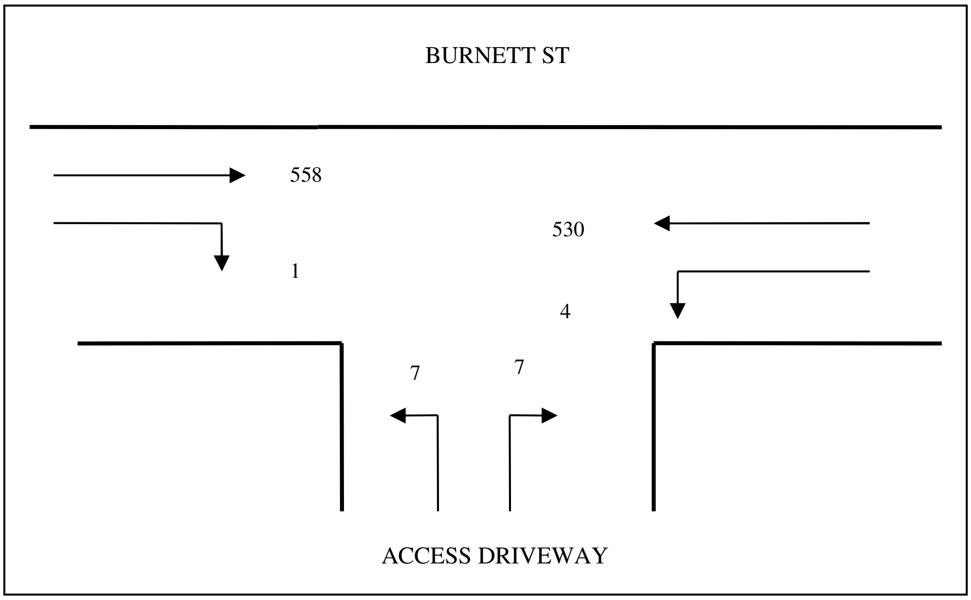


Figure 4.1: Passing traffic volumes on Burnett Street at development site - 4:30pm to 5:30pm

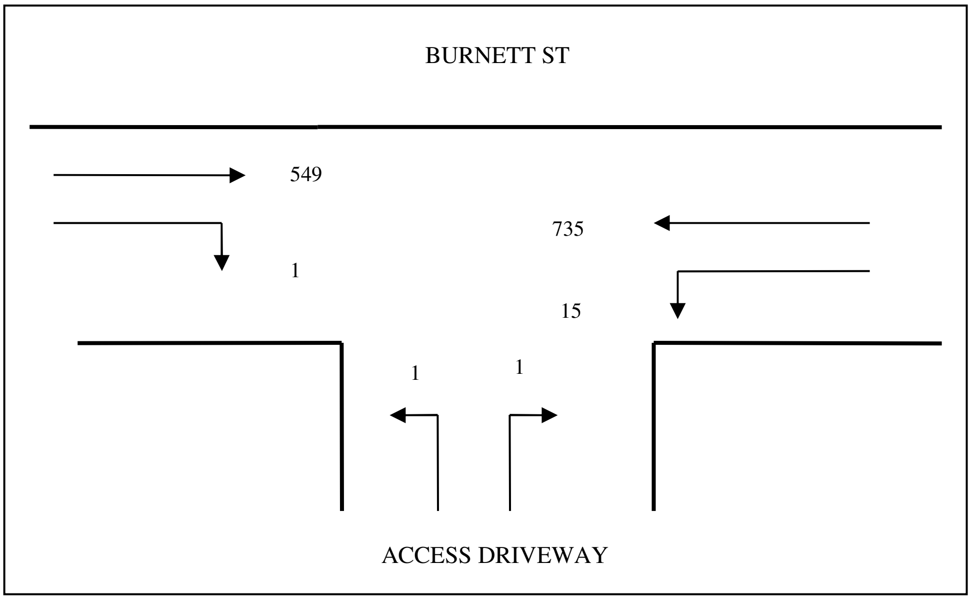


Figure 4.2: Passing traffic volumes on Burnett Street at development site - 8:00am to 9:00am

4.3 Crash Record

All crashes that result in personal injury are required to be reported to Tasmania Police. Tasmania Police record all crashes that they attend. Any crashes that result in property damage only, which are reported to Tasmania Police, are also recorded even though they may not visit the site.

Details of reported crashes are collated and recorded on a computerised database that is maintained by DSG.

Information was requested from DSG about any reported crashes along Burnett Street between Elizabeth Street and Argyle Street over the last five and three-quarter years since January 2012.

Advice has been received that the crash database has record of 45 reported crashes along this section of Burnett Street, including the intersections at each end of this street block.

Of these, 13 crashes occurred between the intersections. These include five rear end collisions while the other eight crashes were all different in nature. All the midblock crashes resulted in property damage only.

At the Elizabeth Street/Burnett Street intersection, five of the 18 reported crashes resulted in injury. The main crash types included:

- three crashes with pedestrians, two resulting in serious injury;
- four crashes between right turning and oncoming vehicles, with two resulting in minor injury; and
- six rear end collisions.

The 14 reported crashes at the Argyle Street/Burnett Street intersection included:

- three collisions between right turning and oncoming vehicles;
- four rear end collisions;
- two collisions involving U-turning vehicles; and
- two collisions involving out of control vehicles.

The two out of control vehicle collisions and one of the U-turning collisions resulted in injury or required first aid attention.

The one concerning factor with the crash record along Burnett Street including the intersections is that the crash rate since January 2016 has been twice that for the previous four years.

5. TRAFFIC GENERATION BY THE DEVELOPMENT

As outlined in Section 3 of this report, the development being proposed is the construction of 68 residential apartments and penthouses plus 22 visitor accommodation apartments and a ground floor café that will have frontage onto Elizabeth Street.

All vehicle access will be via the driveway off Burnett Street, as the existing Elizabeth Street access will be removed as part of the development proposal, as suggested by council officers. There will be pedestrian access along the driveway between Burnett Street and the building entrance as well as an internal access corridor beside the café to/from Elizabeth Street.

In considering the traffic activity that each residential apartment will generate when occupied, guidance is normally sought from the New South Wales, Road Traffic Authority document – Guide to Traffic Generating Developments (RTA Guide). The RTA guide is a nationally well accepted document that provides advice on trip generation rates and vehicle parking requirements for new developments.

The updated 'Technical Direction' to the Guide dated August 2013 advises that the trip generation for residential dwellings in regional areas of New South Wales is 7.4 trips/dwelling/day.

This is consistent with findings by this consultant for dwellings in Tasmania. Surveys in the built-up areas of Tasmania over a number of years have found that typically this figure is 8.0 trips/dwelling/day with smaller residential apartments generating around 4 trips/apartment/day and larger apartments generating around 6 trip/apartment/day.

As example, peak hour traffic surveys were undertaken on Sandy Bay Road in 2015 at the 20 residential apartments in the Governor's Square development at 74 Sandy Bay Road which have car parking access off Sandy Bay Road. The traffic generation by these apartments during the peak hour was 3.75 vehicles/apartment/hour. The apartments each have two bedrooms.

Having regard to the above discussion about traffic generation as well as the fact that:

- the proposed apartments will have one to three bedrooms;
- all apartments will have at least one motorbike parking space or one car parking space (parking space allocation dependant on occupant needs, see discussion later);
- the very close proximity of the development site to the North Hobart shopping centre (less than 200m walking distance to middle of centre);
- passing public transport services; and
- bicycle lanes along Argyle Street and Campbell Street;

the proposed apartments are expected to generate around the same traffic activity (cars and motorbikes) as the Grosvenor Square apartments.

For the purpose of this assessment a slightly higher traffic generation rate of 4 vehicles/apartment/day will be applied. Applying this trip generation rate to the proposed 68 residential apartments, the apartments can be expected to generate some 272 vehicle/day and around 28 vehicles/hour during peak traffic periods when fully developed and occupied, based on the peak hour traffic being the typical 10% of the daily traffic volume.

The 22 visitor accommodation apartments are expected to generate the same as indicated in the RTA Guide for motels: -

> *a daily rate of 3 vehicle movements per parking space (rather than per room) and peak hour trips being 0.4 vehicles per space;*

The traffic generation by the visitor accommodation apartments can be expected to be:

- 66 vehicles/day; and
- 9 vehicles/hour, mostly around the 9:00-10:00am during the main morning departure period and around the 3:00-4:00pm during the main afternoon arrival period; slightly less during the peak hours for Burnett Street.

The café will have two car parking spaces for staff parking, expected to generate some 4 vehicles/day.

The total morning and afternoon peak hour traffic generation of motor vehicles by the proposed development will be around 35 vehicles/hour.

These vehicle movements to and from the site will be via the driveway off Burnett Street.

Allowing for a 1% p.a. increase in the passing traffic volumes, as seen in Figure 4.1 and 4.2, over the next 10 years, the expected turning and passing traffic movements on Burnett Street at the development site driveway during the peak hour traffic periods in 2027 will be as seen in Figures 5.1 and 5.2.

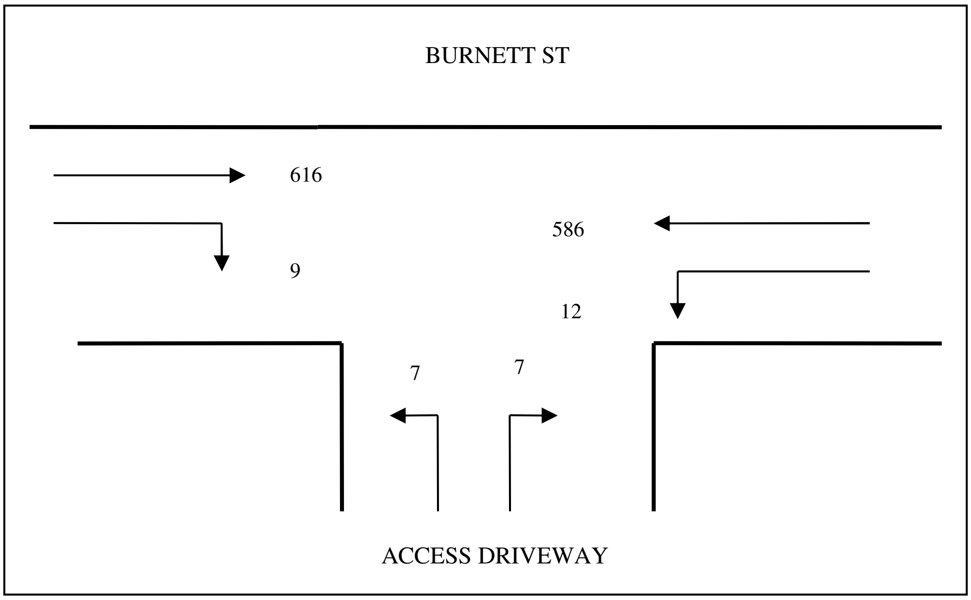


Figure 5.1: Passing traffic volumes on Burnett Street at development site - 4:30pm to 5:30pm in 2027

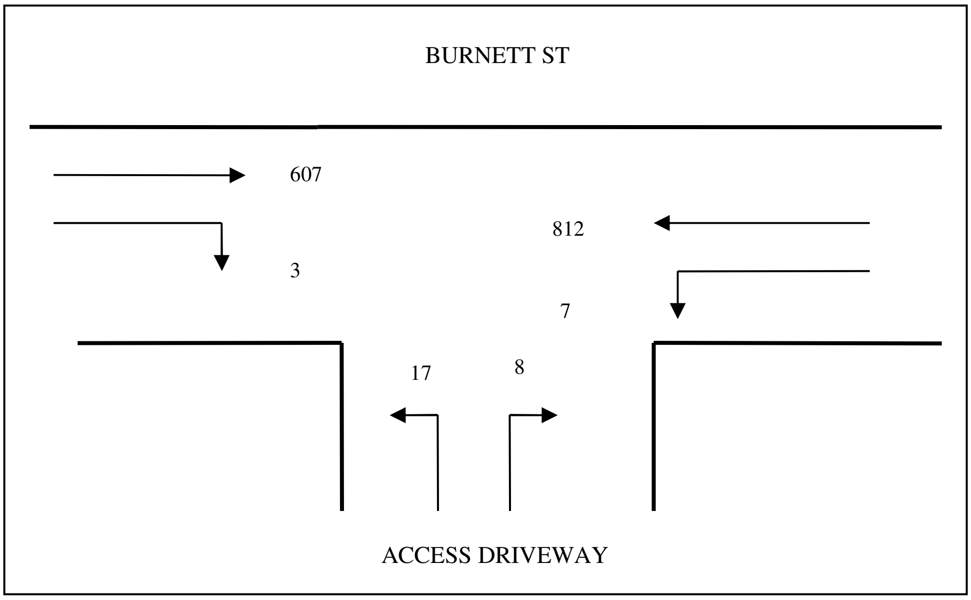


Figure 5.2: Passing traffic volumes on Burnett Street at development site - 8:00am to 9:00am in 2027

6. TRAFFIC ASSESSMENT AND IMPACT

This section of the report evaluates the impact of the expected traffic that will be generated by the proposed residential apartments development on passing Burnett Street traffic volumes.

An assessment has been made of the adequacy of available intersection sight distances along Burnett Street at the site driveway junction; consideration has been given to the proposed internal site layout with respect to traffic circulation and parking as well as pedestrian accessibility to the road network.

6.1 Operational Impact of Increased Traffic Activity

The proposed apartment development is expected to generate some 342 vehicles/day and 35 vehicles/hour during peak traffic periods.

The level of two-way traffic activity generated by the proposed development will not have a significant impact on the Burnett Street traffic flow.

Traffic volumes up to 1,500 vehicles/hour can generally be accommodated between conflicting traffic streams at intersections or junctions before traffic problems can begin to arise. The traffic conflict will be a little less than this.

