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OUR REF: 16323-1 V3.Doc

September 2012

FLOOD ANALYSIS REPORT

Proposed Subdivision

Lot 23 DP 1159704

Berkeley Road, Fountaindale

for

Hapido Pty Ltd & TSM Pty Ltd

LGA

Wyong Shire Council

Revision 3

HOOLIHAN PARTNERS
CONSULTING ENGINEERS

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1 INTRODUCTION

Hoolihan Partners Pty. Ltd. was commissioned to undertake a hydrological and hydraulic analysis of the 1% AEP, 5% AEP and 20% AEP flood levels of the natural watercourses crossing the development site. This report forms part of the Rezoning Application and is to be read in conjunction with survey drawings prepared by Everitt & Everitt Pty Ltd Reference No. 16984.

The study was undertaken to determine the impact of the 1% AEP, 5% AEP and 20% AEP flood levels on the proposed subdivision taking into account the backwater affects from Ourimbah Creek to the North of the site.

Wyong Shire Council Officers have undertaken an initial assessment of the rezoning application and indicated the following is required;

> *There are 2 identified watercourses in the location of the proposed development. Council is also aware of significant flooding of the section of Berkeley Rd in the area of the development. Flooding in this area may have a significant impact on the development of proposed Lot 5043. Therefore the applicant is to provide details of drainage calculations and flood potential in the proposed subdivision area. Issues to be identified are to include but are not limited to:*
>
> - *Flood levels in the area including methodology and calculations.*
> - *Velocity and flow characteristics.*
> - *Affect on proposed Lot 5043*
> - *Any methods of flood mitigation and affect both up and down stream.*

This report shall address the four items identified above by Council.

2 SITE DESCRIPTION

The site is “L” shaped in plan area and is located on the southern and northern sides of Berkeley Road. Refer to survey plan by Everitt & Everitt Pty Ltd Ref. 16984 for site dimensions. The site is vacant consisting mainly of pasture and grazing paddocks to the lower northern portion of the site with more heavily timbered bush areas to the upper southern and western portions.

Two major natural watercourses traverse the site flowing from the steeper higher regions in the south to the lower area to the north. The two major watercourses cross Berkeley Road through pipe culvert structures. The eastern watercourse culvert has recently been upgraded to triple cell 900 mm diameter RCP, during road reconstruction works by Council. The western watercourse has also been recently upgraded to triple cell 600 mm diameter RCP during road upgrading works.

A minor tributary is also located in a gully between the two major watercourses and directs storm flows from the western side of proposed Lot 4 into the western major watercourse.

3 PROPOSED DEVELOPMENT

The proposed subdivision consists of the creation of three lots Zone No. 7 (c) – Scenic Protection: Small Holdings Zone with the remainder of the site being allocated to Zone No. 7 (a) - Conservation Zone.

Everitt & Everitt Pty Ltd Drawing No. 16984 Sheet 1 Revision 2 detail the proposed Lot layout.

4 HYDROLOGY

The area of the catchment upstream of each input node was determined from the 1:4,000 topographic plans produced by the Central Mapping Authority of New South Wales. The catchment areas are shown on Figure 1 of Appendix A.

CATCHMENT – Node C1	Area = 0.110 km^2
CATCHMENT – Node 1.3	Area = 0.031 km^2
CATCHMENT – Node 1.5	Area = 0.066 km^2
CATCHMENT – Node C2	Area = 0.140 km^2
CATCHMENT – Node C3	Area = 0.0076 km^2
CATCHMENT – Node 3.2	Area = 0.009 km^2
CATCHMENT – Node 3.4	Area = 0.0118 km^2

Uniform rainfall patterns were adopted from intensity-frequency-duration (I-F-D) relationships for Fountaindale derived from the following base data;

2yr, 1hr	40.4 mm/hr
2yr, 12hr	9.03 mm/hr
2yr, 72hr	2.86 mm/hr
50yr, 1hr	80.25 mm/hr
50yr, 12hr	17.96 mm/hr
50yr, 72hr	6.16 mm/hr
Skew	0.0
F2	4.3
F50	15.9

The IFD table is detailed in Appendix A

Design peak flood flows were calculated using the probabilistic Rational Method for Eastern New South Wales as detailed in Book Four (4) Volume 1 Australian Rainfall and Runoff. Summaries of the peak flows for the 5yr, 20yr and 100 yr ARI event are tabulated below.

Site **FOUNTAINDALE**

DATA
Design ARI **5** year

Inlet	Land-Use Type	Area	Time t_c=0.76A$^{0.38}$		Intensity	C_{10} Fig. 5.1 Volume 2 AR&R	Frequancy Factor FF_y for Rational Method in Eastern New South Wales				Design Runoff Coefficent C_5	Design Flood Q_5 m^3/s
		km^2	hrs	min	mm/hr		Zone Fig. 1.2.	$I_{12.50}$	$I_{12.2}$	FF_5		
C1	Rural	0.1100	0.33	20	92.66	0.40	B	18.00	9.03	0.88	0.35	1.00
1.3	Rural	0.0310	0.20	12	114.60	0.40	B	18.00	9.03	0.88	0.35	0.35
1.5	Rural	0.0660	0.27	16	101.24	0.40	B	18.00	9.03	0.88	0.35	0.65
C2	Rural	0.1370	0.36	21	89.10	0.40	B	18.00	9.03	0.88	0.35	1.19
C3	Rural	0.0076	0.12	7	141.30	0.40	B	18.00	9.03	0.88	0.35	0.11
3.2	Rural	0.0090	0.13	8	137.97	0.40	B	18.00	9.03	0.88	0.35	0.12
3.4	Rural	0.0118	0.14	8	132.71	0.40	B	18.00	9.03	0.88	0.35	0.15

