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STORMWATER MANAGEMENT PLAN AND FLOOD RISK ASSESSMENT FOR PROPOSED REDEVELOPMENT OF INVERELL POLICE STATION AT 109 OTHO STREET INVERELL, NSW 2360

Job Ref: 190077

Date: 29 April 2020

Revision: 00

Prepared By: _____
Evelyn Sowada
M.Sc. (Civil) Dip. Eng.(MIEI)

CONTENTS

1.0 INTRODUCTION....3

2.0 SITE LOCATION AND DESCRIPTION....3

3.0 DEVELOPMENT PROPOSAL....5

4.0 EXISTING STORMWATER NETWORK....5

5.0 PROPOSED STORMWATER NETWORK....5

6.0 STORMWATER QUANTITY MANAGEMENT....5

7.0 STORMWATER QUALITY MANAGEMENT....6

8.0 PROPOSED STORMWATER QUALITY MANAGEMENT....6

9.0 CONCLUSION....6

APPENDIX A – SITE PLAN AND CIVIL DRAWINGS....A

APPENDIX B – FLOOD RISK ASSESSMENT....B

1.0 INTRODUCTION

Richmond and Ross Pty Ltd, Consulting Engineers, have been engaged to prepare a Stormwater Management Plan and Flood Assessment for the proposed redevelopment works at the existing Inverell Police Station, 109 Otho Street Inverell NSW2360. No responsibility to third parties under the law of contract, tort or otherwise for any loss or damage is accepted.

The purpose of this assessment is to provide advice with respect to stormwater management for the proposed works. The results of this study are limited to this scope. This report is to be read in conjunction with Drawings No. 190077 C100(00), C101(00) and C110(00).

This assessment has been prepared by carrying out a physical walkover of the site, reviewing physical land survey, reviewing hydrological information, historical records and available aerial photography of the site. Proposed management refers also to Inverell Shire Council Development Control Plans, Stormwater Drainage Specification for Building Developments and other relevant Guidelines.

2.0 SITE LOCATION AND DESCRIPTION

The subject site is an existing development located at 109 Otho Street, Inverell NSW2360 and is part of LOT DP1153744 (total LOT area: 7,693 m^2). Refer to Figure 1 for detail.

Proposed construction works apply to area under NSW Police Force (NSWPF) control only. Total redevelopment zone is approximately 2,741m². Subject site has been already cleared under previous consent (Application No DA-74/2019 and Crown Certificate No 20000190/1).

Figure 1 Existing LOT DP 1153774 (Extract from NearMap)

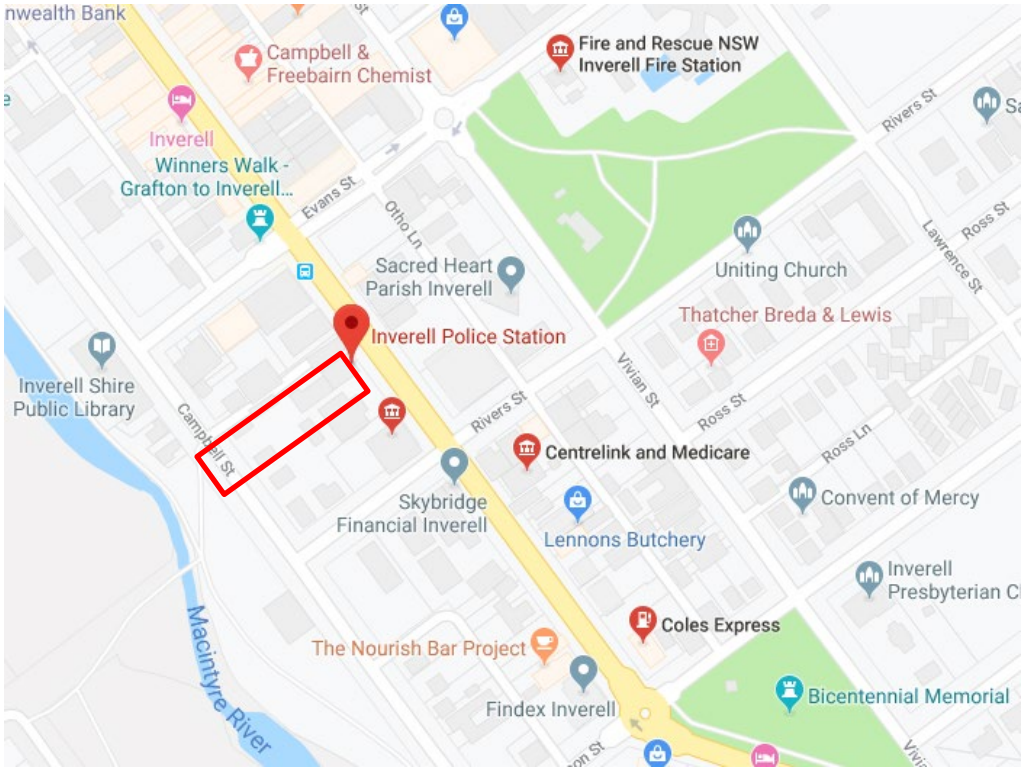


Figure 2 Existing Development under NSWPF Control, Map View/ Redevelopment Zone (Extract from Google Map)

Figure 3 Existing Development under NSWPF Control Satellite View/ Redevelopment Zone (Extract from NearMap)

The existing site area, under NSWPF control, is approx. 2,741m². Prior to demolition works it consisted of: Police Station Building, three (3) detached garage buildings and a metal boat shed with associated open air Police equipment storage. Total impervious area was approx. 2,359 m^2 with some poor quality landscape of 364m². Approximately 83% of the site (2,265 m^2) drains to the kerb at Otho Street, with remaining 17% discharging to Campbell Street, via combination of underground stormwater pipework and surface level overflows.

