FLOOD STUDY REPORT

FOR THE

PROPOSED DEVELOPMENT

AT

No. 5 ROSS STREET

NORTH CURL CURL NSW 2099

PREPARED BY: VNK CONSULTING PTY LTD

PRINCIPAL ENGINEER: LOGAN N LOGESWARAN

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ISSUE: A

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CONTENTS

1. INTRODUCTION

The overland flow study report has been prepared to assess the effect of the upstream overland flow through No 5 Ross Street for the proposed development.

The proposed development site is situated at No 5 Ross Street and affected by the upstream catchment overland flow from the north west direction of the property. The site survey plan is given in Appendix A.

The proposed development is to demolish the existing dwelling and construct a two storey dwelling to the requirements of Northern Beaches Council DCP. The catchment plan information has been obtained from council web site and SIX maps are given in Appendix B.

2. ESTIMATION OF PEAK FLOW RATE

The total upstream catchment area of the proposed development site has been taken from the catchment plan which has been obtained from Council web site and SIX maps. The total peak flow rate in 1 in 100 year ARI has been estimated with two catchments A and B (Refer to App B). The flow from catchment A is 6.97m3 / sec and for catchment B is 1.38 m^3 / sec for 10.0min time of concentration. The flow rate has been calculated by the rational method. All the flow calculations including the road flow are given in Appendix C.

As per the Council mapping system in front of 13 Playfair Road there are two inlets and two outlets in the Council pit. For the flow calculations it has been assumed that the 900 dia outlet pipe takes the full pipe flow and the rest will go as overland flow along the road for the full road capacity up to the top of kerb level. The flow calculations are given in Appendix C. The total flow through 5 Ross Street has been estimated as 4.47 m^3 / sec.

3. OVERLAND FLOW DEPTH

The total 1 in 100 year ARI flow from the upstream catchment has been evaluated as 4.47 m^3 / sec. To evaluate the overland flow depth and its properties the HEC-RAS model has been used for the pre and post development conditions with 50% pipe blocked condition. The flow in the 750 dia pipe

by using Manning's equation has been calculated as 1.462 m^3 / sec (The pipe size 750 dia, pipe slope 2% and n=0.014). The overland flow through the property for the 50% of pipe blocked condition will be (4.470-0.731) 3.74 m^3 / sec.

4. PRE-DEVELOPMENT HEC-RAS MODEL

The Hec-Ras 1d model has been set up for the pre -development condition to evaluate the flood levels at various cross-sections for the 50% blocked condition (3.74 m^3 / sec). In the steady flow analysis mixed flow regime has been used. The plan indicating the Hec-Ras cross sections, overland flow long section, overland flow cross sections and the summary of the results are given in Appendix D.

5. POST-DEVELOPMENT HEC-RAS MODEL

The Hec-Ras 1d model has been set up for the post -development condition to evaluate the flood levels at various cross-sections for the 50% blocked condition (3.74 m^3 / sec). In the steady flow analysis mixed flow regime has been used. The plan indicating the Hec-Ras cross sections, overland flow long section, overland flow cross sections and the summary of the results are given in Appendix E.

6. RECOMMENDATIONS

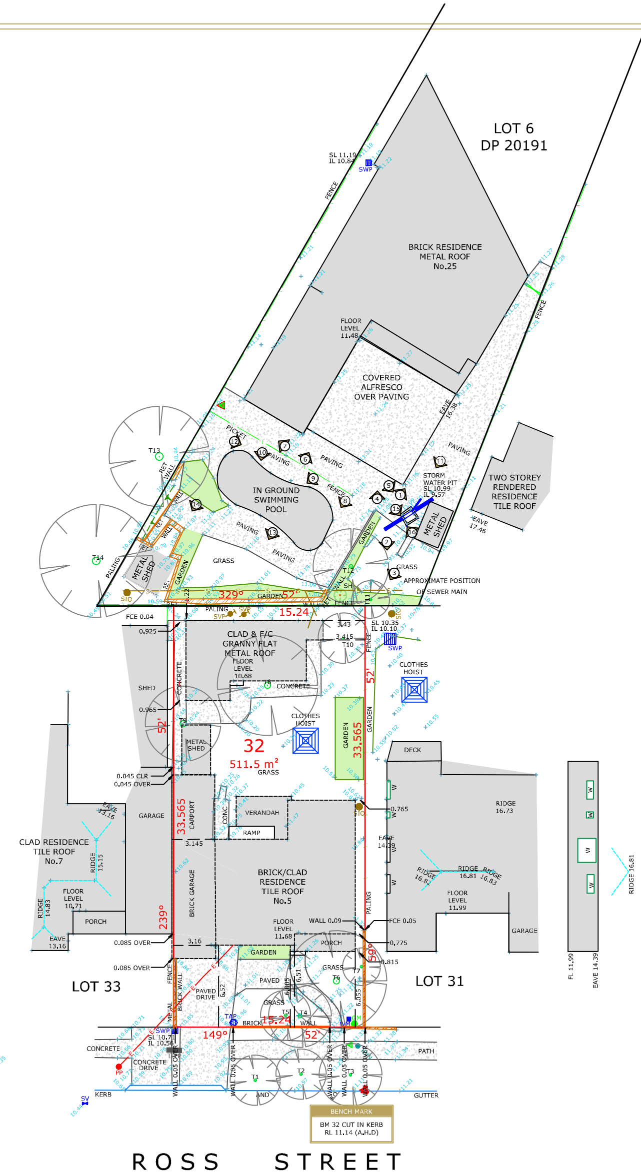
Most of the upstream overland flow from the upstream catchment is passing through the backyard towards the south east direction. The flood level at the cross section 6 for the 50%blocked condition is 10.69m AHD. The proposed building floor level has been used as 10.807m AHD. There is only 100 mm freeboard available at this stage. There are some increases in flood levels within the proposed development backyard in the post development and it will not affect the other properties. The depth of flood water within the backyard is 350mm.

APPENDIX A

Survey Plan

NORTH NOTE

BEARINGS SHOWN HAVE BEEN DETERMINED FROM NSW LAND REGISTRY SERVICES PLANS AND ARE RELATED TO MAGNETIC NORTH. TRUE NORTH IS APPROXIMATE ONLY AND FURTHER INVESTIGATION WOULD BE REQUIRED TO DETERMINE ACCURATE TRUE NORTH.



LOCATION PLAN

LAT: -33.7634
LONG: 151.2897

LOT 32
ABT 59
ROSS STREET
PITT ROAD

SCHEDULE OF TREES

	DIAMETER	HEIGHT	TYPE
T1	0.20	6m	-
T2	0.20	8m	-
T3	0.20	8m	-
T4	0.30	8m	-
T5	0.20	8m	-
T6	0.50	8m	-
T7	0.20	6m	-
T8	0.50	6m	-
T9	0.50	6m	-
T10	0.10	3m	CITRUS

SCHEDULE OF TREES

	DIAMETER	HEIGHT	TYPE
T11	0.20	3m	-
T12	0.30	6m	PALM
T13	0.60	12m	GUM
T14	0.60	9m	GUM

LEGEND

- BENCH MARK
- PHOTO POINT
- GULLY PIT
- VEHICULAR/PRAM CROSSING
- TOP OF BANK
- BOTTOM OF BANK

ABBREVIATIONS

EB - ELECTRICAL BOX
EM - ELECTRICAL METER
GM - GAS METER
H - HYDRANT
KO - KERB OUTLET
LH - LAMP HOLE
LP - LIGHT POLE
MH - MAN HOLE
MS - MAINTENANCE SHAFT
PP - POWER POLE
R - HYDRANT RECYCLED
SH - SHRUB
SIO - SEWER INSPECTION OPENING
SMH - SEWER MAN HOLE
SR - STOP VALVE RECYCLED
SV - STOP VALVE
SVP - SEWER VENT PIPE
SWP - STORM WATER PIT
T - TREE
TP - TELECOMMUNICATIONS PIT
VER - VERANDAH
WT - WATER TAG
WM - WATER METER
WMR - WATER METER RECYCLED
WC, GC, EC, TC - SERVICE CONDUIT
W/C - WATER CLOSET