Site **FOUNTAINDALE**

DATA
Design ARI **20** year

Inlet	Land-Use Type	Area	Time t_c=0.76A$^{0.38}$		Intensity	C_{10} Fig. 5.1 Volume 2 AR&R	Frequancy Factor FF_y for Rational Method in Eastern New South Wales				Design Runoff Coefficent C_{20}	Design Flood Q_{20} m^3/s
		km^2	hrs	min	mm/hr		Zone Fig. 1.2.	$I_{12.50}$	$I_{12.2}$	FF_{20}		
C1	Rural	0.1100	0.33	20	119.18	0.40	B	18.00	9.03	1.12	0.45	1.63
1.3	Rural	0.0310	0.20	12	146.33	0.40	B	18.00	9.03	1.12	0.45	0.56
1.5	Rural	0.0660	0.27	16	129.82	0.40	B	18.00	9.03	1.12	0.45	1.07
C2	Rural	0.1370	0.36	21	114.74	0.40	B	18.00	9.03	1.12	0.45	1.96
C3	Rural	0.0076	0.12	7	179.26	0.40	B	18.00	9.03	1.12	0.45	0.17
3.2	Rural	0.0090	0.13	8	175.15	0.40	B	18.00	9.03	1.12	0.45	0.20
3.4	Rural	0.0118	0.14	8	168.66	0.40	B	18.00	9.03	1.12	0.45	0.25

Site **FOUNTAINDALE**

DATA
Design ARI **100** year

Inlet	Land-Use Type	Area	Time t_c=0.76A$^{0.38}$		Intensity	C_{10} Fig. 5.1 Volume 2 AR&R	Frequancy Factor FF_y for Rational Method in Eastern New South Wales				Design Runoff Coefficent C_{100}	Design Flood Q_{100} m^3/s
		km^2	hrs	min	mm/hr		Zone Fig. 1.2.	$I_{12.50}$	$I_{12.2}$	FF_{100}		
C1	Rural	0.1100	0.33	20	153.79	0.40	B	18.00	9.03	1.40	0.56	2.63
1.3	Rural	0.0310	0.20	12	187.71	0.40	B	18.00	9.03	1.40	0.56	0.90
1.5	Rural	0.0660	0.27	16	167.11	0.40	B	18.00	9.03	1.40	0.56	1.71
C2	Rural	0.1370	0.36	21	148.23	0.40	B	18.00	9.03	1.40	0.56	3.16
C3	Rural	0.0076	0.12	7	228.75	0.40	B	18.00	9.03	1.40	0.56	0.27
3.2	Rural	0.0090	0.13	8	223.63	0.40	B	18.00	9.03	1.40	0.56	0.31
3.4	Rural	0.0118	0.14	8	215.53	0.40	B	18.00	9.03	1.40	0.56	0.40

Stormwater runoff hydrographs were calculated using the Time-Area method which utilise a convolution of the rainfall excess hyetograph with a time-area diagram representing the progressive area contributions within a catchment in set time increments. The stormwater runoff hydrographs were calculated using the XP-STORM (Stormwater Modelling Drainage Design) program developed by XP-Software Pty. Ltd. from the ACT. The XP-STORM program allows multiple rainfall patterns and storm duration's for various design return intervals (ARI's) to be routed (flow through) the modelled system.

Standard Australian rainfall temporal patterns for Zone 1 Fig. 3.2 AR&R 1987 have been used. The 25-minute storm duration was adopted as the critical duration resulting in the maximum runoff for each design storm.

The peak stormwater flows for each ARI modelled using the XP-STORM program were matched to the corresponding peak stormwater flow calculated using the Rational Method for 100% impermeable site conditions. Correlation was achieved by varying the rainfall multiplier until the resulting excess rainfall runoff matched the flows calculated using the Rational Method.

5 HYDRAULICS

Flood routing was performed using the XP-STORM (Urban Drainage Design) program developed by XP-Software Pty. Ltd. The XP-STORM program allows multiple rainfall patterns and storm duration's for various design return intervals (ARI's) to be routed (flow through) the modelled system. XP-STORM provides hydraulic analysis and design using the dynamic wave method, solving all terms in the St Venant equations. This option is recommended where there is any chance of a backwater effect in the system or where tidal boundary conditions are being modelled.

Links between each of the nodes were modelled as natural sections with a main central channel and over bank areas each side of the main channel. The culvert reach was modelled as a pipe system with the road over the culvert acting as a weir during over bank flows.

A model network diagram showing nodes and reaches along with cross sections of each reach is included in Appendix B.