3.0 DEVELOPMENT PROPOSAL

Purpose of the proposed site re-development is to construct new Police Station with associated Police Storage Equipment Area. It is proposed to demolish existing station building, together with existing shed structures, and to introduce a brand new layout to suit specific needs of the Inverell Police Forces. Existing entry and exit points to and from the subject development will stay as present, with one pedestrian and vehicular access from Otho Street and one vehicular access from Campbell Street. It is proposed to remain the existing stormwater discharge arrangements with some only minor adjustments to suit the revised site layout.

Please refer to drawings in Appendix A for details of the new Site Layout.

4.0 EXISTING STORMWATER NETWORK

The subject site currently drains via combination of the existing on-site underground drainage network and a surface level overflow and discharges to the street level via kerb outlets at Otho Street and Campbell Street. A physical walkover of the site indicates there is no evidence of "On Site Detention System" (OSD) or any stormwater quality improvement elements.

5.0 PROPOSED STORMWATER NETWORK

It is proposed to construct new stormwater pipework, to convey rainfall from the re-developed zones and to merge it, where possible, with the existing on-site discharge points on the following principles:

- All new and existing roof areas to be drained via downpipes into underground pipework and discharged to the public drainage system via existing and new kerb outlet points
- All hardstanding areas to be drained via new grated inlet pits and grated channels and discharged via underground pipework to the public drainage system via kerb outlet points;
- Existing discharge points from the site to be maintained were possible or location to be adjusted to suit new site layout.

For additional details please refer to drawings No. 190077-C100(00), C101(00) and C110(00) in Appendix A.

6.0 STORMWATER QUANTITY MANAGEMENT

The new drainage design has been undertaken in accordance with The Inverell Development Control Plan requirements. It is proposed to construct a combination of underground pipe network (grated inlet pits and trenches located in low points) for rainfall events up to 20 years ARI. For annual rainfall events larger (up the 100 years ARI) ponding or a surface overflow will occur. In the event that the on site

system is over capacity, stormwater will pond to approximately 60mm (max) deep at the low point locations.

There is no evidence of any existing "On Site Detention System".

Further to the above, proposed new development introduces:

- Small reduction in total impermeable area within the site;
- Total decrease in impervious areas: approx. 20m²;
- Small increase in landscape area within the site;
- Total increase in landscape area: approx. 36m²;
- Underground pipework's capacity designed for rainfall events up to 20years AIR;
- Surface level overflow for rainfall events larger than 20years AIR;
- All works to be maintained within the existing site boundary with no impact on surrounding land users;
- No increase in discharge volumes from the site and therefore no impact on capacity of the existing drainage network;
- No impact on downstream properties.

For details of the proposed Stormwater Drainage Network please refer to drawings No. 190077-C100(00), C101(00) and C110(00) included in Appendix A

7.0 STORMWATER QUALITY MANAGEMENT

Existing site currently shows no stormwater treatment measures in place. A physical walkover of the site indicates that stormwater from roof and a hardstanding area is discharged directly into the council's drainage system. Furthermore, there is no separation between hardstanding area and police equipment wash bay, with polluted water drained directly to the existing stormwater system.

8.0 PROPOSED STORMWATER QUALITY MANAGEMENT

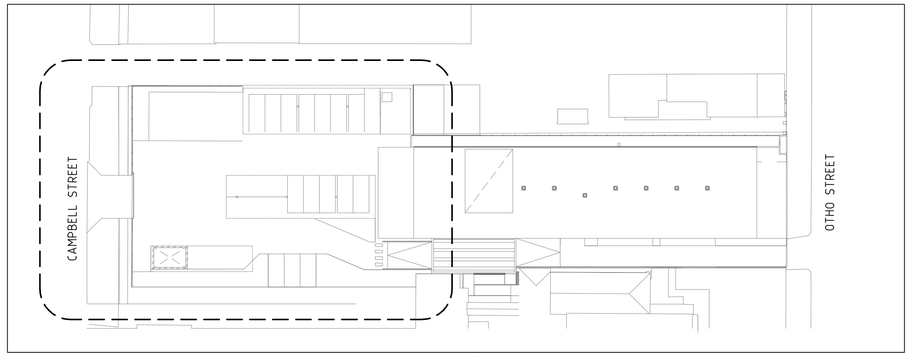
No major alterations are proposed to the existing nutrient removal arrangements. However, to improve quality of stormwater discharged from the site, it is proposed to introduce a clear separation of the police equipment wash bay from rainwater drainage system.