SOURCE OF LEVELS

PM 1995 RL 10.483
S.C.I.M.S

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www.1100.com.au

DRAWING NOTES

1. CONTOURS SHOWN HAVE BEEN INTERPOLATED FROM SPOT LEVELS TAKEN ON-SITE AND ARE A REPRESENTATION OF THE TOPOGRAPHY ONLY.
2. DIMENSIONS SHOWN (BEARINGS & DISTANCES) HAVE BEEN DETERMINED BY NSW LAND REGISTRY SERVICES PLANS ONLY. BOUNDARIES HAVE NOT BEEN ACCURATELY DETERMINED. BUILDINGS AND FENCES ARE SHOWN IN APPROXIMATE POSITIONS ONLY AND COULD VARY + OR - 100MM.
3. SERVICES SHOWN HAVE BEEN LOCATED WHERE POSSIBLE BY FIELD SURVEY. PRIOR TO ANY SITE WORKS, THE RELEVANT AUTHORITY SHOULD BE CONTACTED TO DETERMINE EXACT POSITION OF ANY UNDERGROUND PIPES, CABLES ETC.
4. DIMENSIONS OF ANY TREES SHOWN ON THE PLAN ARE APPROXIMATE.

PLAN BY: DONOVAN ASSOCIATES — REGISTERED SURVEYORS AND CIVIL/STRUCTURAL ENGINEERS

CLIENT: ICON HOMES

CLIENT REFERENCE:

REVISION	DESCRIPTION	DATE
A	EXTRA LEVELS IN REAR LOT	06.12.2022

PROJECT LOCATION:

LOT 32 DP 15141

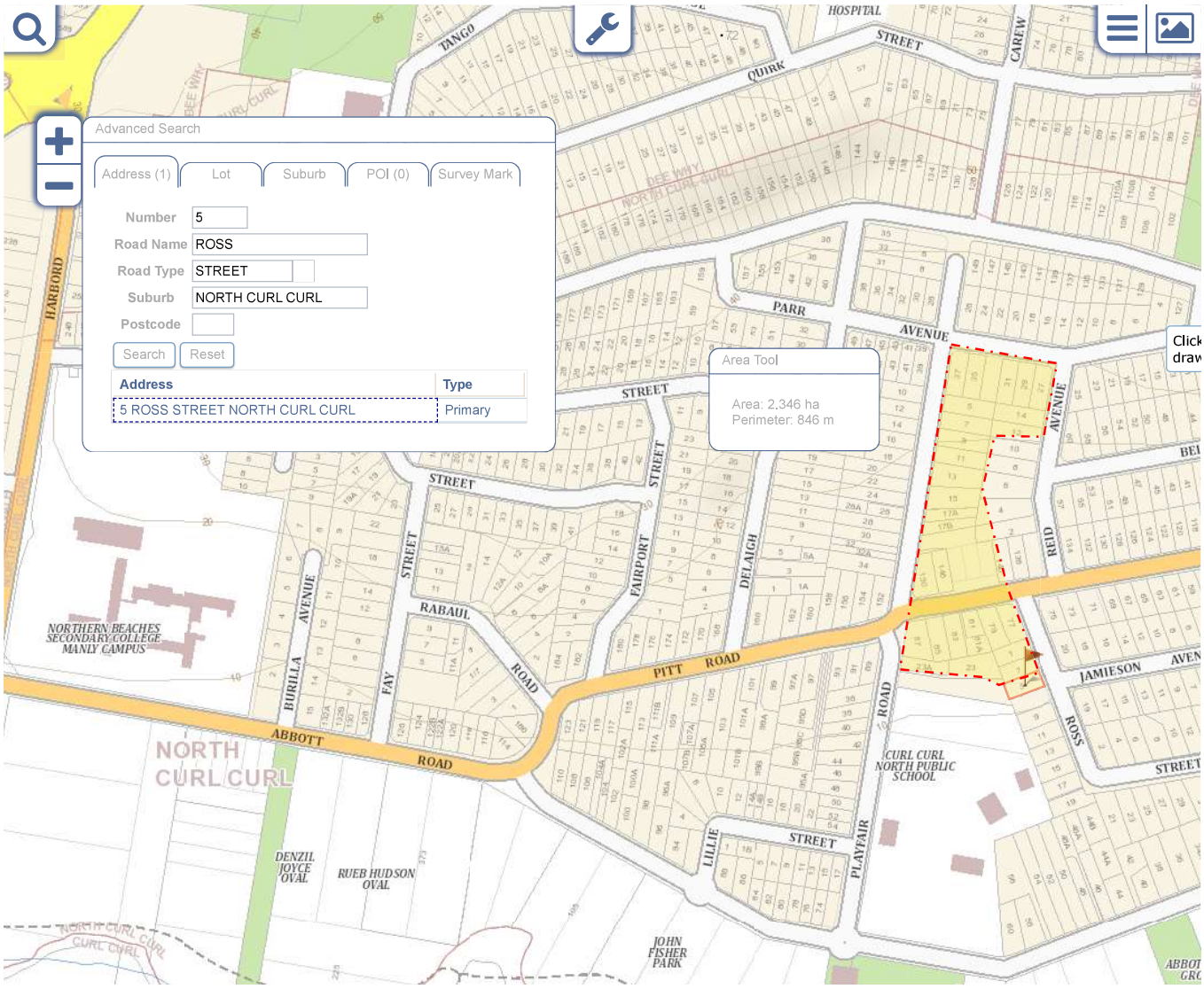
5 ROSS STREET
NORTH CURL CURL, NSW

PLAN TYPE	LEVEL DATUM	
CONTOUR PLAN	AUSTRALIAN HEIGHT DATUM	
	DRAWN	CHECKED
	L.DAWSON	R.McINTYRE
JOB REFERENCE	SURVEY DATE	DGN/DWG No.
0404/329445	06.12.2022	329445
	SHEET SIZE	SCALE
	A1	1:200