In order to model the overland flow through the natural watercourse system, some assumption must be made as to the relevant starting (downstream) water levels. The local catchment lies within the larger catchment flowing into Ourimbah Creek and as such is affected by the 1% AEP flood levels of the Ourimbah Creek system. Wyong Shire Council allowed access to a report prepared by Andrews Neil Pty Ltd. “Enterprise Drive Environmental Studies” dated 1992. As a part of this report a 1% AEP flood study of the Ourimbah Creek Catchment was undertaken by Paterson Consulting Pty Ltd. The local catchment forms a part of Catchment “2J” feeding into creek “2JA” in the Paterson Report. A copy of “Figure 1 – 1% AEP Flood Extents” from the Andrews Neil report is included in Appendix B.

The water surface level adopted at node OUT was as follows;

Design ARI	Stage
100 yr	RL 15.25 m AHD

No data was available for the 5% and 20% AEP downstream backwater levels. Therefore the model was run with 0.0 m depth backwater level for the 20% AEP event and half of the 1% AEP backwater depth = (15.25-12.0) / 2 = 1.625 m for the 5% AEP event.

The water surface level adopted at node OUT was as follows;

Design ARI	Stage
20 yr	RL 13.625 m AHD
5 yr	RL 12.00 m AHD

The model was run with a time control setting of 1.0 hour with a routing time step of 15 seconds.

The calculated water surface levels at each node are included in Appendix C.

6 COMMENTS

Graphs of the 1% AEP Flood Flows and 1% AEP Flood Levels are included in Appendix C. for each Reach. A tabulated summary of maximum 1%, 5% & 20% AEP water surface levels and depths at each node is presented below in Table 1.

		1% AEP Event		5% AEP Event		20% AEP Event	
Node	Node Invert Level m (AHD)	Water Surface Elevation m (AHD)	Depth at Node m	Water Surface Elevation m (AHD)	Depth at Node m	Water Surface Elevation m (AHD)	Depth at Node m
C1	24.50	24.82	0.32	24.75	0.25	24.70	0.20
1.1	23.00	23.47	0.47	23.40	0.40	23.35	0.35
1.2	22.00	22.62	0.62	22.56	0.56	22.51	0.50
1.3	21.50	21.87	0.37	21.82	0.32	21.78	0.28
1.4	18.50	18.78	0.27	18.72	0.22	18.68	0.18
1.5	15.30	16.37	1.07	16.16	0.86	15.97	0.67
1.6	15.20	16.30	1.10	16.14	0.94	15.98	0.78
1.7	14.00	15.25	1.25	14.63	0.63	14.58	0.58
C2	18.02	18.78	0.76	18.61	0.59	18.47	0.45
2.1	16.67	17.56	0.89	17.20	0.53	17.06	0.39
2.2	16.50	17.16	0.66	17.06	0.56	16.96	0.46
2.3	14.00	15.25	1.25	14.78	0.78	14.73	0.73
C3	25.50	25.74	0.24	25.70	0.20	25.67	0.17
3.1	23.80	23.99	0.19	23.97	0.17	23.94	0.14
3.2	22.40	22.66	0.26	22.62	0.22	22.58	0.18
3.3	21.00	21.18	0.18	21.16	0.16	21.14	0.14
3.4	17.96	18.36	0.40	18.28	0.32	18.20	0.24
OUT	12.00	15.25	3.25	13.60	1.60	12.59	0.59

Table 1.

The values for the 1%, 5% and 20% flood level at each node were transposed onto the network diagram placed over the site topography. The 1%, 5% and 20% AEP flood contour for the site was then interpolated between each of the nodes making a judgement based on the local topography between each node. The resulting flood contour plans are included in Appendix D. The flood contours for proposed Lot 4. are included on this plan. We understand from discussions with the developer, there are no plans for flood mitigation works as part of the subdivision.

7 CONCLUSION

Hoolihan Partners was asked to prepare a hydrological and hydraulic analysis of the 1% AEP, 5% AEP and 20% AEP flood levels for the development site.

The study was undertaken to determine the impact of the 1% AEP, 5% AEP and 20% AEP flood levels on the proposed subdivision taking into account the backwater affects from Ourimbah Creek to the North of the site. The resulting 1% AEP, 5% AEP and 20% AEP Flood Contour Plans for the subdivision are presented in Appendix D.

We recommend the Minimum Finished Floor Level (FFL) of RL 24.50 m AHD be adopted for proposed Lot 3 building envelope (BE). This provides a freeboard of 500 mm above the calculated 1% AEP flood level at Node 3.1 adjacent to the south western corner of the building envelope.

