BGAS 175-179 Campbell Street
Multi-Residential Development

ARCHITECT

ACCREDITED DESIGNER
PETER WALKER

ACCREDITATION №
CC2143E

ARCHITECT ADDRESS
HOBART Suite 2, Level 2, 147 Macquarie Street Hobart, TAS 7000 +61(3) 6231 4841

PROJECT INFOMATION

PROJECT №
J20823

PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

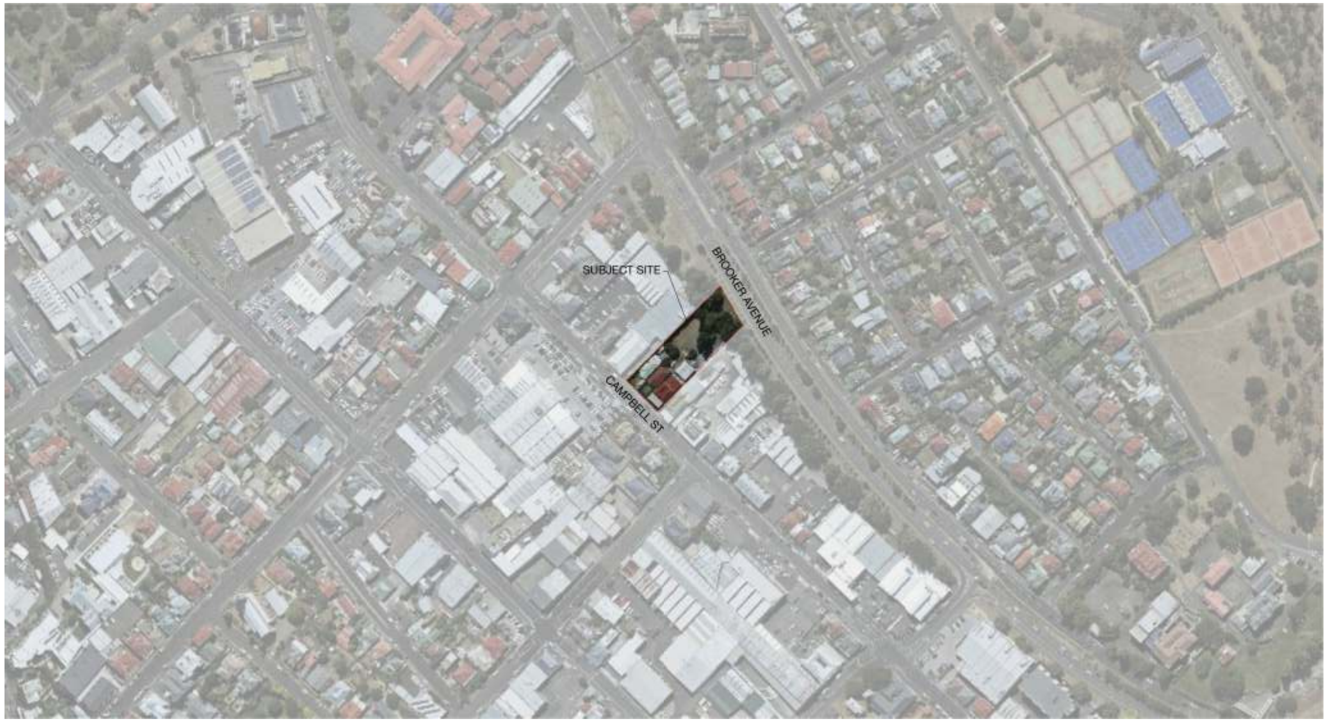
PLACE NAME
NIPALUNA

DETAILS

NCC CLASSIFCATION	2
CONSTRUCTION TYPE	A
TITLE REFERENCE	D 23363/1, 23364/1, 23364/2, SP 22529/1, SP 22529/2
DESIGN WIND SPEED	REFER ENG
SOIL CLASS	REFER ENG
CLIMATE ZONE	7
BAL RATING	N/A
ALPINE AREA	N/A
CORROSION LEVEL	N/A

SK DRAWING LIST

No	Drawing Name	Rev	Date
A-000	COVER PAGE	DA07	13/1/22, 11:39 am
A-001	SITE PLAN	DA05	23/11/21, 3:02 pm
A-002	DEMO PLAN - GROUND	DA06	13/1/22, 11:39 am
A-100	PLAN - BASEMENT	DA06	13/1/22, 11:39 am
A-101	PLAN - GROUND	DA06	14/12/21, 11:54 ...
A-102	PLAN - LEVEL 01	DA05	23/11/21, 3:02 pm
A-103	PLAN - LEVEL 02	DA05	23/11/21, 3:02 pm
A-104	PLAN - LEVEL 03	DA05	23/11/21, 3:02 pm
A-105	PLAN - LEVEL 04	DA05	23/11/21, 3:02 pm
A-106	PLAN - LEVEL 05	DA05	23/11/21, 3:02 pm
A-300	STREET ELEVATIONS	DA05	23/11/21, 3:02 pm
A-301	ELEVATIONS	DA05	23/11/21, 3:02 pm
A-302	ELEVATIONS	DA04	18/11/21, 3:24 pm
A-400	SECTIONS	DA05	23/11/21, 3:02 pm
A-500	MATERIALS SCHEDULE	DA04	23/11/21, 3:02 pm
A-600	MAR/SEP 22ND - 9AM	DA05	23/11/21, 3:02 pm
A-601	MAR/SEP 22ND - 12PM	DA05	23/11/21, 3:02 pm
A-602	MAR/SEP 22ND - 3PM	DA05	23/11/21, 3:02 pm
A-603	JUNE 22ND - 9AM	DA05	23/11/21, 3:02 pm
A-604	JUNE 22ND - 12PM	DA05	23/11/21, 3:02 pm
A-605	JUNE 22ND - 3PM	DA05	23/11/21, 3:02 pm
A-606	DEC 22ND - 9AM	DA05	23/11/21, 3:02 pm
A-607	DEC 22ND - 12PM	DA05	23/11/21, 3:02 pm
A-608	DEC 22ND - 3PM	DA05	23/11/21, 3:02 pm
A-700	PERSPECTIVES	DA05	23/11/21, 3:02 pm



LOCATION PLAN - NTS

APARTMENT AREAS - NLA

Level	Apartment Number	Area (m2)	Notes
GROUND FLOOR			
	G01	52.49	LEVEL 1 of 2
	G02	52.30	LEVEL 1 of 2
	G03	51.11	LEVEL 1 of 2
	G04	51.11	LEVEL 1 of 2
	G05	51.11	LEVEL 1 of 2
	G06	70.18	
	G07	64.83	
	G08	64.83	
	G09	64.83	
LEVEL 01			
	101	57.27	
	102	57.27	
	103	57.27	
	104	65.66	
	105	65.70	
	106	65.66	
	107	65.67	
	108	70.18	
	G01	57.74	LEVEL 2 of 2
	G02	57.82	LEVEL 2 of 2
	G03	53.84	LEVEL 2 of 2
	G04	53.17	LEVEL 2 of 2
	G05	53.16	LEVEL 2 of 2
LEVEL 02			
	201	57.27	LEVEL 1 of 2
	202	57.23	LEVEL 1 of 2
	203	57.27	LEVEL 1 of 2
	204	111.57	
	205	74.76	
	206	67.06	
	207	70.18	
	208	70.63	LEVEL 1 of 2
	209	70.63	LEVEL 1 of 2
	210	70.63	LEVEL 1 of 2
	211	70.51	LEVEL 1 of 2
LEVEL 03			
	201	59.67	LEVEL 2 of 2
	202	59.66	LEVEL 2 of 2
	203	59.97	LEVEL 2 of 2
	208	60.12	LEVEL 2 of 2
	209	60.12	LEVEL 2 of 2
	210	60.12	LEVEL 2 of 2
	211	60.12	LEVEL 2 of 2
	301	81.20	LEVEL 1 of 2
	302	54.90	LEVEL 1 of 2
	303	65.13	LEVEL 1 of 2
LEVEL 04			
	301	44.70	LEVEL 2 of 2
	302	62.63	LEVEL 2 of 2
	303	65.07	LEVEL 2 of 2
		2,874.35 m²	

APARTMENT SUMMARY

APARTMENT TYPE	QTY
1 BED	3
1 BED (SDA)	3
2 BED	9
3 BED	7
SKYHOME	4
TOWNHOUSE	5
	31

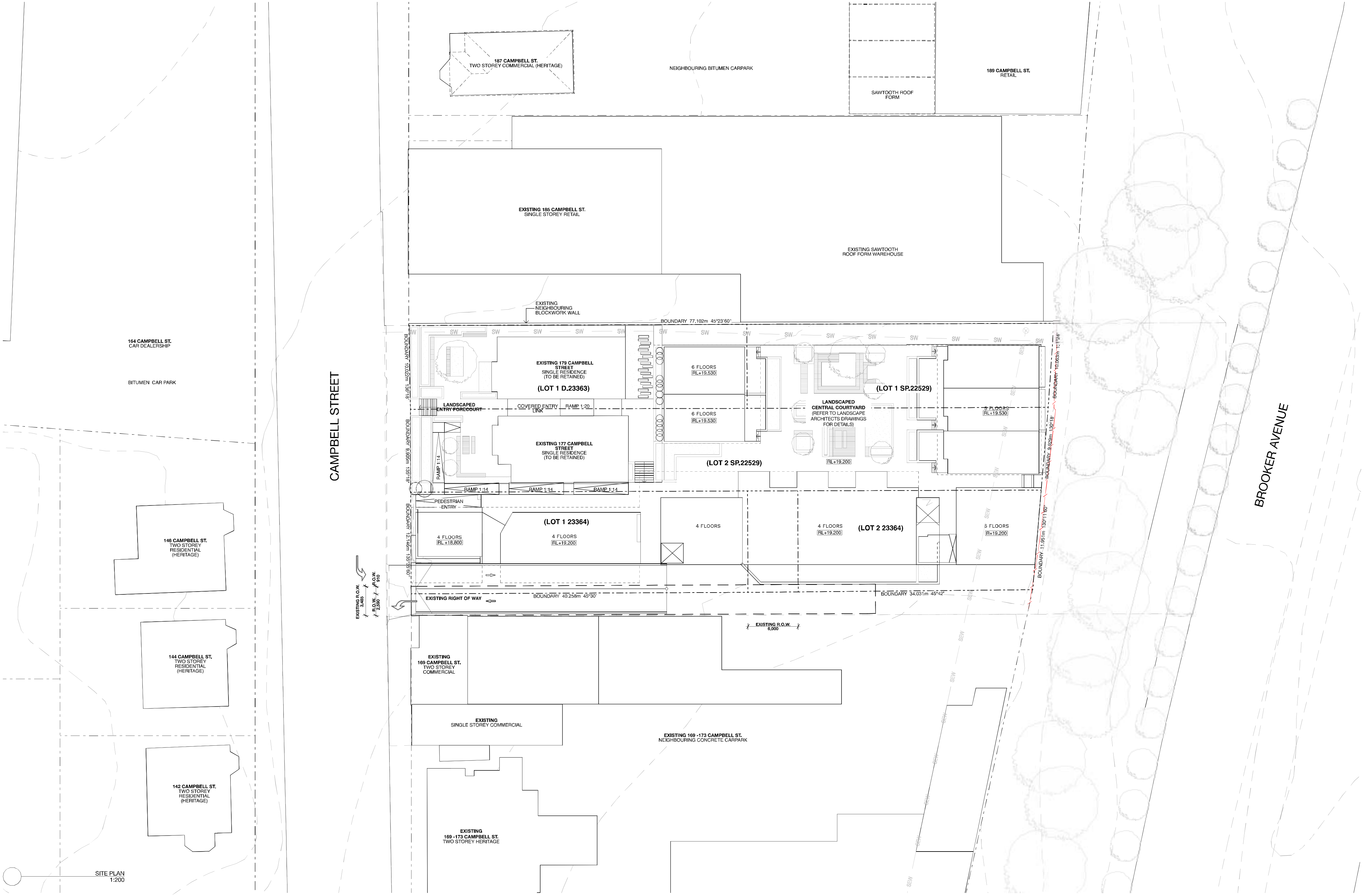
CARPARKING

RESIDENTIAL CARPARKS = 35

TOTAL CARPARKS = 35

13/1/22

MU
CU LUS



CUMULUS EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0930

MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9521 4518

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1060

THESE DRAWINGS SHOW DESIGN INTENT & ARE SUITABLE AS A GUIDE ONLY. DO NOT SCALE OFF THE DRAWINGS. ALL DIMENSIONS IN MILLIMETRES. DIMENSIONS OF EXISTING BUILDINGS ARE INDICATIVE ONLY - THEY SHOULD NOT BE RELIED ON AND ARE TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. ALL DOCUMENTS SHALL BE READ IN CONJUNCTION WITH SPECIFICATIONS AND ANY CONSULTANTS DETAIL. ALL WORK SHALL BE IN ACCORDANCE WITH THE NATIONAL CONSTRUCTION CODE, RELEVANT AUSTRALIAN STANDARDS & LOCAL AUTHORITY BY-LAWS AND REGULATIONS. ANY DISCREPANCIES, ERRORS OR OMISSIONS SHALL BE REFERRED TO THE ARCHITECTS. DRAWINGS ARE NOT TO BE USED FOR CONSTRUCTION UNTIL ISSUED CONSTRUCTION.

PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

N

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

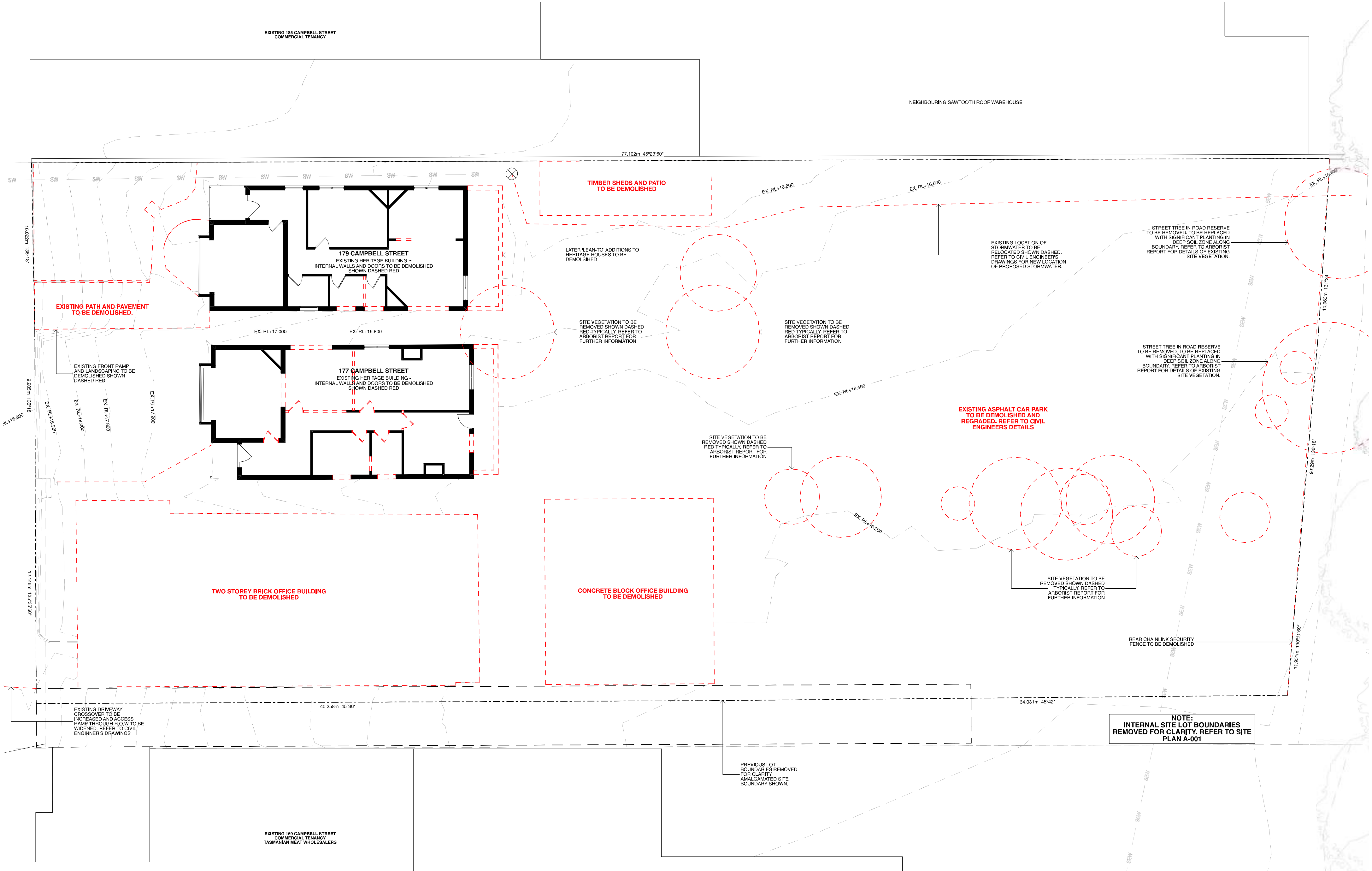
DRAWING TITLE
SITE PLAN

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY: AF, TB
CHECKED BY: PW, KW

DATE: 13/1/22
ORIGINAL SIZE: A1

DRAWING №: J20823-A-001
REVISION: DA05



DEMOLITION - GROUND FLOOR
1:100

CUMULUS EST 2011

REV	DATE	PURPOSE
DA06	13/1/22	COUNCIL RFI

CUMULUS STUDIO PTY LTD

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HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
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BGAS 175-179 Campbell Street
Multi-Residential Development

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PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
DEMO PLAN - GROUND

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

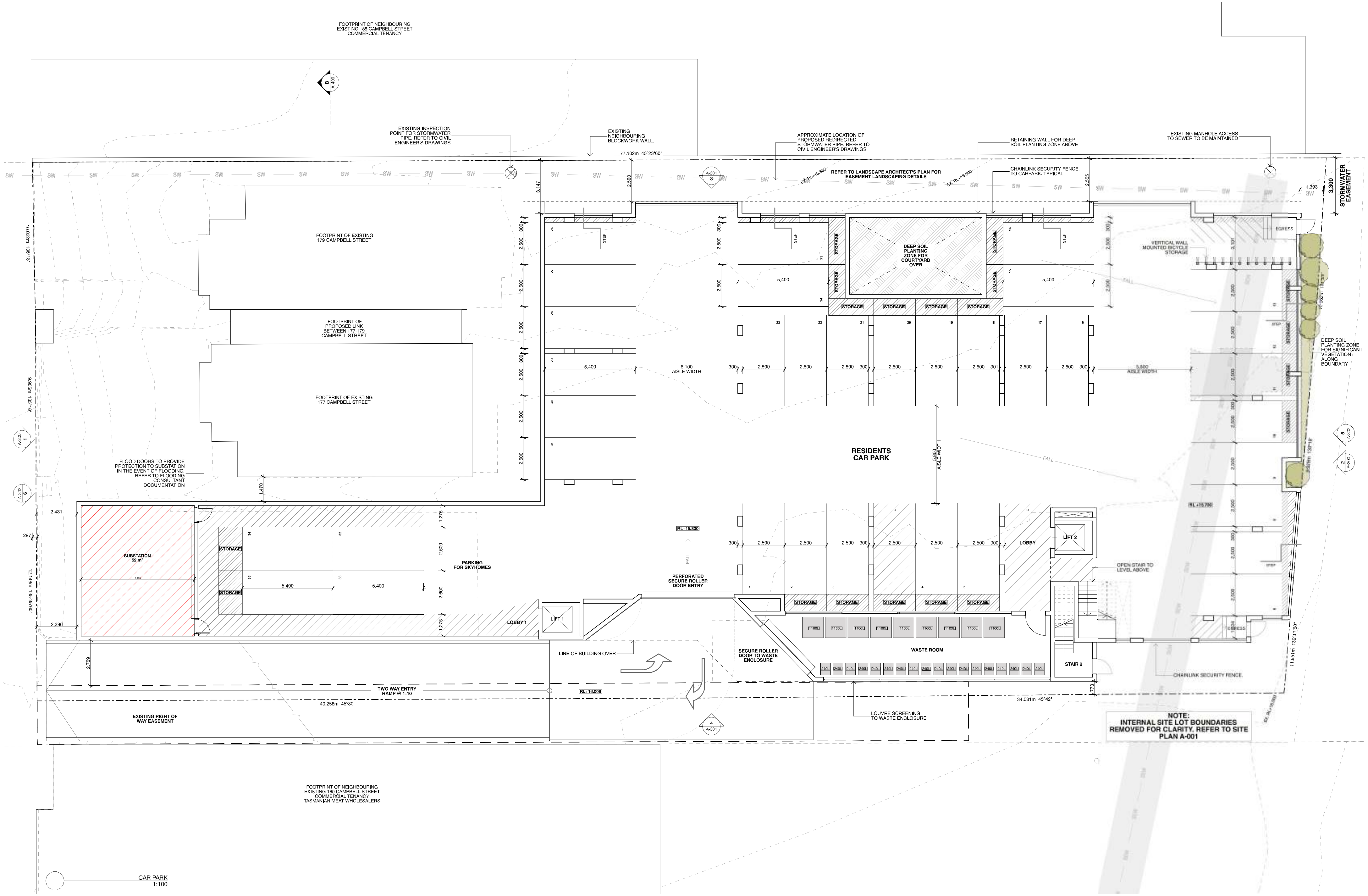
CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-002

REVISION
DA06



CU
MUL
US EST 2011

REV	DATE	PURPOSE
DA06	13/1/22	COUNCIL RFI

CUMULUS STUDIO PTY LTD

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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

N

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

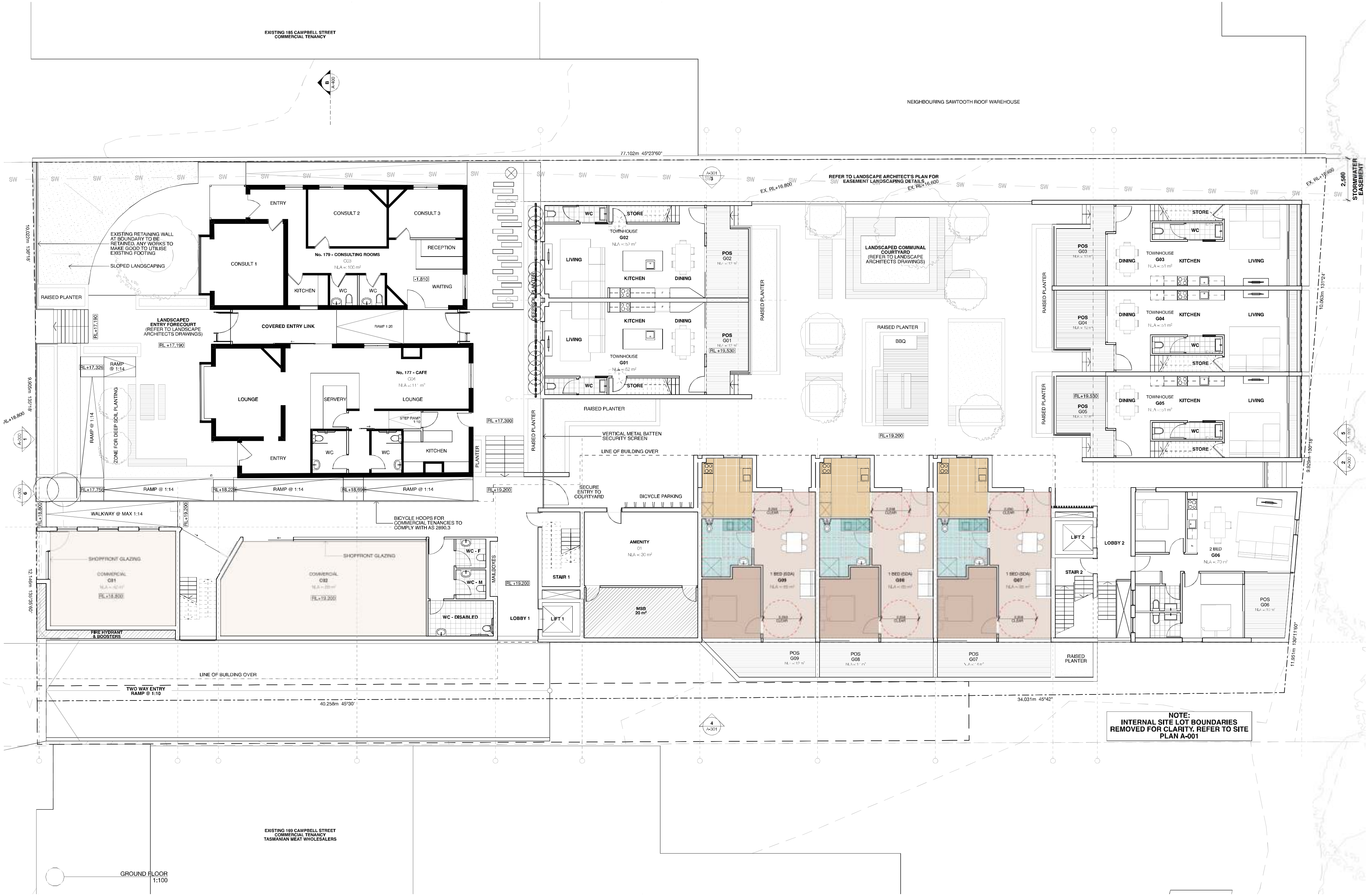
DRAWING TITLE
PLAN - BASEMENT

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY AF, TB
CHECKED BY PW, KW

DATE 13/1/22
ORIGINAL SIZE A1

DRAWING Nº J20823-A-100
REVISION DA06



GROUND FLOOR
1:100

CU MUL US EST 2011

REV	DATE	PURPOSE
DA07	10/2/22	COUNCIL RFI 220210

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HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
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BGAS 175-179 Campbell Street
Multi-Residential Development

N

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
PLAN - GROUND

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
10/2/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-101

REVISION
DA07

1. FIRST FLOOR 1:100

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

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HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
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LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
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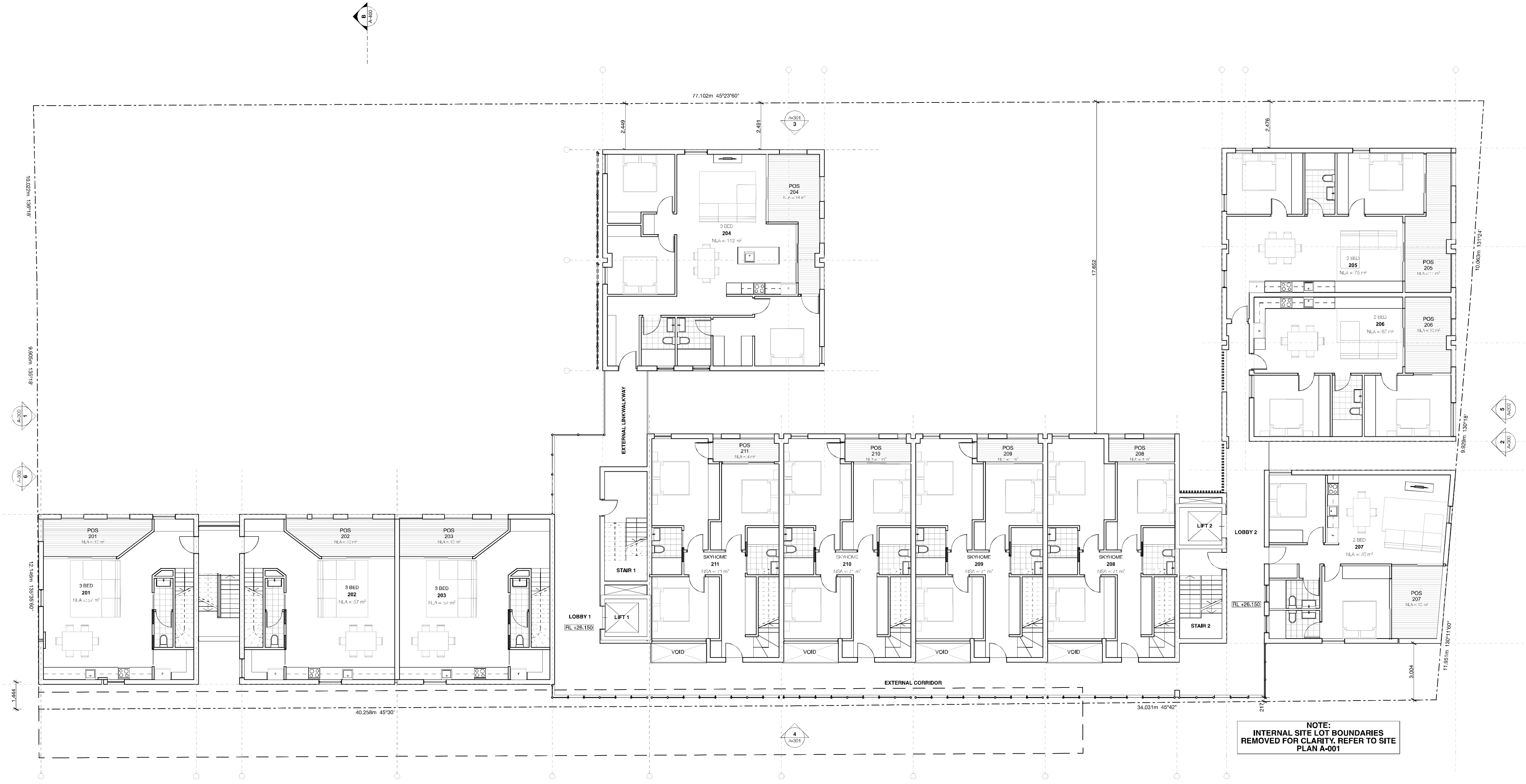
PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

N

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE: CONCEPT DESIGN
DRAWING TITLE: PLAN - LEVEL 01
ARCHITECT: PETER WALKER, CC2143E
DRAWN BY: AF, TB
CHECKED BY: PW, KW
DATE: 13/1/22
ORIGINAL SIZE: A1
DRAWING №: J20823-A-102
REVISION: DA05



SECOND FLOOR
1:100

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
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Multi-Residential Development

N

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
PLAN - LEVEL 02

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

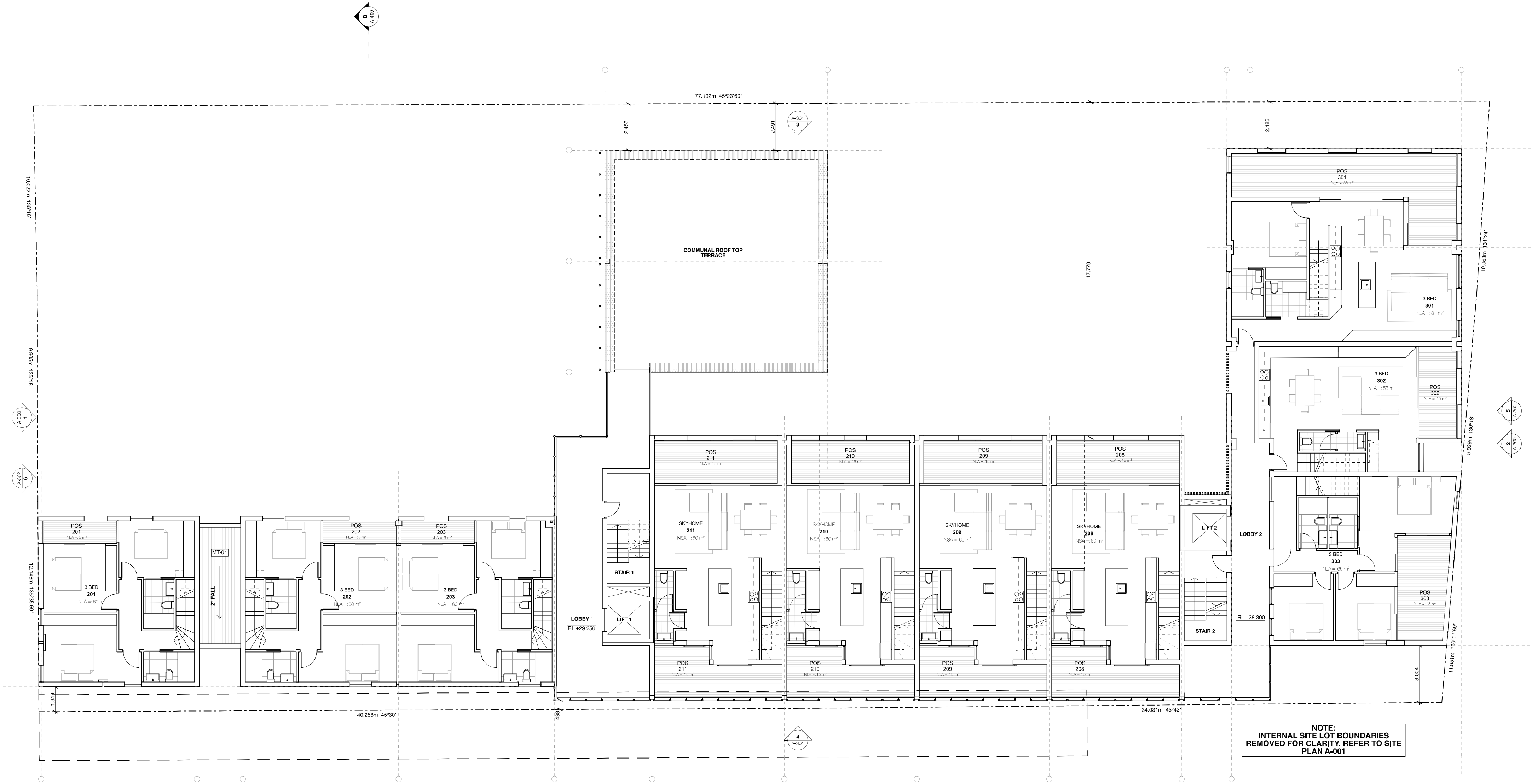
CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-103

REVISION
DA05



THIRD FLOOR
1:100

CU
MUL
US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
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LAUNCESTON
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MELBOURNE
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Multi-Residential Development

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PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
PLAN - LEVEL 03

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

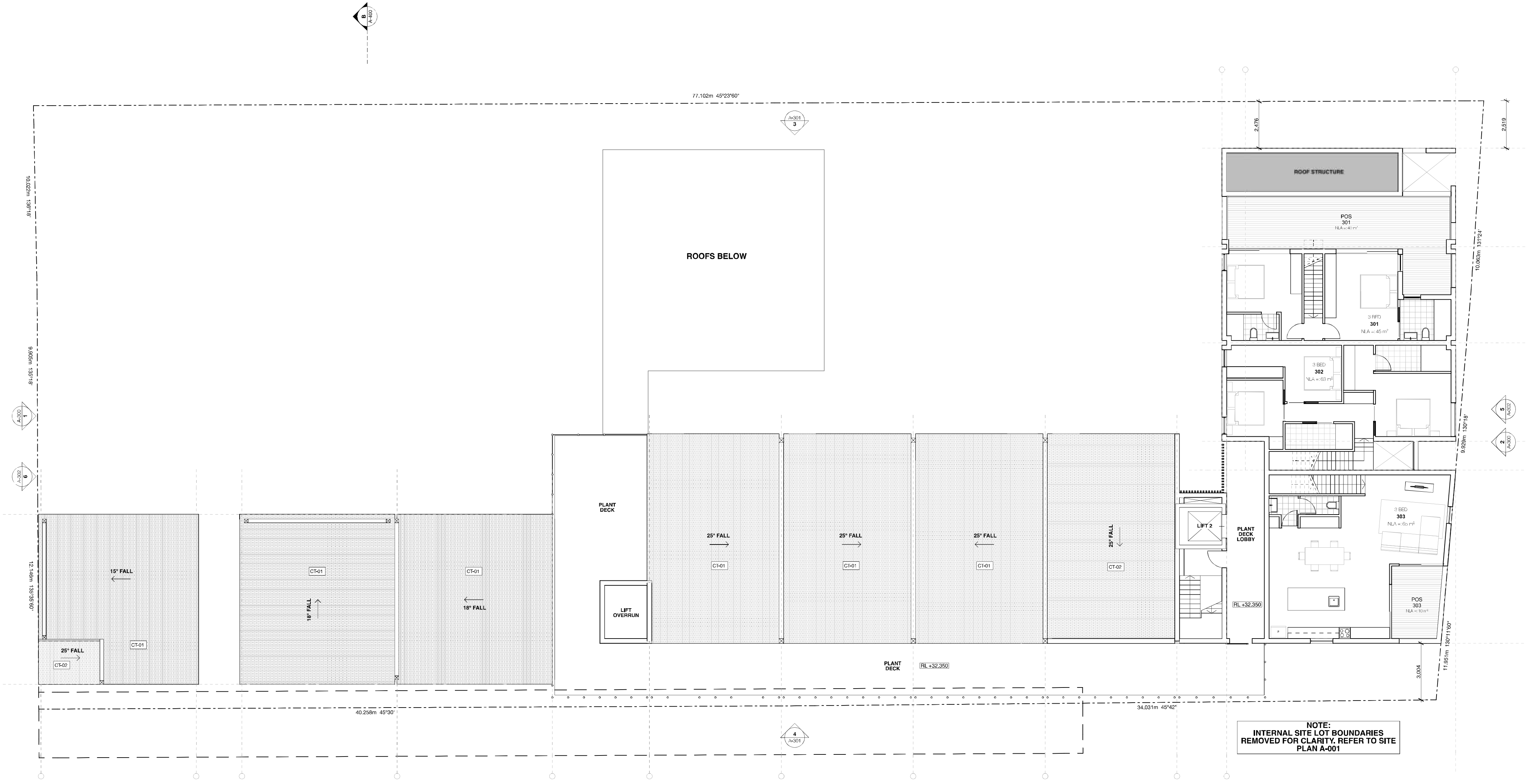
CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-104

REVISION
DA05



FOURTH FLOOR
1:100

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
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MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE: CONCEPT DESIGN

DRAWING TITLE: PLAN - LEVEL 04

ARCHITECT: PETER WALKER, CC2143E

DRAWN BY: AF, TB

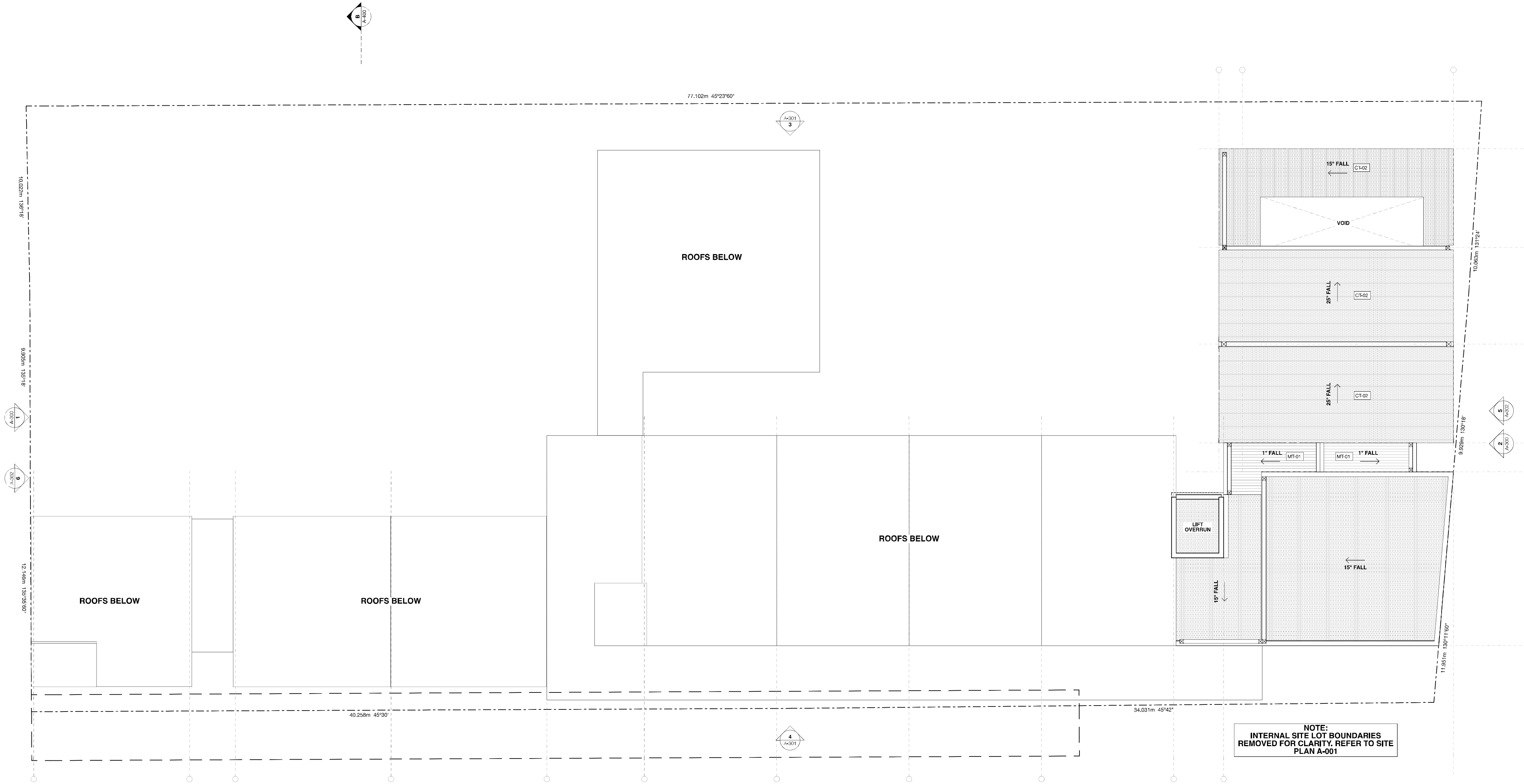
CHECKED BY: PW, KW

DATE: 13/1/22

ORIGINAL SIZE: A1

DRAWING № J20823-A-105

REVISION: DA05



FIFTH FLOOR
1:100

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD
INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
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PROJECT ADDRESS
175-179 Campbell Street
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Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
PLAN - LEVEL 05

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

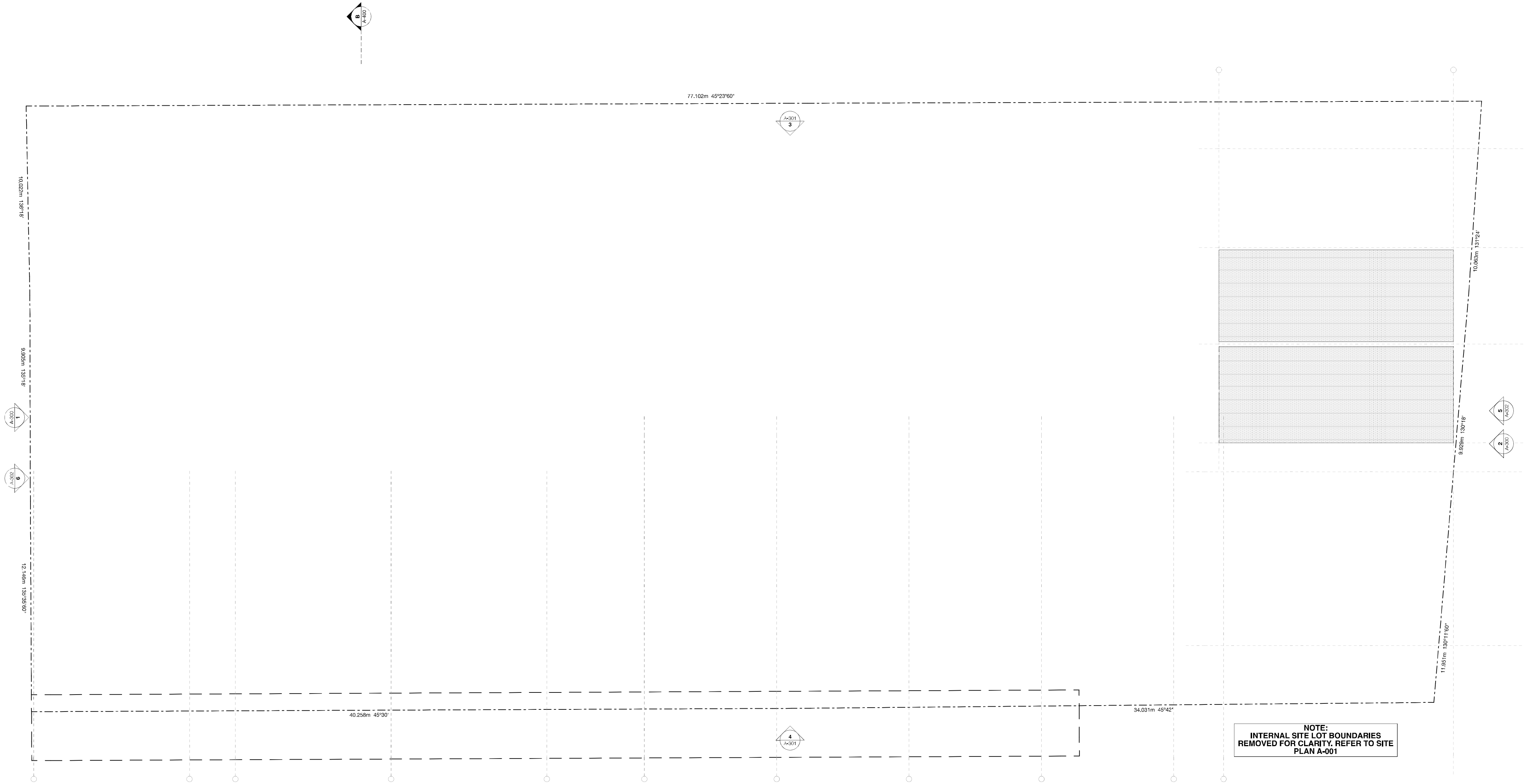
CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-106

REVISION
DA05



CU MUL US EST 2011

REV	DATE	PURPOSE
DA03	12/11/21	Preliminary DA for Comment

CUMULUS STUDIO PTY LTD
INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
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LAUNCESTON
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ADELAIDE SA 5006
+61(8) 7071 1060

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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

N

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
PLAN - ROOF

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
13/1/22

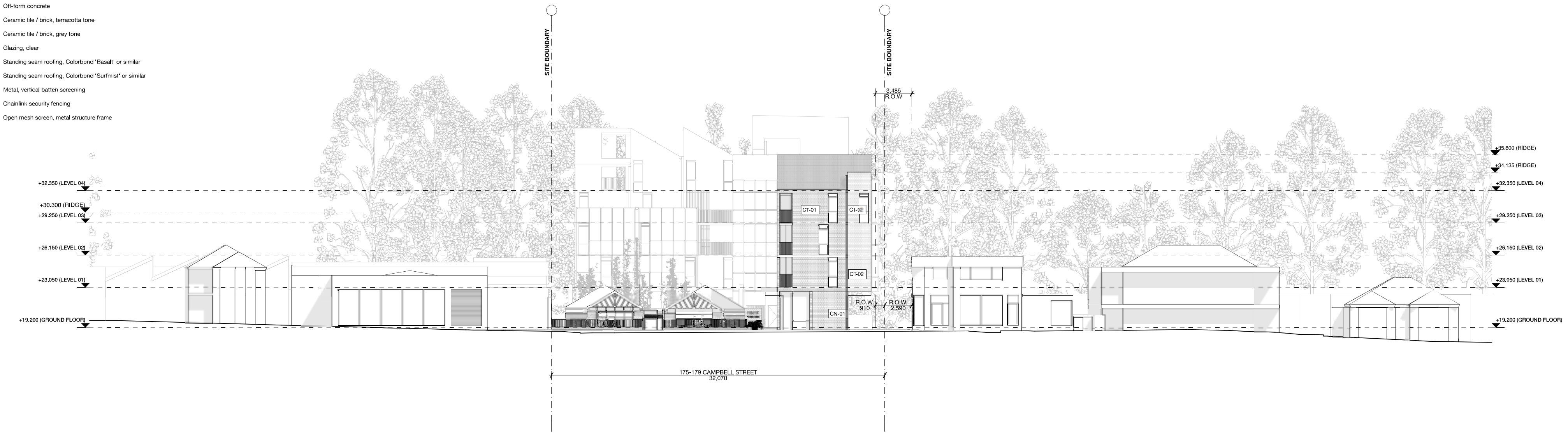
ORIGINAL SIZE
A1

DRAWING №
J20823-A-107

REVISION
DA03

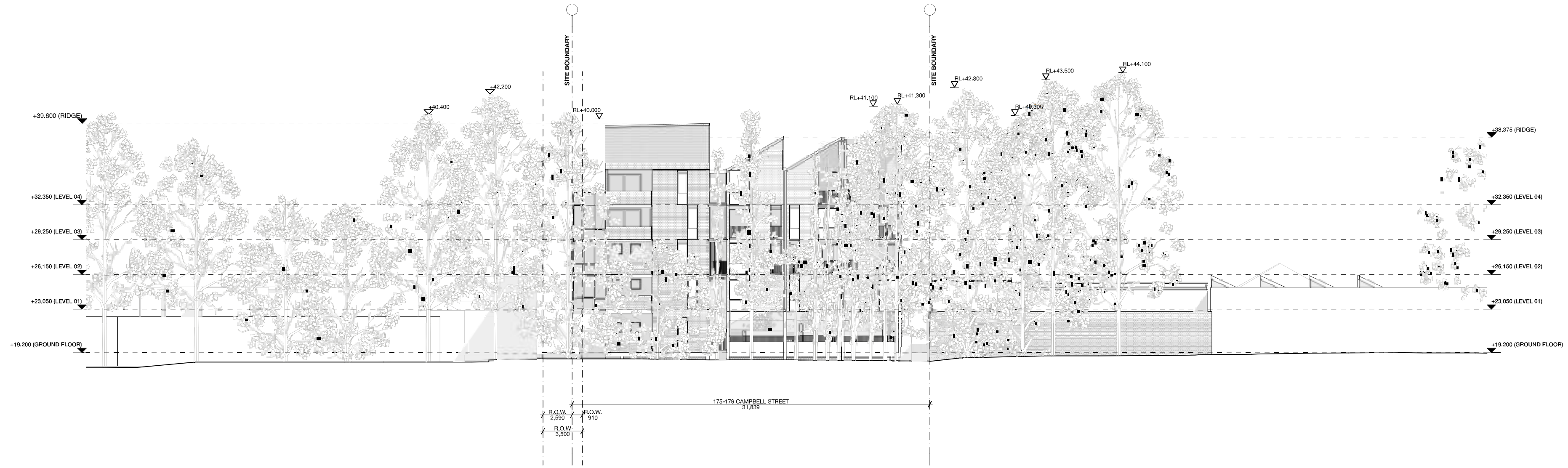
Materials & Finishes

Code	Description
BAL-01	Metal, vertical flat bar ballustrade
CL-01	Polycarbonate cladding, translucent finish
CN-01	Off-form concrete
CT-01	Ceramic tile / brick, terracotta tone
CT-02	Ceramic tile / brick, grey tone
GL-01	Glazing, clear
MT-01	Standing seam roofing, Colorbond 'Basalt' or similar
MT-02	Standing seam roofing, Colorbond 'Surfmist' or similar
SC-01	Metal, vertical batten screening
SC-02	Chainlink security fencing
SC-03	Open mesh screen, metal structure frame



1 CAMPBELL ST - SOUTH WESTERN ELEVATION

Scale 1:200



2 BROOKER AVENUE - NORTH EASTERN ELEVATION

Scale 1:200

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0930

MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9521 4518

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1060

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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
STREET ELEVATIONS

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
13/1/22

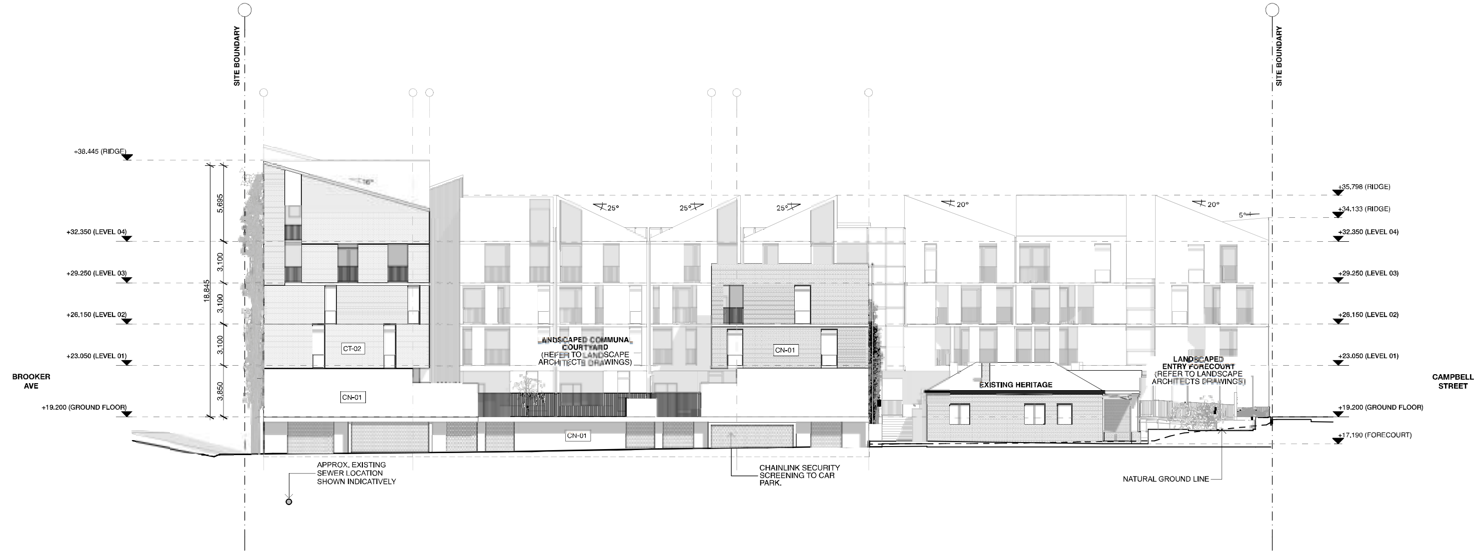
ORIGINAL SIZE
A1

DRAWING №
J20823-A-300

REVISION
DA05

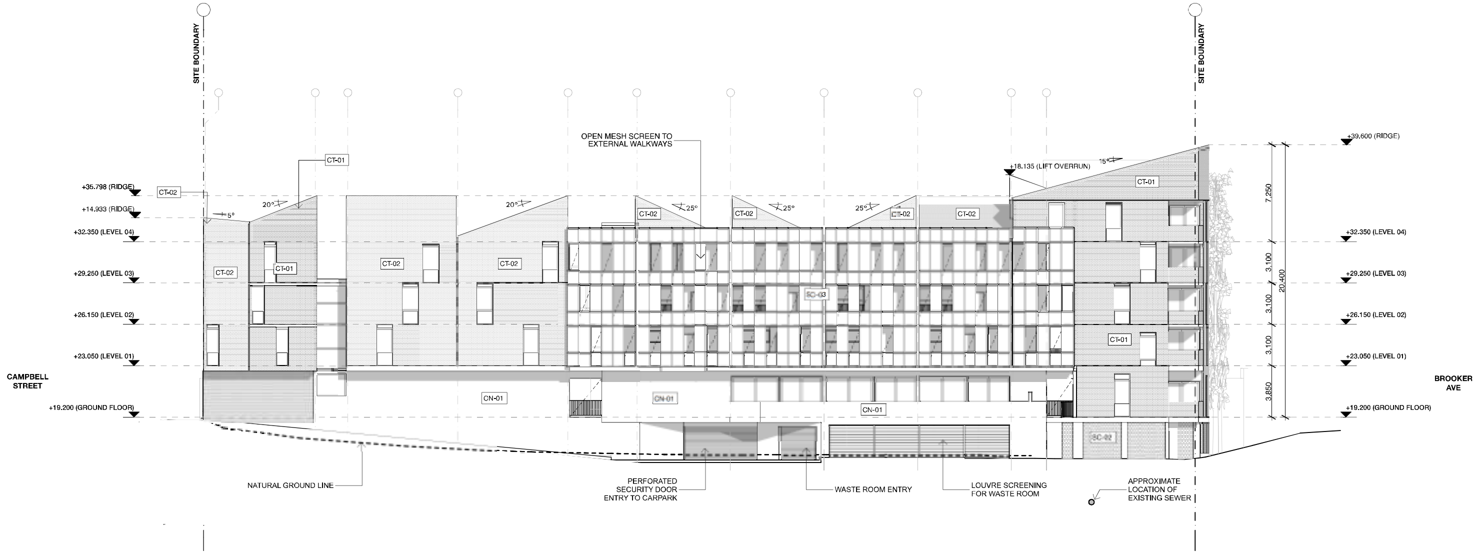
Materials & Finishes

Code	Description
BAL-01	Metal, vertical flat bar balustrade
CL-01	Polycarbonate cladding, translucent finish
CN-01	Off-form concrete
CT-01	Ceramic tile / brick, terracotta tone
CT-02	Ceramic tile / brick, grey tone
GL-01	Glazing, clear
MT-01	Standing seam roofing, Colorbond 'Basalt' or similar
MT-02	Standing seam roofing, Colorbond 'Surfmist' or similar
SC-01	Metal, vertical batten screening
SC-02	Chainlink security fencing
SC-03	Open mesh screen, metal structure frame



3 NORTH WEST ELEVATION

Scale 1:200



4 SOUTH EAST ELEVATION

Scale 1:200

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD
INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0900

MELBOURNE
LEVEL 3, 75-78 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9621 4516

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1066

THESE DRAWINGS SHOW DESIGN INTENT & ARE SUITABLE AS A GUIDE ONLY. DO NOT SCALE OFF THE DRAWINGS. ALL DIMENSIONS IN MILLIMETRES. DIMENSIONS OF EXISTING BUILDINGS ARE INDICATIVE ONLY - THEY SHOULD NOT BE RELIED ON AND ARE TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. ALL DOCUMENTS SHALL BE READ IN CONJUNCTION WITH SPECIFICATIONS AND ANY CONSULTANTS DETAIL. ALL WORK SHALL BE IN ACCORDANCE WITH THE NATIONAL CONSTRUCTION CODE, RELEVANT AUSTRALIAN STANDARDS & LOCAL AUTHORITY BY-LAWS AND REGULATIONS. ANY DISCREPANCIES, ERRORS OR OMISSIONS SHALL BE REFERRED TO THE ARCHITECTS. DRAWINGS ARE NOT TO BE USED FOR CONSTRUCTION UNTIL ISSUED CONSTRUCTION.

PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
ELEVATIONS

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
13/1/22

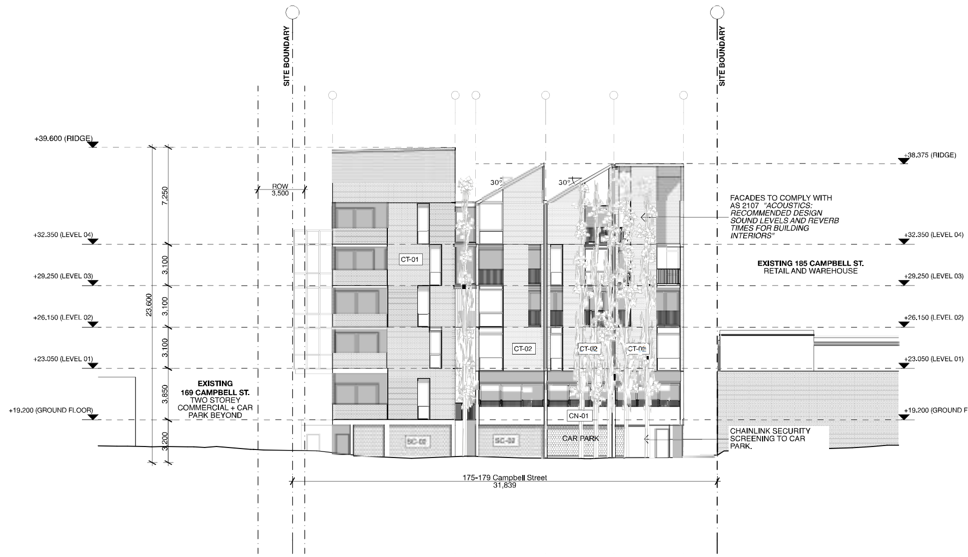
ORIGINAL SIZE
A1

DRAWING №
J20823-A-301

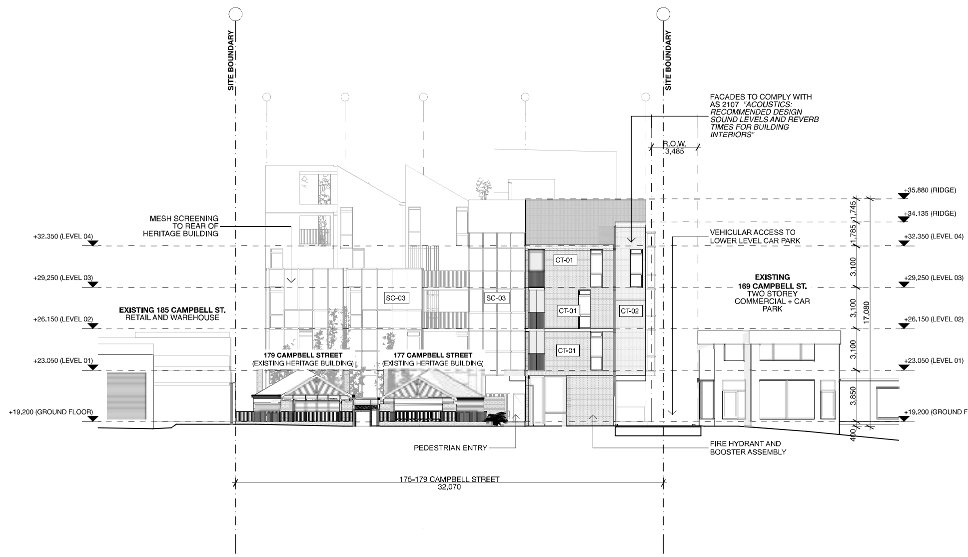
REVISION
DA05

Materials & Finishes

Code	Description
BAL-01	Metal, vertical flat bar balustrade
CL-01	Polycarbonate cladding, translucent finish
CN-01	Off-form concrete
CT-01	Ceramic tile / brick, terracotta tone
CT-02	Ceramic tile / brick, grey tone
GL-01	Glazing, clear
MT-01	Standing seam roofing, Colorbond 'Basalt' or similar
MT-02	Standing seam roofing, Colorbond 'Surfmist' or similar
SC-01	Metal, vertical batten screening
SC-02	Chainlink security fencing
SC-03	Open mesh screen, metal structure frame



5 **NORTH EAST ELEVATION**
Scale 1:200



6 **SOUTH WEST ELEVATION**
Scale 1:200

CU MUL US EST 2011

REV	DATE	PURPOSE
DA04	18/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0930

MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9521 4518

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1060

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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE: CONCEPT DESIGN

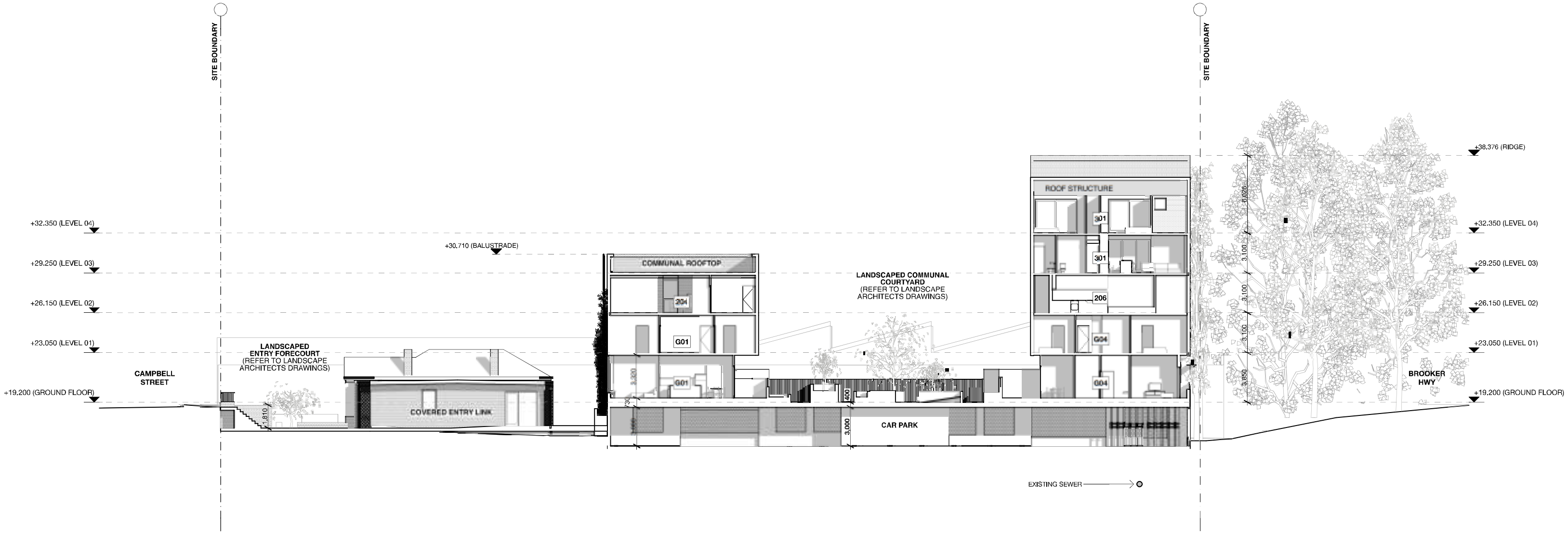
DRAWING TITLE: ELEVATIONS

ARCHITECT: PETER WALKER, CC2143E

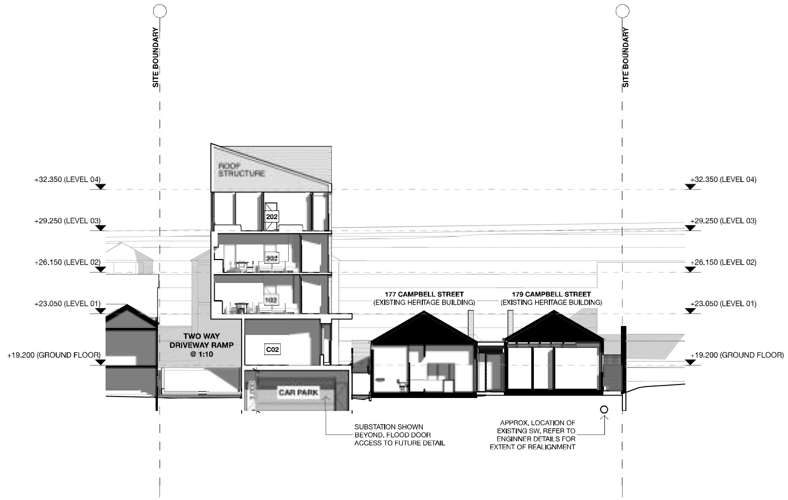
DRAWN BY: AF, TB | CHECKED BY: PW, KW

DATE: 13/1/22 | ORIGINAL SIZE: A1

DRAWING №: J20823-A-302 | REVISION: DA04



SECTION A
Scale 1:200



SECTION B
Scale 1:200

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0930

MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9521 4518

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1060

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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

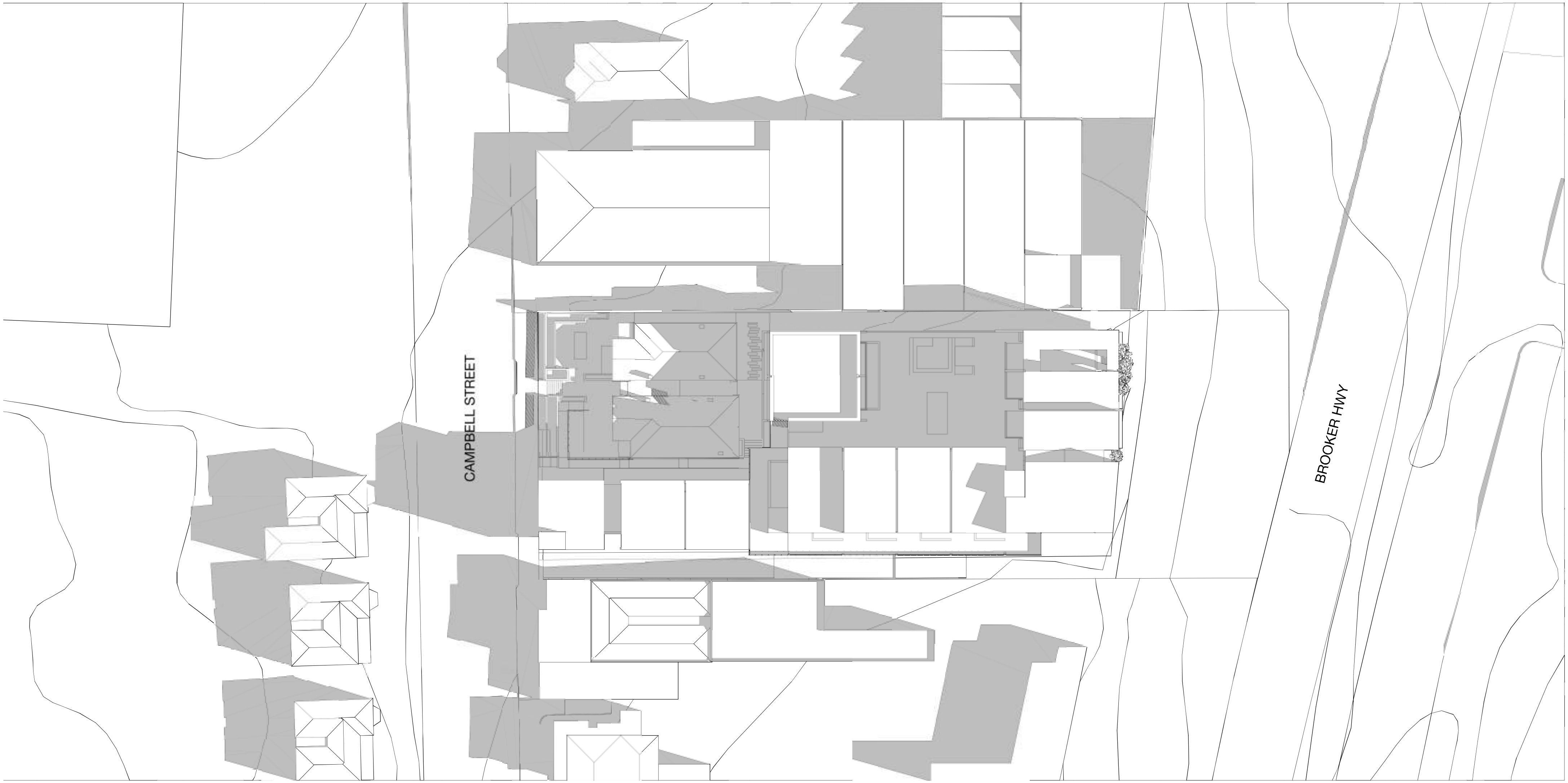
DRAWING TITLE
SECTIONS

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY AF, TB — CHECKED BY PW, KW

DATE 13/1/22 — ORIGINAL SIZE A1

DRAWING № J20823-A-400 — REVISION DA05



08 Sept' 22nd @9am
Scale 1:250

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0930

MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9521 4518

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1060

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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
MAR/SEP 22ND - 9AM

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

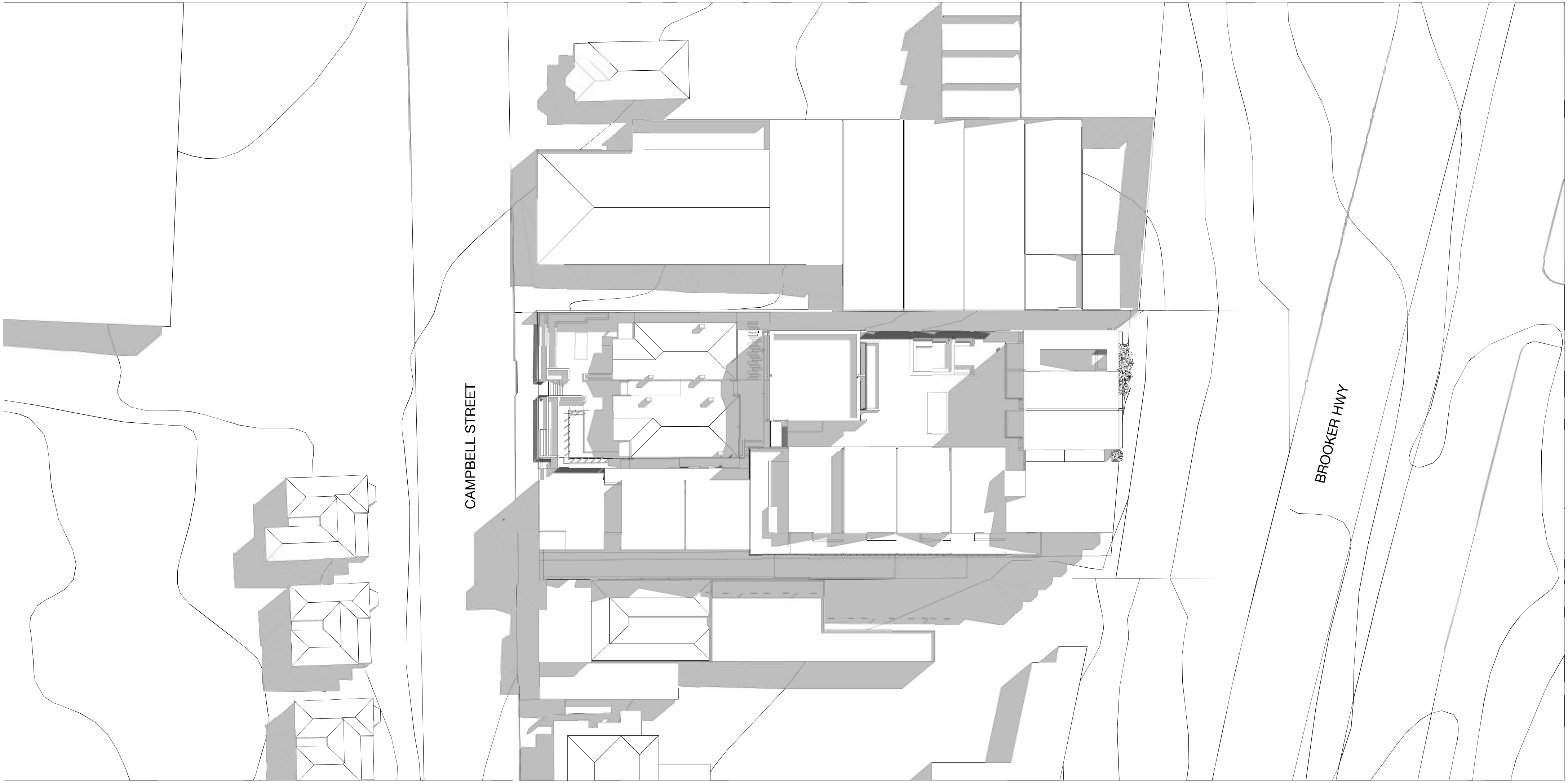
CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-600

REVISION
DA05



Sept' 22nd @12pm

Scale 1:250

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0930

MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9521 4518

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1060

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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
MAR/SEP 22ND - 12PM

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-601

REVISION
DA05

Sept' 22nd @3pm

Scale 1:250

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0930

MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9521 4518

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1060

PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
MAR/SEP 22ND - 3PM

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-602

REVISION
DA05

June 22nd @9am
Scale 1:250

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD
INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0930

MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9521 4518

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1060

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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
JUNE 22ND - 9AM

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

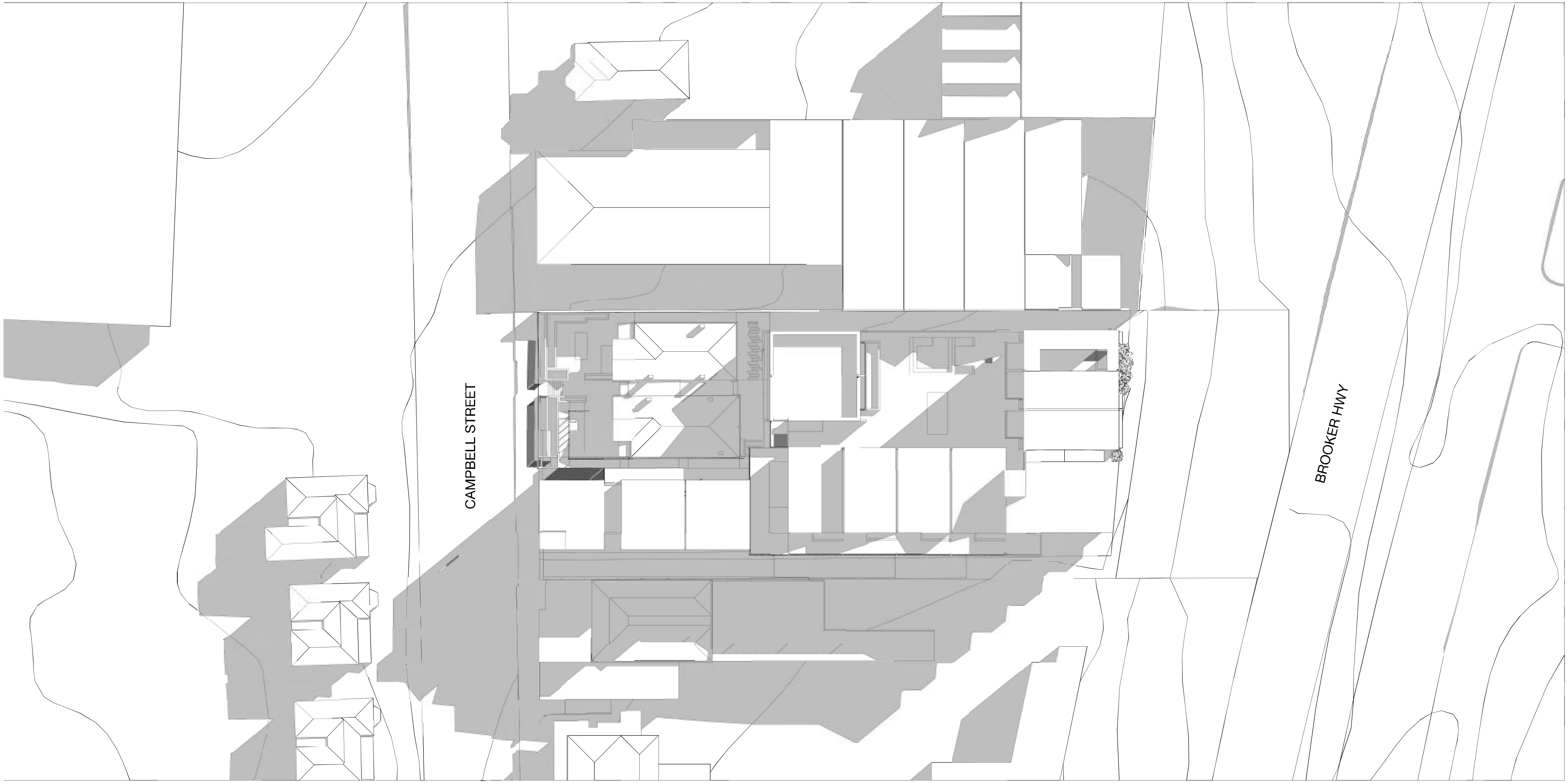
CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-603

REVISION
DA05



June 22nd @12pm
Scale 1:250

CU
MUL
US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0930

MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9521 4518

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1060

PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
JUNE 22ND - 12PM

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-604

REVISION
DA05

June 22nd @3pm
Scale 1:250

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD
INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0930

MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9521 4518

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1060

PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
JUNE 22ND - 3PM

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-605

REVISION
DA05

Dec' 22nd @9am

Scale 1:250

CU MUL US EST 2011

REV	DATE	PURPOSE
DA05	23/11/21	ISSUE FOR DA

CUMULUS STUDIO PTY LTD

INFO@CUMULUS.STUDIO

HOBART
SUITE 2, LEVEL 2, 147 MACQUARIE ST.
HOBART TAS 7000
+61(3) 6231 4841

LAUNCESTON
GROUND FLOOR SUITE 2/33
GEORGE ST.
LAUNCESTON TAS 7250
+61(3) 6333 0930

MELBOURNE
LEVEL 3, 75-76 HARDWARE LN.
MELBOURNE VIC 3000
+61(3) 9521 4518

ADELAIDE
49A O'CONNELL ST.
ADELAIDE SA 5006
+61(8) 7071 1060

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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
DEC 22ND - 9AM

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

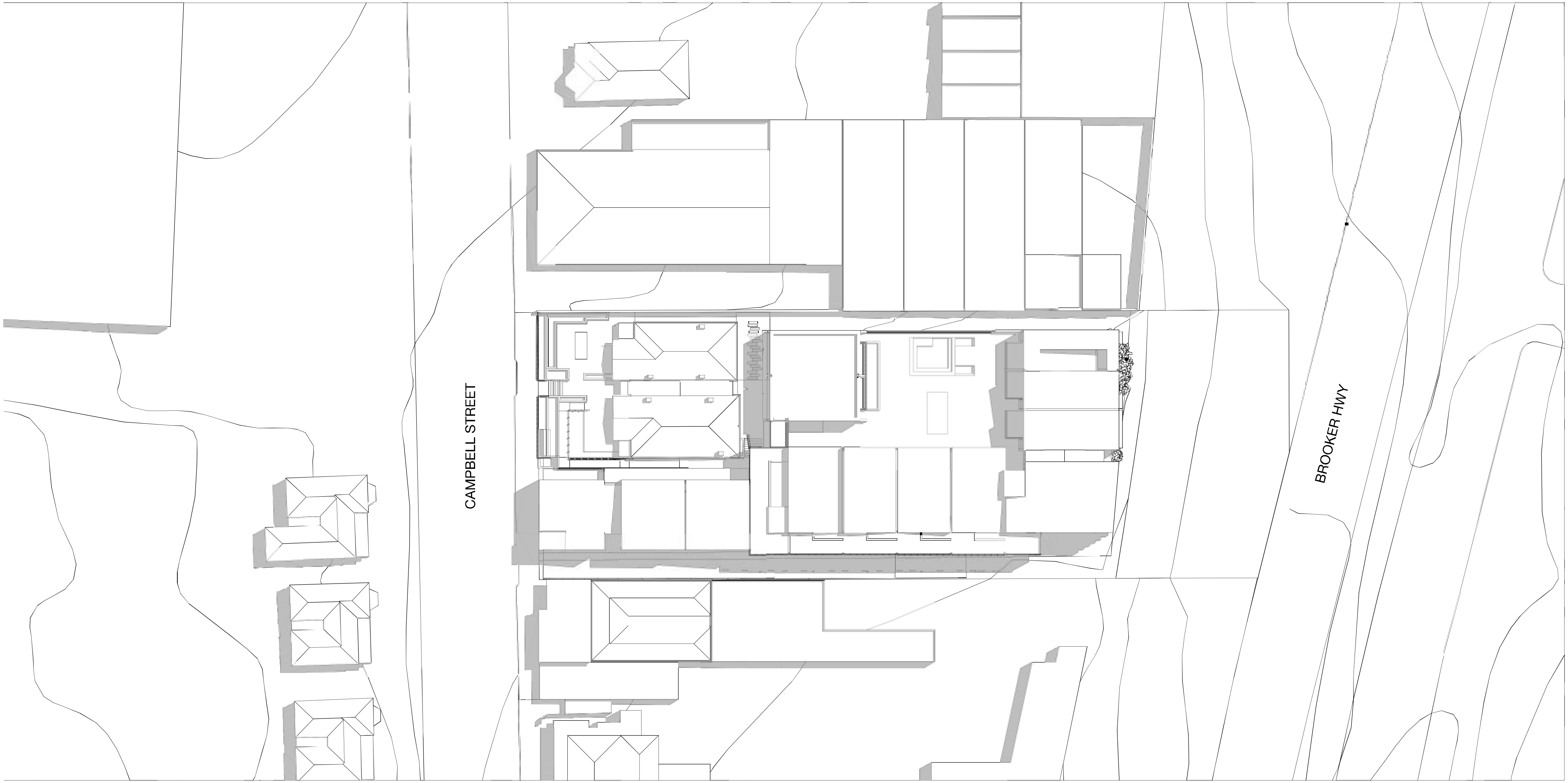
CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-606

REVISION
DA05



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REV	DATE	PURPOSE
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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
DEC 22ND - 12PM

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING Nº
J20823-A-607

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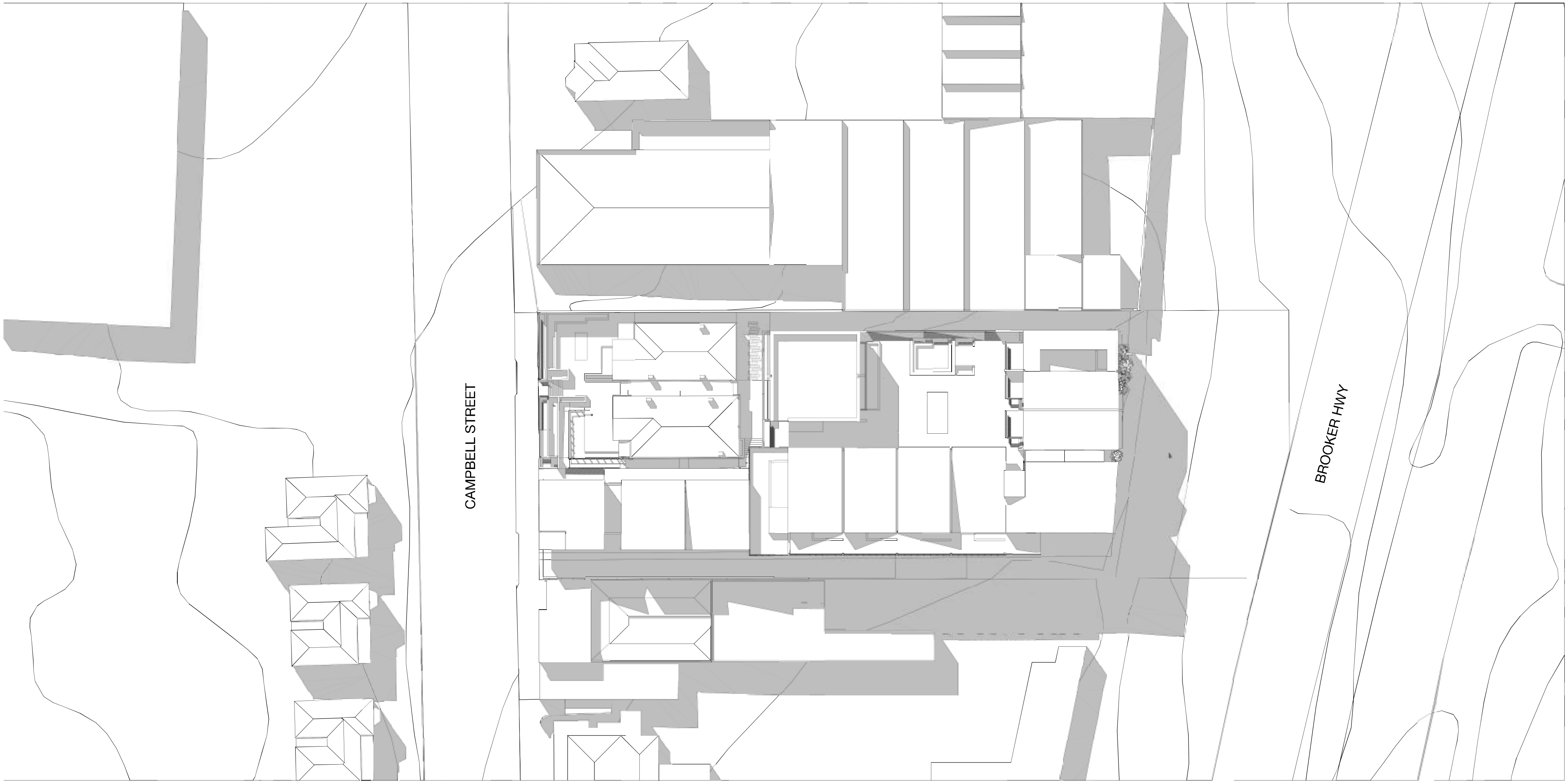
DA05



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DRAWING TITLE
DEC 22ND - 3PM

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

DRAWING №
J20823-A-608

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VIEW FROM CAMPBELL STREET

AERIAL PERSPECTIVE ALONG BROOOKER HWY

VIEW FROM INTERNAL COURTYARD

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Multi-Residential Development

PROJECT ADDRESS
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Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
PERSPECTIVES

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
13/1/22

ORIGINAL SIZE
A1

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J20823-A-700

REVISION
DA05

PLANNING REPORT

BUILDING GROUP APPRENTICESHIP SCHEME LTD

175, 177 & 179 Campbell Street

January 2022

Engineers & Planners

Engineers & Planners

Johnstone McGee & Gandy Pty Ltd

ABN 76 473 834 852 ACN 009 547 139

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1. Estimates have been prepared on the basis of information to hand at the time.
2. Estimates are order of cost. They are not quoting, nor based on quotes and are not upper limit of cost.
3. Estimates are not based on measured quantities or a defined scope of works.
4. Unless stated otherwise estimates are exclusive of GST, engineering fees, market escalation, associated builder's works, builder's margins, design contingency, project contingency.
5. As project scope becomes better defined it is strongly recommended that estimates are updated.