0m 5m 10m 15m 20m

APPENDIX B

Catchment plans



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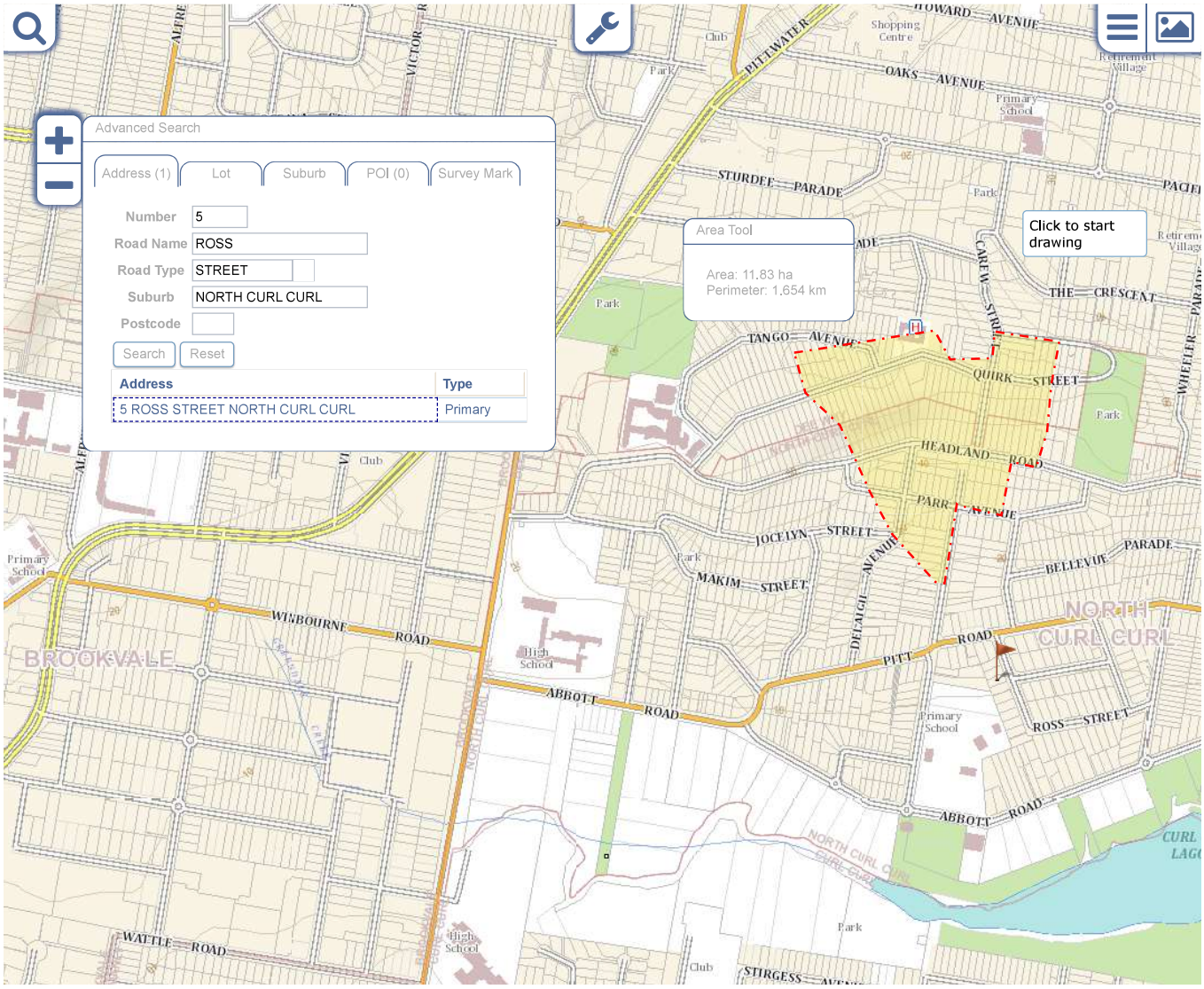

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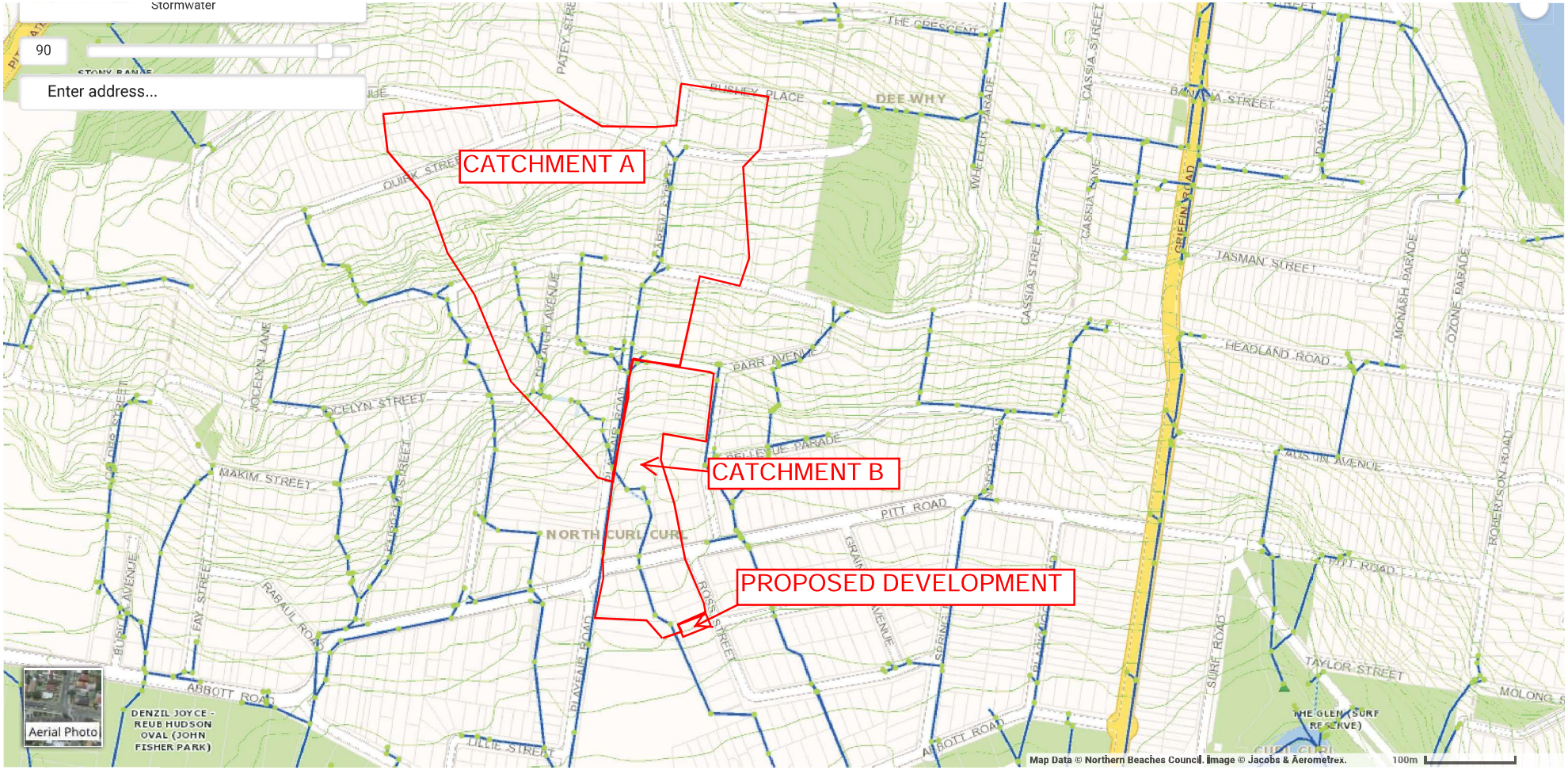
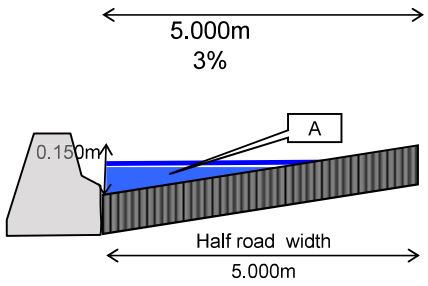

Stormwater
90
Enter address...
CATCHMENT A
CATCHMENT B
PROPOSED DEVELOPMENT
DEE WHY
NORTH CURL CURL
PITT ROAD
HEADLAND ROAD
JASMAN STREET
MAKIM STREET
ABBOTT ROAD
TAYLOR STREET
DENZIL JOYCE - REUB HUDSON OVAL (JOHN FISHER PARK)
THE GLEN (SURF RESERVE)
Aerial Photo
Map Data © Northern Beaches Council. Image © Jacobs & Aerometrex.
100m

APPENDIX C

100-year ARI flow calculation

Estimation of road flow(Half road)

Flow Capacity Road - Assuming 3.5% Longitudinal slope & 3% Crossfall



n_A (pavement) = 0.016

Flooded Areas A			Perimeter P	Radius R (A/P)
A = 1/2 x 5.0 x 0.15	=	0.375 m²	5.15225 m	0.0727837 m

Flow Capacity

$$Qcap = \frac{AR^{2/3}S^{1/2}}{n}$$

$AR^{2/3}/n_A$ = 4.09
S = 3.5 %
Qcap = 0.76 m³/s

V = Q/A = 2.038 m/s

Flow calculation

Overland flow at the back of 5 Rani Street
= 4.47 − 50% of 750ϕ Pipe
= 4.47 − 0.731 = 3.74 m³/sec