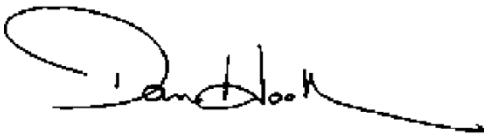
DISCLAIMER

It must be recognised that structural calculations of the type proposed above, are carried out based on data supplied by Council that is determined on a probabilistic flood analysis based on the methods embodied in The Institution of Engineers publication "Australian Rainfall & Runoff. A guide to Flood Estimation". Consequently, it is impossible to assess likely flood consequences in a completely "risk free" context. A Design flood is a probabilistic or statistical estimate, being generally based on some form of probability analysis of flood and/or rainfall data. Our professional opinion has been based on the data presented to us, our calculations and the recommendations and procedures outlined in the New South Wales Government Floodplain Management Manual and the The Institution of Engineers Australia (1998), *Australian Rainfall and Runoff – A guide to Flood Estimation.* In preparing this report, Hoolihan Partners used data, surveys, analysis, designs and other information provided by the individuals and organisations referenced herein. While checks were undertaken to ensure that such materials were the correct and current versions of the materials provided, except as otherwise stated, Hoolihan Partners did not independently verify the accuracy or completeness of these information sources.

This report is provided for the exclusive use of Hapido Pty Ltd and TSM Pty Ltd` for this project only and for the purpose described in the report. We recommend that the information contained in this report be provided to all future owners of the subject property.

Should you require any further assistance with this matter, please do not hesitate to contact the undersigned.

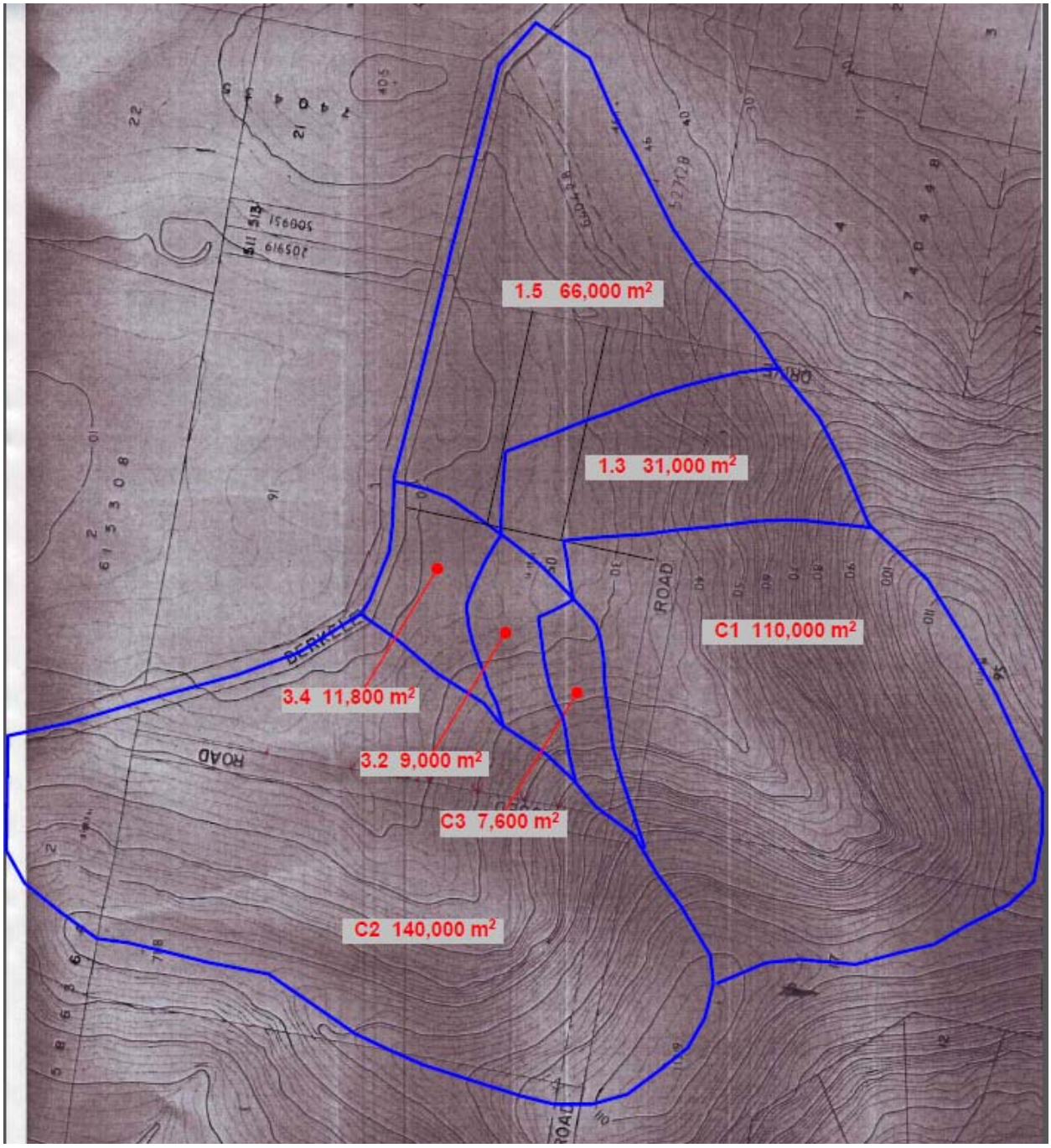
Yours faithfully
HOOLIHAN PARTNERS PTY. LTD.