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Appendix L – Arctas Statement of Archaeological Potential

Appendix M – Landscape Architectural Report

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Executive Summary

SolutionsWon Group on behalf of The Building Group Apprenticeship Scheme Ltd seeks to develop land located at 175, 177 and 179 Campbell Street.

The proposed development is for:

- Demolition of the following:
  - the commercial building and concrete block office building to the rear at 175 Campbell Street;
  - the 'lean-to' additions, the timber shed and patio to the rear of the residential dwelling at 179 Campbell Street;
  - the existing front ramp and landscaping in the front of 177 and 179 Campbell Street;
- Adhesion of four lots to create a single development site area of 2420m^2;
- Refurbishment of the existing residential dwellings at 177 and 179 Campbell Street;
- Development of a 6-storey mixed-use building with basement car parking below the natural ground level:
  - A basement level containing:
    - 35 car parking spaces (including two tandem spaces);
  - Ground floor area centred around a pedestrian circulation spine (including a central courtyard) off which access is provided to:
    - 4 x commercial buildings, three of which front onto Campbell Street (two existing heritage buildings);
    - 1 x amenity room;
    - 1 x two-bedroom apartment
    - 5 x two-storey townhouses;
    - 3 x one-bedroom apartments;
  - The Second floor contains:
    - 3 x one-bedroom apartments;
    - 5 x two-bedroom apartments;
  - The third floor contains:
    - 3 x two-bedroom apartments
    - 4 x three bedroom sky home apartments;
    - 4 x three bedroom apartments;
  - The fourth floor contains:
    - 3 x three bedroom apartments;
    - 1 x communal rooftop terrace
  - The fifth floor contains:
    - the second storey for sky home apartments and three-bedroom apartments.

The total number of dwellings is 31.

The development is located on land within the Urban Mixed Use Zone and the proposed development generates the following discretions under the *Hobart Interim Planning Scheme 2015* (the Scheme):

- **15.4 Development Standards for Buildings and Works**
  - 15.4.1 Building Height P1
  - 15.4.5 Landscaping P1
- **E2.0 Potentially Contaminated Land Code**
  - E2.6.2 Excavation P1
- **E5.0 Road and Railway Assets Code**
  - E5.5.1 Existing road accesses and junctions P3
  - E5.6.4 Sight distance at accesses, junctions and level crossings P1
- **E6.0 Parking and Access Code**
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- **E9.0 Attenuation Code**

    - E9.7.1 Development for Use with Potential to Cause Environmental Harm P1
- **E13.0 Historic Heritage Code**
    - E13.7.1 Demolition P1
    - E13.7.2 Building and Work other than Demolition P1
    - E13.7.2 Building and Work other than Demolition P2
    - E13.7.2 Building and Work other than Demolition P3
    - E13.7.2 Building and Work other than Demolition P4
    - E13.7.2 Building and Work other than Demolition P6
    - E13.10.1 Building, Works and Demolition P1

The proposal has been assessed against all relevant Scheme criteria and is found to either comply with Acceptable Solutions or satisfy relevant Performance Criteria. The application is considered to be acceptable with respect to the Scheme requirements and therefore ought to be supported by the Planning Authority.

1. Introduction

JMG Engineers and Planners have been engaged by SolutionsWon Group to prepare a planning permit application for a mixed-use development at 175, 177 and 179 Campbell Street, Hobart. The proposal involves the demolition of some existing buildings, changing the use of remaining existing buildings and new mix-use multiple dwelling development.

This report serves to provide an assessment of the proposed development and works against the provisions of the *Hobart Interim Planning Scheme 2015* ('the Scheme').

A number of expert reports are provided in support of the planning permit application including a Traffic Impact Assessment, Concept Services Report, Heritage Assessment, Environmental Site Assessment, Flood Modelling Report and an Architectural Design Statement. These reports are provided in the Appendices to this planning report and are referenced as appropriate throughout the document.

2. Site Location & Context

The subject site is located just under 450m from north of the Hobart Central Business zone. The landowner is the Tasmanian Building Group Apprenticeship Scheme Ltd. The proposed development will require works on multiple titles (listed in Table 1) with copies provided in Appendix A. Copies of the landowner notification letters and Council consent as required by section 52 of the *Land Use Planning and Approvals Act 1993* are provided in Appendix D.

Table 1 - Summary of existing titles involved in the proposed development.

Title Reference	Street Number	Comments re existing/proposed	Owner Advice/Consent
CT 23364/1	175 Campbell Street (front lot)	Containing an existing commercial building and shed to the rear, with an area of approximately 483m². All structures to be demolished and a new mixed-use building to be developed.	Landowner notification (section 52(1) *Land Use Planning and Approvals Act 1993*)
CT 23364/2	175 Campbell Street (rear lot)	Containing an existing car parking and vehicle circulation space, with an area of approximately 423m². A new mixed-use building is to be developed over this area of the site.	Landowner notification (section 52(1) *Land Use Planning and Approvals Act 1993*)
CT 22529/3	177 Campbell Street	Containing an existing building with car parking at the rear, used for residential purposes, with an area of approximately 1116m². The existing residential building is to be retained, the front courtyard space to be redeveloped, and the rear area of the Title developed with the new mixed-use building.	Landowner notification (section 52(1) *Land Use Planning and Approvals Act 1993*)
CT 23363/1	179 Campbell Street	Containing an existing building and outbuildings, used for residential purposes, with an area of approximately 413m². The existing residential building is to be retained, the front courtyard space to be redeveloped, and demolition of some structures at the rear of the Title.	Landowner notification (section 52(1) *Land Use Planning and Approvals Act 1993*)
CT 140732/1	169-173 Campbell Street	Containing Tasmanian Meat Wholesalers - utilising access right of way.	Landowner notification (section 52(1) *Land Use Planning and Approvals Act 1993*)
CT 121292/1	181-189 Campbell Street	'Woolworths' – the potential underpinning of an existing warehouse wall.	Landowner notification (section 52(1) *Land Use Planning and Approvals Act 1993*)

The (four) titles [CT 23364/1, CT 23364/2, CT 22529/3, and CT 23363/1] will need to be adhered to and rights of way widths adjusted to ensure CT 140732/1 (Tasmanian Meat Wholesalers) have full access over the new access ramp.

Existing buildings within 100m of the development site are generally single or double-storey displaying a mix of styles including:

- Commercial buildings adjoining the development site to the north-west and south-east, as well as on the southern side of Campbell Street; and
- Residential style buildings to the north-west of the development site and on the southern side of Campbell Street.

There are 3 Metro Bus stops within a 200m radius of the site, associated with a number of services to the northern suburbs as well as southern and eastern suburbs via the Elizabeth Street bus interchange facilities.

3. Proposed Use & Development

The proposed development is for:

- Demolition of the following:
    - the commercial building and concrete block office building to the rear at 175 Campbell Street;
    - the 'lean-to' additions, the timber shed and patio to the rear of the residential dwelling at 179 Campbell Street;
    - the existing crossovers, driveways and landscaping in the front of 177 and 179 Campbell Street;
- Adhesion of four lots to create a single development site area of 2420m^2;
- Refurbishment of the existing residential dwellings at 177 and 179 Campbell Street;
- Development of a 6-storey mixed-use building with basement car parking below the natural ground level:
    - A basement level containing:
        - 35 car parking spaces;
    - Ground floor area centred around a pedestrian circulation spine (including a central courtyard) off which access is provided to:
        - 4 x commercial buildings, three buildings fronting Campbell Street comprising two existing heritage buildings;
        - 1 x amenity room;
        - 1 x two-bedroom apartment
        - 5 x two-storey townhouses;
        - 3 x one-bedroom apartments;
    - The Second floor contains:
        - 3 x one-bedroom apartments;
        - 5 x two-bedroom apartments;
    - The third floor contains:
        - 3 x two-bedroom apartments
        - 4 x three bedroom sky home apartments;
        - 4 x three bedroom apartments;
    - The fourth floor contains:
        - 3 x three bedroom apartments;
        - 1 x communal rooftop terrace
    - The fifth floor contains:
        - the second storey for sky home apartments and three-bedroom apartments.

The basement contains 35 car parking spaces with 22 storage areas and a 58m^2 waste room. The vehicle access will partially use the subject site at 175 Campbell Street and the right of way from 169-173 Campbell Street (Tasmanian Meat Wholesalers).

There are four commercial tenancies on the ground floor. An amenity room, a master switchboard room and fire three bathrooms (one for disability) are also provided with the development.

Details plans of the proposed development (Proposal Plan) are shown in Appendix C and details of the demolition are outlined in a Demolition Plan in Appendix E.

4. Development Assessment

The proposed development comprises the title adhesion, demolition and change of use, the relating special provisions need to be assessed as follow.

4.1 Special Provisions

9.3 Adjustment of a Boundary (Title Adhesion)

The proposed development will involve merging four lots (CT 23364/1, CT 23364/2, CT 22529/3 and CT 23363/1) to create one new lot of 2420m^2. This aspect of the proposed development has been considered against criteria for Adjustment of a Boundary (Clause 9.3.1) under the Scheme and an assessment is as follows:

9.3 Adjustment of a Boundary	Compliance of Proposed Development
(a) No additional lots are created;	Complies – the proposed boundary adjustment will convert 4 existing lots into 1 lot.
(b) There is only a minor change to the relative size, shape and orientation of the existing lots;	Not compliant – there will be more than a minor change to the existing 4 lots that comprise the development site.
(c) No setback from an existing building will be reduced below the applicable minimum setback requirement;	Complies – the setback of the proposed building parallel to the frontage and is not more than 1m as 15.4.2 Setback requested.
(d) No frontage is reduced below the applicable minimum frontage requirement; and	Complies – the frontage of the proposed building is not reduced /there is no minimum frontage required for residential within the Urban Mixed Use Zone.
(e) No lot boundary that aligns with a zone boundary will be changed.	Complies – it will not change the boundary which aligns with a zone boundary

As the proposed development does not satisfy clause 9.3.1 (b) and is not considered a subdivision, it will be treated as an adhesion under Section 110 of the *Local Government (Building and Miscellaneous Provisions) Act 1993*, which is thought to be satisfactorily addressed through permit conditions prescribing an adhesion order.

9.4 Demolition

The proposed development consists of the demolition of buildings.

The two-storey brick office building and concrete block office building at 175 Campbell Street (CT 23364/1) is to be demolished. The timber sheds and patio to the rear of the residential dwelling at 179 Campbell Street (CT 23363/1) are also to be demolished. The internal walls and doors of the existing two heritage buildings at 177 and 179 Campbell Street (22529/3)(CT 23363/1) will be demolished. This is as shown in the demolition plan (Appendix E).

The proposed demolition forms part of a permissible development application within the Urban Mixed Use Zone and it is considered that Clause *9.4 Demolition* has been satisfied.

4.2 Zones

The subject site is zoned 'Urban Mixed Use', the north and south of the subject site with the same zone. The land immediately to the southwest and northeast is zoned 'Utilities' (containing the Campbell Street and Brooker Avenue Road Reserves). The land on the southern side of the Campbell Street Road Reserve is zoned 'Commercial' (18m from the subject site), and land on the northeast side of the Brooker Avenue Road Reserve is zoned 'Inner Residential' (50m from the subject site). The zoning of the Subject Site is shown below in Figure 1.

Figure 1 - Zoning of the Subject Site and surrounding area (source: List Map).

The Subject Site is also subject to the Royal Hobart Hospital Helipad Airspace Specific Area Plan overlay as shown in Figure 2.

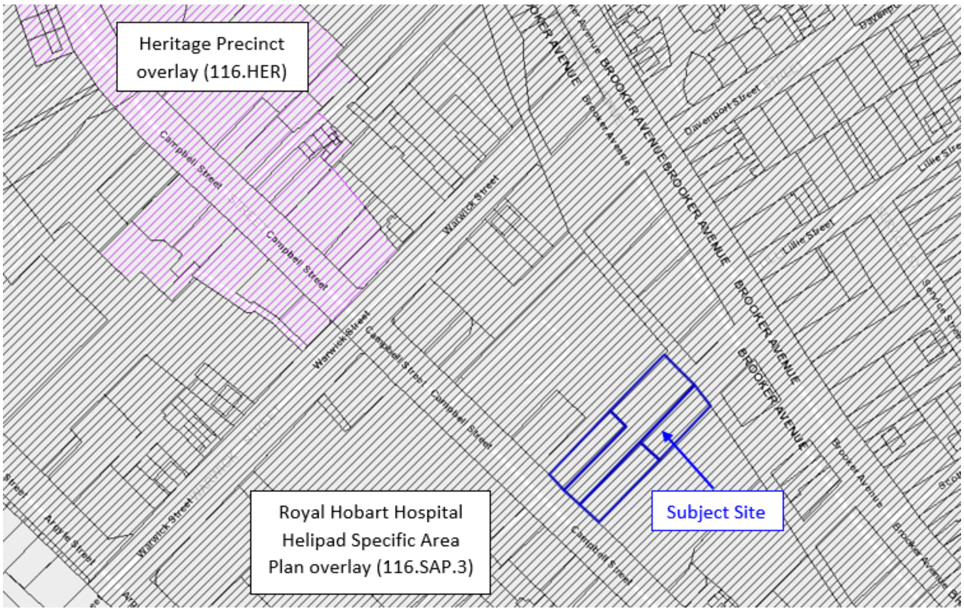

Figure 2 – 'Royal Hobart Helipad Airspace Specific Area Plan' and 'Heritage Precinct' overlays (source: List Map).

15.0 Urban Mixed Use Zone

15.1 Zone Purpose

15.1.1 Zone Purpose Statements
15.1.1.1 To provide for integration of residential, retail, community services and commercial activities in urban locations. 15.1.1.2 To encourage use and development at street level that generates activity and pedestrian movement through the area. 15.1.1.3 To provide for design that maximises the amenity at street level including considerations of microclimate, lighting, safety, and pedestrian connectivity. 15.1.1.4 To ensure that commercial use are consistent with the activity centre hierarchy. 15.1.1.5 To ensure development is accessible by public transport, walking and cycling 15.1.1.6 To provide for a diversity of uses at densities responsive to the character of streetscapes, historic areas and buildings and which do not compromise the amenity of surrounding residential areas. 15.1.1.7 To encourage the retention of existing residential uses and the greater use of underutilised sites as well as the reuse and adaptation of existing buildings for uses with a scale appropriate to the site and area. 15.1.1.8 To ensure that the proportions, materials, openings and decoration of building facades contribute positively to the streetscape and reinforce the built environment of the area in which the site is situated. 15.1.1.9 To maintain an appropriate level of amenity for residential uses without unreasonable restriction or constraint on the nature and hours of commercial activities. 15.1.1.10 To ensure that retail shopping strips do not develop along major arterial roads within the zone.

The proposed development is comprised of residential dwellings and commercial uses to provide integration in urban locations (15.1.1.1).

The street level contains a landscaped courtyard (utilised by the proposed food services use) and a retail space which will create an active street frontage (15.1.1.2).

The proposed development includes a garden area to the streetscape and will provide sufficient lighting to enhance the amenity at street level. The massing of the buildings towards the Brooker Highway will decrease overshadowing onto Campbell Street (15.1.1.3).

The proposed commercial uses are for 'Food Service' and 'General Retail and Hire', the proposed use of the shops will increase the diversity of the commercial uses within the Urban Mixed Use Zone (15.1.1.4).

The proposed development is accessible for walking and cycling. The proposed buildings are facing Campbell Street which has public transport within 30m (15.1.1.5).

The proposal retains the existing heritage buildings on the site and includes a diversity of uses. The primary impact in terms of residential areas is on the Glebe area north of the site. Whilst there will be increased bulk adjoining the Brooker Highway, the building sits behind substantial trees in the road reserve which is of a similar height to the proposal. Further, the façade is detailed to break up the masing of this façade (refer to the Architects Design Statement in Appendix K) (15.1.1.6).

The rear area of the proposed site is comprised of a large parking space that is underutilised. The existing heritage building will be renovated and utilised to service the residential complex (15.1.1.7).

The façade of the proposed building is of a modern style that will make a positive contribution to the streetscape and enhance the environment of the area (15.1.1.8).

The proposed building is for 'Residential' use. Other uses such as 'Food Service' and 'General Retail and Hire' with specific operation hours is consistent with relevant sub-clause under the Scheme (15.1.1.9).

Campbell Street is not a major arterial road (15.1.1.10).

15.3 Use Standards

The proposed uses are Residential, Food services (restaurant – No.177), Business and Professional Services (Consulting Rooms – No.179) and General Retail and Hire (Shops C-01 and C-02). The Residential and Food Services uses are permitted uses, and the remaining uses are discretionary.

15.3.1 Non-Residential Use

Objective:	
To ensure that non-residential use does not unreasonably impact residential amenity.	
Acceptable Solutions	**Performance Criteria**
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** ***

The operation hours of the proposed restaurant, consulting rooms and shop are 7 am to 9 pm weekdays, 8 am to 6 pm Saturdays and 9 am to 5 pm Sundays. The proposal will comply with 15.3.1 A1.

A2 Noise emissions measured at the boundary of the site must not exceed the following: (a) 55dB(A) (LAeq) between the hours of 8.00 am to 6.00 pm; (b) 5dB(A) above the background (LA90) level or 40dB(A) (LAeq), whichever is the lower, between the hours of 6.00 pm to 8.00 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, issued by the Director of Environmental Management, including adjustment of noise levels for tonality and impulsiveness. Noise levels are to be averaged over a 15 minute time interval.	**P2** 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.

A noise assessment has not been undertaken for the proposed development, so A1 cannot be demonstrated. Given the proposed uses are unlikely to generate significant noise and the hours of operation are compliant with A2, the non-residential uses are unlikely to cause environmental harm meeting P2.

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.	**P3** ***

The external lighting will only be for security lighting (a) and the security lights will be baffled (b). The proposed development thus complies with 15.3.1 A3.

A4	**P4** ***

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.	

Commercial vehicle movements (including waste disposal) will be limited to 7 am to 5 pm weekdays, 8 am to 5 pm Saturdays and 9 am to 12 noon Sundays, thus the Acceptable Solution P4 is met.

15.4 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.	
Acceptable Solutions	Performance Criteria
A1 Building height must be no more than: 10m	**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 height of the building is 23.3m in height and thus cannot meet the Acceptable Solution. It has therefore been considered against the Performance Criteria P1 as follows:

There are no Desired Future Character Statements for the Urban Mixed Use Zone, therefore sub-clause (a) is not applicable.

Whilst the immediately surrounding buildings are only of single or double-storey height, there are buildings in the area nearby which are of similar scales such as the 5 storey/17.9m 87-91 Campbell Street (Housing Tasmania), 19 Bathurst (Tafe Tasmanian Campus) – 7 storeys/26.64m and 65-69 Letitia Street (old Hobart High School) – 4 storeys, which similarly abut the Brooker Highway. It is also relevant that whilst the roofing form design results in increased height (as opposed to a flat-roofed concept) it adds visual interest to the form. In terms of the floor plate, 152-170 Campbell Street, 116-138 Campbell Street and 181-189 Campbell Street (Woolworths) all have a substantially larger floor plate than the proposal. As the objective is to require building scale to contribute positively to the streetscape, the proposed design meets this objective as the building steps to the rear of the site where the scale is less visible from Campbell Street (b).

The higher parts of the proposed development would be setback from the site frontage with Campbell Street and stepped in such a way to reduce overshadowing of adjacent public spaces. The shadow diagrams demonstrate that in mid-winter Campbell Street will not be overshadowed at 9 am or 3 pm but would be subject to some overshadowing at 12 midday. However, given the footpath on the same side of the street would be already overshadowed at midday and that footpath on the other side would not be overshadowed by the proposed development, the proposal is not considered to have an unreasonable overshadowing impact upon adjacent public spaces (c).

In terms of transition between adjoining buildings, the design mimics the industrial warehousing that is prevalent on 181-189 Campbell Street (Woolworths) and other sites within the area. The scale of the element that meets Campbell Street has been kept at 4 storeys to maintain consistency with the 2-3 storey building line present on 181-189 Campbell Street (Woolworths) site (particularly the State listed townhouse in the centre of the car park), 185 Campbell Street (Antique Store) and 169-173 Campbell Street (Tasmanian Meat Wholesalers). The proposed design breaks the massing up with differently cladding elements and modulated surfaces. The two landscaped courtyards and connecting spaces give permeability to the design as well as provide deep soil zones and opportunity for significant planting to soften the harder urban forms in the proposal.

Given the above assessment, the Performance Criteria is considered to have been met.

As no part of the building is within 10m of a residential zone, A2 is not applicable.

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.	
Acceptable Solutions	**Performance Criteria**
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.	**P1** ***

The proposed building setback is nil and parallel to the frontage compliant with A1.

As the Subject Site is not in close proximity to a General Residential Zone or Inner Residential Zone A2 is not applicable.

15.4.3 Design

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.	
Acceptable Solutions	**Performance Criteria**
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 or alterations to an existing facade 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 or alterations to an existing facade 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 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** ***

The proposed shop, consulting rooms and café entry forecourt make a positive contribution to the streetscape by providing a shopfront and two landscaped courtyards fronting Campbell Street. The compliance for non-residential use is as follows:

The main pedestrian entrances off of Campbell Street are easily visible and accessible (a).

The façade of two existing commercial use heritage buildings will remain as is. The proposed building has approximately 50 % of the building's front façade as glass/window on the ground floor, allowing for a visual connection between the building and streetscape (b)(c).

No mechanical plant or miscellaneous equipment is visible from the street, as provision for this has been made in the basement car park of the building (d).

The proposed lift overrun is within the roof structure (e).

The proposal includes an awning over the shopfront, although these are not provided on adjoining lots (f).

No security shutters are proposed (g).

Based on the above, the proposed development is considered to satisfy Clause 15.4.3 A1.

Acceptable Solutions	Performance Criteria
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.	**P2** No performance criteria.

The northeast elevation faces the General Residential zone of the Glebe at a distance of approximately 50m. The surfaces are brick and will thus have a low reflective value, however, the substantial row of trees in the Brooker Highway reserve will largely block views of the building from this perspective. Thus A2 is achieved.

15.4.4 Passive Surveillance

Objective:	
To ensure that building design for non-residential uses provides for the safety of the public.	
Acceptable Solutions	**Performance Criteria**
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 or alterations to an existing facade 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 or alterations to an existing facade 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.	**P1** ***

The main pedestrian entrances to the building from Campbell Street are easily visible and accessible (a).

Approximately 50% of the building's ground floor, front façade is for window openings or glass doors, allowing for a visual connection between the building and streetscape (b)(c).

The entryway to the building is open to the northern side and offers passive surveillance of the two shopfronts, whilst the inner courtyard area has passive surveillance of the units. The access through the northern side of the site has the passive surveillance of the alfresco area and the circulation/court area (d).

External lighting to public areas will be implemented as per relevant Australian Standards as well as lighting for the underground car parking area (e).

There is no external car park, thus (f) is not applicable.

Accordingly, the proposal is considered compliant with 15.4.4 A1.

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.	
Acceptable Solutions	Performance Criteria
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.	**P1** Landscaping must be provided to satisfy all of the following: (a) enhance the appearance of the development; (b) provide a range of plant height and forms to create diversity, interest and amenity; (c) not create concealed entrapment spaces; (d) be consistent with any Desired Future Character Statements provided for the area.

The building does not extend along the width of the frontage (due to the existing heritage items) thus landscaping along the frontage is required and as such A1 cannot be met and P1 must be considered.

The proposed development contains a landscaped area in front of the heritage buildings and a central courtyard area (refer to the Landscape Architectural Report in Appendix M) which enhances the appearance of the proposal (a).

A range of shrubs and large trees are utilised (b).

As discussed above, entrapment spaces are not created and landscaping along the street edge is low thus providing passive surveillance of the site from Campbell Street (c).

There is no Desired Future Character Statement thus (d) is not applicable. Therefore, it complies with 15.4.5 P1.

As no part of the site of the proposed development is adjacent to a residential zone, A2 is not applicable.

As no outdoor storage is proposed for the non-residential uses (on the site) 15.4.6 is considered not applicable.

15.4.7 Fencing

Objective:	
To ensure that fencing does not detract from the appearance of the site or the locality and provides for passive surveillance.	
Acceptable Solutions	Performance Criteria
A1 Fencing must comply with all of the following: (a) fences, walls and gates of greater height than 1.5 m must not be erected within 10 m of the frontage; (b) fences along a frontage must be at least 50% transparent above a height of 1.2 m; (c) height of fences along a common boundary with land in a residential zone must be no more than 2.1 m and must not contain barbed wire.	**P1** ***

The proposed steel and brick fence on the Campbell Street frontage is 20m long with a maximum of 2.3m in height and has more than 50% transparency above a height of 0.8m, therefore, it complies with sub-clause A1(a) and (b). As the proposed development is not adjoining with the residential zone sub-clause (c) is not applicable.

15.4.8 Residential Amenity

Objective:	
To ensure that buildings for residential use provide reasonable levels of residential amenity and safety.	
Acceptable Solutions	**Performance Criteria**
A1 A dwelling must have at least one habitable room window (other than a bedroom) facing between 30 degrees west of north and 30 degrees east of north.	**P1** ***

The proposed development contains 31 apartments, the living room windows are facing 30 degrees west of north and 30 degrees east of north. Therefore, the proposal satisfies 15.4.8 A1.

A2 The potential for direct overlooking from windows of habitable rooms with a finished surface or floor level more than 1m above natural ground level on one lot to the windows of habitable rooms, balconies, decks and roof gardens on adjacent lots must be avoided or minimised by complying with any of the following: (a) have a side boundary setback no less than 3 m; (b) be offset no less than 1.5 m from the windows of habitable rooms on adjacent lots where on the same horizontal lane; (c) have a window seal height no less than 1.5 m.	**P2** ***

There are no habitable room windows on adjoining lots thus compliance with A2 (b) is achieved.

A3 Outdoor living space must be provided for a dwelling that complies with all of the following: (a) be no less than $10m^2$; (b) have a width no less than 2 m.	**P3** ***

All dwellings have a single deck space of 10 m^2 with a minimum width of 2m compliant with A3.

A4 Habitable rooms of dwellings adjacent to streets carrying more than 6000 vehicle per day must be designed to achieve internal noise levels no more than 45 dBa in accordance with relevant Australian Standards for acoustics control, (including AS3671 - Road Traffic, and AS2107 - Habitable Rooms).	**P4** ***

There will be noise impacts on the units given the proximity to the Brooker Highway and to a lesser degree Campbell Street. As such, the façade/glazing treatments will comply with AS2107 compliant with A4.

4.3 Codes

E 2.0 Potentially Contaminated Land Code

Hobart City Council has advised that the site is a potentially contaminated site due to the historic use of adjacent land. Therefore, an Environmental Site Assessment has been prepared by Geo-Environmental Solutions (GES) (Appendix F).

The Assessment identified there is a low risk for contaminated soil or groundwater on site.

The Scheme defines 'Potentially Contaminated Land' as follows:

Land that is, or adjoins, land that the applicant or the planning authority:

(a) knows to have been used for a potentially contaminating activity by reference to:
- *(i) a notice issued in accordance with Part 5A of the Environmental Management and Pollution Control Act 1994; or*
- *(ii) a previous permit; or*

(b) ought reasonably to have known was used for a potentially contaminating activity.

The proposed development is a mixed-use proposal and as development is on potentially contaminated land, the Code needs to be considered as per Clause 2.2 (Application of this Code).

An assessment of the proposal against the applicable Code provisions follows.

E2.5 Use Standards

Objective:	
To ensure that potentially contaminated land is suitable for the intended use	
Acceptable Solution	**Performance Criteria**
A1 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.	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 (iii) a statement that the land is suitable for the intended use.

There is no approval from the Director of the EPA for this proposal thus A1 cannot be achieved. The Environmental Site Assessment (Appendix F) identifies *"there is low risk for contaminated soil or groundwater on site"* from underground fuel tanks on the adjacent 181-189 Campbell Street site.

The assessment recommends a further *"environmental site assessment be completed to test for contamination on the site prior to any site excavation and development works"*.

Therefore, it is consistent with E2.5 P1 (b).

E2.6 Development Standards

E2.6.1 Subdivision

As the proposed development does not involve subdivision, this provision is not considered applicable.

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.	
Acceptable Solution	**Performance Criteria**
A1 No acceptable solution.	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.

Significant excavation will occur on-site for the car park level. There is no Acceptable Solution under A1 thus P1 must be considered. The Environmental Site Assessment (Appendix F) identifies *"there is low risk for contaminated soil or groundwater on-site"* from underground fuel tanks on the adjacent 181-189 Campbell Street site. The assessment recommends a further *"environmental site assessment be completed to test for contamination on the site prior to any site excavation and development works"* (b). On this basis, *E2.6.2* P1 (b) is satisfied.

E 5.0 Road and Railway Assets Code

The proposed development will utilise an existing vehicle crossing and two other existing vehicle crossings will be removed.

E5.5 Use Standards

E5.5.1 Existing road accesses and junctions

Acceptable Solution	Performance Criteria
A1 The annual average daily traffic (AADT) of vehicle movements, to and from a site, onto a category 1 or category 2 road, in an area subject to a speed limit of more than 60km/h, must not increase by more than 10% or 10 vehicle movements per day, whichever is the greater.	P1 ***

Vehicle movements from the site will only be onto Campbell Street which is not a category 1 or category 2 road and has a speed limit of 50km/h. Accordingly, A1 is considered not applicable.

A2 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 10% or 10 vehicle movements per day, whichever is the greater.	P2 ***

The speed limit along Campbell Street is 50km/h, accordingly, A2 is considered not applicable.

A3	P3

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.	Any increase in vehicle traffic at an existing access or junction in an area subject 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.

The TIA indicated that the currently AADT of vehicle movements will be increased by more than 40 vehicle movements per day (182 vmpd), therefore, P3 must be considered.

When fully occupied based on the medium density residential, office and commercial and restaurant will generate approximately 182 vehicle movements per day. The residential building is expected to generate 94 vehicle movements per day (base on the RTA Traffic Generating Guidelines). The business and professional services will generate 22 vehicle movements per day. The food service will generate 66 vehicle movements per day. Additionally, 18 vehicle movements were generated within the weekday peak hour surrounding the road network. Thus the fully occupied vehicle movement number will be 200 per day. This number of vehicle movements is low for an Urban Mixed Use area of this size, given much of the zone area is used for multiple purposes (a).

The proposed development is likely to be offset by the inner-city location and will encourage the uptake of other modes of transport (b).

The proposed development is located in a section of Campbell Street which already provides a high level of accessibility to local businesses in area (c).

Campbell Street has sufficient capacity as a collector road for the additional traffic movements (d).

The Campbell Street signalised intersection with Warwick Street effectively creates gaps in the traffic flow for this section of the road for safe entry/exit into properties and parking but not so long that traffic flow is restricted (e).

There is no alternative access (f).

The existing site access has operated safely and efficiently to date and will be upgraded as part of the proposed development (g).

A minor crash history exists for the area but there is no evidence of significant road safety issues in the study area (h).

No advice was received from the road authority (i).

Based on the above the proposal is considered to satisfy Performance Criteria P3.

E5.5.2 Exiting level crossings - Not Applicable

The proposed development does not impact any existing Level Crossings. Accordingly, this provision is considered not applicable.

E5.6 Development Standards

E5.6.1 Development adjacent to road and railways

As the site of the proposed development is not adjacent to a Category 1 or Category 2 road or rail network, Clause E5.6.1 is not applicable.

E5.6.2 Road accesses and junctions

Acceptable Solution	Performance Criteria
A1 No new access or junction to roads in an area subject to a speed limit of more than 60km/h.	P1 ***

The speed limit along Campbell Street is 50 km/hr and accordingly, A1 is not considered applicable.

Acceptable Solution	Performance Criteria
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.	P2 ***

One existing access will provide both entry/exit and no new accesses are proposed as part of the development. Therefore, the proposal is compliant with the E5.6.2 A2.

E5.6.3 New level crossings

As the site is not in proximity to any rail network, Clause E5.6.3 is not considered applicable.

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.	
Acceptable Solution	Performance Criteria
A1 Sight distances at: (a) an access or junction must comply with the Safe Intersection Sight Distance shown in Table E5.1; and (b) rail level crossings must comply with AS1742.7 Manual of uniform traffic control devices - Railway crossings, Standards Association of Australia.	**P1** The design, layout and location of an access, junction or rail level crossing must provide adequate sight distances to ensure the safe movement of vehicles, having regard to: (a) the nature and frequency of the traffic generated by the use; (b) the frequency of use of the road or rail network; (c) any alternative access; (d) the need for the access, junction, or level crossing; (e) any traffic impact assessment; (f) any measures to improve or maintain sight distance; and (g) any written advice received from the road or rail authority.

An acceptable solution is partially met as safe intersection sight distance to the right of the site access is deficient and on-street parking restricts sight distance to the left of the site access.

E5.6.4 has been assessed in the TIA against the Performance Criteria. It is deemed acceptable on the following grounds:

Sight distance to the right of the site access meets the minimum safe sight distance requirement stated in Figure 3.2 of AS/NZS 2890.1 for exiting an access driveway other than domestic property. Use of the site access to enter/exit the off-street car park is less frequent due to the largely residential nature of the development. (a) (b).

The site access arrangements are consistent with those around it hence the proposal does not introduce any new elements (c).

In addition to being a collector road, Campbell Street plays a local access role hence it is challenging to satisfy the SISD requirement for all access points along this road when on-street parking is present (d).

A minor crash history exists for the area but there is no evidence of significant road safety issues in the study area (e).

It is acknowledged on-street parking is commonplace in urban streets thus it is normal for sight distance to be partly obstructed at site accesses. Drivers generally observe gaps between parked vehicles. Whilst the site access will be upgraded, the existing site access has operated safely and efficiently to date. There is sufficient capacity in Campbell Street for the additional traffic movements from the proposed development (f).

No advice was received from the road authority (g).

Therefore, the proposed development is consistent with E5.6.4 P1.

E 6.0 Parking and Access Code

No use or development is exempt from this code as per Clause E6.4.1. The proposal has been assessed against the relevant provisions of the code.

E 6.6 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.**	
Acceptable Solution	Performance Criteria
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; except if: (i) the site is subject to a parking plan for the area adopted by Council, in which case parking provision (spaces or cash-in-lieu) must be in accordance with that plan; (ii) the site is subject to clauses E6.6.5, E6.6.6, E6.6.7, E6.6.8, E6.6.9 or E6.6.10 of this planning scheme.	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; (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 Code.

The proposed development has 31 dwellings comprising 2 bedrooms and 3 bedrooms apartments, townhouses and 2 commercial dwellings. The proposed car parking space contains 34 car parking spaces. Table E6.1 stipulated the number of vehicle parking spaces are 101 (Refer to Appendix G Traffic Impact Assessment – Table 7 Parking Requirements). Therefore, it cannot meet the A1 thus P1 must be considered.

The residential component of the proposed development is sited in a location that reduces the need for a personal vehicle due to the high level of accessibility to local services and community activities (a);

There is a considerable range of on-street parking around the subject site to cater for visitors to the building and business employees (b);

Campbell Street is a Metro route and a bus stop is located less than 50 m from the proposed development (c)

Close proximity to the Hobart CBD and North Hobart with the option to use transport modes such as walking, cycling or bus. The café is likely to attract people in the local area as there are very few other similar food services, and it is likely customers will walk or ride rather than drive. (d) (e);

Car parking demand in this section of Campbell Street is likely to vary considerably across the day with a turnover of time-restricted on-street parking regularly making spaces available for short-term use (f) (g);

There is no car parking credit as a result of previous use of the site, therefore sub-clause (h) is not considered applicable;

Private off-street parking is provided extensively for various purposes in this area taking pressure off on-street parking availability (i);

There is no relevant parking plan for the area adopted by Council, therefore sub-clause (k) is not applicable;

The heritage building has been retained and protected, thus there is no significant impact on the listed items. The Heritage Assessment is enclosed with the report to demonstrate details regarding the Local Heritage Code (l);

The site is not in proximity to any significant trees listed in the Significant Trees Code; therefore, sub-clause (m) is not applicable.

Based on the above, the proposed development is considered to satisfy the applicable E6.6.1 P1.

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.	
Acceptable Solution	**Performance Criteria**
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.	P1 No Performance Criteria.

The proposed development building is classified by the Building Code of Australia as a mix of classes. The classes and number of accessible car spaces required include:

• Class 2 (two or more sole occupancy units) – Not required

• Class 5 (office/commercial) - 1 space for every 100 car parking spaces or part thereof

• Class 6 (café) - 1 space for every 50 car parking spaces or part thereof

D3.5 Accessible car parking of the BCA states that accessible car parking spaces need not be provided in a car parking area where direct access to any of the car parking spaces is not available to the public. This is the case for the proposed development where the car park provided is for the residential apartments with no public access.

On-street car parking in this section of Campbell Street is likely to provide suitable alternatives in most cases for accessible parking, particularly given the wide, level carriageway and time-restricted parking available along the front of the proposed development.

Therefore, the proposed development complies 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.	
Acceptable Solution	**Performance Criteria**
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 except if bulky goods sales, (rounded to the nearest whole number). Where an existing use or development is extended or intensified, the additional number of motorcycle parking spaces provided must be calculated on the amount of extension or intensification, provided the existing number of motorcycle parking spaces is not reduced.	**P1** ***

Not considered applicable to this development however it is noted on-street motorcycle parking is provided in the next block just after the Brisbane Street intersection.

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.	
Acceptable Solution	**Performance Criteria**
A2 The number of on-site bicycle parking spaces provided must be no less than the number specified in Table E6.2.	**P2** ***

This requirement is not applicable for residential dwellings but is applicable for the proposed commercial and food activities based on floor area.

The proposed commercial and food activities individually cover small floor areas hence the requirements are not considered proportionate.

It has been calculated that perhaps 2-3 bicycle parking spaces may be appropriate. Bicycle hoops are provided at the entry to the retail tenancies basement storage lockers (suitable for bicycle storage) and vertical hangers for 12 bicycles are provided in the basement car parking area.

E 6.7 Development Standards

E6.7.1 Number of Vehicular 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.**	
Acceptable Solution	Performance Criteria
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.	**P1** ***

The proposed development will use the existing access from Campbell Street. It complies with E6.7.1 A1.

Acceptable Solution	Performance Criteria
A2 In the Central Business Zone and Particular Purpose Zone 10 (Royal Hobart Hospital) no new vehicular access is provided unless an existing access point is removed.	P2 ***

The site of the proposal is not located within the Central Business Zone or the Particular Purpose Zone 10 (Royal Hobart Hospital). Accordingly, this provision is not applicable.

Acceptable Solution	Performance Criteria
A3 In Particular Purpose Zone 4 - Calvary Healthcare Hospital Campus access to the site is to be provided according to the location of approved access points off Augusta Road and Honara Avenue shown on the endorsed plans associated with permit PLN-14-00428-01. The other access points noted are to be utilised for emergency access only.	P3 No performance criteria.

The proposal is not located in Particular Purpose Zone 4. Accordingly, this provision is not applicable.

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.	
Acceptable Solution	Performance Criteria
A1 Design of vehicle access points must comply with all of the following: (a) In the case of non-commercial vehicle access; the location, sight distance, width and gradient of an access must be designed and constructed to comply with section 3 – “Access Facilities to Off-street Parking Areas and Queuing Areas” of AS/NZS 2890.1:2004 Parking Facilities Part 1: Off-street car parking; (b) In the case of commercial vehicle access; the location, sight distance, geometry and gradient of an access must be designed and constructed to comply with all access driveway provisions in section 3 “Access Driveways and Circulation Roadways” of AS2890.2 - 2002 Parking facilities Part 2: Off-street commercial vehicle facilities.	**P1** ***

The existing access will be utilised which satisfies the location requirements of Section 3.2.3 of

AS/NZS 2890.1:2004 and entry width of 5.5 m wide (Combined for Category 1 access as defined in Tables 3.1 and 3.2 – Based on User Class 1A; local road frontage, <100 car spaces).

The minimum entering sight distance to the right is acceptable despite SISD not being achieved however this is not considered an issue for the reasons given in Section 4.4.

The minimum sightlines for pedestrian safety appear to be met (as required in Figure 3.3 of AS/NZS 2890.1:2004) however this should be checked at the site access detailed design stage.

The gradient of the access driveway does not comply however modification of the grade will be incorporated into the site access driveway design to achieve the standard as far as reasonably practicable.

The proposed development is consistent with E6.7.2 A1.

E6.7.3 Vehicular Passing Areas along an Access

<table>
<tr><td colspan="2">Objective:</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td>Acceptable Solution</td><td>Performance Criteria</td></tr>
<tr><td>A1

Vehicular passing areas must:
(a) be provided if any of the following applies to an access:
(i) it serves more than 5 car parking spaces;
(ii) is more than 30 m long;
(iii) it meets a road serving more than 6000 vehicles per day;
(b) be 6 m long, 5.5 m wide, and taper to the width of the driveway;
(c) have the first passing area constructed at the kerb;
(d) be at intervals of no more than 30 m along the access.</td><td>P1

***</td></tr>
</table>

The existing access meets a road serving more than 6,000 vehicles per day. The width of the access at the kerb will be 5.5 m and will continue at this width for the length of the 40 m driveway up to the car park entry. The driveway then tapers to a 3m width over a 10 m distance providing an area to reverse into if required.

The proposal is considered to comply with E6.7.3 A1.

E 6.7.4 On-Site Turning

<table>
<tr><td colspan="2">Objective:</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td>Acceptable Solution</td><td>Performance Criteria</td></tr>
<tr><td>A1

On-site turning must be provided to enable vehicles to exit a site in a forward direction, except where the access complies with any of the following:
(a) it serves no more than two dwelling units;
(c) it meets a road carrying less than 6000 vehicles per day.</td><td>P1

***</td></tr>
</table>

The off-street car park enables vehicles to exit in a forward direction.

It is noted waste management contractors will require access to the proposed development hence a turning path assessment has been completed (refer to Appendix A).

A typical waste collection vehicle utilised for these types of premises is able to manoeuvre and exit in a forward direction, however, any larger commercial vehicles will not be able to access the car park due to entry clearance height (discussed in E6.7.5).

E 6.7.5 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.	
Acceptable Solution	**Performance Criteria**
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.	**P1** ***

The acceptable solution is met as the off-street car park concept design complies with AS/NZS 2890.1:2004. Entry into the proposed development car park will have a clearance height of approximately 2.71 m (refer to Appendix A). This satisfies Clause 5.3 Headroom - a general requirement of a minimum of 2.2 m. However, this height requires the use of a Low Clearance sign as it is less than the required 3 m for cars/light vans and 4.6 m for all other cases. Level 1 of the building will horizontally overhang the access driveway by 2 m which at the start of the site access from Campbell Street will be a vertical distance of 4.05 m (i.e. ground level up to the Level 1 overhand) hence a Low Clearance sign will be required. On this basis, the proposed development is consistent with E6.7.5 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.	
Acceptable Solution	**Performance Criteria**
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, provided that the standard of paving and drainage complies with the adopted standards of the Council.	**P1** ***

The proposed off-street parking and vehicle circulation roadways will be concrete and drained to an approved stormwater system, including a new stormwater discharge to the kerb, as shown in the Concept Services plan in Appendix H therefore the proposal is consistent with E6.7.6 A1.

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.**	
Acceptable Solution	**Performance Criteria**
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.	**P1** ***

Lighting to public areas will be implemented as per Australian Standards, it is considered appropriate that permit conditions requiring more detailed plans prior to works commencing be incorporated into any planning permit issued.

On this basis, the proposed development is considered able to comply with E6.7.7 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.	
Acceptable Solution	Performance Criteria
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, except in the Central Business Zone where no landscaping is required.	**P1** ***

As the proposed car parking is in the basement E6.7.8 is not considered applicable.

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.	
Acceptable Solution	Performance Criteria
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 30 m of the main entrance to the building.	**P1** ***

As no motorcycle parking areas are included in the proposal, Clause E6.7.9 is not applicable.

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.	
Acceptable Solution	Performance Criteria
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 30 m of the main entrance to the building.	**P1** ***

Bicycle parking compliant with AS2890.3 is shown at the entry to the retail facilities compliant with A1.

E6.7.11 Bicycle End of Trip Facilities

Not applicable - please see the above statement under E6.7.10.

E6.7.12 Siting of Car Parking

Objective:	
To ensure that the streetscape, amenity and character of urban areas is not adversely affected by siting of vehicle parking and access facilities.	
Acceptable Solution	**Performance Criteria**
A1 Parking spaces and vehicle turning areas, including garages or covered parking areas in the Inner Residential Zone, Urban Mixed Use Zone, Village Zone, Local Business Zone and General Business Zone must be located behind the building line of buildings located or proposed on a site except if a parking area is already provided in front of the building line of a shopping centre.	**P1** ***

The Subject Site is zoned 'Urban Mixed Use' and all car parking areas are located on the basement level at the rear of the site, well behind the building lines of both existing heritage buildings.

The proposal complies with E6.7.12 A1.

E6.7.13 Facilities for Commercial Vehicles

Objective:	
To ensure that facilities for commercial vehicles are provided on site, as appropriate.	
Acceptable Solution	**Performance Criteria**
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 50 m of the site; (b) the use is not primarily dependent on outward delivery of goods from the site.	**P1** ***

Commercial vehicle facilities for loading, unloading or manoeuvring have not been provided on-site, there is not a dedicated loading zone within 50 m of the site, and the use is not primarily dependent on outward delivery of goods from the site.

Therefore, E6.7.13 is not considered applicable.

E6.7.14 Access to a Road

Objective:	
To ensure that access to the road network is provided appropriately.	
Acceptable Solution	**Performance Criteria**
A1 Access to a road must be in accordance with the requirements of the road authority.	P1 No Performance Criteria.

The existing access will be increase to 6.2m in width, it is sufficient to accommodate the two-way traffic movement.

The TIA confirms that the dimensions of the access are compliant with relevant Australian Standards thus satisfying the requirements of the road authority.

The proposal is considered compliant with Acceptable Solution (A1).

E 7.0 Stormwater Management Code

This code applies to development requiring the management of Stormwater (Clause E7.2.1) and no development is exempt from this code as per Clause E7.4.1. The proposal has been assessed against the relevant provisions of the code.

E7.7 Development Standards

Flood Modelling Report for the following clauses is contained in Appendix I.

E7.7.1 Stormwater Drainage and Disposal

Objective:	
To ensure that stormwater quality and quantity is managed appropriately.	
Acceptable Solution	**Performance Criteria**
A1 Stormwater from new impervious surfaces must be disposed of by gravity to public stormwater infrastructure.	**P1** ***

The site will drain by gravity via a new internal stormwater network and connect to the existing DN1800 park Street rivulet culvert. Refer to the Concept Services report for further information. The development is compliant with the E7.7.1 A1.

Acceptable Solution	**Performance Criteria**
A2 A stormwater system for a new development must incorporate water sensitive urban design principles R1 for the treatment and disposal of stormwater if any of the following apply: (b) the size of new impervious area is more than 600 m^2; (b) new car parking is provided for more than 6 cars; (c) A subdivision is for more than 5 lots.	**P2** ***

The stormwater system incorporates a proprietary SQID within the basement car park to treat stormwater run-off from the site. The development is compliant with the E7.7.1 A2.

Acceptable Solution	**Performance Criteria**
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 and an ARI of 50 years in the case of 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.	**P3** No Performance Criteria.

The minor stormwater drainage system has been designed to accommodate a storm with an ARI of 20 years. Stormwater detention for any increase inflows can be incorporated in the oversizing of the new private stormwater pipework under the basement car park upstream of the SQID and property connection.

Please Refer to Concept Services (Appendix H).

Given the above assessment the proposal, therefore, meets E7.7.1 A3.

Acceptable Solution	Performance Criteria
A4 A major stormwater drainage system must be designed to accommodate a storm with an ARI of 100 years.	**P4** No Performance Criteria.

The assessment of the development in relation to overland, major, drainage systems across the site is included in the Flood hazard Report, Flussig, July 2021 included in Appendix I. This report demonstrates the site can safely be developed to accommodate a 1% AEP (ARI 100 yrs) event complying with acceptable solution A4.

E8.0 Electricity Transmission Infrastructure Protection Code

The proposed development is not within:

- an electricity transmission corridor;
- 55m of a communications station; or
- 65 m of a substation.

The TasNetworks substation at 222 Campbell Street, North Hobart is approximately 320m northwest of the development site. Accordingly, an assessment against the code is not triggered by the proposal.

E9.0 Attenuation Code

The proposed development comprises uses that are 'sensitive' ('Residential').

The proposed development on land within 100m from 'Smallgoods Manufacture' (Tasmanian Meat Wholesalers) which listed in Table E9.1, but not on land within an Attenuation Area shown on the planning scheme maps. Therefore the code must be considered.

E9.7.2 Development for Sensitive Use in Proximity to Use with Potential to Cause Environmental Harm

Objective:	
To ensure that new sensitive use does not conflict with, interfere with or constrain uses with potential to cause environmental harm.	
Acceptable Solution	**Performance Criteria**
A1 No Acceptable Solution.	**P1** Development for sensitive use, including subdivision of lots within a sensitive zone, 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 or pollution that may emitted from the activity; (b) The degree of encroachment by the sensitive use into the Attenuation Area or the attenuation distance; (c) Measures in the design, layout and construction of the development for the sensitive use to eliminate, mitigate or manage effects of emissions.

As there is no acceptable solution for the above clause, thus E9.7.2 P1 is addressed as follows:

The Tasmanian Meat Wholesalers operation is unlikely to cause environmental harm given its small scale and its regulation under the *Meat Hygiene Act 1985* (a).

The proposed sensitive uses are well within the 100m attenuation distance, but this is not considered significant given the scale and intensity of the manufacturer of the small goods (b).

The façade immediately opposite Tasmanian Meat Wholesalers is the access to the car park only with a 4.3m high wall (c).

Based on the above the proposal is considered to satisfy applicable elements of E9.7.2 P1.

E13.0 Historic Heritage Code

The subject site is not listed on the Tasmanian Heritage Register. However, two of the residential dwellings located on titles within the Subject Site are listed as heritage places within Table E13.1 of the *Hobart Interim Planning Scheme 2015* ('Heritage Places by Street Name – Hobart'). These are located at 177 and 179 Campbell Street respectively (CT 22529/3 and CT 23363/1). Furthermore, Titles immediately adjoining the northwest and southeast boundaries of the Subject Site also contain buildings permanently registered on the Tasmanian Heritage Register (refer to Appendix J). All heritage items on or within immediate proximity to the Subject Site are listed below in Table 2.

Table 2 - Heritage Places by Street Name - Hobart (Cameron to Cross)

Ref. No.	Street No.	Street/Location	C.T.	General Description
514	169	Campbell Street	140732/1	Now part of 169-173 Campbell Street - that part of the address previously known as 169 Campbell Street only
517	177	Campbell Street	22529/3	House
518	179	Campbell Street	23363/1	House
520	187	Campbell Street	121292/1	Listed as 181-189 Campbell Street on the List Map

A heritage consultant has prepared a heritage assessment which can be found in Appendix J. The proposal has also been assessed against Part E13.7 of the Planning Scheme, 'Development Standards for Heritage Places', as outlined below.

E13.7 Development Standards for Heritage Places

E13.7.1 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.	
Acceptable Solution	**Performance Criteria**
A1 No acceptable solution	**P1** Demolition must not result in the loss of significant fabric, form, items, outbuildings or landscape elements that contribute to the historic cultural heritage significance of the place unless all of the following are satisfied: (a) there are environmental, social, economic or safety reasons of greater value to the community than the historic cultural heritage values of the place; (b) there are no prudent and feasible alternatives; (c) important structural or façade elements that can feasibly be retained and reused in a new structure, are to be retained; (d) significant fabric is documented before demolition.

As there is no Acceptable Solution under A1 thus P1 must be considered.

Some of the internal walls and doors of the existing heritage buildings and 'Lean-On' walls at the rear of houses will be demolished. The existing front access ramp, landscaping in the front of the house and the timber shed at the rear of 179 Campbell Street will be demolished. However, all of the significant fabric, forms and items will be protected and maintained.

The heritage consultant concluded that the existing heritage buildings have a low level of historic cultural heritage values and are limited to the architectural qualities in terms of the buildings themselves. The proposed new fence and landscape in front of the heritages would contribute a positive visual impact compared to the existing wire fence and landscape. The heritage buildings will change the residential use to commercial use, which provide greater value to the community (a).

The renovation is a feasible approach to maintain and enhance the value of the existing heritage buildings (b).

The façade and significant structure will be retained and re-used with the new structure (c).

As no significant fabric will be demolished, therefore sub-clause (d) is not applicable.

Based on the above, the proposal satisfies the E13.7.1 P1.

E13.7.2 Buildings and Works other than Demolition

Objective:	
To ensure that development at a heritage place is: **(a) undertaken in a sympathetic manner which does not cause loss of historic cultural heritage significance; and** **(b) designed to be subservient to the historic cultural heritage values of the place and responsive to its dominant characteristics.**	
Acceptable Solution	**Performance Criteria**
A1 No Acceptable Solution.	**P1** Development must not result in any of the following: (a) loss of historic cultural heritage significance to the place through incompatible design, including in height, scale, bulk, form, fenestration, siting, materials, colours and finishes; (b) substantial diminution of the historic cultural heritage significance of the place through loss of significant streetscape elements including plants, trees, fences, walls, paths, outbuildings and other items that contribute to the significance of the place.

As there is no Acceptable Solution under A2 thus P2 must be considered.

The scale of the new building around the heritage items has been carefully considered to ensure it appropriately steps away from the heritage item such as not to dominate them. Further, the building has been designed to respond to the scale of the heritage items by breaking up the form into smaller discrete elements and utilising some of the finishes common with the heritage item. The architectural design statement includes more detail on this matter (a).

The existing heritage buildings are retained intact and their relationship with the street enhances through the proposed forecourt garden. The low retaining wall and fence presented to Campbell Street is of residential scale and maintains view lines into the former front yards of the heritage items (refer to the landscape plan in the Proposal Plan, Appendix C). Therefore, sub-clause (b) is considered not applicable.

Based on the above, the proposal complies with E13.7.2 P1.

A2 No Acceptable Solution.	**P2** Development must be designed to be subservient and complementary to the place through characteristics including: (a) scale and bulk, materials, built form and fenestration; (b) setback from frontage; (c) siting with respect to buildings, structures and listed elements; (d) using less dominant materials and colours.

There is no Acceptable Solution under A2 thus P2 must be considered.

As stated above, the new buildings are set back and designed to complement the heritage items albeit in a changed context. The stepping form of the new building, granular design and common material selections do not diminish the importance of the heritage items (a).

The frontage setback is not altered in front of the heritage buildings themselves, but the new building does wrap around them and creates a frontage with the street (which is consistent in the area. The relationship between the heritage items and the street is enhanced by the re-use of the front garden area into a useable garden space for the commercial premises (b)(c). The materials used are both borrowed from but are less dominant than the heritage items (refer to the architectural design statement in Appendix K). The proposed development is therefore consistent with E13.7.2 P2.

A3	P3
No Acceptable Solution.	Materials, built form and fenestration must respond to the dominant heritage characteristics of the place, but any new fabric should be readily identifiable as such.

As there is no Acceptable Solution under A3 thus P3 must be considered.

The proposed materials, form and detailing respond to the industrial nature of the area and the small scale of the heritage items. The new building is a contemporary design but borrows from surrounding elements in terms of form and materiality (refer to the architectural design statement in Appendix K). Therefore, the proposal complies with E13.7.2 P3.

A4	P4
No Acceptable Solution.	Extensions to existing buildings must not detract from the historic cultural heritage significance of the place.

As there is no Acceptable Solution under A4 thus P4 must be considered.

As there are no extensions proposed to existing buildings, this E13.7.2 P4 is not considered applicable.

A5	P5
New front fences and gates must accord with original design, based on photographic, archaeological or other historical evidence.	New front fences and gates must be sympathetic in design, (including height, form, scale and materials), to the style, period and characteristics of the building to which they belong.

The proposed front fence is a steel brick fence that has a similar style to the existing heritage building. Therefore, it complies with E13.7.2 A5.

A6	P6
Areas of landscaping between a dwelling and the street must be retained.	The removal of areas of landscaping between a dwelling and the street must not result in the loss of elements of landscaping that contribute to the historic cultural significance of the place.

Areas of landscaping to be removed and replaced with new landscaping between the heritage dwellings (177 and 179 Campbell Street) and the Campbell Street Road Reserve are the low steel fencing, trees and shrubbery. Therefore, it cannot meet the Acceptable Solution A6 and has therefore been considered against the Performance Criteria P6. There are no specific elements of the landscaping that contribute to the historic cultural significance of the place, however, the area between the heritage items and the street have been re-landscaped and utilised as open space for commercial activities.

E13.7.3 Subdivision

As the proposed development contains no subdivision, this provision is not considered applicable.

E13.8 Development Standards for Heritage Precincts

As no part of the proposed development is within a Heritage Precinct, no provisions within this Clause are considered applicable.

E13.9 Development Standards for Cultural Landscape Precincts

As no part of the proposed development is within a Cultural Landscape Precinct, no provisions within this Clause are considered applicable.

E13.10 Development Standards for Places of Archaeological Potential

The site is located within a place of Archaeological Potential (namely, that of Central Hobart as shown in Figure E13.4.1, Table 13.4).

E13.0 Development Standards for Places of Archaeological Potential

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.	
Acceptable Solution	Performance Criteria
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'.

Building and works of the proposed development will involve excavation and ground disturbance as a basement level will be created, containing a car park. The proposal, therefore, does not comply with A1 and has instead been considered against P2 as follows:

The ArcTas Statement of Archaeological Potential Report (Appendix L) indicated that the site does not have archaeological potential, therefore compliance with E13.10.1 P1 is achieved.

E13.10.2 Subdivision

As the proposed development does not involve subdivision, this provision is considered not applicable.

4.4 Specific Area Plans

F4.0 Royal Hobart Hospital Helipad Airspace Specific Area Plan

The proposed development is within the area of the Royal Hobart Hospital Helipad Airspace Specific Area Plan. The purpose of this Specific Area Plan is to ensure that the development of land does not obstruct safe air navigation of aircraft approaching and departing the Royal Hobart Hospital helipad.

E13.0 Development Standards for Buildings and Works

F4.3.1 Building Height

Objective:	
To ensure that buildings do not interfere with safe aircraft operations in the vicinity of the Royal Hobart Hospital helipad.	
Acceptable Solution	**Performance Criteria**
A1 Building height including minor protrusions, masts or aerials within the areas shown on Figure F4.1 must be no more than: (a) 64.5m AHD if within the Inner Area; (b) 100m AHD if within the Outer Area.	**P1** Buildings that exceed the specified height must not create an obstruction or hazard for the operation of aircraft, having regard to any advice from the Civil Aviation Safety Authority, the Department of Health and Human Services and the helipad operator.

Building and works of the proposed development are within the Inner Area of the Specific Area Plan, the highest building is 25.4m less than 64.5m. Therefore, it complies with F4.3.1 A1 (a).

5. Impact Assessment

5.1 Visual Impact

The assessment of visual impact considers short, medium and long-distance perspectives. Relevant short distance perspectives are:

- The Glebe;
- The Brooker Highway; and
- On Campbell Street;

Relevant medium distance perspectives are:

- The Aberdeen Street Playground and the upper parts of the Glebe;
- Residential areas to the south-west in the Paternoster and Church Street area; and
- Residential areas to the east in the Warwick Street/Tasma Street area.

Longer distance views are largely blocked by the Church Street ridge from the west and the Queens Domain from the east. Views north and south are generally obstructed by intervening buildings.

An Architects Design Statement (Appendix K) supports the visual assessment.

The Glebe

The proposed building will be clearly visible from houses that are on the lower part of the Glebe, particularly between Scott and Lillie Street directly across from the site at a distance of 60m at the closest point. These residences will view the site through a line of well-established poplar and other trees on the western side of Brooker Highway. Further, there is also a row of paperbark trees in the median strip of the Brooker Highway which in time will add further screening to these houses. It is recognised these trees are deciduous and thus the building will be more obvious in winter and that two trees will be removed. However, significant screening of the building remains and the proposal includes a deep soil zone on the eastern side of the building which will accommodate some larger trees in case those in the highway reserve fail at some time in the future. The building is designed to be lower than the existing trees and thus given the extent of existing and future screening from eastern views, the impact is considered to be reasonable.

Photo 1 - Lillie Street looking west

The Brooker Highway

The proposed building will be visible both north and southbound on Brooker Highway. Both these viewpoints view the building to some extent through the large trees on the western side of the highway. From the north, the northern elevation is visible above the Woolworths site, but does reflect the same roof design as the building on this site and thus is read as part of this architecture. The building is designed to appear as a conglomerate of separate elements, which will assist the building in forming an expected part of the townscape. From the south, the same applies, but as the vegetation is more prominent from this angle

Photo 2 – Brooker Highway looking north

Campbell Street

The proposal will be clearly visible from Campbell Street, particularly as the southern part of the building is built to the frontage. The existing houses will retain their relationship with the street, but the newer parts of the built form will reinforce the street edge as do other buildings in the area. The building mass is concentrated at the rear of the site and is broken into a series of discrete elements that will read as a series of interrelated parts rather than a monolithic form. The views from the street will largely be of the four-storey element meeting the street frontage and the existing houses (and the green spaces in front of them). Given the mass is concentrated to the rear of the site and it does not dominate the streetscape, the visual impact is considered reasonable.

Photomontage 1 – View south down Campbell Street

Aberdeen Street Playground and the upper parts of the Glebe

The views from the upper parts of the Glebe and Aberdeen Street Playground will also view the eastern elevation behind a line of significant trees but from a higher and more distant perspective. Whilst from this elevation the coverage of the existing trees will not be as great, the viewer is more likely to look over the site. For these reasons, the visual impact is considered reasonable.

Photo 3 – View west down Lillie Street

Residential areas to the south-west in the Paternoster and Church Street area

Views down to the site from the Church Street ridge are at a distance of 250-300m. Due to the intervening townscape, only the upper parts of the building will be visible from these perspectives. The building will appear as a series of individual roofs which will be read against the housing in the Glebe. As such, the visual impact is considered reasonable.

Photo 4 – View east from Paternoster Row

Residential areas to the east in the Warwick Street/Tasma Street area

Due to the intervening townscape, only the upper parts of the building will be visible from these perspectives. This area does not have great elevation, as such more of the proposed building will be hidden by the existing townscape. The visual impact from this perspective is considered reasonable.

Photo 5 - Warwick Street looking east

5.2 Traffic and Transport Networks

A Traffic Impact Assessment(TIA) has been undertaken (refer to Appendix G). The report considers the potential increase in traffic from the proposed uses and development, safety implications as well as compliance with elements of the Planning Scheme and relevant Australian Standards. The report concludes that the proposed development does not significantly increase the number of vehicle movements on the local road network during peak periods and is unlikely to impact existing parking facilities therefore should not adversely impact traffic efficiency and road safety in the area. In addition, the Metro bus stops are located within a 200m radius of the subject site. The site is also within easy walking distance of local shops and a college. Future residents and users of the proposed development will be provided with a number of active transport options contributing to better health outcomes. Based on the TIA, the proposed development is supported on traffic grounds.

5.4 Economic Impacts

Beyond the economic stimulus from the construction activity, the future residents and visitors to the site will provide ongoing positive contributions. There will be increased patronage to existing businesses in the Hobart CBD. The proximity of working and studying opportunities is likely to appeal to residents, thereby reducing the need for increased road infrastructure.

6. Conclusion & Recommendations

The proposal seeks to develop Mixed-Use Development predominantly at 175, 177 and 179 Campbell Street (CT 23364/1, CT 23364/2, CT 22529/3, and CT 23363/1 respectively) for residential use with several commercial tenancies and publicly accessible open space areas.

The proposal is for demolition of the existing building at 175 Campbell Street; the adhesion of four lots to create a single development site area; and the development of a 6-storey mixed-use building.

The mixed-use building will comprise a basement car park which is below the ground; 5 floors of residential development with a total of 31 multiple dwellings.

The proposed development will use the existing access to enable vehicle movements. The proposed development generates the following discretions under the *Hobart Interim Planning Scheme 2015* (the Scheme):

- **15.4 Development Standards for Buildings and Works**
    - 15.4.1 Building Height P1
    - 15.4.5 Landscaping P1
- **E2.0 Potentially Contaminated Land Code**
    - E2.6.2 Excavation P1
- **E5.0 Road and Railway Assets Code**
    - E5.5.1 Existing road accesses and junctions P3
    - E5.6.4 Sight distance at accesses, junctions and level crossings P1
- **E6.0 Parking and Access Code**
    - E6.6.1 Number of Car Parking Spaces P1
- **E9.0 Attenuation Code**
    - E9.7.1 Development for Use with Potential to Cause Environmental Harm P1
- **E13.0 Historic Heritage Code**
    - E13.7.1 Demolition P1
    - E13.7.2 Building and Work other than Demolition P1
    - E13.7.2 Building and Work other than Demolition P2
    - E13.7.2 Building and Work other than Demolition P3
    - E13.7.2 Building and Work other than Demolition P4
    - E13.7.2 Building and Work other than Demolition P6
    - E13.10.1 Building, Works and Demolition P1

The proposal has been assessed against all relevant performance criteria and found to either comply with Acceptable Solutions or be able to satisfy applicable Performance Criteria.

In conclusion, the application is considered to be acceptable with respect to the Planning Scheme requirements and therefore ought to be supported by the Planning Authority.

APPENDIX A

Title Information

APPENDIX B

Survey Plan

APPENDIX C

Proposal Plans

APPENDIX D

Notification Letters

APPENDIX E

Demolition Plan

APPENDIX F

Environmental Site Assessment

APPENDIX G

Traffic Impact Assessment

APPENDIX H

Concept Services Report

APPENDIX I

Flood Modelling Report

APPENDIX J

Heritage Assessment

APPENDIX K

Architectural Design Statement

APPENDIX L

Arctas Statement of Archaeological Potential

APPENDIX M

Landscape Architecture Report

APPENDIX N

Arborist Assessment

APPENDIX O

Waste Management Plan

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Engineers & Planners

CU MUL US

175-179 CAMBELL ST
DA REPORT
NOVEMBER 2021

CONTENTS

Cumulus respectfully acknowledges the First Peoples of Australia, their Elders past and present, who were and are the keepers of their cultural and knowledge and traditions, and the traditional owners of the land on which we live and work.

Revision #	Issue Date
Draft	01.07.2021
Revision A	06.07.2021
Revision B	17.11.2021
Revision C	17.01.2022

PROJECT INTRODUCTION

Hobart's high appeal as both a tourism destination and beautiful place to live has also brought with it an increase demand for housing. Unlike other larger Australian cities, Hobart is relatively undeveloped and provides high level of access to the city, social amenities and recreational areas, all of which make it ideal for higher density development inner city living.

Surrounded by residential and commercial uses, the design's form draws inspiration both from the surrounding industrial warehouse buildings as well as neighbouring historic residences.

NOTE:

This report has been updated to reflect a revised proposal based on extensive discussion with the HCC Urban Design Advisory Panel. Design changes include:

- Reduced overall height and nº of apartments
- Reduced roof height over circulation space to south
- Simplification of building form behind heritage cottages
- Relocation of plant equipment on the street so that heritage cottages are not concealed.

View of the Revised (current) Proposed Development from Campbell St

View of Original Proposal from Campbell St

01 / LOCATION

Located between the CBD and the Queens Domain, the site is ideally located for inner city living.

SITE LOCATION

LOCATION

The site is located on the edge of Inner City Hobart with the CBD located within an easy 10min (800m) walk distance and the north Hobart cafe strip also within a similar distance.

It is surrounded by a mix of residences, commercial and semi-industrial uses as well as park lands and recreational facilities.

RECREATIONAL AREAS

RECREATION

A number of parks and recreational grounds are easily accessable by residents within a 10min (800m) walking distance, suplimenting on-site private outdoor space.

SPORTS FACILITIES

SPORTS

A number of sports facilites are easily accessable by residents within a 10min (800m) walking distance, suplimenting on-site private outdoor space.

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ROAD NETWORK

ROADWAYS

The site sits between two major vehicular routes - the Brooker Highway to the east and Campbell St to the west.

There is good access to the site for both private vehicles and public transport routes.

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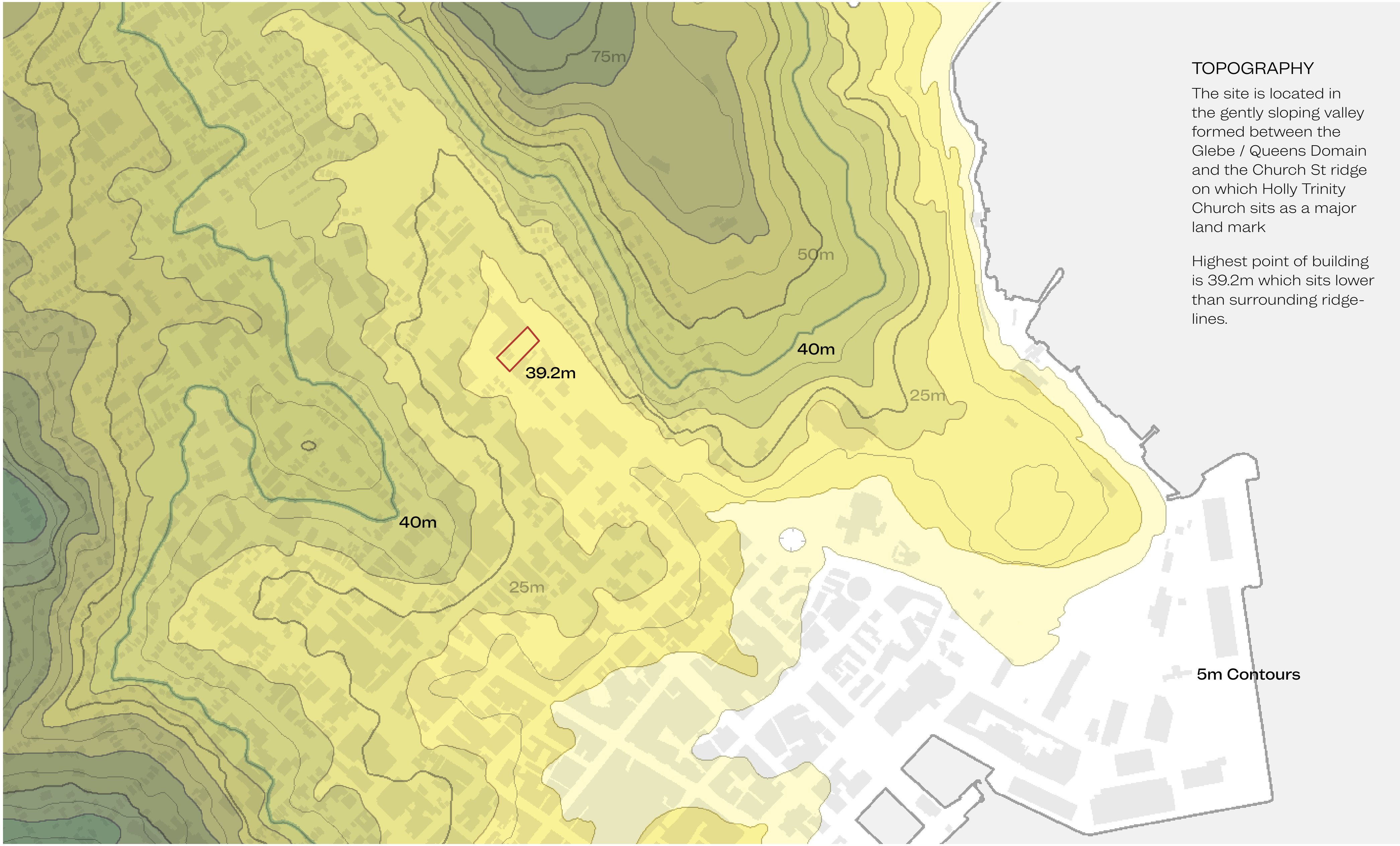
SITE TERRAIN



TOPOGRAPHY

The site is located in the gently sloping valley formed between the Glebe / Queens Domain and the Church St ridge on which Holly Trinity Church sits as a major land mark

Highest point of building is 39.2m which sits lower than surrounding ridge-lines.