A SIDRA analysis of the traffic conflict at the Site driveway junction with Burnett Street with the peak hour traffic volumes in Figures 5.1 and 5.2 has determined traffic movements along Burnett Street will operate at Level of Service A.

For traffic entering Burnett Street, vehicle delays will be at Level of Service C and Level of Service D respectively during afternoon and morning peak hour and queueing will be minimal (not more than one vehicle).

The above peak hour analyses have been based on two traffic lanes in each direction along Burnett Street with the clearway lanes operating during these periods.

With only one lane in each direction during off peak periods, the SIDRA analysis was also undertaken for this period.

Detail of the hourly traffic distribution over the day for Burnett Street is not available. Analysis of other hourly traffic distributions, in particular for Elizabeth Street to the north of Federal Street indicates the average hourly traffic volume between the morning and afternoon peak hour is around 91% of the morning peak hour traffic volume and 83% of the afternoon peak hour volume. The afternoon peak hour traffic volume along Elizabeth Street is higher than the morning peak hour.

As a result, the off-peak SIDRA analysis was based on one traffic lane on Burnett Street in each direction and a 10% reduction in all traffic movements in Figures 5.1 and 5.2 for the morning and afternoon peak hour periods.

This analysis found the operation would continue to operate efficiently over the day beyond the next 10 years.

All SIDRA analyses have also been based on one entry and exit lane in the development site driveway.

The outputs from SIDRA analysis have been summarised in Table 6.1.

MONTH/YEAR	TIME/DAY	LEVEL OF SERVICE
OCTOBER 2027	WEEKDAY AM PEAK	- Burnett Street Level of Service is A - Driveway Level of Service is D - Highest Degree of Saturation is 0.23 on Burnett Street - Longest 95% Queue is 0m on Burnett Street (RT) - Longest 95% Queue is 2m on driveway (RT)
OCTOBER 2027	WEEKDAY PM PEAK	- Burnett Street Level of Service is A - Driveway Level of Service is C - Highest Degree of Saturation is 0.17 on Burnett Street - Longest 95% Queue is 1m on Burnett Street (RT) - Longest 95% Queue is 1m on driveway (RT)
OCTOBER 2027	WEEKDAY BETWEEN PEAK PERIODS 90% OF AM PEAK	- Burnett Street Level of Service is B - Driveway Level of Service is D - Highest Degree of Saturation is 0.42 on Burnett Street - Longest 95% Queue is 1m on Burnett Street (RT) - Longest 95% Queue is 1m on driveway (RT)
OCTOBER 2027	WEEKDAY BETWEEN PEAK PERIODS 90% OF PM PEAK	- Burnett Street Level of Service is A - Driveway Level of Service is C - Highest Degree of Saturation is 0.32 on Burnett Street - Longest 95% Queue is 1m on Burnett Street (RT) - Longest 95% Queue is 1m on driveway (RT))

Table 6.1: SIDRA output findings for various times of day

6.2 Assessment of Available Sight Distances

Views along Burnett Street for motorists entering Burnett Street from the site access driveway are seen in Photographs 6.1 and 6.2 while the available sight lines to and from vehicles turning right into the driveway can be appreciated from the views in Photographs 6.3 and 6.4.

Measurements have determined the available sight distance from the point where a vehicle would stop and give way in the driveway when entering Burnett Street (around 2.5m back from through lane) is around 45m to the west (to the Elizabeth Street intersection) and over 150m further west (toward Murray Street). The sight distance to the east is at least 150m.

The same sight distances, if not longer, are available to and from a vehicle turning right into the driveway.

The speed limit along Burnett Street is 50km/h and observations during peak traffic periods suggest the 85^{th} percentile speed would be a little less than this. The speed of vehicles turning from Elizabeth Street and Argyle Street to Burnett Street is around 25km/h.

The required minimum sight distance for a speed limit of 50km/h for a driveway is desirably up to 69m, according to AS 2890.1. However, the sight distances are far greater than this, and even in excess of current Austroads requirements for a public road intersection.

Photograph 6.1: View to east along Burnett Street from development site driveway

Photograph 6.2: View to west along Burnett Street from development site driveway

Photograph 6.3: View to east along Burnett Street from vehicle turning right into development site driveway

Photograph 6.4: View to west along Burnett Street from rear of vehicle turning right into development site driveway

6.3 Internal Traffic Access, Circulation and Car Parking

Following input into the design of the internal access and parking arrangements and having due regard to the requirement of AS 2890, the proposed layout and design of the internal access driveway, circulation area and parking arrangements which will service the residential and visitor accommodation apartments is shown on the site drawings in Attachment A.

Relevant design elements of the proposed site layout related to traffic are discussed below.

Access driveway and traffic circulation

There is an existing driveway off Burnett Street which provides shared access for No.66 and No.64 Burnett Street (as seen in Photograph 3.1).

In the absence of a final agreement of 'shared right of way' arrangements, it is proposed that the 6.0m wide section of land on the development site from Burnett Street will become the driveway to the site.

As a result, it is proposed the driveway be designed with local traffic management measures to create a 'woonerf' type environment and designated a 'shared zone', as shown on the site drawings.

Such 'woonerf' type shared zones are normally considered for public roads which are higher order roads than private access roads or driveways. Therefore, it should be more readily possible to treat this private driveway in such a manner.

It is estimated the driveway would have the following traffic activity:

Vehicles

- 35 vehicles/hour during peak hours and less at other times;
- At the higher vehicle volume there would be on average 1 vehicle/100 seconds using the driveway;
- Travel distance between the car park access entrance and Burnet Street is 30m;
- Travel time would be 11 seconds at just 10km/h and 5.5 seconds at 20km/h;
- Sidra analysis shows if the passing bays were located only at each end of a 30m length of driveway, the 95%ile queue would be around 1m and average delay would be 0.3 seconds;

Pedestrians

- There will be a total of 90 apartments (visitor and residential);

- Assuming a pedestrian or pedestrian group (pedestrian group = 1 or more pedestrians together) from between a third and a half of the apartments walks along the driveway over same one-hour period (bearing in mind there also is a pedestrian access to Elizabeth Street), there would be on average one pedestrian each 100 seconds using the driveway;

- The time to walk the driveway length of 25m between building access and Burnett Street at 1.1m/sec would be 21 seconds;

These figures indicate that at peak times there would be around 1 vehicle/2 minutes and also around 1 pedestrian group/2 minutes using the driveway while the time taken to travel the driveway length is (say) 7 seconds for a car and 21 seconds for the pedestrian.

There would at such times over the hour be vehicles and pedestrians using the driveway at the same time, but the level of activity will be extremely low from a conflict viewpoint.

This consideration of potential activity along the driveway is sufficient to give confidence that a 'woonerf' type shared zone will work safely and efficiently for this driveway, without any adverse safety outcomes.

The driveway design to achieve the proposed calmed traffic environment for all users, including motorists, pedestrians, bicyclists and motorbike riders that will use the driveway, is shown on the site drawings.

In reality, the level of pedestrian and vehicle traffic activity along this driveway, which will be highly managed, will be much less than along any parking aisle in a shopping centre car park which does not have traffic management measures.

The raised 'garden beds' along the driveway have been placed to also allow passing of cars at each end as well as in the middle, which is more than is necessary for the level of vehicle activity (see car passing plot in Attachment B).

It is proposed a combination of bollards and line marking be installed along the side property boundary to define boundary between the two driveways but keep it visually open.

Reference to Table 3.1 and Table 3.2 of AS 2890.1 to determine the required geometric characteristics of the driveway is not required because the traffic volumes along the passing road (Burnett Street) and along the driveway are known and the operational characteristics have been analysed (see first paragraph of Clause 3.2.1).

The SIDRA analysis and other considerations demonstrate the 6.0m driveway across the footpath with a slightly wider gutter crossover is quite sufficient for the future level of traffic activity along Burnett Street and along the driveway, based on determinations earlier in this report.

Lighting along driveway

Lighting will be provided along the driveway to a sufficient level for the traffic environment, based on the requirements of the Building Code of Australia. The driveway should not require the higher level of lighting as required AS 1185 which is a standard that applies to public roads and public places.

Driveway grades

The driveway will have a fairly flat grade up to where it bifurcates into the ramps to the upper and lower car park levels.

The ramp to the lower level car park will have a grade of 19% over a distance of 10.5m plus a 2m transition at each end. The upper level ramp will have a grade of 3.15%. The ramp design meets requirements as set out in AS 2890.1.

On-site turning considerations

The parking arrangements for the development have been designed to comply with Clause E6.7.4 of the Planning Scheme with respect to on-site turning.

All the parking spaces on the site will be allocated to residents of the apartments, so no separate turnaround area is required. Cars and motorbikes using all of the designated parking spaces will be able to enter and exit each parking space in a three-point turn and hence enter and exit the site in a forward direction.

Car parking supply

Clause E6.6.1 of the Hobart City Council Interim Planning Scheme requires:

- One car parking space for each residential apartment with one bedroom (32 spaces);
- Two car parking spaces for residential apartments with two or more bedrooms (72 spaces);
- One car parking space for each visitor accommodation apartment (22 spaces);
- One visitor car parking space per three residential apartments if considered as an internal site (24 spaces)
- 15 car parks per 100m^2 café floor area (16 spaces).

The required parking supply for the proposed development would therefore be a total of 166 car parking spaces, based on the planning scheme.

There will be 106 car parking spaces, 33 motorbike parking spaces and 44 bicycle parking spaces on the site.

The allocation of the parking spaces to residents and visitor in the apartments will be as detailed in the Ireninc Planning Report; the aim being to provide motor vehicle parking spaces on a needs basis, rather than have spaces permanently assigned to apartments whose residents don't have a need for such parking.

It is understood the Council recognises that the planning scheme requirement for the high number of car parking spaces is at times too demanding and not that necessary for multiple dwelling developments in areas that have access to various transport modes, to shopping areas and services.

This has also been found from surveys of car parking demand at multiple dwelling developments in Hobart, and a lesser parking demand is also recommended in the New South Wales RTA: Guide to Traffic Generating Developments.

This aim with the allocation of parking at the proposed development is to accommodate residents that favour alternative transport modes, other than a motorcar. The development site is well placed to attract low car ownership residents; the 2016 census found that a high 21.3% of private occupied dwellings in North Hobart did not have a car.

Other considerations in assessing the parking supply and accepting the lower car parking supply for this development include:

- the development site is located within 200m walking distance of the heart of the North Hobart shopping centre;

- there are regular route bus services along Elizabeth Street, well within the maximum 400m walking distance to such services and bus stops in Burnett Street outside the development site which service school buses; and

- there are bicycle lanes along Argyle Street and Campbell Street for travel to the Hobart city area.

All these factors will significantly reduce the residents' reliance on car use.

All on-street parking in the surrounding area has limited time parking restrictions which can provide available parking for visitors requiring short time parking.

The café is expected to attract local residents and workers as customers from the surrounding area who will not generate a parking demand.

It is therefore concluded the parking supply on the site for residents will be sufficient to meet the parking demand.

The planning scheme does not require any disabled car parking spaces or bicycle storage area to be provided for residential developments. There will be one disabled car parking space on the site and the 40 bicycle parking spaces will be provided to promote cycling.

Parking area design

All the resident parking spaces on the site will be compliant with AS 2890.1.

The required turn paths of vehicles have been checked and found to be adequate for three-point turns by B85 cars for all manoeuvres to and from all parking spaces.

The specific dimensions that have been assessed include the following:

- All parking spaces will be 5.4m long and 2.4m wide in accordance with User Class 1A for residential parking (as detailed in Figure 2.2 of AS 2890.1 for 90-degree parking);

- All small car parking spaces will be 5.0m long and 2.3m wide (as required in Clause 2.4.1 of AS 2890.1);

- The two disabled car parking spaces will be in accordance with the Building Code of Australia and AS 2890.6;

- All columns will be positioned to not create an obstruction (as detailed in Figure 5.2 of AS 2890.1);

- The width of the parking aisle will be at least 5.8m (as detailed in Figure 2.2 of AS 2890.1 for Class 1A 90-degree parking); will be 6.0m;

- There will be a 1.0m (and more) extension to the end parking bays for reversing out of these parking spaces (which is as detailed in Figure 2.3 and Figure 5.2 of AS 2890.1);

- The height clearance will be a minimum of 2.3m in all trafficable parts of the car parking area access by cars;

- The motorbike parking bays and bicycle parking will be in accordance with AS 2890.1 and AS 2890.3;

- The grade in car parking area will be virtually flat.

With all dimensions meeting the requirements of AS 2890.1, the parking spaces will be compliant with the standard and meet the Acceptable Solution for Clause E6.7.5.

Pedestrian Traffic

Pedestrians will access the site via the driveway between Burnett Street and the building entrance as well as an internal access corridor beside the café to/from Elizabeth Street.

With the proposed shared zone management and environment, no additional special measures are necessary for pedestrians.

In regard to pedestrians walking along the Burnett Street footpath and approaching the driveway from the west, a sufficient sight triangle will not be available between motorists exiting the site and the pedestrians to meet the requirements of Figure 3.3 of AS 2890.1.

Various measures are available to address this issue. In this case, it is recommended a road hump be installed in the driveway located 2m back from the public footpath, as detailed on the site drawings.

This measure will slow exiting traffic to react and avoid any conflict with pedestrians and is considered quite a sufficient measure to address the pedestrian sight line deficiency.

<u>Waste collection/servicing</u>

The collection of waste and building servicing will be arranged with private contractors. The service can occur either within the site or with the truck parked in Burnett Street during times of very low traffic activity along Burnett Street.

For on-site garbage collection, the smaller garbage trucks will be able to enter the driveway in a forward direction, undertake a three-point turn at the ramp junction area and reverse up the ramp to the Level 2 garbage room. The minimum height clearance in this area will be 2.8m, sufficient for the 2.6m high truck.