Darren Hoolihan
B.E. MIE. Aust. C.P.Eng. NPER RPEQ

References:
1. New South Wales Government, April 2005, *Floodplain Management Manual – The management of flood liable land.*
2. The Institution of Engineers Australia (1998), *Australian Rainfall and Runoff – A guide to Flood Estimation.*
3. *"Enterprise Drive Environmental Study " 1992 by Andrews Neil Pty Ltd*
4. *"Plan of Subdivision " Ref 16984 dated 27-6-2008 by Everitt & Everitt Pty Ltd*

APPENDIX A



Catchment Areas

IFD Table

Polynomial Coefficients data for: **FOUNTAINDALE**
Geographic Location: LATITUDE: **33.35** LONGITUDE: **151.4**

BOM 15-Apr 2011

$$\log_e(I) = A + B \times \log_e(T) + C \times (\log_e(T))^2 + D \times (\log_e(T))^3 + E \times (\log_e(T))^4 + F \times (\log_e(T))^5 + G \times (\log_e(T))^6$$

T = Time in hrs I = Intensity in millimetres per hour

ARI	A	B	C	D	E	F	G
1	3.442222595	-5.75E-01	-2.72E-02	7.84E-03	7.04E-05	-2.44E-04	1.73E-06
2	3.696802139	-5.72E-01	-2.98E-02	7.62E-03	4.17E-04	-2.27E-04	-1.06E-05
5	3.95271349	-5.64E-01	-3.50E-02	7.41E-03	1.00E-03	-2.13E-04	-2.74E-05
10	4.075855255	-5.60E-01	-3.78E-02	7.18E-03	1.35E-03	-1.85E-04	-4.15E-05
20	4.218197346	-5.56E-01	-4.02E-02	7.12E-03	1.62E-03	-1.91E-04	-4.70E-05
50	4.378228664	-5.52E-01	-4.28E-02	6.81E-03	1.95E-03	-1.59E-04	-6.09E-05
100	4.484877586	-5.50E-01	-4.46E-02	6.81E-03	2.15E-03	-1.67E-04	-6.49E-05

raw data: 40.4, 9.03, 2.86, 80.25, 17.96, 6.16, skew=0.0, F2=4.3, F50=15.9

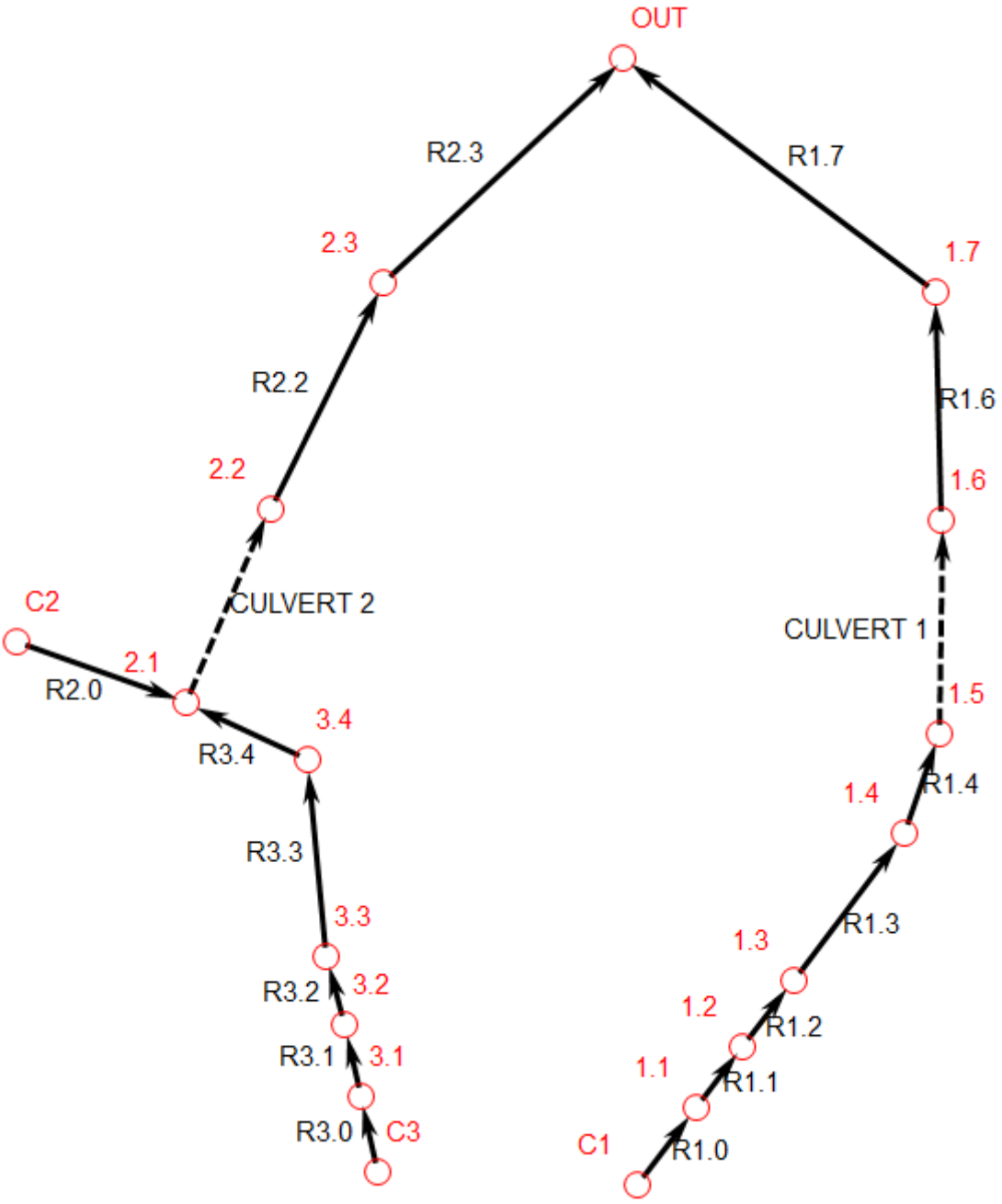
Rainfall Intensity Frequency Duration data for: **FOUNTAINDALE**
Geographic Location: LATITUDE: **33.350** LONGITUDE: **151.4**