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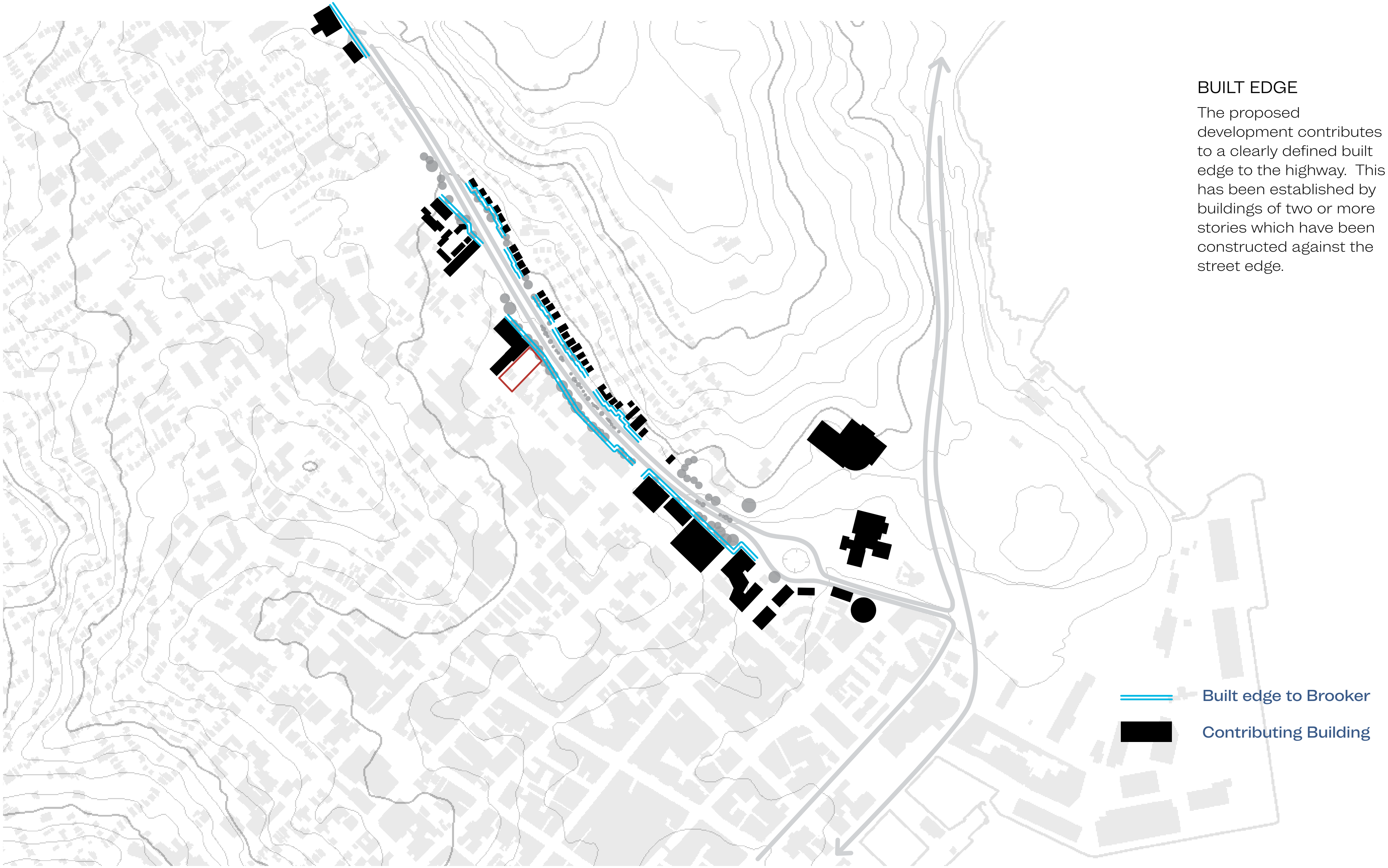
HIGHWAY EDGE



BUILT EDGE

The proposed development contributes to a clearly defined built edge to the highway. This has been established by buildings of two or more stories which have been constructed against the street edge.

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HIGHWAY EDGE

VEGETATION

Established trees along both side of the highway contribute to the defined edge to the highway.

This edge is particularly well defined along the south western verge of the Highway where tall poplar trees are tightly grouped to create a dense vegetation boundary.

FUTURE PATTERN

PATTERN

The proposed development suggests a future development pattern which reinforces a 2 to 3 storey scale along Campbell St while allowing for greater height towards the Highway.

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02 / CONTEXT

The design has evolved through understanding the site, its constraints and the surrounding context.

IMMEDIATE CONTEXT




CONTEXT

The site is located at 175-179 Campbell St and surrounded by a mix of residences, commercial and semi-industrial uses.

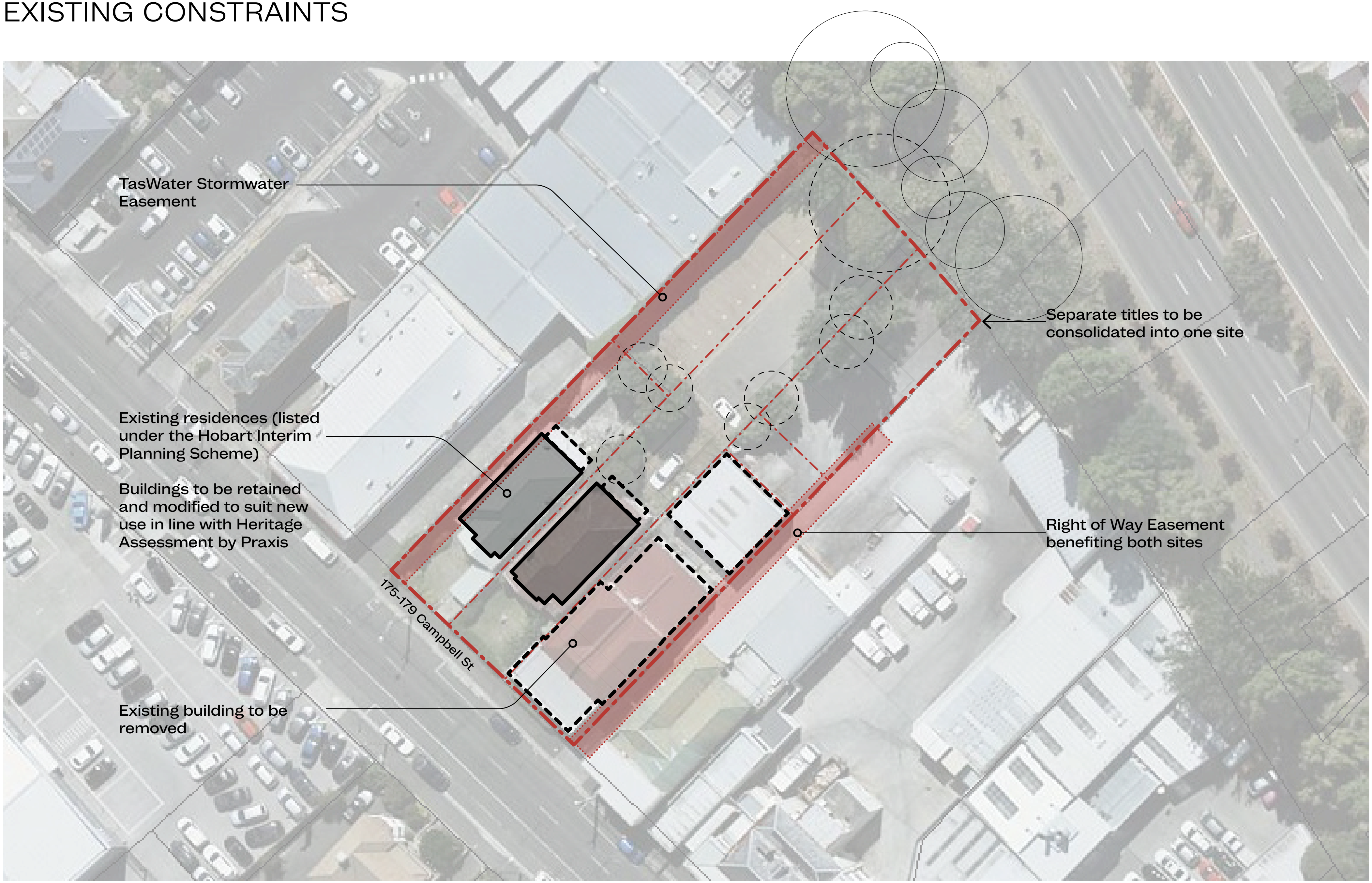
Campbell St is primarily single or two storey buildings however generous floor to ceiling heights, raised piths and pitched roofs fuhrer increase the presence of some of these residential buildings.

Where buildings are residential in nature the buildings generally have a direct relationship to the street.

The design response draws from both the residential and industrial natures of the site. The material pallet for the proposed building is substantially masonary / brick picking up on the construction material of historic residences whilc the form is derived from the saw tooth roofs of the neighboring industrial warehouses.




EXISTING CONSTRAINTS



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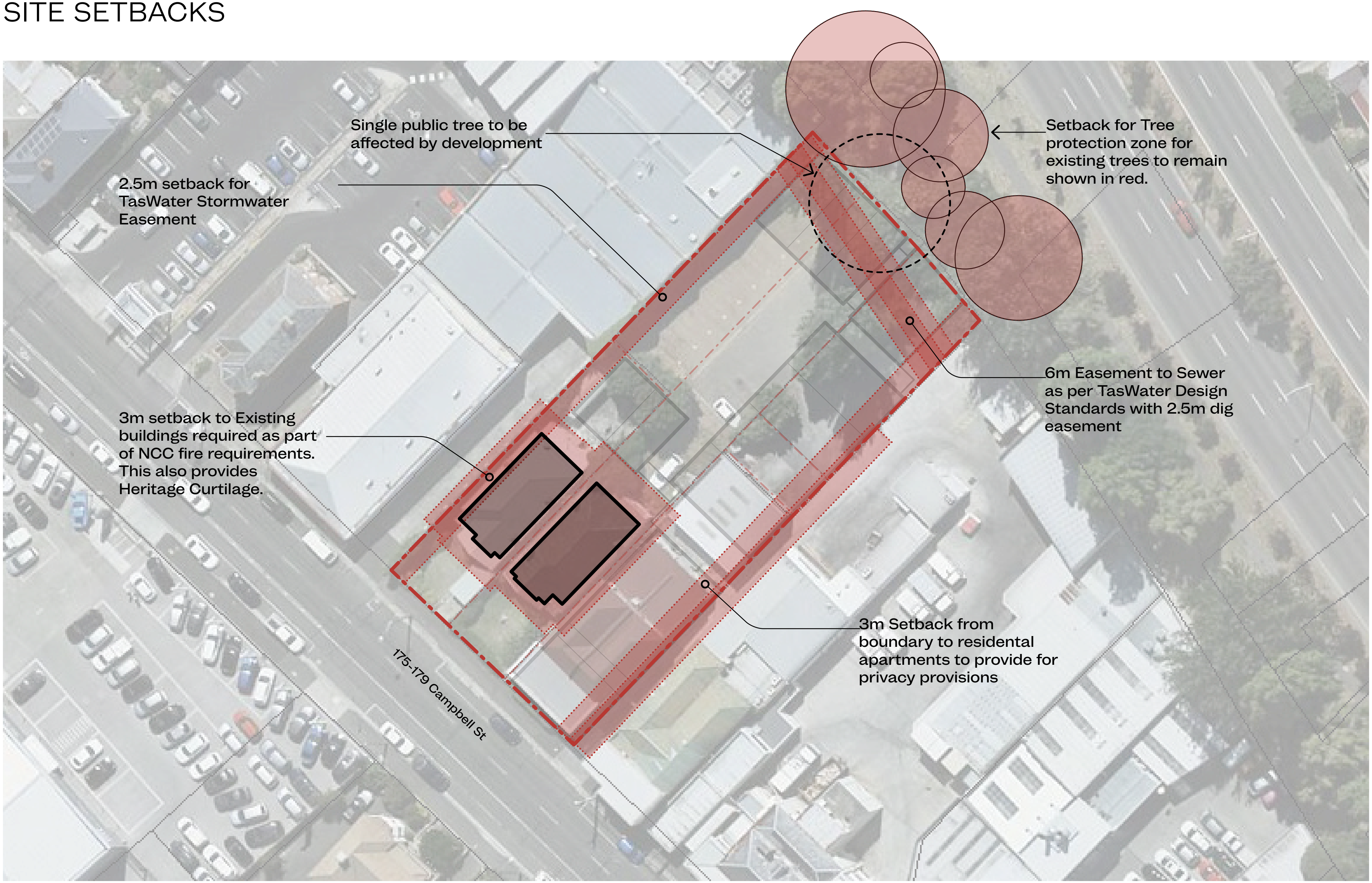
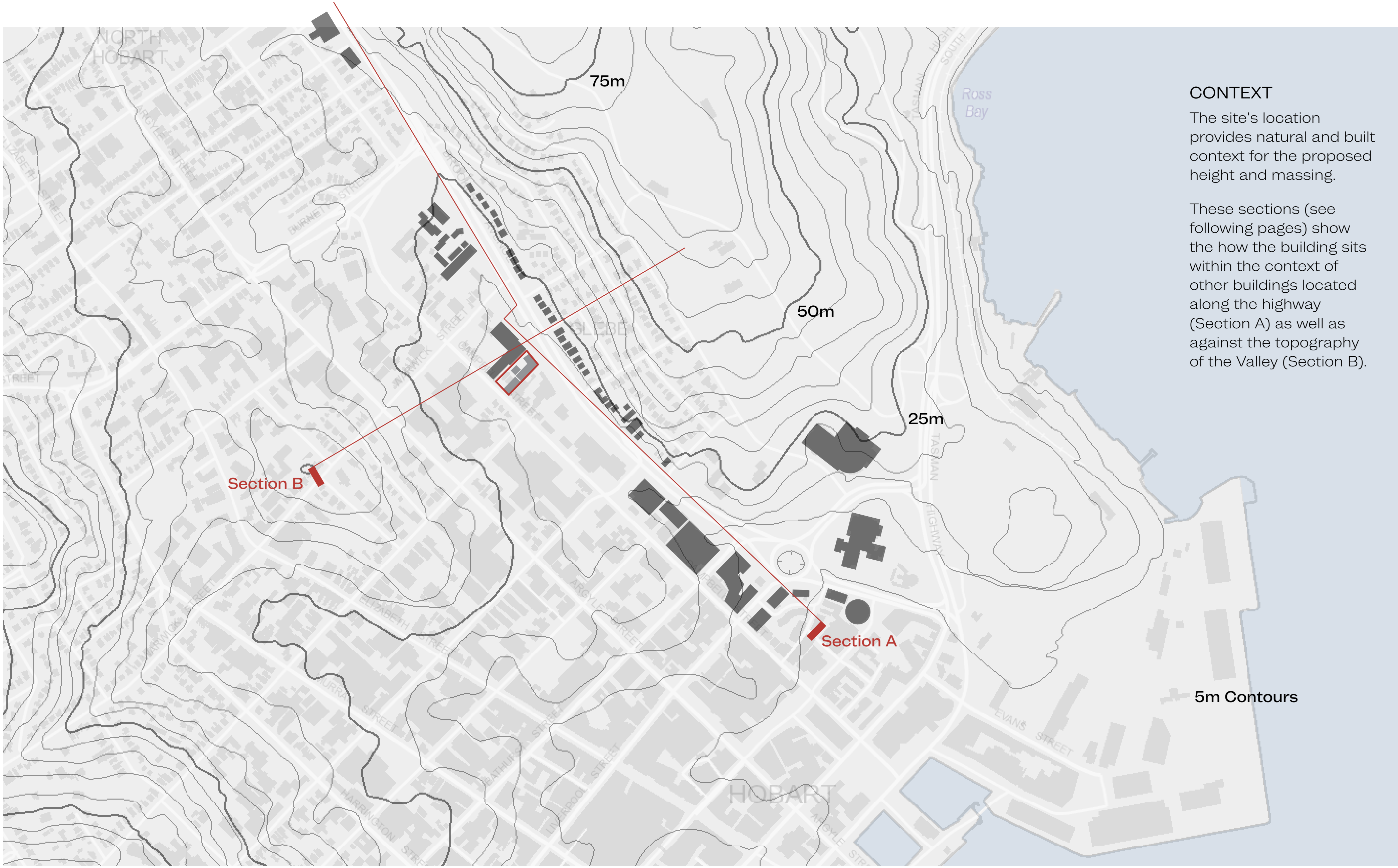
SITE SETBACKS



BUILT CONTEXT



CONTEXT

The site's location provides natural and built context for the proposed height and massing.

These sections (see following pages) show the how the building sits within the context of other buildings located along the highway (Section A) as well as against the topography of the Valley (Section B).

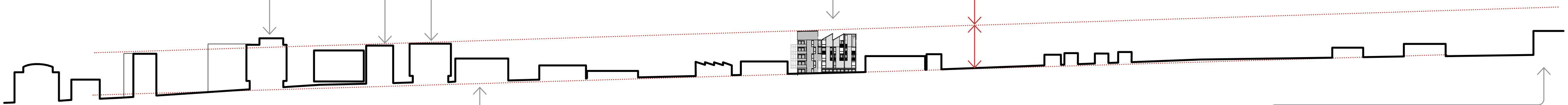
ALONG THE VALLEY / SECTION A

TASTAFE
75 Campbell St, Hobart
5 - 6 Storeys

MENZIES INSTITUTE FOR MEDICAL RESEARCH
17 Liverpool St, Hobart
Approx 6 Storeys

RESIDENCES
91 Campbell St, Hobart
6 Storeys

BUILDING SITS WITHIN THE GENERAL HEIGHT OF OTHER BUILDINGS FACING THE HIGHWAY



OFFICE WORKS
99-103 Campbell St, Hobart
Approx 3 Storeys

FORMER HOBART HIGH
65-69 Letitia St, Hobart
2 - 4 Storeys

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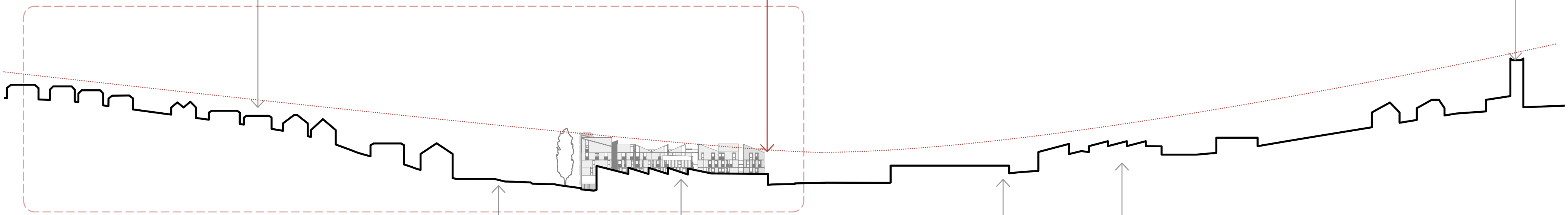
ACROSS THE VALLEY / SECTION B

GLEBE RESIDENCES

HOLY TRINITY CHURCH

BUILDING SITS WITHIN THE GENERAL TOPOGRAPHY OF THE VALLEY

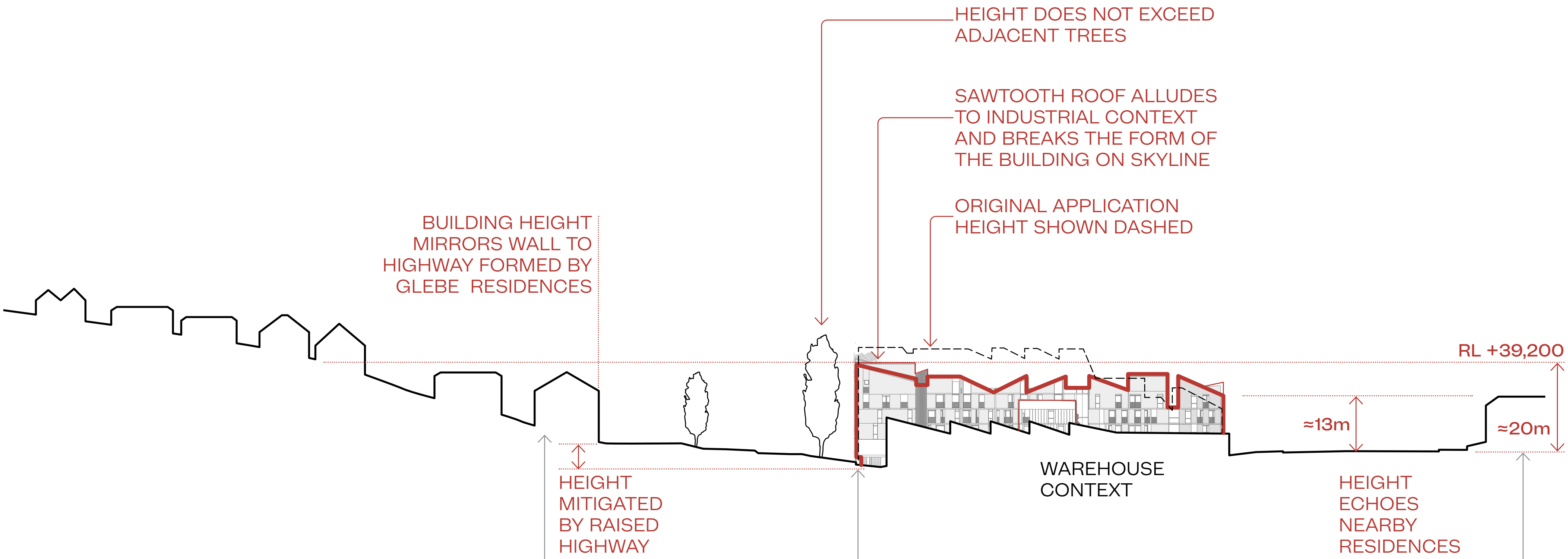


BROOKER HIGHWAY

WOOLWORTHS SUPERMARKET & WAREHOUSES

CAR YARDS & COMMERCIAL WAREHOUSES

HIGHWAY EDGE / DETAILED SECTION B



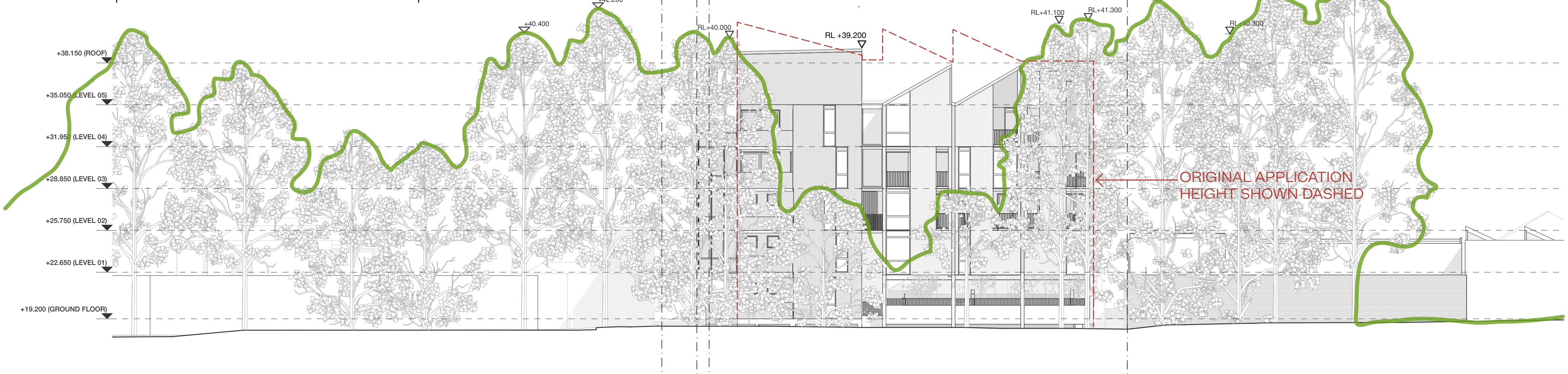
Proposal in keeping with existing tall residential buildings
creating northern edge to Brooker Hwy

Proposal in keeping with existing subustantial buildings
forming southern edge to Brooker Hwy

Proposal is in keeping with the height of other tall
residential buildings on Campbell St

HIGHWAY ELEVATION & TREE HEIGHTS

Existing trees to the highway were surveyed to ensure that the design did not exceed their height. The saw-tooth roof emulates the pattern of solid and void of the tree apexes.



North Eastern Elevation (to Brooker Highway)

Point cloud survey data of surrounding tree heights

CONTEXT PHOTOMONTAGES

The following photomontages show the proposed building in the wider city context.

Five views have been supplied by Hobart City Council - taken from points of interest - using the HCC City Model to show scale, massing and form.

Below each of these, we have provided a rendered photomontage that demonstrates the reduced impact made by material & colour choice as well as the pattern of the openings in the facade of the building.

Note: height of building in photomontage shown as best estimate using data images supplied by HCC

View from Lillie Street (Photomontage - Revised Proposal)

View from Aberdeen Street (Photomontage - Revised Proposal)

View from Brooker Highway (Photomontage - Revised Proposal)

View from Brooker Highway (Photomontage - Revised Proposal)

View from Campbell St (Photomontage - Revised Proposal)

03 / DESIGN

Design seeks to respect the local context, drawing from its scale, material and formal characteristics.

DESIGN STATEMENT

The proposed development at 175-179 Campbell St aspires to be a respectful insertion into the inner city fabric of Hobart. Drawing design inspiration from the surrounding building typologies the building is both contemporary yet contextually appropriate.

The following design moves are particular motivated by a consideration of the local context:

HERITAGE

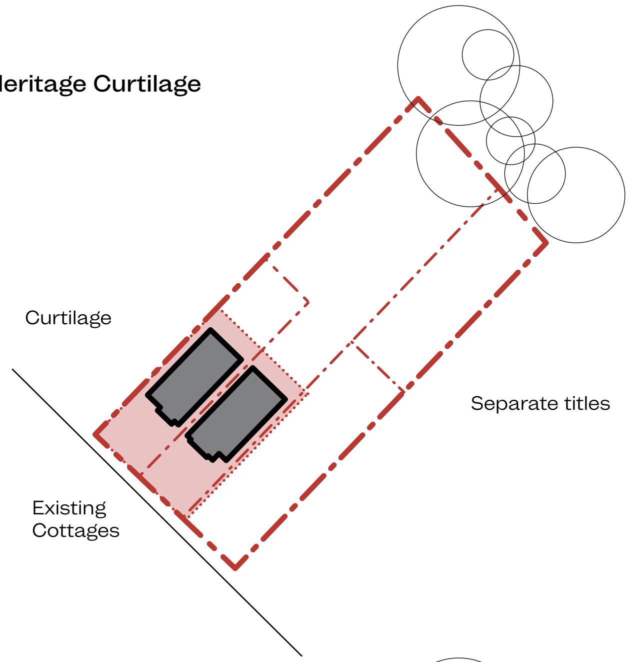
The two existing cottages that are listed in the Heritage Schedule HIPS15 of the Hobart Planning Scheme (177 & 179 Campbell St) have been retained. Noted in the Praxis heritage assessment as "[merely demonstrative] representative of a class of place" rather than of importance to the wider local context, the buildings have been proposed for adaptation to commercial uses.

A new glazed link is proposed between the buildings to provide new access compliant entry to both of the cottages. The new structure will sit under the eaves line of the existing buildings and recessed so that it is subservient to the form of the cottages. Important stylistic features of the buildings will be retained with only minor alterations to the existing fabric to facilitate access and greater connection to the site - the most substantial of which is the removal of poorly constructed lean-to additions to the rear.

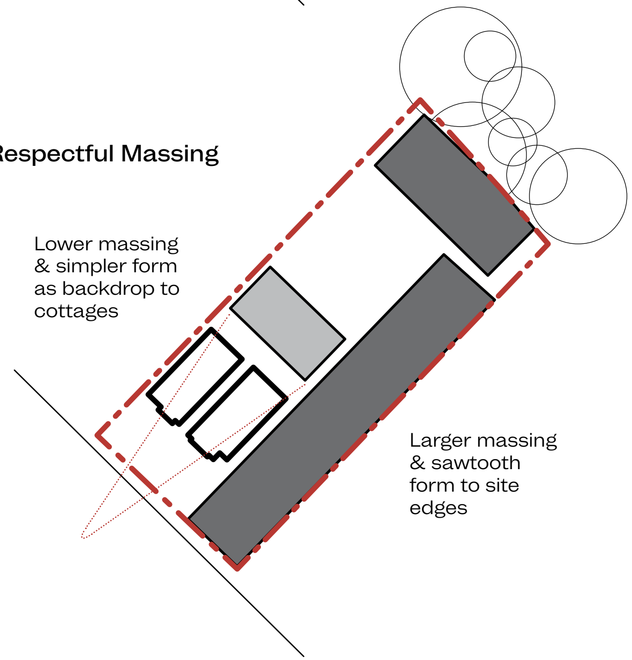
Although not required by the Praxis report, the new apartment building has been arranged to provide appropriate curtilage to the heritage buildings. Where the new building forms a backdrop cottages, the form is simplified and scale has been decreased to reduce its presence. A mesh screen with growing vines adds greenery to the scene, reminiscent of its current vegetated backdrop.

The landscape design proposes two small terrace gardens at the street opening the cottages' facades to the street and forming an active edge to the site. The proposed fencing draws inspiration from the existing simple metal balustrade.

Heritage Curtilage



Respectful Massing

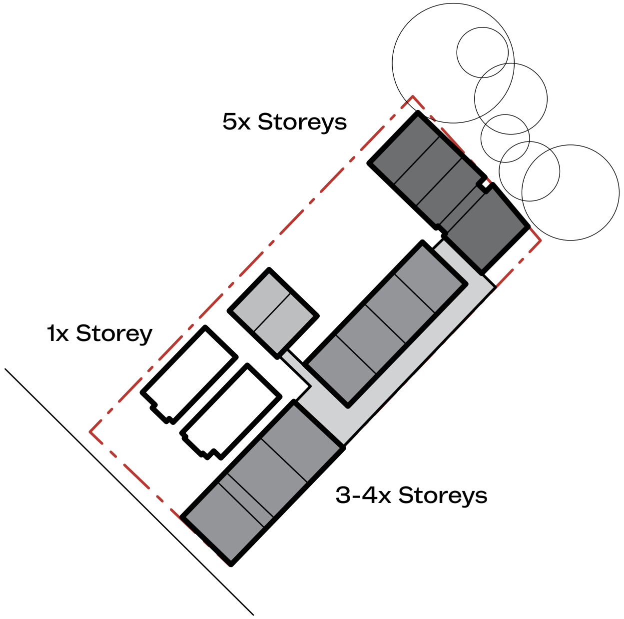


Simplified building form with green screen as backdrop to cottages

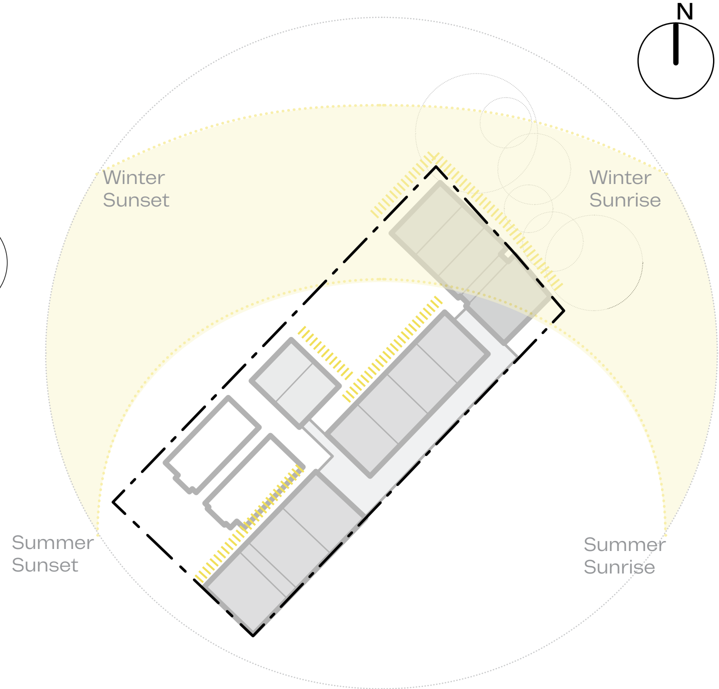
Simplified building form with green screen as backdrop to cottages

Site massing around heritage cottages

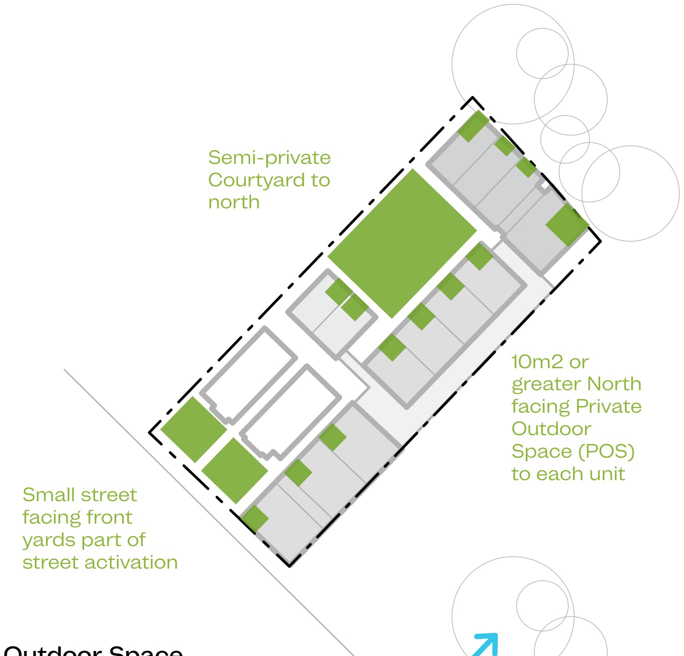
ARRANGEMENT



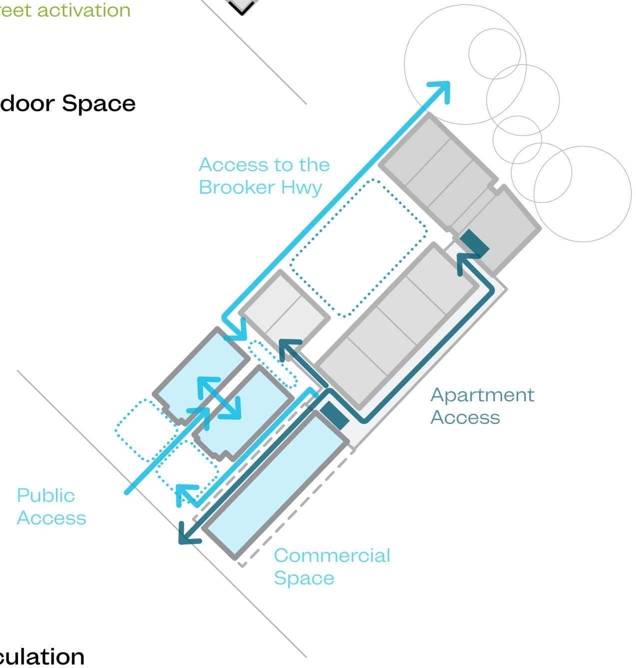
General Massing



Northern Orientation



Outdoor Space



Circulation

ARRANGEMENT

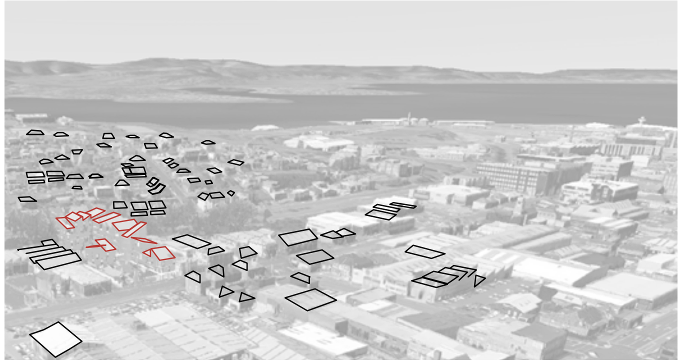
The design has been arranged so that the main mass and bulk of the building is situated along the North Eastern and South Eastern boundaries of the site. Not only does this provide curtilage to the heritage cottages, but also provides the best solar access to the apartments and communal courtyard space.

A lower building is located directly behind the cottages, separating the site into two courtyards around which the apartments are grouped. Each apartment, along with it's private outdoor space, has a northern orientation providing good quality solar access.

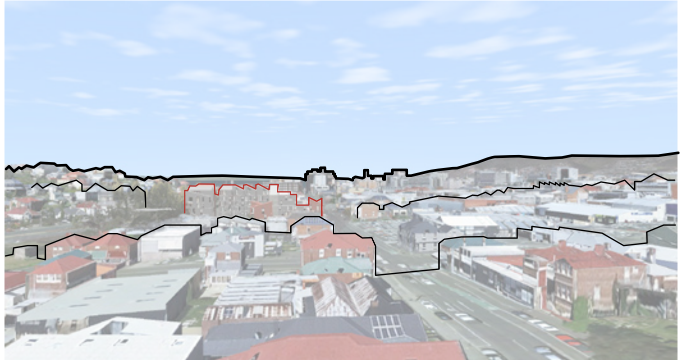
The primary circulation, a sheltered external corridor space from which the apartments are accessed, is located on the southern boundary. This provides opportunity for cross ventilation and secondary access to natural light.

On the ground floor, all of the spaces located towards the street are publicly accessible (including converted cottages) while the main communal courtyard is only accessible to residents. A pathway through the site - connecting Campbell St to the Brooker Highway - is provided along the northern boundary of the site.

BUILDING FORM


Roofs of proposal blends with the patchwork of roofs in the Glebe


Proposal's roof mimics warehouse roofs of surrounding Industrial uses


Height Of proposal sits within the amphitheater form of Hobart

FORM

The building's proposed form is lower on Campbell St - responding to the largely 2 to 3 storey street pattern - and increases in height towards the Brooker Highway - taking precedent from both the adjacent Poplar trees and other buildings that front the Highway.

The pitched roof forms are inspired by the neighbouring sawtooth warehouse roofs as well as the abstracted pattern of roofs seen against the slope of the Glebe - particularly when viewed from West Hobart.

The "sawtooth" roof form also helps to break up the form of the building against the skyline while creating a cohesive and unified design. When viewed from the north the building sits within the general basin form of the valley and creates an uneven roof pattern that comfortably sits within the collection of roof lines of the city.

OPENINGS

Punctuating the solidity of the residential 'blocks' the windows and balcony openings have been arranged as an abstraction of the existing heritage pattern. These take inspiration from neighbouring Victorian houses which have consistent height windows which vary in width as demanded by the floor plan.

Metal balustrades sit within these openings maintaining the simplicity of the opening and providing high degree of solar penetration to the apartments (see following page).

MATERIALS & COLOUR

The cladding materials and colour for the project have also been inspired by the surrounding context.

The residential 'blocks' have been specified as to be cladding either in brick or terracotta brick skin alluding to the primarily brick construction of the surrounding houses. These envisaged to be a mixture of burnt red (to match neighbouring red brick walls and roofs) and sandy grey (picking up on the warehouse context).

Translucent vertical circulation cores break up the solid brick forms of the building. These are envisaged to be clad with light weight, semi-transparent polycarbonate which are also in-keeping with the industrial context.

NOTE: IMAGES SUPPLIED BY HCC FROM CITY MODEL

CONTEXTUAL ABSTRACTION

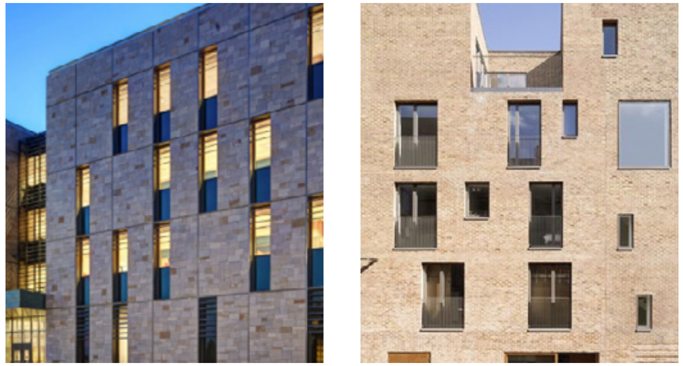
EXISTING PATTERN

Historic window pattern has consistent height but varied widths

Industrial sawtooth forms vary the local roof line

Metal balustrades transparently guard openings

ABSTRACTED DESIGN RESPONSE

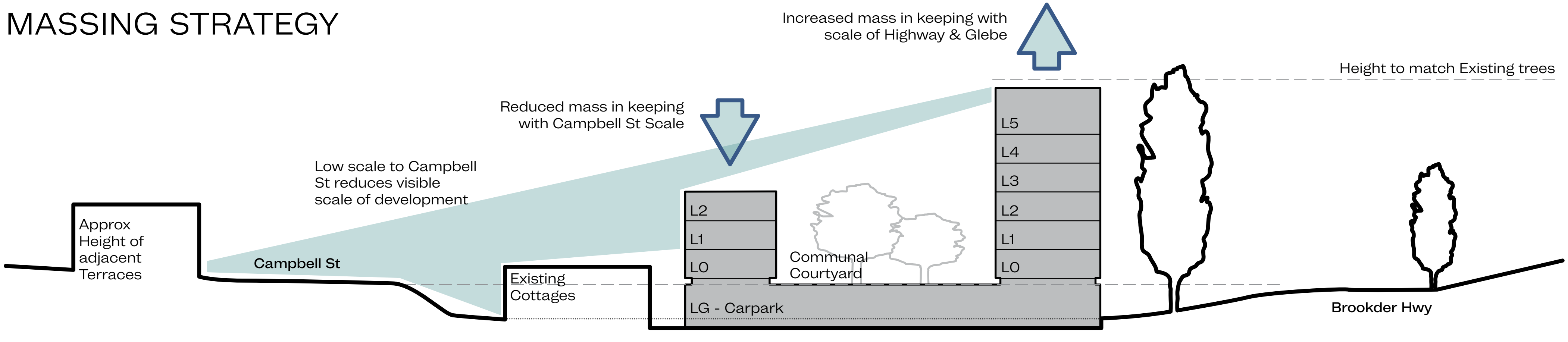


Simple openings that vary in width and location on the facade

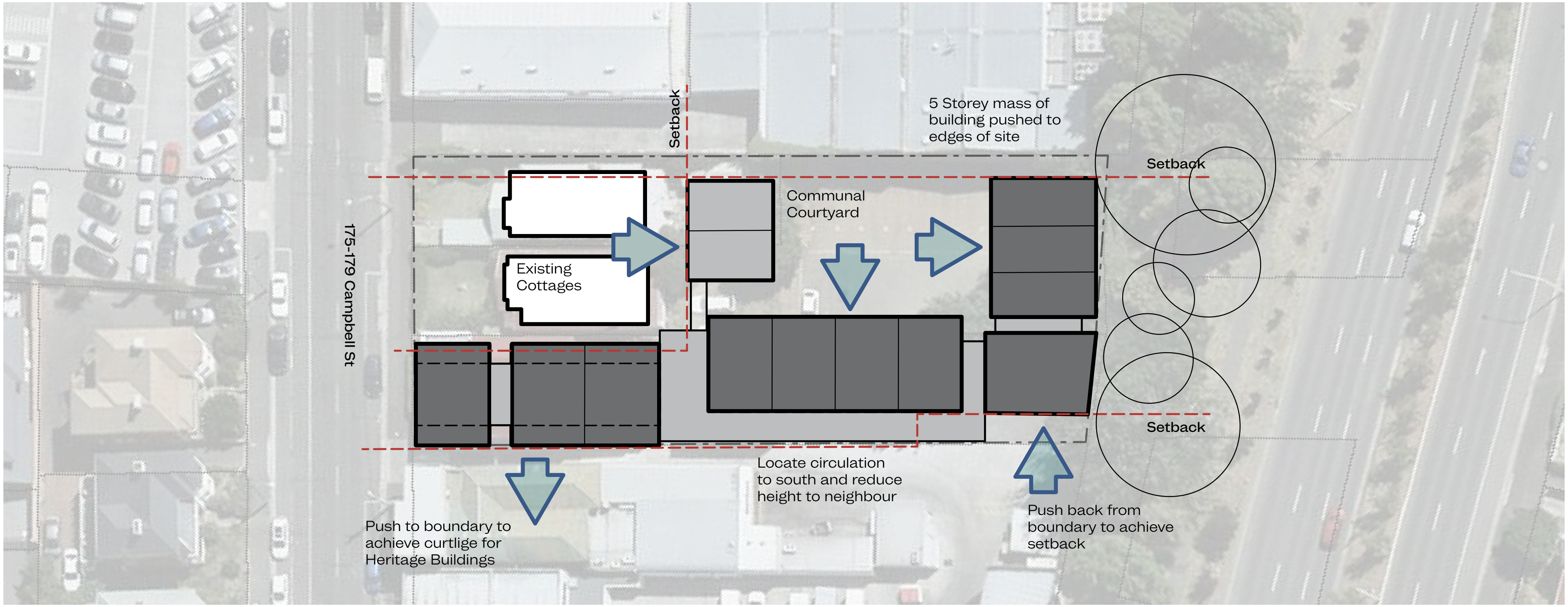
Dynamic roof-line that mimics context

Simple balustrades that do not interfere with pattern of openings

MASSING STRATEGY



Diagramatic Site Section illustrating increased massing away from Campbell St



Diagramatic Plan illustrating Massing towards southern and northern edges of the site

CAMPBELL STREET SCALE

MASSING SITS WITHIN 2-3 STOREY CONTEXT OF CAMPBELL ST

INCREASED MASSING AWAY FROM CAMPBELL ST (TO RHS)

CAMPBELL ST MASSING SITS WITHIN ARRAY OF VARYING HEIGHT BUILDINGS

PROPOSED - MASSING & FORM

AERIAL VIEW - CAMPBELL ST (RHS) TO BROOKER (LHS)

CAMPBELL ST ELEVATION

MASSING OF DEVELOPMENT TO BROOKER (FROM NORTH)

MASSING OF DEVELOPMENT TO BROOKER (FROM SOUTH)

175-179 CAMPBELL ST - PROPOSED

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CONCEPT SERVICES REPORT

Multi-Residential Development

177-179 Campbell Street, Hobart - 7000

June 2022

Engineers & Planners

Engineers & Planners

Johnstone McGee & Gandy Pty Ltd

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Document Issue Status								
Ver.	**Issue Date**	**Description**	**Originator**		**Checked**		**Approved**	
					Civil	Planning		
1		Issued for Review	CAG		CJM		GLA	
2	23.11.2021	Issued for RFI Response	CAG		CJM		GLA	
3	22.6.2022	Issued for RFI Response	GLA		CJM		MSC	23.6

CONDITIONS OF USE OF THIS DOCUMENT

TABLE OF CONTENTS

1 Introduction

This concept services report has been prepared in support of a development application to be lodged with Hobart City Council for the construction of a multi-residential development at 177/179 Campbell Street, Hobart TAS 700 across three titles (S.P.22529/D.23364 and D.23363). The proposal involves the partial demolition of the existing buildings and a new development comprising of 8 Townhouses, 22 apartments (13 two bedrooms/9 three bedrooms) and 4 skyhomes.

The property has a total area of 2431 m² grading at between 1 & 5% from Campbell Street towards the rear of the lot adjacent to the Brooker Highway road reservation. The property shows in addition to the existing residences, an area in the northern region of the land with shrubs, trees, and a considerable portion of gravel paving for the existing light vehicles traffic/parking. The two existing properties being retained across the Campbell Street facade to the south of the land under analysis, represents approximately 200 m² combined. In addition, both properties are planned for partial demolition and reconstruction as part of the proposed development.

The concept is to be serviced with power, communications, water, sewer and stormwater connections all of which are to be installed as part of the development. This report addresses how each of these are to be provided to meet authority and planning scheme requirements.

Figure 1 – Site Locality Plan

2 Power, Lighting and Communications

2.1 Applicable Design Standards

- Electrical Infrastructure on the lot shall be designed in accordance with AS/NZS3000, Australian / New Zealand Wiring Rules.
- Lighting of common areas, where required, shall be provided to meet AS.NZS1158 .3.1 – 2020.
- Nation Broadband Network connections shall be provided to each unit and tenancy in accordance with the NBN standards “Residential preparation and installation: Single Dwelling Units (SDUs) and Multi Dwelling Units (MDUs)” (1).

2.2 Proposed System

Electrical supply to the site is to be provided from the existing TasNetworks system in Campbell Street which consists of overhead and underground services on the eastern side of the street.

A new private sub-station is proposed to be installed at the basement level of the building adjacent to Campbell Street, this sub-station will supply all of the new residential and commercial properties on the site. Due to the potential of inundation of the basement during flood events the sub-station enclosure is to be fitted with suitable flood doors to prevent flooding of the substation during these relatively short term events, refer Flood Hazard Report, Flussig Engineers, July 2021.

Where required by the planning scheme lighting of common areas including the driveway and paths will be provided in accordance with the requirements of AS.NZS 1158.3.1 and the NCC, the electrical supply to the common area lighting shall be provided from a dedicated Common Area switchboard.

Existing NBN services are located in the back of the footpath in Campbell Street adjacent to the property boundary from which a new connection to the site is to be provided.

NBN connections will be provided from the property boundary to the MDU of each unit in accordance with NBN guidelines, "Residential preparation and installation: Single Dwelling Units (SDUs) and Multi Dwelling Units (MDUs)".

NBN designs shall be prepared in accordance with the NBN design standards using the NBN Assisted Drafting Tool (ADT) and be submitted to and approved by NBN prior to the commencement of installation.

3 Sanitary Drainage System

3.1 Applicable Design Standards

The sanitary drainage system for the site shall be designed to comply with AS 3500.2 National Plumbing and Drainage Code – Sanitary Plumbing and Sanitary Drainage and to TasWater Standards (2).

An existing TasWater DN400 sewer gravity trunk main runs perpendicular to the site through the northern region of 177 Campbell St. In addition, it includes a manhole near the northwest perimeter adjacent to the boundary with Woolworths (185 Campbell Street). Furthermore, there is also sewer on the site which services 179 Campbell St, a DN100 TasWater gravity service.

3.2 Proposed System

As part of the development the titles for the existing properties, 175 to 179 Campbell Street are to be amalgamated creating a single lot on which the new development can be constructed. The existing private sewer drains servicing the property, are to become redundant and removed.

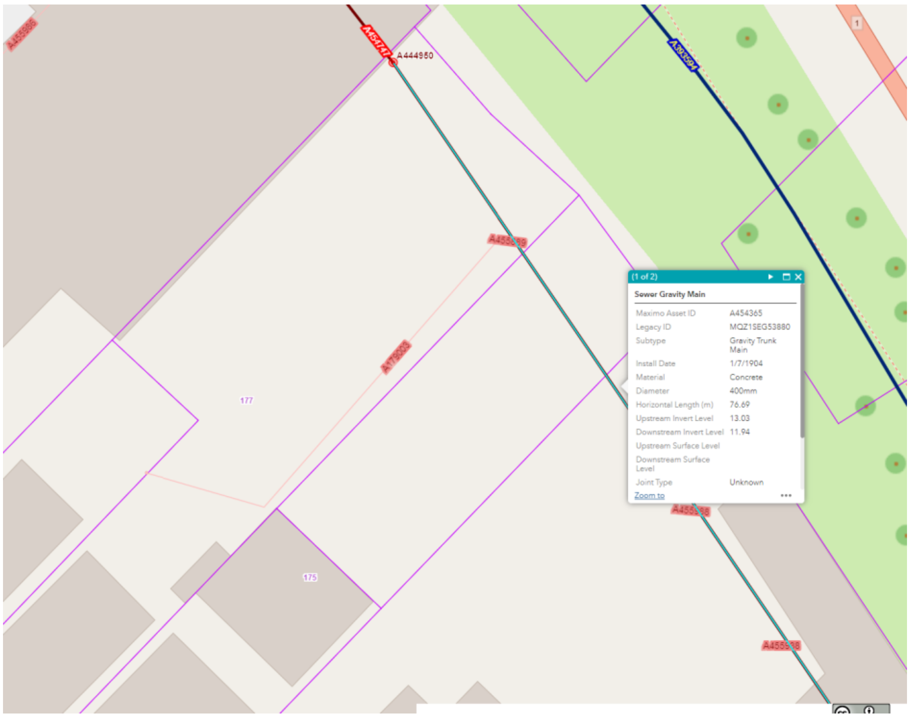


Figure 2: Existing Sewer Connections

The existing connection to the main will need to be upgraded to provide a DN150 connection to the new multi-story development, including the redeveloped commercial properties on Campbell Street. As the area is within the Hobart City Council boundary trap zone a boundary trap will need to be provided on the new connection. Due to the low level of the basement, approximately 1 meter lower than the surrounding ground surface and the potential for overland flows through the site and surrounding properties, it is proposed that a reflux valve be installed upstream of the boundary trap.

The DN150 connection size complies with the minimum lot connection size required by TasWater and referenced on Standard Drawing MRWA-S-104A.The property will be serviced by new internal sanitary drainage pipework to be designed following the approval of the development.

The existing DN400 TasWater sewer main running through the site has a depth below the new finished surface level of the carpark varying from 2.7 meters to 3 metres, TasWater require that the depth to invert from the carpark surface be provided as the minimum clearance above the level of the carpark finished surface to allow for future maintenance of the main. Car park levels of 15.7 to 15.8m AHD have been set to achieve this clearance to the underside of the ground floor level beams, refer drawing J173021PH-P-S1 in Appendix B.

Construction of the new development will limit TasWater access, through the existing property, to the sewer manhole located on the northeast corner of the site adjacent to the Woolworth's boundary wall. Access to this manhole can provided in the future via the Brooker Highway road reservation from Warwick St. The Hobart City Council also have a stormwater pit which provides access to the Park Street Rivulet in the vicinity of the site, within the Brooker Highway road reserve, they will also require access to this from Warwick Street.

Refer drawing J173021PH-P-S1 Appendix B for concept layouts of the proposed sanitary services for the development.

The TasWater supplement to the Sewerage Code of Australia has been used to estimate the sewerage flows from the development as follows:

Table 1: Residential Sewer Flow Calculations

	Value	Units
Number of Units (ET code: RA03)	34	No.
Equivalent Tenements	30.76	(-)
Average Dry Weather Flow	0.160	(L/s)
Peak Dry Weather Flow	1.729	(L/s)
Total Design Flow	1.957	(L/s)

Refer Appendix D for sewer flow calculations.

4 Water

4.1 Applicable Design Standards

The water reticulation system for the site shall be designed to comply with AS3500.1 National Plumbing and Drainage Code – Water Supply.

Water metering shall be provided in accordance with TasWater's Water Metering & Guidelines.

Sub-Metering shall be provided in accordance with TasWater's Southern Region Sub-Metering Policy.

Backflow Protection of the site shall be provided in accordance with TasWater's Water Boundary Backflow Containment Selection Guidelines.

Fire hydrant coverage of the site is to be provided in accordance with AS2419 and Table 8.8 of TasWater's Supplement to the Water Supply Code of Australia WSA-03 2011.

Internal fire hydrants will need to be provided.

4.2 Proposed System

There are currently 3 No. water connections to the properties which are to be developed, 175 to 177 Campbell Street. TasWater has a known size of only one of these, DN20 (ID 11W187160) to 179 Campbell Street with the other 2 being unknown, it is assumed that these will also be of a similar size. Each of the existing connections will become redundant and need to be sealed off at the main by a TasWater accredited Contractor.

TasWater have a DN250 CICL water main located on the eastern side of Campbell Street to which the existing connections are currently connected. It is proposed that the new site connection will be connected to this main.

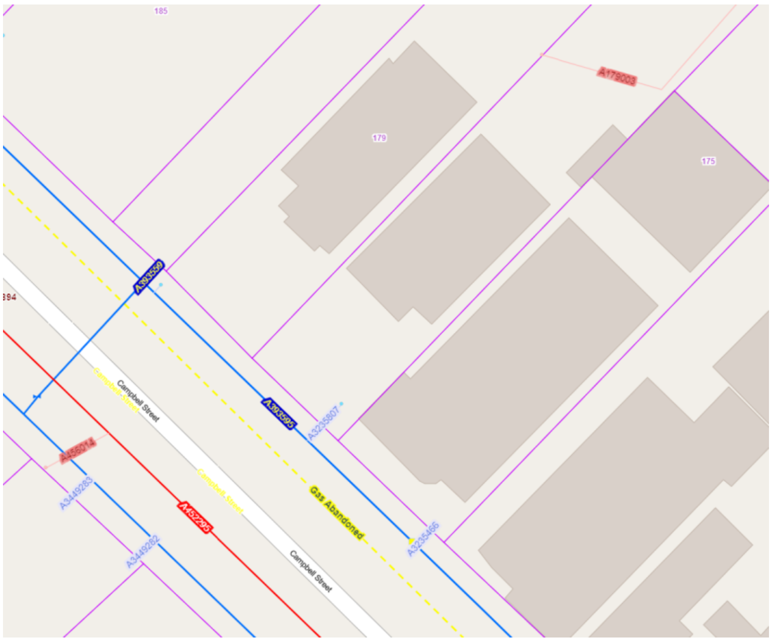


Figure 3: Existing Water Connections

The development of the site with residential apartments, a consulting room and small café will result in the site will being classified as Low Hazard in accordance with TasWater Backflow Containment Guidelines. A new DN100 water connection will be required to service the domestic and fire service requirements of the development, it is proposed that the water meter assembly and fire hydrant booster be located adjacent to the central walkway into the site next to the Campbell Street footpath.

A 65mm domestic water low hazard master meter assembly will be required to service the domestic water requirements of the development. Sub metering of each residential unit, the commercial tenancies and common property landscape requirements can be installed downstream of the meter. These can be installed in the basement carpark to provide easy access for reading with individual pipework to be run from the sub-meters to each tenancy and the communal garden. Sub metering is to be installed in accordance with TasWater's Water Metering Guidelines.

Existing fire plugs are located within the street in front of 175 and 152-170 Campbell Street around 25m to 30m away from the proposed project. Due to the number of stories in the new development the site will require new internal fire hydrants to be installed in accordance with the requirements of AS419.1 and TasFire. The fire hydrant booster assembly being located downstream of the fire service meter assembly on Campbell Street.

Refer Appendix B for Water Services Concept Drawings

The TasWater supplement to the MRWA Water Supply Code has been used to estimate the flows as follows:

Table 2: Residential Water Demand Calculations <100ET - AS3500.1-2003

	Value	Units
Number of Units (ET code: RA03)	34	(-)
Equivalent Tenements	30.76	(-)
Probable Simultaneous Demand	3.46	(L/s)

Refer Appendix D for Water Flow Calculations.

5 Stormwater

5.1 Applicable Planning Scheme Requirements

The applicable planning scheme is the *Hobart Interim Planning Scheme 2015,* with the applicable provisions provided by Code E7.0, Stormwater Management Code. The proposal has been assessed against the requirements of the scheme as detailed in section 5.3.1 below.

5.2 Applicable Design Standards

The stormwater reticulation system for the site shall be designed to comply with AS3500.3 National Plumbing and Drainage Code – Stormwater Drainage.

5.3 Proposed Systems

The site is currently crossed by a DN525 HCC stormwater main which runs along the northern boundary from Campbell Street to the Park Street Rivulet which is located within the Brooker Highway road reservation just to the east of the site boundary.

Figure 4: Existing Stormwater Infrastructure

It is proposed that the DN525 stormwater pipe be realigned where it is adjacent to the new building so as it runs parallel with the northern boundary of the site in a 3.0m wide easement. The existing main is to be retained in its current location from Campbell Street past the existing house located on 179 Campbell Street to SW1.4, refer Figure 5 below.

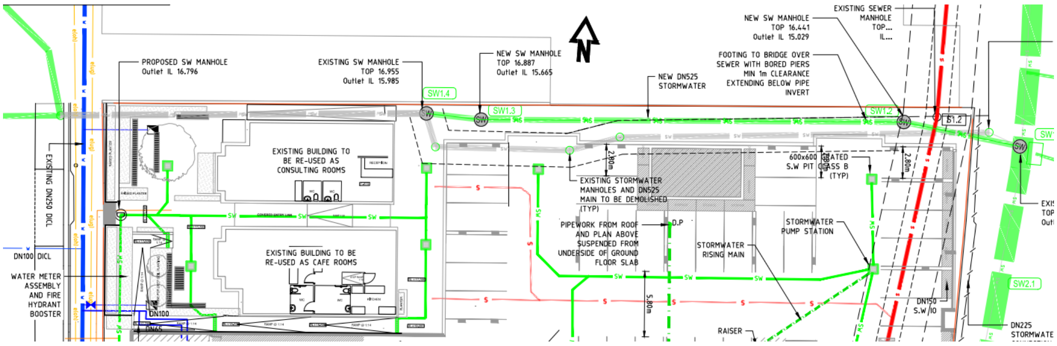


Figure 5: DN525 Stormwater Main Replacement

The level of the pipe relative to the proposed development is shown on the drawings in Appendix B with a preliminary profile and cross sections through the new carpark shown. The new pipe's location, close to the rear of the Woolworths site at 185 Campbell Street may require the under pinning of the adjacent property to ensure the pipe can be installed and maintained without risking damage to this property. This requirement to be determined during detail design where the construction detail of the boundary wall will need to be determined.

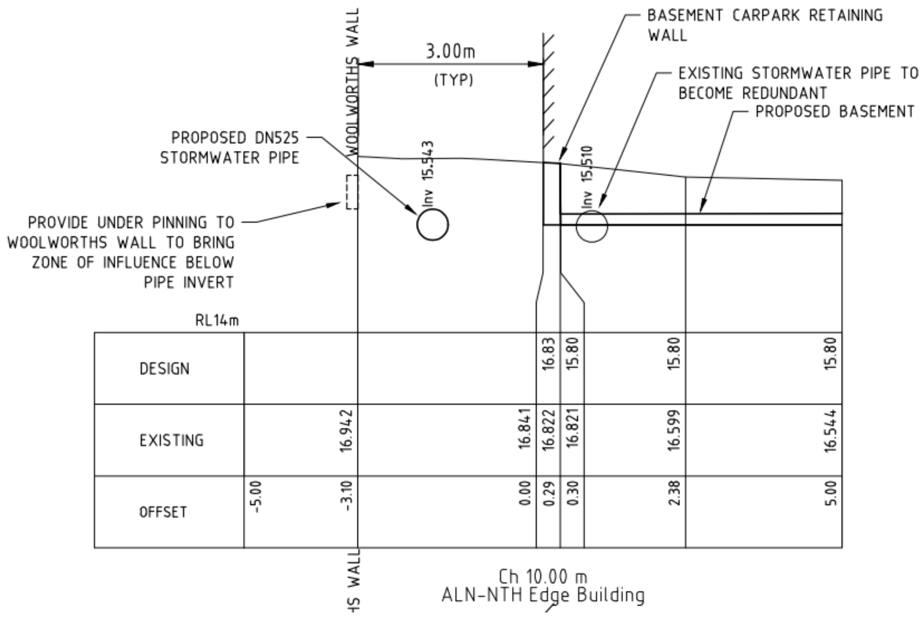


Figure 6: DN525 Stormwater Relative to New Building

The development's eastern boundary runs parallel with the Park Street Rivulet which is located within the Brooker Highway road reservation. The location of the existing main has been determined by CCTV camera and tracking of the camera unit from the surface. Cross section drawings showing the relative location of this existing main and the new development are shown on the drawings in Appendix B. The new building structural elements will need to be constructed such that they are extended below the zone of influence for this main so as to ensure that it can be excavated for maintenance in the future. The closest point of the new development to the main is 1800mm.

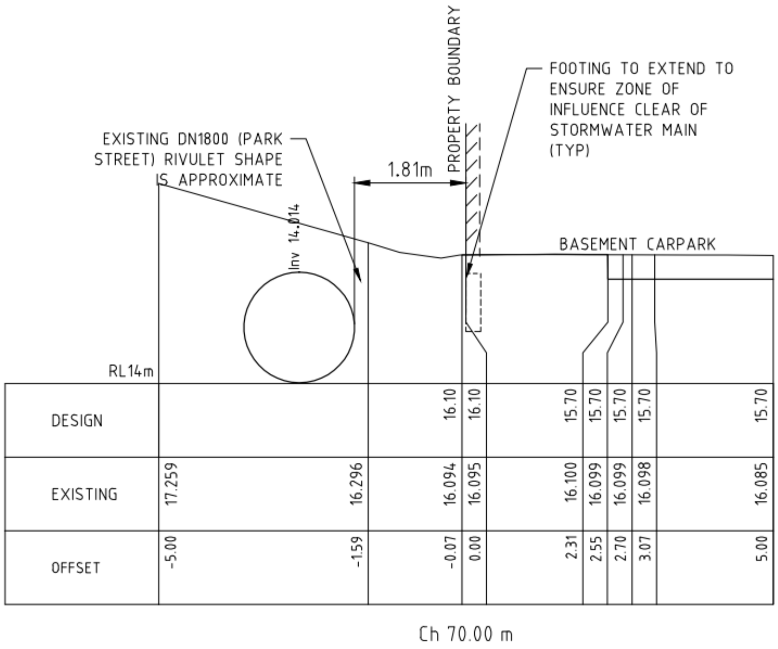


Figure 7: Park Street Rivulet Relative to New Building

A new stormwater connection is proposed into the rivulet main to service the development, a profile of this is included on drawing J173021PH-P-SW5 provided in Appendix B. Due to the level of the connection relative to the main it is proposed that a reflux valve be installed on the connection to prevent flows from the main during significant events from entering the basement carpark.

5.3.1 Planning Scheme Requirements E7.7.1

A1 – Stormwater Disposal

The development meets the acceptable solution A1:

The site will drain by gravity via the new internal stormwater network and connect to the existing DN1800 Park Street rivulet culvert. The connection to the culvert can be made into the top 1/3rd of the pipe. The level of the stormwater connection requires that pits located within the carpark basement be serviced with a stormwater pump station. All roof and plaza drainage, including the area around the existing houses at the front of the site can be collected via gravity drainage to the stormwater detention tank.

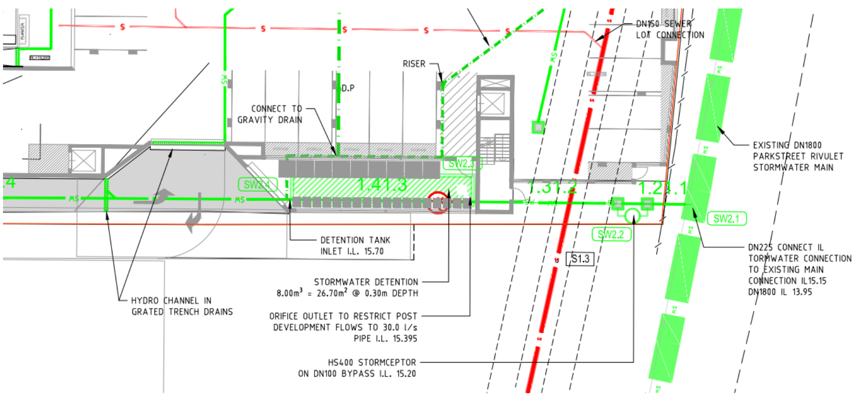


Figure 8: Site Stormwater Connection plan

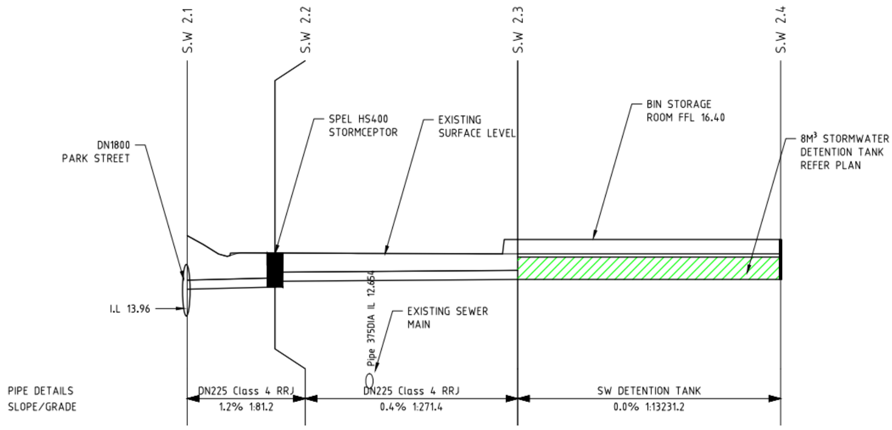


Figure 9: Site Stormwater Connection Profile

A2 - Stormwater Quality and Quantity

The development meets the acceptable solution A2:

The stormwater system incorporates Water Sensitive Urban Design principles as per the *Water Sensitive Urban Design Engineering Procedures for Stormwater Management in Southern Tasmania* with the inclusion of a proprietary SPEL HS400 stormwater treatment device to treat stormwater run-off from the site.

A Model for Urban Stormwater Improvement Conceptualisation (MUSIC) has been created to determine the reduction in runoff pollutants from the road, landscape and roof areas considering a mixed node modelling the whole site (Figure 10). The model reflects the approximation of 10% of pervious area associated with planters, etc.

The results displayed in Figure 11 show the proposed stormwater treatment train complies with best practice pollutant reductions for all parameters.

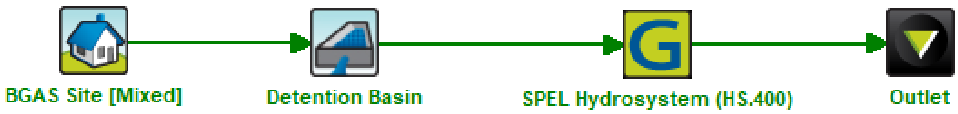


Figure 10 - MUSIC Schematic

	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.19	1.19	0
Total Suspended Solids (kg/yr)	245	14.8	93.9
Total Phosphorus (kg/yr)	0.49	0.144	70.5
Total Nitrogen (kg/yr)	3.43	1.63	52.4
Gross Pollutants (kg/yr)	46.2	0	100

Figure 11 - MUSIC Results

A3 – Minor Stormwater Drainage System Design

The development is compliant with acceptable solution A3:

a) The internal stormwater network will be sized to accommodate the 5% AEP runoff from the property based on it being close to 100% impervious.
b) Stormwater detention for any increase in flows can be incorporated by the inclusion of a $8m^3$ stormwater detention tank under the proposed bin store on the southern side of the site. This tank will collect all stormwater run-off from the site via either gravity drainage from roofs and courtyards or a rising main from a stormwater pump station in the basement carpark. Flows for a 15 minutes duration storm, which is in excess of the catchment time of concentration, provided in Figure 6 of the 175-170 Campbell Street, Flood Hazard Report, Flussig Oct 2021. Outlet flows will be limited to pre-development levels by an orifice outlet sized to limit post development flows to 30l/s. Refer Appendix D for stormwater detention calculations.

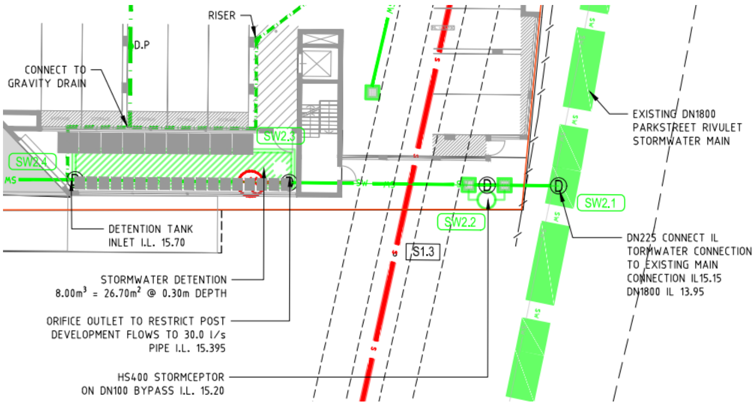


Figure 12: Stormwater Detention Tank

A4 – Major Stormwater Drainage System Design

Refer 175-179 Campbell Street, Flood Hazard Report, Flussig Engineers, October 2021 (Revision 3 June 2022) for discussion on overland flow paths and site inundation. All habitable floors are located more than 300mm above the calculated 1% AEP flood levels.

The Flussig report identifies significant hazard of flooding of the basement car park area in a 1% AEP plus climate change rain event. The resultant risk levels are shown as up to H5 and H6 in areas of the car park closest to the Brooker Highway. Note that the Flussig report identifies that the development will have an insignificant effect on the current flood behaviour. The area concerned is currently acting as a car park as shown in the below Google Earth image Figure 13, and hence the levels of risk are already at the H5 and H6 levels. The development may mean that the risk exposure is for 24 hours per day as compared to the current assumed day shift parking duration.

A key to minimising the risk to users of the proposed car park will be a Flood Emergency Management Plan (FEMP). The development will be run by a Body Corporate with responsibility for safety, security and maintenance of essential health and safety features of the development. While it is not intended to provide the FEMP until the detailed design stage, it is important to consider a range of measures that could be undertaken to reduce risk to future occupiers of the development.

It is recommended that the FEMP be prepared and once adopted, become part of the site maintenance schedule including audits to ensure any elements such as signage, alarm sirens, lights, barriers, water depth transducers, etc. are regularly checked and maintenance registers updated similar to other safety features such as fire extinguishers, fire blankets etc.

It is recommended that the FEMP include occupant inductions so that they are cognisant of the flooding risks and what to do in the event of an event, which might be as simple as do not enter the car park area during extreme rainfall. These can possibly be part of any tenancy agreements.

The updated Flussig report shows a duration to maximum flow (hence depth) of around 13 minutes, slightly longer than previous modelling but still short in terms of a traditional FEMP where occupants may be evacuated from the site – in this case the occupants don't need to leave their rooms, they simply don't enter the car park. If anyone is already in the car park, they would know (from the induction, warning signs, and alarms) that they need to leave the car park promptly. The Flussig report shows the depth in the car park rises from an initial noticeable depth of 50mm to maximum in a period of around 9.5 minutes (refer Fig. 8 of the Flussig report). This gives users adequate time to move to higher ground if they notice water entering the car park. They can either walk up to road level or go up the stairs to ground floor, both of which are safe refuges.

Part of the FEMP is likely to be the appointment of flood wardens who would have a similar role to fire wardens in a fire situation. These wardens (maybe on a roster system but alerted by an alarm system) would need to patrol the car park to ensure there is nobody at risk, for example someone sleeping in a car who may note recognise the warning system.

Any electrical components of the developed FEMP system would need battery backup as major rainfall storms may coincide with a loss of power.

It is noted that higher frequency flooding events will also create risk but at a lower level. There is no significant overland flow expected until the underground pipe system is at capacity – this should be at around the 5% AEP events. When high intensity rainfall events occur, people are not aware what AEP event they are experiencing, but they can appreciate unusually heavy rain events.

One aspect to be considered in the preparation of a FEMP is the potential for someone to attempt to enter the car park to remove their vehicle from the car park to prevent property loss, this can be countered by a cable gate or similar system which would prevent vehicles entering or leaving the car park in an alarmed event. The body corporate insurance may be able to cover such property damage which would reduce the desire to extract the vehicles.

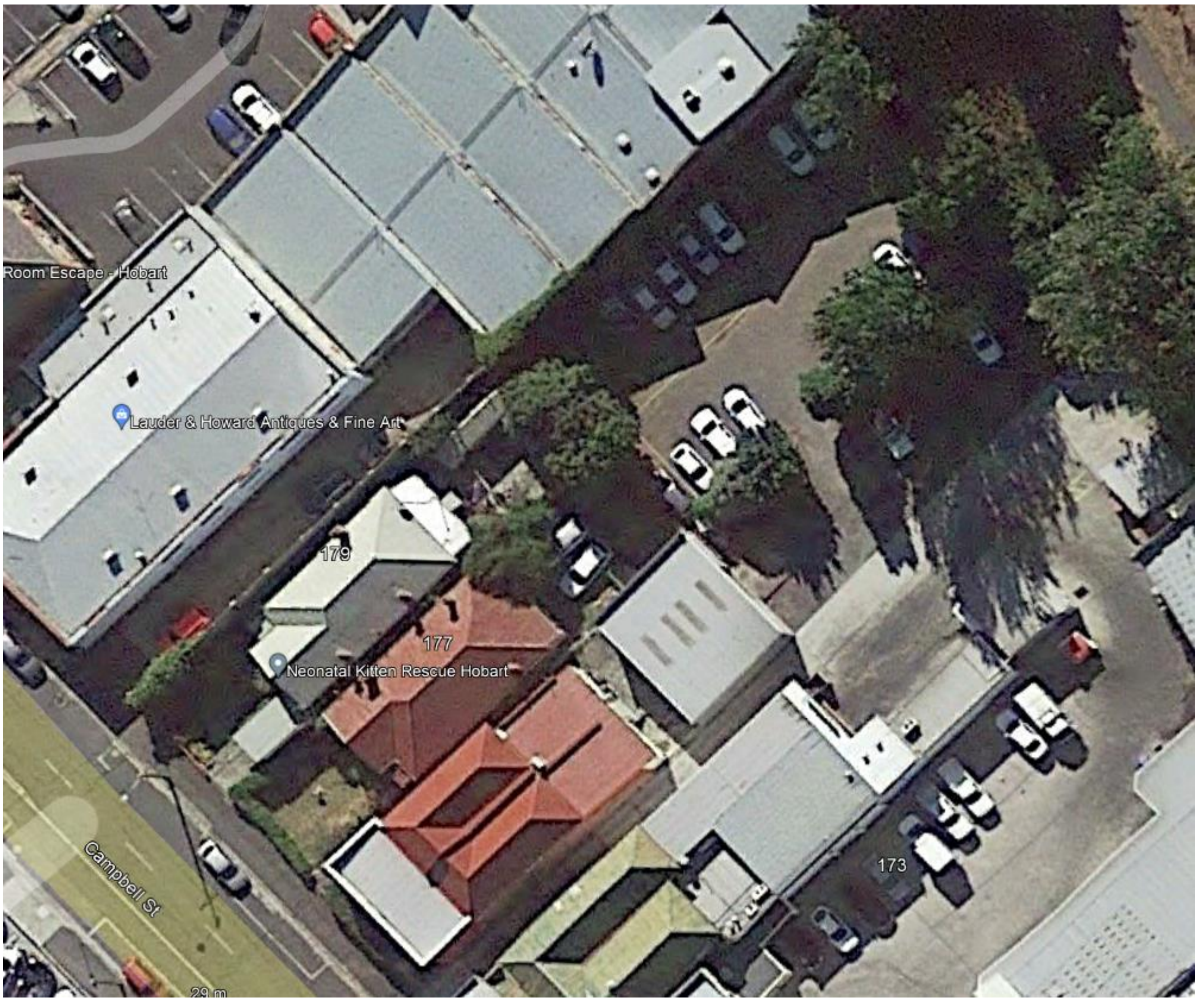


Figure 13: Google Earth image showing existing car parking

6 Abandoned Town Gas

TasWater Records show the presence of Abandoned Town Gas mains in Campbell Street. Incidents have occurred where civil workers have been exposed to harmful gases and Volatile Organic Compounds (VOCs) whilst excavating in roadways in Hobart and Moonah. The sources of the contaminants are mostly related to the old town gas (coal gas) pipes that were made redundant in Hobart in 1978.

Care should be taken when working in the vicinity of old mains for any new connections to the site, VOC monitoring equipment should be used and appropriated PPE should be worn by workers, further information on how to safely work in the vicinity of towns gas infrastructure should be sourced from WorkSafe Tasmania. Ring 1300 366 322 or email wstinfo@justice.tas.gov.au

Figure 14: Existing Abandoned Gas Pipe Locations

7 Access and Parking

Access and parking requirements for the site are addressed in the Traffic Impact Assessment by ECTM Consulting, July 2021.

JMG have prepared drawings which demonstrate the following compliance of the development with the requirements of AS2890.1 & AS2890.2:

- Vertical clearance will be provided across the full width of the driveway for access to the adjacent property for a HRV vehicle
- Vertical clearance will be prided into the undercover carpark to allow turning of the Veolia garbage truck
- Onsite turning is provided within the property and adjacent ROW for the Veolia garbage truck
- Access to the adjacent property is available for a MRV vehicle utilising the widened driveway access
- The vertical profile of the driveway will be improved for existing heavy vehicles accessing the site at the existing crossover
- The new driveway profile will provide clearance for the Veolia garbage truck
- Carparking and aisle dimensions within the basement carpark are provided in accordance AS2890.1 user class 2.

8 Conclusion

The proposed multi-unit residential and commercial development can be constructed with the provision of all required services to comply with the requirements of Council's Planning Scheme, TasWater's Design Guidelines, and the applicable Australian Standards.

The property can be serviced with communications, power, water, sewer and stormwater connections adequately sized to cater for the number of units.

With appropriate engineering detailing, existing and new council and TasWater services can be protected from damage and future maintenance and/or replacement can be undertaken. Building footings for the new development and adjacent properties will need to extend below the zone of influence for these pipes.

The flood risk assessment has highlighted hazardous conditions in the basement car park, and a suitable FEMP will need to be developed and implemented to minimise the risk to as low as reasonably practicable, noting that these risks are already experienced in the current site use. The FEMP will need to include appointment of flood wardens, audio and visual alarms (with battery back-up) and a cable gate across the vehicle access to prevent vehicular access/egress but allow pedestrian egress. The trigger for the alarm/cable gate should be at 50mm water depth in the basement.

9 References

1. Preparation and Installation Guide for-SDUS and MDUS. [Online] https://www.nbnco.com.au/content/dam/nbnco2/2018/documents/NewDevs/preparation-and-installation-guide-for-sdus-and-mdus.pdf.