9.0 CONCLUSION

A stormwater system has been proposed for the new development to address relevant requirements for water pollution and quantity control. We believe the above proposal satisfies relevant requirements and is in accordance with the overall Inverell Shire Council Development Control Plans.

Furthermore, there is no change to the proposed outfalls, nor connection points arrangements, previously approved under original consent (Application No DA-74/2019 and Crown Certificate No 20000190/1).

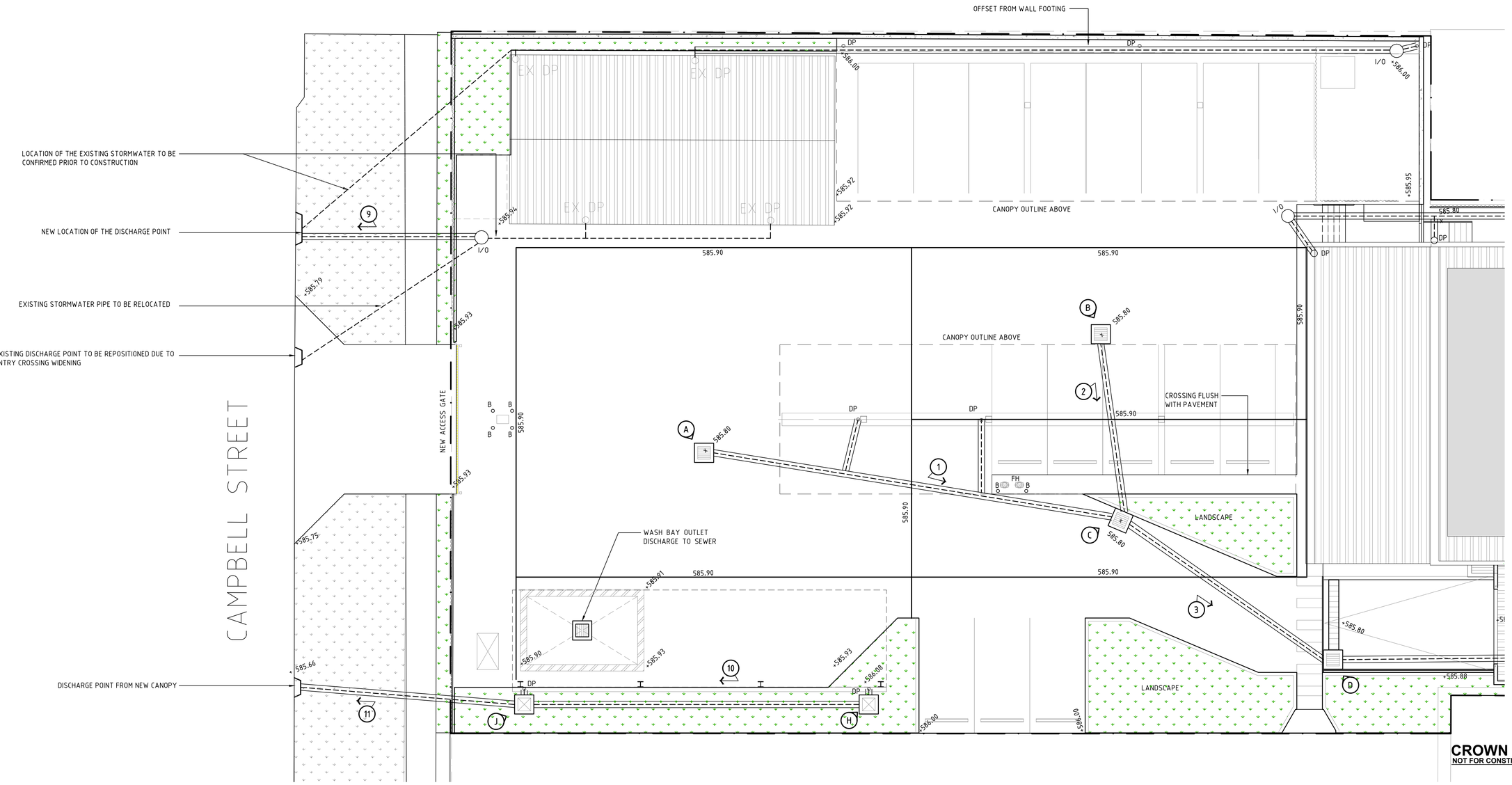
APPENDIX A – SITE PLAN AND CIVIL DRAWINGS



KEY PLAN

LEGEND:

- PROPERTY BOUNDARY
- EXISTING SPOT LEVELS
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPOSED LEVELS
- PROPOSED INSPECTION OPENING
- EXISTING DOWNPIPE
- PROPOSED DOWNPIPE (Ø 150)
- PROPOSED SW INLET PIT
- PROPOSED WASH BAY INLET PIT
- PROPOSED JUNCTION PIT
- PROPOSED GRATED DRAIN
- EXISTING STORMWATER DRAIN
- PROPOSED STORMWATER DRAIN



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REVISION

REV No	COMMENTS	DATE	INIT
00	DA ISSUE	29.04.2020	MA

General Notes

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ORIENTATION:

NSW Police Force

BGIS

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CROWS NEST. NSW 2065
TEL 02 9490 9600
FAX 02 9438 1224