BOM 15-Apr 2011

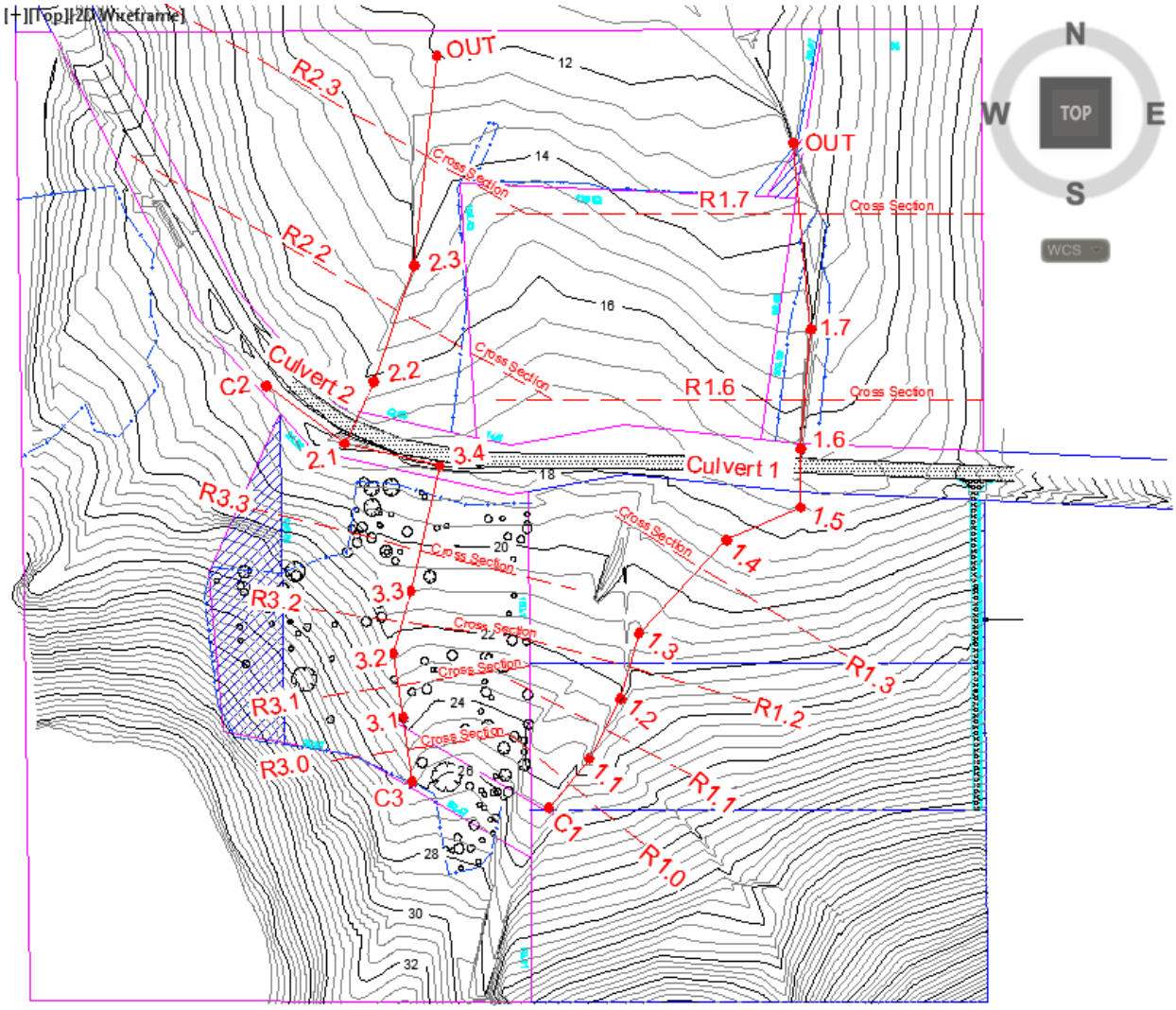
DURATION	1 Yr ARI	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI
min	mm/hr	mm/hr	mm/hr	mm/hr	mm/hr	mm/hr	mm/hr
5	100	128	160	178	203	234	258
6	94.1	120	150	167	191	220	243
10	77.1	98.5	124	139	158	183	202
20	56.3	72.2	92	103	118	138	153
30	45.8	58.9	75.5	85.1	97.8	114	127
60	31.3	40.3	52.1	58.9	67.9	79.7	88.7
120	20.8	26.8	34.7	39.3	45.4	53.4	59.4
180	16.2	21	27.2	30.8	35.5	41.7	46.5
360	10.7	13.7	17.8	20.1	23.2	27.3	30.3
720	7	9.03	11.7	13.3	15.3	18	20.1
1440	4.58	5.94	7.76	8.85	10.2	12.1	13.5
2880	2.92	3.81	5.06	5.82	6.78	8.07	9.05
4320	2.19	2.86	3.83	4.41	5.16	6.15	6.92