A 7.54m long Veolia type TR49, TR52 or TR57 garbage truck has turning circle of 16.9m and height of 2.6m which includes the rear loading. The truck specifications and as well as a plot of the travel and turning path of the truck within the site is included with this report as Attachment B.

On-street garbage collection can also occur by wheeling the bins to the garbage truck parked on-street. This is also not a problem based on discussion with Veolia.

7. SUMMARY AND RECOMMENDATIONS

This Traffic Impact Assessment has been prepared in support of the development application to the Hobart City Council for the construction of 68 residential apartments and 22 visitor accommodation apartments at 66 Burnett Street in North Hobart.

The assessment has reviewed the existing road and traffic environment along Burnett Street in the area of the development site.

Peak hour turning traffic volume surveys were undertaken during the 8:00am-9:00am and 4:30pm – 5:30pm period. The results show the traffic volume along Burnett Street past the development site is around 1,200 vehicles/hour and around 12,000 vehicles/day.

The crash database has record of 45 reported crashes along Burnett Street between Elizabeth Street and Argyle Street over the last five and three-quarter years since January 2012, including the intersections at each end.

Of these, 13 crashes occurred between the intersections. These included five rear end collisions while the other eight crashes were all different in nature. All the midblock crashes resulted in property damage only.

The one concerning factor with the crash record along Burnett Street including the intersections is that the crash rate since January 2016 has been twice that for the previous four years.

It has been estimated that the proposed development when fully developed and occupied will generate some 342 vehicles/day and around 35 vehicles/hour during peak traffic periods.

A SIDRA analysis of the peak hour traffic conflicts in year 2027 has found the traffic movements along Burnett Street will operate at Level of Service A-B. For the driveway traffic entering Burnett Street it will be Level of Service C and Level of Service D during the AM and PM peak hour periods respectively (with four traffic lanes along Burnett Street) as well as during off-peak periods (with two traffic lanes along Burnett Street).

An assessment has been undertaken of the available sight distances at the junction of the development site driveway with Burnett Street. This has found sight distances to be more than adequate in meeting standard requirements.

Consideration has been given to the proposed layout and design of the internal driveway, traffic circulation provisions and parking arrangements as well as pedestrian access for the development site, having regard to accepted practices and relevant Australian Standards.

The driveway will be designed with local traffic management measures to create a 'woonerf' type environment and designated as a 'shared zone'. From a consideration of the potential activity along the driveway, it has been determined the 'woonerf' type shared zone will work safely and efficiently for this driveway, without any adverse safety outcomes with more than sufficient opportunities for cars to pass one another clear of pedestrians.

A combination of bollards and line marking will be installed along the side property boundary to define delineation between this driveway and the driveway to the adjacent property.

Lighting along the driveway will be installed to a sufficient level for the traffic environment, based on the requirements of the Building Code of Australia.

The grade of the vehicle ramps, into the two levels of car parking, meets required standards as set out in AS 2890.1.

While the Hobart City Council Interim Planning Scheme requires 165 car parking spaces for this development, there will be 106 car parking spaces, 33 motorbike parking spaces and 44 bicycle parking spaces provided on the site.

It is understood the Council recognises that the planning scheme requirement for the high number of car parking spaces is at times too demanding and not that necessary for multiple dwelling developments and this has also been found from surveys of car parking demand at multiple dwelling developments.

The development is aiming at accommodating residents that favour alternative transport modes, other than a motorcar. In support of this, just over 1 in 5 dwellings in North Hobart do not have a car and other relevant factors in this regard are:

- the development site is located within 200m walking distance of the heart of the North Hobart shopping centre;

- there are regular bus services along Elizabeth Street, well within the maximum 400m walking distance to such services and bus stops in Burnett Street outside the development site which service school buses; and

- there are bicycle lanes along Argyle Street and Campbell Street for travel to the Hobart city area.

The planning scheme does not require any disabled car parking spaces or bicycle storage area to be provided with the residential part of the development. There will be one disabled car parking space plus 33 motorbikes and 44 bicycle parking spaces within the site.

All the vehicle parking spaces will be compliant with relevant part of AS 2890.

It is therefore concluded the parking supply on the site for residents will be sufficient to meet the parking demand.

All on-street parking in the surrounding area has limited time parking restriction which can provide available parking for visitors requiring short time parking. The café is expected to attract local resident and workers as customers from the surrounding area, who will not generate any parking demand.

In order to address the deficient sight triangle at the driveway between motorists exiting the site and pedestrians walking along the Burnett Street footpath, it is recommended a road hump be installed in the driveway located 2m back from the public footpath.

The servicing of the building will be by a private contractor. Garbage collection can occur on-site with trucks entering and exiting the site in a forward direction, turning around at the ramps and loading just near the waste storage area. It can also occur from Burnett Street by the wheeling of bins to the truck.

Overall it has been concluded that the proposed residential apartment development can be supported on traffic grounds as it will not give rise to any adverse safety or operational traffic issues with the implementation of the proposed measures.

ATTACHMENT A

Design drawings of proposed layout of access and parking for residential and visitor apartment development

ATTACHMENT B

Specification of waste collection vehicle

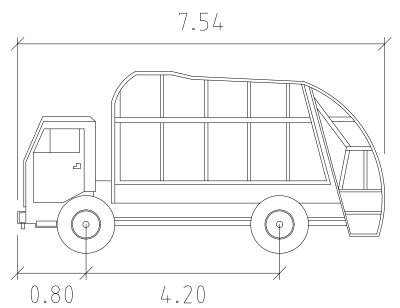
Details of truck and car travel and turning paths

REAR LIFT TRUCK SPECIFICATIONS

** Includes TR49, TR52, TR57

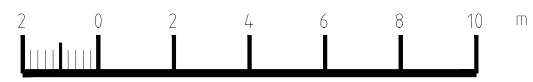
Specifications:

• Overall Length	7.54 metres
• Overall Width (excluding mirrors)	2.42 metres
• Overall Width (Including mirrors)	2.84 metres
• Maximum Height	2.60 metres
• Wheel Base (From centre of front and rear axle)	4.20 metres
• Turning Circle	16.90 metres
• Gross Vehicle Mass	14.00 tonne
• Tare Weight	9.10 tonne
• Payload	4.90 tonne



VEOLIA GARBAGE TRUCK

	meters
Width	: 2.42
Track	: 1.42
Lock to Lock Time	: 6.0
Steering Angle	: 32.4



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PRELIMINARY PRINT

REV	DATE	REMARK
P1		ISSUED FOR CLIENT REVIEW

Accepted Grant Atherton (Discipline Head)	Date
Accepted Chris Males (Team Leader)	Date
Approved Grant Atherton (Group Manager)	Date

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SCALES @ A3	DESIGNED BY	DRAWN BY
	CJM	MY
	PLOT DATE	23/05/2018

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PROJECT
66 BURNETT STREET APARTMENT DEVELOPMENT

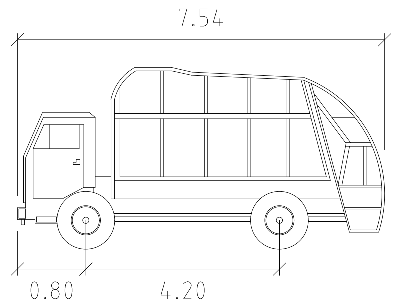
TITLE
TURNING PATH VEOLIA GARBAGE TRUCK SHEET 1

PROJECT NO. J171177CH

DWG NO. SK01

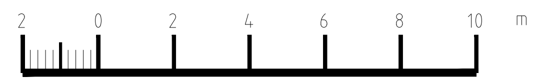
REVISION P1

PLOT DETAILS BURNETT ST APARTMENTS SWEPT PATH.DWG



VEOLIA GARBAGE TRUCK

	meters
Width	: 2.42
Track	: 1.42
Lock to Lock Time	: 6.0
Steering Angle	: 32.4



SCALE 1:200

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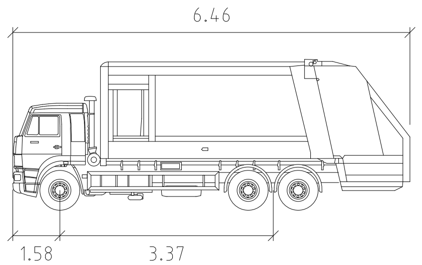
PROJECT
66 BURNETT STREET APARTMENT DEVELOPMENT

TITLE
TURNING PATH
VEOLIA GARBAGE TRUCK
SHEET 2

PROJECT NO.	J171177CH
DWG NO.	SK02
REVISION	P1
PLOT DETAILS	BURNETT ST APARTMENTS SWEPT PATH.DWG



Isuzu N Series NQR 87-190

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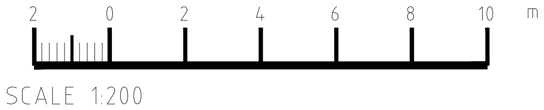
Steering Angle	: 37.6



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	PLOT DATE	23/05/2018

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PROJECT
66 BURNETT STREET APARTMENT DEVELOPMENT

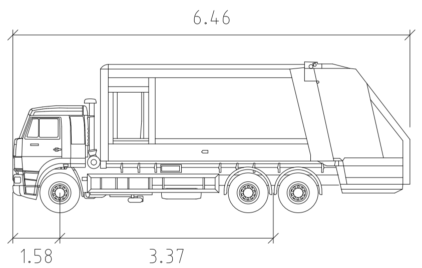
TITLE
TURNING PATH ISUZU NQR 87-190 SHEET 1

PROJECT NO. J171177CH

DWG NO. SK03

REVISION P1

PLOT DETAILS BURNETT ST APARTMENTS SWEPT PATH.DWG



Isuzu N Series NQR 87-190

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Width	: 2.04
Track	: 1.69
Lock to Lock Time	: 6.0
Steering Angle	: 37.6

2 0 2 4 6 8 10 m

SCALE 1:200

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Accepted (Team Leader)	Chris Males	Date
Approved (Group Manager)	Grant Atherton	Date

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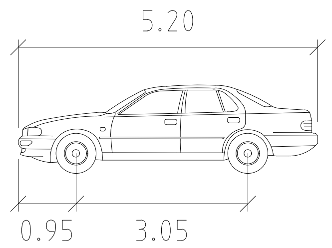
PROJECT
66 BURNETT STREET
APARTMENT
DEVELOPMENT

TITLE
TURNING PATH
ISUZU NQR 87-190
SHEET 2

PROJECT NO. J171177CH

DWG NO. SK04 REVISION P1

PLOT DETAILS BURNETT ST APARTMENTS SWEPT PATH.DWG



B99

	meters
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Lock to Lock Time	: 6.0
Steering Angle	: 33.9

SCALE 1:200

PRELIMINARY PRINT

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Approved Grant Atherton (Group Manager)	Date

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	CJM	MY
	PLOT DATE	23/05/2018

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PROJECT
66 BURNETT STREET APARTMENT DEVELOPMENT

TITLE
TURNING PATH PASSENGER VEHICLE

PROJECT NO. J171177CH

DWG NO. SK05

REVISION P1

PLOT DETAILS BURNETT ST APARTMENTS SWEPT PATH.DWG

PROPOSED RESIDENTIAL UNIT DEVELOPMENT

66 BURNETT ST
NORTH HOBART
FOR
HOBART PROPERTIES & SECURITIES PTY LTD

SIXTY SIX
NORTH HOBART

DRAWING SCHEDULE

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over

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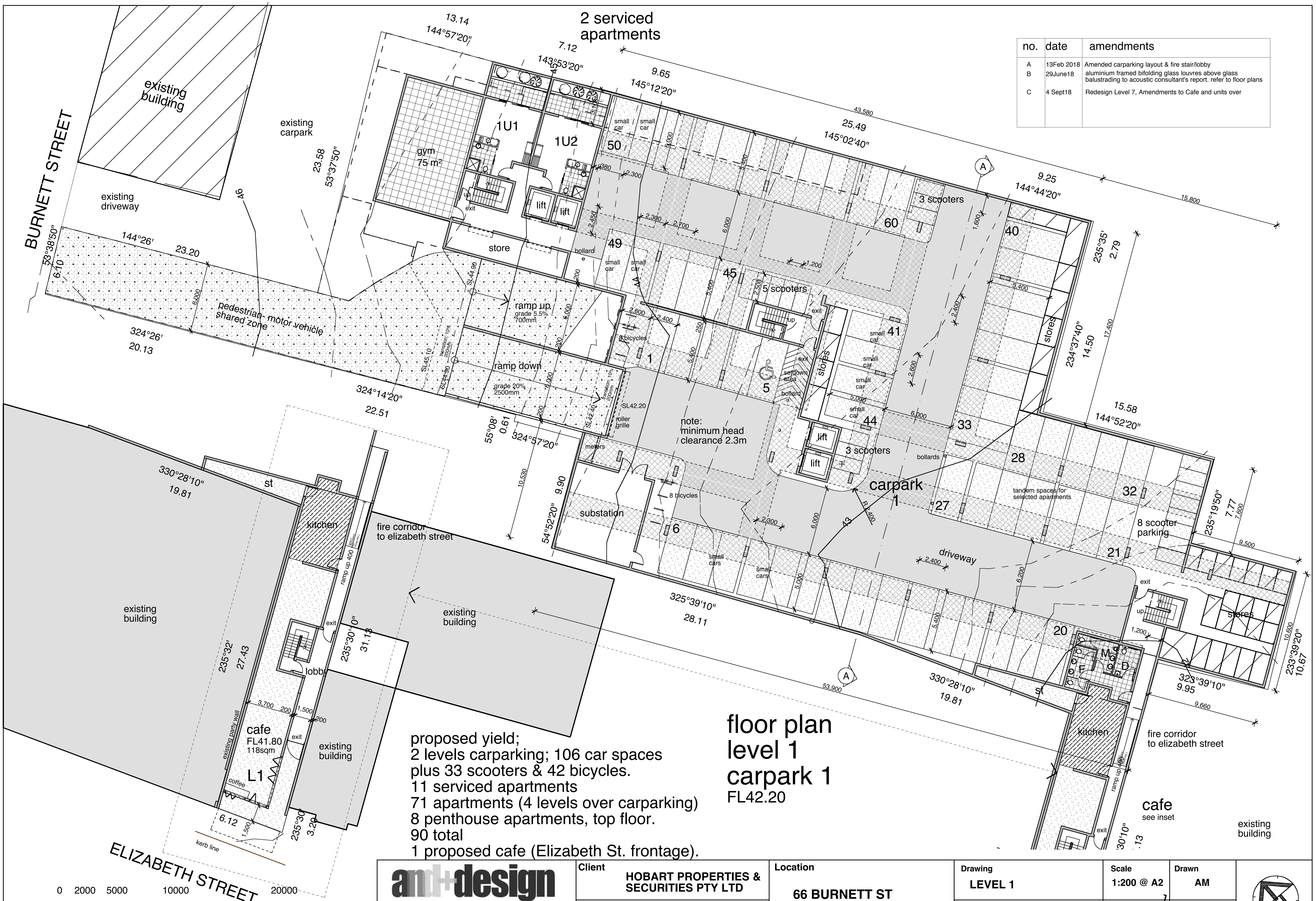