100 YEAR ARI FLOW CALCULATION USING RATIONAL METHOD
5 ROSS STREET NORTH CURL CURL NSW(CATCHMENT B)

The time of concentration has been taken as 10.0 min

100 I_{10} = 212 mm/hr

Total upstream catchment area (A) =2.346 ha

Percentage of impervious area has been taken as 80%

10 I_1 = 60mm/hr

Co-efficient of runoff for a 1 in 10 year storm of 1 hour duration

C'_{10} = 0.1+ (0.7-0.1)* (10I_1 -25)/(70-25) = 0.57

C_{10} = 0.9 f_p + C'_{10} (1-f_p)

C_{10} = 0.9*0.8 + 0.57 (1- 0.80) = 0.915

F_{100} = 1.20 (100 year)

C_{100} = F_{100} x C_{10}

C_{100} = 1.20*0.915 =1.0

Total catchment flow in 1 in 100 year ARI will be

Q_{100} = $C_{100}I_{100}A/360$

= 1.0*212*2.346/360 m^3 / sec

= 1.38 m^3 / sec

100 YEAR ARI FLOW CALCULATION USING RATIONAL METHOD
5 ROSS STREET NORTH CURL CURL NSW(CATCHMENT A)

The time of concentration has been taken as 10.0 min

100 I_{10} = 212 mm/hr

Total upstream catchment area (A) =11.83 ha

Percentage of impervious area has been taken as 80%

10 I_1 = 60mm/hr

Co-efficient of runoff for a 1 in 10 year storm of 1 hour duration

C'_{10} = 0.1+ (0.7-0.1)* (10I_1 -25)/(70-25) = 0.57

C_{10} = 0.9 f_p + C'_{10} (1-f_p)

C_{10} = 0.9*0.8 + 0.57 (1- 0.80) = 0.915

F_{100} = 1.20 (100 year)