2. Development Technical Standards. [Online] https://www.taswater.com.au/Development/Technical-Standards.

3. Installing Pit and Conduit Infrastructure. [Online] https://www.nbnco.com.au/content/dam/nbnco/documents/installing-pit-and-conduit-infrastructure.pdf.

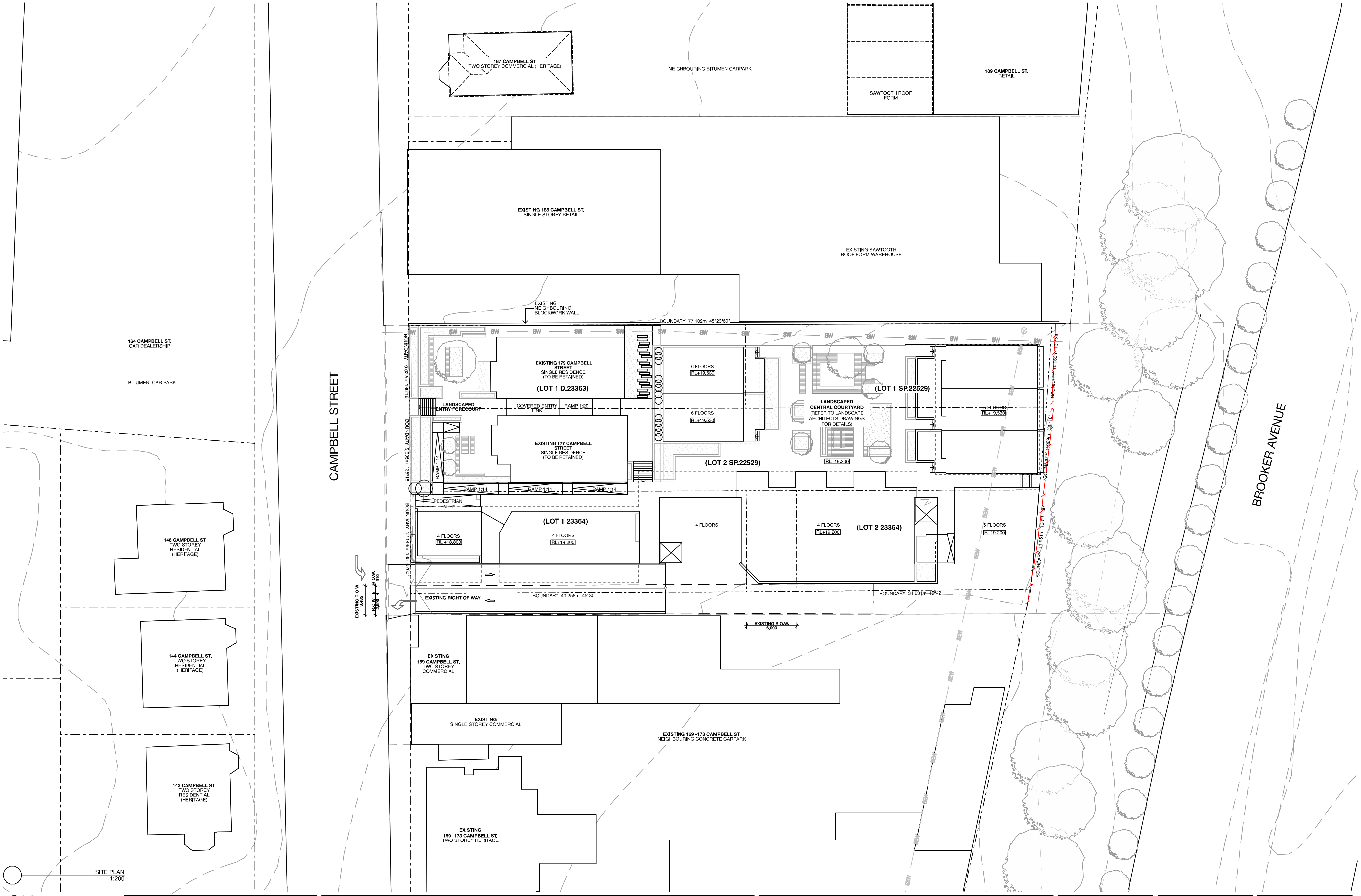
4. Pit and Pipe Design Guide. [Online] https://www.nbnco.com.au/content/dam/nbnco2/2018/documents/NewDevs/pit-and-pipe-design-guide.pdf.

5. Planning Scheme (iplan). [Online] https://iplan.tas.gov.au/Pages/XC.Home/Default.aspx?hid=95613.

6. Flussig Engineers 175-179 Campbell Street Flood Hazard Report Revision 03

APPENDIX A

Architects Plans
(Under Separate Cover)



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REV	DATE	PURPOSE
01	7/6/21	Preliminary - For Information
02	18/6/21	Preliminary DA Issue - For Client Review
03	23/6/21	Preliminary DA Issue - For Consultant Coordination
DA00	6/7/21	Development Application
DA02	5/11/21	Issue for Comment
DA03	12/11/21	Preliminary DA for Comment
DA04	18/11/21	ISSUE FOR DA

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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

N

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
SITE PLAN

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

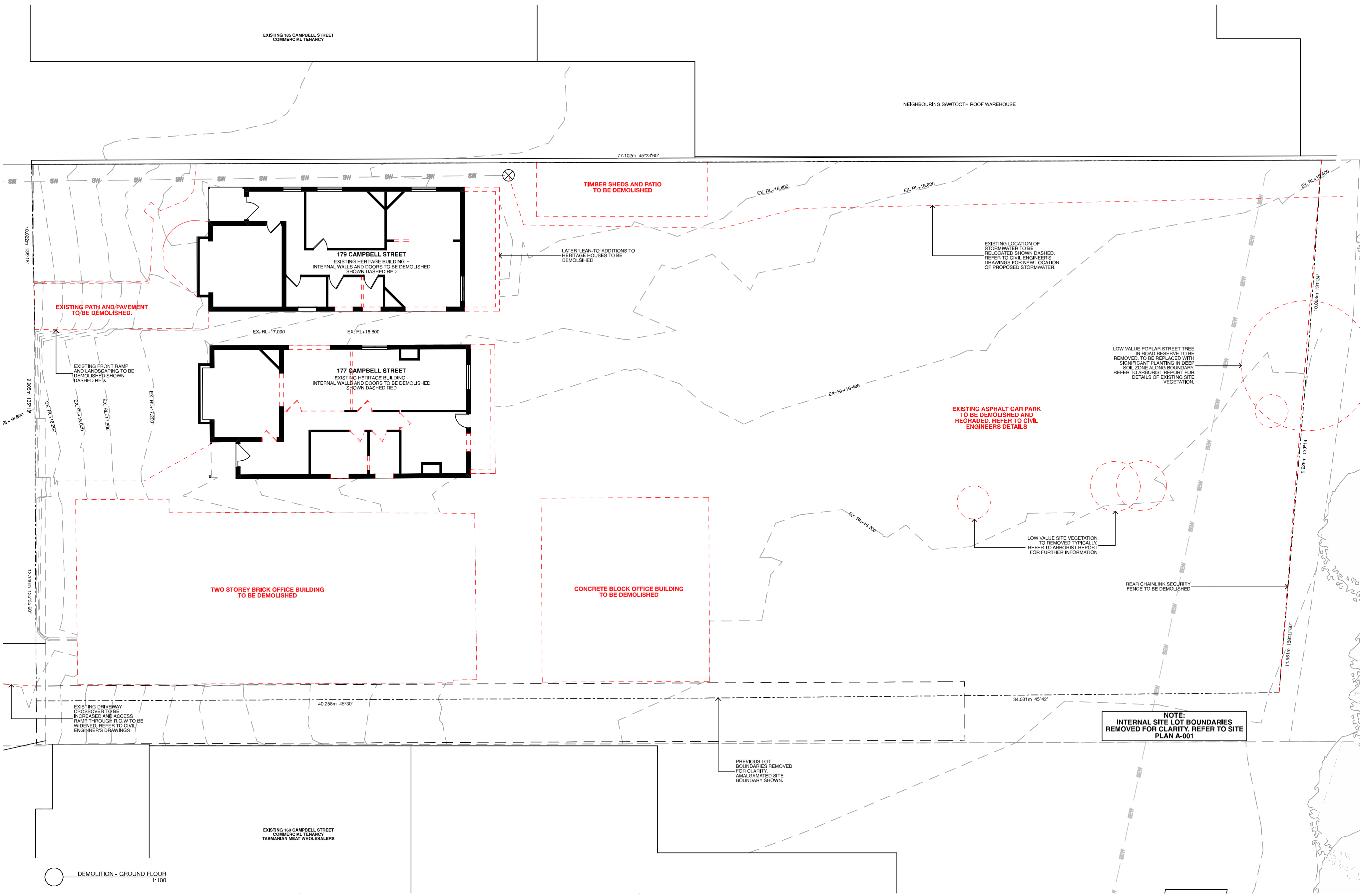
CHECKED BY
PW, KW

DATE
18/11/21

ORIGINAL SIZE
A1

DRAWING Nº
J20823-A-001

REVISION
DA04



DEMOLITION - GROUND FLOOR
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CU MUL US EST 2011

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DA04	18/11/21	ISSUE FOR DA

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Multi-Residential Development

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Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
DEMO PLAN - GROUND

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

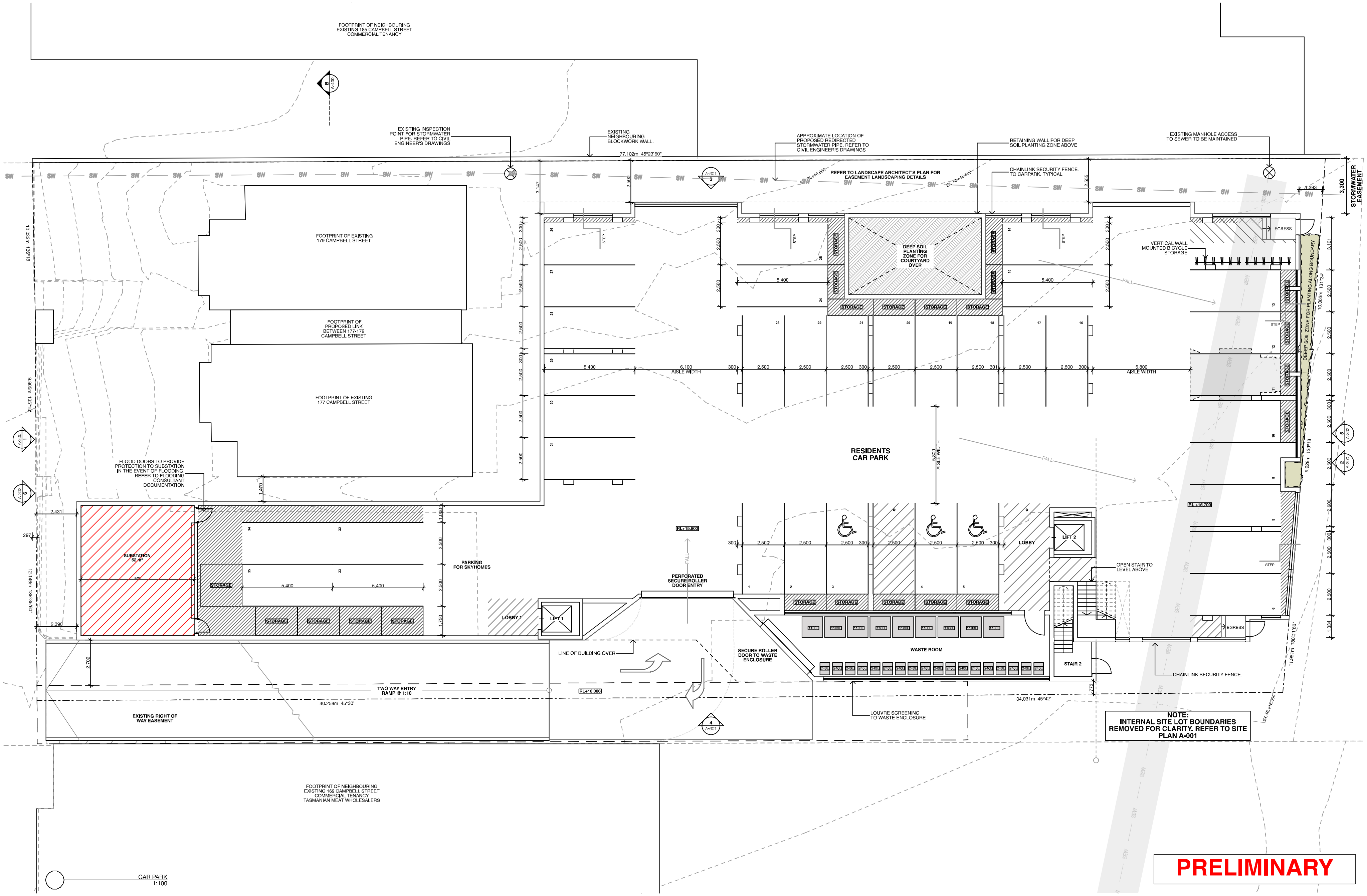
CHECKED BY
PW, KW

DATE
18/11/21

ORIGINAL SIZE
A1

DRAWING Nº
J20823-A-002

REVISION
DA04



CAR PARK
1:100

CU MUL US EST 2011

REV	DATE	PURPOSE
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02	7/6/21	Preliminary - For Information
03	9/6/21	DWG Issue - For Coordination
04	16/6/21	Preliminary DA Issue - For Information
05	18/6/21	Preliminary DA Issue - For Client Review
06	23/6/21	Preliminary DA Issue - For Consultant Coordination
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DA02	5/11/21	Issue for Comment

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PROJECT NAME
BGAS 175-179 Campbell Street
Multi-Residential Development

N

PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
PLAN - BASEMENT

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

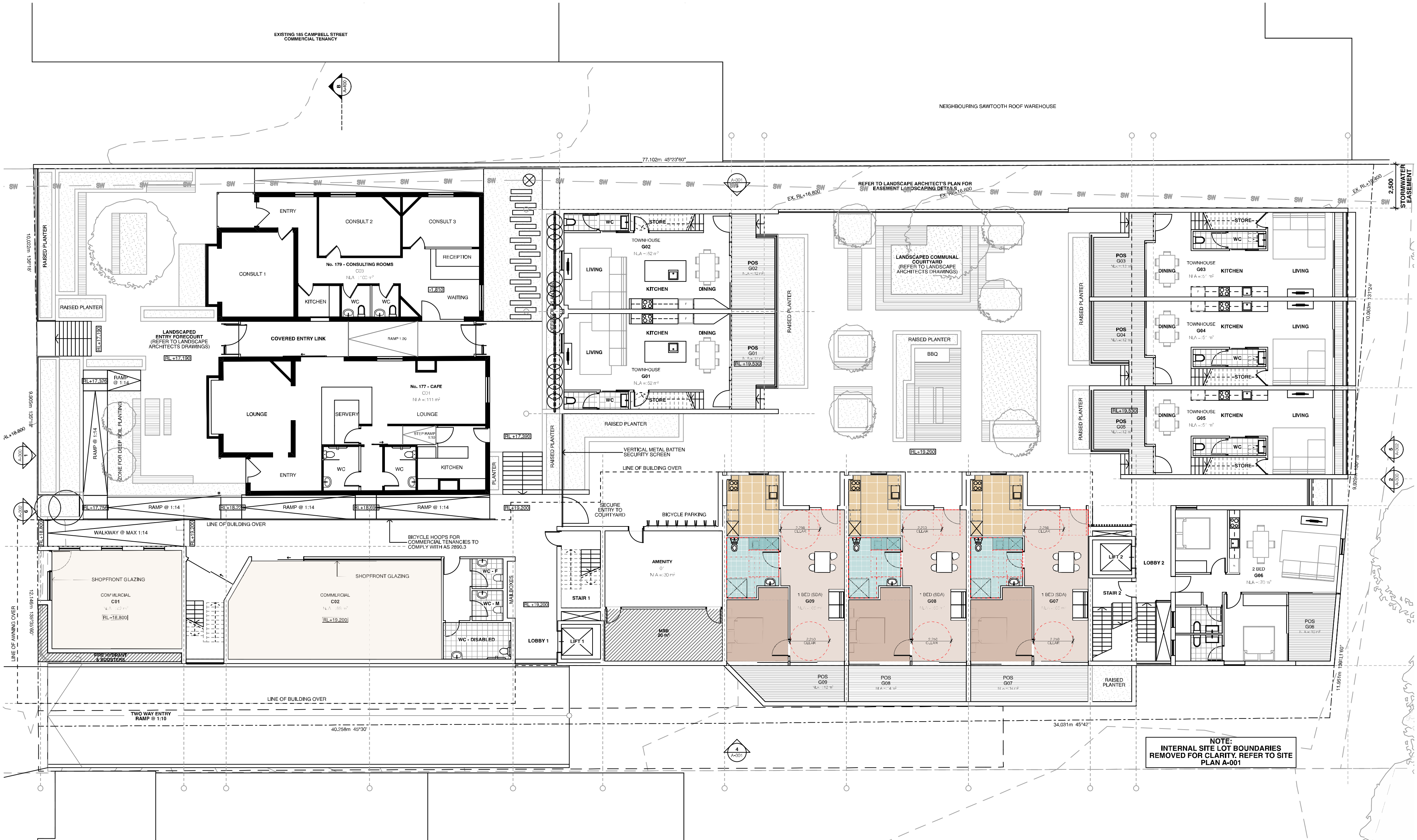
CHECKED BY
PW, KW

DATE
18/11/21

ORIGINAL SIZE
A1

DRAWING Nº
J20823-A-100

REVISION
DA04



WORK IN PROGRESS

GROUND FLOOR
1:100

CU
MUL
US EST 2011

REV	DATE	PURPOSE
01	21/5/21	Preliminary - For Discussion Only
02	7/6/21	Preliminary - For Information
03	9/6/21	DWG Issue - For Coordination
04	16/6/21	Preliminary DA Issue - For Information
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06	23/6/21	Preliminary DA Issue - For Consultant Coordination
DA00	6/7/21	Development Application
DA02	5/11/21	Issue for Comment

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GEORGE ST.
LAUNCESTON TAS 7250
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MELBOURNE
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CONCEPT DESIGN

DRAWING TITLE
PLAN - GROUND

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

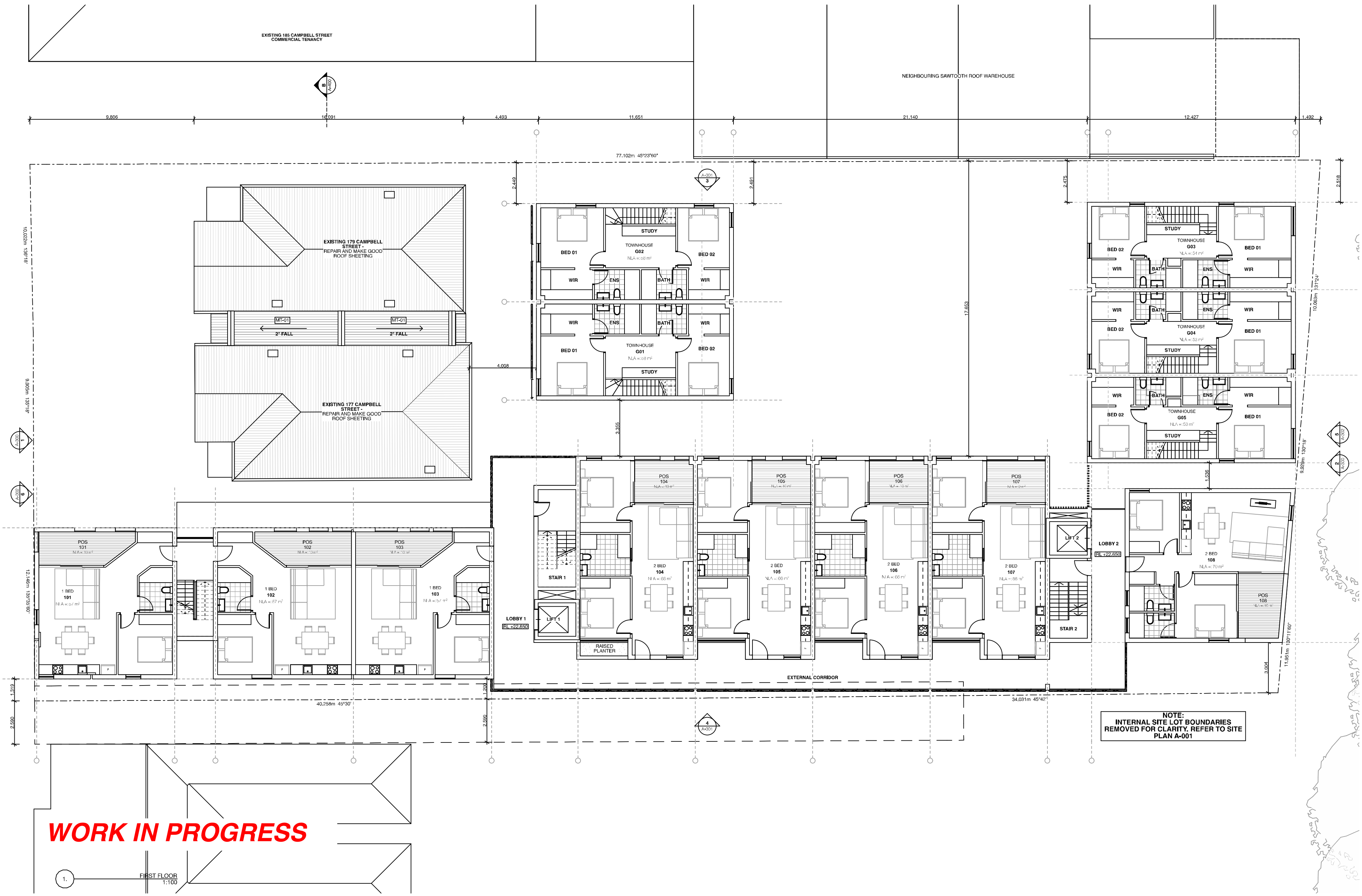
CHECKED BY
PW, KW

DATE
18/11/21

ORIGINAL SIZE
A1

DRAWING Nº
J20823-A-101

REVISION
DA04



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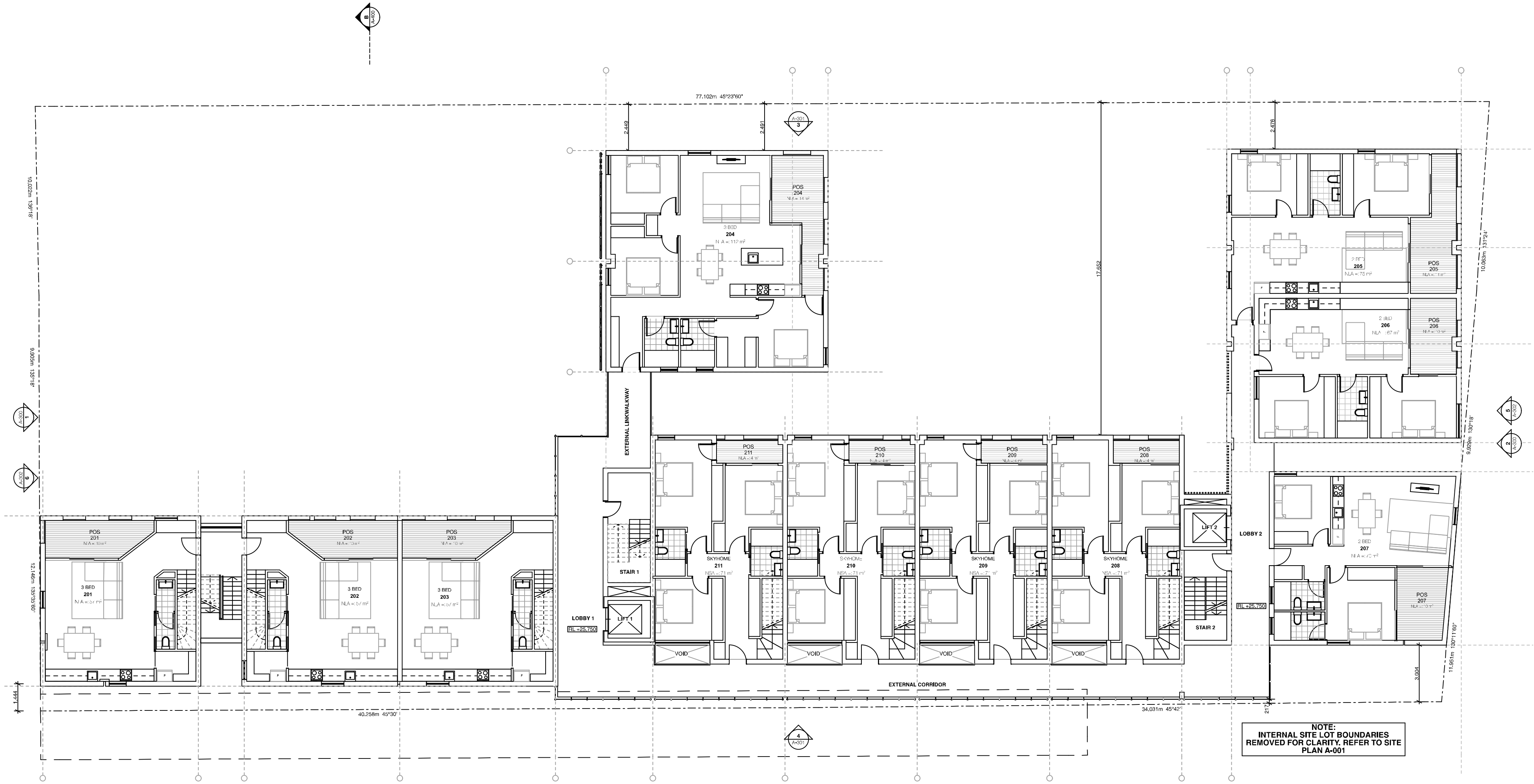
PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE: CONCEPT DESIGN
DRAWING TITLE: PLAN - LEVEL 01
ARCHITECT: PETER WALKER, CC2143E
DRAWN BY: AF, TB
CHECKED BY: PW, KW
DATE: 18/11/21
ORIGINAL SIZE: A1
DRAWING Nº: J20823-A-102
REVISION: DA04



SECOND FLOOR
1:100

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BGAS 175-179 Campbell Street
Multi-Residential Development

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PROJECT ADDRESS
175-179 Campbell Street
Hobart
Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
PLAN - LEVEL 02

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

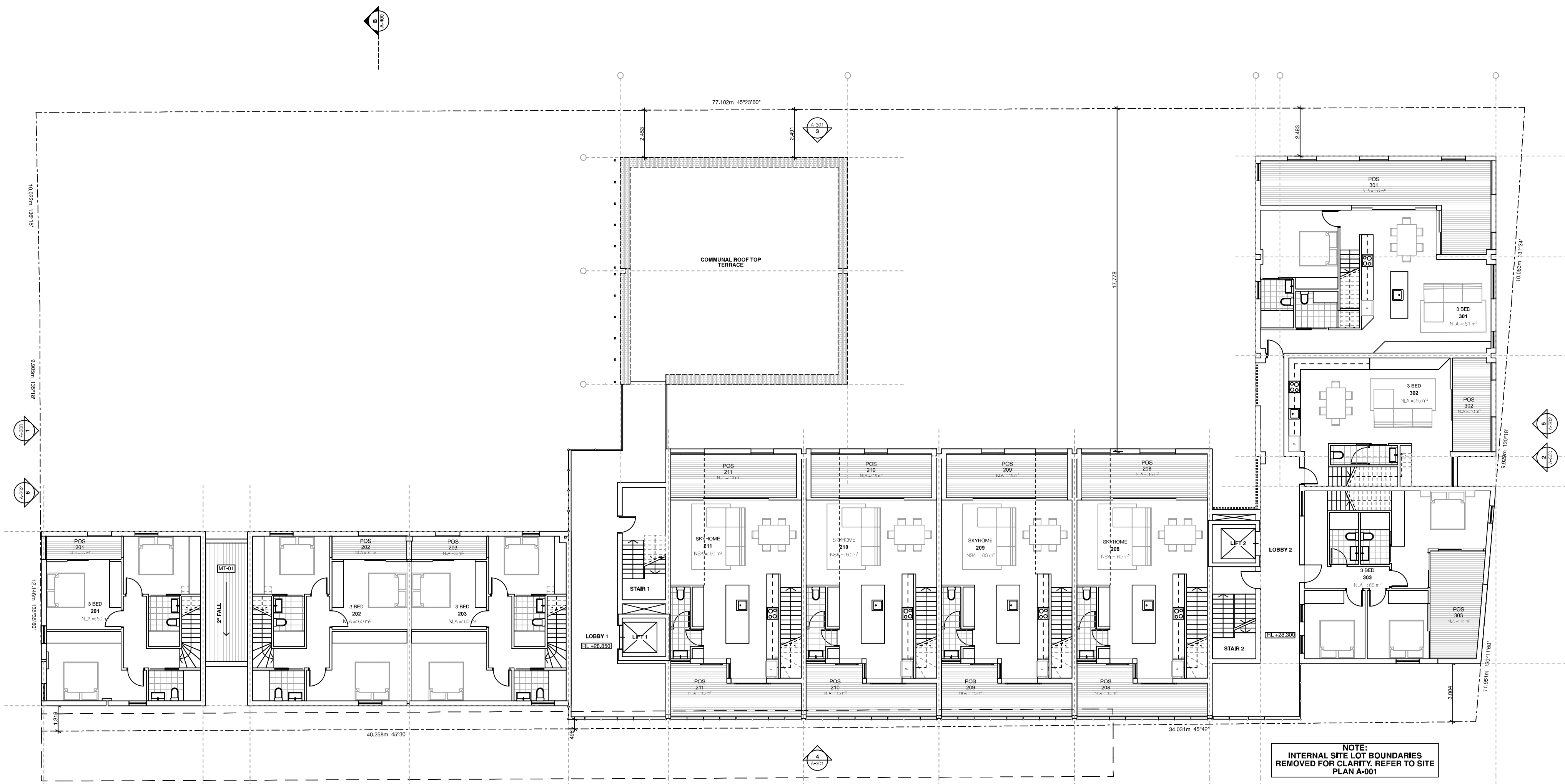
CHECKED BY
PW, KW

DATE
18/11/21

ORIGINAL SIZE
A1

DRAWING Nº
J20823-A-103

REVISION
DA04



WORK IN PROGRESS

THIRD FLOOR
1:100

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US EST 2011

REV	DATE	PURPOSE
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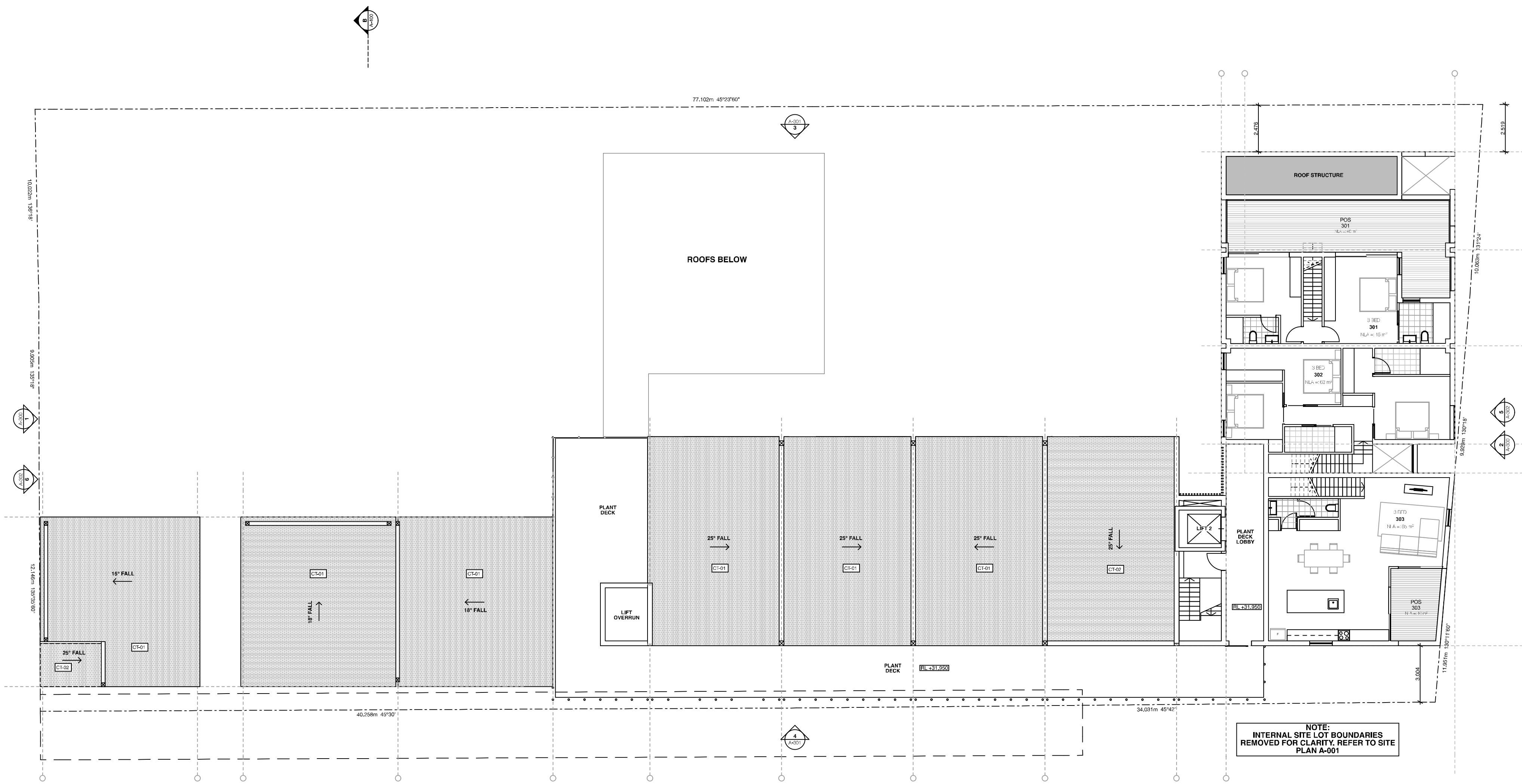
Tasmania 7000

PROJECT STAGE	CONCEPT DESIGN
DRAWING TITLE	PLAN - LEVEL 03
ARCHITECT	PETER WALKER, CC2143E
DRAWN BY	AF, TB
CHECKED BY	PW, KW
DATE	18/11/21
ORIGINAL SIZE	A1
DRAWING Nº	J20823-A-104
REVISION	DA04



WORK IN PROGRESS

FOURTH FLOOR
1:100

CU
MUL
US EST 2011

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Tasmania 7000

PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
PLAN - LEVEL 04

ARCHITECT
PETER WALKER, CC2143E

DRAWN BY
AF, TB

CHECKED BY
PW, KW

DATE
18/11/21

ORIGINAL SIZE
A1

DRAWING Nº
J20823-A-105

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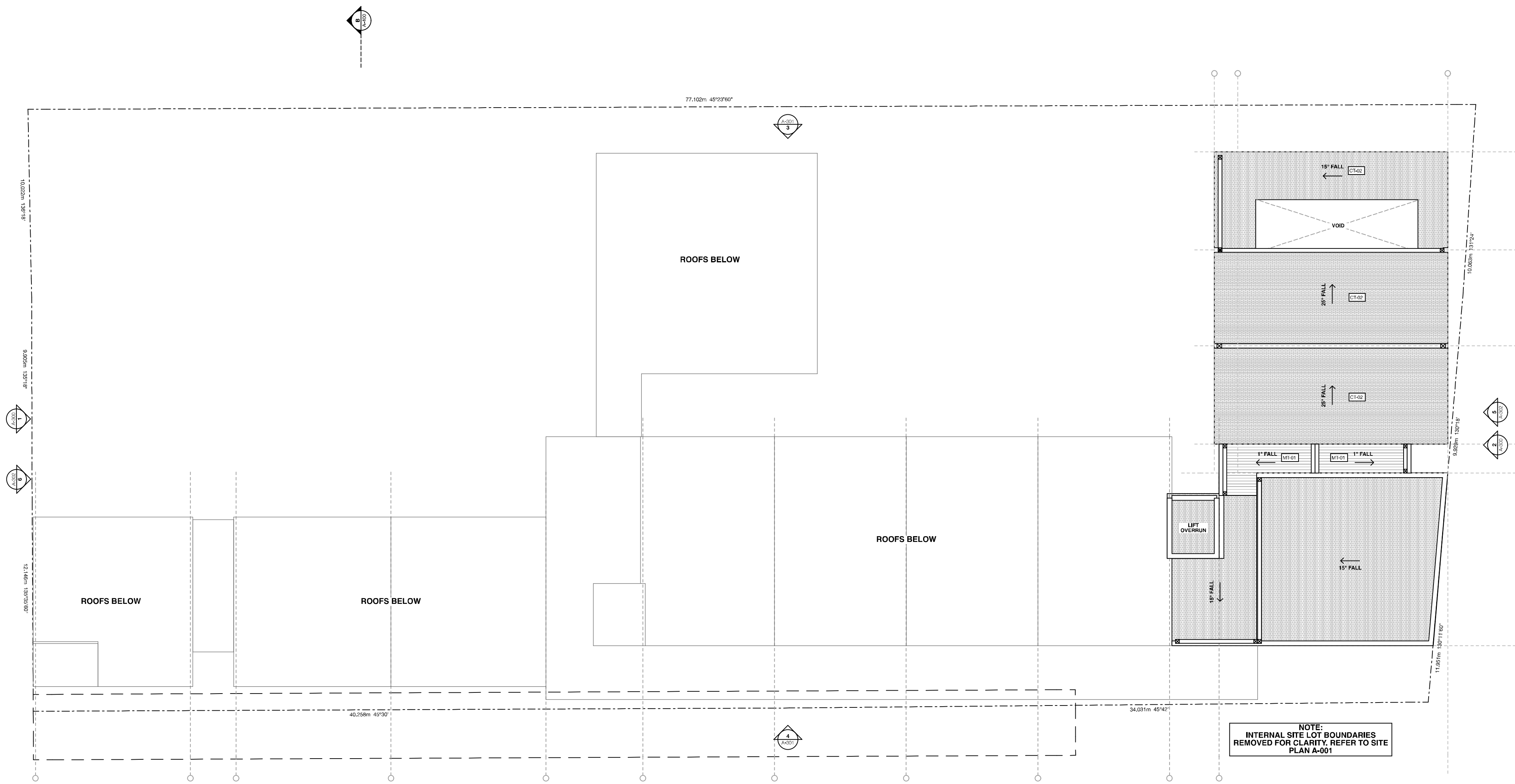

FIFTH FLOOR
1:100

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PROJECT STAGE
CONCEPT DESIGN

DRAWING TITLE
PLAN - LEVEL 05

ARCHITECT
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18/11/21

ORIGINAL SIZE
A1

DRAWING Nº
J20823-A-106

REVISION
DA04

APPENDIX B

Concept Services Plans

APPENDIX C

Water and Sewer Demand Calculations

177&179 Campbell St. - Hobart
WATER REQUIREMENTS

Probable Simultaneous Demand Calculation

ET's < 100

For a water flow estimate, use: AS/NZS 3500.1:2003 Section 3

	Quantity	Units	Comments
Number of Units/Homes/Town Houses	30.76	ET's	
Probable Simultaneous Demand (PSD)	3.46	L/s	Depends on the no. of units (Cell B10), determine from: AS/NZS 3500.1:2018 Table 3.2.3

Average Day Usage Calculations

ET's >= 100

	Quantity	Units	Comments
Average Day Demand (AD)	0	L/ET/day	As per 2.3.1 of TasWater Supplement
Average Water Demand (per day)	0	L/day	Based on ET of 13.2
Average Water Demand (per day)	0	kL/day	

TABLE 3.2.3

PROBABLE SIMULTANEOUS DEMAND (PSD) FOR DWELLINGS

No. of units or dwellings	Flow rate L/s	No. of units or dwellings	Flow rate L/s	No. of units or dwellings	Flow rate L/s
1	0.48	35	3.74	68	5.79
2	0.70	36	3.81	69	5.85
3	0.88	37	3.88	70	5.91
4	1.03	38	3.95	71	5.96
5	1.17	39	4.01	72	6.02
6	1.30	40	4.08	73	6.08
7	1.41	41	4.14	74	6.13
8	1.53	42	4.21	75	6.19
9	1.64	43	4.27	76	6.25
10	1.74	44	4.34	77	6.30
11	1.84	45	4.40	78	6.36
12	1.94	46	4.47	79	6.41
13	2.03	47	4.53	80	6.47
14	2.12	48	4.59	81	6.53
15	2.21	49	4.66	82	6.58
16	2.30	50	4.72	83	6.64
17	2.39	51	4.78	84	6.69
18	2.47	52	4.84	85	6.75
19	2.55	53	4.90	86	6.80
20	2.64	54	4.96	87	6.86
21	2.72	55	5.02	88	6.91
22	2.79	56	5.09	89	6.96
23	2.87	57	5.15	90	7.02
24	2.95	58	5.21	91	7.07
25	3.03	59	5.27	92	7.12

Total ET	30.76

TasWater Supplement Appendix B

1-2 Storeys, Medium Density, Dwelling	1 Bedroom	2 Bedroom	3 Bedroom	
Factor/dwelling	0.4	0.6	0.8	
No. of Units	0	18	16	Sum
ET	0	10.8	12.8	23.6

>2 Storeys, High Density, Dwelling	1 Bedroom	2 Bedroom	3 Bedroom	
Factor/dwelling	0.33	0.5	0.67	
No. of Units	0	0	0	Sum
ET	0	0	0	0

Accomodation (permanent)	Nursing Home / Special Care Home	
Factor/Bed	0.657	
No. of Beds	0	Sum
ET	0	0

Meal Preparation	Catering	Restaurant/Café	Take Away/Fast Food (no	Take Away/Fast	
Factor/GBFA m2	0.005	0.005	0.015	0.03	
GBFA m2	0	0	0	0	Sum
ET	0	0	0	0	0

Services	Industrial Laundry	Laboratories	
Factor/GBFA m2	0.24	0.064	
GBFA m2	0	0	Sum
ET	0	0	0

Business (excl. food preparation)	Office	Single Retail Shop	
Factor/GBFA m2	0	0.002	
GBFA m2	210	0	Sum
ET	0	0	0

26	3.10	60	5.32	93	7.18
27	3.17	61	5.38	94	7.23
28	3.25	62	5.44	95	7.29
29	3.32	63	5.50	96	7.34
30	3.39	64	5.56	97	7.39
31	3.46	65	5.62	98	7.44
32	3.53	66	5.68	99	7.50
33	3.60	67	5.73	100	7.55
34	3.67	—	—	—	—

NOTES:

1 The minimum flow rates shown in this Table are based on domestic installations. If it is expected that the dwelling(s) will have a greater demand, then the probable simultaneous flow rate may be estimated using the loading unit method outlined in Appendix D.

2 Determination of PSD for dwellings exceeding the scope of this Table may be estimated using the following equation:

$$Q = 0.03\,n + 0.4554\sqrt{n}$$

where

Q = flow rate, in litres per second

n = number of dwellings

3 Scott Street Bellerive
WSA CALCULATIONS

		CALCULATED VALUES	UNITS	COMMENTS
DESIGN FLOW	PDWF + GWI + RDI	1.957028895	L/s	Design flow result

PDWF	d x ADWF	1.729359753	L/s	
	PDWF			
d	0.01*(LOG(A))^4-0.19*(LOG(A))^3+1.4*(LOG(A))^2-4.66*LOG(A)+7.57	10.79513408		
A	Gross Area of Development	0.2618	Ha	Determine area (m2) off plans
	ADWF			
ADWF	0.001736*EP (150L/d/EP - as per TasWater)	0.16019808	L/s	
EP	3 x ET	92.28		TasWater overrides WSA
ET	Total Equivalent Tenements	30.76		TasWater Assumption (right)

GWI	0.025 x A x Portion(wet)	0.0045815	L/s	
$Portion_{wet}$	Portion of Network where GW > Pipe RL	0.7		TasWater Assumption (5.5.5.2)

RDI	0.028 x Aeff x C x I	0.223087642	L/s	
A_{eff}	A x (Density/150)^0.5 **OR** A	0.2618		Density >/< 150
Density	EP/A	352.4828113		
C	Saspect + Naspect	1.4		
Saspect	Soil Aspect	0.8		TasWater Assumption
Naspect	Network Defects Aspect	0.6		TasWater Assumption
I	$I_{1,2}$ x $Factor_{size}$ x $Factor_{containment}$	21.73801101		
I(1,2)	1 hr duration rainfall intensity, ARI 2 years	11.8		Determined from BOM
Factor(size)	(40/A)^0.12	1.828482642		
Factor(containment)	0.77 x (10^(0.43X)) / (10^(0.14X^2))	1.007504409		
X	log(ARI)	0.301029996		
ARI	Annual Reccurence Interval	2		TasWater Assumption

Total ET	**30.76**

TasWater Supplement Appendix B

1-2 Storeys, Medium Density, Dwelling				
	1 Bedroom	**2 Bedroom**	**3 Bedroom**	
Factor/dwelling	0	0.75	1	
No. of Units	0	18	16	**Sum**
ET	0	13.5	16	29.5

>2 Storeys, High Density, Dwelling				
	1 Bedroom	**2 Bedroom**	**3+ Bedroom**	
Factor/dwelling	0.5	0.75	1	
No. of Units	0	0	0	**Sum**
ET	0	0	0	0

Accomodation (permanent)		
	Nursing Home / Special Care Home	
Factor/Bed	0.971	
No. of Beds	0	**Sum**
ET	0	0

Meal Preparation					
	Catering	**Restaurant/Café**	**Take Away/Fast Food (no public ammenities)**	**Take Away/Fast Food (incl. public ammenities)**	
Factor/GBFA m2	0.008	0.008	0.024	0.048	
GBFA m2	0	0	0	0	**Sum**
ET	0	0	0	0	0

Services			
	Industrial Laundry	**Laboratories**	
Factor/GBFA m2	0.24	0.064	
GBFA m2	0	0	**Sum**
ET	0	0	0

Business (excl. food preparation)			
	Office	**Single Retail Shop**	
Factor/GBFA m2	0.006	0.003	
GBFA m2	210	0	**Sum**
ET	1.26	0	1.26

Time of Concentration			
C_1,10	25	mm	10% AEP, 60min Rainfall
A=	2618	m2	Insert Catchment Area
A=	0.00262	Km^2	Calculated in Km2
S_e=	-	m/Km	Insert Catchment Grade
L=	-	Km	Insert Flow Length
t_c=	-	mins	Tc Calculated
	5	**mins**	Whole Number Tc

Impervious Area		
Existing Hardstand Area=	2546.96	m2
Total Area =	2618	m2
Fraction Impervious =	97%	

Runoff Coefficient		
Fraction impervious =	97%	
C1,10 =	0.100	*Formula - Refer ARR Book VIII*
C10 =	**0.88**	**Runoff Coefficient**

Frequency Conversion Factors -Refer AR&R 1987										
ARI (years)	1	2	5	10	20	40	60	80	50	100
Factor, F_y	0.8	0.85	0.95	1	1.05	1.2	1.17	1.19	1.15	1.2

Peak Catchment Flows For Varied 5% AEP Storm Durations		
AEP	**Duration (min)**	**Flow (m^3/s)**
5%	5	0.057
5%	10	0.043
5%	15	0.035
5%	20	0.030
5%	25	0.026
5%	30	0.023
5%	45	0.018
5%	60	0.015
5%	90	0.012
5%	120	0.010
5%	180	0.008
5%	270	0.006

Peak Catchment Flows For Given AEP at T.O.C.		
AEP	**$I_{tc,Y}$ (mm/h)**	**Flow (m^3/s)**
63.20%	38.2	0.0195
50.00%	43.2	0.0235
20.00%	60.0	0.0364
10.00%	72.1	0.0461
5.00%	84.7	0.0568
2.00%	102.0	0.0750
1.00%	116.0	0.0890

Hardstand (100% Impervious)		
Roof	851	
Walkway	1649	
Carpark	0	
Impervious Area	**2499.6**	m2

Landscaping (40% Impervious)		
Backyard	118.4	
Impervious Area	47.36	m2

Catchment & Flow Details			Comments
Catchment Area =	0.26	Ha	
10 Year Runoff Coefficient =	0.88	-	
20 Year Effective Catchment Area =	0.24	Ha	
Restricted Outflow Requirement =	0.053	m3/s	Site Runoff: pre development 5% AEP, 5min (ToC) storm duration.

Detention Calculation							29% Climate Change			
Storm Duration	**5% AEP**	**5% AEP + 29% CC**	**Ip**	**Qp**	**V1**	**Smax**	**Ip**	**Qp**	**V1**	**Smax**
(min)	**Intensity (mm/hr)**	**Intensity (mm/hr)**	**(m3/s)**	**(m3/s)**	**(m3)**	**(m3)**	**(m3/s)**	**(m3/s)**	**(m3)**	**(m3)**
1	138.00	178.0	0.093	0.053	5.55	2.36	0.119	0.053	7.16	3.97
2	109.00	140.6	0.073	0.053	8.77	2.38	0.094	0.053	11.32	4.93
3	98.60	127.2	0.066	0.053	11.90	2.32	0.085	0.053	15.35	5.77
4	91.00	117.4	0.061	0.053	14.65	1.87	0.079	0.053	18.89	6.12
5	84.70	109.3	0.057	0.053	17.04	1.07	0.073	0.053	21.98	6.01
10	63.90	82.4	0.043	0.053	25.71	-6.24	0.055	0.053	33.17	1.22
15	51.90	67.0	0.035	0.053	31.33	-16.60	0.045	0.053	40.41	-7.51
20	44.20	57.0	0.030	0.053	35.57	-28.32	0.038	0.053	45.89	-18.01
25	38.80	50.1	0.026	0.053	39.03	-40.84	0.034	0.053	50.35	-29.52

Rainfall mm/hr								
Annual Exceedance Probability (AEP) mm/hr								
Duration	**Duration (min)**	**63.20%**	**50%**	**20%**	**10%**	**5%**	**2%**	**1%**
1 min	**1**	61	69.1	96.7	117	138	169	194
2 min	**2**	52.4	59	80	94.7	109	127	142
3 min	**3**	46.3	52.2	71.4	84.9	98.6	116	130
4 min	**4**	41.8	47.2	65	77.8	91	108	122
5 min	**5**	38.2	43.2	60	72.1	84.7	102	116
10 min	**10**	27.7	31.4	44.2	53.8	63.9	78.7	91
15 min	**15**	22.4	25.5	35.9	43.7	51.9	64.1	74.3
20 min	**20**	19.2	21.8	30.6	37.2	44.2	54.4	62.9
25 min	**25**	17	19.3	27	32.7	38.8	47.5	54.8
30 min	**30**	15.3	17.4	24.3	29.4	34.7	42.4	48.6
45 min	**45**	12.2	13.8	19.2	23.1	27.1	32.6	37.1
1 hour	**60**	10.4	11.8	16.2	19.4	22.7	27	30.5
1.5 hour	**90**	8.35	9.44	12.9	15.3	17.7	20.9	23.4
2 hour	**120**	7.14	8.07	11	13	15	17.6	19.6
3 hour	**180**	5.73	6.5	8.86	10.4	12	14	15.5
4.5 hour	**270**	4.6	5.23	7.17	8.44	9.67	11.3	12.5
6 hour	**360**	3.92	4.48	6.17	7.28	8.34	9.75	10.8
9 hour	**540**	3.11	3.57	4.97	5.9	6.78	7.99	8.9
12 hour	**720**	2.62	3.02	4.24	5.05	5.84	6.92	7.75
18 hour	**1080**	2.03	2.34	3.34	4.01	4.67	5.59	6.3
24 hour	**1440**	1.67	1.94	2.78	3.35	3.93	4.73	5.36
30 hour	**1800**	1.43	1.65	2.38	2.89	3.4	4.11	4.67
36 hour	**2160**	1.25	1.45	2.09	2.54	3	3.63	4.13
48 hour	**2880**	0.999	1.16	1.68	2.05	2.42	2.93	3.34
72 hour	**4320**	0.718	0.831	1.2	1.46	1.73	2.09	2.38
96 hour	**5760**	0.564	0.65	0.932	1.13	1.34	1.6	1.82
120 hour	**7200**	0.466	0.536	0.762	0.921	1.08	1.29	1.47
144 hour	**8640**	0.4	0.459	0.646	0.776	0.904	1.08	1.22
168 hour	**10080**	0.351	0.403	0.563	0.671	0.776	0.928	1.05

177/179 Campbell St. **Stormwater Calculations** Pre Development

Time of Concentration			
C_1,10	25	mm	10% AEP, 60min Rainfall
A=	2618	m2	Insert Catchment Area
A=	0.00262	Km^2	Calculated in Km2
S_e=	-	m/Km	Insert Catchment Grade
L=	-	Km	Insert Flow Length
t_c=	-	mins	Tc Calculated
	5	**mins**	Whole Number Tc

Impervious Area		
Existing Hardstand Area=	2364.8	m2
Total Area =	2618	m2
Fraction Impervious =	90%	

Runoff Coefficient		
Fraction impervious =	90%	
C1,10 =	0.100	*Formula - Refer ARR Book VIII*
C10 =	**0.82**	**Runoff Coefficient**

Frequency Conversion Factors -Refer AR&R 1987										
ARI (years)	1	2	5	10	20	40	60	80	50	100
Factor, F_y	0.8	0.85	0.95	1	1.05	1.2	1.17	1.19	1.15	1.2

Peak Catchment Flows For Varied 5% AEP Storm Durations		
AEP	**Duration (min)**	**Flow (m^3/s)**
5%	5	0.053
5%	10	0.040
5%	15	0.033
5%	20	0.028
5%	25	0.024
5%	30	0.022
5%	45	0.017
5%	60	0.014
5%	90	0.011
5%	120	0.009
5%	180	0.008
5%	270	0.006

Peak Catchment Flows For Given AEP at T.O.C.		
AEP	**$I_{tc,Y}$ (mm/h)**	**Flow (m^3/s)**
63.20%	38.2	0.0183
50.00%	43.2	0.0220
20.00%	60.0	0.0341
10.00%	72.1	0.0432
5.00%	84.7	0.0532
2.00%	102.0	0.0702
1.00%	116.0	0.0833

Hardstand (100% Impervious)		
Roof	704	
Concrete Ground Resd.	229	
Carpark / Driveway	841	
Impervious Area	**1774**	m2

Landscaping (70% Impervious)		
Gravel and Grass	844	
Impervious Area	590.8	m2

APPENDIX D

Stormwater Detention Calculations

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177 & 179 CAMPBELL STREET

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IFD TABLE (AEP)

		Rainfall mm/hr						
		Annual Exceedance Probability (AEP) mm/hr						
Duration	**Duration (min)**	**63.20%**	**50%**	**20%**	**10%**	**5%**	**2%**	**1%**
1 min	**1**	61	69.1	96.7	117	138	169	194
2 min	**2**	52.4	59	80	94.7	109	127	142
3 min	**3**	46.3	52.2	71.4	84.9	98.6	116	130
4 min	**4**	41.8	47.2	65	77.8	91	108	122
5 min	**5**	38.2	43.2	60	72.1	84.7	102	116
10 min	**10**	27.7	31.4	44.2	53.8	63.9	78.7	91
15 min	**15**	22.4	25.5	35.9	43.7	51.9	64.1	74.3
20 min	**20**	19.2	21.8	30.6	37.2	44.2	54.4	62.9
25 min	**25**	17	19.3	27	32.7	38.8	47.5	54.8
30 min	**30**	15.3	17.4	24.3	29.4	34.7	42.4	48.6
45 min	**45**	12.2	13.8	19.2	23.1	27.1	32.6	37.1
1 hour	**60**	10.4	11.8	16.2	19.4	22.7	27	30.5
1.5 hour	**90**	8.35	9.44	12.9	15.3	17.7	20.9	23.4
2 hour	**120**	7.14	8.07	11	13	15	17.6	19.6
3 hour	**180**	5.73	6.5	8.86	10.4	12	14	15.5
4.5 hour	**270**	4.6	5.23	7.17	8.44	9.67	11.3	12.5
6 hour	**360**	3.92	4.48	6.17	7.28	8.34	9.75	10.8
9 hour	**540**	3.11	3.57	4.97	5.9	6.78	7.99	8.9
12 hour	**720**	2.62	3.02	4.24	5.05	5.84	6.92	7.75
18 hour	**1080**	2.03	2.34	3.34	4.01	4.67	5.59	6.3
24 hour	**1440**	1.67	1.94	2.78	3.35	3.93	4.73	5.36
30 hour	**1800**	1.43	1.65	2.38	2.89	3.4	4.11	4.67
36 hour	**2160**	1.25	1.45	2.09	2.54	3	3.63	4.13
48 hour	**2880**	0.999	1.16	1.68	2.05	2.42	2.93	3.34
72 hour	**4320**	0.718	0.831	1.2	1.46	1.73	2.09	2.38
96 hour	**5760**	0.564	0.65	0.932	1.13	1.34	1.6	1.82
120 hour	**7200**	0.466	0.536	0.762	0.921	1.08	1.29	1.47
144 hour	**8640**	0.4	0.459	0.646	0.776	0.904	1.08	1.22
168 hour	**10080**	0.351	0.403	0.563	0.671	0.776	0.928	1.05

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177 & 179 CAMPBELL STREET - HOBART

STORMWATER CALCULATION - PRE DEVELOPMENT

Time of Concentration			
C_1,10	25	mm	10% AEP, 60min Rainfall
A=	2,567.00	m2	Insert Catchment Area
A=	0.00257	Km^2	Calculated in Km2
Tc	15	mins	Whole Number Tc

Impervious Area		
Existing Hardstand Area=	2,159.90	m2
Total Area =	2,567.00	m2
Fraction Impervious =	0.84	

Runoff Coefficient		
Fraction impervious =	84.14%	
C1,10 =	0.10	*Formula - Refer ARR Book VIII*
C10 =	0.77	**Runoff Coefficient**

Frequency Conversion Factors -Refer AR&R 1987										
ARI (years)	1	2	5	10	20	40	60	80	50	100
Factor, F_y	0.8	0.85	0.95	1	1.05	1.2	1.17	1.19	1.15	1.2

Peak Catchment Flows For Varied 5% AEP Storm Durations		
AEP	**Duration (min)**	**Flow (m^3/s)**
5%	5	0.049
5%	10	0.037
5%	15	0.030
5%	20	0.026
5%	25	0.022
5%	30	0.020
5%	45	0.016
5%	60	0.013
5%	90	0.010
5%	120	0.009
5%	180	0.007
5%	270	0.006

Peak Catchment Flows For Given AEP at T.O.C.		
AEP	**$I_{tc,Y}$ (mm/h)**	**Flow (m^3/s)**
63.20%	22.4	0.0099
50.00%	25.5	0.0120
20.00%	35.9	0.0188
10.00%	43.7	0.0241
5.00%	51.9	0.0301
2.00%	64.1	0.0407
1.00%	74.3	0.0492

Garden (50%)		
Vegetation Area	155.00	m2
Impervious Area	77.50	**m2**

Gravel (60%)		
Carpark Gravel Area	824.00	m2
Impervious Area	494.40	**m2**

Hardstand Area (100% Impervious)		
Roof	655	m2
Concrete Floor	464	m2
Asphalt Carpark & Driveway	469	m2
Impervious Area	1588	**m2**

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177 & 179 CAMPBELL STREET - HOBART

STORMWATER CALCULATION - POST DEVELOPMENT

Time of Concentration			
C_1,10	25	mm	10% AEP, 60min Rainfall
A=	2,567.00	m2	Insert Catchment Area
A=	0.00257	Km^2	Calculated in Km2
Tc=	15	**mins**	Whole Number Tc

Impervious Area		
Existing Hardstand Area=	2,499.00	m2
Total Area =	2,567.00	m2
Fraction Impervious =	97%	

Runoff Coefficient		
Fraction impervious =	97%	
C1,10 =	0.100	*Formula - Refer ARR Book VIII*
C10 =	**0.88**	**Runoff Coefficient**

Frequency Conversion Factors -Refer AR&R 1987										
ARI (years)	1	2	5	10	20	40	60	80	50	100
Factor, F_y	0.8	0.85	0.95	1	1.05	1.2	1.17	1.19	1.15	1.2

Peak Catchment Flows For Varied 5% AEP Storm Durations		
AEP	**Duration (min)**	**Flow (m^3/s)**
5%	5	0.056
5%	10	0.042
5%	15	0.034
5%	20	0.029
5%	25	0.026
5%	30	0.023
5%	45	0.018
5%	60	0.015
5%	90	0.012
5%	120	0.010
5%	180	0.008
5%	270	0.006

Peak Catchment Flows For Given AEP at T.O.C.		
AEP	**$I_{tc,Y}$ (mm/h)**	**Flow (m^3/s)**
63.20%	22.4	0.0112
50.00%	25.5	0.0136
20.00%	35.9	0.0214
10.00%	43.7	0.0274
5.00%	51.9	0.0342
2.00%	64.1	0.0462
1.00%	74.3	0.0559

Hardstand Area (100% Impervious)		
Roof + Building Line	1,343.00	m2
Driveway	300.00	m2
Concrete Floor	754.00	m2
Impervious Area	2,397.00	**m2**

Vegetation (60% Impervious)		
Garden Beds	170	m2
Impervious Area	102	**m2**

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177 & 179 CAMPBELL STREET - HOBART

5% AEP STORMWATER DETENTION CALCULATION

Catchment & Flow Details			Comments
Catchment Area =	0.26	Ha	
10 Year Runoff Coefficient =	0.88	-	
20 Year Effective Catchment Area =	0.24	Ha	
Restricted Outflow Requirement =	0.0301	m3/s	Site Runoff: pre development 5% AEP, 20min (ToC) storm duration.

Detention Calculation					
Storm Duration	**5% AEP**	**Ip**	**Qp**	**V1**	**Smax**
(min)	**Intensity (mm/hr)**	**(m3/s)**	**(m3/s)**	**(m3)**	**(m3)**
1	138.00	0.091	0.030	5.45	3.64
2	109.00	0.072	0.030	8.61	5.00
3	98.60	0.065	0.030	11.68	6.27
4	91.00	0.060	0.030	14.37	7.15
5	84.70	0.056	0.030	16.72	7.70
10	63.90	0.042	0.030	25.23	7.19
15	51.90	0.034	0.030	30.73	3.67

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175-179 Campbell Street,

Stormwater Management Plan

Prepared For:
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Prepared by: .... Date: 29th May 2022
Mark D. Smith

Reviewed by: .... Date: 29th May 2022
John Holmes

Authorised by: .... Date: 29th May 2022
Max W. Möller

Revision History					
Rev No.	**Description**	**Prepared by**	**Reviewed by**	**Authorised by**	**Date**
00	175-179 Campbell St, SWMP	Mark Smith	John Holmes	Max W. Möller	08/07/2021
01	Corrections following peer review section 3.3, update to pre/post dev depth maps. Minor formatting changes.	Mark Smith	John Holmes	Max W. Möller	29/05/2022

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1. Introduction

Flüssig Engineering has been engaged by **Solutionswon Group Pty Ltd** to undertake a site-specific Stormwater Management Plan for the property at number 175-179 Campbell Street, Hobart in the **City of Hobart** municipality. The purpose of this report is to determine the quantity and quality properties of stormwater runoff on the existing and post-development lot drainage for the 5% AEP.

1.1 Objectives and Scope

This stormwater analysis has been written to meet the standards of the Hobart City Council Interim Planning Scheme 2015 (HIPS, 2015), with the intent of understanding the development influences on local runoff. The objectives of this study are:

- Provide an assessment of the current and proposed site runoff for the 5% AEP Storm event ensuring there is no increase in runoff from the development, or any increase can be catered for by receiving infrastructure.
- Provide an assessment of the receiving infrastructure and its capacity.
- Provide quality mitigation methods which met water pollutant reduction standards of 80% TSS, 45% TN and 45% P.
- Provide maintenance regimes for any mitigation methods.
- Provide recommendations for potential future development, where appropriate.

1.2 Limitations

This study is limited to the objectives of the client engagement, the availability and reliability of data, and including the following:

- The quantity model is limited 5% AEP worst case temporal design storm.
- All parameters have been derived from best practice manuals and available relevant studies (if applicable) in the area.
- All provided data by the client or government bodies for the purpose of this study is deemed fit for purpose and has not been checked for accuracy.
- The study is to determine the effects of the new development on stormwater runoff and should not be used outside the specified area without further assessment.

2. Site Characteristics

2.1 Site Location

175-179 Campbell Street, Hobart is located along the Park Street Rivulet. The properties total approximately 2,430m^2 (Figure 1). The site is in inner city Hobart and is listed as mixed urban use.

Figure 1 below outlines the approximate location for the site at 175-179 Campbell Street.

Figure 1. Development Location, 175-179 Campbell Street, Hobart

2.2 Topography

The 2D surface model was taken from *Mt Wellington LiDAR 2011* to create a 1m and cell size DEM. For the purposes of this report, 1m cells are enough to capture accurate flow paths. The DEM with hill shading can be seen below (Figure 2).

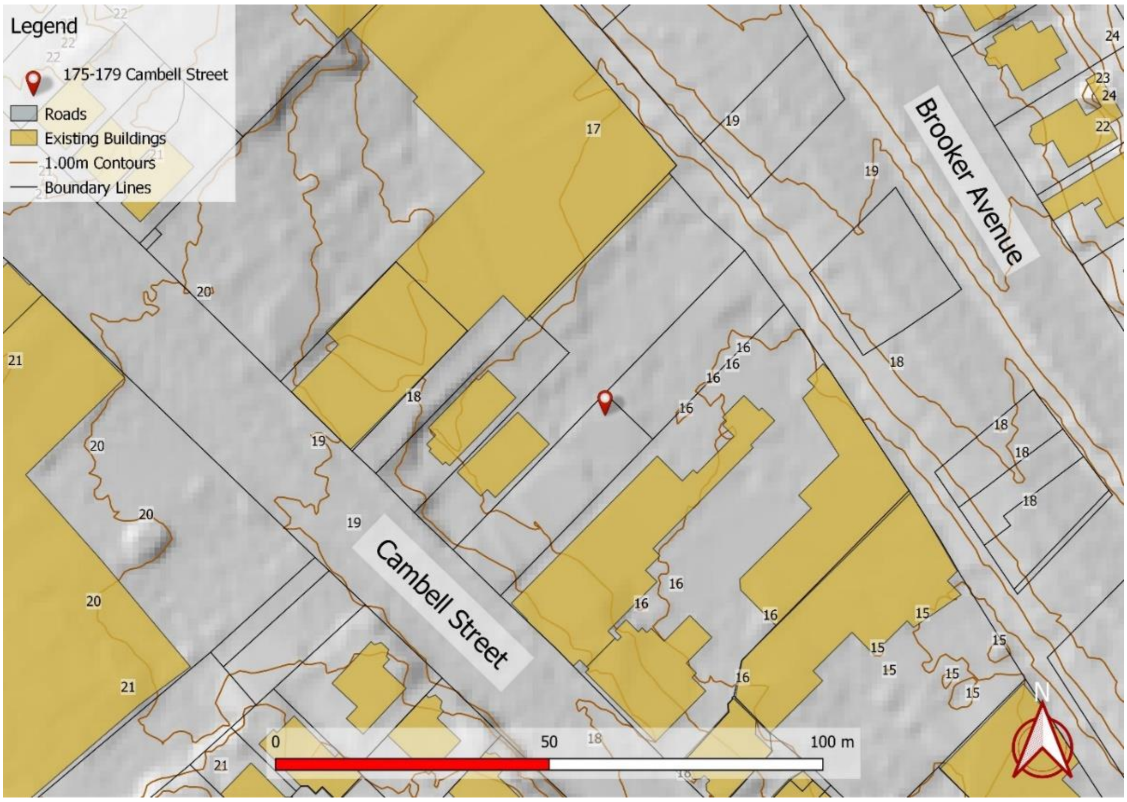


Figure 2. 1m DEM (Hill shade) of Property Area

2.3 Proposed Development

The proposed development consists of the construction of multi storey townhouse complex at the rear of 175-179 Campbell Street, currently a partially sealed carpark. This includes the redivision of a DN525 stormwater main to allow for footings.

3. Stormwater Quantity

3.1 Catchment

The following Table 1 states the adopted hydrological parameters for the RAFTS catchment.

Table 1. Parameters for RAFTS catchment

Catchment Area (ha)	Initial Loss Perv/imp (mm)	Continuing Loss Perv/imp (mm/hr)	Manning's N pervious	Manning's N impervious	Non-linearity factor
0.243	10/1	3.0/0.0	0.035	0.018	-0.285

3.1.1 Design Rainfall Events

Design storm durations and temporal pattern were calculated using Australian Rainfall and Runoff 2019 (ARR19) guidelines, running ten temporal pattern events through each duration to determine the worst-case duration using the median temporal pattern. below shows the 5% AEP 10min duration temporal pattern 8 rainfall event as the storm event.

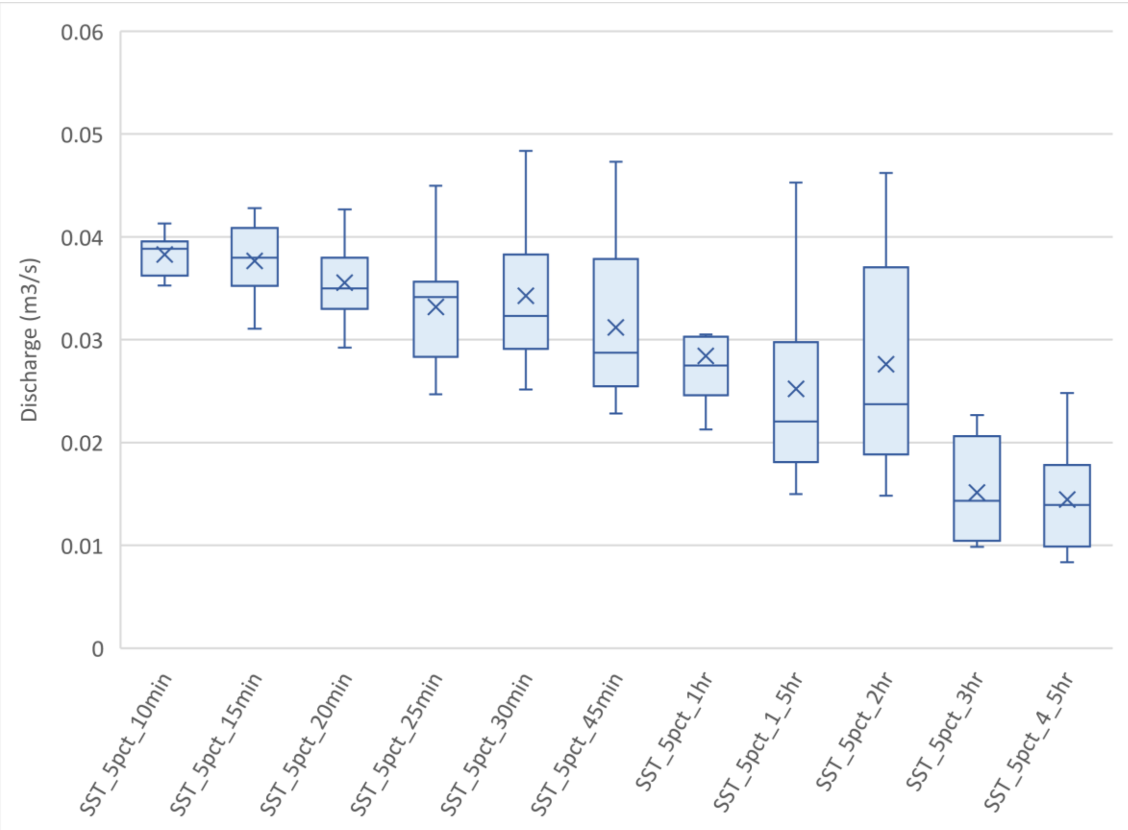


Figure 3. 1% Box and Whisker Plot

3.1.2 Land use

Pervious and impervious land use for the development both pre- and post-development were derived from plans and aerial imagery. Land use values are as follows in Table 2.

Table 2. Site Characteristics

Catchment	Area (ha)	Average Slope (%)	Total Land use pervious/ impervious (ha)	Storm duration and pattern
Pre-Development	0.243	2.6	0.040/ 0.203	5% 10-minute storm pattern 8
Post-Development	0.243	2.6	0.02/ 0.223	5% 10-minute storm pattern 8

3.1.3 Roughness (Manning's n)

Roughness values for this model were derived from the ARR 2019 Guidelines. The Manning's values are listed in Table 3.

Table 3. Manning's Coefficients (ARR 2019)

Land Use	Roads	Open Channel	Rural	Residential	Parks	Buildings	Piped Infrastructure
Manning's n	0.018	0.035	0.04	0.045	0.05	0.3	0.013

3.2 Development Runoff

Stormwater runoff from the development site has been assessed under pre- and post-development models to determine the potential impact the development at 175-179 Campbell Street has on the immediate local flows. As per planning guidelines it is a requirement that this does not worsen from pre to post development.

Using the above parameters, the site was calculated using Infoworks ICM software and ARR19 best practice manuals. Site characteristics for the pre- and post-development model were summarised in Table 2. Site Characteristics.

3.3 Model Results

The pre- and post-development scenarios were calculated using Infoworks ICM software against the 5% AEP. The storm durations were derived from the worst case median temporal pattern for these two events which were both 10 minutes duration.

The pre and post conditions can be seen in Table 4 below showing the peak discharge and increase in peak discharge from pre to post development.

Table 4. Discharge rates pre- and post-development

Design Event (AEP)	Peak Discharge (L/s) Development Areas		Difference (L/s)
	Pre-Development	Post- Development	
5%	37	39	2

As per the Hobart City Council Interim Planning Scheme 2015, E7.0 (Stormwater Management) the post-development allowable site discharge must not exceed the pre-development site discharge. As can be seen from Table 4, this is exceeded in the 5% AEP by a peak discharge of 39 L/s, 2 L/s more than the allowable site discharge of 37 L/s. Therefore, the site must detain the difference using an onsite stormwater detention (OSD) system.

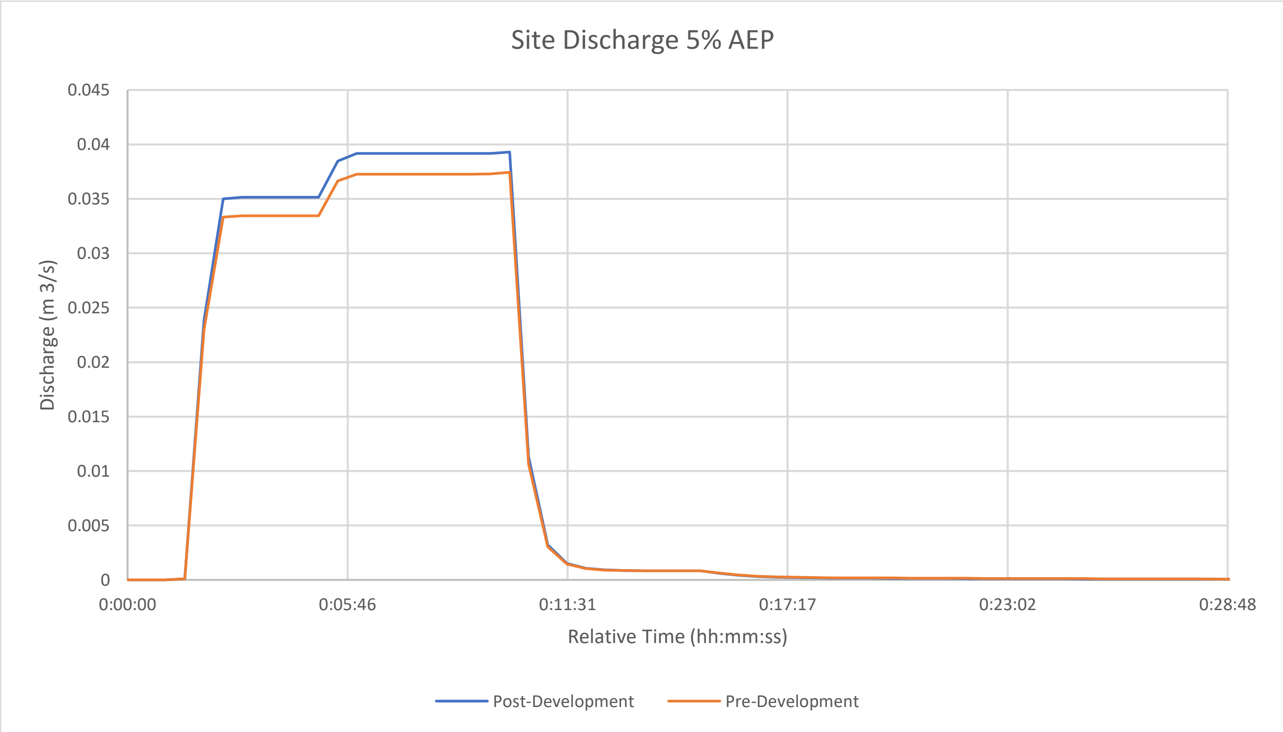


Figure 4. Site Discharge Pre- Vs Post-development comparison

3.4 On-Site Detention Sizing and Configuration

Pre- and post-development 5% AEP modelling for the site shows a total volume of 19.594 m^3 post-development, 0.88m^3 more than pre-development flows of 18.714. As per ARR2019, Book 9, Section 5.5.1 “An Integrated Approach” – Figure 5.6, a single 880 Litre detention tank is proposed to be discharged into existing stormwater network.

3.5 Maintenance

To ensure ongoing operation of the tanks, strata owners/body corporate would be required to perform regular maintenance on OSD devices to ensure they remain in good working order. This would include but not be limited to the tasks described in Table 5.

Table 5. Concept Maintenance Plan

Task	Action	Frequency
General Cleaning – pits, pipe, filters etc.	Clear all debris from tank and tank filters, ensure operational.	Approximately every 6 months
Specialised cleaning and inspection	Inspect all pipes, inflow and outflow – flush if required. Inspect all filters replace if required. Inspect main tank for defects.	Yearly
Maintenance	Perform detailed inspection and maintenance of tank and associated infrastructure by a qualified person.	Every 5 years

The above maintenance plan is generic and based on best practise advice. Specific maintenance plans should be created for each specific device upon purchasing or confirmation of design.

3.6 Existing Stormwater Network Capacity

The site currently drains to an existing council DN525 stormwater pipe that runs through the site and joins into a DN1800 trunk main (piped Park Street Rivulet). The DN525 has an upstream contributing catchment of approximately 2 ha of commercial zoned area (largely impervious). As can be seen from Figure 5, with the addition of upstream Park Street Rivulet catchment and Providence Rivulet the existing infrastructure is well under capacity for even a 5% AEP event, flooding the existing car park and neighbouring properties.

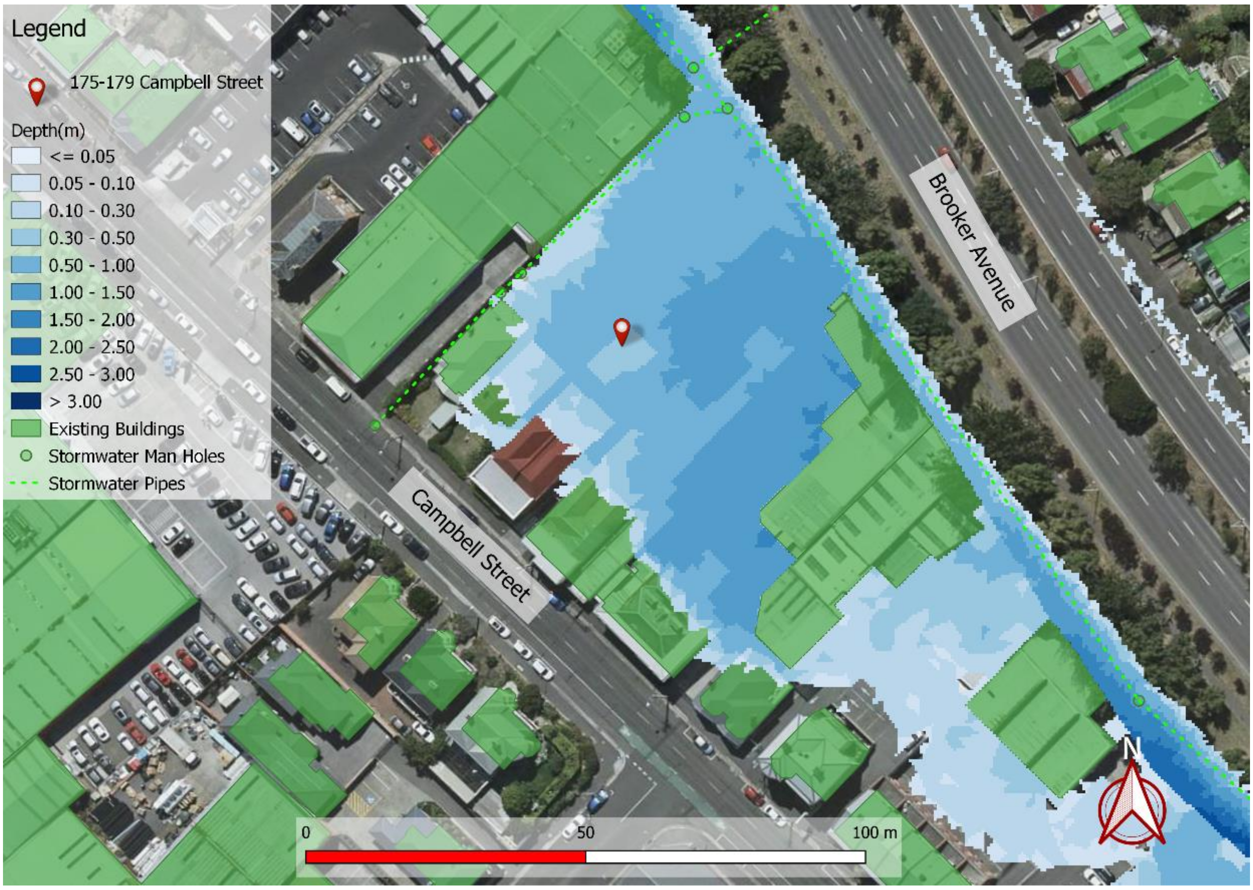


Figure 5. Pre-development 5% AEP, flood depths and extents

With the introduction of the lowered car park the basement carpark flooding occurs with depths of up to 1.5m (Figure 7). Figure 7 Shows how the Park Street Rivulet floods the proposed re-aligned DN525 restricting any additional flow from contributing catchments and flooding 175-179 Campbell Street and surrounding properties.