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proposed yield;
2 levels carparking; 106 car spaces
plus 33 scooters & 42 bicycles.
11 serviced apartments
71 apartments (4 levels over carparking)
8 penthouse apartments, top floor.
90 total
1 proposed cafe (Elizabeth St. frontage).

floor plan level 1 carpark 1

FL42.20

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Client	Location	Drawing	Scale	Drawn
HOBART PROPERTIES & SECURITIES PTY LTD	66 BURNETT ST NORTH HOBART	LEVEL 1	1:200 @ A2	AM
Project		**Drawing no.**	**Date**	**Page**
PROPOSED RESIDENTIAL UNIT DEVELOPMENT		20.0717.1.1C	AUG 2017	1.1C

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
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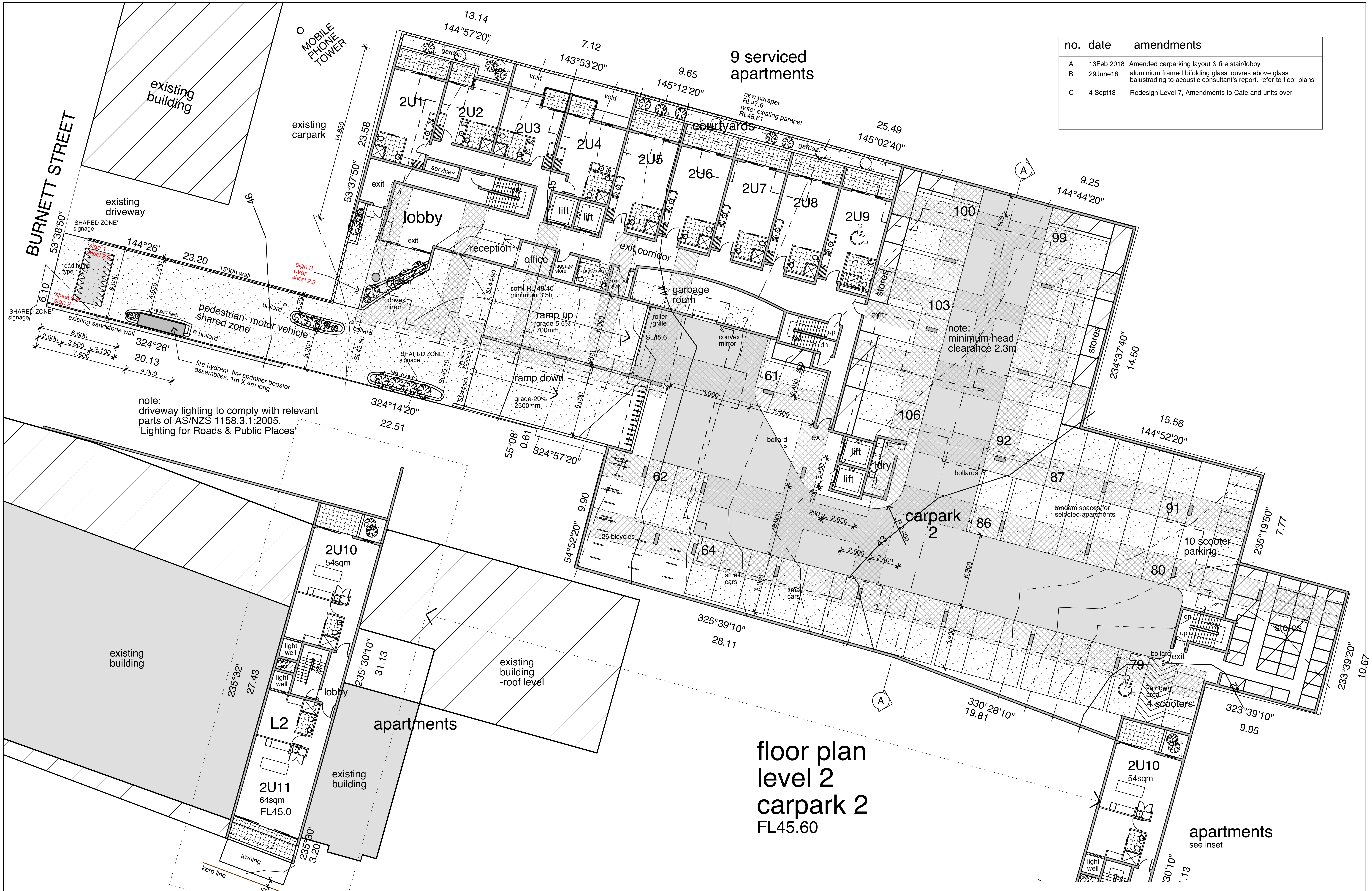

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Client	HOBART PROPERTIES & SECURITIES PTY LTD
Project	PROPOSED RESIDENTIAL UNIT DEVELOPMENT
Location	66 BURNETT ST NORTH HOBART
Drawing	LEVEL 2
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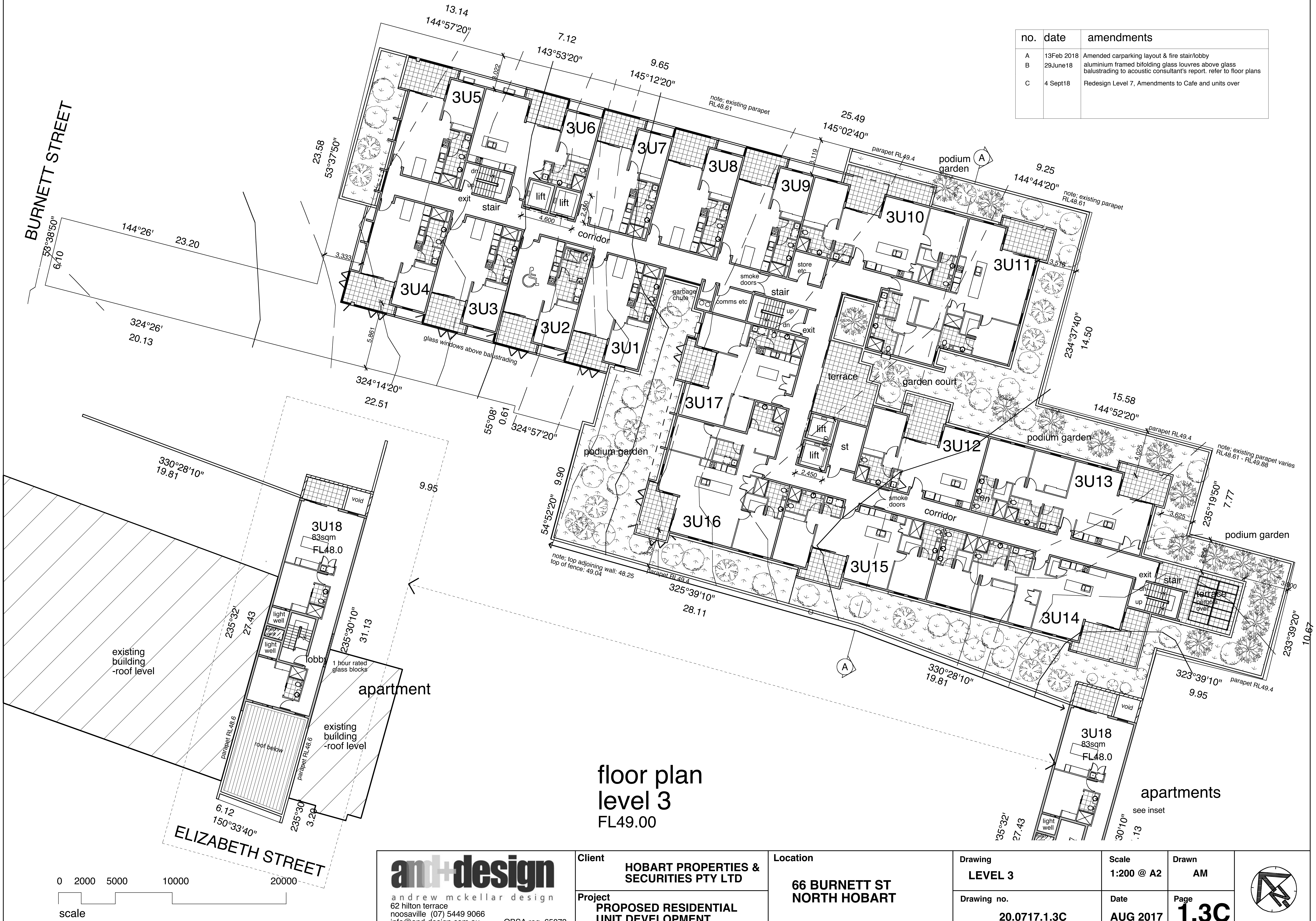
Scale	1:200 @ A2
Drawn	AM
Date	AUG 2017
Page	1.2C



no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over

floor plan level 3

FL49.00

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Client	HOBART PROPERTIES & SECURITIES PTY LTD
Project	PROPOSED RESIDENTIAL UNIT DEVELOPMENT
Location	66 BURNETT ST NORTH HOBART
Drawing	LEVEL 3
Drawing no.	20.0717.1.3C
Scale	1:200 @ A2
Drawn	AM
Date	AUG 2017
Page	1.3C

no.	date	amendments
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B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over

floor plan
level 4
FL51.80

0 2000 5000 10000 20000
scale

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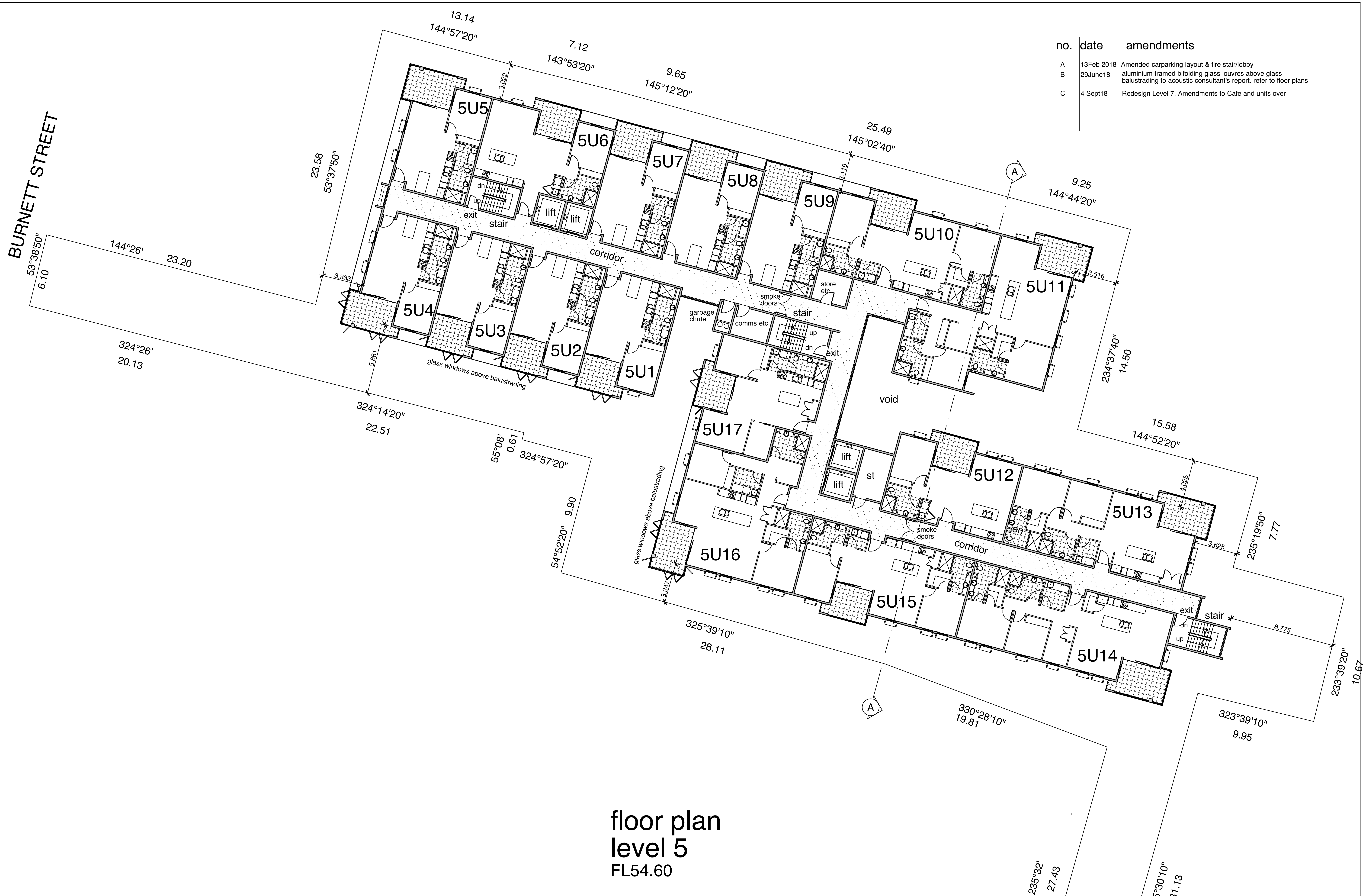
Client HOBART PROPERTIES & SECURITIES PTY LTD	**Location** 66 BURNETT ST NORTH HOBART	**Drawing** LEVEL 4	**Scale** 1:200 @ A2	**Drawn** AM	
Project PROPOSED RESIDENTIAL UNIT DEVELOPMENT		**Drawing no.** 20.0717.1.4C	**Date** AUG 2017	**Page** 1.4C	