C_{100} = F_{100} x C_{10}

C_{100} = 1.20*0.915 =1.0

Total catchment flow in 1 in 100 year ARI will be

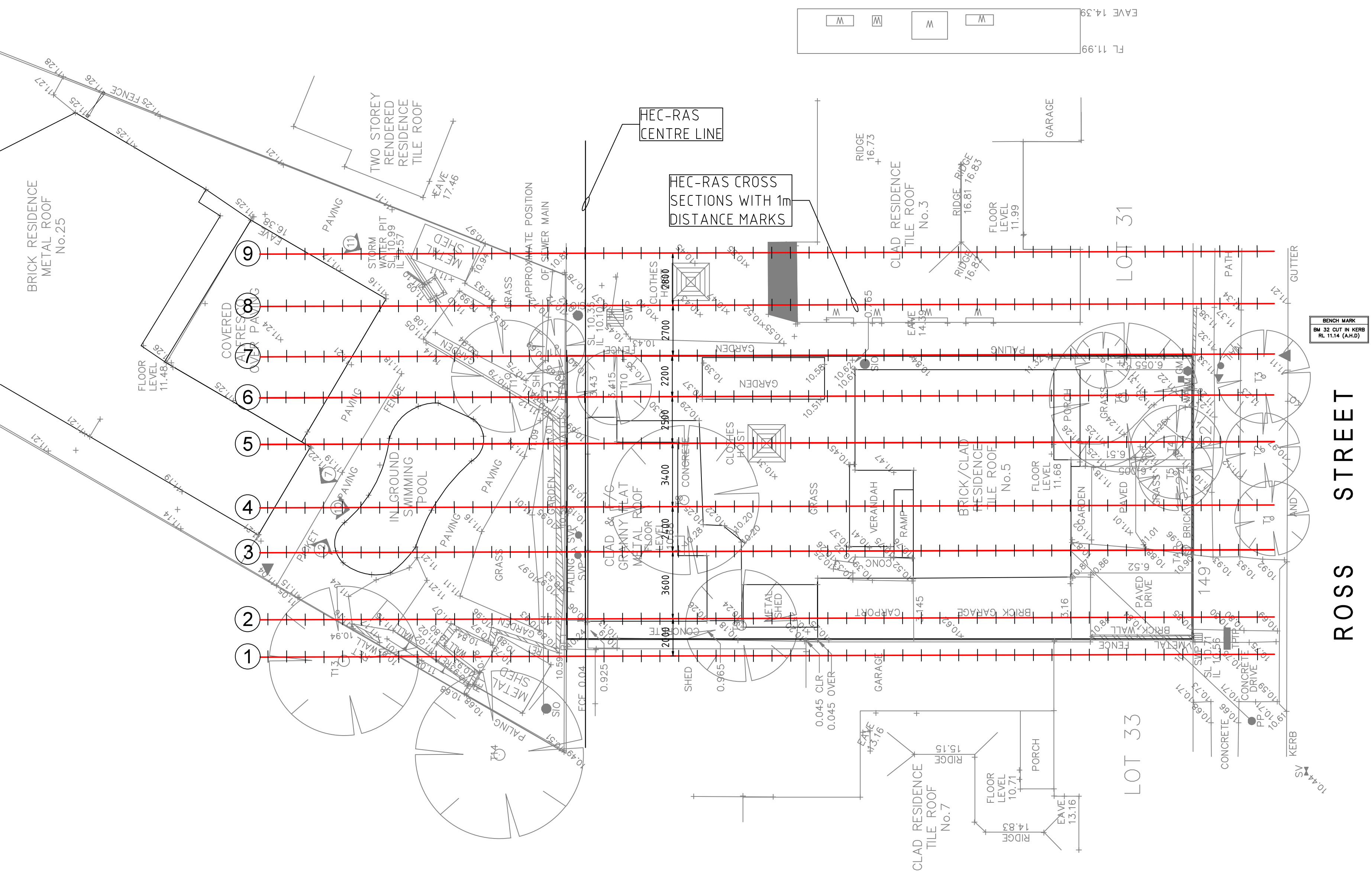
Q_{100} = $C_{100}I_{100}A/360$

= 1.0*212*11.83/360 m^3 / sec

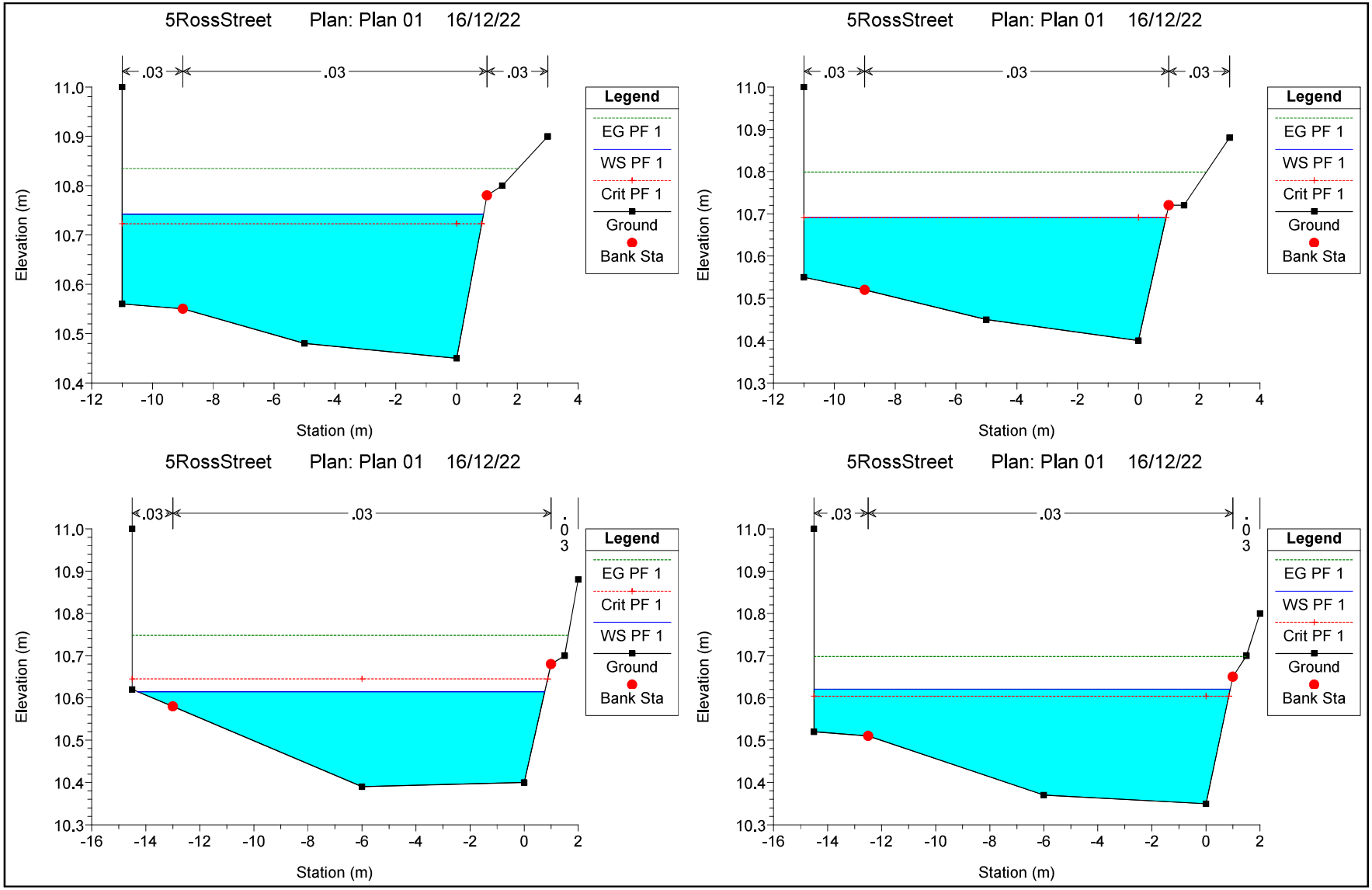
= 6.97 m^3 / sec

APPENDIX D

Pre- Development HEC-RAS Model Results



HEC RAS CROSS SECTIONS_PRE-DEVELOPMENT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Elevation (m)
Station (m)
Legend
EG PF 1
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Crit PF 1
Ground
Bank Sta
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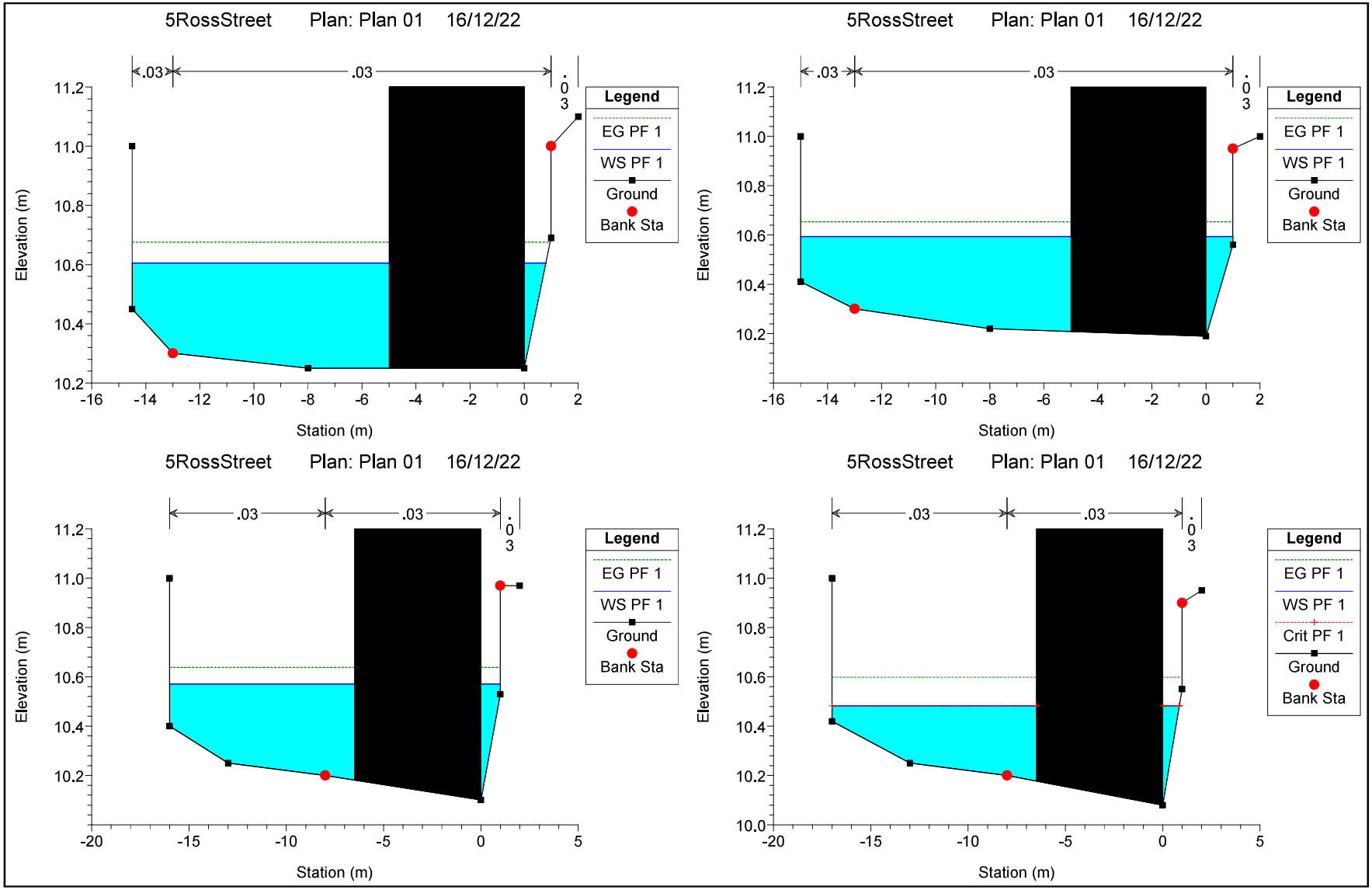
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Station (m)
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5RossStreet Plan: Plan 01 16/12/22
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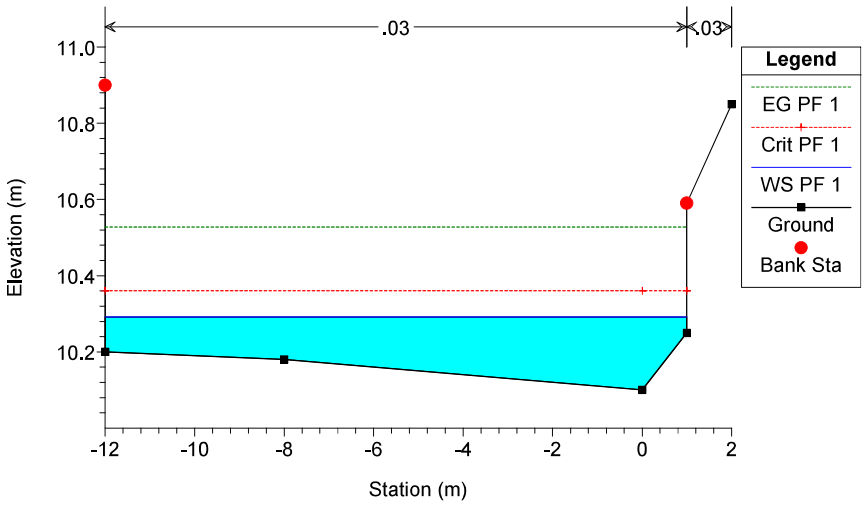