APPENDIX B

Network Diagram – Major Watercourse

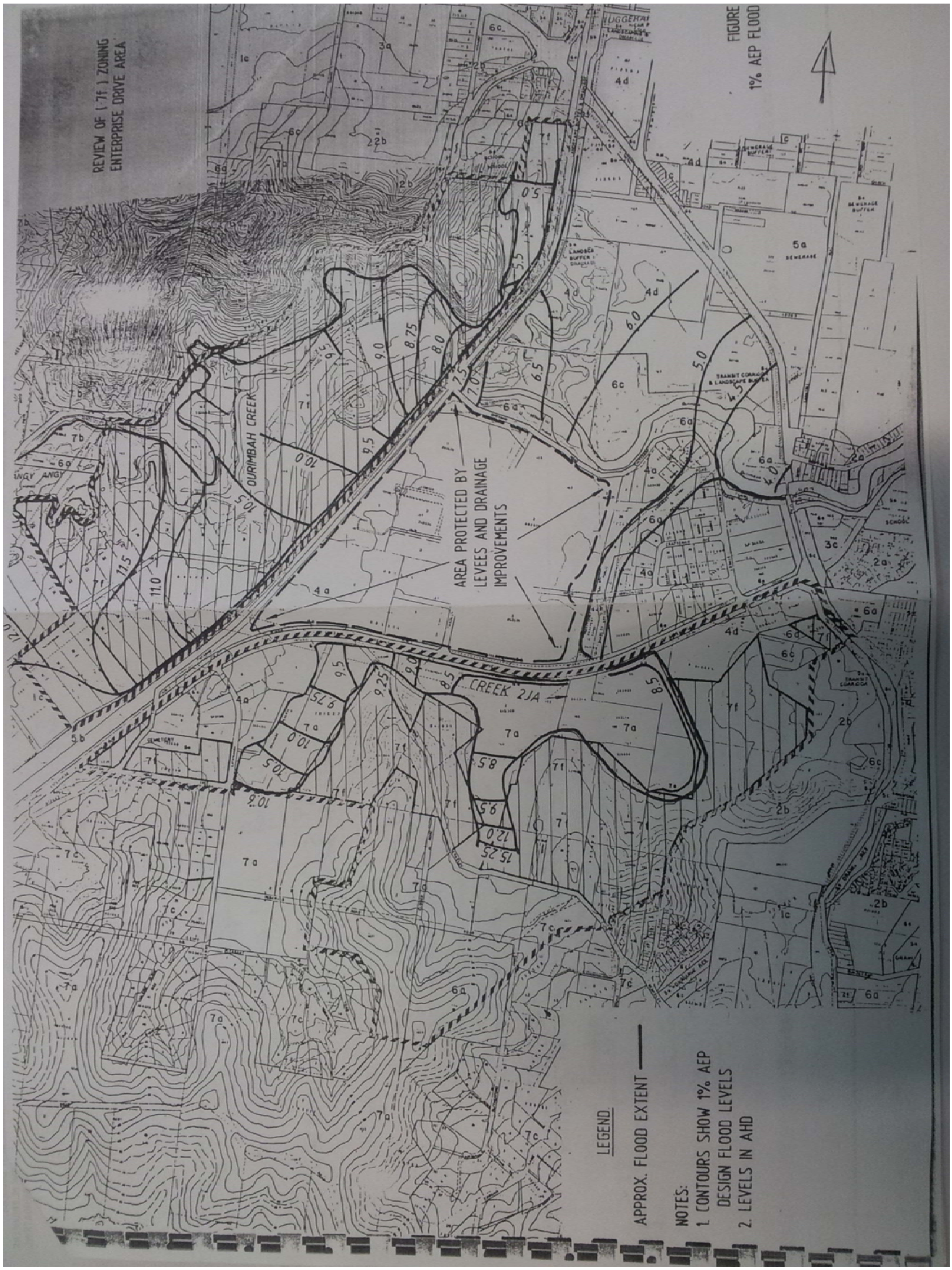


XP-STORM NETWORK DIAGRAM

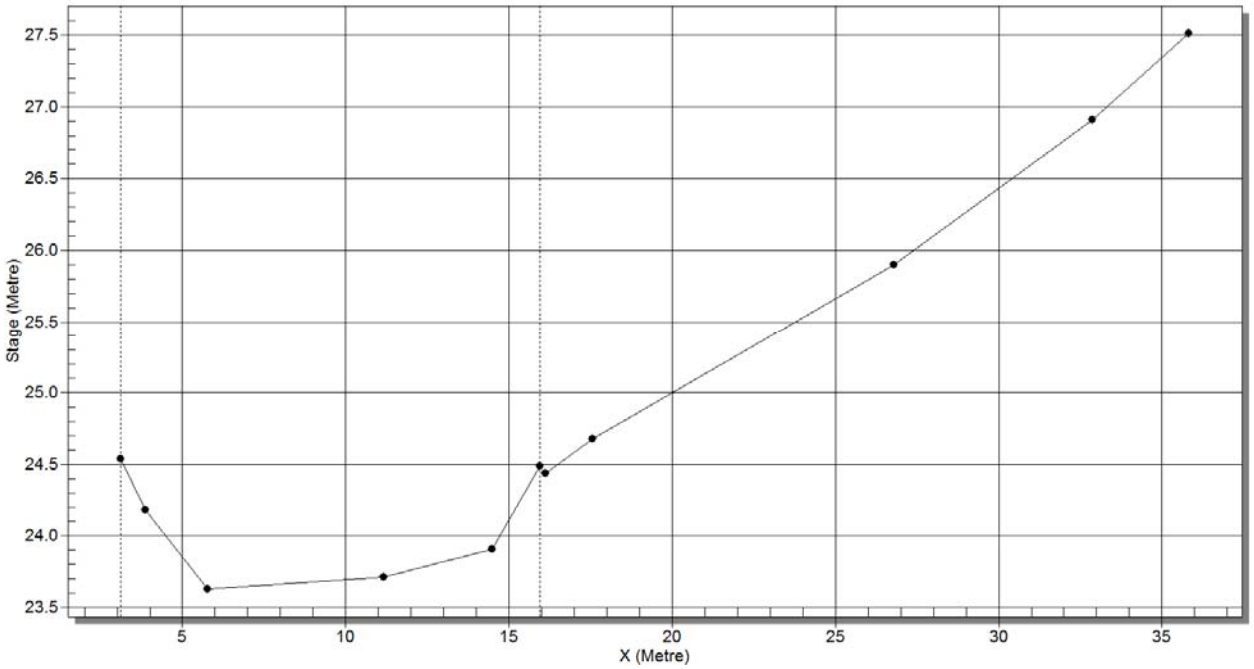


NETWORK DIAGRAM OVER TOPOGRAPHY

Figure 1 – 1% AEP Flood Extents" from