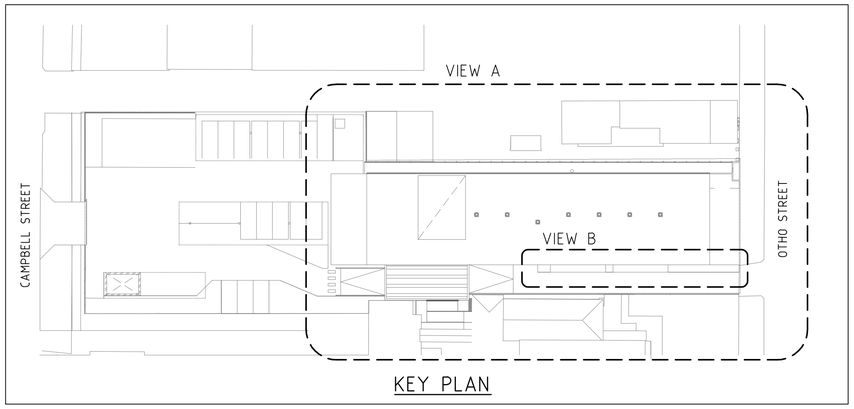
PROJECT:
INVERELL POLICE STATION

LOCATION:
109 OTHO STREET, INVERELL

SCALE: 1:100 @A1

DRAWING: STORMWATER PLAN SHEET 1 OF 2

JOB No.: **190077** DRG. No. C100 REV 00



KEY PLAN

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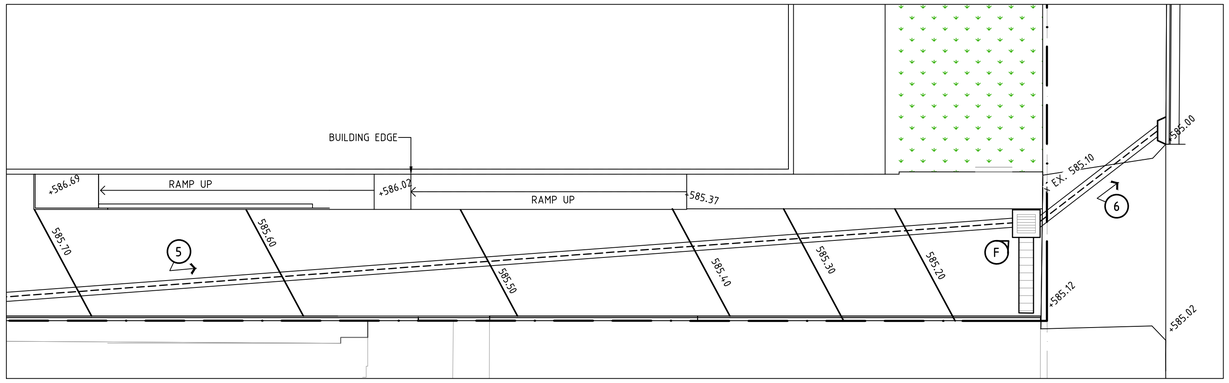
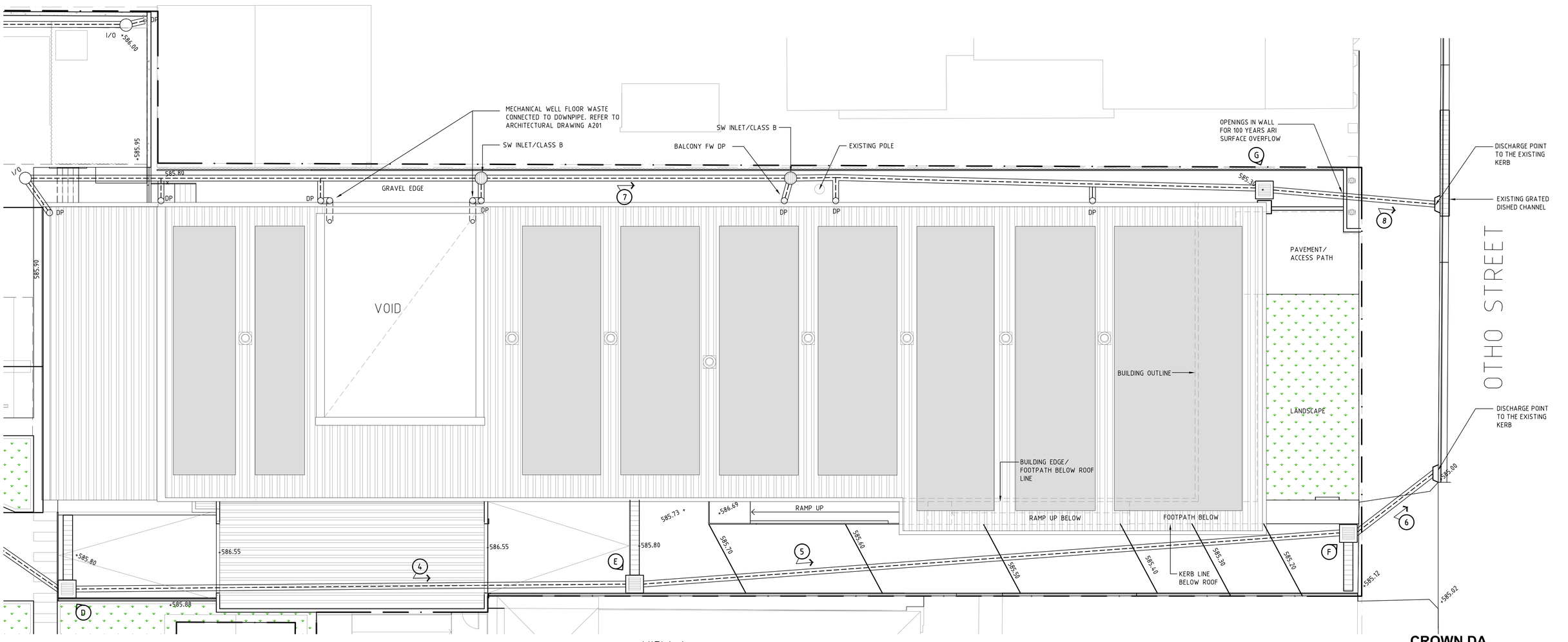
- PROPOSED STORMWATER DRAIN