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over



floor plan
level 5
FL54.60

0 2000 5000 10000 20000
scale

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Client	Location	Drawing	Scale	Drawn
HOBART PROPERTIES & SECURITIES PTY LTD	66 BURNETT ST NORTH HOBART	LEVEL 5	1:200 @ A2	AM
Project		Drawing no.	Date	Page
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no.	date	amendments
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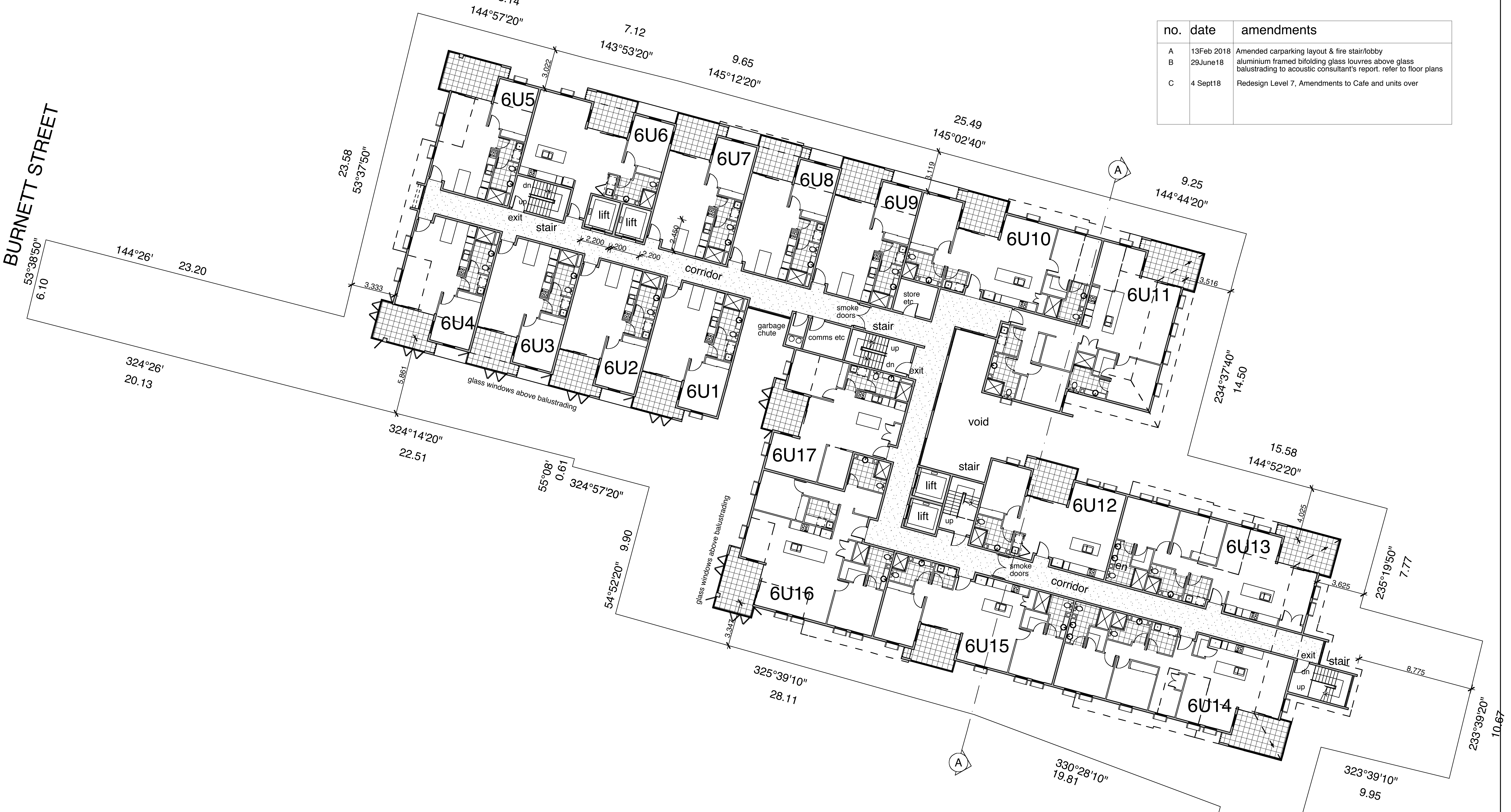

floor plan
level 6
FL57.40

0 2000 5000 10000 20000
scale

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Client
HOBART PROPERTIES & SECURITIES PTY LTD

Project
PROPOSED RESIDENTIAL UNIT DEVELOPMENT

Location
66 BURNETT ST
NORTH HOBART

Drawing
LEVEL 6

Drawing no.
20.0717.1.6C

Scale
1:200 @ A2

Date
AUG 2017

Drawn
AM

Page
1.6C

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
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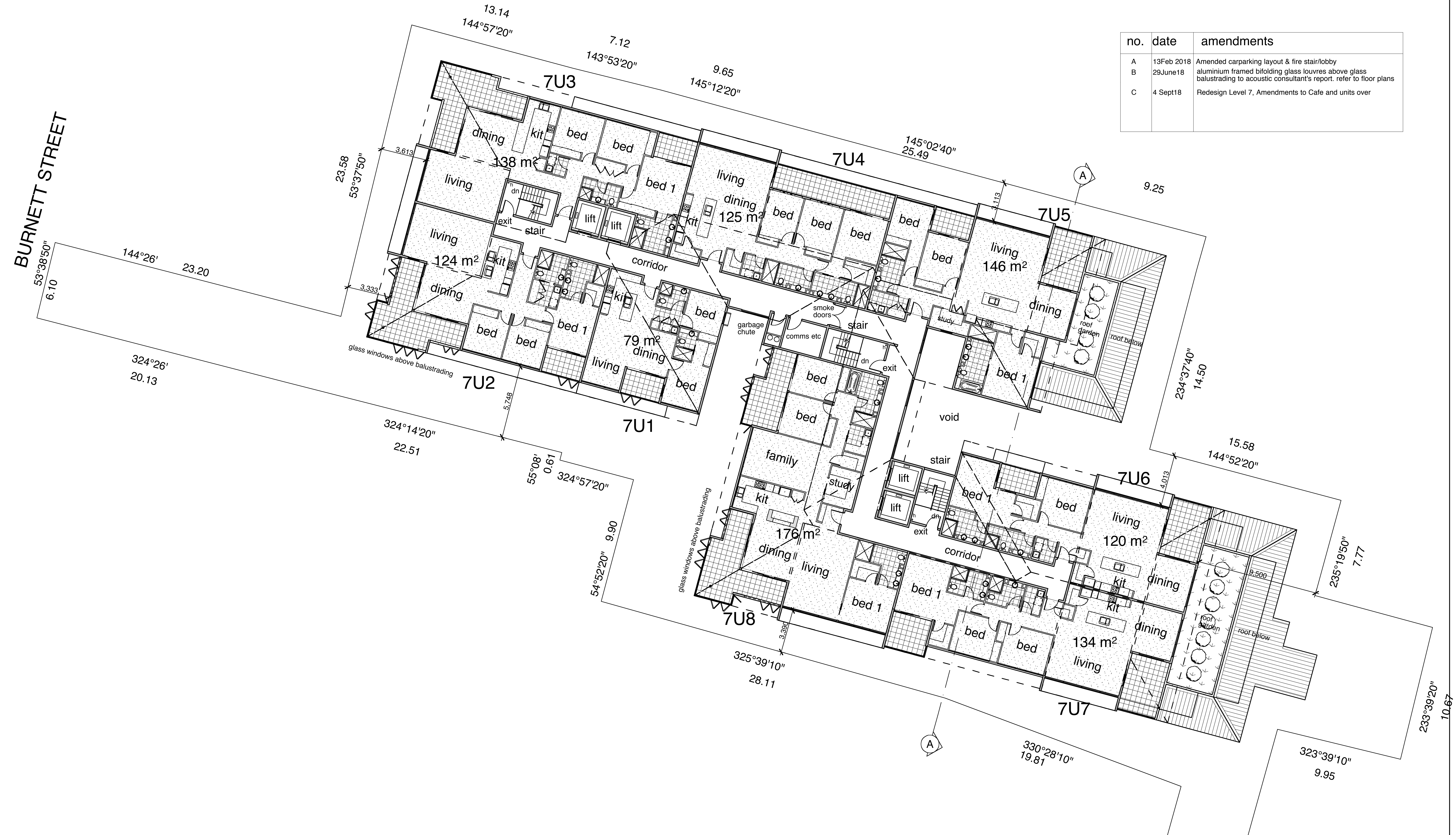

floor plan
level 7
FL59.60

0 2000 5000 10000 20000
scale

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Client	Location	Drawing	Scale	Drawn
HOBART PROPERTIES & SECURITIES PTY LTD	66 BURNETT ST NORTH HOBART	LEVEL 7	1:200 @ A2	AM
Project		**Drawing no.**	**Date**	**Page**
PROPOSED RESIDENTIAL UNIT DEVELOPMENT		20.0717.1.7C	AUG 2017	1.7C

no.	date	amendments
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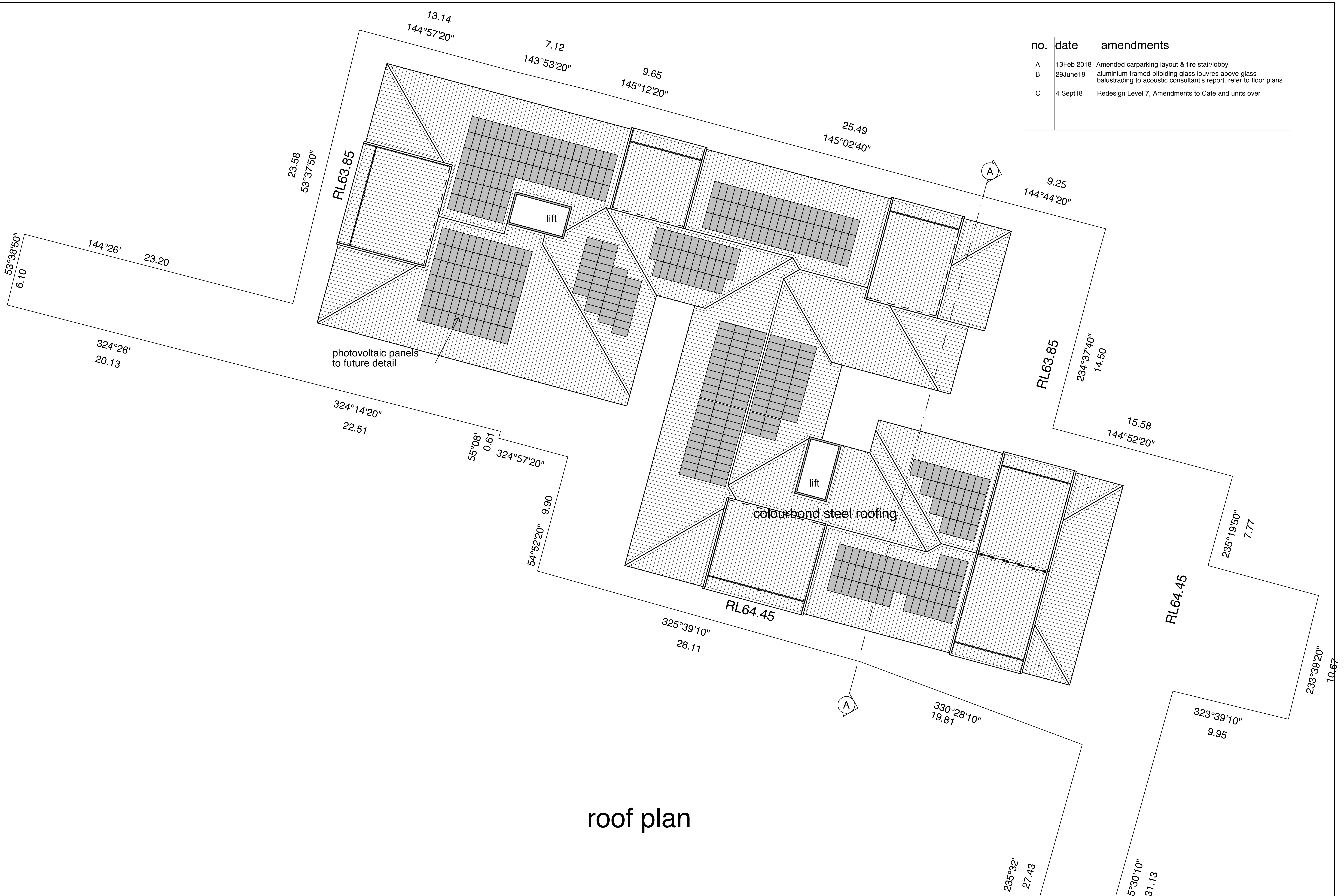

roof plan

0 2000 5000 10000 20000

scale

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Client	HOBART PROPERTIES & SECURITIES PTY LTD
Project	PROPOSED RESIDENTIAL UNIT DEVELOPMENT
Location	66 BURNETT ST NORTH HOBART
Drawing	ROOF PLAN
Drawing no.	20.0717.1.8C
Scale	1:200 @ A2
Drawn	AM
Date	AUG 2017
Page	1.8C