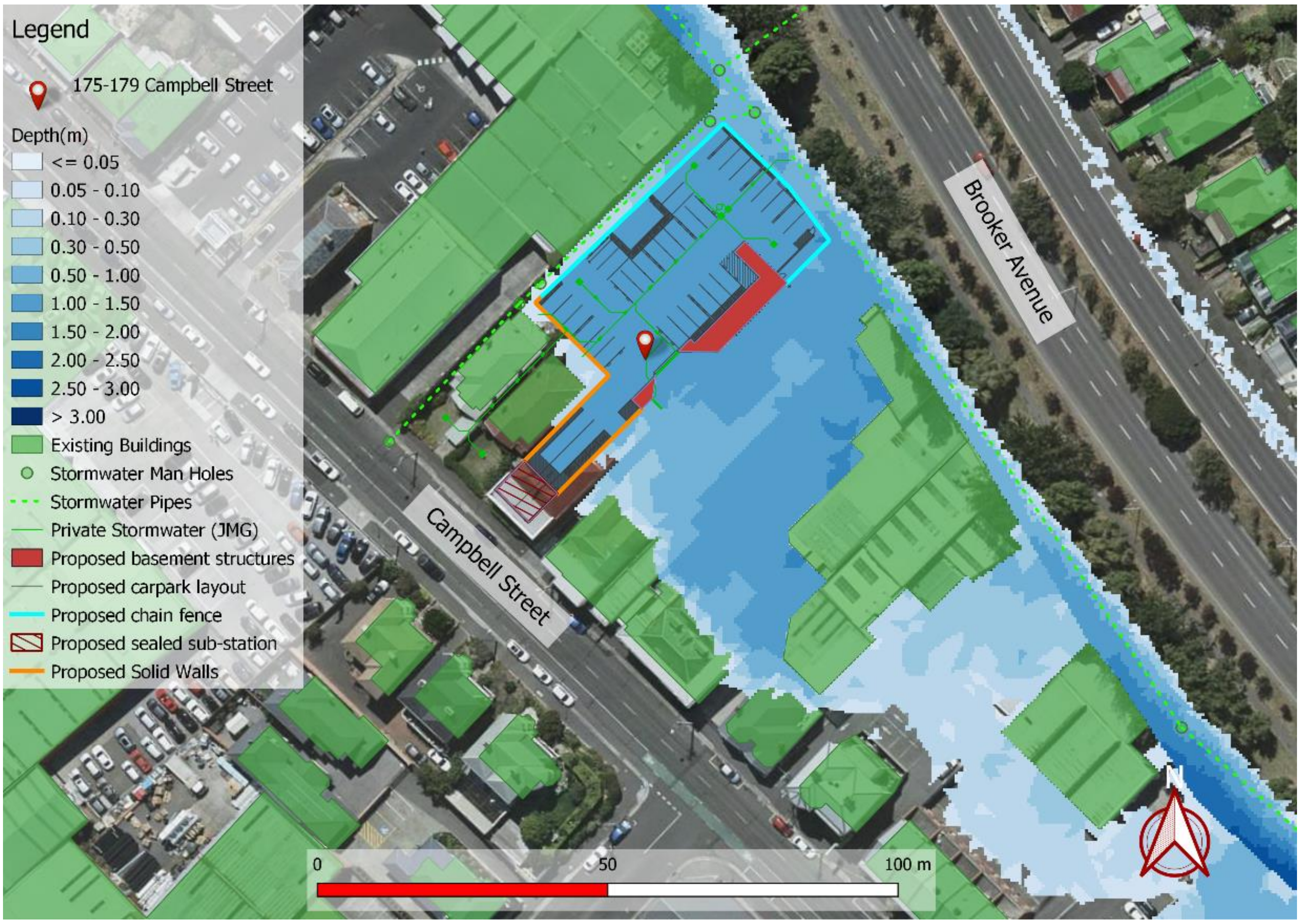
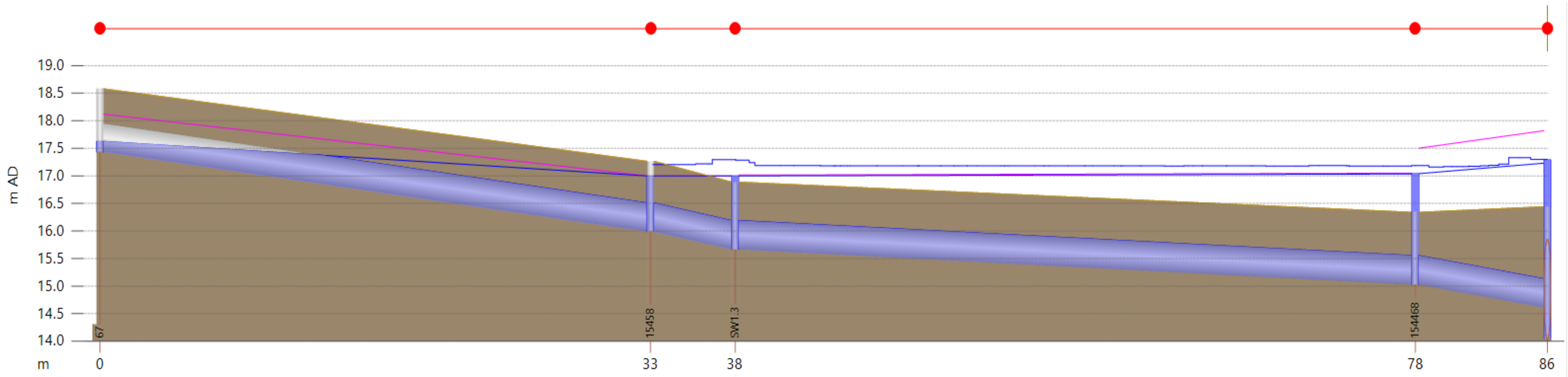


Figure 6. Post – Development 1% AEP at 2100, flood depths and extents

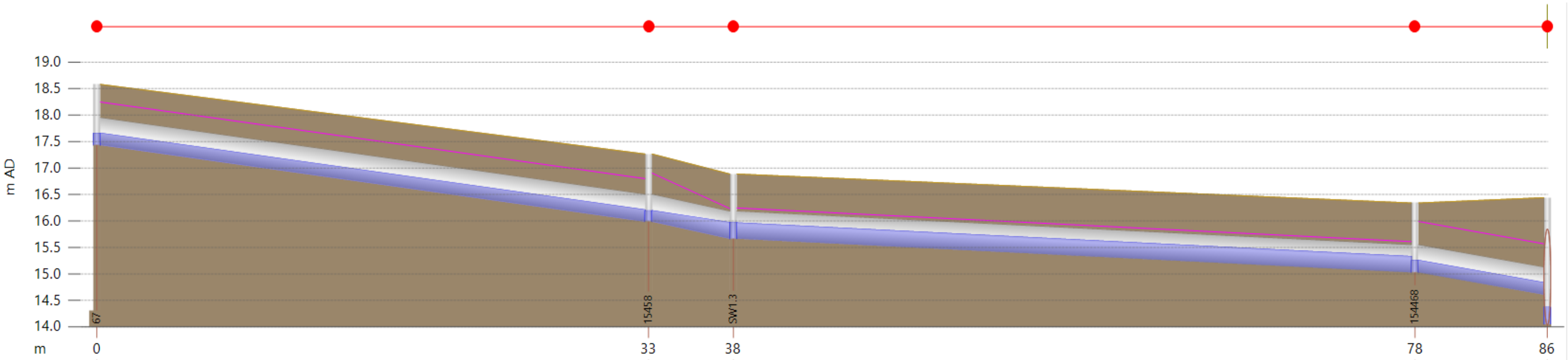
Figure 8 shows the capacity of the DN525 Stormwater infrastructure with only the contributing catchments to this section of pipe included (localised rainfall). In this long section current requirement is 34 L/s at post development contribution well under the pipe's maximum 92.5 L/S free flowing capacity.



Link	67.1	15458.1	SW1.3.1	154468.1
length (m)	32.7	5.0	40.4	7.8
width (mm)	525	525	525	525
us inv (m AD)	17.432	15.985	15.665	15.029
ds inv (m AD)	15.985	15.662	15.029	14.608
US flow (m3/s)	0.22290	0.22250	0.21813	-0.87196
US total head (m AD)	18.118	16.999	17.014	17.501
US velocity (m/s)	3.115	3.266	2.064	4.282
DS flow (m3/s)	0.22241	0.22251	0.21846	-0.87529
DS total head (m AD)	16.999	16.999	17.049	17.820
DS velocity (m/s)	2.886	2.026	2.049	4.218

Node	67	15458	SW1.3	154468	66
ground (m AD)	18.580	17.265	16.887	16.340	16.440
Ch floor lev (m AD)	17.432	15.985	15.662	15.029	14.040
flood dep (m)	-0.954	-0.266	0.111	0.696	0.848

Figure 7. Long section of the proposed re-alignment of the DN525 (proposed by JMG) including DN1800 catchments.



Link	67.1	15458.1	SW1.3.1	154468.1
length (m)	32.7	5.0	40.4	7.8
width (mm)	525	525	525	525
us inv (m AD)	17.432	15.985	15.665	15.029
ds inv (m AD)	15.985	15.662	15.029	14.608
US flow (m3/s)	0.29970	0.29956	0.29952	0.33864
US total head (m AD)	18.247	16.903	16.246	15.990
US velocity (m/s)	3.404	3.730	2.351	3.797
DS flow (m3/s)	0.29958	0.29954	0.29935	0.33862
DS total head (m AD)	16.799	16.233	15.610	15.569
DS velocity (m/s)	3.403	2.276	2.350	3.797

Node	67	15458	SW1.3	154468	66
ground (m AD)	18.580	17.265	16.887	16.340	16.440
Ch floor lev (m AD)	17.432	15.985	15.662	15.029	14.040
flood dep (m)	-0.923	-1.070	-0.918	-1.084	-2.070

Figure 8. Long Section of proposed DN525 with localised to DN525 contributing catchments.

3.7 Quantity Summary

This concept quantity report is based off limited available information and guidelines from the Hobart City Council in line with the Hobart Interim Planning Scheme. The following is a summary of the concept requirements for stormwater management for the development at 175-179 Campbell Street, Hobart:

1. Site exceeds pre-development maximum discharge by 0.20 L/s for the 5% AEP.
2. Recommended onsite storage detention of 880 litres for the 10 min storm duration.
3. Site drainage to have minimum 1.0kL tank as OSD for site.
4. New building must provide a free flowing path to allow for overland flow path for the 1% and 5% AEP runoff around development site.

4. Stormwater Quality

Water quality modelling for the site has been undertaken with the urban stormwater improvement. conceptualisation software MUSIC. The modelling conducted in MUSIC has been done in accordance with MUSIC Modelling Guidelines (BMT WBM, August 2019) and the Tasmanian State Stormwater Strategy. This document provides a guide to water quality modelling methodology and outlines the assumptions that should be made when selecting input parameters.

Recommendation for the improvement of the water quality on site would include the diversion of stormwater flows from the subdivision to a primary and secondary treatment (treatment train). This would reduce the pollutants in the receiving waters further downstream and be a safe design option if future usage of this sub catchment provides higher pollutant storm water runoff.

4.1 Stormwater Quality Treatment (Construction phase)

During construction, many pollutants are generated from various sources. These pollutants can easily be captured in stormwater runoff and introduced into the downstream receiving environment, polluting the waterways. Some of the main construction phase pollutants are described below:

- Litter from construction – Material packaging, paper, plastic, food packaging, off cuts etc.
- Sediment erosion and transports from excavated material and fresh surfaces.
- Hydrocarbons – equipment and machinery
- Toxic material – cement, solvents, paints, cleaning agents etc.
- pH altering substances – cement, cleaning agents etc.

Construction phase pollutants should be planned and mitigated for by a designed site-specific SWMP as part of the drawing set. This should detail controls including, but not limited to:

- Diversion of upslope water (where applicable)
- Stabilised exit/entry points
- Minimise site disturbance where possible.
- Implement sediment control along downslope boundaries.
- Appropriate location and protection for stockpiles
- Capture on-site runoff that may contain pollutants.
- Maintain control measures.
- Stabilise site after disturbance (revegetate etc)

4.2 Stormwater Quality Modelling

Stormwater pollutant modelling for Campbell Street development was undertaken using Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software, version 6.3.0 under the guidelines of the State Stormwater Strategy and Interim Planning Scheme.

This model splits the catchment into the following typical areas:

- Roof Catchment
- Road Catchment
- Driveways
- Revegetated land

The following fraction impervious and land areas were adopted in the modelling as per the concept design measurements. Revegetated land was left to freely drain to the node as there is no mechanism to drain this area to a treatment device. See Table 6 below for fraction imperviousness (fi).

Table 6. Adopted Fraction Impervious

Catchment Area (ha)	Roof		Driveways		Revegetated	
	Area (ha)	fi	Area (ha)	fi	Area (ha)	fi
0.243	0.203	1	0.02	0.9	0.02	0

4.2.1 Council Planning Quality Removal Standards

The Hobart Interim Planning Scheme 2015 has adopted the pollutant removal targets and best practice from the State Stormwater Strategy 2010. See Table 7 for target removal rates.

Table 7. State Stormwater Strategy Pollutant Removal Targets

Parameter	Result Pollutant Retention on Developed Site
Total Suspended Solids (TSS) (kg/yr)	80%
Total Phosphorous (TP) (kg/yr)	45%
Total Nitrogen (TN) (kg/yr)	45%
Total Pollutants (kg/yr)	100%

4.3 Treatment Train

To achieve stormwater pollutant removal targets outlined above and considering site constraints, this model utilised a primary and secondary proprietary treatment. The treatment train consists of a primary stormwater tank, followed by a gross pollutant trap which receives flow from new ground impervious areas and roofs (via rainwater tank). The driveway is captured by a Hydrochannel or similar.

4.4 Quality Results

The MUSIC pollutant load reductions can be seen detailed in Table 8 below. As can be seen when comparing the MUSIC results to the required state stormwater strategy target load reductions, the specified treatment train outlined above and as seen in Table 8, shows that all targets either meet or exceed reduction targets.

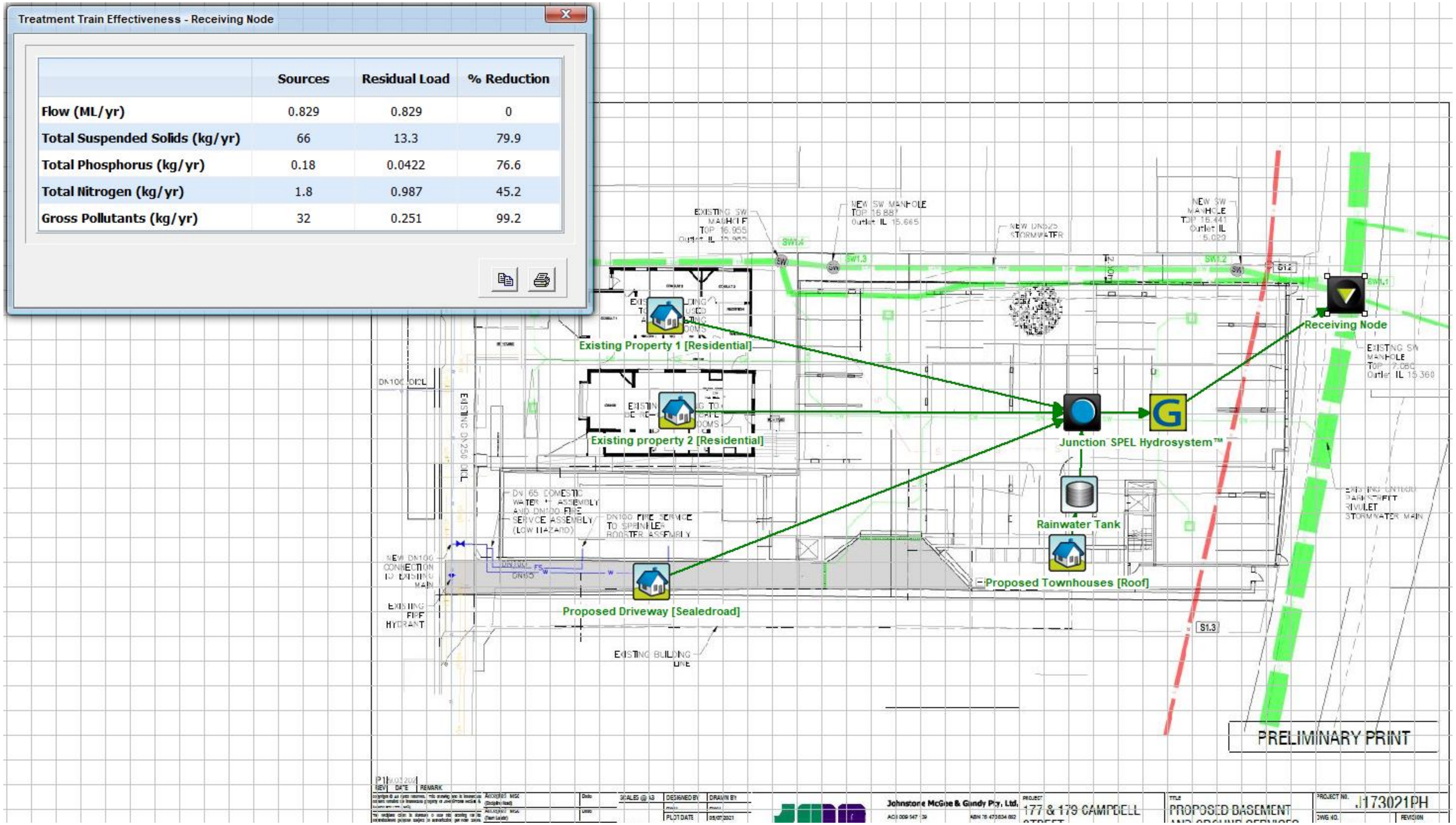
Table 8. Pollutant Removal Achieved vs Targets.

Parameter	Required Load Reduction (%)	MUSIC Modelled Load Reduction (%)	State Stormwater Targets Achieved
Total Suspended Solids (TSS) (kg/yr)	80.0	79.9	Y
Total Phosphorous (TP) (kg/yr)	45.0	76.6	Y
Total Nitrogen (TN) (kg/yr)	45.0	45.2	Y
Total Pollutants (kg/yr)	90.0	99.2	Y

Based on the water quality assessment using the MUSIC software, it is found that the pollutant reduction improvement can be achieved by adopting the Stormwater Quality Improvement Devices (SQIDs) specified in Table 9.

Table 9. Required SQIDS

Stormwater Quality Improvement Device	Quantity
Detention Tank	1
Spel Hydrosystem HS.800	1


Treatment Train Effectiveness - Receiving Node

	Sources	Residual Load	% Reduction
Flow (ML/yr)	0.829	0.829	0
Total Suspended Solids (kg/yr)	66	13.3	79.9
Total Phosphorus (kg/yr)	0.18	0.0422	76.6
Total Nitrogen (kg/yr)	1.8	0.987	45.2
Gross Pollutants (kg/yr)	32	0.251	99.2

Figure 9. Music Model Treatment Train and removal statistics

4.5 SQID Maintenance

To ensure ongoing operation of all treatment systems the strata management group would be required to perform regular maintenance on all treatment devises to ensure they remain in good working order. This would include, but not be limited to, information described in Table 10.

Table 10. Concept Maintenance Plan

Task	Action	Frequency
General Cleaning	Clear all pollutants from storage and device filters, ensure operational	Approximately every 6 months
Specialised cleaning and inspection	Inspect all storage, inflow and outflow – clean and flush if required. Inspect all filters replace if required. Visually inspect main device for defects	Yearly
Maintenance	Perform detailed inspection and maintenance of tank and associated infrastructure by a qualified person.	Every 5 years

The above maintenance plan is generic and based on removal rates and best practise advise. Specific maintenance plans should be created for each specific device upon purchasing or confirmation of design.

4.6 Quality Summary

Flüssig Spatial recommends the following be undertaken to ensure the ongoing stormwater quality from the developed site:

1. Construction quality control should be implemented to prevent pollution during construction.
2. Installation of treatment devices in the order specified in this document.
3. Maintenance plans need to be created and adhered to ensure the ongoing operation of the systems.

5. Conclusion

The Concept Stormwater Management Plan for 175-179 Campbell Street, Hobart development site has reviewed the post development quantity and quality scenarios. Post-development quantity and quality has been assessed against the State Stormwater Strategy to ensure the post-development flows meet specified standards.

The following conclusions were derived in this report:

1. A comparison of the post-development peak flows for the 5% AEP storm event were undertaken against pre-development discharge and found to meet the allowable discharge using OSD measure which include 1.0Kl detention tank.
2. 1% and 5% AEP OFP is considered through the site and car park must maintain a free flow through the car park.
3. SQIDs designed and sized using MUSIC can achieve required pollutant removal through the installation of said primary treatment devices.

Under the Stormwater Management Plan, the development site will meet current specified standards for both quantity and quality control.

6. Limitations

Flüssig Engineers were engaged by **Solutionswon Group Pty Ltd**, for the purpose of a site-specific Stormwater Management Plan for 175-179 Campbell Street, Hobart, as per E7.0 of the Hobart Interim Planning Scheme 2015. This report is deemed suitable for purpose at the time of undertaking the study. If the conditions of the development should change, the plan will need to be reviewed against all changes.

This report is to be used in full and may not be used in part to support any other objective other than what has been outlined within, unless specific written approval to do otherwise is granted by Flüssig Engineers.

Flüssig Engineers accepts no responsibility for the accuracy of third-party documents supplied for the purpose of this Stormwater Management Plan.

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175-179 Campbell Street,

Flood Hazard Report

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Prepared by: .... Date: 29th May 2022

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Reviewed by: .... Date: 30th May 2022

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Max W. Möller

Revision History					
Rev No.	**Description**	**Prepared by**	**Reviewed by**	**Authorised by**	**Date**
00	175-179 Campbell St, Flood Report	Mark Smith	John Holmes	Max W. Möller	07/07/2021
01	Appendix A & B added	Mark Smith	John Holmes	Max Moller	13/10/2021
02	Appendix A Amended	Mark Smith	John Holmes	Max Moller	18/02/2022
03	Additional detail re. storm verification, boundary conditions, blockage and time to inundation	Mark Smith	John Holmes	Max Moller	31/05/2022

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1. Introduction

Flüssig Engineering has been engaged by **Solutionswon Group Pty Ltd** to undertake a site-specific Flood Hazard Report for the property at number 175-179 Campbell Street, Hobart in the **City of Hobart** municipality. The purpose of this report is to determine the flood characteristics on the existing and post-development flood hazard scenarios for the 1% AEP plus climate change storm event.

1.1 Objectives and Scope

This flood analysis has been written to meet the standards of the Hobart City Council Interim Planning Scheme 2015 (HIPS, 2015), with the intent of understanding the development risk with flooding. The objectives of this study are:

- Provide an assessment of the flood characteristics through the site under the 1% AEP plus climate change (CC) scenario.
- Provide comparison of flooding for pre- and post-development against acceptable solution and performance criteria.
- Provide flood mitigation recommendations for potential future development, where appropriate.

1.2 Limitations

This study is limited to the objectives of the client engagement, the availability and reliability of data, and including the following:

- The flood model is limited to a 1% AEP + CC worst case duration design storm.
- All parameters have been derived from best practice manuals and available relevant studies (if applicable) in the area.
- All provided data by the client or government bodies for the purpose of this study is deemed fit for purpose and has not been checked for accuracy.
- The study is to determine the effects of the new development on flooding behaviour and should not be used as a full flood study outside the specified area without further assessment.

2. Model Build

2.1 Overview of Catchment

The property at 175-179 Campbell Street, Hobart is located along the Park Street Rivulet. At this point the contributing catchment is made up of the upper Park Street Rivulet, Providence Gully Rivulet and a small catchment from the Brooker Highway to Church Street, North Hobart (Figure 1). These total approximately 283 ha and drain from a maximum height of approximately 322 mAHD to the site at approximately 16 mAHD. The land use is predominantly General Residential and Inner Residential with areas of light industrial and commercial zones, with the specific site being listed as mixed urban use.

Figure 1 below outlines the approximate contributing catchment for the site at 175-179 Campbell Street.

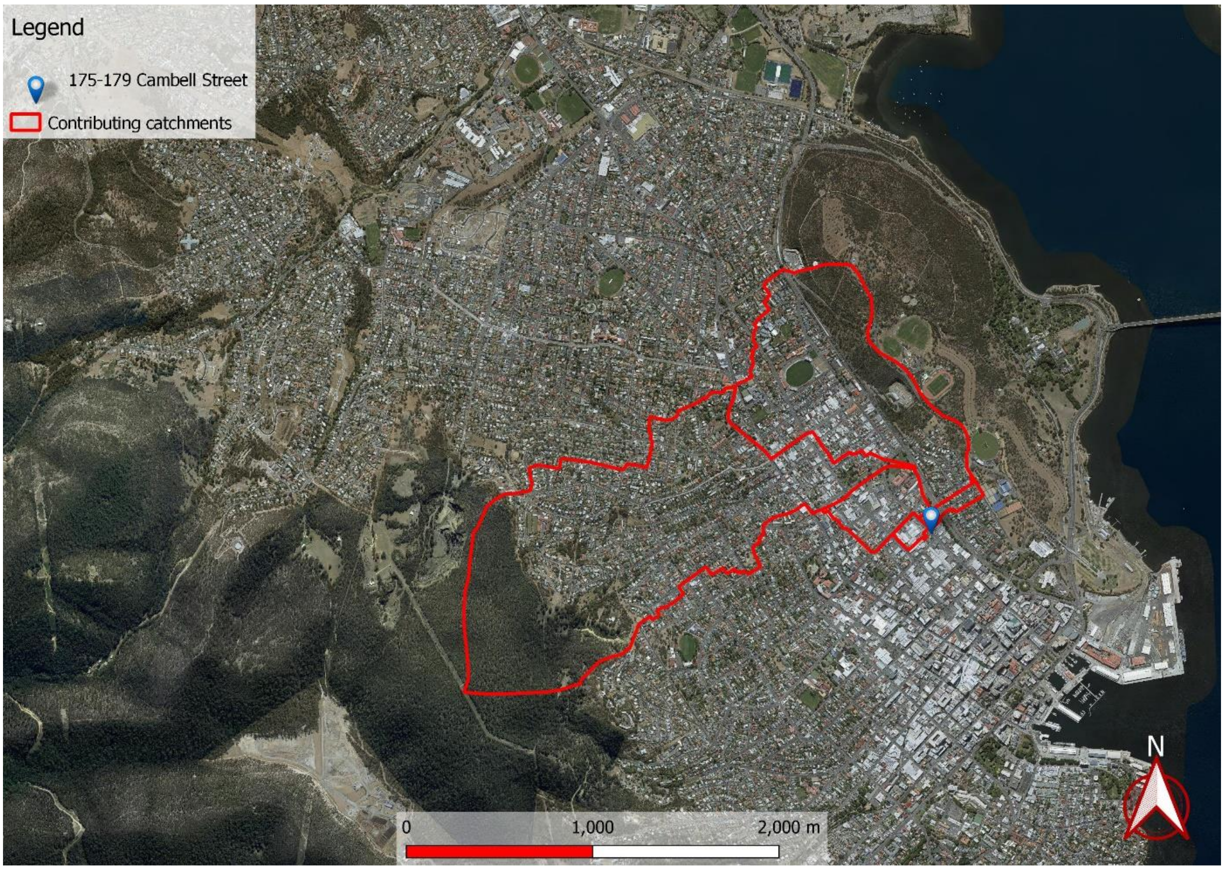


Figure 1. Contributing Catchment, 175-179 Campbell Street, Hobart

2.2 Hydrology

The upper catchment was modelled using Infoworks ICM hydrology (RAFTS) module, which uses the Australian designed Laurenson method to calculate runoff to the outlet. The catchment characteristics (% impervious, roughness etc.) were taken from best practice manuals. The hydrology catchment was connected to the 2D hydraulic model.

The following Table 1 states the adopted hydrological parameters for the RAFTS catchment.

Table 1. Parameters for RAFTS catchment

Catchment Area (ha)	Initial Loss Perv/imp (mm)	Continuing Loss Perv/imp (mm/hr)	Manning's N pervious	Manning's N impervious	Non-linearity factor
283	10/1	3.0/0.0	0.045	0.018	-0.285

2.2.1 Design Rainfall Events

HIPS 2015 requires modelling of flood events of 1% AEP (100yr ARI) for the life of the development. Therefore, the design events assessed in this analysis are limited to the 1% AEP + CC design events. Due to the size and grade of the catchment the peak rainfall time was restricted to between 10 min – 4.5 hrs.

The model ran each duration for the 1% AEP design event against 10 temporal patterns sourced from the ARR data hub. ARR 2019 advises the use of the worst-case duration median temporal pattern to ensure the event is not too conservative. These events were run through a hydrologic model to determine the required storm event. Figure 2 shows the box and whisker output of the model run. The model shows that the 1%

AEP 10 min storm temporal pattern 5 was the worst-case median storm. Therefore, this storm event was used within the hydraulic model. The short duration storm found to be the worst case is likely caused by the short nature of the side catchments in conjunction with short duration flooding from the upper catchments causing the largest runoff at the site.

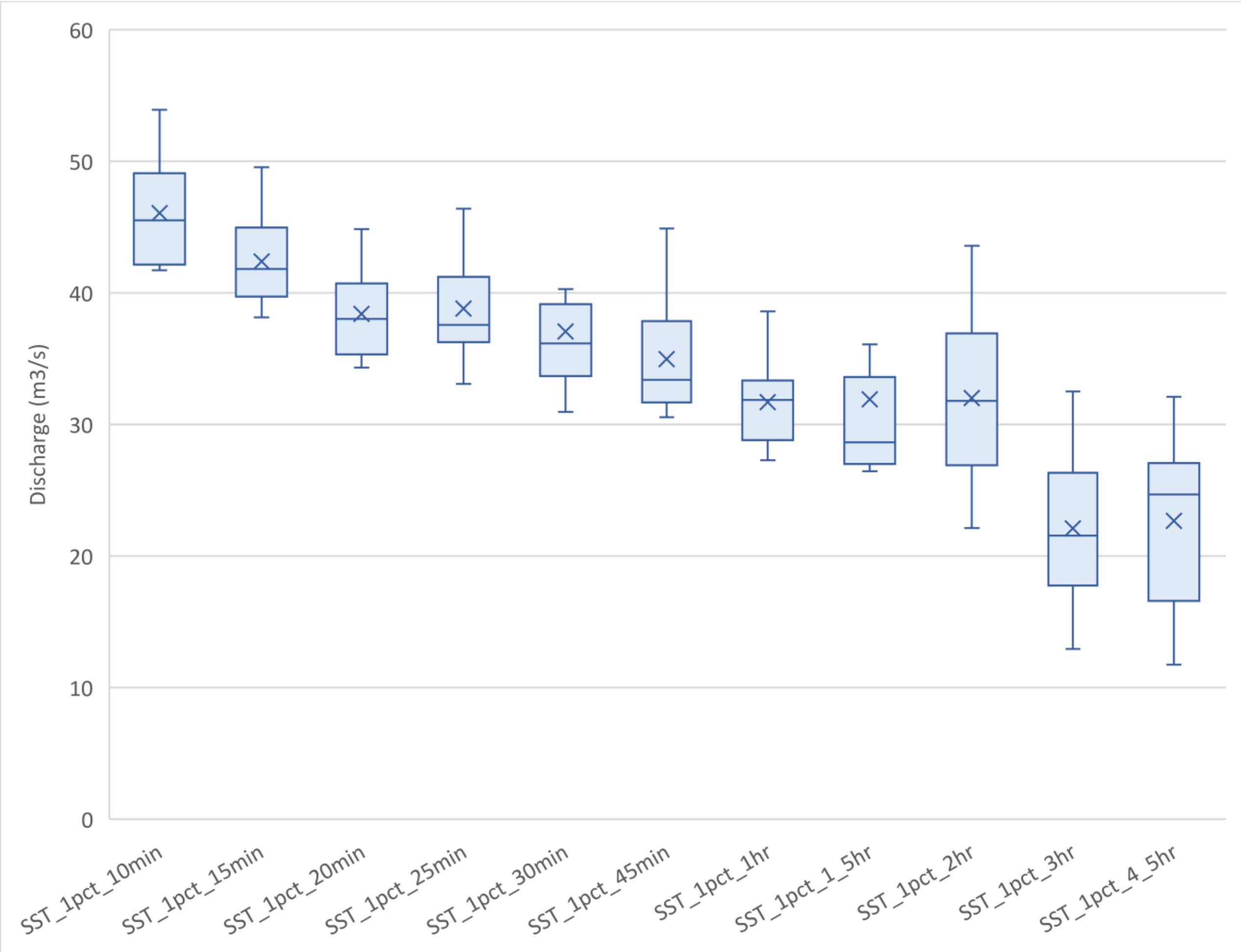


Figure 2. 1% Box and Whisker Plot

Verification of Worst-Case Storm

Given the contributing catchment and the 10-minute median worst case storm result, the hydrology model was verified using two individual scenarios to compare the outcomes of the hydrology output.

Scenario 1 included each sub catchment connected to the Park Street Rivulet underground 1D pipe infrastructure with the outlet connected via a 110m wide 1D channel. The result was assessed at both the pipe and channel for the worst-case event.

Scenario 2 connects each sub catchment to its respective downstream catchment until the final catchment (at site) is connected to the 1D Park Street system. The worst-case storm was assessed based on the total outflow from the last sub catchment. This method ignores any 1D and 2D model parameters and assesses purely from the runoff routing calculations.

In both cases the median worst-case storm resulted in the 10-minute storm and similar discharge quantities. Given the near identical outputs, and no gauge data available along Park Street Rivulet to calibrate the hydrology model, the 10-minute storm was accepted for use in the hydraulic model.

2.2.2 Climate Change

As per ARR 2019 Guidelines, for an increase in rainfall due to climate change at 2100, it is recommended the use of RCP 8.5. However, ARR 2019 recommends that this figure be used in lieu of more local data being available. Climate Futures Tasmania, 2010 (CFT) was a Tasmanian in-depth, entire state study into climate. Table 2 shows the ARR 8.5 increase compared to the CFT increase of 30% that was used within the model.

Table 2. Climate Change Increases

Sub-Catchment	CFT increase @ 2100	ARR 8.5 increase @ 2100
Hobart	30.0%	16.3%

2.3 Hydraulics

A 1D/2D hydraulic model was created to determine the flood level through the target area.

2.3.1 Extents and topography

The hydraulic model extends from Brisbane Street to Burnett Street and from the Brooker to Argyle Street. This considers the interaction between pipe network and sub catchment inflows as well as showing all overland flow paths, detention basins and weirs. Hydraulic topography ranges between 15-40 mAHD with the site location around approximately 16 mAHD, with an average gradient of approximately 5.1%.

Boundary Conditions

Inflow points were supplied at the end of each catchment as a hydrology/hydraulic connected inflow point. All sub catchments were connected to the closest pit, all pits were connected to the 2D zone to provide the overland flow as egress from a pit or manhole.

Given the complexities of the downstream natural 'bowl', with Brisbane Street acting as a weir, the 2D model is extended to below Brisbane Street to ensure all terrain features and restrictions can be included without any user bias associated with guessing fixed boundaries.

2.3.2 Blockage

Blockage in the DN1800 Park Street Rivulet was not considered as there are no culvert inlets into this main that provide an opening large enough to block this pipe at any percent. Given the nature and location of the on-grade inlets, pits blockage at a pit level was deemed unlikely for this model and no pit level blockage was applied.

2.3.3 Calibration/Validation

This catchment has no stream gauge to calibrate the model against a real-world storm event. Similarly, there is little historical information available, and no past flood analysis undertaken to validate against the flows obtained in the model. Therefore, all parameters have been adopted from best practice manuals.

2.3.4 Survey

The 2D surface model was taken from *Mt Wellington LiDAR 2011* to create a 1m and cell size DEM. For the purposes of this report, 1m cells are enough to capture accurate flow paths. The DEM with hill shading can be seen below (Figure 3).

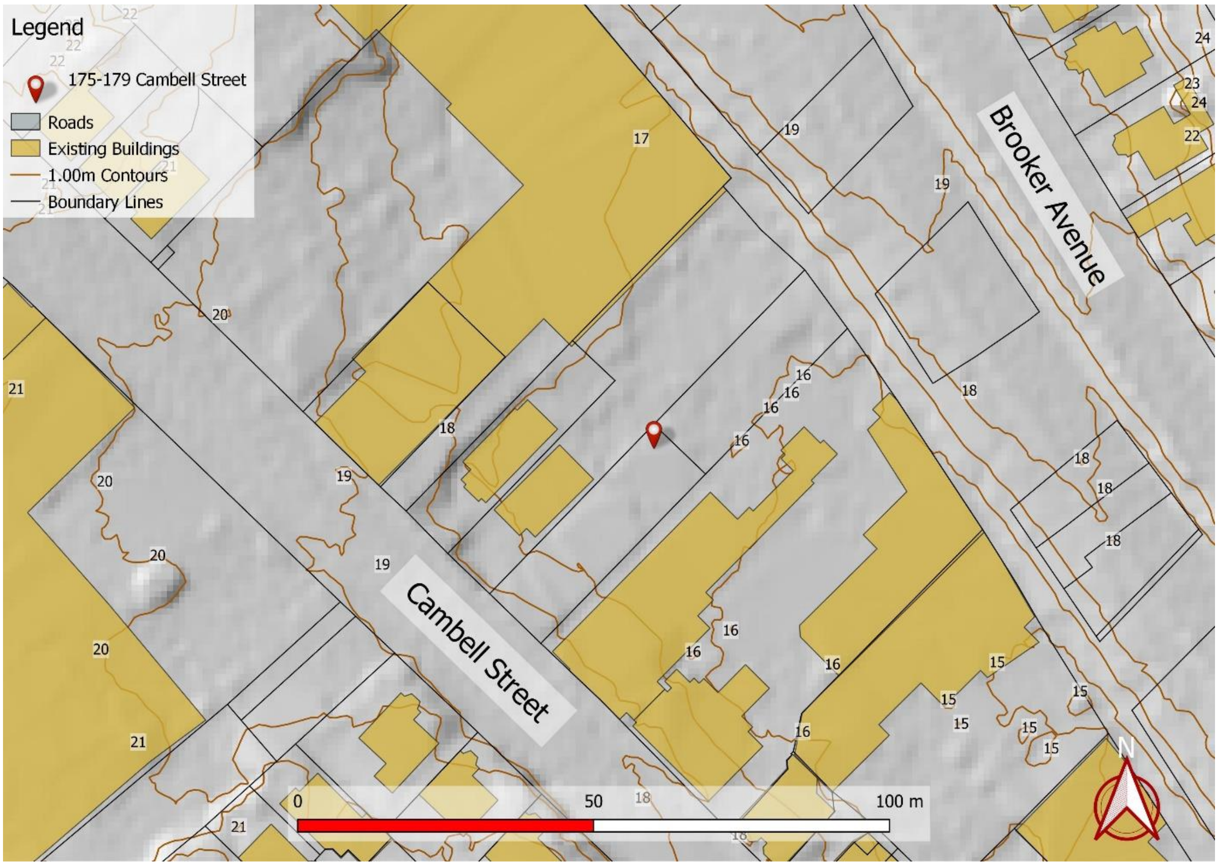


Figure 3. 1m DEM (Hill shade) of Property Area

2.3.5 Roughness (Manning's n)

Roughness values for this model were derived from the ARR 2019 Guidelines. The Manning's values are listed in Table 3.

Table 3. Manning's Coefficients (ARR 2019)

Land Use	Roads	Open Channel	Rural	Residential	Parks	Buildings	Piped Infrastructure
Manning's n	0.018	0.035	0.04	0.045	0.05	0.3	0.013

2.3.6 Walls

All significant walls/fences and retaining structures were included as 2D linear wall structures within the 2D model, all walls are assumed built to withstand flooding. Wall heights were derived from Utility Detection and Mapping survey or design documents.

2.3.7 Infrastructure

Major pipe network including Park Street Rivulet was included within the model as 1D structures linked to the 2D mesh. Infrastructure location and size was sourced from City of Hobart's GIS open-source database, where inverts are not known a default 600mm cover was included.

2.3.8 Buildings

Buildings were represented as mesh polygons with a high Manning's n value within the model. Buildings with unknown floor levels were set with a minimum 300mm above ground. This method allows for flow through the building if the flood levels/pressure become great enough. The aim is to mimic flow through passageways such as doors, windows, and hallways.

Commercial properties along the boundary of each lot and the Brooker Highway Road reserve, were set to 4m high to act as solid structures along the overland flow path of Park Street Rivulet. This will provide a better flow path representation; however, it is likely to show conservative flood levels as some of these properties would likely flood, reducing the overall level.

Although on the conservative side, this approach was adopted as it is deemed that the direction of flow and level would be the most accurate representation.

2.4 Model Results

The 1% AEP at 2100 was run through the pre-development and post-development model scenarios to compare the effects flooding has onsite and to surrounding areas. It can be seen from the pre-development model runs (Figure 4), that significant flooding occurs through the site as well as all neighbouring properties and Campbell Street. This is expected given the current site topography and the catchment that feeds the Park Street Rivulet. The post-development run (Figure 5) shows the proposed structure extending well over the flood inundation hazard area. To mitigate against flooding, the current design proposes the ground level as a basement carpark, remaining open along the Park Street Rivulet side, with chain fencing to provide security. Included in the design and model as solid structures are the proposed wall against the existing dwellings at the front of the property including a staircase, two lift wells and a substation.

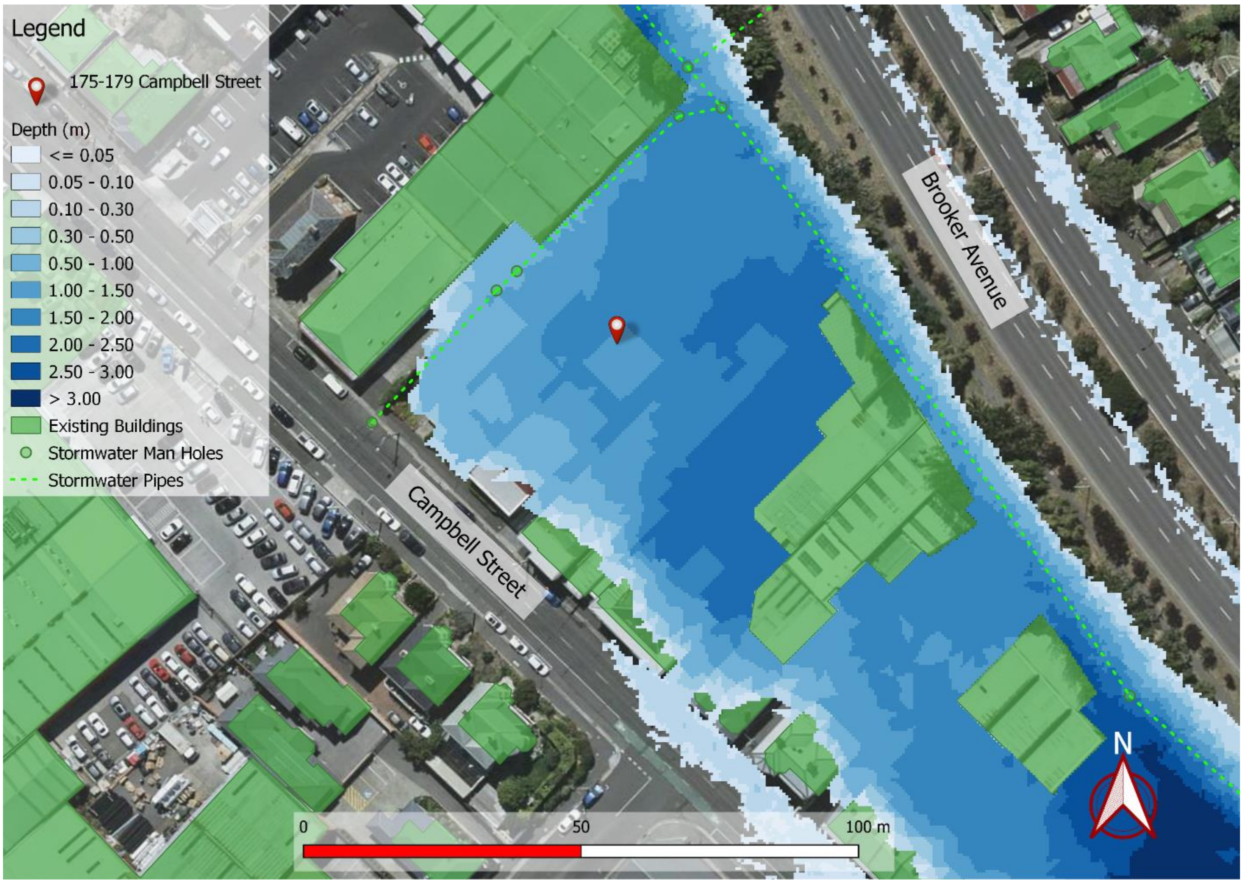


Figure 4. Pre-development 1% AEP at 2100, flood depths and extents

It can be seen in Figure 5 that the proposed structures have minimal effect on surrounding properties. However, Figure 6 shows that the proposed structure does increase flow within the Brooker Road Reserve from 29.09 to 32.93 m^3/s. This increase is relatively minor and does not cause an increase in flood hazards to any properties down to 1A Brisbane Street.

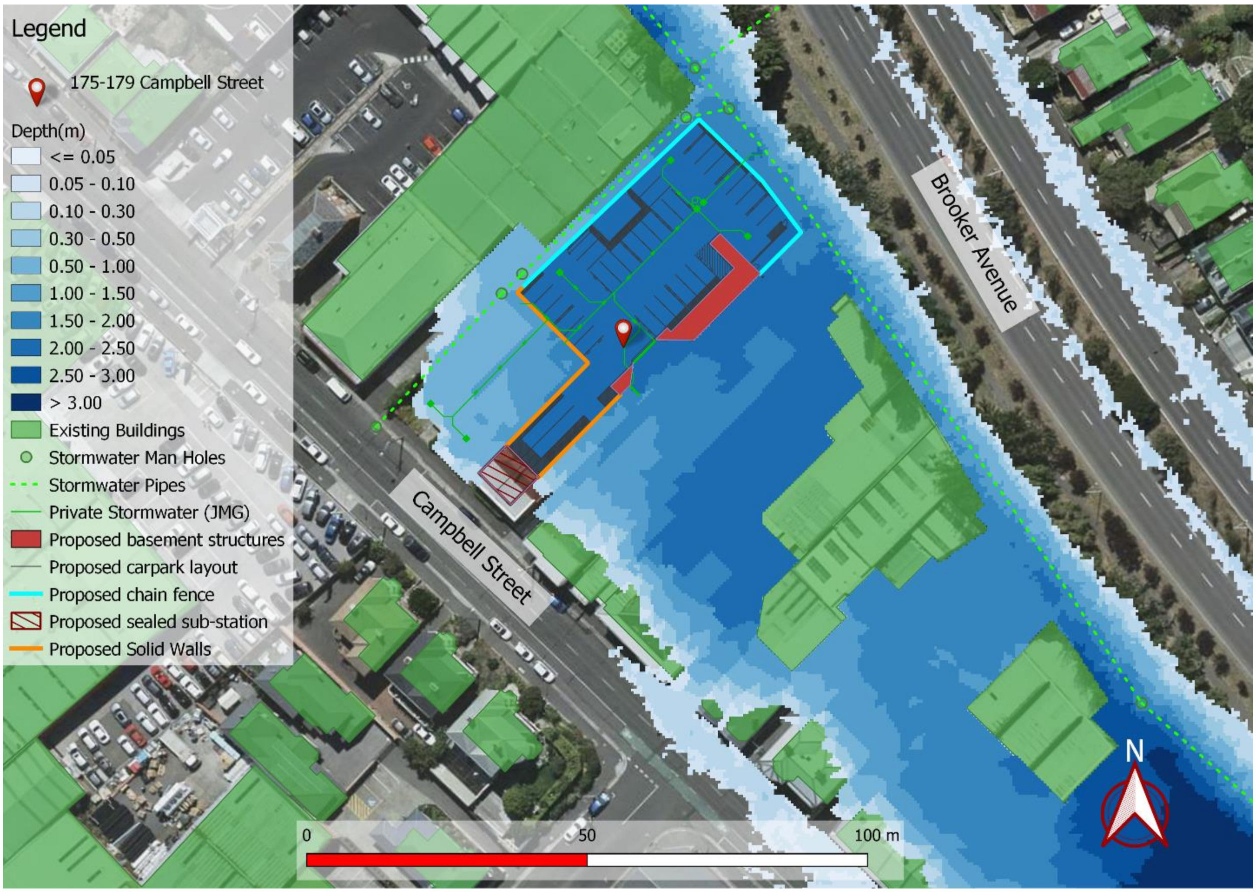


Figure 5. Post – Development 1% AEP at 2100, flood depths and extents

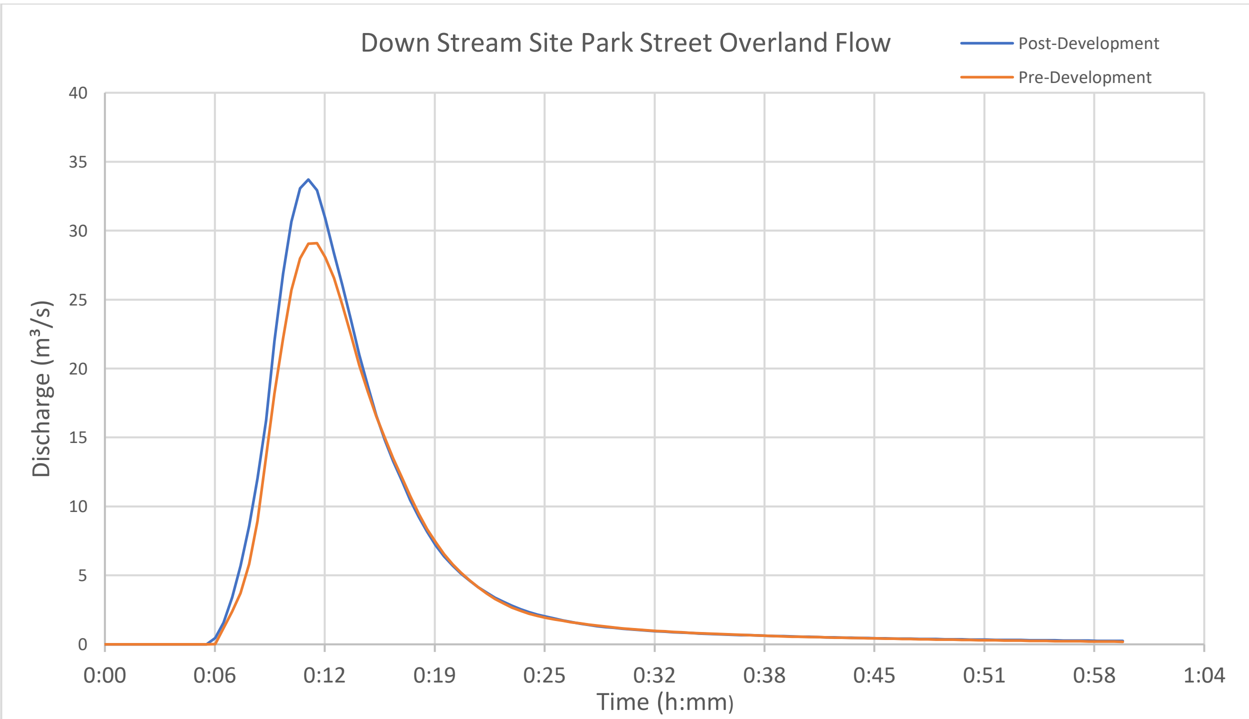


Figure 6. Pre and Post Development Downstream Site, Park St Rivulet OFP Flow 1% +CC

2.4.1 Displacement of Overland Flow on Third Party Property

Figure 7 shows post-development depths on 169-173 Campbell St as the property immediately downstream, and on 167 Campbell Street to 1A Brisbane Street, when compared against pre-development, there is no increase in flood extents or depths.

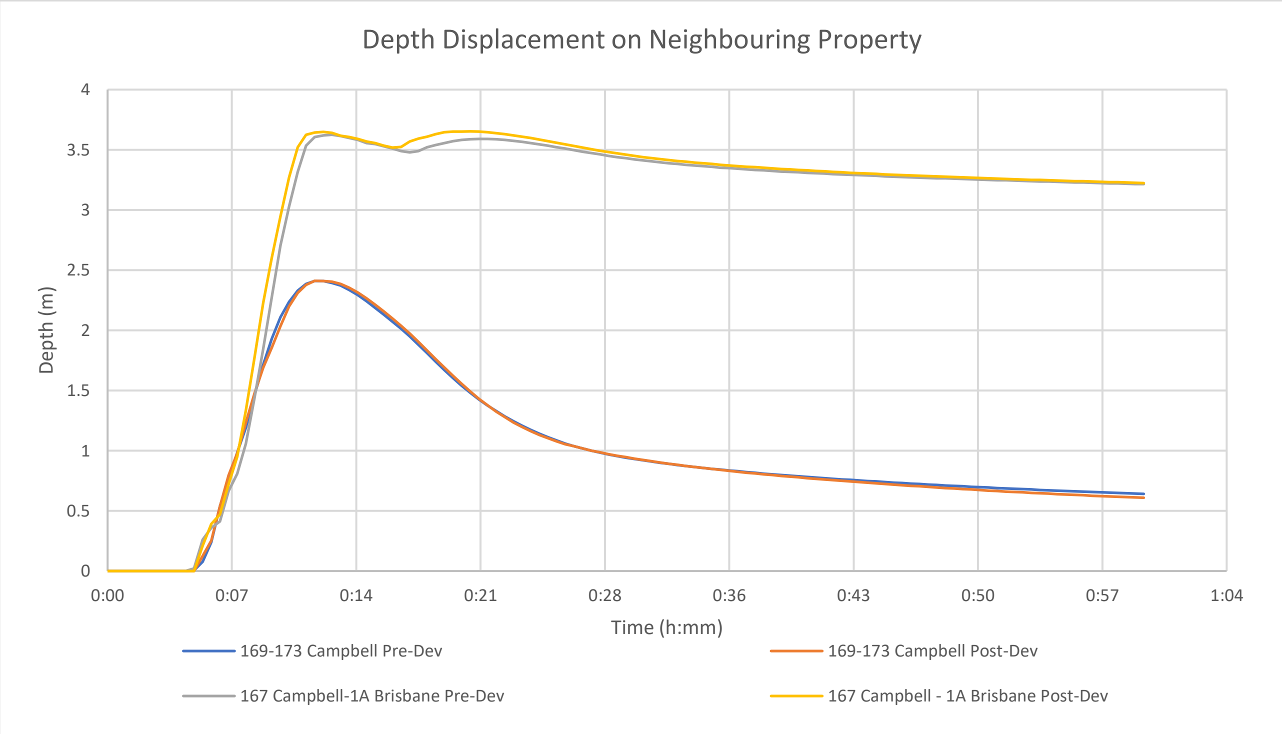


Figure 7. Pre and Post Development Depth Displacement 1% +CC

Time To Inundation

Figure 8 shows the pre vs post development depth-time graph. It can be seen from this graph that time to maximum inundation occurs at approximately 13m30s with a maximum depth in the post development scenario of 2.3 m, however, initial ingress of water into the carpark of approximately 30 mm, occurs around 5 minutes from the beginning of the storm.

Therefore, from the first noticeable ingress of water to the peak there is approximately 8 mins, with water extending to greater than 1 meter at 8m03s from first ingress.

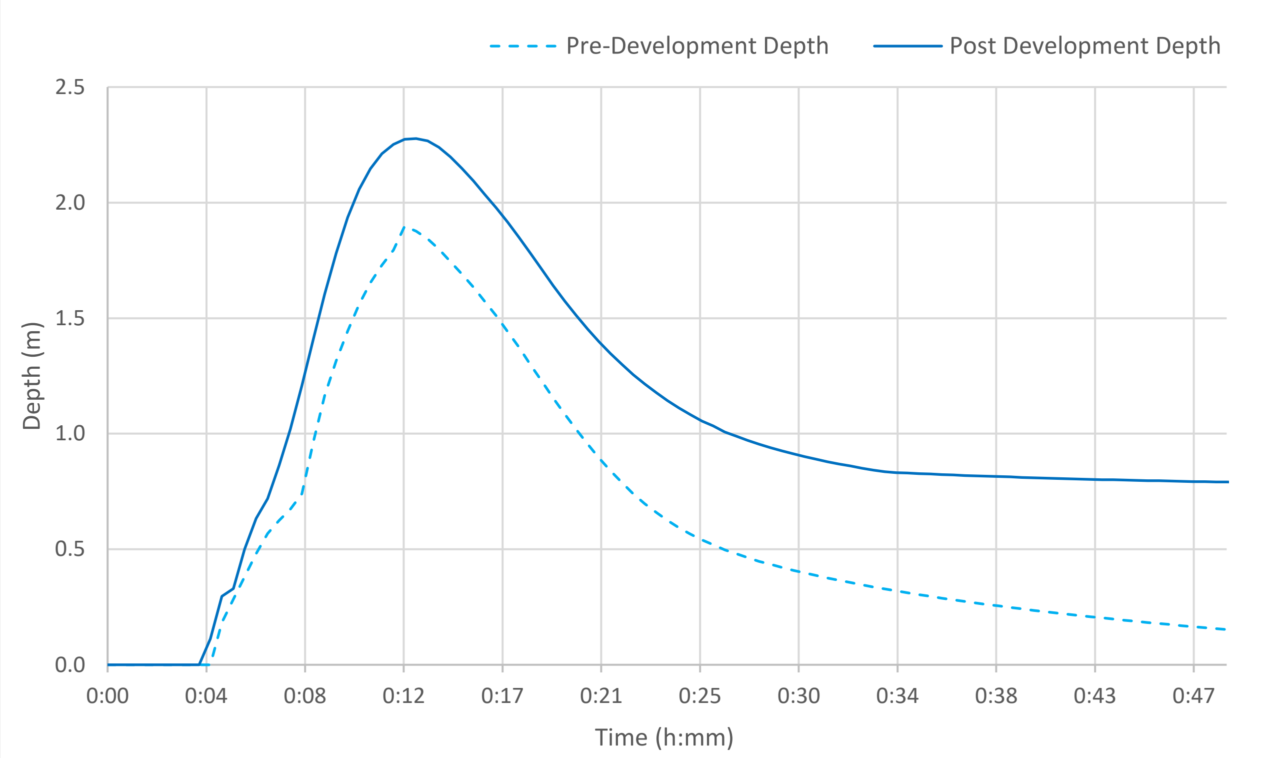


Figure 8. Pre & post-development depth

2.4.2 Development Effects on Stormwater Discharge

Figure 9 below shows the discharge hydrograph for the new property combined with the neighbouring proposed property runoff. The graph was captured in the model for both pre- and post-development runs and combined in graph format to demonstrate the change in net discharge. It can be seen from Figure 9 the pre-development discharge of 18.32 m^3/s is marginally lower than the post-development discharge of 19.17 m^3/s. This can be attributed in the change in flow around structures such as the lift well and stairs.

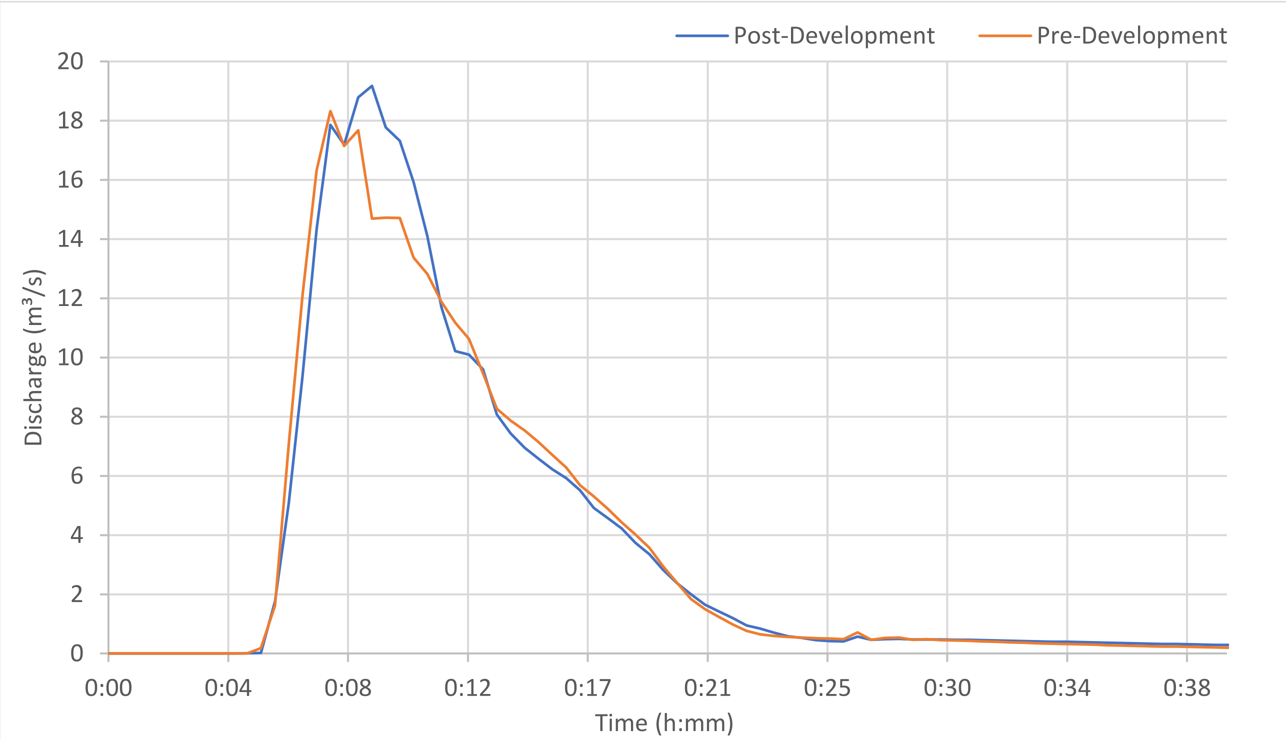


Figure 9. Pre and Post Development Net Discharge 1% +CC

2.5 Description of Building Regulation S.53

In accordance with the Building Regulations S.53, the finished floor levels of habitable rooms must be at least 300mm above the defined flood level for that land. This includes:

- **S.53 – Acceptable Solution**

a) A new habitable building must have a floor level no lower than the 1% AEP (100 yr ARI) storm event plus 300 mm.

2.5.1 New Habitable Building

The construction of a new dwelling is required to either have a habitable floor level >1% AEP CC flood level + 300mm and meet the performance criteria of the Building Regulations S.53. This is equivalent to a height of 18.315 mAHD or greater for habitable space as per 1% AEP CC. The new dwelling must meet this regulation as shown in Table 4. (The floor level floor level >1% AEP CC flood level + 300mm does not apply for non-habitable buildings).

Table 4. Habitable Floor Construction Levels

Dwelling	1% AEP +CC flood level (mAHD)	Minimum Floor Level required (mAHD)	Current Design Floor Level (mAHD)
175-179 Campbell St	18.015	18.315	19.200

3. Flood Hazard

The proposed property is subject to inundation predominately <2m flood depth and <5.6m/s velocity (Figure 11). This places the hazard rating as adopted by Australian Flood Resilience and Design Handbook as predominantly H5 – *Unsafe for vehicles and people,* and some structures as shown in Figure 10, with the exception of the boundary with Brooker Highway, can see hazard ratings of up to H6. Downstream of the site, the post-development hazard rating shows minimal to no change from pre-development. However, the hazard remains above H4 in most areas.

Therefore, in the event of 1% AEP +CC, basement car park flood flows are predominately unsafe for people and vehicles and furthermore can create structural damage if not suitably catered for. Flüssig Engineers recommend any structures (piers or otherwise) be designed and certified by a suitably qualified person to withstand hydrodynamic and hydrostatic forces. Use of the carpark will be required to undergo a risk management and flood emergency evacuation design to ensure safe use for people.

Current design shows level access to Campbell Street, which would allow unimpeded access to the street free from flooding. Access to the basement carpark should be restricted in a flooding event.

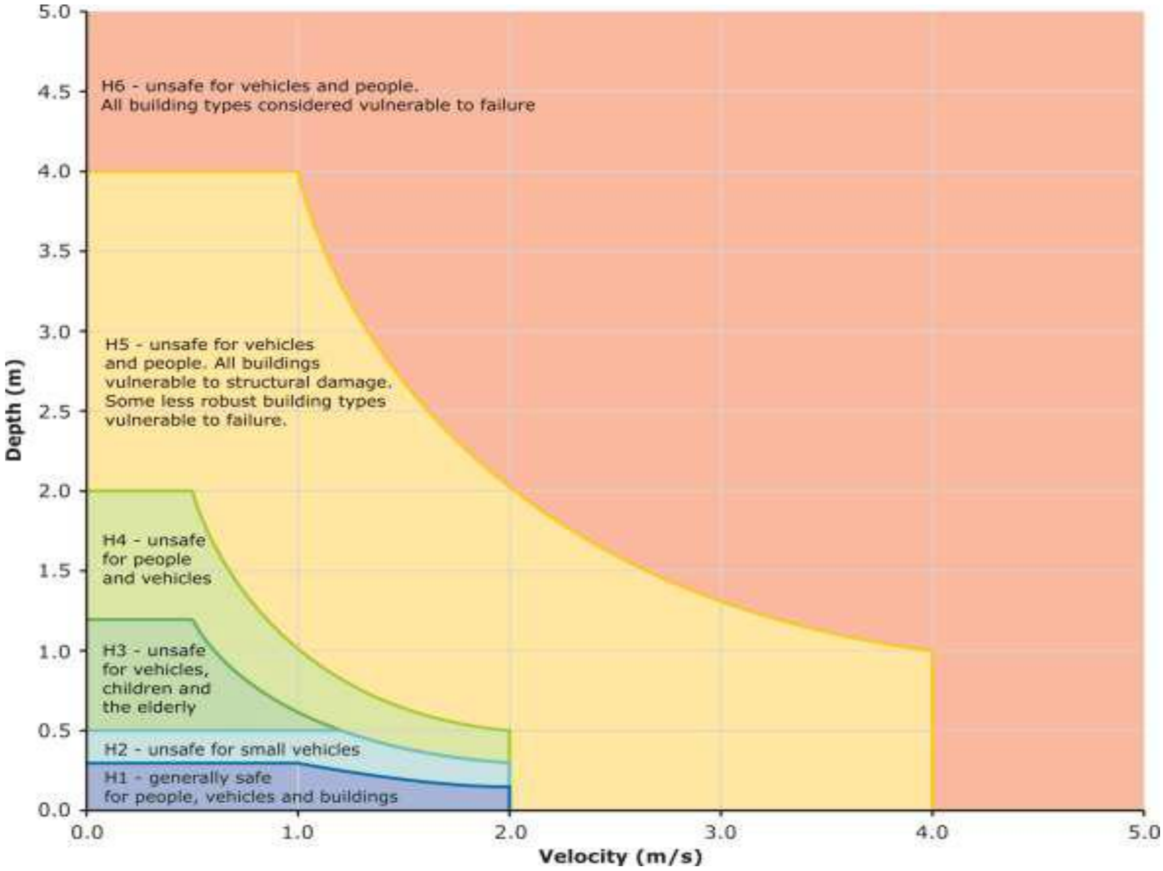


Figure 10. Hazard Categories Australian Disaster and Resilience Handbook

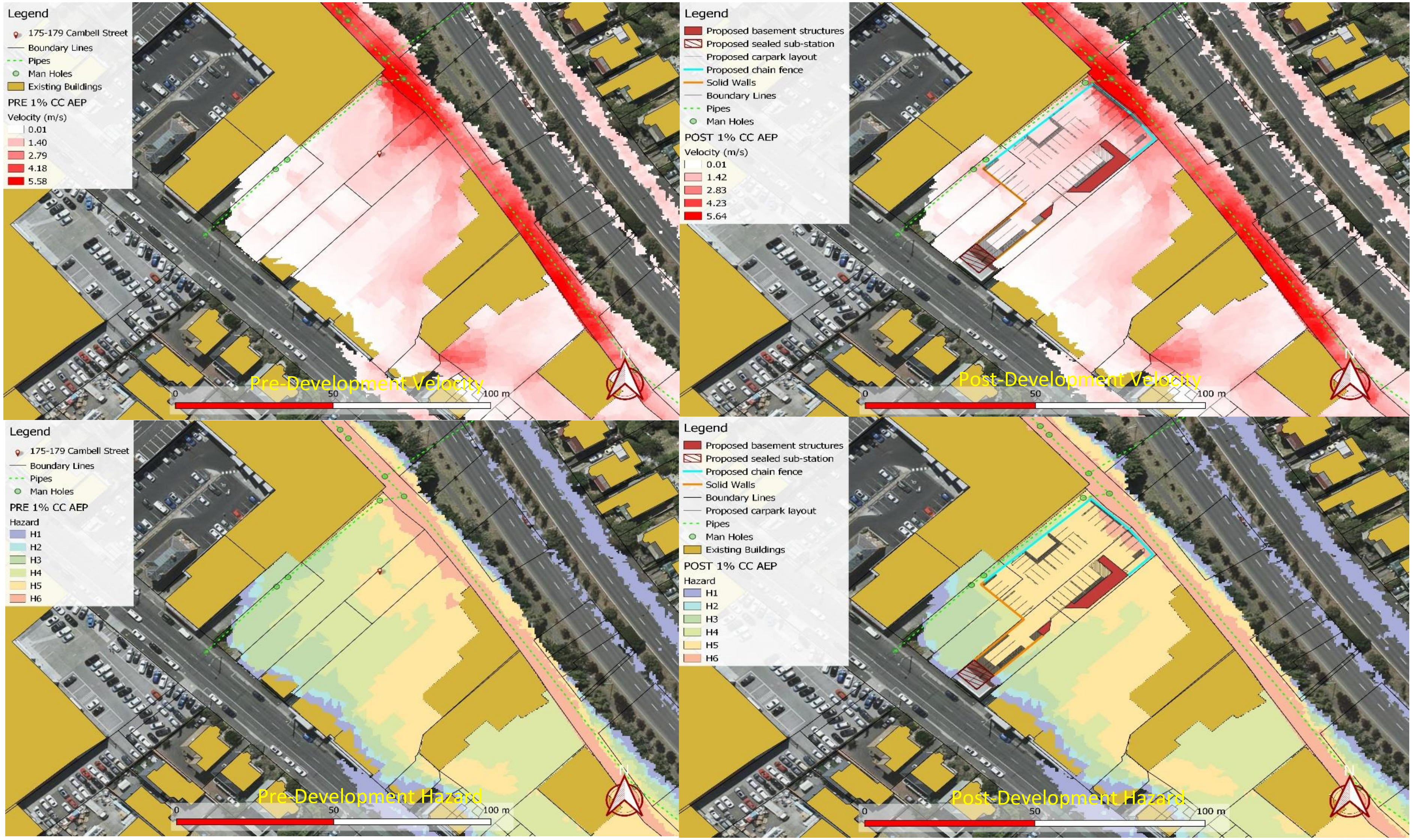


Figure 11. Pre- and post-development velocity (top) and hazard (bottom) maps

Table 5. HIPS 2015 E15.8.3 Acceptable Solution Response

E15.7.4 Property within a Riverine Inundation Hazard Area				
Objective: To ensure that risk from riverine, watercourse or inland flooding is appropriately managed and takes into account the use of the buildings.				
Acceptable Solution		**Response from Flood Report**		
A1		**A1**		
		All responses have been derived from modelling report FS_HOB_2181		
				Met (Y/N)
(a)	A new habitable building must have a floor level no lower than the 1% AEP (100 yr ARI) storm event plus 300 mm.	(a)	Minimum Floor level set at 18.315mAHD for all habitable floor levels. Proposed floor level set at 19.200mAHD.	**Y**
(b)	be for the creation of separate lots for existing buildings; An extension to an existing habitable building must comply with one of the following: (a) floor level of habitable rooms is no lower than the 1% AEP (100 yr ARI) storm event plus 300 mm; (b) floor area of the extension no more than 60 m2 as at the date of commencement of this planning scheme.	(b)	N/A	**N/A**
(c)	The total floor area of all non-habitable buildings, outbuildings and Class 10b buildings under the Building Code of Australia, on a site must be no more than 60 m2.	(c)	N/A	**N/A**

Table 6. HIPS 2015 E15.8.3 Performance Criteria Response

E15.7.5 Riverine, Coastal Investigation Area, Low, Medium, High Inundation Hazard Areas				
Objective: **(a) To ensure that landfill and mitigation works do not unreasonably increase the risk from riverine, watercourse and inland flooding, and risk from coastal inundation.**				
Performance Criteria		**Response from Flood Report**		
P1		**P1**		
Landfill, or solid walls greater than 5 m in length and 0.5 m in height, must satisfy all of the following:		**All responses have been derived from modelling report FS_HOB_2181**		
				Met (Y/N)
(a)	No adverse effect on flood flow over other property through displacement of overland flows;	(a)	No adverse effects can be seen on neighbouring private properties through the displacement of overland flows. However, a small increase in flow has been shown along the Park Street Rivulet through the reduction in available flood plain area. The slight increase does not increase hazard in the area from the already extreme rating.	**Y**
(b)	the rate of stormwater discharge from the property must not increase;	(b)	Rate of discharge from the property remains consistent pre- and post-development	**Y**
(c)	stormwater quality must not be reduced from pre-development levels.	(c)	There is no evidence that stormwater quality will be reduced.	**Y**

4. Conclusion

The Flood Hazard Report for 175-179 Campbell Street, Hobart property site has reviewed the potential pre- vs post- development flood scenarios.

The following conclusions were derived in this report:

1. A comparison of the pre- and post-development peak flows for the 1% AEP shows that there is no displacement of flood waters on neighbouring private properties, however there is a slight increase in flows down the overland flow path of the Park Street Rivulet (Brooker Highway).

2. Peak discharge from the site remains constant between pre- and post-development flood scenarios.

3. Peak flood depths on private property downstream remains constant between pre- and post-development scenarios.

4. Velocity pre- and post-development remains consistent downstream of the development, on 3rd party property, with a small diversion of increased velocity around the stairwell/elevator structure located on site.

5. Hazard from flooding in the area is predominantly H5 post development scenario, with predominately H4 for pre-development. Downstream of the development, on 3rd party property, the hazard rating remains constant (high) between pre- and post-development.

6. Post-development depth, velocity and hazard require Hydrostatic and hydrodynamic structural design considerations.

5. Recommendations

Flüssig Engineers therefore recommends the following engineering design parameters be adopted for the development to ensure the works meets the Inundation Code for properties, and future residents are free and safe from inundation:

1. The new buildings proposed habitable floor level is to have a minimum floor height of 18.315 mAHD.

2. The new building and associated structures must be designed to resist flood forces (hydrodynamic and hydrostatic) including debris, for flood depths >2m and velocities >5m/s.

3. Vehicles should be prevented from being swept away by means of a barrier or similar. Proposed chain link fence will need to withstand debris including vehicles.

4. Building use in inundated areas should be limited to use deemed safe under the ARR Disaster manual categories.

5. Substation should be sealed to flooding to prevent inundation and subsequent damage of electrical infrastructure.

6. All electrical and mechanical mechanisms for lifts should be provided above flood level or provide a strict inspection regime after any flooding event.

7. Any treatment devices including but not limited to stormwater or sewer treatment, to provide sealed chambers or similar with backflow prevention devices.

8. An emergency evacuation plan be implemented as a precaution to flooding.

Under the requirements of Flood Hazard Report, the development site will likely meet current acceptable solutions and performance criteria under the Hobart Interim Planning Scheme 2015.

6. Limitations

Flüssig Engineers were engaged by **Solutionswon Group Pty Ltd**, for the purpose of a site-specific Flood Hazard Report for 175-179 Campbell Street, Hobart, as per E15.0 of the Hobart Interim Planning Scheme 2015. This study is deemed suitable for purpose at the time of undertaking the study. If the conditions of the property should change, the plan will need to be reviewed against all changes.

This report is to be used in full and may not be used in part to support any other objective other than what has been outlined within, unless specific written approval to do otherwise is granted by Flüssig Engineers.

Flüssig Engineers accepts no responsibility for the accuracy of third-party documents supplied for the purpose of this Flood Hazard Report.

7. References

1. Australian Disaster Resilience Guideline 7-3: Technical flood risk management guideline: Flood hazard, 2014, Australian Institute for Disaster Resilience CC BY-NC
2. Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), 2019, Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia
3. Entura 2019, Newtown Rivulet Flood Study, Hydroelectric Company Pty Ltd, ENTURA-11B3E2.
4. Grose, M. R., Barnes-Keoghan, I., Corney, S. P., White, C. J., Holz, G. K., Bennett, J. & Bindoff, N. L. (2010). Climate Futures for Tasmania: General Climate Impacts Technical Report.