VIEW B



VIEW A

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PROJECT:
INVERELL POLICE STATION

LOCATION:
109 OTHO STREET, INVERELL

SCALE: 1:100 @A1

DRAWING: STORMWATER PLAN SHEET 2 OF 2

JOB No.: **190077** DRG. No. C101 REV 00

STORMWATER DISPOSAL PHILOSOPHY

1. COLLECT ALL SITE RUNOFF FROM SURFACE GRADES, SUMPS AND UNDERGROUND DRAINS PRIOR TO DISCHARGE TO KERB OUTLETS.
2. ROOF RUNOFF TO BE DIRECTED INTO SITE STORMWATER SYSTEM.
3. ON-SITE UNDERGROUND DRAINAGE HAS BEEN DESIGNED FOR 1 IN 20 YEAR FLOWS, TO CONNECT INTO COUNCIL SYSTEM VIA EXISTING AND NEW OUTFALLS.

GENERAL NOTES

1. FIT STEP IRONS TO PITS DEEPER THAN 1000.
2. ALL GRATES TO BE WELDED CONSTRUCTION SUPPLIED COMPLETE WITH H.D. BOLTS AND FRAMES. PROVIDE FLATTENED EXPANDED METAL TO ALL GRATES.
3. ALL PIT COVERS & GRATES TO BE SECURELY BOLTED DOWN.
4. ALL UPVC PIPES TO HAVE SOLVENT WELDED JOINTS.

STORMWATER NOTES

1. THIS IS A STORMWATER DRAINAGE PLAN ONLY. REFER TO ARCHITECTURAL DRAWINGS FOR ALL SETOUT INFORMATION.
2. ALL DRAINAGE LAYOUTS, LEVELS & DETAILS ARE DIAGRAMMATIC AND INDICATIVE ONLY. NOTE ONLY MAJOR LINES ARE SHOWN.
3. ALL PIPES TO BE 150 DIA UPVC LAID AT 1.0% MIN GRADE. UPVC PIPES TO BE SOLVENT WELDED JOINTS U.N.O.
4. ALL GRATED DRAINS TO HAVE BASE GRADED 1.0% MIN WITH HEEL GUARD TYPE GRATES.
5. IT IS THE BUILDERS RESPONSIBILITY TO LAY ALL PIPES IN ACCORDANCE WITH ALL RELEVANT AUTHORITY REQUIREMENTS (EG. COUNCIL, EPA, ETC.).

STORMWATER RUNOFF CALCULATIONS

USING FORMULA $Q = 0.000278\ CAI$

WHERE
- Q = DISCHARGE IN LITRES PER SECOND
- C = A RUNOFF COEFFICIENT
- A = CATCHMENT AREA IN SQ.M.
- I = RAINFALL INTENSITY IN MILLIMETRES PER HOUR
- I_{20} = 180 MM/HR FOR 20 YEAR RETURN PERIOD

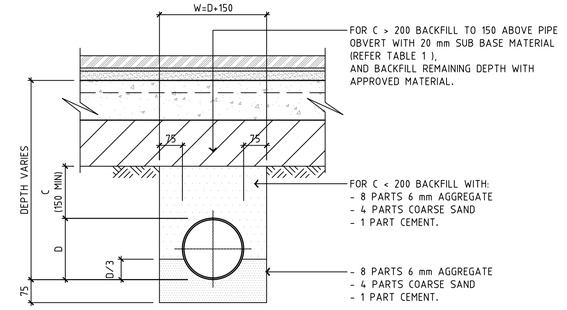
LINE	AREA OF CATCHMENT (SQM)	FLOW FROM AREA (l/s)	TOTAL FLOW IN THE PIPE (l/s)	SIZE MIN. (mm)
1	340	16.16	16.16	Ø 150@1:180
2	200	9.51	9.51	Ø 150@1:180
3	260	12.36	38.03	Ø 225@1:200
4	118	5.82	43.85	Ø 225@1:200
5	84	4.15	48.00	Ø 225@1:200
6	126	5.99	53.99	Ø 225@1:140
7	840	42.00	42.00	Ø 225@1:200
8	-	-	42.00	Ø 225@1:200
9	310	15.51	15.51	Ø 150@1:100
10	63	3.30	3.30	Ø 150@1:100
11	-	-	3.30	Ø 150@1:100