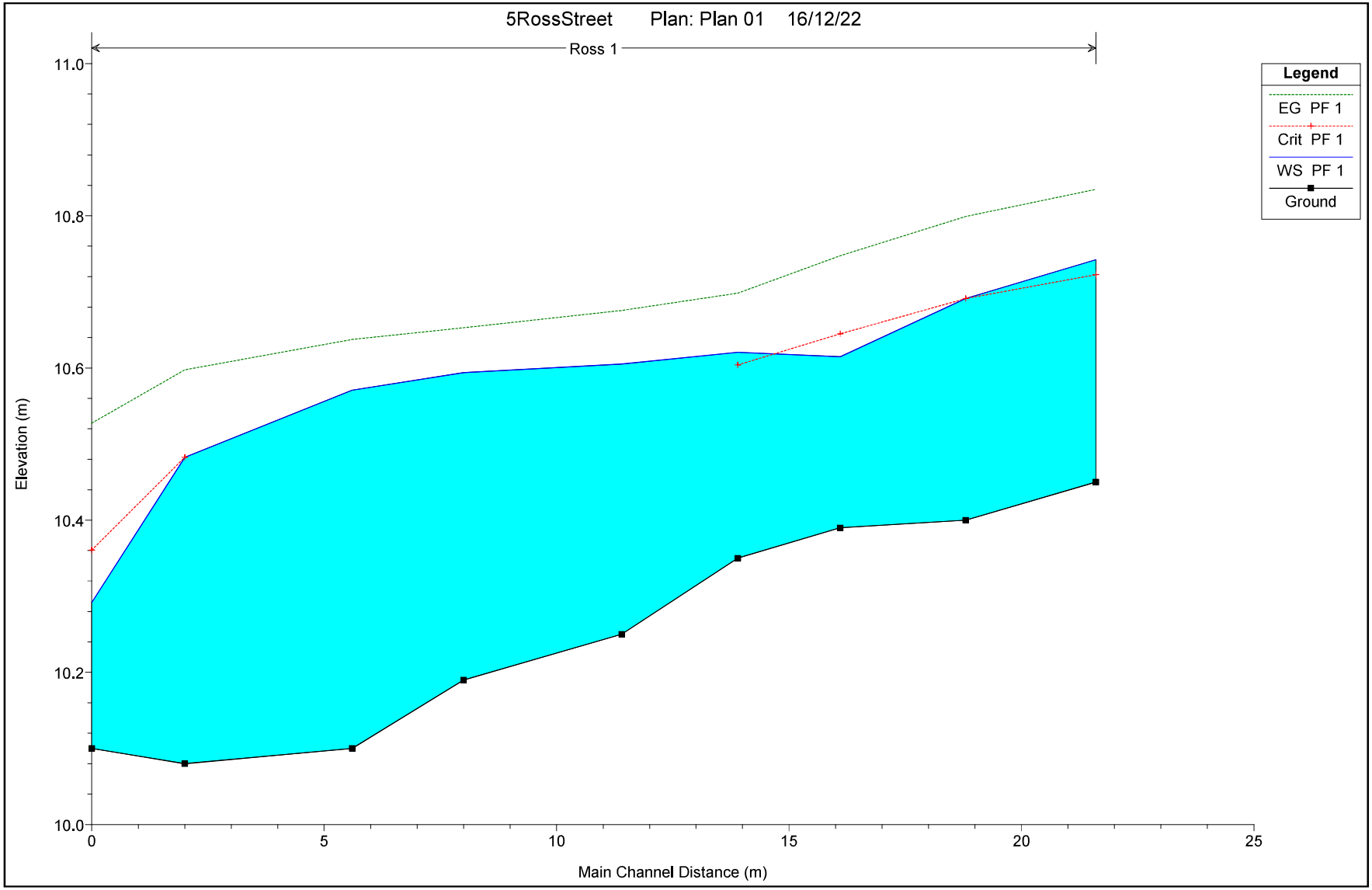
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Elevation (m)
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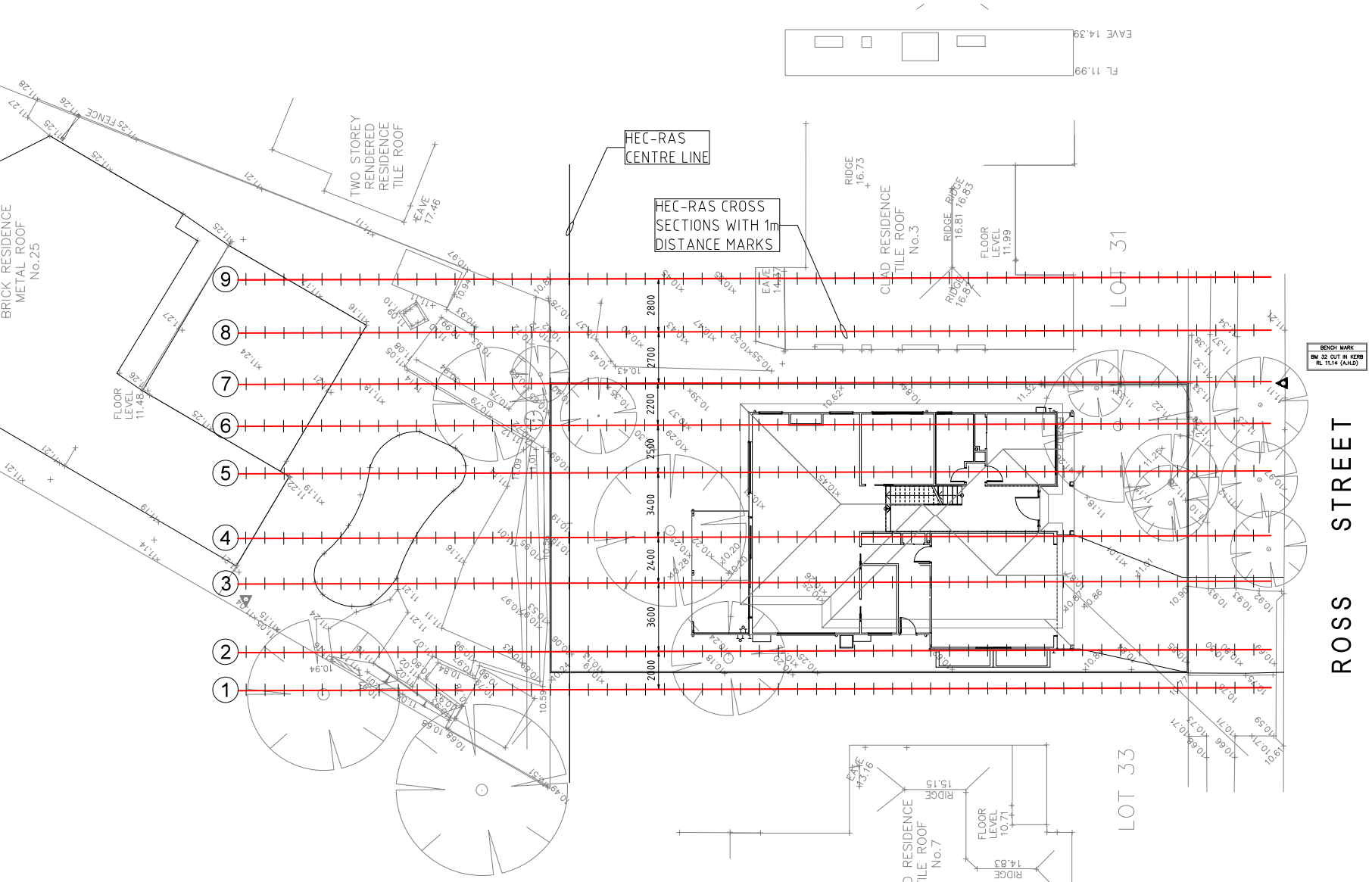
25
Main Channel Distance (m)