APPENDIX A: Risk Assessment Matrix

Site/ job number FS_HOB_2181_175-179 Campbell St Flood Report RISKS OF THE DEVELOPMENT IMPACTING ON EXISTING FLOOD BEHAVIOUR

Pre-Development Risk Identification (1% AEP)			Post-Development				Recommendations			
				Risk with no Treatment				Risk following recommended treatment		
Risk Ref No	Risk Type A - Asset P - Project F - Financial S - Safety	Risk Description	Conclusions derived from report for the post development scenario	Likelihood	Consequence	Risk Level	Treatment	Likelihood	Consequence	Risk Level
P1	A, F, S	There is a risk that the development could displace flood waters on neighboring properties resulting in damage to adjoining assets, infrastructure and and increased risk to personal safety.	No increased displacement of flood waters observed in flood model. No treatment recommended.	N/A	N/A	#N/A	none required	N/A	N/A	#N/A
P2	A, S	There is a risk that the development could contribute to an increased flow in the overland flow path resulting in damage to downstream assets, infrastructure and and increased risk to personal safety.	Slight increase in flows down the overland flow path of the Park Street Rivulet.	Rare	Minor	Low	none recommended	Rare	Minor	Low
P3	A, F, S	There is a risk that during a 1% AEP flood event, the development could result in an increase in the peak discharge from the site resulting in damage to stormwater infrastructure, assets and risk to personal safety.	No increase in peak discharge.	N/A	N/A	#N/A	none required	N/A	N/A	#N/A
P4	A, S	There is a risk that peak flood depths on private property downstream could increase as a result of the development increasing the risk of damage to assets, infrastructure and personal safety.	No increase on peak flood depths downstream from the development site.	N/A	N/A	#N/A	none	N/A	N/A	#N/A
P5	A,S	There is a risk that the development could increase the velocity of the floodwater resulting in damage to assets, infrastructure and increased risk to personal safety.	Small increase in velocity around stairwell/ elevator structure on proposed site development.	Possible	Moderate	High	Electrical and mechanical lift mechanisms to provided above installed above flood level. Habitable floor level to be above 18.315 mAHD.	Rare	Minor	Low
P6	A, F, S	There is a risk that the development could increase the flood hazard rating for surrounding areas and downstream resulting in increased risk to property and safety of residents and visitors.	There is an increase in the Hazard rating from H4 to H5 in the immediate area of the development, while remaining constant downstream.	Possible	Moderate	High	Structural design to consider hydrostatic and hydrodynamic forces at >2m depth and >5m/s velocity, chain link fence to prevent vehicle and debris movement, but allowing free flow of flood water, building use in inundated area limited to use deemed safe under ARR disaster manual categories, emergency evacuation plan to be implemented in relation to flooding.	Unlikely	Moderate	Medium

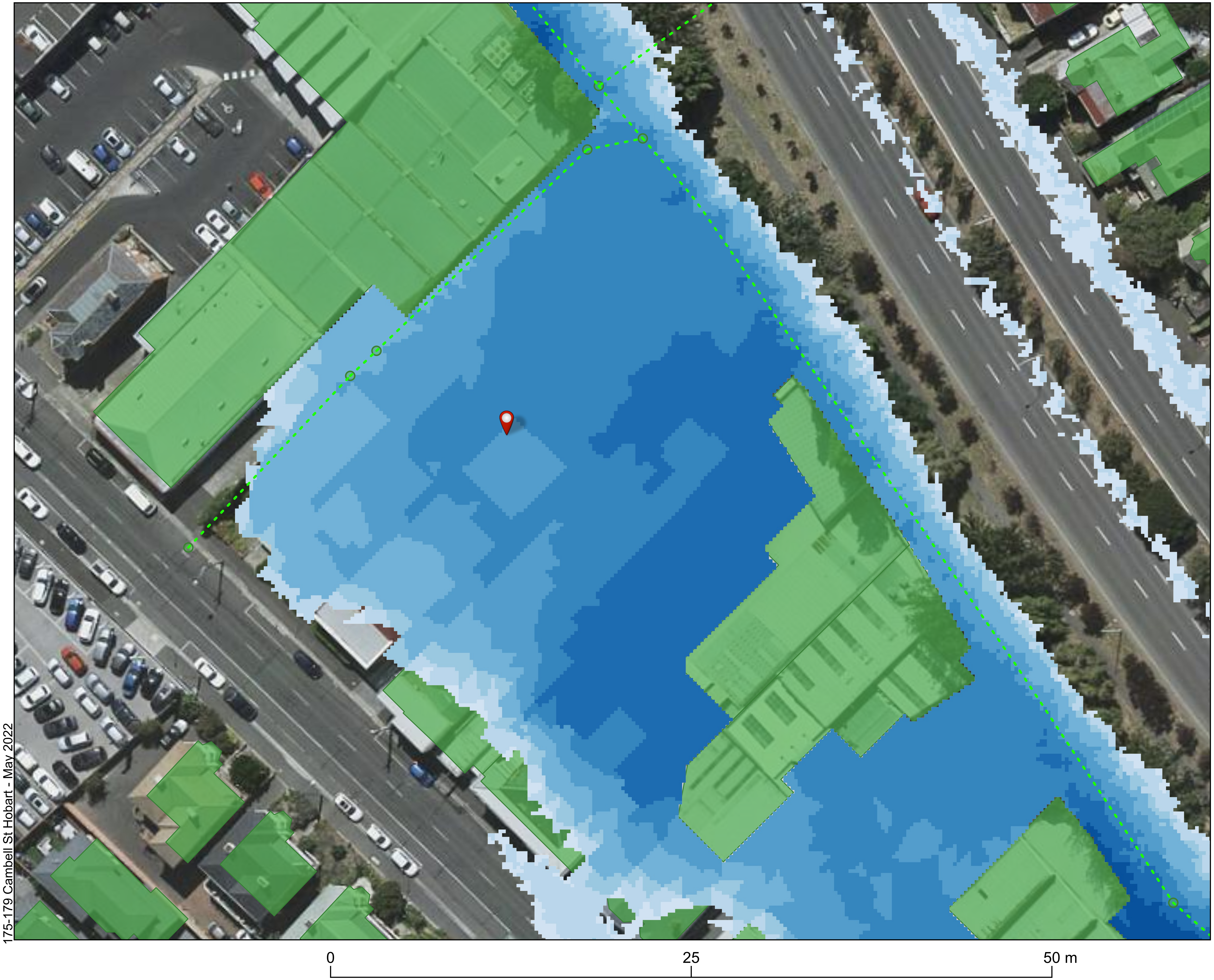
Site/ job number FS_HOB_2181_175-179 Campbell St Flood Report

RISKS OF FLOOD BEHAVIOUR ON THE DEVELOPMENT POST CONSTRUCTION

Risk Identification (1% AEP)						Recommendations			
			Risk with no Treatment				Risk following recommended treatment		
Risk Ref No	Risk Type A - Asset P - Project F - Financial S - Safety	Risk Description	Likelihood	Consequence	Risk Level	Treatment	Likelihood	Consequence	Risk Level
D1	A	There is a risk that during a 1% AEP flood event, excessive flow could result in back flow of treatment devices (inc. stormwater and sewer).	Possible	Minor	Medium	Treatment devices to be installed with sealed chambers and backflow prevention devices.	Rare	Minor	Low
D2	S	There is a risk to personal safety in areas categorised as hazard H5 (i.e. waste room and carpark) during a 1% AEP flood event.	Unlikely	Moderate	Medium	An emergency exit door should be installed at the far end of the waste room ensuring people cannot become trapped. An emergency management plan should be established and communicated to the occupants and visitors to the site, all structures should be cretified for hydrodynamic and hydrostatic forces.	Rare	Minor	Low
D3	A, F	There is a risk that the flow path of a 1% AEP flood event could result in damage to the proposed development due to flood water depth, velocity and debris.	Almost Certain	Moderate	Extreme	Building designed to resist flood forces, inc debris, for flood depths >2m & velocity >5m. Substation to be sealed.	Unlikely	Minor	Low
D4	A, S	There is a risk the flow path in hazard categories of H5 could pose a risk to assets and personal safety of the occupants of the development.	Possible	Moderate	High	Chain link fence erected to prevent and withstand vehicle and debris movement. Inundated areas of building to be limited to use according to ARR Disaster manual categories. Electrical and mechanical lift mechanisms to provided above installed above flood level.	Rare	Minor	Low

APPENDIX B: A3 Inundation Maps

PRE DEVELOPMENT 1% AEP + CC



Legend

175-179 Campbell Street

Depth (m)

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.30
- 0.30 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- > 3.00
- Existing Buildings
- Stormwater Man Holes
- Stormwater Pipes

N

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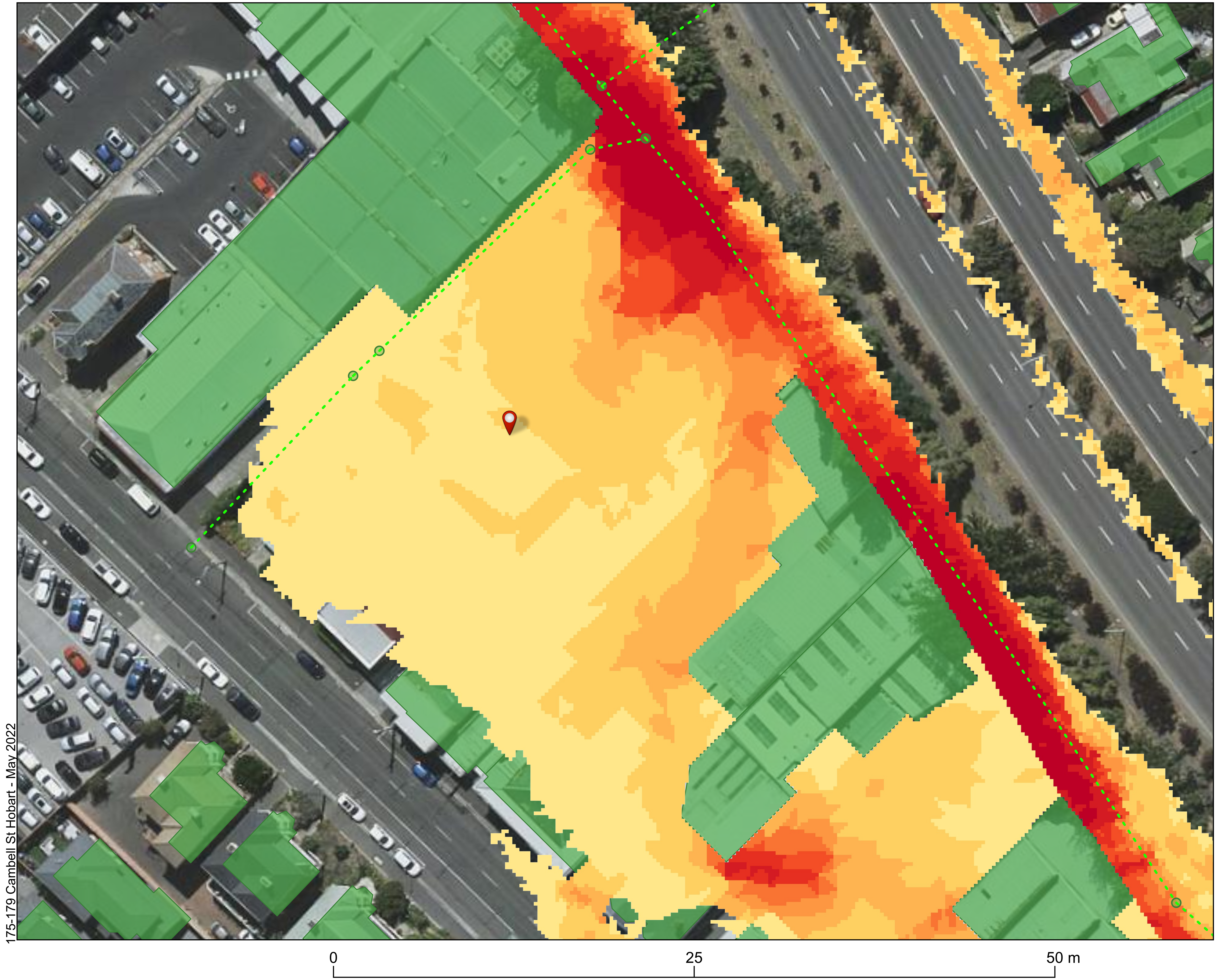
175-179 Campbell St Hobart - May 2022

PRE DEVELOPMENT 1% AEP + CC



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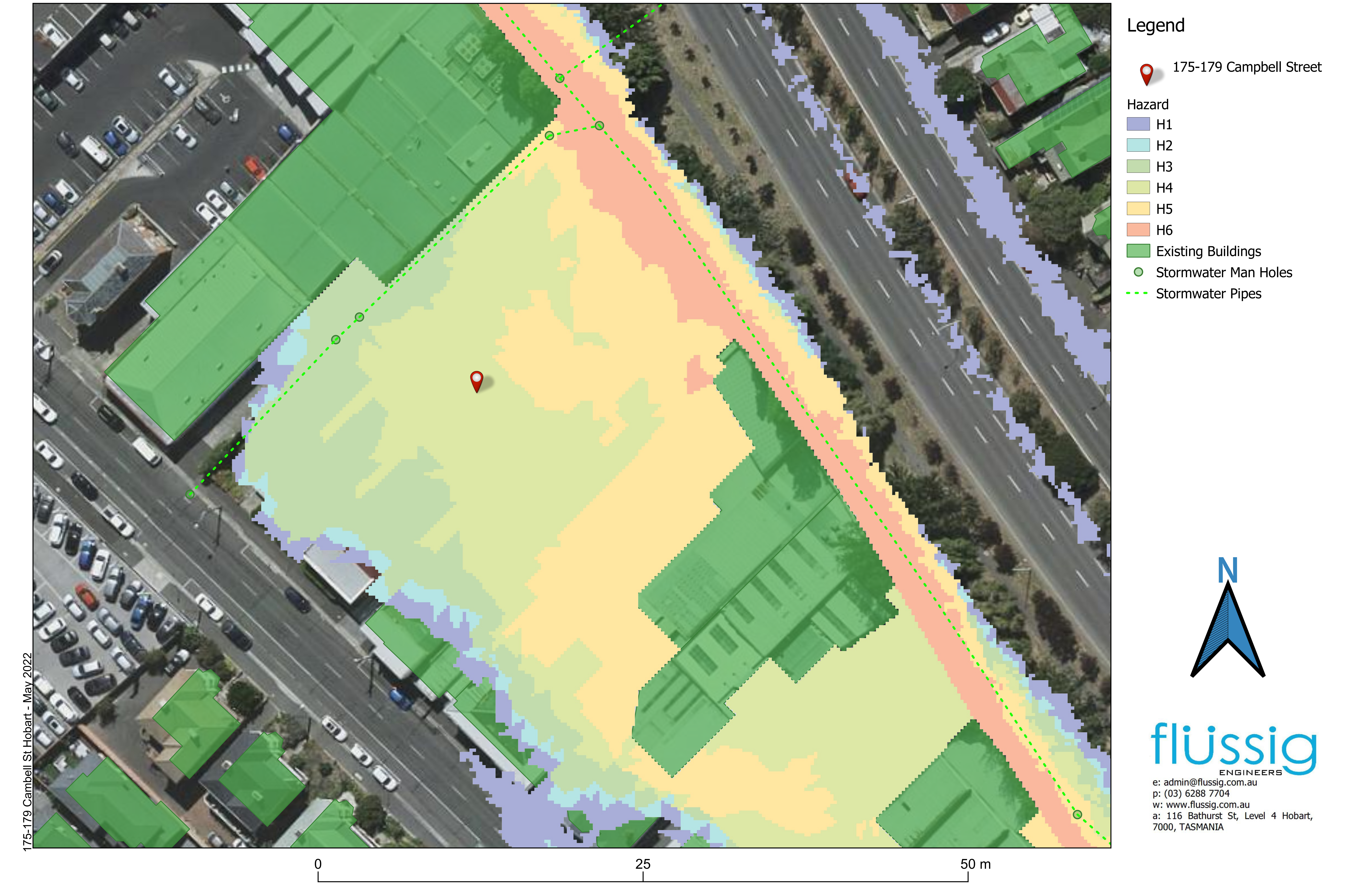

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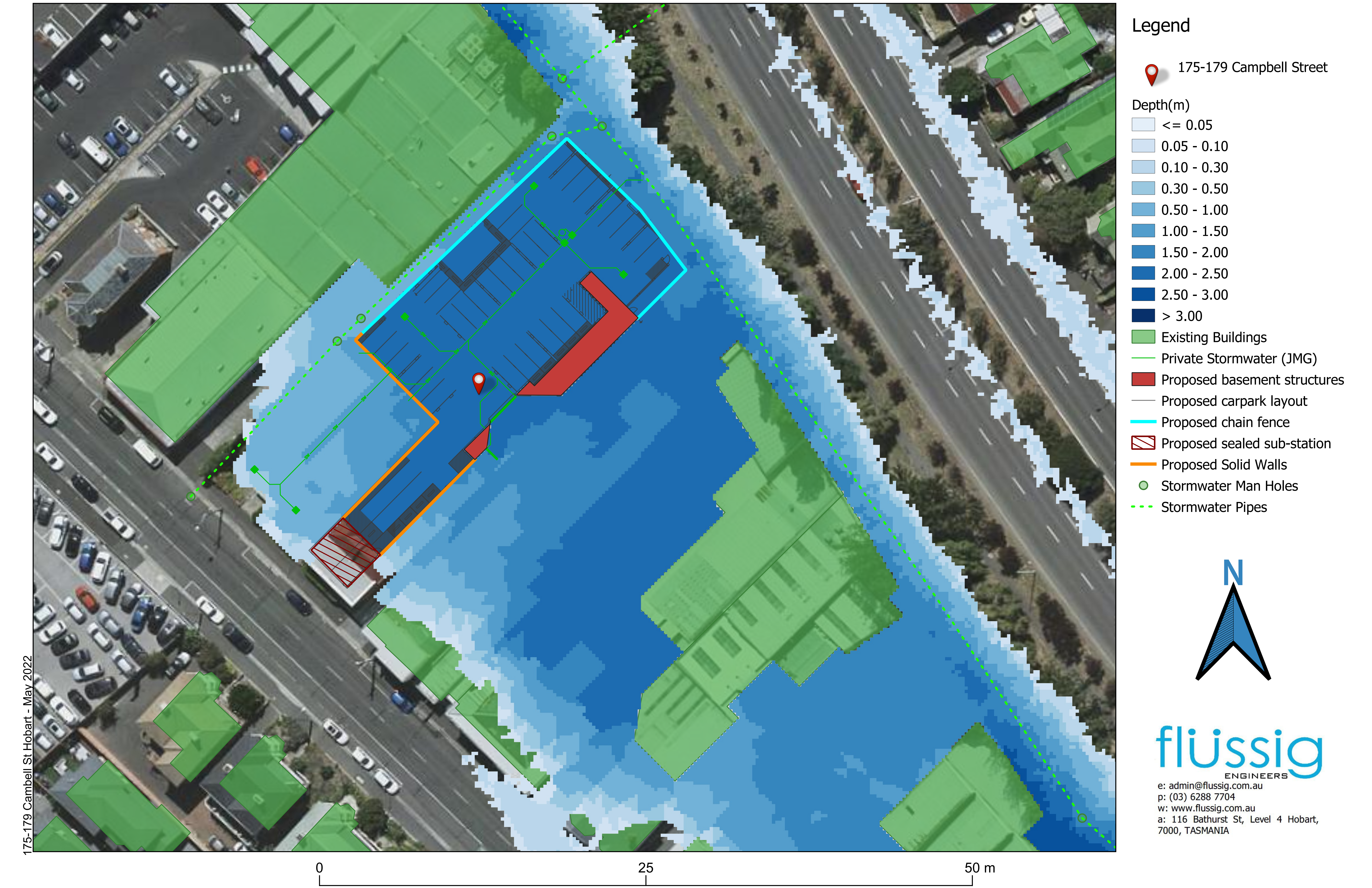
POST DEVELOPMENT 1% AEP + CC



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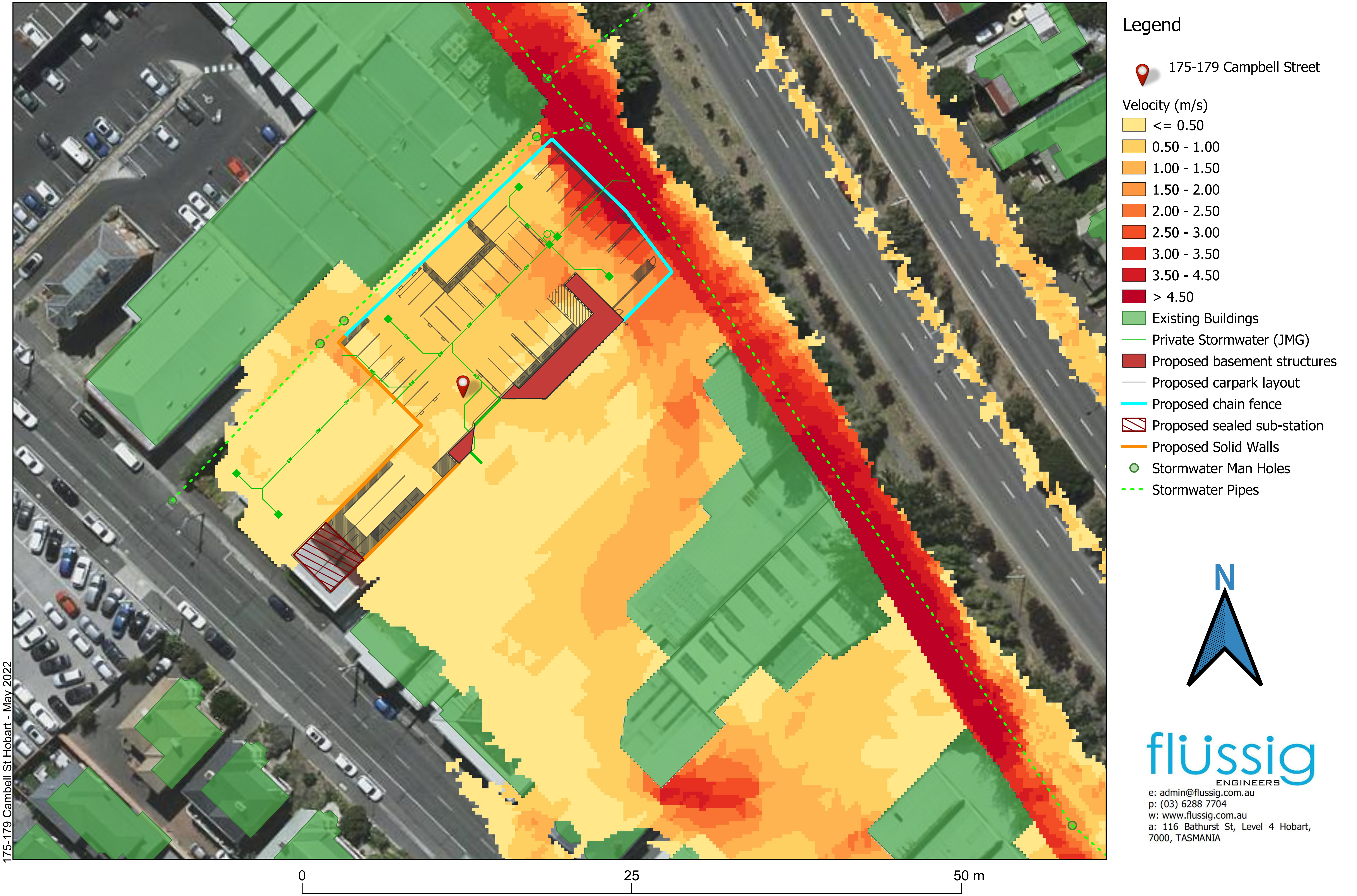

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ECTM Consulting

BGAS Multi-Residential Development

175-179 Campbell St, Hobart

Traffic Impact Assessment

Prepared for JMG Engineers and Planners

Version 5

January 2022

Table of Contents

List of Tables

List of Figures

Acronyms

AADT	Average Annual Daily Traffic
ADT	Average Daily Traffic
AWDT	Average Weekday Daily Traffic
CBD	Central Business District
DSG	Department of State Growth
HCC	Hobart City Council
MRV	Medium rigid vehicles
SRV	Small rigid vehicles
SISD	Safe Intersection Sight Distance
TIA	Traffic Impact Assessment
vpd	vehicles per day
vph	vehicles per hour

1 Introduction

1.1 Background and Scope of Work

The property at 175-179 Campbell St, Hobart is being developed by BGAS. The 2,421 m^2 site contains an existing business and two original cottages fronting Campbell St with a large area of vacant land at the rear of the properties, some of which is currently used for carparking.

BGAS is proposing to develop a multi-residential apartment building with commercial space across the properties at 175-179 Campbell St. The footprint will incorporate the existing cottages at 177 and 179 Campbell St. The design provides the commercial frontage on Campbell St by retaining the original cottages for businesses and incorporating new commercial space at 175 Campbell St. Hobart City Council (HCC) requires a traffic impact assessment to be submitted with the development application for the proposed development.

ECTM Consulting Pty Ltd has been engaged by JMG to undertake the Traffic Impact Assessment for the proposed multi- residential development at 175-179 Campbell St, Hobart.

1.2 Traffic Impact Assessment Scope

The scope of this TIA is outlined as follows:

- Review of the existing road environment in the vicinity of the subject site and the traffic conditions on the road network.
- Provision of information on the proposed development with regards to traffic movements and activity.
- Identification of the traffic generation potential of the proposal with respect to the surrounding road network in terms of road network capacity.
- Review of the parking requirements of the proposed development and assessment of the parking supply with Planning Scheme requirements.
- Traffic implications of the proposal with respect to the external road network in terms of traffic efficiency and road safety.
- Provision of conclusions and recommendations relating to the key findings drawn from the traffic impact assessment.

This TIA has been prepared with reference to the Department of State Growth publication, *A Traffic Impact Assessments Guidelines*, September 2020 and Hobart Interim Planning Scheme 2015 (Planning Scheme). This TIA has also been prepared with reference to other relevant publications as listed in Section 7.

1.3 Subject Site

The subject site is located at 175-179 Campbell St, Hobart and covers four titles of varying size. The site sits in the fringe area of the Hobart Central Business District (CDB) and as such is an inner city location. The site is zoned 15.0 Urban Mixed Use under the Planning Scheme and is not subject to any additional overlays that require consideration in this TIA. Beyond the Urban Mixed Use zone, there is 11.0 Inner Residential zone to the east and north, and 23.0 Commercial to the south and west.

The subject site and surrounding road network are shown in Figure 1 and the location of the existing site access is shown in Figure 2. Surrounding land use in the immediate area of the site includes car sales yard, various retail and commercial businesses, residential properties and small supermarket.

Figure 1 Subject Site and Surrounding Road Network

Figure 2 Existing Site Access

*Base image by **TASMAP** © State of Tasmania*

2 Existing Conditions

2.1 Transport Network

For the purpose of this report, the transport network under review consists of the section of Campbell St in Hobart between the intersections with Warwick St and Brisbane St which includes the intersection with Patrick St.

Campbell St in the study area is a one-way Council owned road travelling in a south-eastly direction toward Hobart CBD where it ends at the intersection with Davey St. The sealed carriageway has an average width of 12 m between the kerbs (near the existing site access) and consists of two lanes for traffic, a 2 m wide cycle lane and on-street parking on both sides of the road. The traffic lanes are defined by a broken white centre line while a solid white line delineates the cycle lane on the western side of the road. There are three traffic lanes on approach to the signalised intersection with Brisbane St – the cycle lane become a through and right-turn lane, centre lane is a through lane only and left lane becomes through and left turn lane.

The proposed development site access is located on a straight and level section of Campbell St which has a posted speed limit of 50 km/hr. Pathways with an average width of 2.5 m are evident on both sides of the subject section of Campbell St and street lighting is generally provided on both sides of the road. Figure 3 and Figure 4 illustrate Campbell St, viewing to the south-east (towards Brisbane St intersection) and north-west (toward Warwick St intersection) respectively.

Figure 3 Campbell St – View to the South-East (Brisbane St)

Figure 4 Campbell St – View to the North-West (Warwick St)

On-street parking is available frequently on both sides of the road; located between the numerous accesses into properties along this section. The parking bays are marked and signposted with time limits (either 2P, 1P or ½P). There is evidence of yellow lines along kerbs indicating no stopping zones. There are many off-street carparks associated with surrounding businesses and various properties.

Campbell St is a Metro bus route with the closest bus stop located approximately 40 m to the south-east of the site. The site is in easy walking distance to the Hobart CDB on relatively level terrain for the most part and has access to other sustainable transport modes such as the Intercity Cycleway, a shared-use commuter and recreational user corridor, extending from Claremont in the north of the Greater Hobart area, to the Hobart Regatta Grounds in located near Hobart CBD.

In summary, Campbell St operates as a collector road defined as connecting arterial roads to local areas and supplementing arterial roads in providing traffic movements between urban areas. Collector roads provide high connectivity by supplementing arterial roads in connecting suburbs, business districts and localised facilities.

The following observations were made in the vicinity of the proposed development during the site inspection at 9 am on Tuesday 15 June 2021:

- Drivers were able to easily find gaps to enter or exit the traffic flow from parking spaces or site accesses due to the upstream signalised intersection with Warwick St.
- On-street parking in the study area appears to have a high-turnover of vehicles.

- Very few vehicles were observed using the existing site access next to 175 Campbell St - this was confirmed by an AM peak period survey as discussed in Section 2.4.
- Campbell St predominately carries light vehicles, but heavy vehicles are not unusual given there is a medium-size supermarket, large car yard and bodyworks in the same block.
- Reasonable volume of pedestrian traffic on both sides.

Warwick St and Brisbane St are both two-lane, two-way Council owned roads and are signalised at their intersections with Campbell St. Green time is predominantly with Campbell St as the major road. Both Warwick St and Brisbane St operate as link roads, connecting arterial roads such as the Brooker Ave to collector roads such as Campbell St.

Patrick St is a two-lane, two-way Council owned road controlled by a give-way sign at the intersection with Campbell St. This intersection is 40 m to the south-east of the proposed development site access. Patrick St also operates as a link road.

2.2 Existing Traffic Volumes

HCC administers traffic counting stations on local roads within its municipality while the Department of State Growth administers State owned roads and signalised intersections across Tasmania. DSG use the Sydney Coordinated Adaptive Traffic System (SCATS) to obtain data from signalised intersections. Given the signalised intersection of Campbell St with Warwick St provides SCATS data, this data source was utilised to provide current and representative traffic volumes.

Table 1 provides relevant traffic volume data, noting the following:

- Average daily traffic (ADT), average weekday daily traffic (AWDT) and peak volumes on Campbell St is based on data extracted from one week of Campbell St/ Warwick St intersection SCATS data collected in May 2021.
- A review of the May 2021 SCATS dataset indicates very consistent traffic volumes across weekdays as well as on Saturday and Sunday.
- Weekday peak hour volumes are also very consistent and occur at the same morning and afternoon time everyday.

Table 1 Existing Traffic Volume Data

Location	ADT (vpd)	AWDT (vpd)	Weekday AM Peak		Weekday PM Peak	
			AWT (vph)	Period	AWT (vph)	Period
Campbell Street (Mid-block; two lanes one-way)	7,800	8,803	915	8.00-9.00	772	16.00-17.00

2.3 Road Safety Performance

The following crash data has been obtained from Department of State Growth for the section of Campbell St from which the site is accessed and other areas of interest in the study area and is for the period January 2016 to April 2021. This data is based on compulsory reporting to Police if someone is injured or if an involved vehicle is damaged to the extent that it cannot be driven (i.e.

needs to be towed away). Crashes that do not meet these criteria do not have to be reported to Police although many are for other reasons.

Crash data can provide valuable information on the road safety performance of a road network. Existing road safety deficiencies can be highlighted through the examination of crash data, which can assist in determining whether traffic generation from the proposed development may exacerbate any identified issues.

It is evident from the data in Table 2 that there have been a low number of crashes in the section of Campbell St from which the site will be accessed. One crash had a severity of 'minor' (occurred in September 2017) while the remaining crashes had a severity of 'property damage only'.

It is noted three of the crashes occurred within the vicinity of the subject site however all occurred before August 2017 with a severity of 'property damage only'. Two of the three crashes were parking related while one involved a parallel lane side swipe. There have been no crashes near the site access for the past 4 years.

Occurrence of crashes is also evident in the areas immediately surrounding the subject site. However, the maximum injury severity has been recorded as 'first aid' and the overall frequency is low given the 5 year period over which this data has been collected.

Table 2 Crash Summary

Location	Year	Number of Crashes	Number of Injury Crashes
Campbell St between Intersection with Warwick St and Brisbane St	2016-2020	10	1 x Minor
Intersection of Campbell St and Warwick St	2016-2021	9 (3 in 2021)	1 x Minor; 4 x first aid
Intersection of Campbell St and Brisbane St	2017-2019	5	1 x Minor; 1 x first aid
Intersection of Campbell St and Patrick St	2019	2	2 x Minor

2.4 Existing Activity

The subject site consists of an existing business at 175 Campbell St and two original cottages at 177 and 179 Campbell St. There is a large area of vacant land at the rear of the properties, currently used for carparking (under lease arrangements) and accessed via a driveway to the south-east of 175 Campbell St.

The existing site access driveway is situated on the adjoining property of 169-173 Campbell St (Title 140732/1) over which 175-177 Campbell St has right of way. This adjoining property has another access driveway as shown in Figure 5. A meat wholesalers business operates on this site hence a survey of the access arrangement was conducted during an AM peak period (1 December 2021) to establish how they are currently being utilised. A summary of the survey results is provided below:

- Site access driveway 1 – 21 light vehicles IN (13 during the period 6.45 am to 8 am); 2 small delivery vans IN; 1 small delivery van OUT

- Site access driveway 2 – 1 light vehicle IN; 2 small delivery vans OUT; 1 medium delivery van IN and OUT (reversed into the driveway at 7.45am with no issues and minor delay for one light vehicle)

Other observations included:

- The carpark at the rear of 175 Campbell St appears to be utilised by people working in the area as there was a steady flow of people from the driveway shortly after light vehicles entered (between 7 and 8 am).
- Customers accessing the meat wholesalers utilised on-street parking which was readily available out the front (rather than park at the rear although this is offered as an option).
- Heavy vehicle movements are not unusual in this section of Campbell St due to deliveries to the supermarket, car yards and vehicle bodyworks.

Assuming the above survey results are representative of how the accesses are utilised, it appears light vehicles and small delivery vans use Access 1, and while all vehicle types may use Access 2, medium-sized heavy vehicles are more likely to enter and exit this site at this point.

Additional information regarding the adjoining business (Tasmanian Meat Wholesalers) is provided below:

<u>Operational characteristics of TMW</u>

- Has an annual turnover of approximately $10M supplying a variety of products to wholesale and retail clients
- The site currently employs 35 full time staff
- The site currently sells approximately 52 tonnes of product a year
- The business currently operates across 169-173 Campbell Street, with a commercial lease for carparking on the adjacent site (175 Campbell Street)

<u>Operational hours</u>

- The retail shop is currently open:
    - 7:30 – 18:00, Monday – Friday
    - 7:30 – 14:00, Saturday
    - Closed Sunday
- The commercial/wholesale currently operates:
    - 6:00 – 18:00, Monday – Friday
    - Closed Saturday & Sunday

<u>Transport and access</u>

- The site is currently serviced by approximately 7 deliveries a week by TMW vehicles which comprise 'Medium Rigid' trucks
- The site is also serviced by third party suppliers with a variety of 'Heavy Rigid' trucks, with smaller trucks entering the site and larger vehicles loading from the street
- The site operates an LPG forklift which operates within the service yard areas and buildings approximately 12 hours a day (6:00 – 18:00, Monday – Friday)

Figure 5 Existing Site Access Arrangement for Subject Site and Adjoining Property

3 Proposed Development

The proposed development at 175-179 Campbell St, Hobart consists of a multi-residential apartment building with commercial space at the Campbell St frontage. The residential component of the design comprises 31 apartments with a mix of townhouse, 1, 2 and 3 bedroom apartments and skyhomes. A commercial frontage is provided by retaining the original cottages at 177 and 179 Campbell St for businesses and incorporating new commercial space at 175 Campbell St.

The 2,421 m^2 development footprint covers most of the land area of the three properties with the existing building at 175 Campbell St being removed and the existing cottages at 177 and 179 Campbell St integrated into the design.

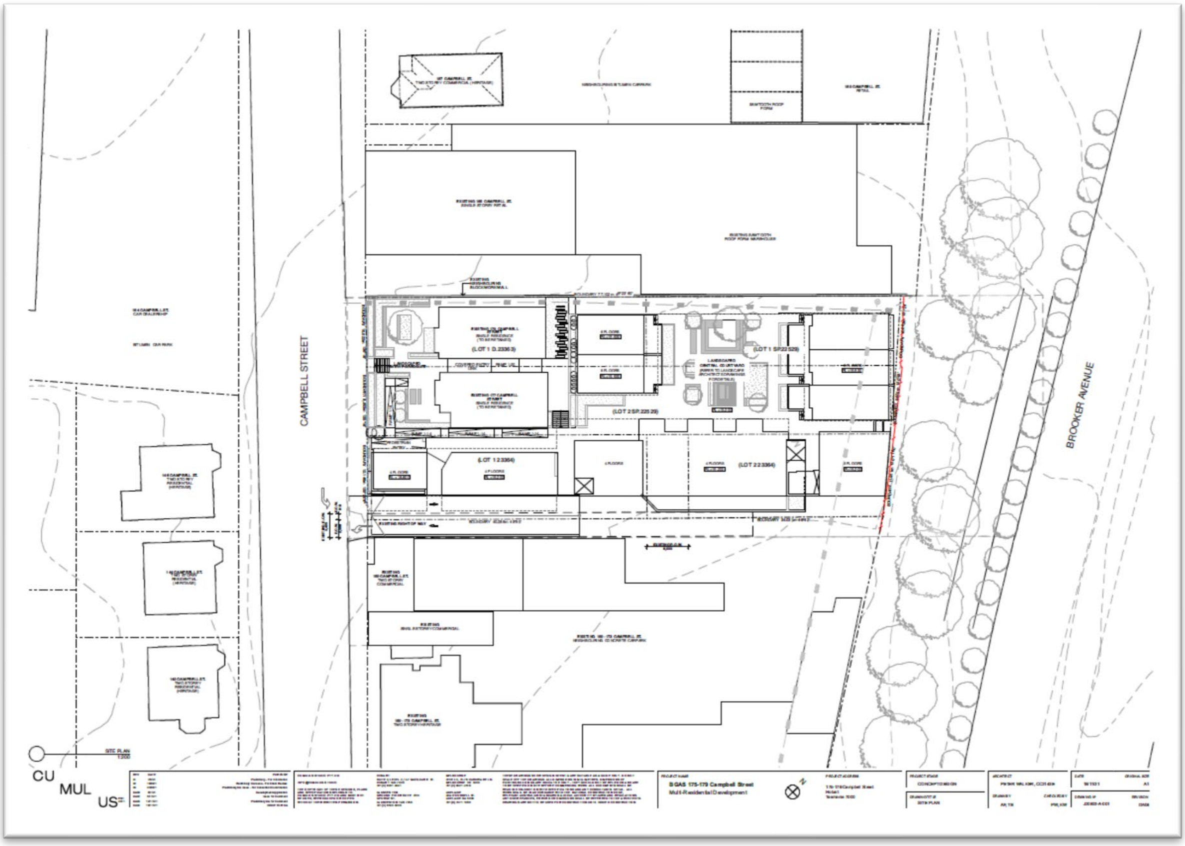
The following key elements of the proposed development are of importance to this TIA:

- Basement level contains a carpark (35 spaces), bicycle storage (12 space rack), storage areas and services which will be accessed by vehicles via a two-way site access driveway located to the south-east of the site; and

- Ground level is situated at Campbell St level providing access to the commercial areas and a central courtyard beyond which some apartments can be directly entered as well as access points for apartments on floors above.

The proposed development site plan is provided in Figure 6.

Figure 6 Proposed Development Site Plan



Ref: Cumulus Studios, Concept Design, Revision DA04, 18 November 2021

4 Traffic Impacts

4.1 Traffic Generation

The nature of the proposed development on the site is best represented by a traffic generating classification of 'Medium density residential flat building', 'Office and commercial' and 'Restaurant' as defined in the *NSW Guide to traffic generating developments* (Roads and Traffic Authority NSW 2002).

Recent surveys indicate a much lower peak hour vehicle trip rate when residential flat dwellings are located within metropolitan areas compared with regional areas. The weekday rates for AM and PM peak vehicle trips per unit ranged between 0.07-0.32 and 0.06-0.41 respectively for higher density residential flats in a metropolitan area. (RMS, 2013)

Based on the medium density residential rates provided in the RTA guide but applying 40% reduction in daily trips and 40% reduction in peak hour trips due to the factors of inner-city area and close proximity to services, the proposed development is expected to generate traffic volumes as shown in Table 3.

In summary, the proposed development together may generate an additional 182 journeys each day and add around 18 vehicles per hour to the AM and PM weekday peak periods of the surrounding road network. This is considered to be appropriate given the close proximity of the subject site to the Hobart CBD, short walking distance to a mainstream supermarket (90m) and range of other services, and access to a key route of the public transport system.

Table 3 Traffic Generation

Activity	Quantity	Daily Vehicle Trip Rate[1]	Daily Trips (veh/day)	Weekday Peak Hour Vehicle Trip Rate[1]	Weekday Peak Hour Trips (veh/hr)
Residential: Multiple dwelling containing 2 or more bedrooms Rate is / unit or apartment	31 apartments	3	94	0.24	7
Business and professional services: Consulting rooms, Commercial space Rate is / 100 m^2 gross floor area	214 m^2 GFA	10	22	2	5
Food services: Café Rate is / 100 m^2 gross floor area	111 m^2 GFA	60	66	5	6
Total trips			**182**		**18** (each peak)

Note 1: RTA NSW Guide to traffic generating developments, 2002

4.2 Traffic Efficiency Impacts

Table 4 provides the traffic volumes on Campbell St once the proposed development has commenced.

Table 4 Traffic Volumes after Proposed Development

Location	ADT (vpd)	% Increase in ADT	% Increase in AM Weekday Peak	% Increase in PM Weekday Peak
Campbell St (2021)	7,991	2.3%	1.9%	2.2%

As indicated in Section 2.1, Campbell St operates as a collector road and as such, can carry between 3,000 – 10,000 vehicles per day. Whilst this a broad range, Campbell St has a wide carriageway, provision of footpaths and good sight distance along this section due to the combined pavement width and open nature of the street. There is spare capacity in this section of Campbell St (ADT of 7,991 veh/day) under the current conditions.

The proposed development will add a low number of vehicles per hour to each peak morning and afternoon hour traffic flow on Campbell St. Based on this assessment, the level of service will remain the same hence it is considered that the traffic efficiency will not be adversely affected by the proposed development.

4.3 Site Access Impacts

The existing site access arrangements were described in Section 2.4, noting the properties at 175-177 Campbell St currently have right of way over the existing driveway (shown in Figure 7). The driveway is part of the adjoining property and hence is also utilised by the business on this site. The traffic is predominately comprised of a low volume of light vehicles but also small delivery vans. The existing site access is approximately 3 m wide, and an upward grade exists for traffic leaving the property to access Campbell St.

Figure 7 Existing Site Access

The access arrangements for the proposed development involve the ongoing use of the existing driveway however it will be upgraded to accommodate two-way light vehicle movements and access by small to medium rigid vehicles (SRV and MRV). Some key details of the access upgrade are provided below.

Width

- According to the *AS/NZS 2890.1:2004 Parking facilities Part 1: Off-street car parking*, the vehicle access driveway width into the site should be 5.5 m (Table 3.1 and Table 3.2 of the Australian Standard) for a User Class 1A (residential, domestic and employee parking), local access facility with 25 to 100 parking spaces. It is proposed to widen the existing site access by 2 m in order to provide a 5.5 m wide driveway over the full distance of 40 m to the carpark entrance.
- The existing access driveway currently safely operates as a two-way lane with a combination of light vehicles and small trucks. Whilst it appears likely that medium rigid vehicle movements associated with the meat wholesalers will enter and exit at Site Access

2 based on access survey results (Figure 5 and Section 2.4), a turning path for MRVs accessing the meat wholesalers via the proposed development site access in shown in Appendix A.

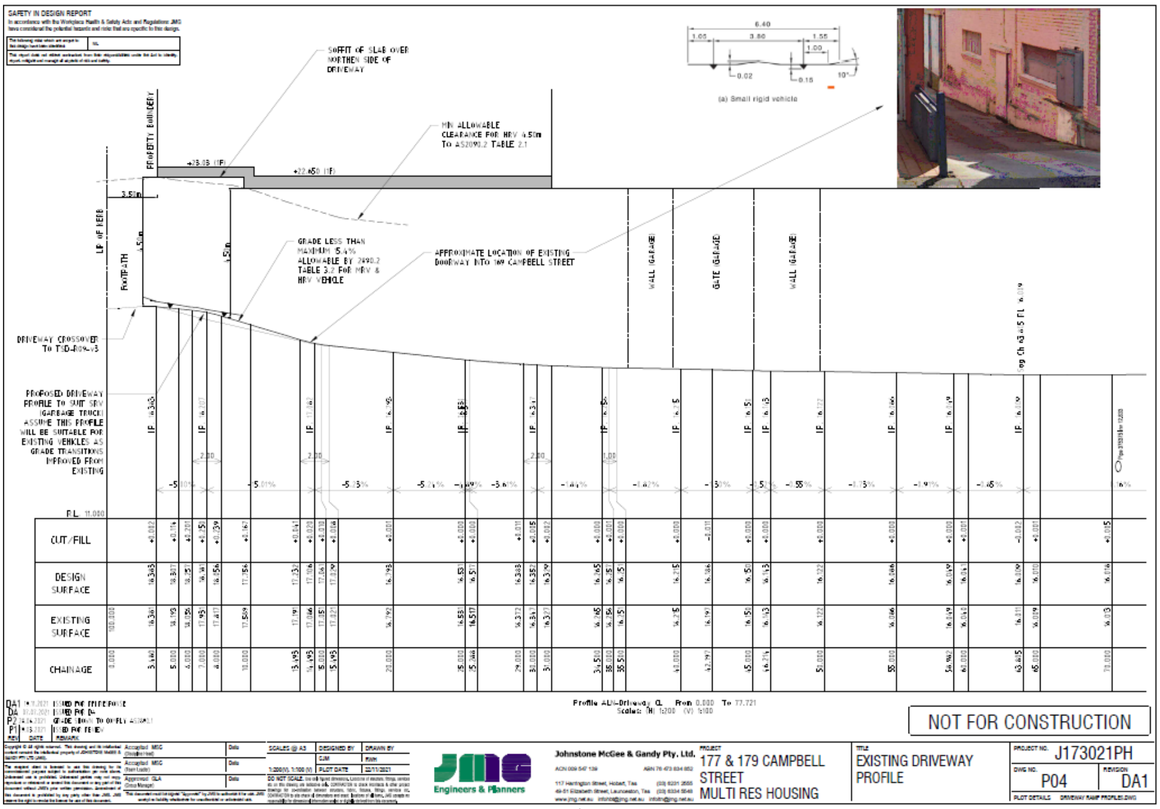
Height

- Level 1 of the building will overhang the site access on the north-western side, at a vertical height of 4.5 m at the Campbell St property boundary.
- To allow for potential MRV into the meat wholesalers, a step up in the new slab has been included to provide 4.5 m vertical clearance to comply with *AS 2890.2* as shown in Figure 8.
- It is noted that MRVs are unlikely to utilise this access driveway, given the presence of a more suitable alternative access into the area behind the meat wholesalers.

Grade

- The grade change does not comply with *AS2890.2* however an assessment of a SRV (Garbage truck) negotiating the crossover is shown in Appendix B to demonstrate it will work effectively. As the new profile will be better than the existing with regard to grade changes it is assumed there will be no impact on the existing vehicles accessing the site.

Figure 8 Existing Driveway Profile



4.4 Sight Distance Assessment

The Austroads publication, Guide to Road Design, Part 4A: 'Unsignalised and Signalised Intersections', 2021 defines Safe Intersection Sight Distance as "the minimum distance which should be provided on the major road at any intersection". Austroads 2021 states SISD:

- *is measured along the carriageway from the approaching vehicle to the conflict point; the line of sight having to be clear to a point 7.0 m (5.0 m minimum) back along the side road from the conflict point.*
- *provides sufficient distance for a driver of a vehicle on the major road to observe a vehicle on a minor road approach moving into a collision situation (e.g. in the worst case, stalling across the traffic lanes), and to decelerate to a stop before reaching the collision point*
- *is viewed between two points to provide inter-visibility between drivers and vehicles on the major road and minor road approaches. It is measured from a driver eye height of 1.1 m above the road to points 1.25 m above the road, which represents drivers seeing the upper part of cars.*
- *assumes the driver on the minor road is situated at a distance of 7.0 m (minimum of 5.0 m) from the conflict point on the major road SISD allows for a 3 sec observation time for a driver on the priority legs of the intersection to detect a problem ahead (e.g. car from minor road stalling in through lane), plus the SSD.*
- *provides sufficient distance for a vehicle to cross the non-terminating movement on two-lane two-way roads, or undertake two-stage crossings of dual carriageways, including those with design speeds of 80 km/h or more.*
- *should also be provided for drivers of vehicles stored in the centre of the road when undertaking a crossing or right-turning movement.*
- *enables approaching drivers to see an articulated vehicle, which has properly commenced a manoeuvre from a leg without priority, but its length creates an obstruction.*

The Planning Scheme states the requirements for SISD in *E5.0 Road and Railway Assets Code, E5.6.4 Sight distance at accesses, junctions and level crossings* which are closely aligned with the Austroads requirements. *Figure E5.1 Sight lines for Accesses and Junctions* from the Planning Scheme is shown in Figure 9. However, it is important to point out the above mentioned Austroads guide also states that while sight distances at accesses should comply with the sight distance requirements for intersections, these criteria often cannot be obtained for various reasons. In these cases, the minimum gap sight distance should be assessed in context of the specific situation.

The site access on Campbell St was assessed for available SISD with a summary of sight distance findings provided in Table 5, noting:

- Campbell St is categorised in 'all other roads' and hence 'X' is required to equal 5 m in Figure 9.
- The vehicle speed equates to the 85th percentile speed however this is unknown for Campbell St hence the posted speed limit will be utilised.

Figure 9 Extract from Planning Scheme: Figure E5.1 Sight Lines for Accesses and Junctions

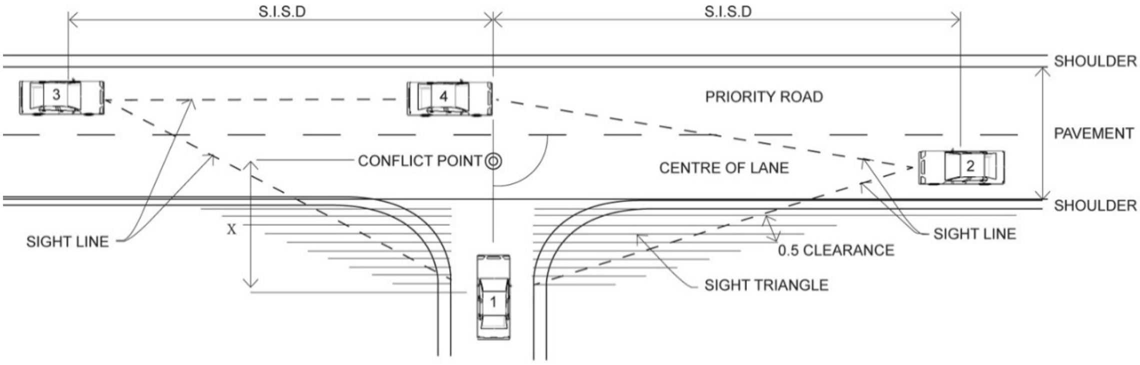


Table 5 Sight Distance Assessment

Access / Junction	85th Percentile Speed	Required SISD	Min Gap (5 s) Sight Distance	Sight Distance Left	Sight Distance Right	Comments
Campbell St site access	50 km/hr	80 m	69 m	NA	~45 m	SISD may be impeded due to location of power poles and presence on-street parking

As shown in Table 5, the sight distance to the right of the existing site access does not meet the Planning Scheme requirement for a range of reasons including impeded by the presence of on-street parking. However, it is acknowledged on-street parking is commonplace in urban streets thus it is normal for sight distance to be partly obstructed at site accesses. Drivers generally observe gaps between parked vehicles.

The sight distance to the right of the existing site access meets the minimum safe sight distance (SSD) requirement of 45 m (for 50 km/hr speed) but falls short of the SSD with the desirable 5 s gap (69 m) stated in Section 3.2.4 of *AS/NZS 2890.1 Off-street car parking* (for exiting an access driveway other than a domestic property) and Section 3.4.5 of *AS/NZS 2890.2 Off-street commercial vehicle facilities*. The Australian Standard also highlights the potential need to restrict parking either side of the access driveway to ensure an approaching vehicle is not obstructed. However, this block of Campbell St has a high degree of property access, including heavy vehicle movements, yet it operates well and with minimal safety issues. Hence, it is noted also there are numerous other examples on Campbell St where it would be challenging to satisfy the SISD requirement.

Figure 10 shows the view to the right of the existing site access. Although the SISD will be deficient according to the planning scheme requirements, it is considered the site access will operate in a safe and efficient manner due to the existing access function of the road, one-way two-lane arrangement with preceding signalised intersection to provide gaps in the traffic flow, provision for cyclists and pedestrians, proposed access upgrade and absence of road safety issues in the vicinity of the site access.

Figure 10 View Right at Existing Site Access

4.5 Road Safety Impacts

Analysis of crash history data for the section of Campbell St relevant to the proposed development along with an on-site investigation of the site access has highlighted a deficiency in the required sight distance for use as a development access and a low level crash history in the surrounding area.

However, no significant detrimental road safety impacts are foreseen as a result of the proposed development based on the following:

- The existing site access has operated safely and efficiently for many years as an access to the subject site and adjoining existing businesses. The proposed development does not significantly increase the number of movements in and out of the access nor to the road network.
- There is sufficient capacity in the surrounding road network to safely absorb the minimal increase in traffic movements.
- There is no crash history trend as such to suggest that there is a road safety deficiency in the vicinity of the existing site access. Furthermore, there has been no crashes near the site access in the past four years.
- Whilst the proposed development is new in concept for this site, vehicle movements into and out of the site will not be seen as an unusual event by other motorists due to existing access into other properties along this section of Campbell St.

4.6 Assessment of Relevant Road and Railway Assets Code Use Standards

The Planning Scheme requires developments to comply with relevant Use Standards set out in the Road and Railway Assets Code. Applicable use standards are addressed in Table 6.

Table 6 Planning Scheme E5.0 Road and Railway Assets Code

Acceptable Solutions / Performance Criteria	Assessment of Compliance with Code
E5.5.1 Existing road accesses and junctions 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 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; I the nature and efficiency of the access or the junction; (d) the nature and category of the road; I 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.	Acceptable solution is not met but has been assessed in this TIA against the Performance Criteria**.** It is deemed acceptable on the following grounds: • Increase in daily vehicle trips will be less than 2.5% and whilst more than 40 vehicle movements per day are expected, this is likely to be off-set by the inner city location of the proposed development which will encourage the use of other modes of transport. • The proposed development is located in a section of Campbell St already providing a high level of accessibility to local businesses in the area – the site access arrangements are consistent with those around it hence does not introduce any new elements. • There is sufficient capacity in Campbell St as a collector road for the additional traffic movements from the proposed development. • The existing site access has operated safely and efficiently to date and will be upgraded as part of the proposed development. • A minor crash history exists for the area but there is no evidence of significant road safety issues in the study area. • Campbell St signalised intersection with Warwick St effectively creates gaps in the traffic flow for this section of the road for safe entry/exit into properties and parking but not so long that traffic flow is restricted.
E5.6.2 Road accesses and junctions 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.	Acceptable solution is met – One existing access will provide both entry / exit and no new accesses are proposed as part of the development.

Acceptable Solutions / Performance Criteria	Assessment of Compliance with Code
E5.6.4 Sight distance at accesses, junctions and level crossings A1 Sight distances at: an access or junction must comply with the Safe Intersection Sight Distance shown in Table E5.1 P1 The design, layout and location of an access, junction or rail level crossing must provide adequate sight distances to ensure the safe movement of vehicles, having regard to: (a) the nature and frequency of the traffic generated by the use; (b) the frequency of use of the road or rail network; I any alternative access; (d) the need for the access, junction or level crossing; I any traffic impact assessment; (f) any measures to improve or maintain sight distance; and (g) any written advice received from the road or rail authority.	Acceptable solution is partially met as safe intersection sight distance to the right of the site access is deficient and on-street parking restricts sight distance to the left of the site access. E5.6.4 has been assessed in this TIA against the Performance Criteria for both light and heavy vehicles**.** It is deemed acceptable on the following grounds: • Sight distance to the right of the site access meets the minimum safe sight distance requirement stated in Figure 3.2 of *AS/NZS 2890.1* for exiting an access driveway other than domestic property. • It is acknowledged on-street parking is commonplace in urban streets thus it is normal for sight distance to be partly obstructed at site accesses. Drivers generally observe gaps between parked vehicles. • The site access arrangements are consistent with those around it hence does not introduce any new elements. • In addition to being a collector road, Campbell St plays a local access role hence it is challenging to satisfy the SISD requirement for all access points along this road when on-street parking is present. • There is sufficient capacity in Campbell St for the additional traffic movements from the proposed development. • Use of the site access to enter/exit the off-street carpark is less frequent due to the largely residential nature of the development. • Whilst the site access will be upgraded, the existing site access has operated safely and efficiently to date. • A minor crash history exists for the area but there is no evidence of significant road safety issues in the study area. • A range of small, medium and large heavy vehicles were observed manoeuvring in and out of accesses nearby and at the subject/adjoining site during morning peak hour, and whilst there were very minor delays at times, the traffic continues to flow well and without incident. • Good provision for pedestrians and cyclists in this area with wide carriageway hence providing opportunities for drivers to identify potential conflict points and assess suitability to accept gap for entry into traffic flow.

5 Parking Assessment

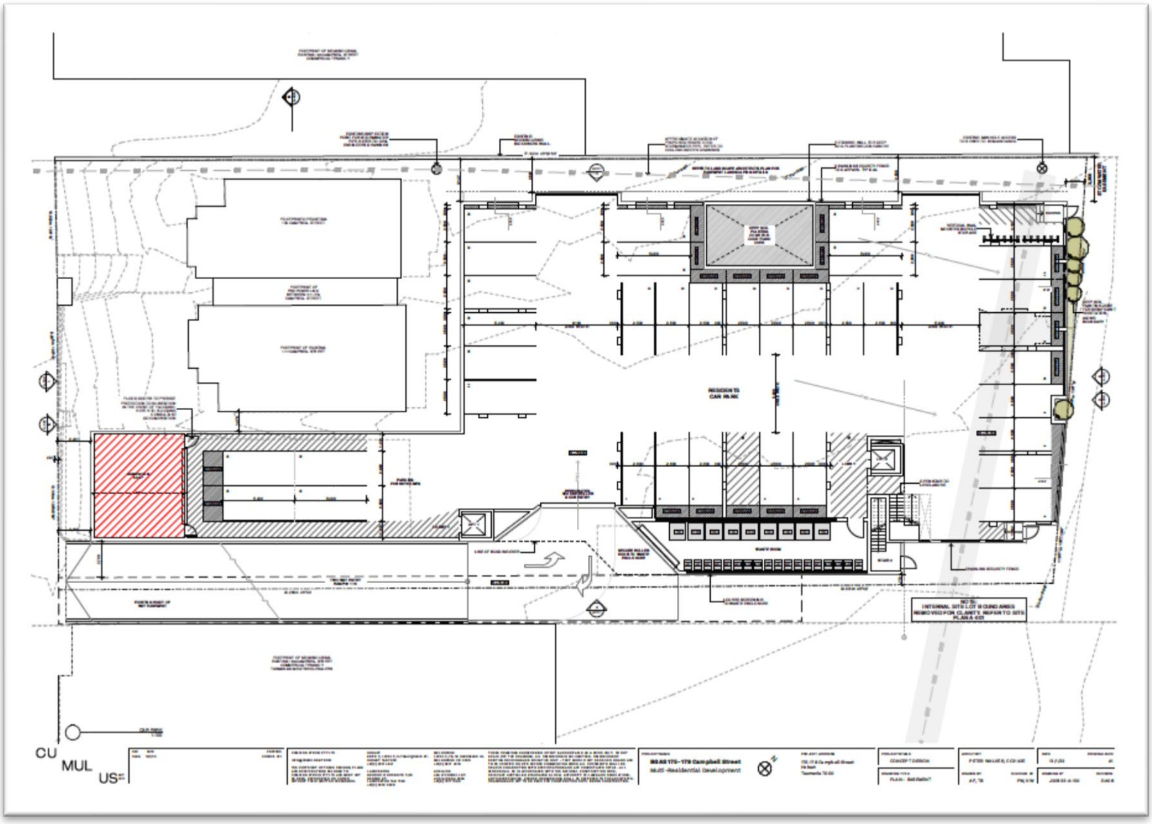
5.1 Parking Provision and Carpark Layout

Parking provision and carpark layout for the proposed development is shown in Figure 11. It is proposed to provide an off-street carparking area on the basement level of the building footprint. A total of thirty-five (35) car spaces will be provided for the residential component of the development, consisting of one space for each of the twenty-seven (27) apartments and townhouses, and two spaces each for the four skyhomes (total of 8).

It is noted that car spaces numbered 3, 4 and 5 will be compliant with accessibility design criteria hence can be allocated to residents with these requirements as needed. However, these spaces will not be signposted for accessible use only to avoid limiting their use. Car spaces 32 to 35 are in jockey configuration providing two spaces each for two of the skyhomes, and satisfying the requirement to be 2.6 m wide.

A vertical wall-mounted bicycle storage rack for up to twelve bikes, is located between car space 13 and an external exit pathway. The provision of bike storage for residents complements the development's close proximity to the city and encourages alternative modes of transport.

Figure 11 Proposed Development Off-Street Carpark Layout



Ref: Cumulus Studios, Concept Design, Revision DA06, 13 January 2022

There is a considerable amount of time-limited on-street parking (60 car spaces) available in the Campbell St block between Warwick St and Brisbane St, with parking bays marked and signposted with time limits (either 2P, 1P or ½P) as described in Section 2.1. This is complemented by existing off-street parking provided within properties in the immediate surrounding area as can be seen in the aerial image shown in Figure 1.

The traffic generated from the proposed development is not likely to impact the availability of the parking in the surrounding area due to the provision of off-street parking for the proposed development as well as existing off-street parking in the area and turn-over rate of time-limited on-street parking. However, surrounding parking facilities will be utilised (as they are by all businesses and residential properties in the local area) to some extent by those either living or working at the 175-179 Campbell St development.

5.2 Calculated Parking Requirements

The proposed development must be categorised in several use classes specified in the Planning Scheme due to the multi-use nature of the development including 'Residential', 'Business and professional services' and 'Food services'. Parking requirements for the proposed development at the subject site have been calculated using *Table E6.1 Number of Car Parking Spaces Required*. An overview of the calculated parking requirements is provided in Table 7 which is based on applicable Use Class as defined in the Planning Scheme. Accordingly, 87 parking spaces are required to comply with the Planning Scheme.

The proposed development parking provision does not align with the planning scheme requirement hence is assessed against performance criteria in Point 1 of Table 8.

Table 7 Parking Requirements

Use Class	Number	Planning Scheme Rates	Parking Spaces Required
Residential: Multiple dwelling containing 1 bedroom	6 x 1 bedroom apartments	1 for each dwelling and visitor parking (see below)	6
Residential: Multiple dwelling containing 2 or more bedrooms	25 x 2+ bedroom apartments	2 for each dwelling and visitor parking (see below)	50
Residential: Visitor parking associated with dwellings	31 apartments	1 dedicated visitor parking space per 4 dwellings (applies to both types of multiple dwellings)	7
Business and professional services: Consulting rooms	100 m^2	1 for each 30 m^2 of floor area	3
Business and professional services: Commercial space	114 m^2	1 for each 30 m^2 of floor area	4
Food services: Café	111 m^2	15 for each 100 m^2 of floor area or 1 space for each 3 seats	17
Total parking spaces required			**87**

5.3 Assessment of Relevant Parking and Access Code Use Standards

The Planning Scheme requires all use and development to comply with relevant Use Standards set out in the Parking and Access Code. Applicable use standards are addressed in Table 8.

Table 8 Planning Scheme E6.0 Parking and Access Code

Code Use Standards	Assessment of Compliance with Use Standard
E6.6.1 Number of Car Parking Spaces A1 Acceptable Solution The number of on-site car parking spaces must be: no less than and no greater than the number specified in Table E6.1 P1 Performance Criteria 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 /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 (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 any relevant parking plan for the area adopted by Council (k) 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 Code	Acceptable solution not met / Performance criteria addressed – The number of car spaces for the proposed use at the site as required by the Planning Scheme is outlined in Section 5.2. It has been calculated the number of car spaces to be provided does not align with the Planning Scheme parking requirements. However, it is recommended that the proposed parking provision is acceptable based on the following grounds: • The residential component of the proposed development is sited in a location that reduces the need for a personal vehicle due to the high level of accessibility to local services and community activities • There is a considerable range of on-street parking around the subject site to cater for visitors to the building and business employees • Campbell St is a Metro route and a bus stop is located less than 50 m from proposed development • Car parking demand in this section of Campbell St is likely to vary considerably across the day with turnover of time-restricted on-street parking regularly making spaces available for short-term use • Private off-street parking is provided extensively for various purposes in this area taking pressure off on-street parking availability • Close proximity to the Hobart CBD and North Hobart with the option to use transport modes such as walking, cycling or bus • The café is likely to attract people in the local area as there are very few other similar food services, and it is likely customers will walk or ride rather than drive.

<table>
<tr><th>Code Use Standards</th><th>Assessment of Compliance with Use Standard</th></tr>
<tr><td>E6.6.2 Number of Accessible Car Parking Spaces for People with a Disability
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.</td><td>Acceptable solution met – The proposed development building is classified by the Building Code of Australia as a mix of classes. The classes and number of accessible car spaces required include:
• Class 2 (two or more sole occupancy units) – Not required
• Class 5 (office/commercial) – 1 space for every 100 carparking spaces or part thereof
• Class 6 (café) – 1 space for every 50 carparking spaces or part thereof

D3.5 Accessible carparking of the BCA states that accessible carparking spaces need not be provided in a carparking area where a parking service is provided and direct access to any of the carparking spaces is not available to the public. This is the case for the proposed development where the carpark provided is for the residential apartments with no public access.

On-street carparking in this section of Campbell St is likely to provide suitable alternatives in some cases for accessible parking, particularly given the wide, level carriageway and time-restricted parking available along the front of the proposed development.</td></tr>
<tr><td>E6.6.3 Number of Motorcycle Parking Spaces
A1</td><td>Not considered applicable to this development however it is noted on-street motorcycle parking is provided in the next block just after the Brisbane St intersection.</td></tr>
<tr><td>E6.6.4 Number of Bicycle Parking Spaces
A1 The number of onsite bicycle parking spaces provided must be no less than the number specified in Table E6.2.</td><td>Acceptable solution met / Performance criteria addressed – Whilst not required under the planning scheme, a bicycle storage rack for up to 12 bikes will be provided in the basement carpark for residential apartments.

Bicycle parking is applicable for the proposed commercial and food activities both of which individually cover very small floor areas. Hence provision has been made for 5 bicycle hoops outside the commercial area of the proposed development which is considered appropriate for the subject site.</td></tr>
</table>

<table>
<tr><th>Code Use Standards</th><th>Assessment of Compliance with Use Standard</th></tr>
<tr><td>E6.7.1 Number of Vehicular Accesses
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.</td><td>Acceptable solution met – One vehicle access on Campbell St.</td></tr>
<tr><td>E6.7.2 Design of Vehicular Accesses
A1
Design of vehicle access points must comply with all of the following:

(a) in the case of non-commercial vehicle access; the location, sight distance, width and gradient of an access must be designed and constructed to comply with section 3 – “Access Facilities to Off-street Parking Areas and Queuing Areas” of AS/NZS 2890.1:2004 Parking Facilities Part 1: Off-street car parking;

(b) in the case of commercial vehicle access; the location, sight distance, geometry and gradient of an access must be designed and constructed to comply with all access driveway provisions in section 3 “Access Driveways and Circulation Roadways” of AS2890.2 – 2002 Parking facilities Part 2: Off-street commercial vehicle facilities

P1
Design of vehicle access points must be 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</td><td>Acceptable solution partially met/ Performance criteria addressed. The existing access will be utilised noting the following aspects:
• Entry width of 5.5 m wide (Combined for Category 1 access as defined in Tables 3.1 and 3.2 – Based on User Class 1A; local road frontage, <100 car spaces) will be provided;
• Location requirements are met in Section 3.2.3 of AS/NZS 2890.1
• Minimum entering sight distance to the right is acceptable despite SISD not achieved for reasons given in Section 4.4
• Minimum sightlines for pedestrian safety appear to be met (as required in Figure 3.3 of AS/NZS 2890.1:2004) however this should be checked at the site access detailed design stage
• Grade of access driveway complies with Table 3.2 of AS/NZS 2890.2, designed to suit SRV (garbage truck) – refer to Figure 8

Performance criteria addressed:
(a) Campbell St is a one-way, two lane section of road with a dedicated cycle lane where the proposed development is located, hence provides opportunities to avoid conflicts between various road users, particularly as cyclists are encouraged to use the cycle lane on the opposite side of the road and pedestrians are provided with wide footpaths on both sides
(b) There is evidence from site survey observations to indicate various sized rigid vehicles regularly access businesses along Campbell St and through timely traffic gap selection such as when signals change, these vehicles largely avoid interfering with traffic flow
(c) & (d) Existing access has operated safely and efficiently to date as a two-way single lane hence the upgraded access will be suitable for the type and relatively small increase in traffic utilising the access (predominantly light vehicles associated with the proposed development)</td></tr>
</table>

Code Use Standards	Assessment of Compliance with Use Standard
E6.7.3 Vehicular Passing Areas Along an Access A1 Vehicular passing areas must: (a) be provided if any of the following applies to an access: (i) it serves more than 5 car parking spaces; (ii) is more than 30 m long; (iii) it meets a road serving more than 6000 vehicles per day; (b) be 6 m long, 5.5 m wide, and taper to the width of the driveway; (c) have the first passing area constructed at the kerb; (d) be at intervals of no more than 30 m along the access.	Acceptable solution met – Existing access meets a road serving more than 6,000 vehicles per day. The width of the access at the kerb will be 5.5 m and will continue at this width for the length of the 40 m driveway up to the carpark entry. The driveway then tapers to a 3m width over a 10 m distance providing an area to reverse into if required.
E6.7.4 On-Site Turning A1 On-site turning must be provided to enable vehicles to exit a site in a forward direction, except where the access complies with any of the following: (a) it serves no more than two dwelling units; (b) it meets a road carrying less than 6000 vehicles per day.	Acceptable solution met – Off-street carpark enables vehicles to exit in a forward direction. It is noted waste management contractors will require access to the proposed development hence a turning path assessment has been completed (refer Appendix A). A typical waste collection vehicle utilised for these types of premises is able to manoeuvre and exit in a forward direction, however any larger commercial vehicles will not be able to access the carpark due to entry clearance height (discussed in E6.7.5). Collection of waste will be completed outside peak traffic times to ensure carpark access is not impacted and queuing does not occur.
E6.7.5 Layout of Parking Areas 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.	Acceptable solution met – The off-street carpark concept design indicates consideration of key parking area elements and based on a high-level review appears to comply with Section 2 of *AS/NZS 2890.1:2004*. Some specific points: • Dimensions of car spaces will meet standard design requirements for the designated User Class 1A. • Entry into the proposed development carpark will have a clearance height of approximately 2.8 m (refer to Appendix B). This satisfies Clause 5.3 Headroom – general requirement of a minimum of 2.2 m. It is recommended to ensure the detailed design of carpark layout is in accordance with relevant clauses of Section 2 AS/NZS 2890.1.

Code Use Standards	Assessment of Compliance with Use Standard
E6.7.6 Surface Treatment of Parking Areas **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.	Acceptable solution will be addressed to the necessary standard in the detailed design phase of the proposed development.
E6.7.7 Lighting of Parking Areas **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.	Acceptable solution will be addressed to the necessary standard in the detailed design phase of the proposed development.
E6.7.8 Landscaping of Parking Areas **E6.7.9 Design of Motorcycle Parking Areas** **E6.7.11 Bicycle End of Trip Facilities**	Not applicable.
E6.7.10 Design of Bicycle Parking Areas **A1** (a) be provided in accordance with the requirements of Table E6.2 (b) be located within 30 m of the main entrance to the building	Acceptable solution will be addressed to the necessary standard in the detailed design phase of the proposed development.
E6.7.12 Siting of Car Parking **A1** Parking spaces and vehicle turning areas, including garages or covered parking areas in the Inner Residential Zone, Urban Mixed Use Zone, Village Zone, Local Business Zone and General Business Zone must be located behind the building line of buildings located or proposed on a site except if a parking area is already provided in front of the building line of a shopping centre.	Acceptable solution met – Carpark located behind retail and commercial buildings.
E6.7.14 Access to a Road **A1** Access to a road must be in accordance with the requirements of the road authority.	Acceptable solution met – Existing access to Campbell Street.

6 Conclusions and Recommendations

This report documents the findings from a Traffic Impact Assessment conducted for the proposed residential apartment building at 175-179 Campbell St, Hobart. This assessment has been conducted following a review of available traffic data, information on the proposed development and site plans provided to ECTM Consulting, relevant standards and guidelines, the Hobart Interim Planning Scheme and other supplementary traffic information.

The analysis undertaken in this report demonstrates that the additional traffic generated from the proposed development at the subject site on a day to day basis during normal peak hours, will not impact the operation of the surrounding road network nor significantly affect the existing road capacity.

The key findings of the TIA are summarised as follows:

- There is sufficient capacity in the surrounding road network to safely absorb the relatively small increase in traffic movements.
- There is no crash history trend to suggest that there are road safety deficiencies in the vicinity of the existing site access.
- The existing site access has operated safely and efficiently for many years as an access to the subject site and adjoining property at 169-173 Campbell St and will be upgraded as part of the proposed development.
- Minimum sight distance requirements are met at the site access although exiting the site may be restricted at times due to on-street parking. However, there are other examples on Campbell St where it would be challenging to satisfy the SISD requirement when on-street parking is present. As such, it is considered the site access provides acceptable safe entry and exit for the reasons outlined in the relevant section of the report.
- The proposed parking provision and carpark layout is considered adequate based on the grounds described in the report.

The following recommendations are made based on the findings of the TIA:

- Design site access in accordance with applicable clauses of Section 3 *AS/NZS 2890.1:2004 Off-street car parking* noting the site access needs to be widened to a minimum of 5.5 m.
- Check minimum sightlines for pedestrian safety are adequate at the site access detailed design stage.
- Incorporate modification of the site access driveway grade into the detailed design phase to achieve the *AS/NZS 2890.1:2004 Off-street car parking* standard as far as reasonably practicable.
- Ensure carpark layout is designed in accordance with relevant clauses of Section 2 *AS/NZS 2890.1:2004 Off-street car parking* noting dimensions of car spaces will meet standard design requirements for the designated User Class 1A (residents and employees).
- Ensure bicycle parking is designed in accordance with relevant clauses of *AS 2890.3:2015 Parking facilities – Bicycle parking*.
- Review and address parking area surface treatment, drainage and lighting requirements as stated in the Planning Scheme during the detailed design phase.

In conclusion, the proposed development does not significantly increase the number of movements on the local road network during peak periods and is unlikely to impact on existing parking facilities therefore should not adversely impact on traffic efficiency and road safety in the area. Based on the findings of this report and subject to the recommendations above, the proposed development is supported on traffic grounds.

7 References

Australian Building Codes Board, National Construction Code 2019 Building Code of Australia – Volume 1, Amendment 1, 2020

Australian Standards, AS/NZS 2890.1:2004, Parking facilities—Off-street car parking

Australian Standards, AS/NZS 2890.2:2018, Parking facilities—Off-street commercial vehicle facilities

Australian Standards, AS/NZS 2890.3:2015, Parking facilities— Bicycle parking

Australian Standards, AS/NZS 2890.6:2009, Parking facilities—Off-street parking for people with disabilities

Austroads, Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections, 2021

Austroads, Guide to Road Design, Part 6A: Paths for Walking and Cycling, 2017

Austroads, Guide to Traffic Management Part 3: Traffic Studies and Analysis, 2017

Austroads, Guide to Traffic Management Part 6: Intersections. Interchanges and Crossings, 2020

Austroads, Guide to Traffic Management, Part 12: Traffic Impacts of Developments, 2019

Department of State Growth, Traffic Impact Assessment Guidelines, 2020

Department of State Growth, State Road Hierarchy (year not stated)

Department of Main Roads Qld, Chapter 3 Road Planning and Design Fundamentals, 2005

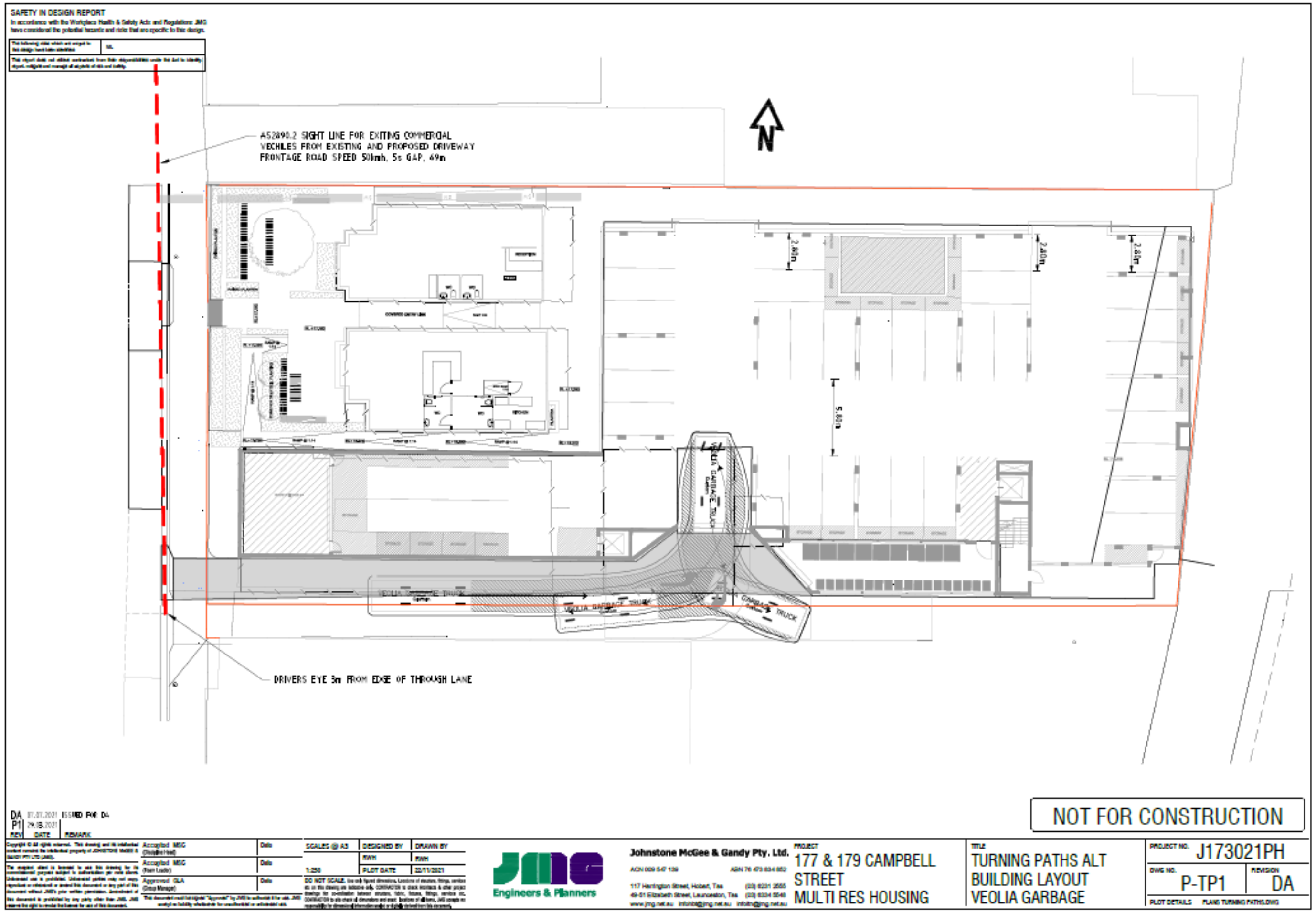
Hobart Interim Planning Scheme 2015 (Planning Scheme)

Monash University (Institute of Transport Studies), Traffic Engineering and Management, 2003

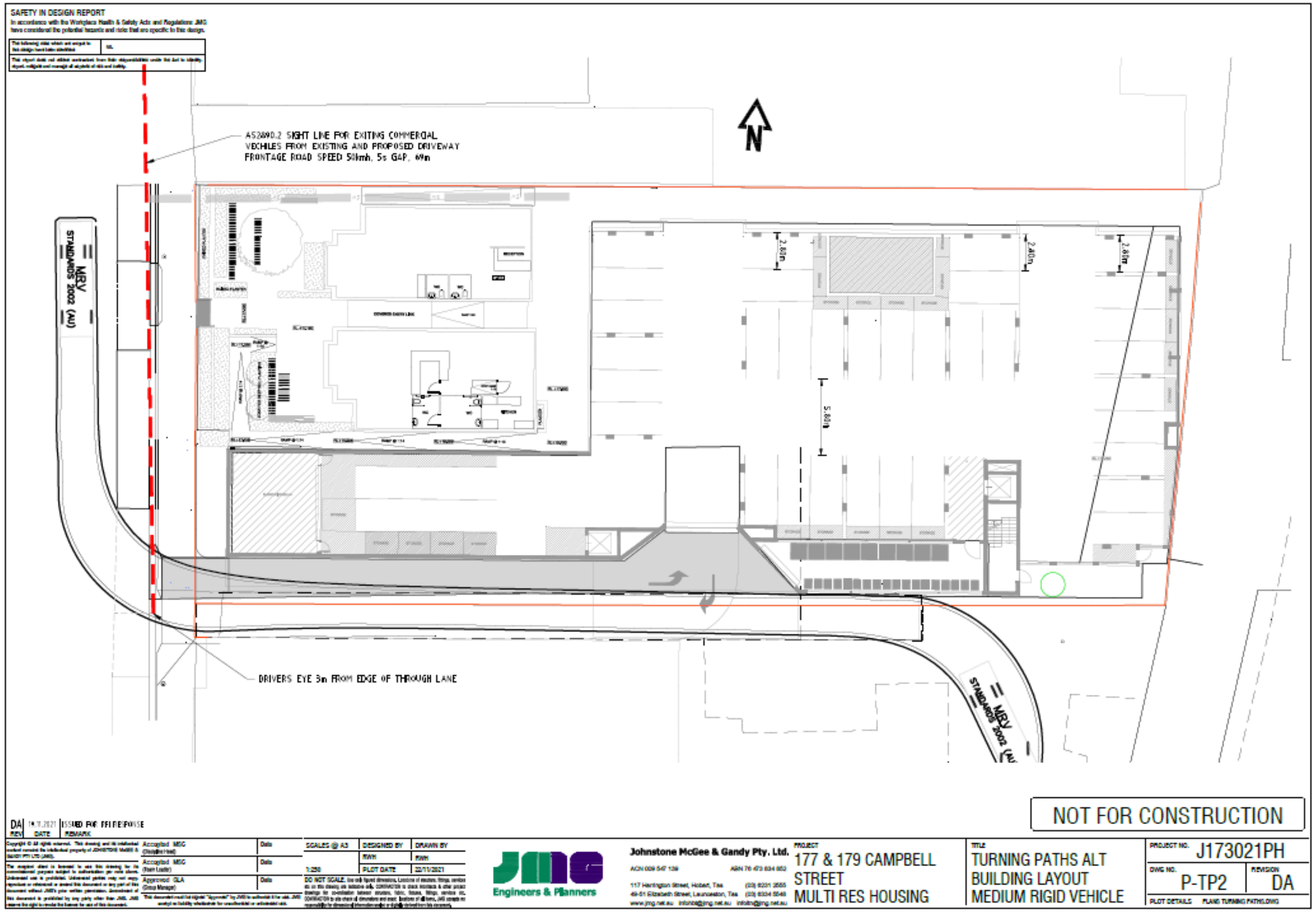
Roads and Traffic Authority NSW, Guide to Traffic Generating Developments, 2002 (RTA Guide)

Roads and Maritime Services NSW, Updated Traffic Surveys, 2013 (Updated RMS Guide)

Appendix A – Small and Medium Rigid Vehicle Turning Paths

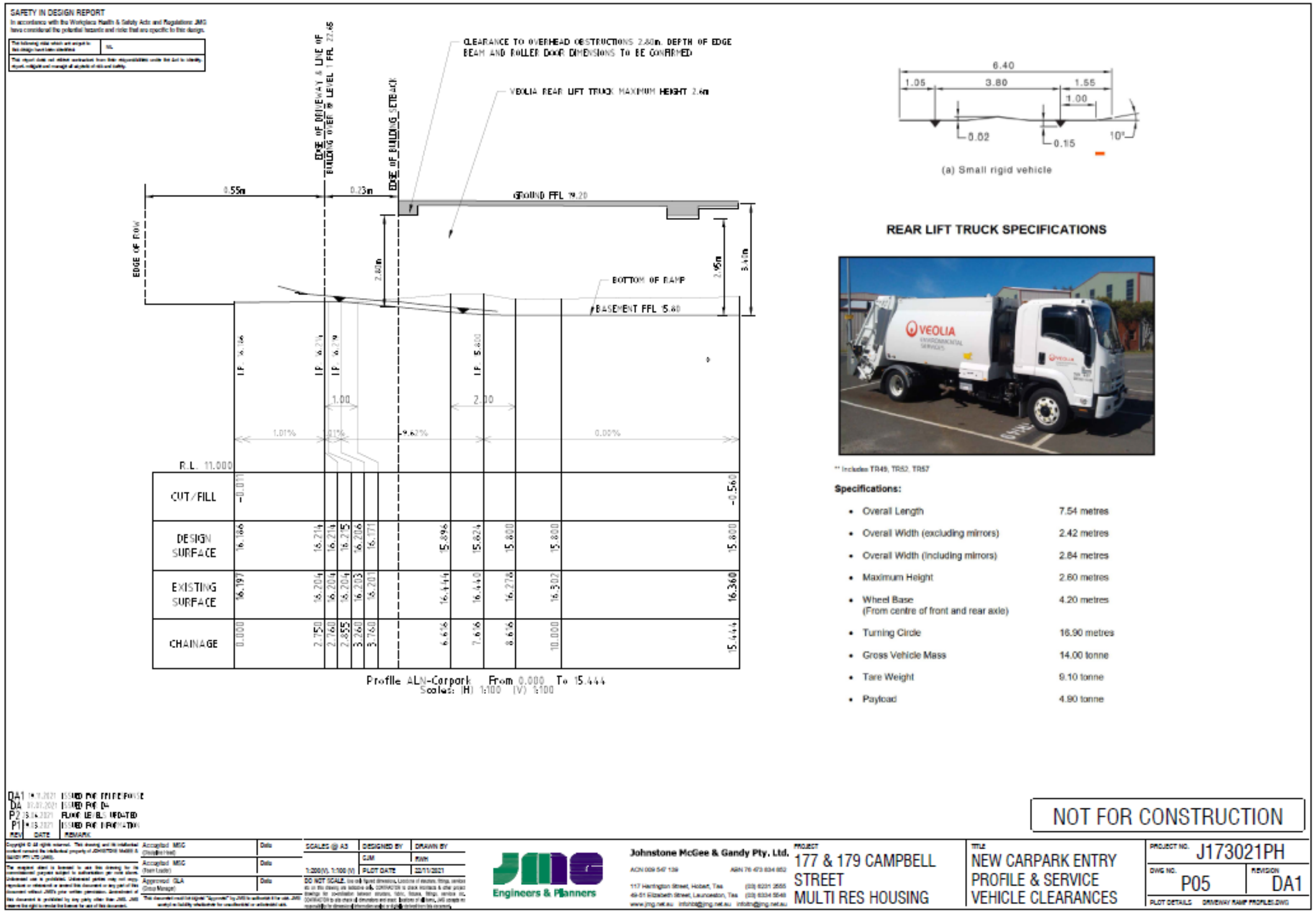


Ref: JMG Drawing P-TP1 22/11/21 – Turning Paths Alt Building Layout Veolia Garbage



Ref: JMG Drawing P-TP2 22/11/21 – Turning Paths Alt Building Layout Medium Rigid Vehicle

Appendix B – Waste Collection Truck Carpark Entry Clearance



Ref: JMG Drawing P05 22/11/21 – New Carpark Entry Profile and Service Vehicle Clearance

Document History and Status

Version	Date of Report	Prepared by	Revision type
1.0	30/06/2021	A Halley	Issued to client
2.0	7/07/2021	A Halley	Minor amendments
3.0	22/11/2021	A Halley	Update drawings and no. of car spaces
4.0	1/12/2021	A Halley	Inclusion of new information, update drawings, additional site access assessment
5.0	13/1/2021	A.Halley	Update Section 5 with revised carpark drawing and clarification of parking provision

Disclaimer

All sections of this report should be read in conjunction with the entire report. Information provided to ECTM Consulting Pty Ltd is taken as true and correct.