LINE SCHEDULE

TAG	UPSTREAM INVERT	SIZE	MATERIAL	LENGTH (m)	GRADE	DOWNSTREAM INVERT	NOTES
1	585.35	150	UPVC	18.0	1:180	585.25	
2	585.35	150	UPVC	7.0	1:170	585.25	
3	585.25	225	UPVC	11.0	1:183	585.19	
4	585.19	225	UPVC	28	1:200	585.05	
5	585.05	225	UPVC	32.0	1:213	585.90	
6	585.90	200x100	RHS	9.0	1:180	584.85	2xRHS
7	585.25	225	UPVC	56.5	1:157	584.90	
8	585.90	200x100	RHS	9.0	1:112	584.82	2xRHS
9	TBC	200x100	RHS	8.0	TBC	585.75	1xRHS
10	585.83	125x75	RHS	15.0	1:200	585.76	
11	585.76	125x75	RHS	10.0	1:100	585.66	1xRHS

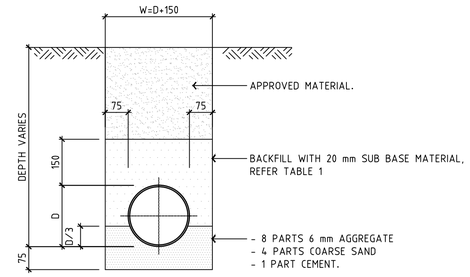
PIT SCHEDULE

TAG	TYPE	SIZE	RL TOP	IL	COVER	NOTES
A	INLET	450x450	585.80	585.35	CLASS D	
B	INLET	450x450	585.80	585.35	CLASS D	
C	INLET	450x450	585.80	585.25	CLASS D	
D	GRATED TRENCH + INLET	ACO S 100 K + 600x600	585.87	585.19	CLASS D	ACO OR SIMILAR
E	GRATED TRENCH + INLET	ACO S 100 K + 600x600	585.80	585.05	CLASS D	ACO OR SIMILAR
F	GRATED TRENCH + INLET	ACO S 100 K + 450x450	585.25	584.90	CLASS D	ACO OR SIMILAR
G	INLET	450x450	585.30	585.00	CLASS B	
H	JUNCTION	350x350	586.08	585.83	CLASS B	
J	JUNCTION	350x350	586.05	585.76	CLASS B	



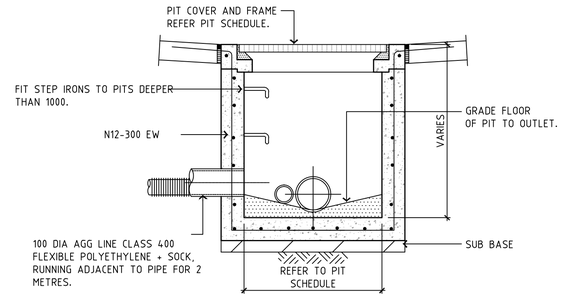
STORMWATER PIPE BEDDING DETAIL (UNDER PAVEMENT)

SCALE 1:10



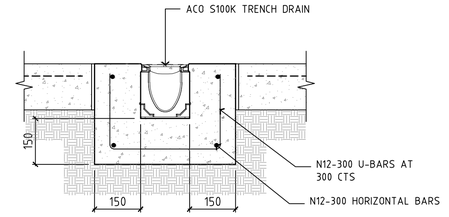
STORMWATER PIPE BEDDING DETAIL (UNDER GROUND)

SCALE 1:10



INLET PIT (JUNCTION PIT SIMILAR)

SCALE 1:20



TYPICAL TRENCH GRATE SECTION DETAIL

SCALE 1:10

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PROJECT:
INVERELL POLICE STATION

LOCATION:
109 OTHO STREET, INVERELL

SCALE:
AS SHOWN @A1

DRAWING:
STORMWATER SCHEDULES AND DETAILS

JOB No.: **190077** DRG. No. C110 REV 00

APPENDIX B – FLOOD RISK ASSESSMENT

Inverell Shire Council Development Control Plan shows, that the subject site is located within the High Hazard Flood Fringe zone. There are two flood heights applicable to Inverell relating to the 1976 and 1991 flood in accordance with the Inverell Floodplain Management Plan 1996. Relevant Flood Markers has been shown in the Figures and Table below.