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
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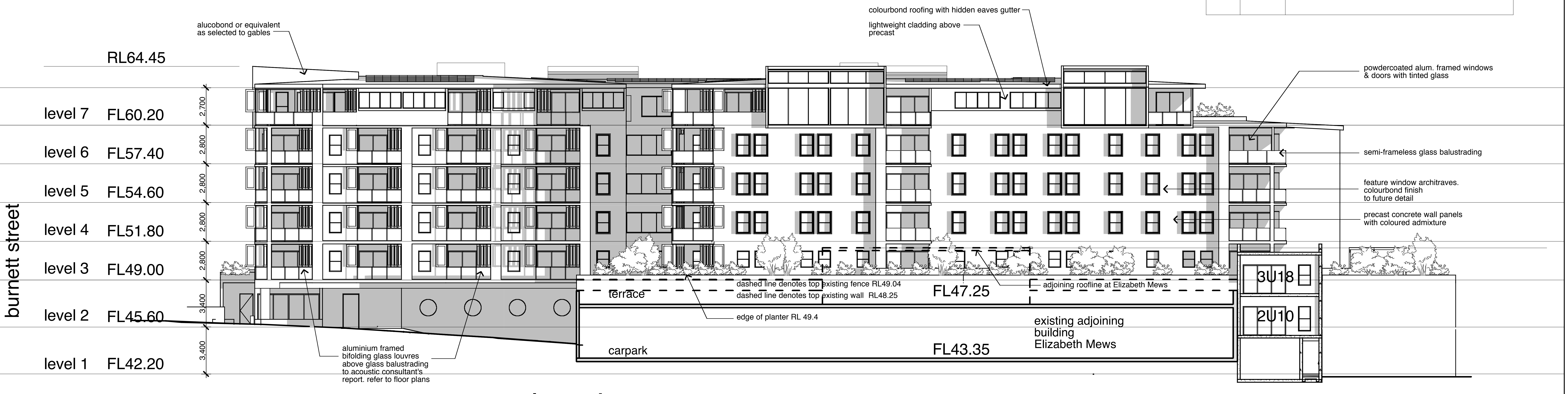
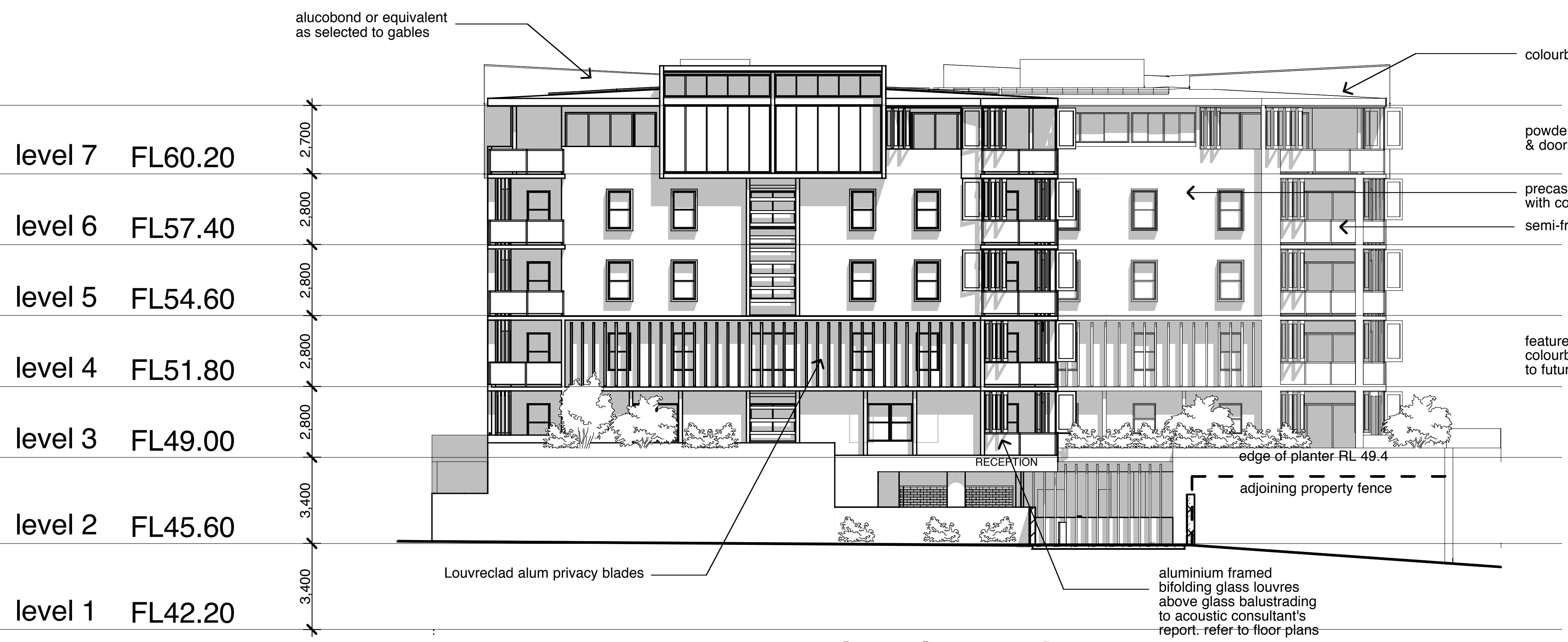
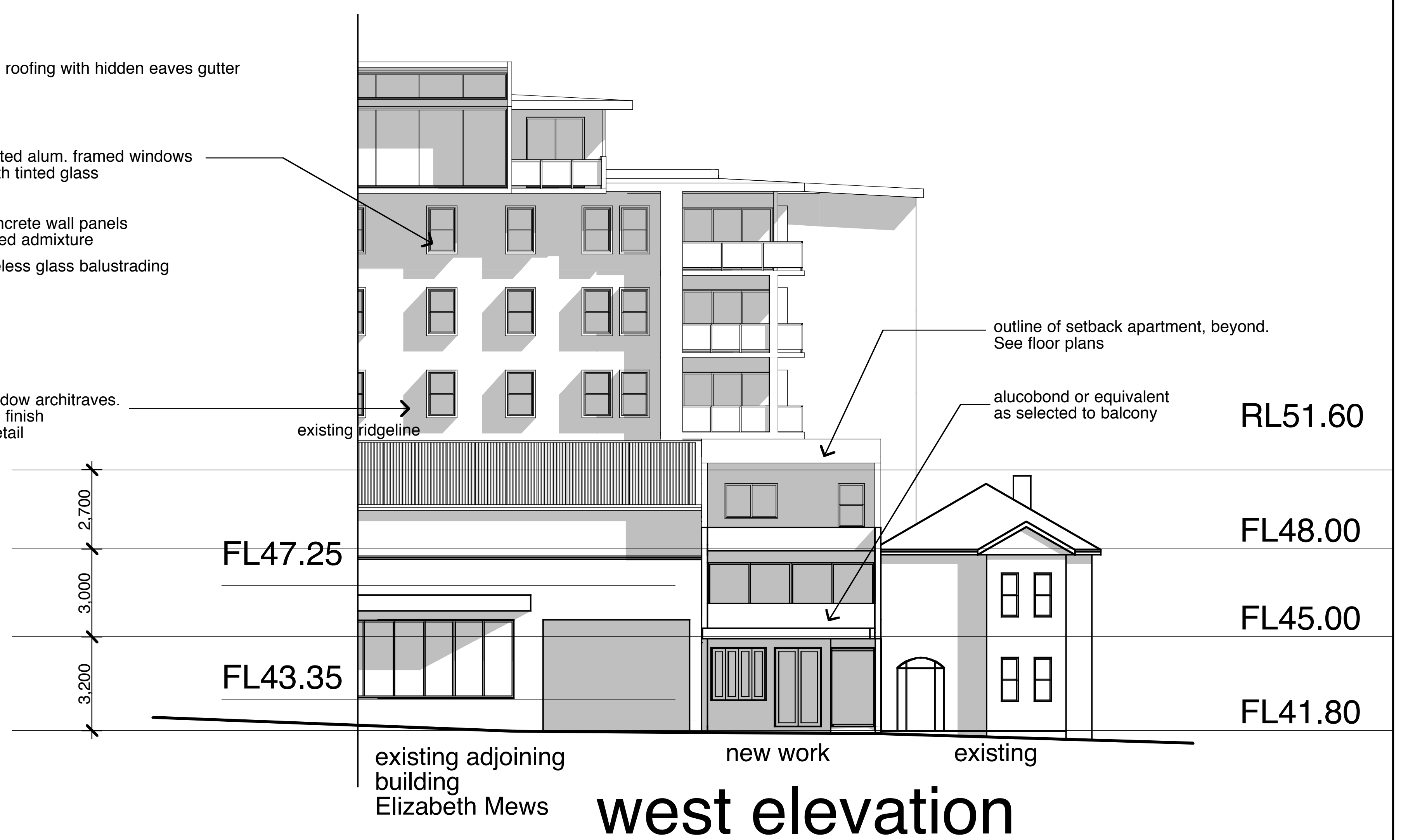


west elevation



north elevation



west elevation
elizabeth street

0 2000 5000 10000 20000
scale

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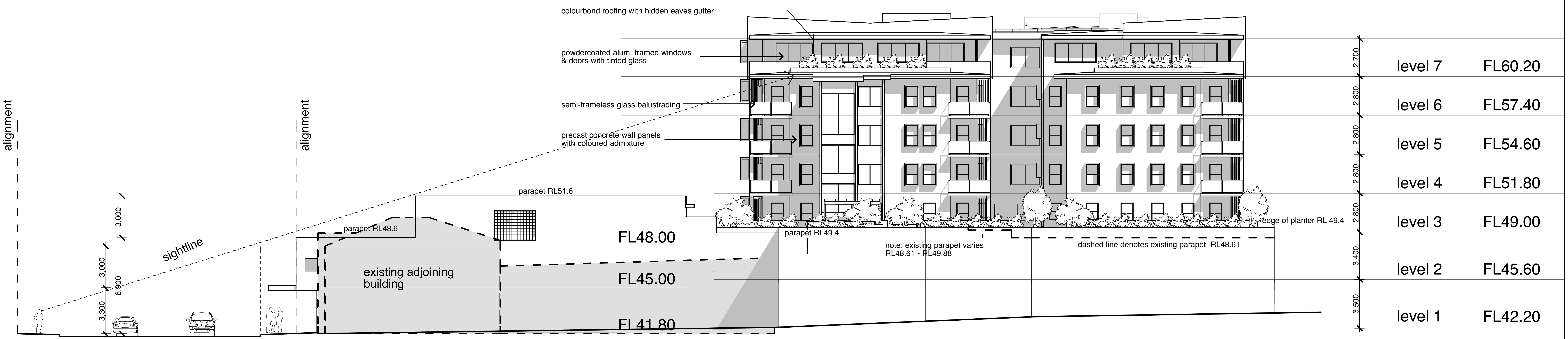
Client HOBART PROPERTIES & SECURITIES PTY LTD	**Location** 66 BURNETT ST NORTH HOBART	**Drawing** ELEVATIONS 1	**Scale** 1:200 @ A2	**Drawn** AM
Project PROPOSED RESIDENTIAL UNIT DEVELOPMENT		**Drawing no.** 20.0717.2.1C	**Date** AUG 2017	**Page** 2.1C

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over

east elevation



south elevation

0 2000 5000 10000 20000

scale

and+design
andrew mckellar design
62 hilton terrace
noosaville (07) 5449 9066
info@and-design.com.au QBSA reg. 65073