HEC-RAS Plan: Pre River: Ross Reach: 1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	9	PF 1	3.74	10.45	10.74	10.72	10.83	0.011136	1.37	2.80	11.89	0.89
1	8	PF 1	3.74	10.40	10.69	10.69	10.80	0.014110	1.49	2.60	11.91	0.99
1	7	PF 1	3.74	10.39	10.61	10.64	10.75	0.025456	1.62	2.33	15.07	1.26
1	6	PF 1	3.74	10.35	10.62	10.60	10.70	0.011112	1.25	3.07	15.40	0.87
1	5	PF 1	3.74	10.25	10.61		10.68	0.006447	1.19	3.21	10.31	0.67
1	4	PF 1	3.74	10.19	10.59		10.65	0.005259	1.10	3.50	11.00	0.60
1	3	PF 1	3.74	10.10	10.57		10.64	0.006193	1.00	3.29	10.50	0.56
1	2	PF 1	3.74	10.08	10.48	10.48	10.60	0.016878	1.45	2.49	11.36	0.91
1	1	PF 1	3.74	10.10	10.29	10.36	10.53	0.061743	2.15	1.74	13.00	1.88

APPENDIX E

Post- Development HEC-RAS Model Results



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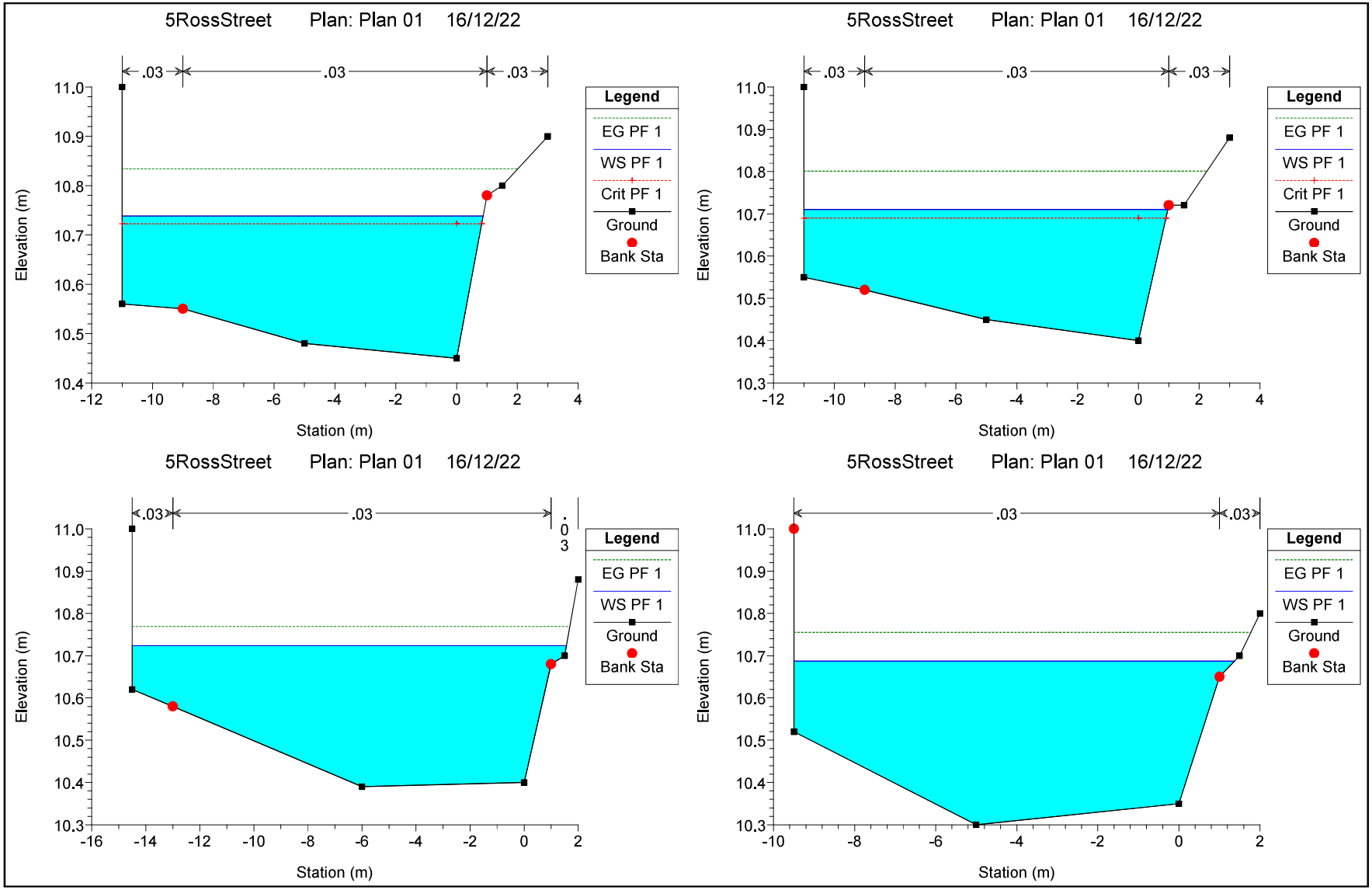
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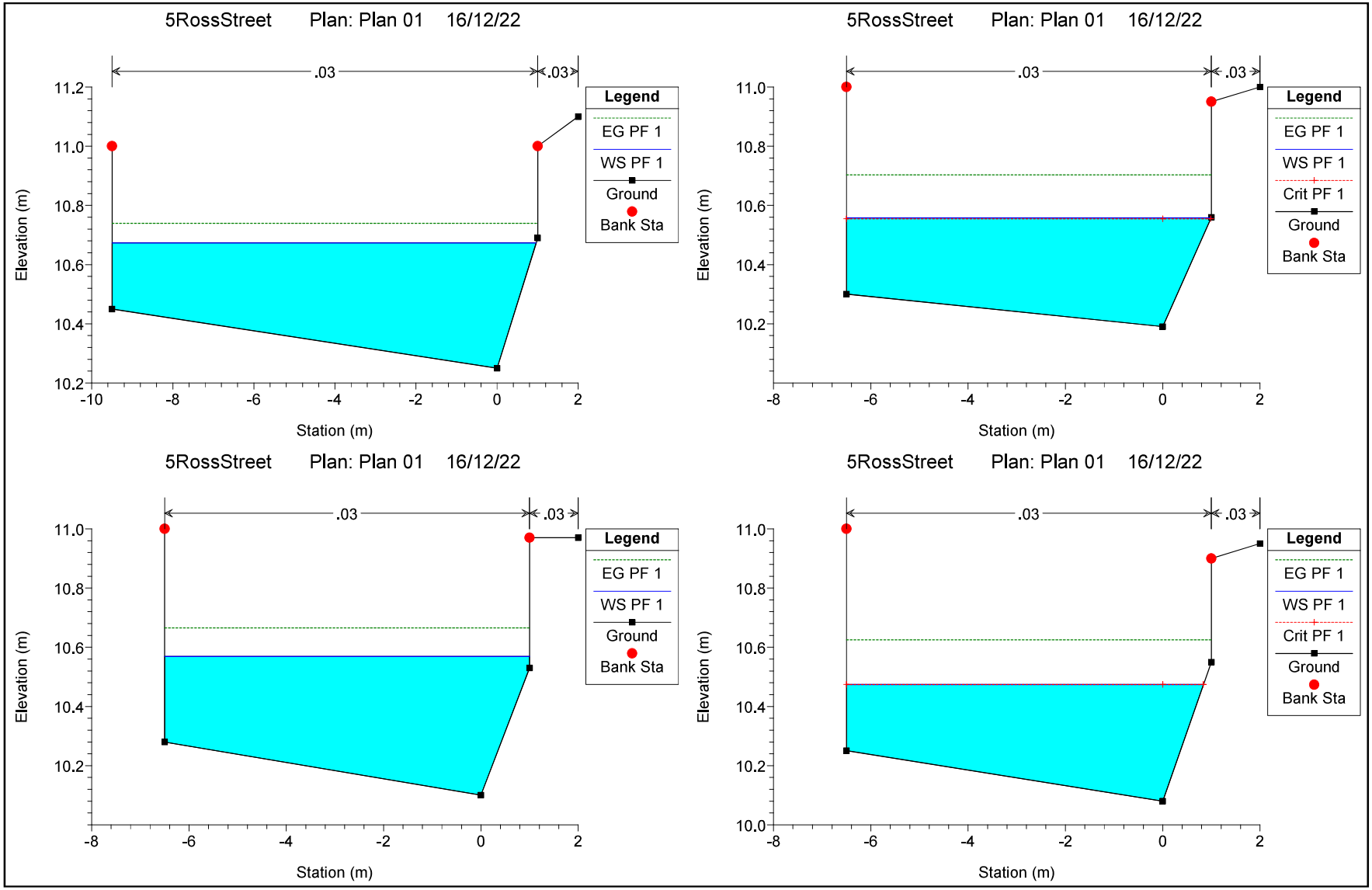
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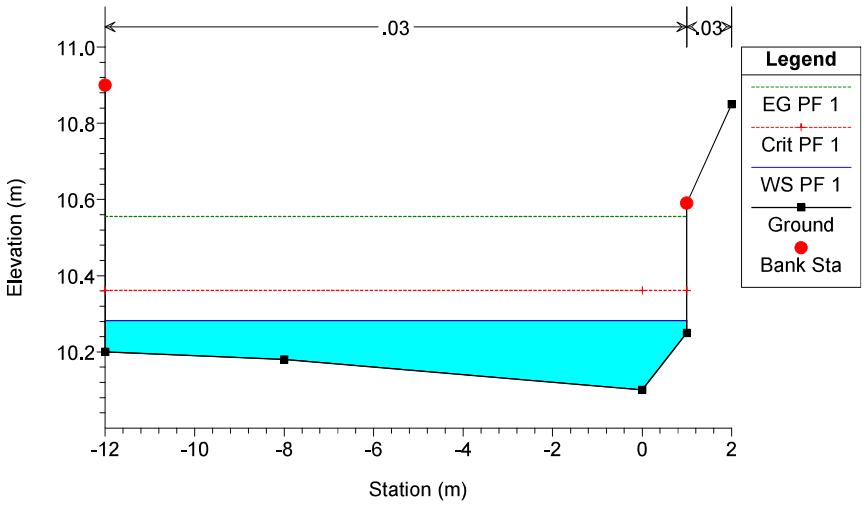