At no point does this document, or any correspondence provided by ECTM Consulting Pty Ltd absolve the client, site occupiers or any third party from any legal obligation or duty of care. If there is any conflict between information provided by ECTM Consulting Pty Ltd and any legislation, codes of practice, standards or industry guidance notes, then the latter is to take precedence in all circumstances.

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GES

GEO-ENVIRONMENTAL SOLUTIONS

ENVIRONMENTAL SITE ASSESSMENT

175-179 Campbell Street, Hobart

November 2021

For Solutionswon Group Pty Ltd

Geo-Environmental Solutions P/L 29 Kirksway Place, Battery Point, 7004. Ph 6223 1839 E: Office@geosolutions.net.au

DOCUMENT CONTROL

Title	**Version**	**Date**	**Author**	**Reviewed By**
Environmental Site Assessment: 175-179 Campbell Street, Hobart, Tasmania	Version 1	25th November 2021	Mark Downie	JP Cumming

EXECUTIVE SUMMARY

This report presents the findings of an Environmental Site Assessment (ESA) undertaken by Geo-Environmental Solutions Pty. Ltd. (GES) at 175-179 Campbell Street, Hobart, Tasmania - hereby referred to as 'The Site'. GES was commissioned by Solutionswon Group Pty Ltd to conduct the site assessment.

This ESA has been prepared by a suitably qualified and experienced practitioner in accordance with procedures and practices detailed in National Environmental Protection Measure [Assessment of Site Contamination] (NEPM ASC; 2013).

The objective of this ESA was to investigate the site for contamination, and address performance criteria under the potentially contaminated land code (E2) of the *Hobart City Council Interim Planning scheme 2015*. The assessment determines the suitability and safety of the soil for excavation at a typical depth for foundation & services excavation, and any human or environmental risks from the soil present on site.

The following information was gathered during the desktop investigation:

- The site is zoned *Urban Mixed Use* under the Hobart City Councils Interim Planning Scheme of 2015. The geology of the site is Quaternary alluvial deposits. Groundwater is inferred to travel south east along similar trajectory to the Brooker Highway towards the River Derwent. Surface water may be collected in stormwater culverts and discharged into Hobart Rivulet to the south east, or may infiltrate nearby unsealed areas to infiltrate to groundwater.
- A review of available information suggests that the site has been mostly residential land for 50+ years, with the buildings on site being converted to office use in more recent years. There are no records of potentially contaminating activities occurring on the site, or dangerous goods being stored on the site. The site is adjacent to a commercial warehouse and supermarket (formerly a commercial site with fuel storage) and as such there is potential for the presence of contaminants in the local area.
- Contaminants Of Potential Concern (COPC) include the following: TPH/TRH; Mono Aromatic hydrocarbons: (BTEXN); PAH; and metals.

From the soil assessment, it is concluded that:

- <u>Environment:</u> Zinc was detected above NEPM ASC 2013 EIL guideline limits in one sample, and Benzo(a)pyrene exceeded NEPM ASC 2013 ESL guideline limits in two samples. Metals and hydrocarbons were at elevated levels in samples which corresponded with overlying fill material, and not in the underlying clay soil.
- <u>Human Health:</u> There were no human health guideline exceedances for dermal contact or vapour intrusion risk. For NEPM ASC 2013 guidelines for dust inhalation and soil ingestion; for sample BH01 0.50, PAHs exceeded HIL C Class (recreation) investigation limits and Benzo(a)pyrene exceeded both HIL C Class and HIL D Class (commercial/industrial), and for sample BH02 0.50, Benzo(a)pyrene exceeded HIL C Class.
- <u>Excavated Soil Management:</u> In terms of *IB105*, the soil is a mixture of Level 1 Material (Clean Fill), Level 2 Material (Low Level Contaminated Soil), Level 3 and Level 4 Material (Contaminated Soil). If the soil is to be disturbed, it must be handled in accordance with IB105 and disposed of in line with IB105 and Controlled Waste Guidelines.

GES recommends the following:

- There are human health guideline exceedances for dust inhalation and soil ingestion, a Contamination Management Plan (CMP) will be required to mitigate risks to human receptors prior to development at the site.
- There are exceedances for ESL and EIL ecological guideline limits. A Soil and Water Management Plan (SWMP) will be required to account for the management and erosion of soil with ecological impacts during developments at the site.
- Any disposal of soil off site must be in accordance with IB105 and the controlled waste regulations. Excavated soil will require disposal at a suitable waste facility and a permit to transport the waste (obtained through the EPA) will be required.

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Plates

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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
BTEXN	Benzene Toluene Ethylbenzene Xylene Naphthalene
COA	Certificate of Analysis
COC	Chain of Custody
COPC	Contaminant of Potential Concern
CRC CARE	Corporative Research Centre for Contamination Assessment and Remediation of the Environment
CSM	Conceptual Site Model
DQO	Data Quality Objectives
EOH	End Of Hole
EIL	Ecological Investigation Levels
ESL	Ecological Screening Levels
EPA	Environmental Protection Authority
ESA	Environmental Site Assessment
GDA94	Geocentric Datum of Australia 1994
GES	Geo-Environmental Solutions Pty. Ltd.
HIL	Health Investigation Levels
HSL	Health Screening Levels
IL	Investigation Levels
LOR	Limits of Reporting
MDL	Mean Detection Limit
NATA	National Association of Testing Authorities
NEPM ASC	National Environmental Protection (Assessment of Site Contamination) Measure
NHMRC	National Health and Medical Research Council
NL	Non Limiting
NRMMC	Natural Resource Management Ministerial Council
PAH	Polynuclear Aromatic Hydrocarbons
PCP	Physico-Chemical Parameters
PHC	Petroleum Hydrocarbons
PID	Photo-Ionisation Detector
PPA	Preferential (PVI) Pathways Assessment
PVI	Petroleum Vapour Intrusion
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
USCS	Unified Soil Classification System

1 INTRODUCTION

1.1 General

This report presents the findings of an Environmental Site Assessment (ESA) undertaken by Geo-Environmental Solutions Pty. Ltd. (GES) at 175-179 Campbell Street, Hobart - hereby referred to as 'The Site'. The site location is presented in Figure 1 and the aerial photograph is presented in Figure 2. GES was commissioned by Solutionswon Group Pty Ltd to conduct the site assessment.

The site appears to of predominantly residential use for >50 years, and is surrounded by long-standing commercial and light industrial area. The ESA will compare contamination against E2.6.2 Excavation code of the Potentially Contaminated Land Code which will account for any future potential contact or excavation of earth such as services trenches or digging for foundations.

This ESA has been prepared by a suitably qualified and experience practitioner in accordance with procedures and practices detailed in National Environmental Protection Measure [Assessment of Site Contamination] (NEPM ASC; 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.

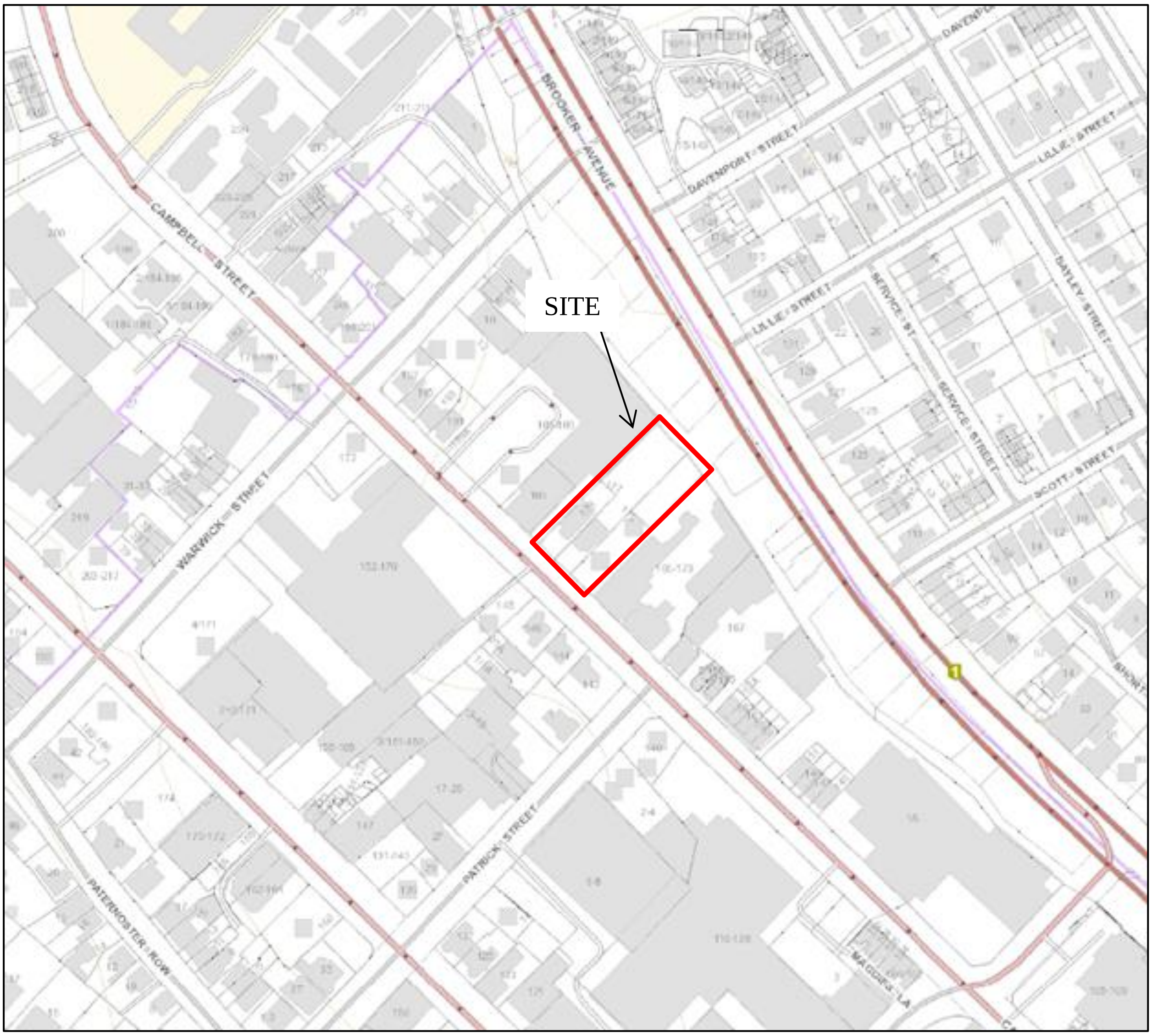

Figure 1 Site Location (Image C/O The LIST)

1.2 Site Layout

An aerial image of the existing site layout is presented in Figure 2.

Figure 2 Existing Site Layout (Image C/O The LIST)

1.3 Site Details

Site details are presented in Table 1.

Table 1 Site Details

SITE LOCATION: 175-179 Campbell Street, Hobart, Tasmania
INVESTIGATION AREA The site, with attention to be paid to the area behind the existing houses
SITE ELEVATION & GRADIENT Approximately 20 m AHD gently SE sloping site
SITE SURFACING Sealed driveways, gravel hardstands, grasses and shrubs
TITLE REFERENCES The title references: CT 23364/1, 23364/2, 22529/3, 23363/1
SITE OWNER Building Group Apprenticeship Scheme Ltd
PREVIOUS LANDUSE Mixed residential then office use for at least 50 years
SITE SURROUNDING LAND ZONING *Tasmanian Interim Planning Scheme 2015; Urban Mixed Use*
SITE LAND USE Mixed offices and residential
PROPOSED LAND USE Mixed offices and residential
SURROUNDING LAND USE: Adjacent properties all Urban mixed use, mix of offices, retail and residential

1.4 Investigation Objectives

The objective of this ESA was to investigate the site for contamination, we have done this by addressing E2.6.2 performance criteria under the *Hobart City Council Interim Planning scheme 2015* for excavation. To assess the suitability and safety of the soil for excavation at a typical depth foundations and services, and any human or environmental risks of the soil present on site.

Given the potential for contamination leaching to depth from upgradient sources, we have investigated the soil at a variety of depths where possible, and investigated any groundwater if found during testing.

1.5 Scope of Works

The scope of work for this ESA was to:

- Conduct a desktop and an invasive soil investigation at the site.
- Drill seven (7) soil bores and collect sixteen (16) primary soil samples, and any groundwater samples if groundwater is present (note – groundwater was not present); the primary samples were sent for analysis of total recoverable hydrocarbons (TRH) Benzene Toluene Ethylbenzene Xylene Naphthalene (BTEXN), Polynuclear Aromatic Hydrocarbons (PAH), and a suite of fifteen (15) metals to a National Association of Testing Authorities (NATA) accredited laboratory.
- Samples were sent with quality assurance/ quality control (QA/QC) samples including one rinsate blank, one duplicate sample.
- Determine the absence or presence and if present the level of site contamination and compare soil results against the relevant guidelines.
- Conduct a risk assessment, known as a Conceptual Site Model; and
- Report findings in an Environmental Site Assessment report, detailing specific onsite human health or environmental risk which may source from potentially detected contamination.

2 PLANNING

2.1 Overview

GES has previously conducted a desktop Preliminary Site Investigation (PSI) at the site (GES 2021) to determine likelihood of contamination. The client has requested an Environmental Site Assessment to test for contamination and as a requirement for lodging a development application at the site. Plans include a development of units behind the existing houses, with a car parking basement below the proposed units, refer to Appendix 2 for plans.

The site is not considered a potentially contaminated site by Hobart City Council (HCC), but it is identified as sharing a boundary with a potentially contaminated site at 181-189 Campbell Street.

The site is within a long standing commercial and light industrial area, with decommissioned underground fuel storage identified at 181-189 Campbell Street, 12 Warwick Street and 171 Argyle Street. Given the long history of commercial and light industrial operations in the area (notably upgradient mechanics and workshops), other potential sources of contamination may be present. Identifying all potential contamination sources is beyond the scope of this report.

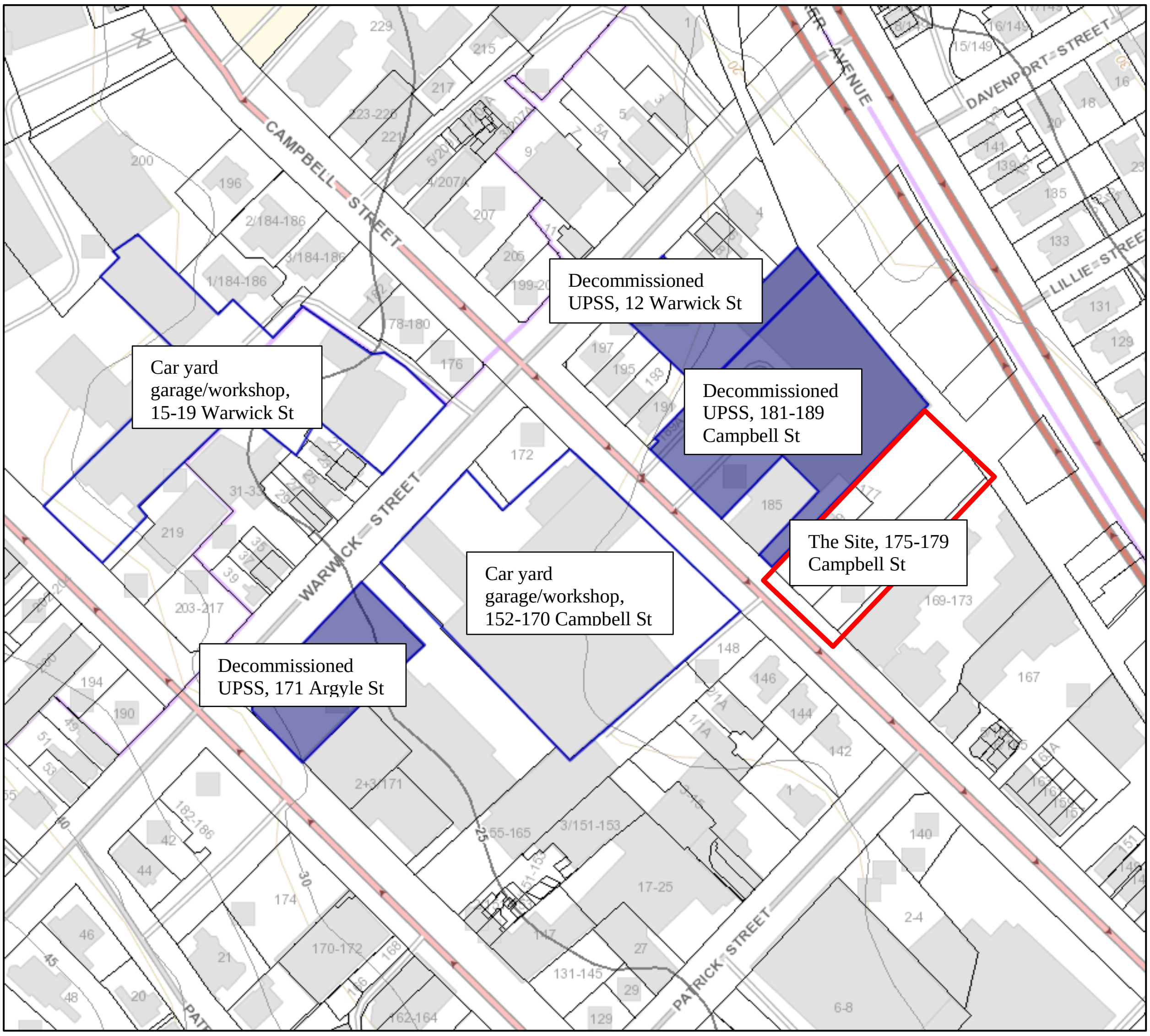

Figure 3 Potentially Contaminated Sites

2.1.1 Excavation Works E2.6.2 P1

For this investigation we have addressed E2.6.2 P1 performance criteria to determine levels of potential contamination on site, of Hobart City Council's Interim Planning Scheme 2015. The performance criteria identify that any future potential excavation works must 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.

2.1.2 Statement of Suitability

A statement based on the results of the Environmental Site Assessment that the excavation as part of the planned works will not adversely impact on human health or the environment is to be provided (subject to implementation of any identified remediation and/or protection measures as required).

3 DESKTOP STUDY

3.1 Site Zoning

The site is zoned *Urban Mixed Use* under the Tasmanian Interim Planning Scheme of 2015. The adjacent land on the north eastern side of Campbell Street is also zoned mixed use whilst the land on the south western side of Campbell Street is zoned commercial – see Figure 4. The site is to be assessed against land use Class D for Commercial and Industrial land use, for construction of units that will be not in direct contact with soil, due to a car parking basement below the units. A small strip of ground along the north western edge of the units will be retained and landscaped (see Appendix 2 for architect plans), and this area should be assessed against land use Class C for Recreational Land Use.

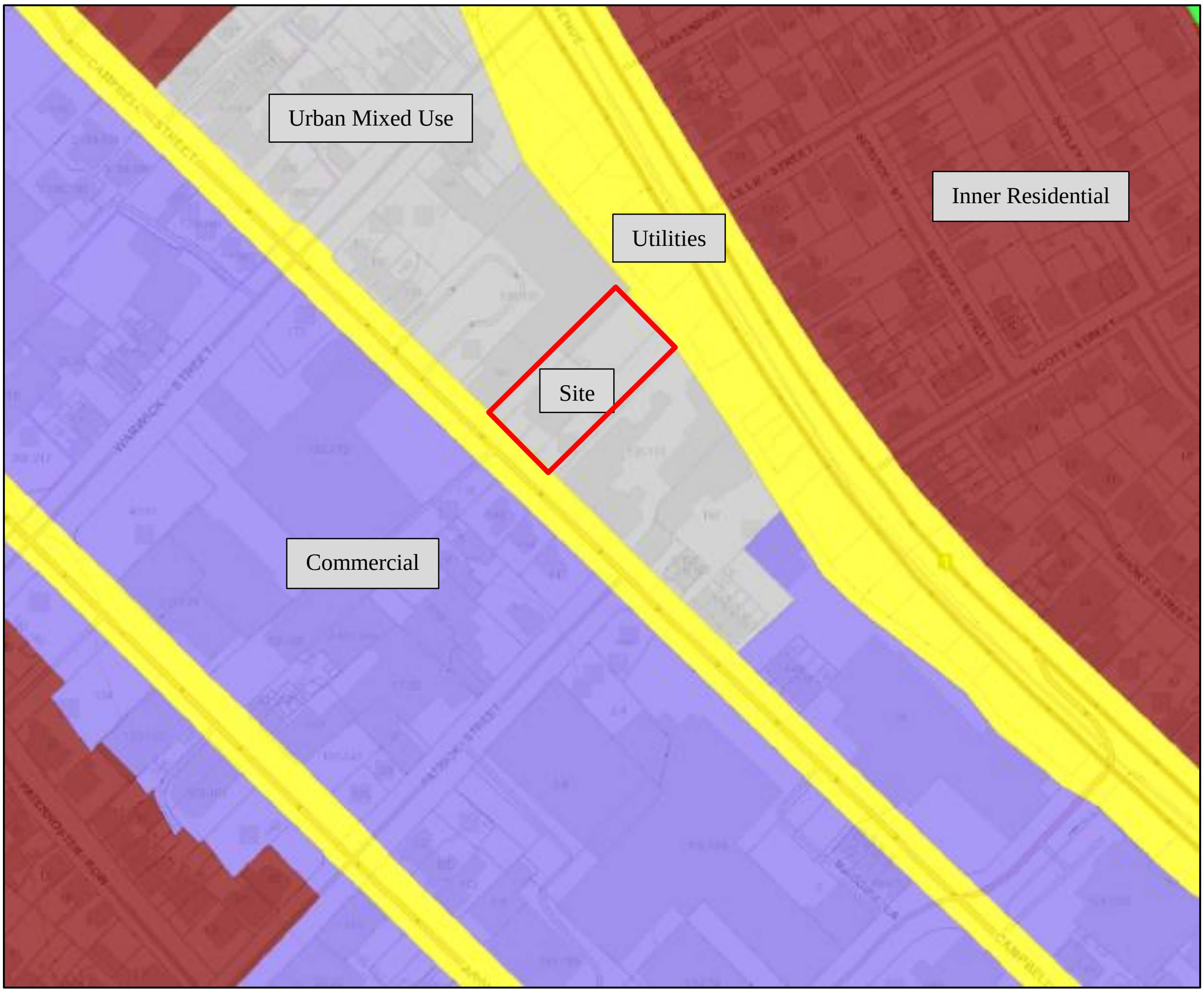

Figure 4 Hobart City Councils Interim Planning Scheme Zones (2015)

3.2 Site Walkover

An initial site walkover was completed by GES staff on 30th June 2021, an additional site walkover with soil sampling was completed by GES staff on the 26th October 2021. No obvious staining or odour of the site surface or underlying soil was observed. Images are presented in Appendix 3.

3.3 MRT Geology Mapping

The geology of the site has been mapped by Mineral Resources Tasmania, see Figure 5. The majority of the site is inferred to be underlain with **Qa** (Quaternary aged alluvial deposits), with a boundary to **Q** (Undifferentiated Quaternary sediments) around the buildings existing at the Campbell Street frontage. Triassic sandstone is likely to be present upslope. Geological descriptions follow:

R– Triassic – Undifferentiated Upper Parmeener Supergroup rocks.

Jd– Jurassic – Dolerite and related rocks.

Qa – Quaternary deposits – Alluvial gravel, sand and clay.

Q – Undifferentiated Quaternary sediments.

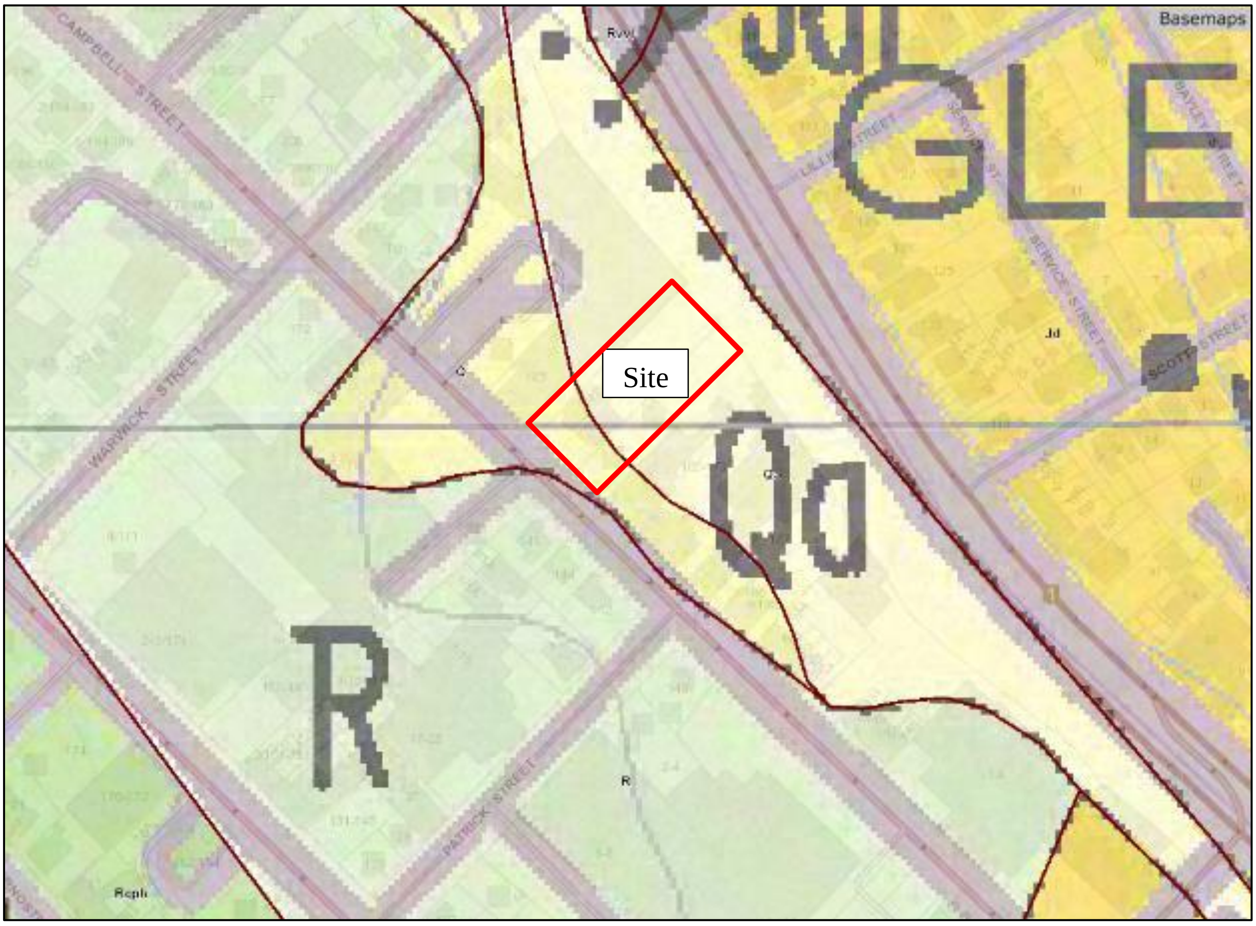

Figure 5 Mineral Resources Tasmania 1:25000 Scale Mapping (The LIST).

3.4 Hobart City Council Records

The Hobart City Council was contacted for comment. The following information was provided:

- The Site is not listed as a potentially contaminated site.
- The site adjacent to the site; 181-189 Campbell Street is listed as a potentially contaminated site. This site had underground fuel storage tanks which were decommissioned in 1999 as part of redevelopment of the site for a supermarket.
- The site at 12 Warwick Street formerly hosted underground fuel tanks which were decommissioned in 2010.

3.5 EPA Regulated Premises

There are no EPA Regulated Premises layer points on The LIST within a 500m radius of the Site. There are two sites listed as containing decommissioned former underground fuel infrastructure (pins as shown in Figure 6), 12 Warwick Street approximately 75m upgradient of the site and 171 Argyle Street approximately 130m upgradient of the site. The adjacent site at 181-189 Campbell Street is not listed despite council records indicating decommissioned former fuel tanks at the site.

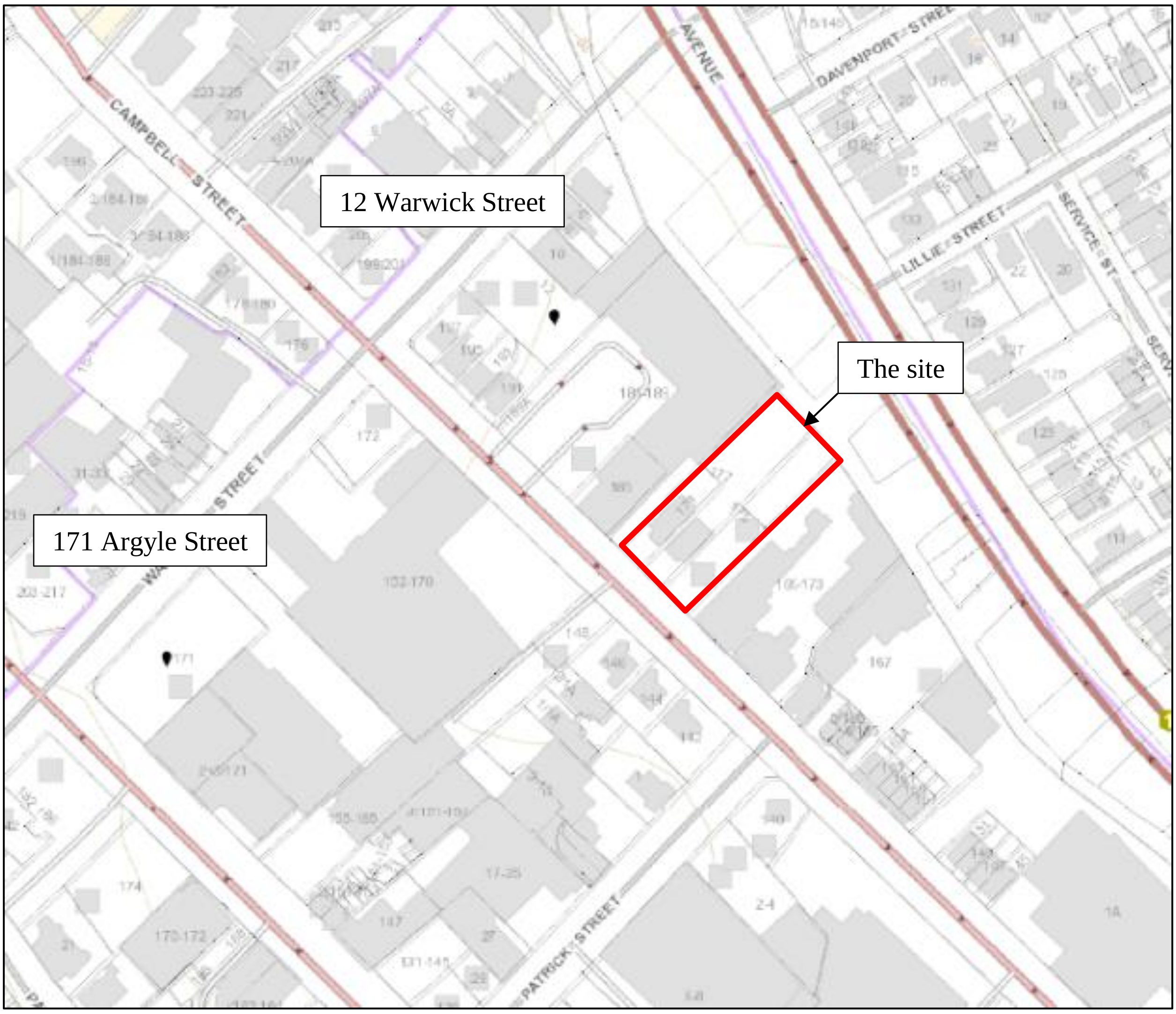

Figure 6 Spatial Relationship of nearby EPA listed premises (Image source The LIST)

3.6 WorkSafe Tasmania Records

WorkSafe Tasmania were contacted by phone to ascertain if a dangerous goods search was required for the site. The search was not deemed necessary as no files were held for the site. This includes any possible WorkSafe Tasmania records, and the EPA ERLUR records. A further search was not warranted given the site has predominantly been residential for the past 50 years and has not been used for any industrial purposes.

3.7 Previous Environmental Site Investigations

GES undertook a PSI of the Site in June 2021, with conclusions as follows:

> *The desktop investigation has identified there is low risk for contaminated soil or groundwater on site. However, it cannot be demonstrated without doubt that the land is not contaminated, given that there are records of dangerous goods storage (underground fuel tanks) on the adjacent site (181-189 Campbell Street). Therefore, it is recommended that an environmental site assessment be completed to test for contamination on the site prior to any site excavation and development works.*

GES is unaware of any other site investigations at the Site, or at the adjacent 181-189 Argyle Street.

3.8 Historical Aerial Photography Interpretation

Historical aerial photographs of the site and surrounding areas were accessed through the Department of Primary Industries, Parks, Water and Environment (DPIPWE) and Google Earth images were reviewed for the period 2003-2020. Individual aerial photos are presented in Appendix 4.

Error! Not a valid bookmark self-reference. Table 2 presents a summary of alterations to the site between photo events, and the individual aerial photos are presented in Appendix 4.

Table 2 Historical Aerial Photograph Review

Photo	Observations
1957	• The site features a house on each title, with gardens and small sheds visible in each backyard, consistent with residential use.
1969	• The site is unchanged from 1957.
1977	• The buildings on each site remain, the rear yard of 175 Campbell has been cleared and perhaps the building converted from residential to an office use
1989	• Renovations to 175 Campbell have occurred, new small warehouse building to rear of existing building on 175 Campbell, further clearing for car parking at rear of 177-179 Campbell
2020	• The site is largely unchanged from 1989

The surrounding area appears to feature commercial and light industrial premises surrounding the site in all photos, including the adjacent 181-189 Campbell Street (now a supermarket), and car yards on the opposite side of Campbell Street. This suggests a long history of commercial and light industrial operations in the general vicinity of the Site.

3.9 Site Topography, Drainage & Hydrogeology

The site is situated in a relatively flat area with a gentle gradient to the east, in a slight depression between Campbell Street and the Brooker Highway. Surface water from the site is likely to drain in a south easterly direction parallel with the Brooker Highway eventually towards the Hobart Rivulet. Groundwater is likely to have a low gradient and slow to moderate movement towards the south east. Refer to Figure 7.

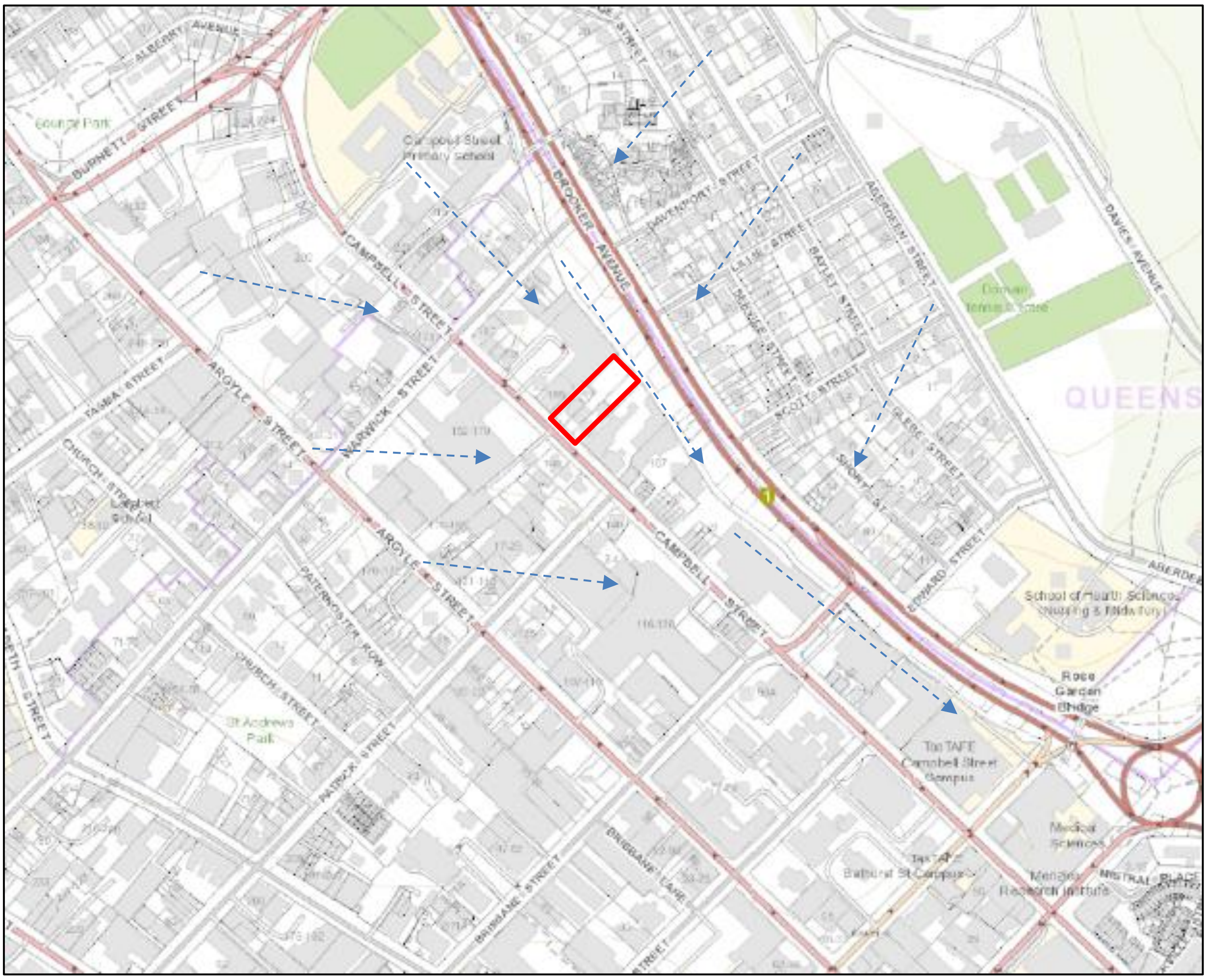

Figure 7 Contour Elevations and Inferred Surface and Groundwater Flow Direction

3.10 Groundwater

No groundwater was encountered during excavation and soil sampling at the Site, with boreholes terminating at depths between 1.7 and 2.2m BGS.

3.10.1 Potential Up-Gradient Contamination Sources

The presence of former upgradient underground fuel tanks is a potential contamination source for groundwater at the site. Given the long history of light industrial land use in the vicinity, other potential up-gradient contamination sources may be present, identifying all contamination sources is beyond the scope of this report.

3.10.2 Downgradient Ecosystem Receptors

The closest downgradient ecosystems are Hobart Rivulet approximately 800m to the south east, and the Derwent River approximately 1km to the south east. It is likely that groundwater will have slow movement, due to the low gradient in the area.

3.10.3 Registered Water Bores

The closest registered Water Bore is 2864 (Water Resources Tasmania, Groundwater Information Access Portal), located on the eastern side of the Queens Domain, 1.4km from the site. The bore is not in the same groundwater catchment of the Site and is not considered applicable to the Site. Water bores have not been considered further in this investigation.

3.11 Potential Contamination Issues

There is no evidence of any industrial operations, or storage of dangerous goods on the site.

The site has predominantly been used for residential purposes over the last 50+years, with more recent development on 175 Campbell Street for offices with an associated small warehouse storage building to the rear.

The rear of the site is also used for car parking. The chance of hydrocarbon contamination of soil due to occasional parking is considered low, however possible in surface soils. There is also potential for localised contamination from former residential use and the burning of coal or other backyard waste.

The main potential contamination impact upon the site is the former storage of fuel on the upgradient properties at 181-189 Campbell Street and 12 Warwick Street which may have impacted groundwater in the local area with hydrocarbons and lead.

3.11.1 Areas of Potential Concern

The areas of potential concern is the area of the site, in the event that soil or groundwater has been contaminated by the activities outlined above in Section 3.11.

3.11.2 Contaminants of Potential Concern

Potential contaminants of potential concern (COPC) that have been considered include the following:

- Total Petroleum/Recoverable Hydrocarbons (TPH/TRH);
- Mono Aromatic hydrocarbons: Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene (BTEXN);
- Polynuclear Aromatic Hydrocarbons (PAHs); and
- A suite of 15 Metals.

4 FIELD INVESTIGATION PROCEDURES

4.1 Works Summary

Site investigation works comprised of soil bore drilling which is summarised in Table 3 and Figure 8

Table 3 Summary of Site Investigation Work Dates

Scope	Data	Lab Report	Details
Geoprobe direct push drilling & Sample collection	21st October 2021	EM2121267 Primary Lab	16 Primary soil samples, 1 Duplicate sample, and 1 Rinsate sample were collected for analysis. No groundwater was encountered within the depths drilled, and no groundwater samples collected.

Figure 8 Borehole Plan (Aerial photo overlay)

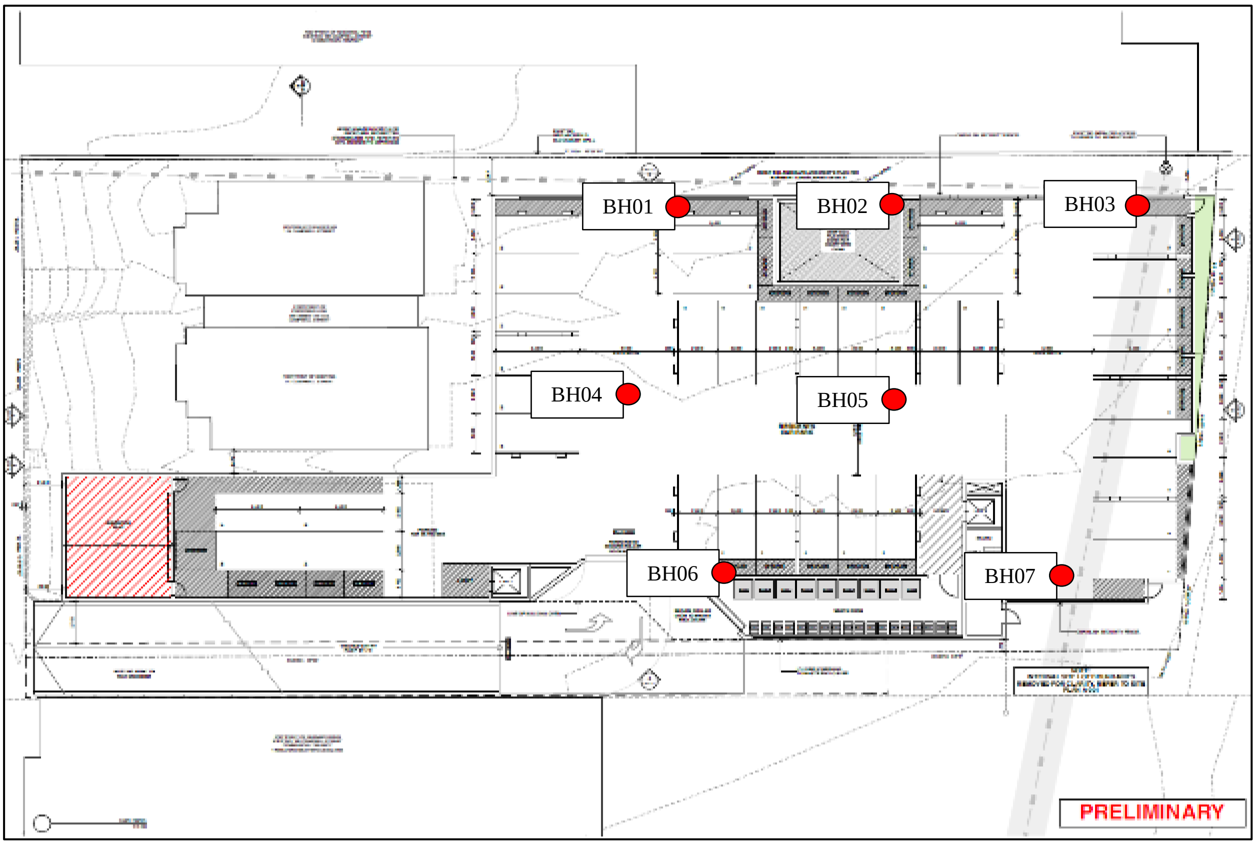

Figure 9 Borehole Plan (Preliminary Architect plans for ground level/basement)

4.2 Soil Investigation

4.2.1 Borehole Drilling

A total of seven 65 mm diameter soil bores drilled using the industry recognized Geoprobe direct push drilling system for assessing site geology and sampling for contamination impact.

4.2.2 Soil Sampling

Soil sampling was conducted per the National Environmental Protection Measure (NEPM ASC 2013) and AS4482 sampling guidelines. Table 4 presents a summary of the soil assessment methodology adopted at the site.

Table 4 Summary of Soil Sampling Methods

Activity	**Details / Comments**
Drilling Method	Geoprobe direct push drilling system, and 65mm hand auger to clear for services.
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 (hand auger) between each borehole sampling event.
Soil Screening	In accordance with AS4482.2. Individual soil samples were collected from the core tray at 0.5 intervals below ground surface (bgs) and/or change in geology. Collected samples were deemed to not have odour associated with hydrocarbon contamination, and screening for volatile fractions using a photoionisation Detector (PID) was deemed not necessary.
Laboratory Soil Sample Collection	In accordance with AS4482.2. All samples were collected using disposable nitrile gloves. Samples were selected for laboratory analysis: • at 0.5m below ground surface (bgs) • at 1.5m below ground surface (bgs) • at 2.2m or 2.5m below ground surface (bgs) A minimum number of samples were carefully selected which would provide enough information to delineate soil contamination.
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 ASC B3-2013) from collection to extraction.

4.2.3 Sample Analysis

Primary and QC samples were submitted to Analytical Laboratory Services (ALS), Springvale, Melbourne for analysis. A total of 18 samples (16 primary and 2 QC) were selected for analysis. Chain of Custody (COC) documentation was completed and is provided in Appendix 5 along with the Sample Receipt Notification (SRN) for each batch. Table 5 presents a summary of the laboratory analyses undertaken.

Table 5 Overview of Soil and Groundwater Analysis and Quality Control

Analytes	Primary Soil Samples	Duplicate Soil Samples[a]	Rinse Blank[b]
TRH	16	1	1
BTEXN	16	1	1
PAH	16	1	1
Suite 15 Metals	16	1	1

Sampling Quality Control Standards (AS4482):
a – Duplicate and Inter-Laboratory Split samples, one (1) in twenty (20) primary samples
b– Single rinse sample per piece of equipment per day

Given metals were 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 (CEC); and Soil pH. The soil physical properties were based on knowledge of similar soil types encountered around the greater Hobart area.

5 QUALITY CONTROL

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

5.1 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 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 6

Table 6 Soil Field QA/QC procedures and Compliance

QA/QC Requirement	Compliance	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 ASC 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 splits: Duplicate & inter-lab splits: 1 per 20 primary samples	No	1 duplicate sample was collected and analysed as per AS4482.1-2005. An inter-lab split sample was not collected.
QA/QC samples reported RPD's within indicated MDL guidelines.	No	For Duplicate and BH01 0.50 pairs, 57% of analytes complied. Non compliances were generally for hydrocarbons, particularly PAH, as outlined in Appendix 6. This suggest a non-uniform distribution of hydrocarbons within the soil samples.
Required numbers of rinse blank samples collected with no laboratory detections?	Yes	One rinse blank was collected, as per AS4482.1-2005.
Trip blanks collected with no laboratory detections?	NA	According to Australian Standards, there is no requirement to collect trip blanks, unless there is potential for hydrocarbon contamination.
Field blanks collected with no laboratory detections?	NA	According to Australian Standards, there is no requirement to collect field blanks, unless there is concern with cross contamination risks.
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.

5.2 Laboratory

Soil laboratory QA/QC procedures and compliance are summarised in Table 7.

Table 7 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 ASC 2013. Acceptable laboratory limits of reporting (LORs) adopted.
Method Blanks: zero to <Practical Quantitation Limit (PQL)	Yes	There were no method blank value outliers in the QCI report.
Laboratory Control Samples: 70% to 130% recovery for soil.	Yes	There were no laboratory control sample recovery outliers in the QCI report.
Matrix spikes: 70% to 130% recovery for organics or 80%-120% recovery for inorganics	Yes	There were no matrix spike outliers in the QCI report
Duplicate Samples: 0% to <20% RPD.	No	There were 19 duplicate sample RPD outliers in the EM2121267 QCI report. 17 of the RPD outliers are for hydrocarbons in sample BH01 0.50, and could be attributed to non-uniform distribution of hydrocarbons in that sample.
Surrogates: 70% to 130% recovery	Yes	There were no surrogate recovery outliers in the QCI report.
Analysis holding time outliers	Yes	There were no analysis holding time outliers in the QCI report.
Quality Control Sample Frequency Outliers	No	For EM2002563 QCI Report: For NEPM 2013 B3 & ALS QC Standard; PAH/Phenols; Laboratory Duplicates and Matrix Spikes below expected, TRH – Semivolatile Fraction; Laboratory Duplicates and Matrix Spikes below expected

6 FIELD INVESTIGATION FINDINGS

6.1 Soil Bores

6.1.1 Geological Interpretation

Our test holes yielded a clayey soil underneath a surface of fill material. Fill material is deeper at the north western edge (from 0.4m BGS at BH03 to 1.0m BGS at BH01 and BH02), and shallower at the south eastern edge (from 0.1m BGS at BH06 to 0.3m BGS at BH07). The fill material featured bricks in some samples suggesting debris from demolitions, and did not contain hydrocarbon odour. The geology of the site is mapped as Quaternary alluvial deposits, and clay soils below the fill surface are likely to have formed from alluvial deposits. Test holes yielded refusal on underlying rocks at depths around 1.7-2.2m BGS, the underlying rock may not be bedrock, as gravels encountered varied between test holes, which can be an indication of boulder deposits underlying alluvial clays.

6.1.2 Grain & Depth 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) relative to the proposed finished floor level.

Table 8 provides a summary of the grain class averages for material overlying the samples.

Table 8 Summary of Grain Class Based on USCS Classification

Sample	Footing Excavation Depth^ - Red / Fill Thickness^ - Green	Sample PVI Depth (m) Relative to Slab/Cut Depth	Soil Grain Size Class Averaging Above Soil Sample																		Attenuation				
			GW	GP	GM	GC	SW	SP	SM	SC	ML	CL	OL	MH	CH	OH	CI	Rock (R)	Existing Pavement (P)	Crawl Space Thickness (m)	Proposed CONCRETE (CH)	Crawl Space	Biodegradation	Petroleum Vapour Intrusion HSL Grain Class*	SAMPLE USCS
BH01 0.50	0.4	0.4	0.1									0.3								NA	0.1	1.0	1.0	CLAY	CL
BH01 1.50	0.4	1.5	0.4									0.5					0.5			NA	0.1	1.0	1.0	CLAY	CI
BH02 0.50	0.4	0.4										0.3								NA	0.1	1.0	1.0	CLAY	CL
BH02 1.50	0.4	1.5	0.4									0.5					0.5			NA	0.1	1.0	1.0	CLAY	CI
BH03 0.50	0.4	0.4										0.3					0.1			NA	0.1	1.0	1.0	CLAY	CI
BH03 1.50	0.4	1.5										0.3					1.1			NA	0.1	1.0	1.0	CLAY	CI
BH04 0.50	0.4	0.4										0.3					0.1			NA	0.1	1.0	1.0	CLAY	CI
BH04 1.50	0.4	1.5										0.3					1.1			NA	0.1	1.0	1.0	CLAY	CI
BH04 2.50	0.4	2.5										0.5					1.8			NA	0.1	1.0	1.0	CLAY	CL
BH05 0.50	0.4	0.4													0.3		0.1			NA	0.1	1.0	1.0	CLAY	CH
BH05 1.50	0.4	1.5													1.3		0.1			NA	0.1	1.0	1.0	CLAY	CH
BH05 2.20	0.4	2.2													1.7		0.3			NA	0.1	1.0	1.0	CLAY	CI
BH06 0.50	0.4	0.4													0.3					NA	0.1	1.0	1.0	CLAY	CH
BH06 1.50	0.4	1.5													1.4					NA	0.1	1.0	1.0	CLAY	CH
BH07 0.50	0.4	0.4								0.2					0.2					NA	0.1	1.0	1.0	CLAY	CH
BH07 1.50	0.4	1.5								0.2					1.2					NA	0.1	1.0	1.0	CLAY	CH

Footnotes:
* Grain class is modified based on proposed building construction: concrete is interpreted to have similar vapour intrusion properties to clay and is therefore designated as CLAY within the grain size averaging assessment; backfill is inferred to comprise of gravel (GW)
< Sample has been collected from above the proposed excavation (base of slab or proposed ground level) and is not relevant in PVI risk assessment
^ Excavation depths are approximate and may vary due to change in services depths or overall building/footing construction design

6.1.3 Soil Contamination Observations

No staining or odour consistent with hydrocarbon contamination were observed either on the site surface, or in the soil during the site visit. Collected samples were not observed to have any odour consistent with hydrocarbon contamination.

7 SOIL ECOLOGICAL IMPACT ASSESSMENT

7.1 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.

7.2 NEPM ASC (2013) Guidelines

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

- NEPM ASC (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 ASC 2013);
- NEPM ASC (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 ASC 2013).

Soil analytical results are compared against Ecological Screening Levels (ESL's) and EIL's limits presented in Table 9.

Table 9 Summary of Soil Contaminates Considered as part of this investigation, based on NEPM (2013) ASC

Investigation Levels (IL)	**Analytes Investigated**						
	Hydrocarbons				**Metals**		**DDT**
	BTEX	**TRH (F1 to F4)**	**Benzo(a) pyrene (PAH)**	**Naphthalene (PAH)**	**Zn, Cu, Cr(III), Ni & As**	**Lead**	
ESL's	Analysed	Analysed	Analysed				
EIL's				Analysed	Analysed	Analysed	Not Analysed

7.3 Guidelines

7.3.1 Ecological Screening Levels

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

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

Selection of ESL threshold investigation limits are set out in the NEPM ASC (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 ASC (2013) soil and land use classifications are presented below.

7.3.2 Ecological Investigation Levels

The following compounds were compared against Environmental Investigation Levels:

- Lead;
- Nickel;
- Chromium;
- Zinc;
- Copper;
- Arsenic; and
- Naphthalene.

There was a requirement to classify the soil according to physicochemical properties to develop investigation limits for 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 ASC (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 10.

We have selected Commercial and Industrial land use as most applicable as; The surrounding area is predominantly commercial premises, The proposed residential developments will be built above a carpark basement and not in direct contact with any soil, and a lack of ecological receptors being within an urban environment with contained stormwater networks.

Table 10 Adopted Land Use Scenario for the Soil Bores

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

Based on a preliminary assessment of site soil conditions, the following physicochemical properties are applied to assess guideline EIL's:

- Clay content consistent with field observations;
- A soil pH and cation exchange capacity (CEC) consistent with Table 11.

Table 11 Cation Exchange and Clay content, Adopted for the Site

Soil Physicochemical Properties Adopted for The Site			
USCS	Clay %	CEC	pH
R	100	10	6.0
GW	0	10	6.0
GP	0	10	6.0
GM	10	15	6.0
GC	30	20	6.0
SW	0	10	6.0
SP	0	10	6.0
SM	10	15	6.0
SC	20	20	6.0
ML	30	20	6.0
CL	100	35	6.0
OL	50	35	6.0
MH	30	35	6.0
CH	100	45	6.0
OH	100	60	6.0
PT	100	80	6.0
P	0	0	6.0
CL	100	35	6.0
CI	100	35	6.0
Rock	0	10	4.5

7.4 Findings

7.4.1 Ecological Screening Levels

Laboratory analytical results are presented in Appendix 7. Table 12 compares soil analytical results against relevant NEPM ASC (2013) ESL's. Concentrations which exceeded laboratory limit of reporting (LOR) are highlighted in bold, and ESL exceedances are highlighted with a coloured cell.

The concentration of Benzo(a)pyrene was 20-50x above ESL in BH01 0.50, and 5-20x above ESL in BH02 0.50, at commercial/industrial land use.

Table 12 Summary of Soil Analytical Results Compared with ESL's for commercial/industrial land use.

NEPM Ecological Screening Levels for Soil				BTEX				PAH	TRH			
Bold - Indicates LOR Exceedances X - Indicates Sample has been Excavated 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)
Sample ID	Sample Date	Soil Texture Class (fine / coarse)	Land Use	mg/kg	mg/kg	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 0.5	LOR 10	LOR 50	LOR 100	LOR 100
BH01 0.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	**27.4*** **	<10	**70**	**1440**	**240**
BH01 1.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH02 0.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	**9** **	<10	<50	**480**	**100**
BH02 1.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH03 0.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH03 1.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH04 0.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH04 1.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH04 2.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH05 0.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH05 1.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH05 2.20	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH06 0.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH06 1.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH07 0.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH07 1.50	21/10/21	F	COM/IND	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100

7.4.2 Ecological Investigation Levels

Table 13 compares soil analytical results against relevant EIL's. Concentrations which exceeded laboratory LOR are reported in the table, EIL exceedances are highlighted with a coloured cell. Zinc exceeded commercial/industrial guidelines by 1-2x in BH01 0.50.

Table 13 Soil Analytical Results Compared Against Ecological Investigation Levels commercial/industrial land use.

NEPM Ecological Investigation Levels for Soil

Bold - Indicates LOR Exceedances
X - Indicates Sample Within Inferred Excavation

Colour Shading - Indicates EIL 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 Texture Class (fine / coarse)	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
BH01 0.50	21/10/21	COM/IND	35	6 (3)	F	55	55	13	243	14	201	<5	<1
BH01 1.50	21/10/21	COM/IND	35	6 (3)	F	18	18	13	21	16	8	<5	<1
BH02 0.50	21/10/21	COM/IND	35	6 (3)	F	81	81	16	655	21	406	6	<1
BH02 1.50	21/10/21	COM/IND	35	6 (3)	F	23	23	14	22	14	9	<5	<1
BH03 0.50	21/10/21	COM/IND	35	6 (3)	F	42	42	16	43	24	37	<5	<1
BH03 1.50	21/10/21	COM/IND	35	6 (3)	F	39	39	22	22	14	6	<5	<1
BH04 0.50	21/10/21	COM/IND	35	6 (3)	F	22	22	12	14	20	12	<5	<1
BH04 1.50	21/10/21	COM/IND	35	6 (3)	F	31	31	13	17	16	6	<5	<1
BH04 2.50	21/10/21	COM/IND	35	6 (3)	F	15	15	16	29	13	5	<5	<1
BH05 0.50	21/10/21	COM/IND	45	6 (3)	F	36	36	18	20	28	16	<5	<1
BH05 1.50	21/10/21	COM/IND	45	6 (3)	F	23	23	13	18	14	<5	<5	<1
BH05 2.20	21/10/21	COM/IND	35	6 (3)	F	33	33	17	30	10	5	<5	<1
BH06 0.50	21/10/21	COM/IND	45	6 (3)	F	34	34	18	21	30	13	<5	<1
BH06 1.50	21/10/21	COM/IND	45	6 (3)	F	30	30	17	23	27	10	<5	<1
BH07 0.50	21/10/21	COM/IND	45	6 (3)	F	33	33	17	24	29	13	<5	<1
BH07 1.50	21/10/21	COM/IND	45	6 (3)	F	28	28	16	17	14	5	<5	<1

pH Designation:
(1) Using 0.01M CaCl2 extract. Rayment, G.E. and Lyons, D.J. (2011). "Soil Chemical Methods – Australasia". 495+20 pp. CSIRO Publishing, Melbourne.
(2) pHF (1:5). Adjusted by subtracting 0.75 with +/- 0.25 error to calibrate to the CaCl2 method (per comm. ALS Brisbane Acid Sulphate Soils Laboartory). Methods in accordance with Ahern, C.R., Stone Y., and Blunden B. (1998b). 'Acid Sulfate Soils Assessment Guidelines'. Acid Sulfate Soils Management Advisory Committee, Wollongbar, NSW, Australia.
(3) Classified in accordance with parent material typical soil pH as per the Tasmanian soils database

8 SOIL HUMAN HEALTH DIRECT CONTACT ASSESSMENT

8.1 Guidelines

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

- Trench workers repairing or building services (typically to 1 m bgs). This classification is not dependent on the land use class.
- Onsite workers which may be exposed to potential shallow soil impact during development of the site; and
- Onsite future residents having access to landscaped communal space on the site.

8.1.1 Land Use Classification

The NEPM ASC (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 ASC 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 centre, 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.

8.1.2 Adopted Land Use Classification

The adopted land use class is presented in Table 14. Land use class is based on the opportunity for soil access as per NEPM ASC 2013 guidelines. Soil contact is anticipated during the construction stage of the proposed project, with negligible opportunity for soil contact post-construction phase given residential properties are above a basement carpark, noting an exception being small areas of landscaped ground along the north western edge of the property which we have assessed as equivalent to open public space.

Table 14 Summary of Land Use Setting and Density for Determining Exposure Risk

Soil Bores	Construction Phase	Location	Land Use	Pathway	Land Use Class
All soil	During	Site	Construction worker and trench workers	ALL	D and trench worker specific
		Offsite	Commercial/ Industrial workers	DI	D
	Post	Site	Future maintenance workers including trench workers	ALL	D and trench worker specific
		Site	Future public space users	ALL	C
		Site	Residential site users above carpark basement	ALL	D

DC – Dermal Contact - Trench Worker Guidelines (CRC CARE 2013); DI – Dust Inhalation - HIL Guidelines (NEPM ASC 2013); SI – Soil Ingestion - HIL Guidelines (NEPM ASC 2013) or ALL – All of above

8.1.3 Health Investigation & Screening Levels

The main exposure pathways and methods for assessing heath risk from contaminated soils are presented in Table 15.

Table 15 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	HSL's (addressed in PVI sections)	NEPM ASC (2013)
Vapour Inhalation – Trench (PVI)			CRC CARE (Friebel & Nadebaum, 2011)
Dermal Contact		HSL's	
Dust Inhalation	Metals PAH's Chlorinated Solvents	Health Investigation Levels (HIL's)	NEPM ASC (2013)
Soil Ingestion			

PVI – Petroleum Vapour Intrusion

8.2 Findings

8.2.1 Dermal Contact - Petroleum Hydrocarbons

Laboratory analytical results are presented in Appendix 7. Table 16 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, HSL exceedances would be highlighted with a coloured cell indicating the highest HSL land used class which is exceeded.

There were no hydrocarbon guideline exceedances for dermal contact. No dermal contact risk has been identified.

Table 16 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									
21/10/2021	BH01 0.50	<0.2	<0.5	<0.5	<0.5	<1	<10	**70**	**1440**	**240**
21/10/2021	BH01 1.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH02 0.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	**480**	**100**
21/10/2021	BH02 1.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH03 0.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH03 1.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH04 0.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH04 1.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH04 2.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH05 0.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH05 1.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH05 2.20	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH06 0.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH06 1.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH07 0.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
21/10/2021	BH07 1.50	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100

8.2.2 Dust Inhalation & Soil Ingestion

Laboratory analytical results are presented in Appendix 7. Soil analytical results are compared against combined dust inhalation and soil ingestion risk is assessed through the application of NEPM ASC (2013) Health Investigation Levels (HILs) for exposure to soil contaminants are presented in Table 17. Concentrations which exceed laboratory LOR are highlight in bold (except for the metals), and HIL exceedances are highlighted with a coloured cell indicating the highest HIL land used class which is exceeded.

There were guideline exceedances for dust inhalation and soil ingestion for Benzo(a)pyrene in BH01 0.50 exceeding both Recreational HILs (open space area post-construction) and Commercial/Industrial HILs (site workers, construction phase).

There were guideline exceedances for dust inhalation and soil ingestion for Benzo(a)pyrene in BH02 0.50 exceeding Recreational HILs (open space area post-construction) but below Commercial/Industrial HILs (site workers, construction phase).

There were guideline exceedances for dust inhalation and soil ingestion for Total PAHs in BH01 0.50 exceeding Recreational HILs (open space area post-construction), but below Commercial/Industrial HILs (site workers, construction phase).

Table 17 Soil Analytical Results Compared Against NEPM ASC (2013) Health Investigation Levels Guidelines

NEPM Health Investigation Levels (HIL's) **Dust Inhalation and Soil Ingestion Assessment** X - Indicates Sample Within Proposed Excavation Zone			Moisture Content	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	50	1	2	2	5	5	5	2	5	5	2	5	5	5	0.1
HIL A Low Density Residential		☑ HIL A		100		60	4500	20		100	6000	300	3800	400	200		7400	40
HIL B Medium/High Density Resident		☑ HIL B		500		90	40000	150		600	30000	1200	14000	1200	1400		60000	120
HIL C Recreational		☑ HIL C		300		90	20000	90		300	17000	600	19000	1200	700		30000	80
HIL D Commerial/Industrial		☑ HIL D		3000		500	300000	900		4000	240000	1500	60000	6000	10000		400000	730
HIDE ROW		D		3000		500	300000	900		4000	240000	1500	60000	6000	10000			730
Sample date:	Sample ID																	
21/10/2021	BH01 0.50		16.7	<5	140	<1	<50	<1	14	10	55	201	273	13	<5	46	243	0.2
21/10/2021	BH01 1.50		17.5	<5	40	<1	<50	<1	16	11	18	8	71	13	<5	39	21	<0.1
21/10/2021	BH02 0.50		17.1	6	270	<1	<50	2	21	18	81	406	401	16	<5	79	655	0.4
21/10/2021	BH02 1.50		18.6	<5	70	<1	<50	<1	14	18	23	9	268	14	<5	52	22	<0.1
21/10/2021	BH03 0.50		24.6	<5	120	<1	<50	<1	24	12	42	37	296	16	<5	88	43	0.3
21/10/2021	BH03 1.50		16.3	<5	20	<1	<50	<1	14	19	39	6	177	22	<5	143	22	<0.1
21/10/2021	BH04 0.50		21.3	<5	110	<1	<50	<1	20	7	22	12	79	12	<5	66	14	<0.1
21/10/2021	BH04 1.50		20.6	<5	60	<1	<50	<1	16	12	31	6	115	13	<5	55	17	<0.1
21/10/2021	BH04 2.50		13.2	<5	20	<1	<50	<1	13	10	15	5	102	16	<5	25	29	<0.1
21/10/2021	BH05 0.50		30.6	<5	140	1	<50	<1	28	19	36	16	567	18	<5	103	20	<0.1
21/10/2021	BH05 1.50		18.3	<5	20	<1	<50	<1	14	10	23	<5	93	13	<5	41	18	<0.1
21/10/2021	BH05 2.20		16.5	<5	50	<1	<50	<1	10	14	33	5	272	17	<5	81	30	<0.1
21/10/2021	BH06 0.50		31.5	<5	160	1	<50	<1	30	12	34	13	173	18	<5	94	21	<0.1
21/10/2021	BH06 1.50		30.4	<5	70	<1	<50	<1	27	9	30	10	142	17	<5	69	23	<0.1
21/10/2021	BH07 0.50		25	<5	120	1	<50	<1	29	10	33	13	95	17	<5	98	24	<0.1
21/10/2021	BH07 1.50		17.1	<5	20	<1	<50	<1	14	12	28	5	62	16	<5	71	17	<0.1

			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		☑ HIL A																	300	3
HIL B Medium/High Density Resident		☑ HIL B																	400	4
HIL C Recreational		☑ HIL C																	300	3
HIL D Commerial/Industrial		☑ HIL D																	4000	40
HIDE ROW		D																	4000	40
Sample date:	Sample ID																			
21/10/2021	BH01 0.50		1.0	7.8	1.6	8.3	79.6	15.9	74.6	73.9	30.4	28.6	17.2	17.7	27.4	14.1	4.4	16.1	**419**	**40**
21/10/2021	BH01 1.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH02 0.50		<0.5	1.8	<0.5	1.2	13.6	3.6	18.0	19.4	9.2	9.4	5.9	7.7	9.0	4.7	1.5	5.4	**110**	**13**
21/10/2021	BH02 1.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH03 0.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH03 1.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH04 0.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH04 1.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH04 2.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH05 0.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH05 1.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH05 2.20		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH06 0.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH06 1.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH07 0.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
21/10/2021	BH07 1.50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

9 INDOOR INHABITANT PVI ASSESSMENT – HSL's

This PVI assessment has been conducted in accordance with relevant CRC CARE Technical Documentation and NEPM ASC 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 odours;
- 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.

9.1 Selected Media for Assessing PVI Risk

Table 18 presents a summary of the preferred HSL approach to assessing PVI risk. In this case, all soil investigated was within the excavation zone and within the water table.

Table 18 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	More robust and reliable that soil in determining onsite and in particular, offsite risks. Determining PVI risk based on groundwater is inherently conservative when interpreting vapour risk to account for not readily discernible 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. Soil results provide localised information.	Tertiary

9.2 Land Use Class

For surrounding properties, the potential PVI risk is characterized through application of CRC CARE HSL's for each individual property 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 commercial spaces, and residential dwellings above basement car parks* – All test holes

9.3 Soil Assessment

Laboratory analytical results are presented in Appendix 7. Table 19 presents the results against a potential indoor vapour risk. Concentrations which exceeded laboratory LOR are highlighted in bold. HSL exceedances would be highlighted with a coloured cell.

There was no indoor vapour risk identified.

Table 19 Soil Analytical Results Compared Against HSL D for Indoor Vapour Risk

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 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
BH01 0.50	21/10/2021	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	**70**
BH01 1.50	21/10/2021	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 0.50	21/10/2021	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 1.50	21/10/2021	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.50	21/10/2021	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 1.50	21/10/2021	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.50	21/10/2021	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 1.50	21/10/2021	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 2.50	21/10/2021	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 0.50	21/10/2021	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 1.50	21/10/2021	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 2.20	21/10/2021	2 - 4	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH06 0.50	21/10/2021	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH06 1.50	21/10/2021	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH07 0.50	21/10/2021	0 - 1	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH07 1.50	21/10/2021	1 - 2	CLAY	D	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

10 TRENCH WORKER PVI ASSESSMENT – HSL's

10.1 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 vapours from soil and soil vapours. Groundwater is generally not used to assess risk as threshold 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:

- Dominant grain size class of material at the soil sample depth or based on the dominant grain class of the backfill material based on US Agriculture Soil Classification System (SCS) and partitioning into either sand, silt or clay; and
- Classifying soil according to depth ranges: 0 to 2 m; 2 to 4 m; 4 to 8 m; and greater than 8 m;

10.2 Findings

Laboratory analytical results are presented in Appendix 7. Summary of Soil Analytical Results Compared against HSL's for Assessing PVI Risk to Trench Workers are presented in Table 20. Concentrations that exceeded laboratory LOR are highlighted in bold, and if there were any HSL exceedances they would be highlighted with a coloured cell. There were no exceedances of the CRC CARE HSL guidelines for Assessing PVI Risk to Trench Workers and no risk identified.

Table 20 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
BH01 0.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	**70**
BH01 1.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 0.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 1.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 1.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 1.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 2.50	21/10/2021	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 0.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 1.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 2.20	21/10/2021	2 to 4m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH06 0.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH06 1.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH07 0.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH07 1.50	21/10/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

11 SOIL DISPOSAL ASSESSSMENT

11.1 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 four categories to classify contaminated soil as per Table 21:

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

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

Table 21 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*.

11.2 Findings

The soil samples have been compared against IB105 guidelines for potential future soil disposal, see Table 22. The following conclusions can be made:

- The soil tested from sample BH01 0.50 is equivalent to Level 4 Material (Contaminated Soil for Remediation) due to Benzo(a)pyrene and Sum of PAH's.
- The soil tested from sample BH02 0.50 is equivalent to Level 3 Material (Contaminated Soil) due to Benzo(a)pyrene and Sum of PAH's.
- The soil is equivalent to Level 2 (Low Level Contaminated Soil) in BH05 0.50 due to Manganese.
- The remaining 13 samples are equivalent to Level 1 (Clean Fill).

PAH's, and in particular Benzo(a)pyrene is often found in a less mobile form, and we would recommend leachate testing on further site investigations, as this could reduce the volume of material classified as Level 3 and Level 4 Material, and as a result reduce the costs of soil disposal.

Metals (Lead, Manganese and Zinc) are noted to be in higher concentrations in the upper horizons associated with fill, and not in the underlying clay soil, we consider that after hydrocarbon contamination has been dealt with, the remaining soil could be classified as Level 2 for overlying fill material, and Level 1 for underlying clayey natural soil.

Table 22 Soil Analytical Results Compared Against IB105 Investigation Limits for soil Disposal

Information Bulletin 105 **Classification and Management of Contaminated Soil For Disposal**		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Copper	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Benzo(a)pyrene	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes
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	mg/kg
LOR		50	1	2	5	5	2	5	5	5	0.1	2	5	5	0.5	10	50	0.5	0.2	0.5	0.5	0.5
Investigation Level Selected																						
IB105 Level 1		<20	<300	<2	<3	<50	<100	<100	<300	<500	<1	<60	<10	<200	<0.08	<65	<1000	<20	<1	<1	<3	<14
IB105 Level 2		20	300	2	3	50	100	100	300	500	1	60	10	200	0.08	65	1000	20	1	1	3	14
IB105 Level 3		200	3000	40	40	500	2000	200	1200	5000	30	600	50	14000	2	650	5000	40	5	100	100	180
IB105 Level 4		750	30000	400	400	5000	7500	1000	3000	25000	110	3000	200	50000	20	1000	10000	200	50	1000	1080	1800
21/10/2021	BH01 0.50	<5	140	<1	<1	14	55	10	201	273	0.2	13	<5	243	27.4	<10	1630	419	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH01 1.50	<5	40	<1	<1	16	18	11	8	71	<0.1	13	<5	21	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH02 0.50	6	270	<1	2	21	81	18	406	401	0.4	16	<5	655	9	<10	520	110	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH02 1.50	<5	70	<1	<1	14	23	18	9	268	<0.1	14	<5	22	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH03 0.50	<5	120	<1	<1	24	42	12	37	296	0.3	16	<5	43	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH03 1.50	<5	20	<1	<1	14	39	19	6	177	<0.1	22	<5	22	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH04 0.50	<5	110	<1	<1	20	22	7	12	79	<0.1	12	<5	14	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH04 1.50	<5	60	<1	<1	16	31	12	6	115	<0.1	13	<5	17	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH04 2.50	<5	20	<1	<1	13	15	10	5	102	<0.1	16	<5	29	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH05 0.50	<5	140	1	<1	28	36	19	16	567	<0.1	18	<5	20	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH05 1.50	<5	20	<1	<1	14	23	10	<5	93	<0.1	13	<5	18	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH05 2.20	<5	50	<1	<1	10	33	14	5	272	<0.1	17	<5	30	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH06 0.50	<5	160	1	<1	30	34	12	13	173	<0.1	18	<5	21	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH06 1.50	<5	70	<1	<1	27	30	9	10	142	<0.1	17	<5	23	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH07 0.50	<5	120	1	<1	29	33	10	13	95	<0.1	17	<5	24	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
21/10/2021	BH07 1.50	<5	20	<1	<1	14	28	12	5	62	<0.1	16	<5	17	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5

12 CONCEPTUAL SITE MODEL

12.1 Potential Contaminants

The Site has been used for residential properties for >50 years, and is within an area that has a long history of commercial and light industrial activities.