Client HOBART PROPERTIES & SECURITIES PTY LTD

Project PROPOSED RESIDENTIAL UNIT DEVELOPMENT

Location 66 BURNETT ST NORTH HOBART

Drawing ELEVATIONS 2

Drawing no. 20.0717.2.2C

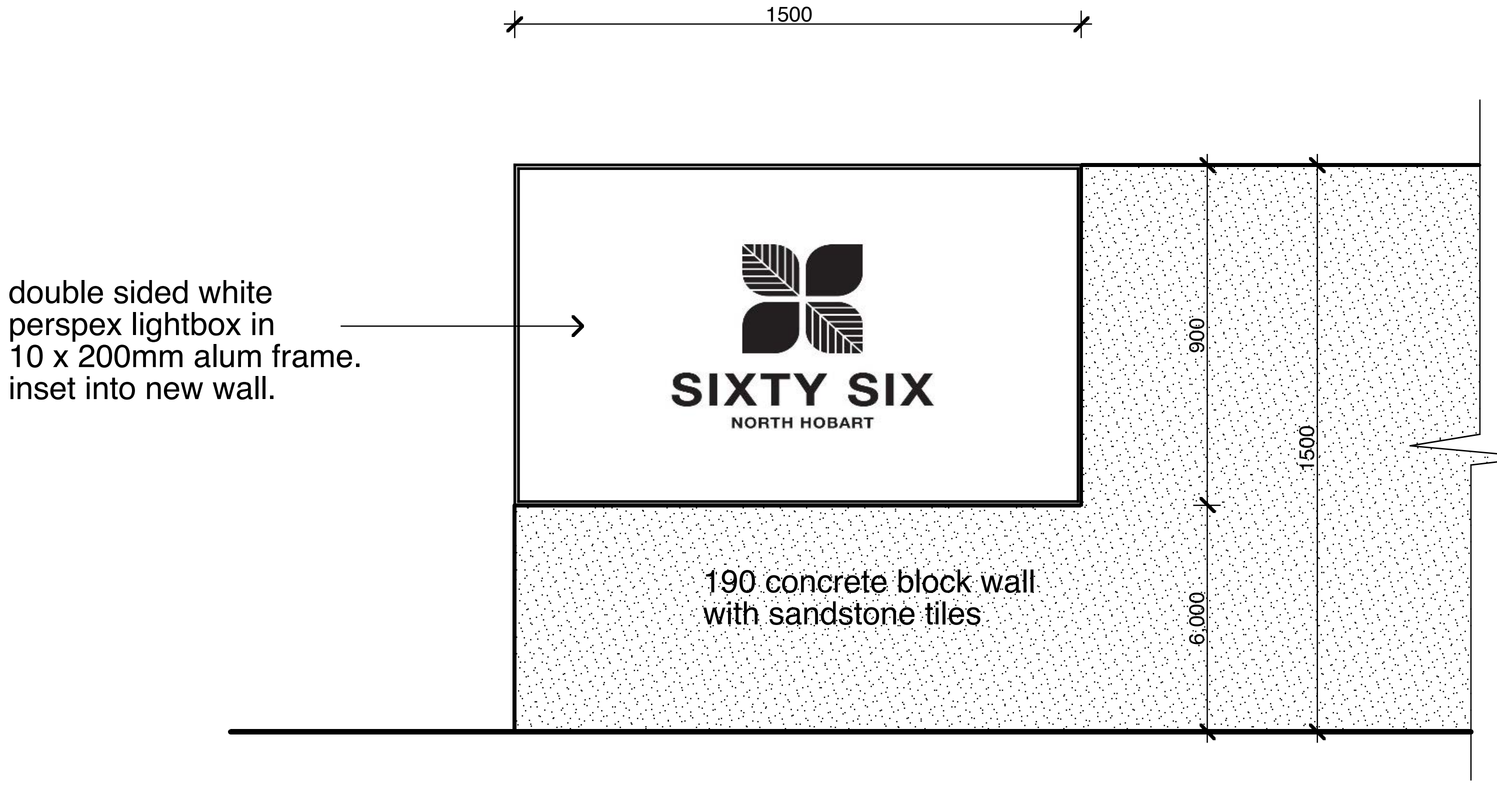
Scale 1:200 @ A2

Date AUG 2017

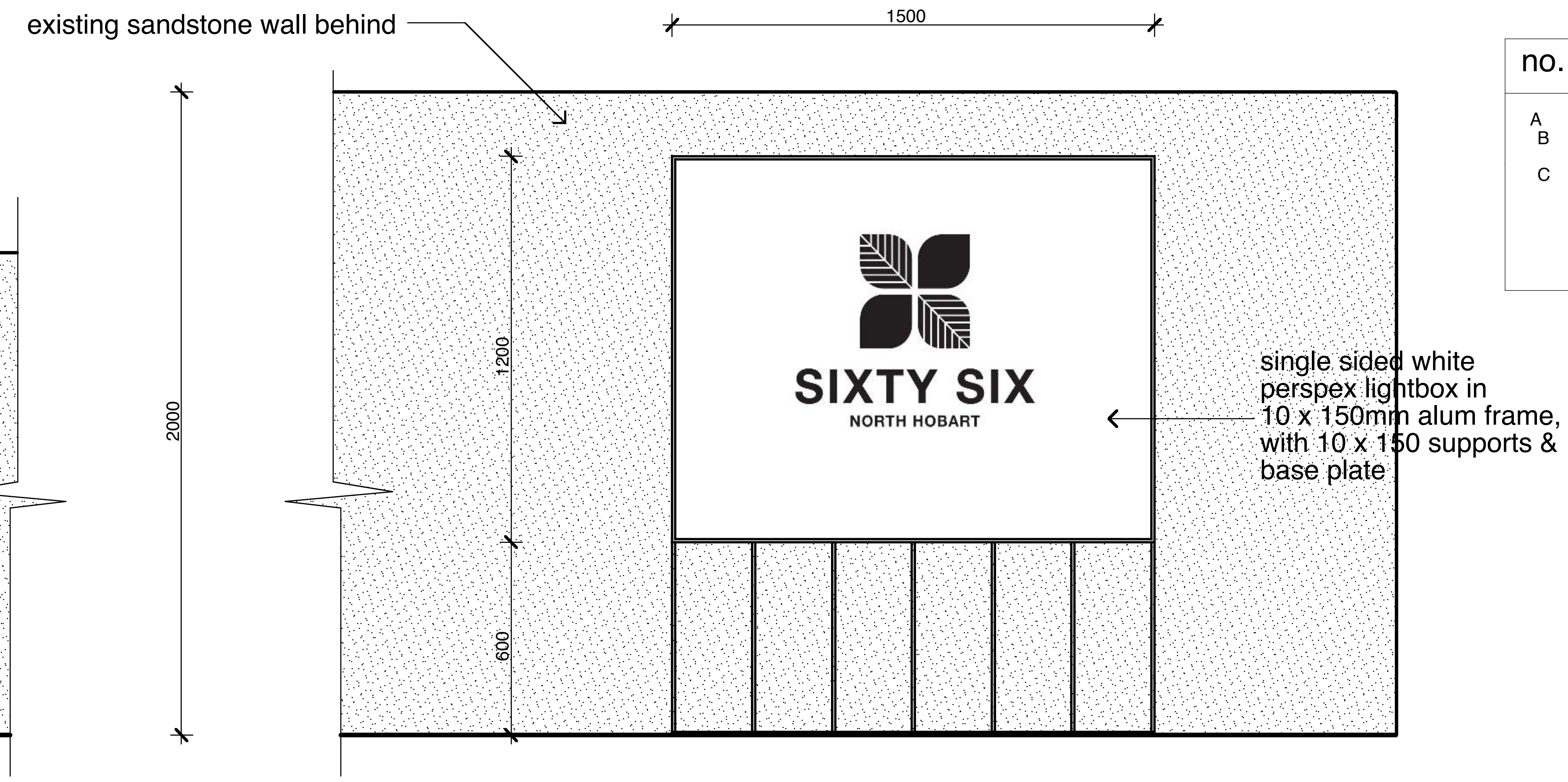
Drawn AM

Page 2.2C

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over



sign 1
at entry driveway;
see sheet 1.2
scale 1:20

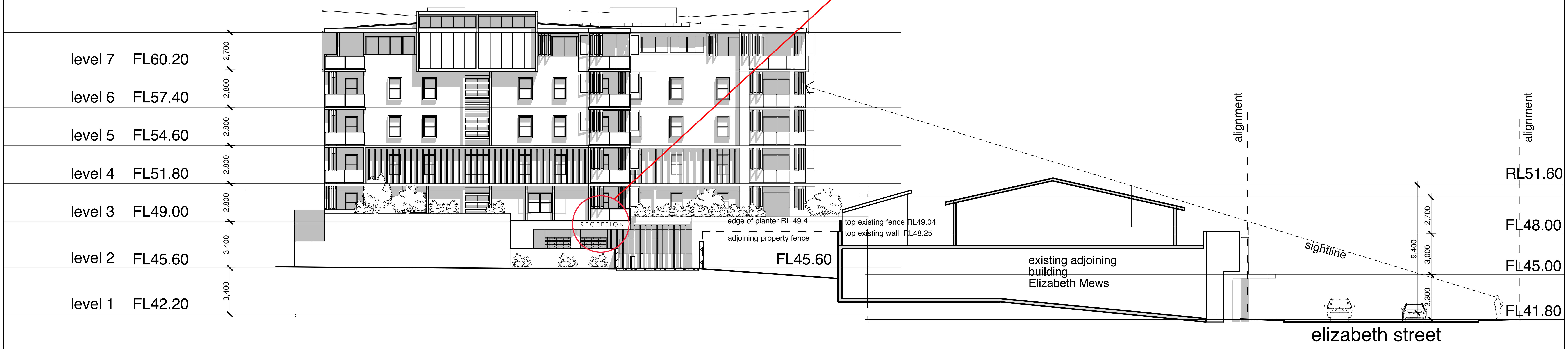


sign 2
at entry driveway;
see sheet 1.2
scale 1:20

RECEPTION

sign 3
NTS

individual letters ex 50x10, fixed to concrete facade



north elevation
elizabeth street building

0 2000 5000 10000 20000
scale

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andrew mckellar design
62 hilton terrace
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info@and-design.com.au
QBSA reg. 65073

Client: HOBART PROPERTIES & SECURITIES PTY LTD	Location: 66 BURNETT ST NORTH HOBART	Drawing: ELEVATIONS 3	Scale: 1:200 @ A2	Drawn: AM
Project: PROPOSED RESIDENTIAL UNIT DEVELOPMENT		Drawing no.: 20.0717.2.3C	Date: AUG 2017	Page: 2.3C

section A

no.	date	amendments
A	13Feb 2018	Amended carparking layout & fire stair/lobby
B	29June18	aluminium framed bifolding glass louvres above glass balustrading to acoustic consultant's report. refer to floor plans
C	4 Sept18	Redesign Level 7, Amendments to Cafe and units over

and+design andrew mckellar design 62 hilton terrace noosaville (07) 5449 9066 info@and-design.com.au QBSA reg. 65073	Client HOBART PROPERTIES & SECURITIES PTY LTD Project PROPOSED RESIDENTIAL UNIT DEVELOPMENT	Location 66 BURNETT ST NORTH HOBART	Drawing SECTION A Drawing no. 20.0717.1.3.1C	Drawn AM Date AUG 2017	Scale 1:100 @ A2 3.1C

Submission to Planning Authority Notice

Council Planning Permit No.	PLN-17-1066	Council notice date	2/01/2018
TasWater details			
TasWater Reference No.	TWDA 2018/00015-HCC	Date of response	28 Aug 2018
TasWater Contact	Greg Clausen	Phone No.	(03) 6237 8242
Response issued to			
Council name	HOBART CITY COUNCIL		
Contact details	coh@hobartcity.com.au		
Development details			
Address	66 BURNETT ST, NORTH HOBART	Property ID (PID)	5658573
Description of development	mixed-use residential and visitor apartments, cafe/bar/restaurant		

Schedule of drawings/documents

Prepared by	Drawing/document No.	Rev No.	Date of Issue
And+design	Level 1		
TasWater	Infrastructure Plan - Works External to the Development		6 July 2018
TasWater	Infrastructure Plan - Connections		28 Aug 2018

Conditions

Pursuant to the *Water and Sewerage Industry Act* 2008 (TAS) Section 56P(1) TasWater imposes the following conditions on the permit for this application:

CONNECTIONS, METERING & BACKFLOW

1. The water connections must be made to the DN250 water main in Burnett Street. The sewerage connection must be made to the DN150 sewerage main in Elizabeth Street.
2. Suitably sized water supply with metered connections / sewerage system and connections to each dwelling unit / lot of the development must be designed and constructed to TasWater's satisfaction and be in accordance with any other conditions in this permit.

   Advice*: TasWater will not accept direct fire boosting from the network unless it can be demonstrated that the periodic testing of the system will not have a significant negative effect on our network and the minimum service requirements of other customers serviced by the network. To this end break tanks may be required with the rate of flow into the break tank controlled so that peak flows to fill the tank do not also cause negative effect on the network.*
3. Any removal/supply and installation of water meters and/or the removal of redundant and/or installation of new and modified property service connections must be carried out by TasWater at the developer's cost.
4. Prior to commencing construction of the development, any water connection utilised for construction must have a backflow prevention device and water meter installed, to the satisfaction of TasWater.

WORKS EXTERNAL TO THE DEVELOPMENT

5. Prior to submitting an application for Certificate(s) for Certifiable Work (Building and/or Plumbing), a Permit to Construct works external to the development to upsize the sewerage mains A452203 and A454623 to DN225 as shown on the attached plan 'Infrastructure Plan - Works External to the Development' must have been issued.

   Advice*: TasWater sewerage system modelling shows that two (2) of four (4) lengths of DN150* *sewerage main downsteam of the development will be hydraulically overloaded as a consequence of the development.*

6. Plans submitted with the application for Certificate(s) for Certifiable Work (Building and/or Plumbing) must, to the satisfaction of TasWater show, all existing, redundant and/or proposed property services and mains.
7. Prior to applying for a Permit to Construct works external to the development, the developer must obtain from TasWater Engineering Design Approval for new TasWater infrastructure. The application for Engineering Design Approval must include engineering design plans prepared by a Registered Profession Engineer showing the hydraulic servicing requirements for water and sewerage to TasWater's satisfaction.
8. Prior to works commencing, a Permit to Construct must be applied for and issued by TasWater. All infrastructure works must be inspected by TasWater and be to TasWater's satisfaction.
9. In addition to any other conditions in this permit, all works must be constructed under the supervision of a suitably qualified person in accordance with TasWater's requirements.
10. Prior to the issue of a Certificate of Water and sewerage Compliance (Building and/or Plumbing), Certificates of Practical Completion for all identified works external to the development must have been issued at the expense of the developer to the satisfaction of TasWater.
11. At practical completion of the water and sewerage works and prior to applying to TasWater for a Certificate of Water and Sewerage Compliance (Building and/or Plumbing), the developer must obtain a Certificate of Practical Completion from TasWater for the works that will be transferred to TasWater. To obtain a Certificate of Practical Completion:
    a. Written confirmation from the supervising suitably qualified person certifying that the works have been constructed in accordance with the TasWater approved plans and specifications and that the appropriate level of workmanship has been achieved;
    b. A request for a joint on-site inspection with TasWater's authorised representative must be made;
    c. Security for the twelve (12) month defects liability period to the value of 10% of the works must be lodged with TasWater. This security must be in the form of a bank guarantee;
    d. As constructed drawings must be prepared by a suitably qualified person to TasWater's satisfaction and forwarded to TasWater.
12. After the Certificate of Practical Completion has been issued, a 12 month defects liability period applies to this infrastructure. During this period all defects must be rectified at the developer's cost and to the satisfaction of TasWater. A further 12 month defects liability period may be applied to defects after rectification. TasWater may, at its discretion, undertake rectification of any defects at the developer's cost. Upon completion, of the defects liability period the developer must request TasWater to issue a "Certificate of Final Acceptance". The newly constructed infrastructure will be transferred to TasWater upon issue of this certificate and TasWater will release any security held for the defects liability period.
13. The developer must take all precautions to protect existing TasWater infrastructure. Any damage caused to existing TasWater infrastructure during the construction period must be promptly reported to TasWater and repaired by TasWater at the developer's cost.
14. Ground levels over the TasWater assets and/or easements must not be altered without the written approval of TasWater.
15. A construction management plan must be submitted with the application for TasWater Engineering Design Approval. The construction management plan must detail how the new TasWater infrastructure will be constructed while maintaining current levels of services provided by TasWater to the community. The construction plan must also include a risk assessment and contingency plans covering major risks to TasWater during any works. The construction plan must be to the

satisfaction of TasWater prior to TasWater's Engineering Design Approval being issued.