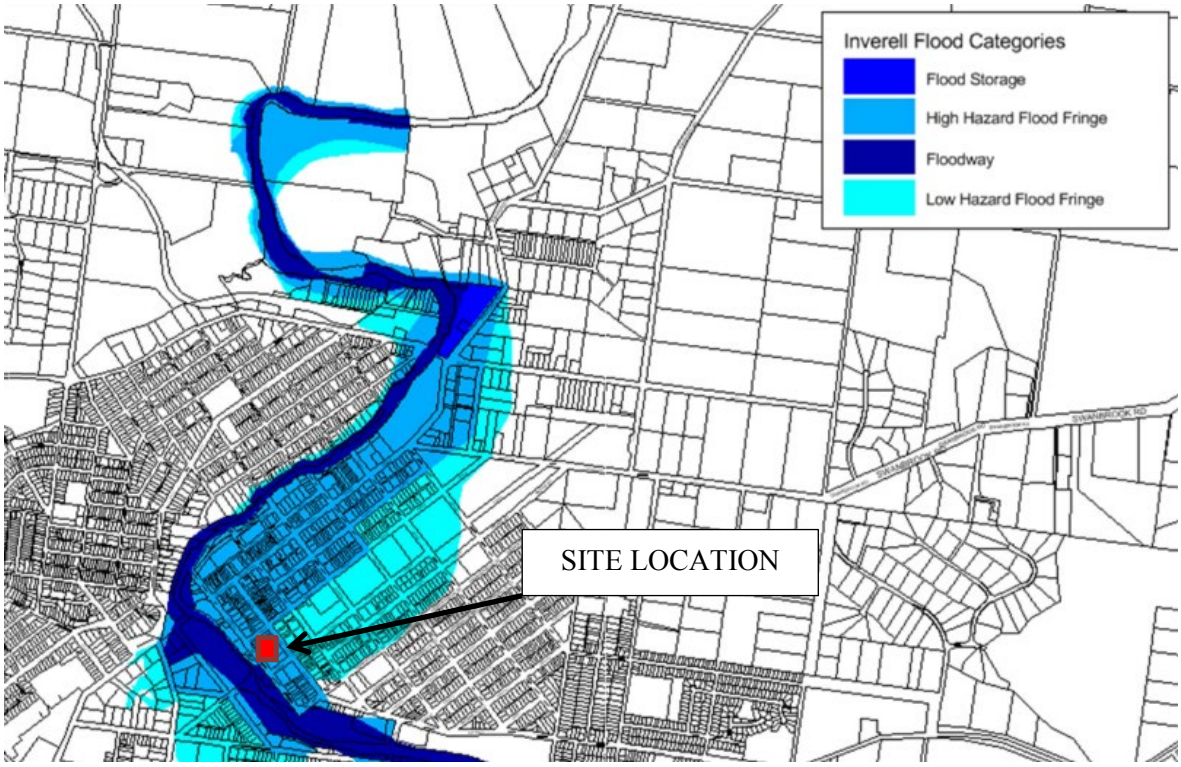

Figure 1 Local Flood Extend (Extract from Inverell Shire Council DCP)

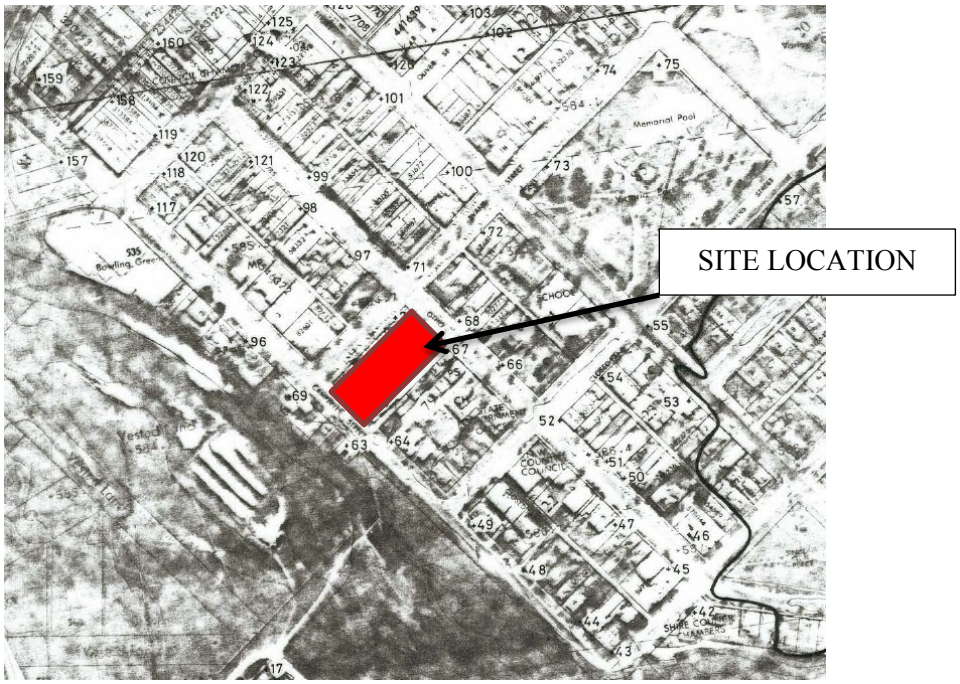

Figure 2 Historical Map of Flood Markers (Extract from Inverell Shire Council records)