There is potential for contamination from off-site sources given the Site is within a long term commercial and light industrial area. The adjacent site at 181-189 Campbell Street had underground fuel storage systems decommissioned in 1999 (Hobart City Council Records).

Other potential contaminants include, the use of the site for car parking (with fuel or oil drips/leaks possible), and the presence of fill on the site of undetermined origins.

The potential contaminants include; Total Petroleum/Recoverable Hydrocarbons (TPH/TRH), Mono Aromatic hydrocarbons: Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene (BTEXN), Polynuclear Aromatic Hydrocarbons (PAHs), and a suite of 15 Metals.

Figure 10 illustrates potential risks that may be associated with potential site contamination. Potential pathways have been identified and ruled out in the Conceptual Site Model.

12.2 Potential Human Receptors

The proposed development is to construct units over an underground car park basement.

As a result there are limited areas where future residential site users may be in contact with potentially contaminated soil, with this area being limited to the easement area along the north western part of the site, and a communal courtyard. For the sake of potential human receptors, we will treat these areas as communal open space for future residents.

Potential human receptors also includes onsite construction workers during future potential site redevelopment and future trench workers (commercial land users / trench worker specific).

12.3 Potential Ecological Receptors

The closest ecological receptor is the River Derwent at Sullivans Cove which is approximately 1 km to the south east of the site, and Hobart Rivulet is 770m to the south east of the site. Hobart Rivulet is contained within a culvert, and discharges into the River Derwent approximately 1.2km to the East of the Site.

12.4 Identified Receptors

12.4.1 Identified Human Receptors

NEPM ASC (2013) human Health Investigation Limits were exceeded for soil ingestions and dust inhalation for Benzo(a)pyrene at BH01 0.50 at commercial/industrial land use (applies to construction workers), and at BH02 0.50 at recreational/open space land use. The investigation area is currently used for car parking. Consequently human health risks are considered plausible future, for the future potential construction phase, and then for any potential soil contact for future residential site users.

12.4.2 Identified Ecological Receptors

Two of the sixteen primary samples exceeded NEPM ASC (2013) Ecological Screening Levels for Benzo(a)pyrene at commercial/industrial investigation limits. Zinc exceeded NEPM ASC (2013) Ecological Investigation Levels in one sample at commercial/industrial investigation limits. The Benzo(a)pyrene and Zinc concentration appear elevated only in samples across the north western part of the site (BH01-03) and only at the 0.50m depth, which is reflective of the overlying fill material, and not the underlying clay soil material. Soil movement including erosion has a potential present risk to ecological receptors.

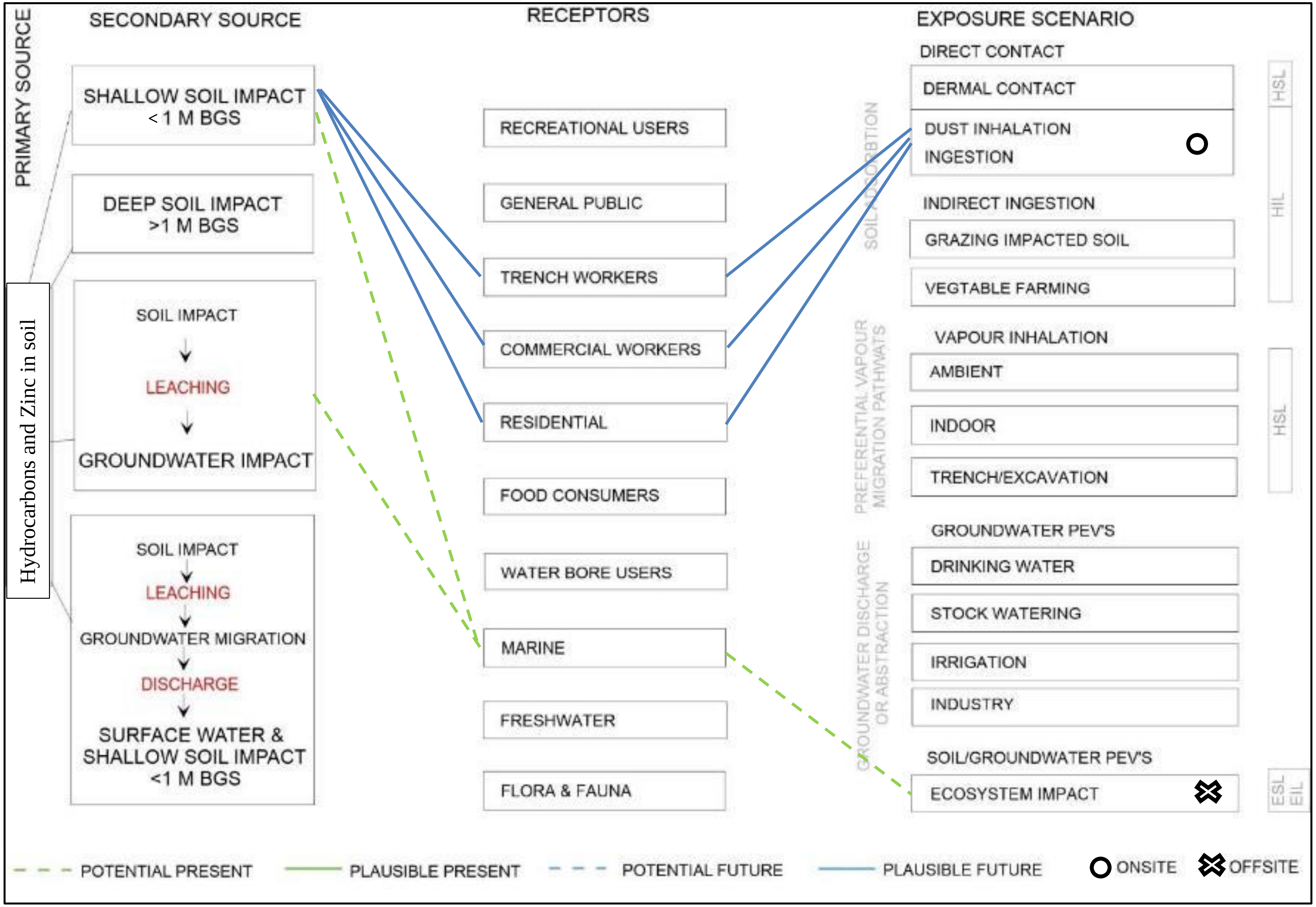

Figure 10 Conceptual Site Mode

13 CONCLUSIONS & RECOMMENDIATIONS

13.1 Desktop Assessment

The following information was gathered during the desktop investigation:

- The site is zoned *Urban Mixed Use* under the Hobart City Councils Interim Planning Scheme of 2015.
- The geology of the site is Quaternary alluvial deposits. Groundwater is inferred to travel south east along similar trajectory to the Brooker Highway towards the River Derwent. Surface water may be collected in stormwater culverts and discharged into Hobart Rivulet to the south east, or may infiltrate nearby unsealed areas to infiltrate into groundwater.
- A review of available information including historical aerial photographs suggests that it has been mostly residential land for 50+ years, with the buildings on site being converted to office use in more recent years.
- A review of available information including HCC, Worksafe Tasmania and EPA records, indicates that there are no records of potentially contaminating activities occurring on the site, or dangerous goods being stored on the site.
- The site is adjacent to a commercial warehouse and supermarket (formerly a commercial site with fuel storage) and as such there is potential for the presence of contaminants in the local area (HCC records).
- Contaminants Of Potential Concern (COPC) include the following: TPH/TRH; Mono Aromatic hydrocarbons: (BTEXN); PAH; and metals.

13.2 Adopted Guideline Settings

The following investigation limits were adopted for the site:

- Ecosystem receptor
  - Discharge to Hobart Rivulet and River Derwent – Urban ESL and EILs
- Human Receptor
  - HIL C//HIL D for soil direct contact risk to future open space site users that may have access to soil / Future construction workers
  - HIL C / HIL D for soil ingestion and dust inhalation risk to future open space site users in contact with soil / Future construction workers soil direct contact risk
  - HSL C / HSL D vapour risk to site users open space/ future potential trench workers

13.3 Soil Assessment

From the soil assessment, it is concluded that:

- Environment: For commercial/industrial investigation limits, Zinc was detected above NEPM ASC 2013 EIL guideline limits in one sample; BH02 0.50. Benzo(a)pyrene exceeded NEPM ASC 2013 ESL guideline limits in two samples; BH01 0.50 and BH02 0.50. Zinc and hydrocarbons were at elevated levels in the two samples mentioned, which corresponds with overlying fill material, and not the underlying clay soil. For any disturbance to the soil planned on the site, a Soil and Water Management Plan (SWMP) should be put in place to account for the management and erosion of soil with ecological impacts.

- Human Health: There were no human health guideline exceedances at HSL C or HSL D for dermal contact. For NEPM ASC 2013 guidelines for dust inhalation and soil ingestion; for sample BH01 0.50, PAHs exceeded HIL C Class (recreation) investigation limits and Benzo(a)pyrene exceeded both HIL C Class and HIL D Class (commercial/industrial), and for sample BH02 0.50, Benzo(a)pyrene exceeded HIL C Class. A Contamination Management Plan (CMP) will be required to account for the management of soil with human health impacts prior to any construction work on the site.
- Vapour Risk There were no indoor vapour risks or inhalation risk for trench workers or site users identified and therefore no risk to human receptors for vapour.
- Excavated Soil Management: In terms of *IB105*, of the sixteen samples*;* One sample (BH01 0.50) is considered Level 4 Material (Contaminated Soil) due to Benzo(a)pyrene and Sum of PAHs. One sample (BH02 0.50) is considered Level 3 Material (Contaminated Soil) due to Benzo(a)pyrene and Sum of PAHs. One sample (BH05 0.50) is considered Level 2 Material (Low Level Contaminated Soil) due to Manganese. The remaining thirteen samples can be considered Level 1 Material (Clean Fill). Elevated concentrations of metals (Lead, Zinc and Manganese) and hydrocarbons (Benzo(a)pyrene and total PAHs) were all observed in the overlying fill material at the site, and not in the underlying clayey natural soil profile.
- If the soil is to be disturbed, it must be handled in accordance with IB105 and disposed of in line with IB105 and Controlled Waste Guidelines. It is likely that soil excavation will occur on the site, and we recommend further testing to better delineate the areas of contamination, and we also recommend leachate testing of the PAH hydrocarbon fractions. The PAH fractions, and in particular Benzo(a)pyrene, are commonly found in less mobile forms, and as a result leachate testing may reduce the volume of soil requiring disposal as Level 3 and Level 4 material by reclassifying the material as Level 2 if found to be in less mobile forms.

13.4 Conclusion Summary

GES recommends the following:

- There are human health guideline exceedances for dust inhalation and soil ingestion for Benzo(a)pyrene at HIL Class D (commercial/industrial) levels, which is applicable to construction workers at the site during development. There are human health guideline exceedances for dust inhalation and soil ingestion for Benzo(a)pyrene and Total PAHs at HIL Class C (recreational) levels, which is applicable areas of open space post-development. As a result of this, a Contamination Management Plan will be required prior to development at the site.
- Zinc was detected above EIL guideline limits in one sample, and Benzo(a)pyrene exceeded ESL guideline limits in two of the sixteen primary samples. A Soil and Water Management Plan (SWMP) will be required to account for the management and erosion of soil with ecological impacts.
- For any soil disturbance on site, disposal of soil off site must be in accordance with IB105 and the controlled waste regulations. Excavated soil will require disposal at a suitable waste facility and a permit to transport the waste (obtained through the EPA) will be required.
- Elevated levels of hydrocarbon and metals were observed in the overlying fill material, and not in the underlying clayey soil material. We recommend further analysis focussing on the areas of identified contamination, to better delineate contamination. We also recommend future analysis to include leachate testing, as PAHs are often in less mobile forms and may present a lower IB105 Level Classification as a leachable fraction results.
- Any imported fill will need to be verified as Clean Fill in line with IB105.

Statement of Suitability.

Based on the results of this Environmental Site Assessment, the excavation as part of the planned works will not adversely impact on human health or the environment subject to implementation of remediation and/or protection measures including;

A Contamination Management Plan that addresses risk of dust inhalation and ingestion of hydrocarbon contaminated soil to human receptors during the construction phase, and in areas where soil may be present as open space post construction phase.

A Soil and Water Management Plan that to accounts for the management and erosion of soil with ecological impacts during the construction phase.

Yours faithfully,

Mark Downie B.Agr.Sci

Soil Scientist

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LIMITATIONS STATEMENT

This *Environmental Site Assessment* Report has been prepared in accordance with the scope of services between Geo-Environmental Solutions Pty. Ltd. (GES) and SolutionsWon Group 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

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- Principle Author and Principle Environmental Consultant
- PhD in Environmental Soil Chemistry from the University of Tasmania in 2007
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Mr Mark Downie B.Agr.Sc

- Soil Scientist
- 8 Year experience in contamination assessment and reporting of soils and groundwater.

Mr Grant McDonald (Adv. cert. hort.)

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

GES STAFF – CONTAMINATED SITES EXPERIENCE

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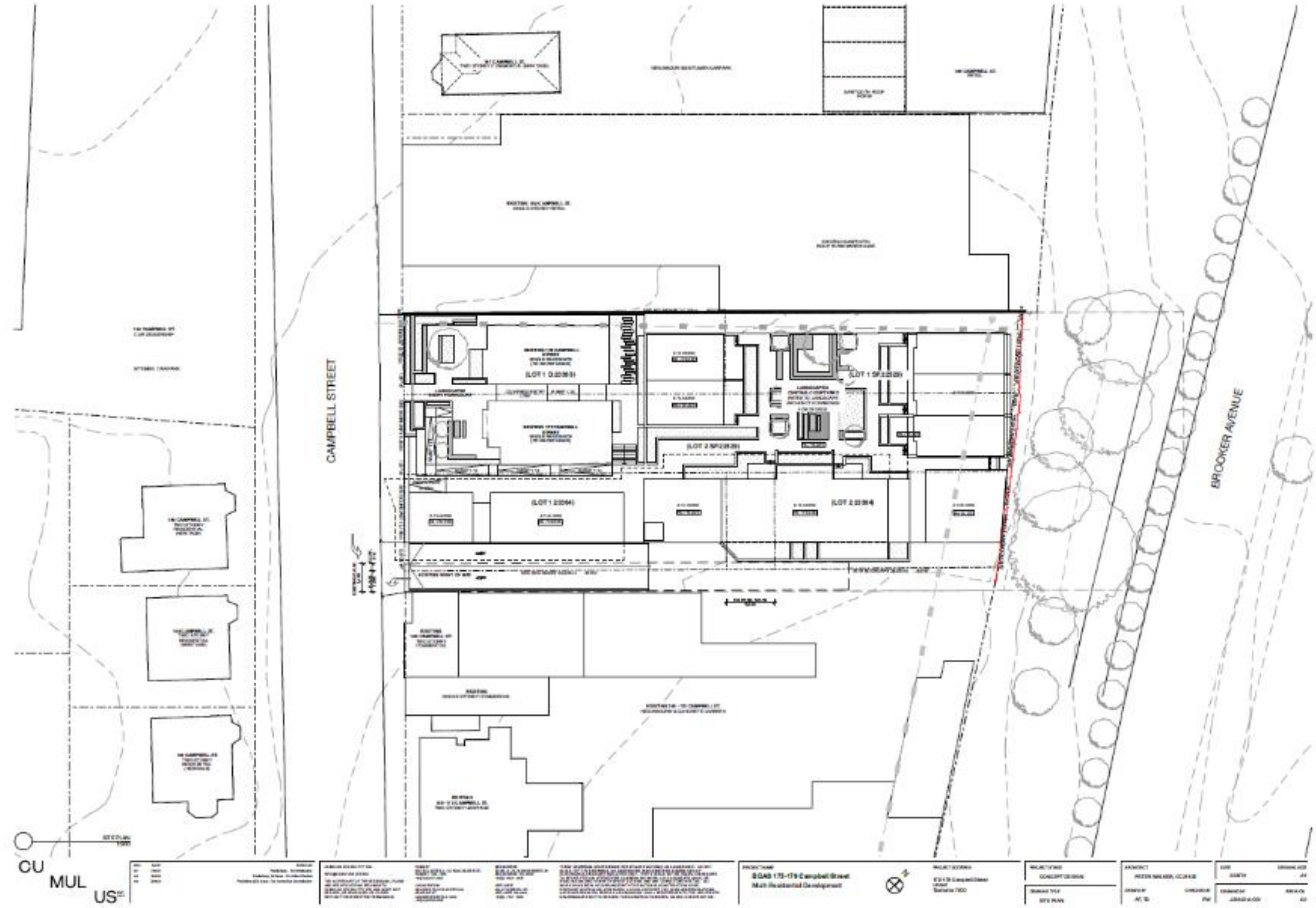
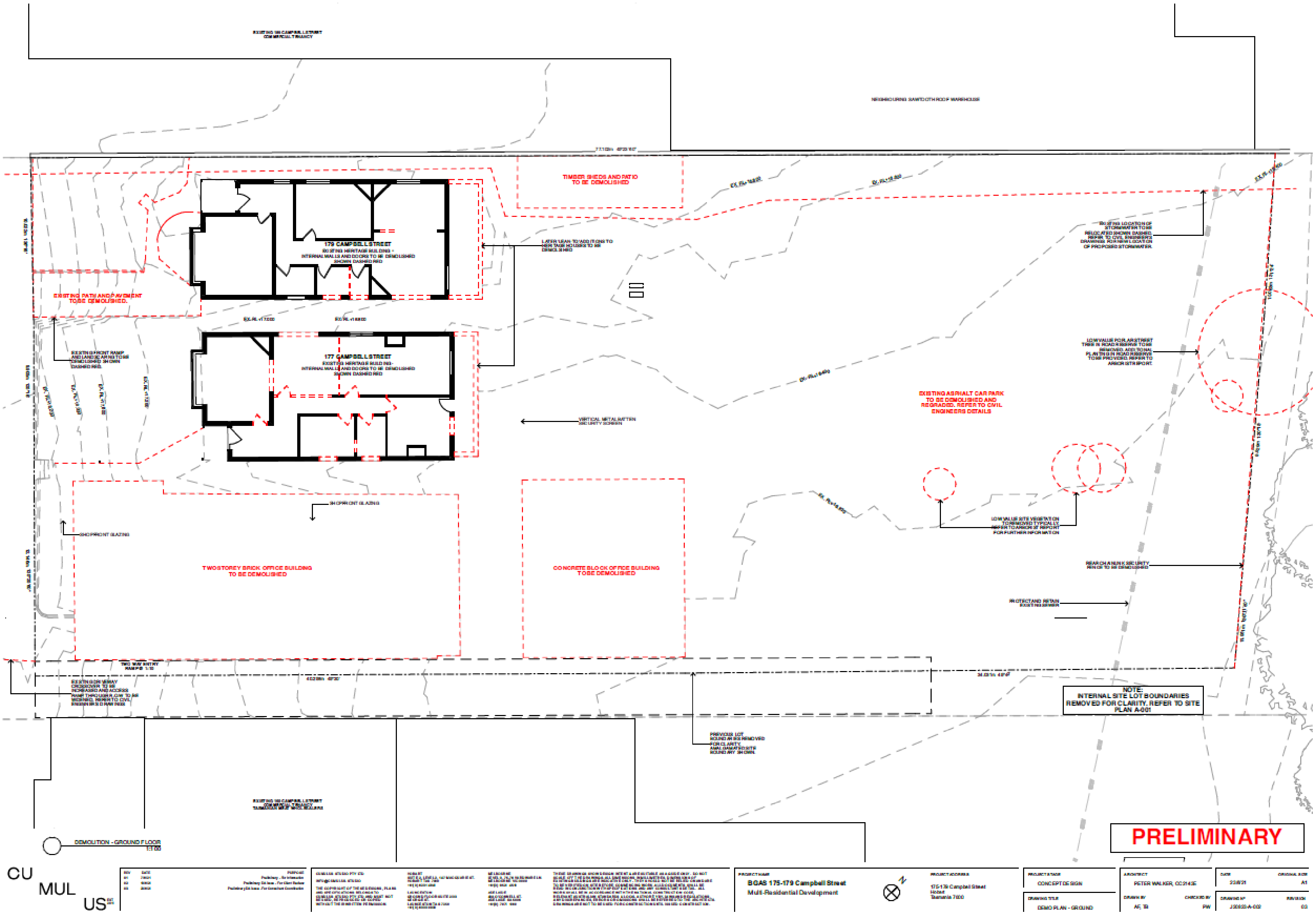
- Soil & Environmental Scientist
- 6 years' experience in hydrocarbon and heavy metal contamination assessment and reporting of soils and groundwater.

Mr Aaron Plummer (Cert. IV)

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

Appendix 2 Preliminary Plans (Cumulus Studio Architects)





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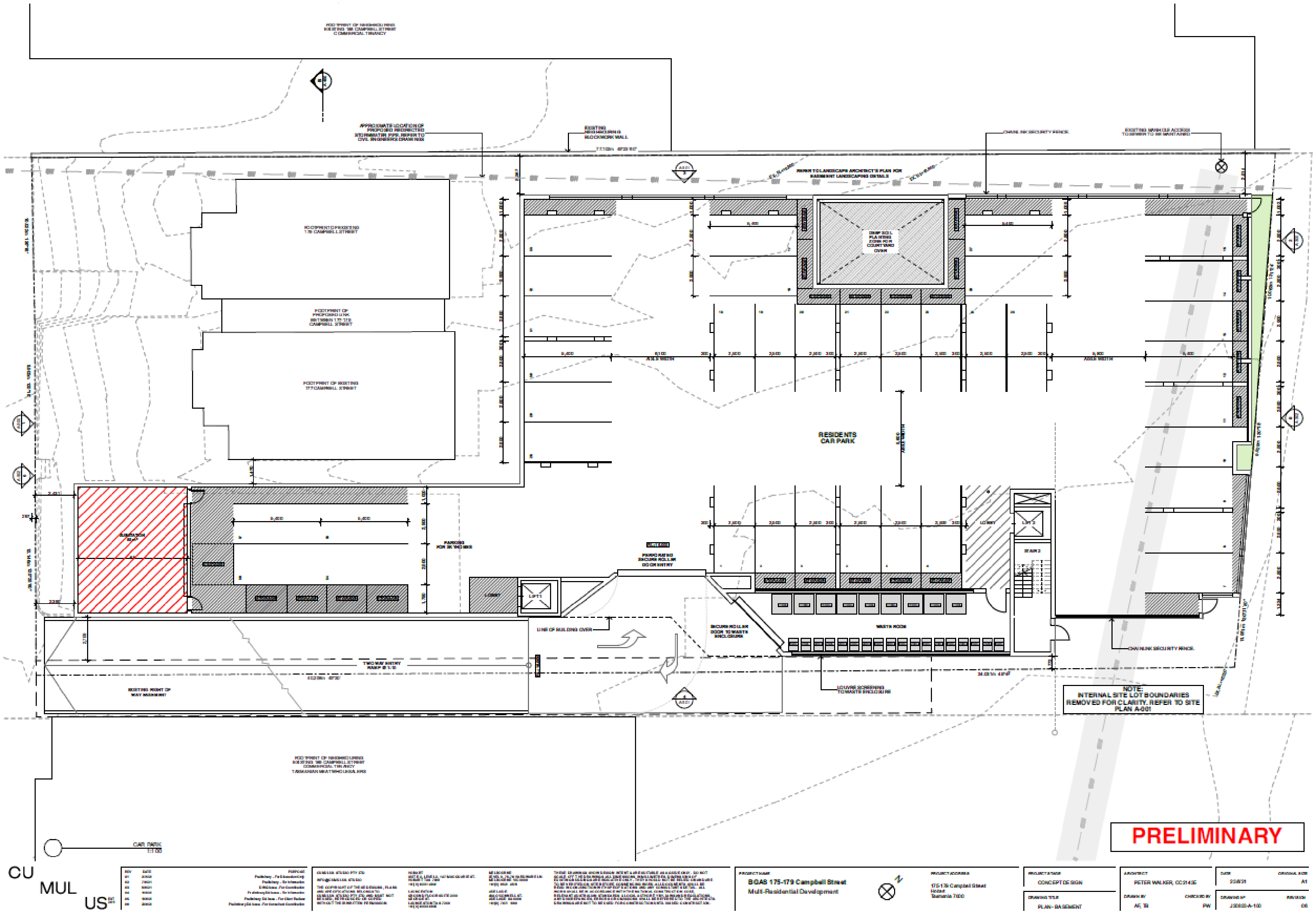
177 CAMPBELL STREET
EXISTING PATH AND PAVEMENT TO BE DEMOLISHED
EXISTING ASPHALT CAR PARK TO BE DEMOLISHED AND REGRADED. REFER TO CIVIL ENGINEERS DETAILS
TWO STOREY BRICK OFFICE BUILDING TO BE DEMOLISHED
CONCRETE BLOCK OFFICE BUILDING TO BE DEMOLISHED
NOTE: INTERNAL SITE LOT BOUNDARIES REMOVED FOR CLARITY. REFER TO SITE PLAN A-001
PRELIMINARY
DEMOLITION - GROUND FLOOR
BGAS 175-179 Campbell Street
Multi-Residential Development


RESIDENTS
CAR PARK
NOTE:
INTERNAL SITE LOT BOUNDARIES
REMOVED FOR CLARITY. REFER TO SITE
PLAN A-001
PRELIMINARY
CAR PARK
CU
MUL
US
BGAS 175-179 Campbell Street
Multi-Residential Development

PRELIMINARY

CU MUL US

Appendix 3 Site Photographs

June 2021 walkover:

October 2021 site investigation:

Appendix 4 Historical Aerial Photographs

Plate 1 Historical Aerial Photograph – January 2020 (C/O Google Earth)

Plate 2 Historical Aerial Photograph – October 2003 (C/O Google Earth)

Plate 3 Historical Aerial Photograph - 1989 (c/o DPIPWE)

Plate 4 Historical Aerial Photograph, 1977 (c/o DPIPWE)

Plate 5 Historical Aerial Photograph, 1969 (c/o DPIPWE)

Plate 6 Historical Aerial Photograph, 1958 (c/o DPIPWE)

Appendix 5 Chain of Custody (COC) and Sample Receipt Notification (SRN)

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EM2121267**		
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: jcumming@geosolutions.net.au	E-mail	: peter.ravlic@alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9645
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: Campbell	Page	: 1 of 3
Order number	: ----	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 26-Oct-2021 11:10	Issue Date	: 26-Oct-2021
Client Requested Due Date	: 03-Nov-2021	Scheduled Reporting Date	: **03-Nov-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 8.2°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 laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

RIGHT SOLUTIONS | RIGHT PARTNER

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	Sampling date / time	Sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 TRH/BTEXN/PAH (SIM)
EM2121267-001	21-Oct-2021 00:00	BH01 0.50	✓	✓	✓
EM2121267-002	21-Oct-2021 00:00	BH01 1.50	✓	✓	✓
EM2121267-003	21-Oct-2021 00:00	BH02 0.50	✓	✓	✓
EM2121267-004	21-Oct-2021 00:00	BH02 1.50	✓	✓	✓
EM2121267-005	21-Oct-2021 00:00	BH03 0.50	✓	✓	✓
EM2121267-006	21-Oct-2021 00:00	BH03 1.50	✓	✓	✓
EM2121267-007	21-Oct-2021 00:00	BH04 0.50	✓	✓	✓
EM2121267-008	21-Oct-2021 00:00	BH04 1.50	✓	✓	✓
EM2121267-009	21-Oct-2021 00:00	BH04 2.50	✓	✓	✓
EM2121267-010	21-Oct-2021 00:00	BH05 0.50	✓	✓	✓
EM2121267-011	21-Oct-2021 00:00	BH05 1.50	✓	✓	✓
EM2121267-012	21-Oct-2021 00:00	BH05 2.20	✓	✓	✓
EM2121267-013	21-Oct-2021 00:00	BH06 0.50	✓	✓	✓
EM2121267-014	21-Oct-2021 00:00	BH06 1.50	✓	✓	✓
EM2121267-015	21-Oct-2021 00:00	BH07 0.50	✓	✓	✓
EM2121267-016	21-Oct-2021 00:00	BH07 1.50	✓	✓	✓
EM2121267-017	21-Oct-2021 00:00	Duplicate	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - W-03T 15 Metals (Total) (NEPM)	WATER - W-07 TRH/BTEXN/PAH
EM2121267-018	21-Oct-2021 00:00	Rinsate	✓	✓

Proactive Holding Time Report

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

Requested Deliverables

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 - ESDAT (ESDAT)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
MARK DOWNIE		
- *AU Certificate of Analysis - NATA (COA)	Email	mdownie@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mdownie@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mdownie@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mdownie@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	mdownie@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	mdownie@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	mdownie@geosolutions.net.au
- EDI Format - ESDAT (ESDAT)	Email	mdownie@geosolutions.net.au

ALS Environmental

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

Environmental Division Melbourne
Work Order Reference
EM2121267

Telephone : + 61-3-8549 9600

CLIENT:	GEOENVIRONMENTAL SOLUTIONS	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	★ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	29 Kirksway Pl, Battery Point TAS 7004	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: ① 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
PROJECT:	CAMPBELL		
ORDER NUMBER:			
PROJECT MANAGER:	JP Cumming	CONTACT PH: 0413 541 531	
SAMPLER:		SAMPLER MOBILE: 0427 007 817	RELINQUISHED BY: G M. Dutch; DATE/TIME: 2pm 25.10.21
COC emailed to ALS? (YES / NO)		EDD FORMAT:	RECEIVED BY: DATE/TIME:
Email Reports to jcumming@geosolutions.net.au; mdownie@geosolutions.net.au			RELINQUISHED BY: DATE/TIME:
Email Invoice to jcumming@geosolutions.net.au; miran@geosolutions.net.au; mdownie@geosolutions.net.au			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

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).

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH, BTEXN, PAH,	NEPM 15 Metals	LOW LOR B(a)p	TRH C6 - C10	Tas EPA IB105 (no TBT)			HOLD	Additional Information: Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	BH01 0-0.50	21.10.21	Soil	JAR	1	✓	✓							
2	BH01 1.50				1	✓	✓							
3	BH02 0.50				1	✓	✓							
4	BH02 1.50				1	✓	✓							
5	BH03 0.50				1	✓	✓							
6	BH03 1.50				1	✓	✓							
7	BH04 0.50				1	✓	✓							
8	BH04 1.50				1	✓	✓							
9	BH04 2.50				1	✓	✓							
10	BH05 0.50				1	✓	✓							
11	BH05 1.50				1	✓	✓							
12	BH05 2.20				1	✓	✓							
TOTAL														

Received: Albert Carrier: - TasFast
Date: 26/10/21 - 11.10
Temp: 8.2 °C Seal: Y / N
Ice / Ice bricks / NA

ALS FREIGHT

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

ALS Environmental

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

[redacted]

CLIENT: GEOENVIRONMENTAL SOLUTIONS	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	★ Standard TAT (List due date):	
OFFICE: 29 Kirksway Pl, Battery Point TAS 7004		☐ Non Standard or urgent TAT (List due date):	
PROJECT: CAMPBELL	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	
ORDER NUMBER:		COC: 1 2 3 4 5 6 7	
PROJECT MANAGER: JP CUMMING	CONTACT PH: 0413 541 531	OF: 1 2 3 4 5 6 7	
SAMPLER: G M DONALD	SAMPLER MOBILE: 0427 007 887	RELINQUISHED BY: G M DONALD	RECEIVED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT:	DATE/TIME: 2pm 25.10.21	DATE/TIME:
Email Reports to jcumming@geosolutions.net.au; mdownie@geosolutions.net.au		RELINQUISHED BY:	RECEIVED BY:
Email Invoice to jcumming@geosolutions.net.au; miran@geosolutions.net.au, mdownie@geosolutions.net.au		DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

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.

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TRH, BTEXN, PAH,	NEPM 15 Metals	LOW LOR B(a)p	TRH C6 - C10	Tas EPA IB105 (no TBT)			HOLD	Additional Information
13	BH06 0.60	21.10.21	Soil	JAR	1	✓	✓							
14	BH06 1.50	|	|	|	1	✓	✓							
15	BH07 0.50	|	|	|	1	✓	✓							
16	BH07 1.50	|	|	|	1	✓	✓							
17	DUPLICATE	|	|		1	✓	✓							
18	RINSATE	|	WATER	1P 2SAV 1A	4	✓	✓							
						✓	✓							
						✓	✓							
						✓	✓							
						✓	✓							
						✓	✓							
						✓	✓							
						✓	✓							
					TOTAL 21									

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.

Appendix 6 Quality Assurance and Quality Control

Duplicate Comparrison	Sample	Moisture Content (dried @ 103'	Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Vanadium	Zinc	Mercury
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
LOR		1	50	1	2	5	5	5	2	5	5	2	5	5	0.1
21/10/2021	Duplicate	19.5	6	160	<1	<1	17	11	52	184	347	14	47	273	0.2
21/10/2021	BH01 0.50	16.7	<5	140	<1	<1	14	10	55	201	273	13	46	243	0.2
Relative Percentage Difference (RPD) %		15.5	NA	13.3	NA	NA	19.4	9.5	5.6	8.8	23.9	7.4	2.2	11.6	0.0
RPD Compliance Limit %			NA	15	NA	NA	50	50	30	30	30	50	50	30	50
Method Detection Limit (MDL)		20	NA	>100	NA	NA	100	100	200	500	500	40	100	500	2
MDL Class		LOW	NONE	HIGH	NONE	NONE	LOW	LOW	MED	MED	MED	LOW	LOW	MED	LOW
RPD Compliance With MDL?	32/56 (57%)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Duplicate Comparrison	Sample	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 hydr	Benzo(a)pyrene TEQ (WHO)
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
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
21/10/2021	Duplicate	0.5	2.1	<0.5	1.5	17.7	4.1	22.9	23.3	10.3	10.6	7.4	8.1	10.2	5.4	1.6	6.3	132	15.1
21/10/2021	BH01 0.50	1	7.8	1.6	8.3	79.6	15.9	74.6	73.9	30.4	28.6	17.2	17.7	27.4	14.1	4.4	16.1	419	40.2
Relative Percentage Difference (RPD) %		66.7	115.2	NA	138.8	127.2	118.0	106.1	104.1	98.8	91.8	79.7	74.4	91.5	89.2	93.3	87.5	104.2	90.8
RPD Compliance Limit %		NA	50	50	50	30	30	30	30	30	30	30	30	30	50	50	30	15	30
Method Detection Limit (MDL)		NA	10	10	10	50	50	50	50	50	50	50	50	50	10	10	50	>50	50
MDL Class		NONE	LOW	LOW	LOW	MED	MED	MED	MED	MED	MED	MED	MED	MED	LOW	LOW	MED	HIGH	MED
RPD Compliance With MDL?	32/56 (57%)	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Duplicate Comparrison	Sample	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)	C6 - C10 Fraction	F1	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	F2	Selenium	Boron	Benzo(a)pyrene TEQ (half LOR)	Benzo(a)pyrene TEQ (LOR)
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	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.2	0.5	0.5	0.5	0.5	0.2	0.5	1	10	50	100	100	50	10	10	50	100	100	50	50	5	2	0.5	0.5
21/10/2021	Duplicate	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	340	200	540	<10	<10	<50	480	<100	480	<50	<5	<50	15.1	15.1
21/10/2021	BH01 0.50	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	1150	480	1630	<10	<10	70	1440	240	1750	70	<5	<50	40.2	40.2
Relative Percentage Difference (RPD) %		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	108.7	82.4	100.5	NA	NA	NA	100.0	NA	113.9	NA	NA	NA	90.8	90.8
RPD Compliance Limit %		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	50	30	NA	NA	NA	50	NA	30	NA	NA	NA	30	30
Method Detection Limit (MDL)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2000	2000	5000	NA	NA	NA	2000	NA	5000	NA	NA	NA	50	50
MDL Class		NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	LOW	LOW	MED	NONE	NONE	NONE	LOW	NONE	MED	NONE	NONE	NONE	MED	MED
RPD Compliance With MDL?	32/56 (57%)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	YES	NO	YES	YES	YES	NO	NO

***Footnote: For Duplicate and BH01 0.50 pairs, 57% of analytes complied. Non compliances include: an RPD of 115% for Acenaphthylene where <50% was expected; Inconsistent Detection for Acenaphthene an RPD of 139% for Fluorene where <50% was expected; an RPD of 127% for Phenanthrene where <30% was expected; an RPD of 118% for Anthracene where <30% was expected; an RPD of 106% for Fluoranthene where <30% was expected; an RPD of 104% for Pyrene where <30% was expected; an RPD of 99% for Benz(a)anthracene where <30% was expected; an RPD of 92% for Chrysene where <30% was expected; an RPD of 80% for Benzo(b)fluoranthene where <30% was expected; an RPD of 74% for Benzo(k)fluoranthene where <30% was expected; an RPD of 91% for Benzo(a)pyrene where <30% was expected; an RPD of 89% for Indeno(1.2.3.cd)pyrene where <50% was expected; an RPD of 93% for Dibenz(a.h)anthracene where <50% was expected; an RPD of 88% for Benzo(g.h.i)perylene where <30% was expected; an RPD of 104% for Sum of polycyclic aromatic hydrocarbons where <15% was expected; an RPD of 91% for Benzo(a)pyrene TEQ (WHO) where <30% was expected; an RPD of 109% for C15 - C28 Fraction where <50% was expected; an RPD of 82% for C29 - C36 Fraction where <50% was expected; an RPD of 100% for C10 - C36 Fraction (sum) where <30% was expected; an RPD of 100% for >C16 - C34 Fraction where <50% was expected; an RPD of 114% for >C10 - C40 Fraction (sum) where <30% was expected; an RPD of 91% for Benzo(a)pyrene TEQ (half LOR) where <30% was expected; an RPD of 91% for Benzo(a)pyrene TEQ (LOR) where <30% was expected;**

Quality Control Blanks		Arsenic	Beryllium	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Boron	Mercury	Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Sum of BTEX	Naphthalene	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C6 - C10 Fraction	C6 - C10 Fraction minus BTEX (F1)	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	>C10 - C16 Fraction minus Naphthalene (F2)
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	mg/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
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	0.0001	1	2	2	2	2	2	1	5	20	50	100	50	50	20	20	100	100	100	100	100
Date	Sample																																			
21/10/2021	Rinsate	<0.001	<0.001	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100

Quality Control Blanks		Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	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)
Unit		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
LOR		1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	0.5	0.5
Date	Sample																		
21/10/2021	Rinsate	<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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: EM2121267	Page	: 1 of 13
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9645
Project	: Campbell	Date Samples Received	: 26-Oct-2021
Order number	: ----	Date Analysis Commenced	: 27-Oct-2021
C-O-C number	: ----	Issue Date	: 01-Nov-2021
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 15		
No. of samples analysed	: 15		

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, unless the sampling was conducted by ALS. 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	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Jarwis Nheu	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

Page	: 2 of 13
Work Order	: EM2121267
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Campbell

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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.

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
[illegible] = 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	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3981685)									
EM2121169-003	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	1	1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	100	80	15.9	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	117	110	6.0	0% - 20%
		EG005T: Cobalt	7440-48-4	2	mg/kg	17	17	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	45	44	2.9	0% - 20%
		EG005T: Arsenic	7440-38-2	5	mg/kg	8	8	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	36	36	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	13	14	8.5	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	508	469	13.2	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	110	116	5.4	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	22	21	0.0	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.0	No Limit
EM2121181-046	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	260	260	10.0	0% - 20%
		EG005T: Chromium	7440-47-3	2	mg/kg	32	31	0.0	0% - 50%
		EG005T: Cobalt	7440-48-4	2	mg/kg	24	25	0.0	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	28	28	0.0	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	10	9	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	36	35	0.0	No Limit

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Work Order : EM2121287
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Campbell

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
				Laboratory Duplicate (DUP) Report					
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3981685) - continued									
EM2121181-046	Anonymous	EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	52	48	8.7	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	7	7	0.0	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.0	No Limit
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3981686)									
EM2121287-009	BH04 2.50	EG005T: Manganese	7439-96-5	5	mg/kg	102	# 134	27.4	0% - 20%
EM2121268-001	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	309	# 560	57.8	0% - 20%
EM2121287-009	BH04 2.50	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	20	20	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	13	13	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	10	8	22.8	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	16	12	30.6	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	15	13	13.2	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	5	<5	0.0	No Limit
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	25	23	8.2	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	26	21	22.0	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.0	No Limit
EM2121268-001	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	1	1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	300	270	10.6	0% - 20%
		EG005T: Chromium	7440-47-3	2	mg/kg	14	14	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	11	11	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	12	12	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	7	7	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	108	103	4.8	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	561	570	1.6	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	32	32	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	294	243	18.9	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.0	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3984226)									
EM2121268-001	Anonymous	EA055: Moisture Content	----	0.1	%	24.1	25.4	5.2	0% - 20%
EM2121287-010	BH05 0.50	EA055: Moisture Content	----	0.1	%	30.6	30.7	0.4	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3981684)									
EM2121169-008	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EM2121181-046	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit

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Work Order : EM2121287
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Campbell

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
				Laboratory Duplicate (DUP) Report					
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3981687)									
EM2121287-009	BH04 2.50	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EM2121268-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	2.1	1.8	19.2	0% - 20%
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3981525)									
EM2121287-001	BH01 0.50	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	1.0	0.6	50.8	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	7.8	# 3.4	77.6	0% - 50%
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	1.6	<0.5	105	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	6.3	# 3.1	52.0	0% - 50%
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	79.6	# 35.0	78.0	0% - 20%
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	15.9	# 6.3	86.2	0% - 20%
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	74.6	# 37.0	67.4	0% - 20%
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	73.9	# 37.7	64.8	0% - 20%
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	30.4	# 15.2	66.4	0% - 20%
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	28.6	# 15.3	60.7	0% - 20%
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	17.2	# 10.4	48.8	0% - 20%
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	17.7	# 11.4	42.8	0% - 20%
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	27.4	# 14.7	60.5	0% - 20%
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	14.1	# 7.6	59.6	0% - 20%
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	4.4	2.4	59.9	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	16.1	# 6.8	58.3	0% - 20%
EM2121287-011	BH05 1.50	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3979246)									
EM2121287-001	BH01 0.50	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EM2121287-011	BH05 1.50	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit

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Work Order : EM2121267
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Campbell

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
				Laboratory Duplicate (DUP) Report					
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3981526)									
EM2121267-001	BH01 0.50	EP071: C15 - C28 Fraction	—	100	mg/kg	1150	# 540	72.6	0% - 50%
		EP071: C29 - C36 Fraction	—	100	mg/kg	480	250	62.0	No Limit
		EP071: C10 - C14 Fraction	—	50	mg/kg	<50	<50	0.0	No Limit
		EP071: C10 - C36 Fraction (sum)	—	50	mg/kg	1630	# 790	69.4	0% - 20%
EM2121267-011	BH05 1.50	EP071: C15 - C28 Fraction	—	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	—	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	—	50	mg/kg	<50	<50	0.0	No Limit
		EP071: C10 - C36 Fraction (sum)	—	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3979248)									
EM2121267-001	BH01 0.50	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EM2121267-011	BH05 1.50	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3981526)									
EM2121267-001	BH01 0.50	EP071: >C16 - C34 Fraction	—	100	mg/kg	1440	# 700	68.7	0% - 50%
		EP071: >C34 - C40 Fraction	—	100	mg/kg	240	130	62.3	No Limit
		EP071: >C10 - C16 Fraction	—	50	mg/kg	70	<50	38.3	No Limit
		EP071: >C10 - C40 Fraction (sum)	—	50	mg/kg	1750	# 880	71.3	0% - 20%
EM2121267-011	BH05 1.50	EP071: >C16 - C34 Fraction	—	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	—	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	—	50	mg/kg	<50	<50	0.0	No Limit
		EP071: >C10 - C40 Fraction (sum)	—	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEXN (QC Lot: 3979248)									
EM2121267-001	BH01 0.50	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EM2121267-011	BH05 1.50	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
				Laboratory Duplicate (DUP) Report					
EG020T: Total Metals by ICP-MS (QC Lot: 3979072)									
EM2121118-004	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0002	<0.0002	0.0	No Limit

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Work Order : EM2121267
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Campbell

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
				Laboratory Duplicate (DUP) Report					
EG020T: Total Metals by ICP-MS (QC Lot: 3979072) - continued									
EM2121118-004	Anonymous	EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.006	0.006	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.002	<0.002	0.0	No Limit
		EG020A-T: Barium	7440-39-3	0.001	mg/L	0.038	0.036	4.3	0% - 50%
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.002	<0.002	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.002	<0.002	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.012	0.011	10.7	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.002	<0.002	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.593	0.588	0.8	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.002	<0.002	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.056	0.056	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.02	<0.02	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.02	<0.02	0.0	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	2.25	2.23	0.9	0% - 20%
EM2121267-002	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	0.0008	0.0004	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	0.016	0.016	0.0	0% - 50%
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Barium	7440-39-3	0.001	mg/L	0.036	0.035	3.4	0% - 20%
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	0.009	0.009	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.038	0.036	4.2	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.003	0.002	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.157	0.160	1.8	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.017	0.017	0.0	0% - 50%
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.105	0.107	2.4	0% - 20%
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	1.18	1.29	9.2	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3983884)									
EM2121215-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3979207)									
EB2130129-001	Anonymous	EP080: C6 - C9 Fraction	—	20	µg/L	<20	<20	0.0	No Limit
EB2130129-011	Anonymous	EP080: C6 - C9 Fraction	—	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3979207)									
EB2130129-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EB2130129-011	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 3979207)									
EB2130129-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit

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Project	: Campbell

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080: BTEXN (QC Lot: 3979207) - continued									
EB2130129-001	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EB2130129-011	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit

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Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Campbell

Method Blank (MB) and Laboratory Control Sample (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 Sample (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: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3981685)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	125 mg/kg	103	70.0	130
EG005T: Barium	7440-39-3	10	mg/kg	<10	99.3 mg/kg	87.4	70.0	130
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	0.87 mg/kg	85.8	70.0	130
EG005T: Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.23 mg/kg	85.5	50.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	20.2 mg/kg	106	70.0	130
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	11.2 mg/kg	83.0	70.0	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	55.9 mg/kg	99.8	70.0	130
EG005T: Lead	7439-92-1	5	mg/kg	<5	62.4 mg/kg	87.7	70.0	130
EG005T: Manganese	7439-96-5	5	mg/kg	<5	580 mg/kg	88.2	70.0	130
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.4 mg/kg	86.1	70.0	130
EG005T: Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	61.3 mg/kg	105	70.0	130
EG005T: Zinc	7440-66-6	5	mg/kg	<5	182 mg/kg	71.4	70.0	130
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3981686)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	125 mg/kg	106	70.0	130
EG005T: Barium	7440-39-3	10	mg/kg	<10	99.3 mg/kg	88.8	70.0	130
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	0.87 mg/kg	82.9	70.0	130
EG005T: Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.23 mg/kg	73.2	50.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	20.2 mg/kg	103	70.0	130
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	11.2 mg/kg	86.9	70.0	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	55.9 mg/kg	102	70.0	130
EG005T: Lead	7439-92-1	5	mg/kg	<5	62.4 mg/kg	80.9	70.0	130
EG005T: Manganese	7439-96-5	5	mg/kg	<5	580 mg/kg	91.1	70.0	130
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.4 mg/kg	88.3	70.0	130
EG005T: Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	61.3 mg/kg	107	70.0	130
EG005T: Zinc	7440-66-6	5	mg/kg	<5	182 mg/kg	73.8	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3981684)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.84 mg/kg	99.2	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3981687)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.84 mg/kg	101	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3981525)								

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Project : Campbell

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3981535) - continued								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	100	85.7	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	100	81.0	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	99.6	83.0	120
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	98.0	81.3	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	99.4	79.4	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	104	81.7	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	103	78.3	124
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	107	79.8	126
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	102	76.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	110	80.9	130
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	87.5	70.0	121
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	95.3	80.4	130
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	89.1	70.2	123
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	95.3	67.3	122
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	95.4	65.8	123
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	93.3	65.8	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3979248)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	81.6	58.8	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3981528)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	660 mg/kg	105	75.0	128
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	2430 mg/kg	106	82.0	123
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1380 mg/kg	101	82.4	121
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3979248)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	80.8	59.3	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3981528)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	920 mg/kg	118	77.0	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3700 mg/kg	102	81.5	120
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	270 mg/kg	103	73.3	137
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 3979248)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	87.7	61.9	117
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	88.1	65.8	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	85.1	65.5	124
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	85.0	64.8	134
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	93.7	66.7	132

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Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Campbell

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP080: BTEXN (QCLot: 3979248) - continued								
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	103	81.5	125

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 3979072)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	100	89.2	115
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	93.8	86.0	116
EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	98.7	87.2	117
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	100	88.4	115
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	95.1	86.9	112
EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	98.6	87.7	113
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	95.7	86.9	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	95.8	86.3	112
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	93.7	88.7	113
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	95.2	87.9	113
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	100	84.8	116
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	98.9	87.1	114
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	97.6	86.7	117
EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	111	89.3	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3983884)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	89.8	73.4	119
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3978560)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	87.0	42.8	114
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	98.3	46.8	119
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	96.2	47.0	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	90.1	49.5	119
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	97.9	49.4	121
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	95.9	46.4	122
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	98.3	50.3	124
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	94.1	50.2	129
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	90.0	49.4	127
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	93.4	46.7	128
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	109	54.5	134
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	102	56.1	134
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	110	55.8	135
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	102	54.4	126
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	105	54.5	128

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Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Campbell

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3978560) - continued								
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	123	54.4	126
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3978559)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	4870 µg/L	75.9	44.2	140
EP071: C15 - C28 Fraction	----	100	µg/L	<100	15600 µg/L	81.9	46.9	127
EP071: C29 - C36 Fraction	----	50	µg/L	<50	8180 µg/L	78.8	47.4	128
EP071: C10 - C36 Fraction (sum)	----	----	µg/L	----	28660 µg/L	79.9	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3979207)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	97.4	66.2	134
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3978559)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	6100 µg/L	78.3	43.0	127
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	21200 µg/L	75.8	46.8	129
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	1020 µg/L	87.0	42.2	120
EP071: >C10 - C40 Fraction (sum)	----	----	µg/L	----	28020 µg/L	70.1	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3979207)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	99.8	66.2	132
EP080: BTEXN (QCLot: 3979207)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	87.7	66.8	127
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	87.8	72.0	129
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	97.1	71.7	130
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	114	72.3	136
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	117	75.0	134
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	104	66.3	131

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	Spike Recovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3981685)							
EM2121188-036	Anonymous	EG005T: Nickel	7440-02-0	50 mg/kg	93.8	78.0	120
		EG005T: Zinc	7440-66-6	250 mg/kg	100	80.0	120
EM2121188-036	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	88.1	78.0	124
		EG005T: Cadmium	7440-43-9	50 mg/kg	88.7	79.7	116
		EG005T: Chromium	7440-47-3	50 mg/kg	100	79.0	121
		EG005T: Copper	7440-50-8	250 mg/kg	101	80.0	120

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Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Campbell

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3981685) - continued							
EM2121188-036	Anonymous	EG005T: Lead	7439-92-1	250 mg/kg	85.6	80.0	120
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3981686)							
EM2121257-010	BH05 0.50	EG005T: Arsenic	7440-38-2	50 mg/kg	92.3	78.0	124
		EG005T: Cadmium	7440-43-9	50 mg/kg	92.2	79.7	116
		EG005T: Chromium	7440-47-3	50 mg/kg	95.3	79.0	121
		EG005T: Copper	7440-50-8	250 mg/kg	103	80.0	120
		EG005T: Lead	7439-92-1	250 mg/kg	90.5	80.0	120
		EG005T: Nickel	7440-02-0	50 mg/kg	94.8	78.0	120
		EG005T: Zinc	7440-66-6	250 mg/kg	84.4	80.0	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3981684)							
EM2121188-036	Anonymous	EG035T: Mercury	7439-97-6	0.5 mg/kg	101	76.0	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3981687)							
EM2121257-010	BH05 0.50	EG035T: Mercury	7439-97-6	0.5 mg/kg	102	76.0	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3981525)							
EM2121257-002	BH01 1.50	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	94.8	77.2	116
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	108	69.5	136
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3979248)							
EM2121257-002	BH01 1.50	EP080: C6 - C9 Fraction	----	28 mg/kg	89.9	33.4	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3981526)							
EM2121257-003	BH02 0.50	EP071: C10 - C14 Fraction	----	660 mg/kg	105	71.2	125
		EP071: C15 - C28 Fraction	----	2220 mg/kg	122	75.8	122
		EP071: C29 - C36 Fraction	----	1380 mg/kg	108	78.0	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3979248)							
EM2121257-002	BH01 1.50	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	86.8	30.8	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3981526)							
EM2121257-003	BH02 0.50	EP071: >C10 - C16 Fraction	----	920 mg/kg	120	72.2	128
		EP071: >C16 - C34 Fraction	----	3700 mg/kg	116	76.5	119
		EP071: >C34 - C40 Fraction	----	270 mg/kg	126	66.6	138
EP080: BTEXN (QCLot: 3979248)							
EM2121257-002	BH01 1.50	EP080: Benzene	71-43-2	2 mg/kg	127	54.4	127
		EP080: Toluene	108-88-3	2 mg/kg	128	57.1	131

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 3979072)							

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 3979072) - continued							
EM2121118-004	Anonymous	EG020A-T: Arsenic	7440-38-2	0.25 mg/L	91.2	82.0	123
		EG020A-T: Beryllium	7440-41-7	0.25 mg/L	79.9	79.0	126
		EG020A-T: Barium	7440-39-3	0.25 mg/L	84.9	80.0	120
		EG020A-T: Cadmium	7440-43-9	0.05 mg/L	102	81.8	123
		EG020A-T: Chromium	7440-47-3	0.25 mg/L	83.2	78.9	119
		EG020A-T: Cobalt	7440-48-4	0.25 mg/L	85.5	80.7	121
		EG020A-T: Copper	7440-50-8	0.25 mg/L	83.9	80.4	118
		EG020A-T: Lead	7439-92-1	0.25 mg/L	81.0	80.5	121
		EG020A-T: Manganese	7439-96-5	0.25 mg/L	75.0	73.0	123
		EG020A-T: Nickel	7440-02-0	0.25 mg/L	83.8	80.0	118
		EG020A-T: Vanadium	7440-62-2	0.25 mg/L	82.0	81.0	119
		EG020A-T: Zinc	7440-66-6	0.25 mg/L	80.7	74.0	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3983884)							
EM2121257-001	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	97.3	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3979207)							
EB2130128-001	Anonymous	EP080: C6 - C9 Fraction	----	280 µg/L	50.8	33.9	126
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3979207)							
EB2130128-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	52.1	34.0	122
EP080: BTEXN (QCLot: 3979207)							
EB2130128-001	Anonymous	EP080: Benzene	71-43-2	20 µg/L	77.2	66.8	133
		EP080: Toluene	108-88-3	20 µg/L	78.2	69.4	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2121267**	Page	: 1 of 10
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Telephone	: +6138549 9645
Project	: Campbell	Date Samples Received	: 26-Oct-2021
Site	: ----	Issue Date	: 01-Nov-2021
Sampler	: ----	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 Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **Duplicate 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.**

RIGHT SOLUTIONS | RIGHT PARTNER

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Work Order	: EM2121267
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Campbell

ALS

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
Duplicate (DUP) RPDs							
EG005(ED093)T: Total Metals by ICP-AES	EM2121268--001	Anonymous	**Lead**	7439-92-1	57.8 %	0% - 20%	**RPD exceeds LOR based limits**
EG005(ED093)T: Total Metals by ICP-AES	EM2121267--009	BH04 2.50	**Manganese**	7439-96-5	27.4 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Acenaphthylene**	208-96-8	77.5 %	0% - 50%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Fluorene**	86-73-7	92.0 %	0% - 50%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Phenanthrene**	85-01-8	78.0 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Anthracene**	120-12-7	86.2 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Fluoranthene**	206-44-0	67.4 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Pyrene**	129-00-0	64.0 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Benz(a)anthracene**	56-55-3	66.4 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Chrysene**	218-01-9	60.7 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Benzo(b+j)fluoranthene**	205-99-2 205-82-3	48.6 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Benzo(k)fluoranthene**	207-08-9	42.9 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Benzo(a)pyrene**	50-32-8	60.5 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Indeno(1.2.3.cd)pyrene**	193-39-5	59.8 %	0% - 20%	**RPD exceeds LOR based limits**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	EM2121267--001	BH01 0.50	**Benzo(g.h.i)perylene**	191-24-2	58.3 %	0% - 20%	**RPD exceeds LOR based limits**
EP080/071: Total Petroleum Hydrocarbons	EM2121267--001	BH01 0.50	**C15 - C28 Fraction**	----	72.6 %	0% - 50%	**RPD exceeds LOR based limits**
EP080/071: Total Petroleum Hydrocarbons	EM2121267--001	BH01 0.50	**C10 - C36 Fraction (sum)**	----	69.4 %	0% - 20%	**RPD exceeds LOR based limits**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2	EM2121267--001	BH01 0.50	**>C16 - C34 Fraction**	----	68.7 %	0% - 50%	**RPD exceeds LOR based limits**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2	EM2121267--001	BH01 0.50	**>C10 - C40 Fraction (sum)**	----	71.3 %	0% - 20%	**RPD exceeds LOR based limits**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	8	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	12	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	8	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	0	12	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

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Work Order	: EM2121267
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Project	: Campbell

ALS

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)								
BH01 0.50,	BH01 1.50,	**21-Oct-2021**	----	----	----	**28-Oct-2021**	04-Nov-2021	✓
BH02 0.50,	BH02 1.50,							
BH03 0.50,	BH03 1.50,							
BH04 0.50,	BH04 1.50,							
BH04 2.50,	BH05 0.50,							
BH05 1.50,	BH05 2.20,							
BH06 0.50,	BH06 1.50,							
BH07 0.50,	BH07 1.50,							
Duplicate								
EG005(ED093)T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH01 0.50,	BH01 1.50,	**21-Oct-2021**	**28-Oct-2021**	19-Apr-2022	✓	**28-Oct-2021**	13-Apr-2022	✓
BH02 0.50,	BH02 1.50,							
BH03 0.50,	BH03 1.50,							
BH04 0.50,	BH04 1.50,							
BH04 2.50,	BH05 0.50,							
BH05 1.50,	BH05 2.20,							
BH06 0.50,	BH06 1.50,							
BH07 0.50,	BH07 1.50,							
Duplicate								
EG035T: Total Recoverable Mercury by FIMS								
Soil Glass Jar - Unpreserved (EG035T)								
BH01 0.50,	BH01 1.50,	**21-Oct-2021**	**28-Oct-2021**	18-Nov-2021	✓	**28-Oct-2021**	18-Nov-2021	✓
BH02 0.50,	BH02 1.50,							
BH03 0.50,	BH03 1.50,							
BH04 0.50,	BH04 1.50,							
BH04 2.50,	BH05 0.50,							
BH05 1.50,	BH05 2.20,							
BH06 0.50,	BH06 1.50,							
BH07 0.50,	BH07 1.50,							
Duplicate								

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Work Order : EM2121267
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Campbell

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
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
BH01 0.50,	BH01 1.50,	**21-Oct-2021**	**28-Oct-2021**	04-Nov-2021	✓	**28-Oct-2021**	07-Dec-2021	✓
BH02 0.50,	BH02 1.50,							
BH03 0.50,	BH03 1.50,							
BH04 0.50,	BH04 1.50,							
BH04 2.50,	BH05 0.50,							
BH05 1.50,	BH05 2.20,							
BH06 0.50,	BH06 1.50,							
BH07 0.50,	BH07 1.50,							
Duplicate								
EP080/071: Total Petroleum Hydrocarbons								
Soil Glass Jar - Unpreserved (EP071)								
BH01 0.50,	BH01 1.50,	**21-Oct-2021**	**28-Oct-2021**	04-Nov-2021	✓	**28-Oct-2021**	07-Dec-2021	✓
BH02 0.50,	BH02 1.50,							
BH03 0.50,	BH03 1.50,							
BH04 0.50,	BH04 1.50,							
BH04 2.50,	BH05 0.50,							
BH05 1.50,	BH05 2.20,							
BH06 0.50,	BH06 1.50,							
BH07 0.50,	BH07 1.50,							
Duplicate								
Soil Glass Jar - Unpreserved (EP080)								
BH01 0.50,	BH01 1.50,	**21-Oct-2021**	**28-Oct-2021**	04-Nov-2021	✓	**28-Oct-2021**	04-Nov-2021	✓
BH02 0.50,	BH02 1.50,							
BH03 0.50,	BH03 1.50,							
BH04 0.50,	BH04 1.50,							
BH04 2.50,	BH05 0.50,							
BH05 1.50,	BH05 2.20,							
BH06 0.50,	BH06 1.50,							
BH07 0.50,	BH07 1.50,							
Duplicate								

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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)								
BH01 0.50,	BH01 1.50,	**21-Oct-2021**	**28-Oct-2021**	04-Nov-2021	✓	**28-Oct-2021**	07-Dec-2021	✓
BH02 0.50,	BH02 1.50,							
BH03 0.50,	BH03 1.50,							
BH04 0.50,	BH04 1.50,							
BH04 2.50,	BH05 0.50,							
BH05 1.50,	BH05 2.20,							
BH06 0.50,	BH06 1.50,							
BH07 0.50,	BH07 1.50,							
Duplicate								
Soil Glass Jar - Unpreserved (EP080)								
BH01 0.50,	BH01 1.50,	**21-Oct-2021**	**28-Oct-2021**	04-Nov-2021	✓	**28-Oct-2021**	04-Nov-2021	✓
BH02 0.50,	BH02 1.50,							
BH03 0.50,	BH03 1.50,							
BH04 0.50,	BH04 1.50,							
BH04 2.50,	BH05 0.50,							
BH05 1.50,	BH05 2.20,							
BH06 0.50,	BH06 1.50,							
BH07 0.50,	BH07 1.50,							
Duplicate								
EP080: BTEXN								
Soil Glass Jar - Unpreserved (EP080)								
BH01 0.50,	BH01 1.50,	**21-Oct-2021**	**28-Oct-2021**	04-Nov-2021	✓	**28-Oct-2021**	04-Nov-2021	✓
BH02 0.50,	BH02 1.50,							
BH03 0.50,	BH03 1.50,							
BH04 0.50,	BH04 1.50,							
BH04 2.50,	BH05 0.50,							
BH05 1.50,	BH05 2.20,							
BH06 0.50,	BH06 1.50,							
BH07 0.50,	BH07 1.50,							
Duplicate								

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
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)							
Rinsate	**21-Oct-2021**	**27-Oct-2021**	19-Apr-2022	✓	**27-Oct-2021**	19-Apr-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T)							
Rinsate	**21-Oct-2021**	----	----	----	**28-Oct-2021**	18-Nov-2021	✓

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
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) Rinsate	21-Oct-2021	27-Oct-2021	28-Oct-2021	✓	27-Oct-2021	06-Dec-2021	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) Rinsate	21-Oct-2021	27-Oct-2021	28-Oct-2021	✓	27-Oct-2021	06-Dec-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate	21-Oct-2021	27-Oct-2021	04-Nov-2021	✓	27-Oct-2021	04-Nov-2021	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) Rinsate	21-Oct-2021	27-Oct-2021	28-Oct-2021	✓	27-Oct-2021	06-Dec-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate	21-Oct-2021	27-Oct-2021	04-Nov-2021	✓	27-Oct-2021	04-Nov-2021	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) Rinsate	21-Oct-2021	27-Oct-2021	04-Nov-2021	✓	27-Oct-2021	04-Nov-2021	✓

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 / Analytical Methods	Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Evaluation	Quality Control Specification
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	6	40	15.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	40	7.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	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 / Analytical Methods	Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Evaluation	Quality Control Specification
Laboratory Duplicates (DUP)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	8	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	12	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard

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Work Order	: EM2121267
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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							
Total Mercury by FIMS	EG035T	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	8	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	12	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard

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Project	: Campbell

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 Schedule B(3).
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 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 Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015. Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3)
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. 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 Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	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. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered 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 Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015. 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 Schedule B(3)
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270. 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 Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260. 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 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 Schedule B(3).
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.
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM 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 purging.

Appendix 7 Certificate of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2121267**	Page	: 1 of 18
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9645
Project	: Campbell	Date Samples Received	: 26-Oct-2021 11:10
Order number	: ----	Date Analysis Commenced	: 27-Oct-2021
C-O-C number	: ----	Issue Date	: 01-Nov-2021 16:02
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 18		
No. of samples analysed	: 18		

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, unless the sampling was conducted by ALS. 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	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Jarwis Nheu	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

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Work Order	: EM2121267
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: Campbell

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) 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.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) 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.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG020-T : EM2121267 #18 results for total metal have been confirmed by re-digestion and re-analysis.
- EG005T: EM2121267 #9 Poor duplicate precision for Manganese due to sample heterogeneity. Confirmed by re-analysis.
- EG005T: EM2121286 #1 Poor duplicate precision for Lead due to sample heterogeneity. Confirmed by re-analysis.
- EP075(SIM): EM2121267_001 Poor duplicate precision due to sample heterogeneity. Confirmed by re-extraction and re-analysis.

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Work Order : EM2121267
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Campbell

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH01 0.50	BH01 1.50	BH02 0.50	BH02 1.50	BH03 0.50
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00
				EM2121267-001	EM2121267-002	EM2121267-003	EM2121267-004	EM2121267-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	16.7	17.5	17.1	18.6	24.6
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	6	<5	<5
Barium	7440-39-3	10	mg/kg	140	40	270	70	120
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	2	<1	<1
Chromium	7440-47-3	2	mg/kg	14	16	21	14	24
Cobalt	7440-48-4	2	mg/kg	10	11	18	18	12
Copper	7440-50-8	5	mg/kg	55	16	81	23	42
Lead	7439-92-1	5	mg/kg	201	8	406	8	37
Manganese	7439-96-5	5	mg/kg	273	71	401	208	296
Nickel	7440-02-0	2	mg/kg	13	13	16	14	16
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	46	38	79	52	66
Zinc	7440-66-6	5	mg/kg	243	21	666	22	43
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.2	<0.1	0.4	<0.1	0.3
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	1.0	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	7.8	<0.5	1.8	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	1.6	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	8.3	<0.5	1.2	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	79.6	<0.5	13.6	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	15.8	<0.5	3.6	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	74.6	<0.5	18.8	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	73.8	<0.5	19.4	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	30.4	<0.5	9.2	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	28.8	<0.5	9.4	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	17.2	<0.5	5.9	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	17.7	<0.5	7.7	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	27.4	<0.5	9.0	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	14.1	<0.5	4.7	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	4.4	<0.5	1.5	<0.5	<0.5

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Work Order : EM2121267
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Campbell

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH01 0.50	BH01 1.50	BH02 0.50	BH02 1.50	BH03 0.50
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00
				EM2121267-001	EM2121267-002	EM2121267-003	EM2121267-004	EM2121267-005
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	16.1	<0.5	5.4	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	419	<0.5	110	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	40.2	<0.5	13.4	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	40.2	0.6	13.4	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	40.2	1.2	13.4	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	1150	<100	320	<100	<100
C29 - C36 Fraction	----	100	mg/kg	480	<100	200	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg	1630	<50	520	<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	70	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	1440	<100	480	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	240	<100	100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	1750	<50	580	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	70	<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	%	91.4	86.7	88.9	87.7	85.9
2-Chlorophenol-D4	93951-73-6	0.5	%	91.4	84.4	85.7	85.1	82.6
2.4.6-Tribromophenol	118-79-6	0.5	%	98.6	84.4	96.9	82.5	84.9

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH01 0.50	BH01 1.50	BH02 0.50	BH02 1.50	BH03 0.50
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00
Compound	CAS Number	LOR	Unit	EM2121267-001	EM2121267-002	EM2121267-003	EM2121267-004	EM2121267-005
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	93.8	88.8	103	101	88.3
Anthracene-d10	1719-06-8	0.5	%	105	128	114	114	127
4-Terphenyl-d14	1718-51-0	0.5	%	106	109	109	111	109
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	108	114	122	108	114
Toluene-D8	2037-26-5	0.2	%	107	110	118	100	111
4-Bromofluorobenzene	460-00-4	0.2	%	103	110	115	98.4	108

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH03 1.50	BH04 0.50	BH04 1.50	BH04 2.50	BH05 0.50
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00
Compound	CAS Number	LOR	Unit	EM2121267-006	EM2121267-007	EM2121267-008	EM2121267-009	EM2121267-010
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	16.3	21.3	20.8	13.2	30.6
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	20	110	60	20	140
Beryllium	7440-41-7	1	mg/kg	<1	<1	<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	<1	<1
Chromium	7440-47-3	2	mg/kg	14	20	18	13	28
Cobalt	7440-48-4	2	mg/kg	19	7	12	10	19
Copper	7440-50-8	5	mg/kg	39	22	31	15	36
Lead	7439-92-1	5	mg/kg	6	12	6	5	16
Manganese	7439-96-5	5	mg/kg	177	79	115	102	567
Nickel	7440-02-0	2	mg/kg	22	12	13	16	18
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	143	66	55	25	103
Zinc	7440-66-6	5	mg/kg	22	14	17	29	20
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)			Sample ID	BH03 1.50	BH04 0.50	BH04 1.50	BH04 2.50	BH05 0.50
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00
Compound	CAS Number	LOR	Unit	EM2121267-006	EM2121267-007	EM2121267-008	EM2121267-009	EM2121267-010
				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	%	94.6	91.2	93.8	91.5	95.4
2-Chlorophenol-D4	93951-73-6	0.5	%	91.7	88.9	91.4	89.0	91.7
2.4.6-Tribromophenol	118-79-6	0.5	%	77.1	74.9	75.1	70.8	74.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH03 1.50	BH04 0.50	BH04 1.50	BH04 2.50	BH05 0.50
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00
Compound	CAS Number	LOR	Unit	EM2121267-006	EM2121267-007	EM2121267-008	EM2121267-009	EM2121267-010
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	97.6	93.4	97.0	93.8	98.1
Anthracene-d10	1719-06-8	0.5	%	120	126	113	130	121
4-Terphenyl-d14	1718-51-0	0.5	%	106	105	109	107	110
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	111	114	115	118	119
Toluene-D8	2037-26-5	0.2	%	106	107	112	110	110
4-Bromofluorobenzene	460-00-4	0.2	%	107	111	110	110	107

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Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH05 1.50	BH05 2.20	BH06 0.50	BH06 1.50	BH07 0.50
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00
Compound	CAS Number	LOR	Unit	EM2121267-011	EM2121267-012	EM2121267-013	EM2121267-014	EM2121267-015
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	18.3	16.5	31.5	30.4	25.0
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg	20	60	160	70	120
Beryllium	7440-41-7	1	mg/kg	<1	<1	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	<1	<1
Chromium	7440-47-3	2	mg/kg	14	10	30	27	29
Cobalt	7440-48-4	2	mg/kg	10	14	12	9	10
Copper	7440-50-8	5	mg/kg	23	33	34	30	33
Lead	7439-92-1	5	mg/kg	<5	5	13	10	13
Manganese	7439-96-5	5	mg/kg	93	272	173	142	95
Nickel	7440-02-0	2	mg/kg	13	17	18	17	17
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	41	61	94	69	66
Zinc	7440-66-6	5	mg/kg	18	30	21	23	24
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

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Project : Campbell

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH05 1.50	BH05 2.20	BH06 0.50	BH06 1.50	BH07 0.50
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00
Compound	CAS Number	LOR	Unit	EM2121267-011	EM2121267-012	EM2121267-013	EM2121267-014	EM2121267-015
				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	<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	%	93.5	92.0	97.4	97.8	86.3
2-Chlorophenol-D4	93951-73-6	0.5	%	91.0	88.6	95.4	94.5	83.9
2.4.6-Tribromophenol	118-79-6	0.5	%	70.6	74.2	81.2	76.9	69.4

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Client : GEO-ENVIRONMENTAL SOLUTIONS
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Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH05 1.50	BH05 2.20	BH06 0.50	BH06 1.50	BH07 0.50
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00	21-Oct-2021 00:00
				EM2121267-011	EM2121267-012	EM2121267-013	EM2121267-014	EM2121267-015
				Result	Result	Result	Result	Result
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	97.5	95.8	101	101	89.6
Anthracene-d10	1719-06-8	0.5	%	119	122	118	118	127
4-Terphenyl-d14	1718-51-0	0.5	%	110	107	113	115	101
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	118	114	114	117	109
Toluene-D8	2037-26-5	0.2	%	113	109	106	113	93.7
4-Bromofluorobenzene	460-00-4	0.2	%	116	114	108	110	102

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Client : GEO-ENVIRONMENTAL SOLUTIONS
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Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH07 1.50	Duplicate	----	----	----
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	----	----	----
				EM2121267-016	EM2121267-017	-------	-------	-------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	17.1	18.5	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	6	----	----	----
Barium	7440-39-3	10	mg/kg	20	100	----	----	----
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	14	17	----	----	----
Cobalt	7440-48-4	2	mg/kg	12	11	----	----	----
Copper	7440-50-8	5	mg/kg	28	52	----	----	----
Lead	7439-92-1	5	mg/kg	5	184	----	----	----
Manganese	7439-96-5	5	mg/kg	82	347	----	----	----
Nickel	7440-02-0	2	mg/kg	16	14	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	71	47	----	----	----
Zinc	7440-66-6	5	mg/kg	17	273	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.2	----	----	----
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	2.1	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	1.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	17.7	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	4.1	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	33.9	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	23.3	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	16.3	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	16.6	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	7.4	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	8.1	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	10.2	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	5.4	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	1.6	----	----	----

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Work Order : EM2121267
Client : GEO-ENVIRONMENTAL SOLUTIONS
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Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH07 1.50	Duplicate	----	----	----
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	----	----	----
				EM2121267-016	EM2121267-017	-------	-------	-------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6.3	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	132	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	15.1	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	15.1	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	15.1	----	----	----
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	340	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	200	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	540	----	----	----
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	480	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	480	----	----	----
^ >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	%	88.8	83.6	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	87.5	88.9	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	68.4	89.0	----	----	----

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Work Order : EM2121267
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Campbell

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)

Compound	CAS Number	LOR	Unit	BH07 1.50	Duplicate	----	----	----
			Sampling date / time	21-Oct-2021 00:00	21-Oct-2021 00:00	----	----	----
				EM2121267-016	EM2121267-017	-------	-------	-------
				Result	Result	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	92.5	88.3	----	----	----
Anthracene-d10	1719-06-8	0.5	%	116	110	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	104	104	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	116	108	----	----	----
Toluene-D8	2037-26-5	0.2	%	102	88.1	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	104	93.8	----	----	----

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Work Order : EM2121267
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Campbell

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Rinsate	----	----	----	----
			Sampling date / time	21-Oct-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2121267-018	-----	-----	-----	-----
				Result	----	----	----	----
EG020T: Total 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	0.002	----	----	----	----
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	<0.005	----	----	----	----
EG035T: Total Recoverable 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	----	----	----	----

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Work Order : EM2121267
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : Campbell

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Rinsate	----	----	----	----
			Sampling date / time	21-Oct-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2121267-018	-----	-----	-----	-----
				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	%	25.9	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	79.3	----	----	----	----
2.4.6-Tribromophenol	118-79-6	1.0	%	90.6	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	88.2	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	84.6	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	84.1	----	----	----	----

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

			Sample ID	Rinsate	----	----	----	----
			Sampling date / time	21-Oct-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EM2121267-018	-------	-------	-------	-------
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	87.2	----	----	----	----
Toluene-D8	2037-26-5	2	%	106	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	117	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) 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**

Compound	CAS Number	Recovery Limits (%) Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	51
2-Chlorophenol-D4	93951-73-6	30	114
2.4.6-Tribromophenol	118-79-6	20	155
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	36	127
Anthracene-d10	1719-06-8	44	122
4-Terphenyl-d14	1718-51-0	44	124
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

Submission to Planning Authority Notice

Council Planning Permit No.	PLN-21-471		**Council notice date**	5/07/2022
TasWater details				
TasWater Reference No.	TWDA 2022/01054-HCC		**Date of response**	15/07/2022
TasWater Contact	Phil Papps Oliver Leith (Trade Waste)	**Phone No.**	0474 931 272 0460 007 105	
Response issued to				
Council name	CITY OF HOBART			
Contact details	coh@hobartcity.com.au			
Development details				
Address	175 CAMPBELL ST, HOBART		**Property ID (PID)**	7162926
Description of development	Multi-Residential Development			

Schedule of drawings/documents

Prepared by	Drawing/document No.	Revision No.	Date of Issue
Cumulus Studio	Site Plan / J20823-A-001	DA05	23/11/2021
Cumulus Studio	Basement Floor Plan / J20823-A100	DA06	13/01/2022
Cumulus Studio	Ground Floor Plan / J20823-A101	DA07	10/02/2022
Cumulus Studio	Level 01-05 Floor Plans / J20823-A102-A106	DA05	23/11/2021
JMG	Concept Servicing Plan / J173021PH / P03	DA1	19/11/2021
JMG	Sewer Clearance Profile / J173021PH / P-S1	DA1	19/11/2021

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. A suitably sized water supply with metered connections and sewerage system and connections to 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.*

2. 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.

3. Prior to use of the development, any water connection utilised for the development must have a backflow prevention device and water meter installed, to the satisfaction of TasWater.

TASWATER ASSET PROTECTION & ACCESS

4. 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.

5. Ground levels over the TasWater assets must not be altered without the written approval of TasWater.

6. The developer must ensure unfettered access at all times to TasWater's sewer maintenance hole (Asset A444950).

56W CONSENT

7. Prior to the issue of the Certificate for Certifiable Work (Building) and/or (Plumbing) by TasWater the applicant or landowner as the case may be must make application to TasWater pursuant to section 56W of the Water and Sewerage Industry Act 2008 for its consent in respect of that part of the development which is built over and/or within two metres of TasWater infrastructure.

TRADE WASTE

8. Prior to the commencement of operation the developer/property owner must obtain Consent to discharge Trade Waste from TasWater.

9. The developer must install appropriately sized and suitable pre-treatment devices prior to gaining Consent to discharge including but not limited to sink and floor wastes for all commercial food prep areas.

10. The Developer/property owner must comply with all TasWater conditions prescribed in the Trade Waste Consent.

DEVELOPMENT ASSESSMENT FEES

11. The applicant or landowner as the case may be, must pay a development assessment fee of $723.84 to TasWater, as approved by the Economic Regulator and the fee will be indexed, until the date 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 https://www.taswater.com.au/building-and-development/technical-standards

For application forms please visit https://www.taswater.com.au/building-and-development/development-application-form

Submetering

As of July 1 2022, TasWater's Sub-Metering Policy no longer permits TasWater sub-meters to be installed for new developments. Please ensure plans submitted with the application for Certificate(s) for Certifiable Work (Building and/or Plumbing) reflect this. For clarity, TasWater does not object to private sub-metering arrangements. Further information is available on our website (www.taswater.com.au) within our Sub-Metering Policy and Water Metering Guidelines.

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.
The location of this infrastructure as shown on the GIS is indicative only.

(a) A permit is required to work within TasWater's easements or in the vicinity of its infrastructure. Further information can be obtained from TasWater

(b) 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.

56W Consent

The plans submitted with the application for the Certificate for Certifiable Work (Building) and/or (Plumbing) will need to show footings of proposed buildings located over or within 2.0m from TasWater pipes and will need to be designed by a suitably qualified person to adequately protect the integrity of TasWater's infrastructure, and to TasWater's satisfaction, be in accordance with AS3500 Part 2.2 Section 3.8 to ensure that no loads are transferred to TasWater's pipes. These plans will need to also include a cross sectional view through the footings which clearly shows;

(a) Existing pipe location and depth and proposed finished surface levels over the pipe;

(b) Minimum above ground clearance must be no less than 3.0m;

(c) The line of influence from the base of the footing must pass below the invert of the pipe and be clear of the pipe trench and;

(d) A note on the plan indicating how the pipe location and depth were ascertained.

(e) The location of the property service connection and sewer inspection opening (IO).

Boundary Trap Area

The proposed development is within a boundary trap area and the developer will need to provide a boundary trap that prevents noxious gases or persistent odours back venting into the property's sanitary drain. The boundary trap is to be be contained within the property boundaries and the property owner remains responsible for the ownership, operation and maintenance of the boundary trap.

Trade Waste

If hot food is being prepared in the commercial café a grease arrestor may be required under the Trade Waste pre-treatment guidelines. If no hot food or hot foods limited to service of foods cooked/prepared off site such as slices of cake, toasted sandwiches, pies etc plus coffee then a grease arrestor is unlikely to be required. If service is restricted to only coffee then category 0 may apply please see the 2022 pretreatment guidelines and Customer Category Guidelines for details

<https://www.taswater.com.au/customers/businesses/trade-waste/commercial-trade-waste-customers>

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. grease arrestor;
- 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.

TasWater Contact Details			
Phone	13 6992	Email	development@taswater.com.au
Mail	GPO Box 1393 Hobart TAS 7001	Web	www.taswater.com.au