TRADE WASTE

16. Prior to the commencement of operation the developer/property owner must obtain Consent to discharge Trade Waste from TasWater.
17. The developer must install appropriately sized and suitable pre-treatment devices prior to gaining Consent to discharge.
18. The Developer/property owner must comply with all TasWater conditions prescribed in the Trade Waste Consent

BOUNDARY TRAP AREA

19. The proposed development is within a boundary trap area and the developer must provide a boundary trap that prevents noxious gases or persistent odours back venting into the property's sanitary drain. The boundary trap must be contained within the property boundaries and the property owner remains responsible for the ownership, operation and maintenance of the boundary trap.

DEVELOPMENT ASSESSMENT FEES

20. The applicant or landowner as the case may be, must pay a development assessment fee of $1,139.79 to TasWater, as approved by the Economic Regulator and the fees will be indexed, until the date they are paid to TasWater. The payment is required within 30 days of the issue of an invoice by TasWater.

Advice

General

For information on TasWater development standards, please visit http://www.taswater.com.au/Development/Development-Standards

For application forms please visit http://www.taswater.com.au/Development/Forms

Service Locations

Please note that the developer is responsible for arranging to locate the existing TasWater infrastructure and clearly showing it on the drawings. Existing TasWater infrastructure may be located by a surveyor and/or a private contractor engaged at the developers cost to locate the infrastructure.

A copy of the GIS is included in email with this notice and should aid in updating of the documentation. The location of this infrastructure as shown on the GIS is indicative only.

- A permit is required to work within TasWater's easements or in the vicinity of its infrastructure. Further information can be obtained from TasWater
- TasWater has listed a number of service providers who can provide asset detection and location services should you require it. Visit www.taswater.com.au/Development/Service-location for a list of companies
- TasWater will locate residential water stop taps free of charge
- Sewer drainage plans or Inspection Openings (IO) for residential properties are available from your local council.

Advice to Planning Authority (Council) and developer on fire coverage

TasWater cannot provide a supply of water for the purposes of firefighting to the lots on the plan.

Trade Waste

Prior to any Building and/or Plumbing work being undertaken, the applicant will need to make an application to TasWater for a Certificate for Certifiable Work (Building and/or Plumbing). The Certificate for Certifiable Work (Building and/or Plumbing) must accompany all documentation submitted to Council.

Documentation must include a floor and site plan with:

- Location of all pre-treatment devices i.e. Oil Water Separator;
- Schematic drawings and specification (including the size and type) of any proposed pre-treatment device and drainage design; and
- Location of an accessible sampling point in accordance with the TasWater Trade Waste Flow Meter and Sampling Specifications for sampling discharge.
- Details of the proposed use of the premises, including the types of food that will be prepared and served; and
- The estimated number of patrons and/or meals on a daily basis.

At the time of submitting the Certificate for Certifiable Work (Building and/or Plumbing) a Trade Waste Application form is also required.

If the nature of the business changes or the business is sold, TasWater is required to be informed in order to review the pre-treatment assessment.

The application forms are available at http://www.taswater.com.au/Customers/Liquid-Trade-Waste/Commercial.

Declaration

The drawings/documents and conditions stated above constitute TasWater's Submission to Planning Authority Notice.

Authorised by

Jason Taylor
Development Assessment Manager

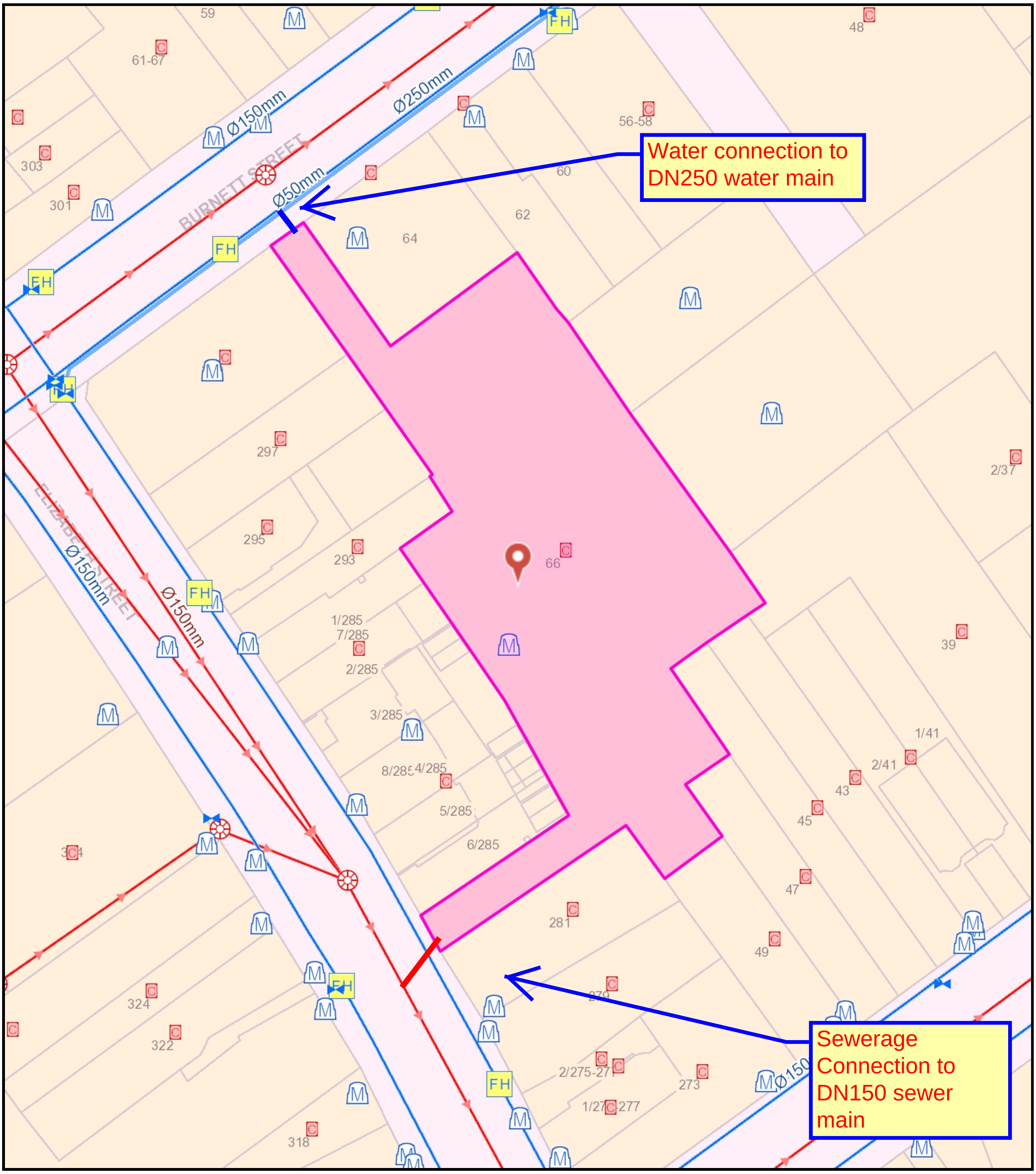
TasWater Contact Details

Phone	13 6992	Email	development@taswater.com.au
Mail	GPO Box 1393 Hobart TAS 7001	Web	www.taswater.com.au

taswater

INFRASTRUCTURE PLAN

28/8/2018



TasWater Infrastructure
- Water Reticulation Main
- Stormwater Rising Main
- Stormwater Gravity Reticulation Main
- Sewer Pressure Reticulation Main
- Sewer Rising Main
- Sewer Gravity Reticulation Main
- Recycled Water Distribution Main

Private Infrastructure
- Water Mains - Private
- Stormwater Gravity Main - Private
- Sewer Pressurised Mains - Private
- Sewer Gravity Mains - Private
- Recycled Water Mains - Private

Abandoned Infrastructure
- Water Abandoned Line
- Sewer Abandoned Line
- Recycled Water Abandoned Line

1: 800

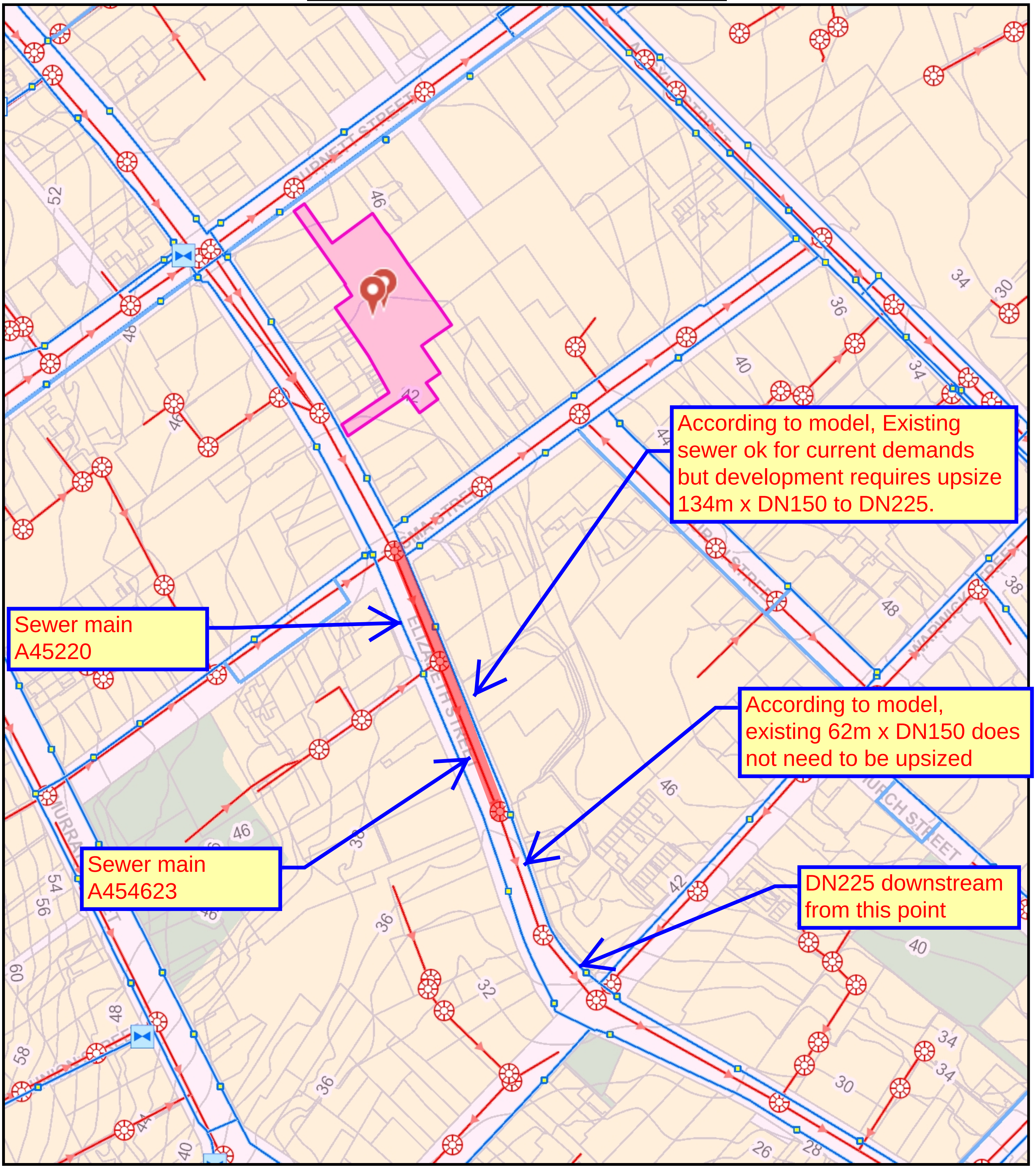
40.64 Meters 0 20.32 40.64

NOTE: The representation of the TasWater assets shown on this map was derived from data supplied by TasWater. TasWater makes no representation as to the accuracy or completeness of the assets shown on this map.

taswater

INFRASTRUCTURE PLAN - WORKS EXTERNAL TO THE DEVELOPMENT

6/7/2018



TasWater Infrastructure

- Water Reticulation Main
- Stormwater Rising Main
- Stormwater Gravity Reticulation Main
- Sewer Pressure Reticulation Main
- Sewer Rising Main
- Sewer Gravity Reticulation Main
- Recycled Water Distribution Main

Private Infrastructure

- Water Mains - Private
- Stormwater Gravity Main - Private
- Sewer Gravity Mains - Private
- Recycled Water Mains - Private

Abandoned Infrastructure

- Water Abandoned Line
- Sewer Abandoned Line
- Recycled Water Abandoned Line

N

1: 2,500

127.00 Meters 0 63.50 127.00

NOTE: The representation of the TasWater assets shown on this map was derived from data supplied by TasWater. TasWater makes no representation as to the accuracy or completeness of the assets shown on this map.