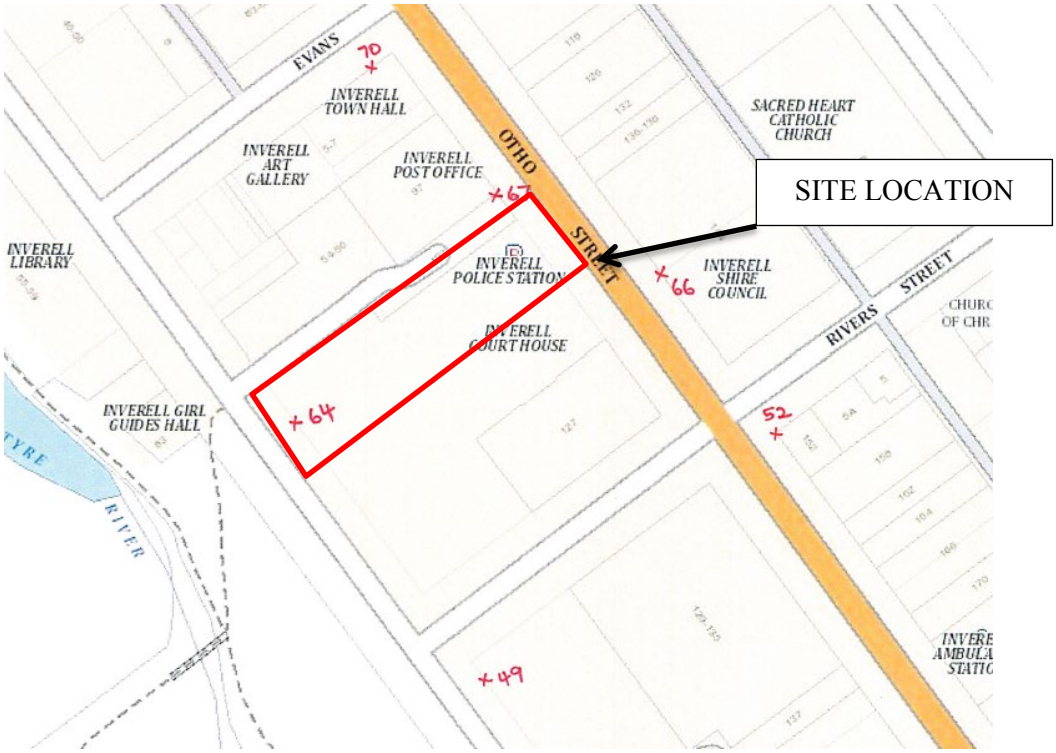

Figure 3 Map of Flood Markers relevant to subject site

OBSERVED FLOOD LEVELS

FLOOD MARK No.	REDUCED LEVELS (A.H.D.) 1955	1976	1983	1991
1		586.40		587.48
2				587.14
3				586.99
4	586.40	586.30		586.80
5				587.03
6				586.88
7				586.46
8				586.42
9				586.58
10				586.42
11				586.54
12				586.43
13				586.34
14	585.80			586.38
15	586.60			586.84
16				586.60
17	586.50			586.52
18				586.51
19				586.44
20				586.42
21				586.40
22	584.40			584.97
23		584.60		584.90
24				584.35
25				583.86
26				583.71
27				583.64
28	583.10			583.63
29				583.60
30	582.40			583.32
31				583.05
32				582.66
33		581.80		582.51
34				582.36
35				582.30
36		581.40		582.11
37				581.46
38				580.66
39				580.16
40				579.71
41			585.90	587.44
42				586.90
43	586.50	586.00		587.16
44	586.60			586.77
45				586.79
46				586.62
47				586.37
48				586.74
49	586.40		585.10	586.43
50				586.30
51				586.20
52				585.95
53				585.41
54				585.57
55	585.20			585.46
56				584.90
57				584.60
58				584.36
59				584.32
60				584.21
61				584.18
62	583.80			584.15
63				586.44
64				586.52
65				586.28
66				585.93
67	586.00			585.96
68				586.00
69				586.16
70	586.10	585.20		585.95
71	585.30	584.60		585.90
72	585.00	584.20		585.19
73				584.76
74				584.63

Figure 4 Observed Flood Levels for relevant markers (Extract from Inverell Shire Council records)

Inverell Shire Council DCP requires that: *Any new building is to be constructed of flood damage resistant material and is to be fitted with flood protection measures to protect the interior of the building against a flood equal to the 1991 flood level plus 500mm.*

Available records received from the Council's Planning Officer shows the maximum flood level, for the subject site, to be at level of 585.96mAHD. However, Inverell Police Personnel confirmed that, during flooding in 1991, top water level was approx. 2 steps down from the existing building's finished floor level (Ex. FFL 586.69m AHD), which would be an equivalent of approx. 586.50mAHD. In light of this specific information, the higher level has been adopted, as base for the flood protection measures.

It is proposed to maintain the existing finished floor levels for the main Police Station as present. Therefore, the Proposed Finished Floor Level (FFL) of the new building remains as: 586.69mAHD.

To satisfy DCP requirement of flood protection measures, up to the flood level with additional 500mm freeboard, it is proposed to install a proprietary drop-in plastic flood barrier at each entry to the building up to the level of 587mAHD. This will create required degree of protection to the interior of the building from flooding water, and still provide an easy way out for the personnel during evacuation procedure (height of the barrier above FFL is to be 310mm).

Furthermore, we confirm that the proposed re-development works can be constructed at the proposed levels and will have no significant impact on current flood volumes or top water levels. Localised changes in top water levels will be minimal and will not increase risk to surrounding properties.

In summary, the post-development flows at the critical sections do not result in increase of the flood hazard or risk to other properties.