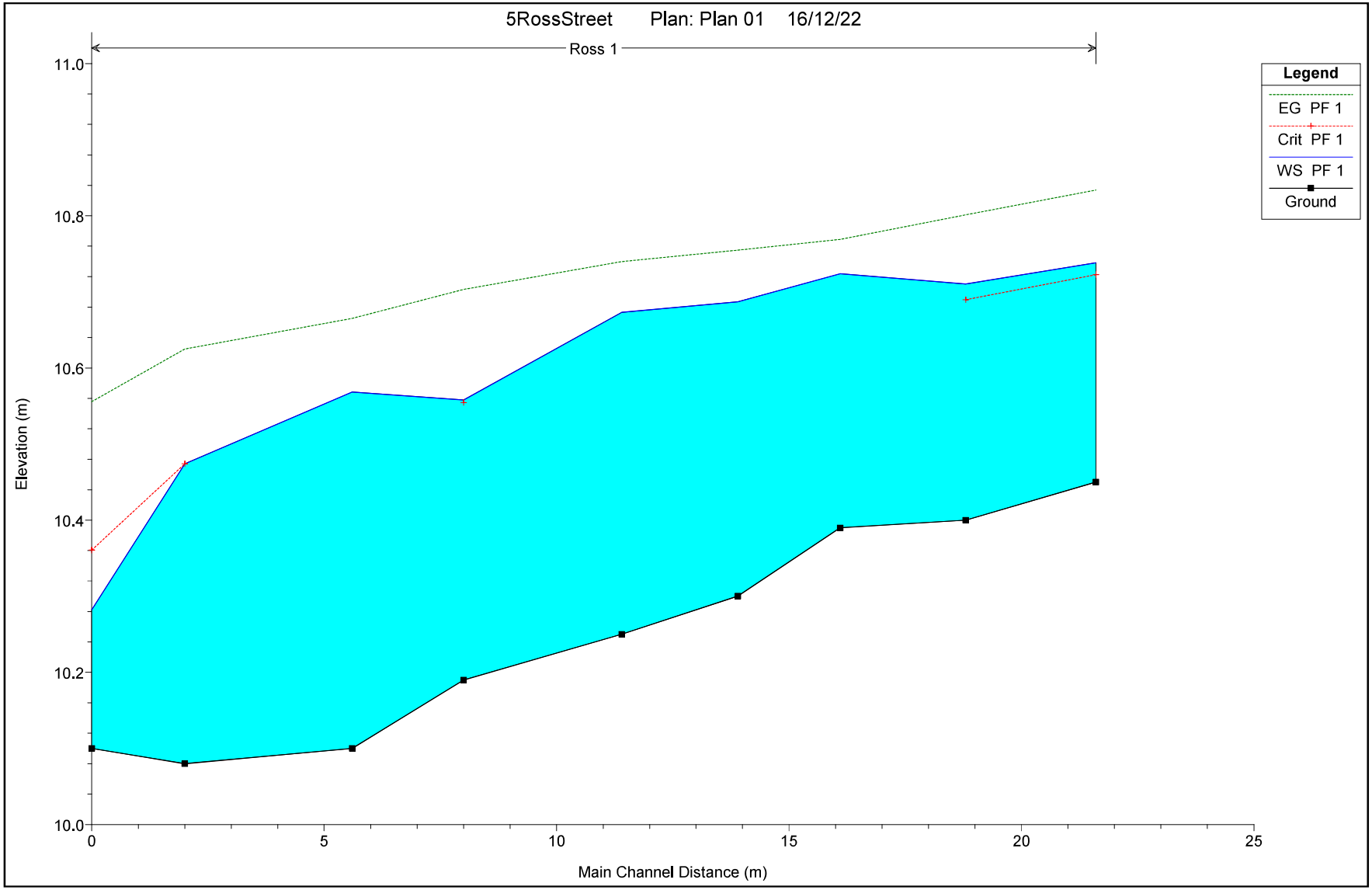
5RossStreet Plan: Plan 01 16/12/22




5RossStreet Plan: Plan 01 16/12/22
Ross 1
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Elevation (m)
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Main Channel Distance (m)

HEC-RAS Plan: Post River: Ross Reach: 1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	9	PF 1	3.74	10.45	10.74	10.72	10.83	0.011784	1.40	2.75	11.87	0.91
1	8	PF 1	3.74	10.40	10.71	10.69	10.80	0.010768	1.36	2.83	11.97	0.87
1	7	PF 1	3.74	10.39	10.72		10.77	0.004594	0.95	4.03	16.07	0.58
1	6	PF 1	3.74	10.30	10.69		10.75	0.005883	1.15	3.25	10.87	0.66
1	5	PF 1	3.74	10.25	10.67		10.74	0.005760	1.14	3.27	10.46	0.65
1	4	PF 1	3.74	10.19	10.56	10.55	10.70	0.013772	1.69	2.22	7.49	0.99
1	3	PF 1	3.74	10.10	10.57		10.67	0.007131	1.38	2.71	7.50	0.73
1	2	PF 1	3.74	10.08	10.47	10.47	10.63	0.014265	1.72	2.17	7.34	1.01
1	1	PF 1	3.74	10.10	10.28	10.36	10.56	0.078822	2.32	1.62	13.00	2.10