"Enterprise Drive Environmental Studies" dated 1992 by Andrews Neil Pty Ltd



REACH CROSS SECTIONS



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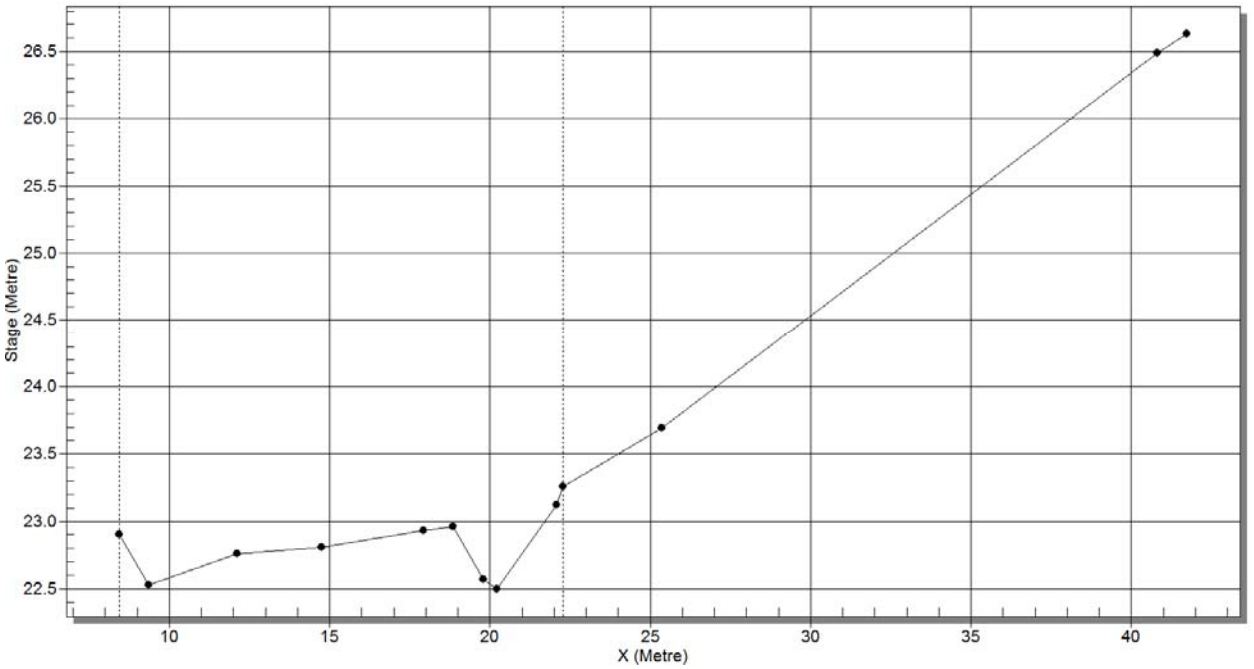

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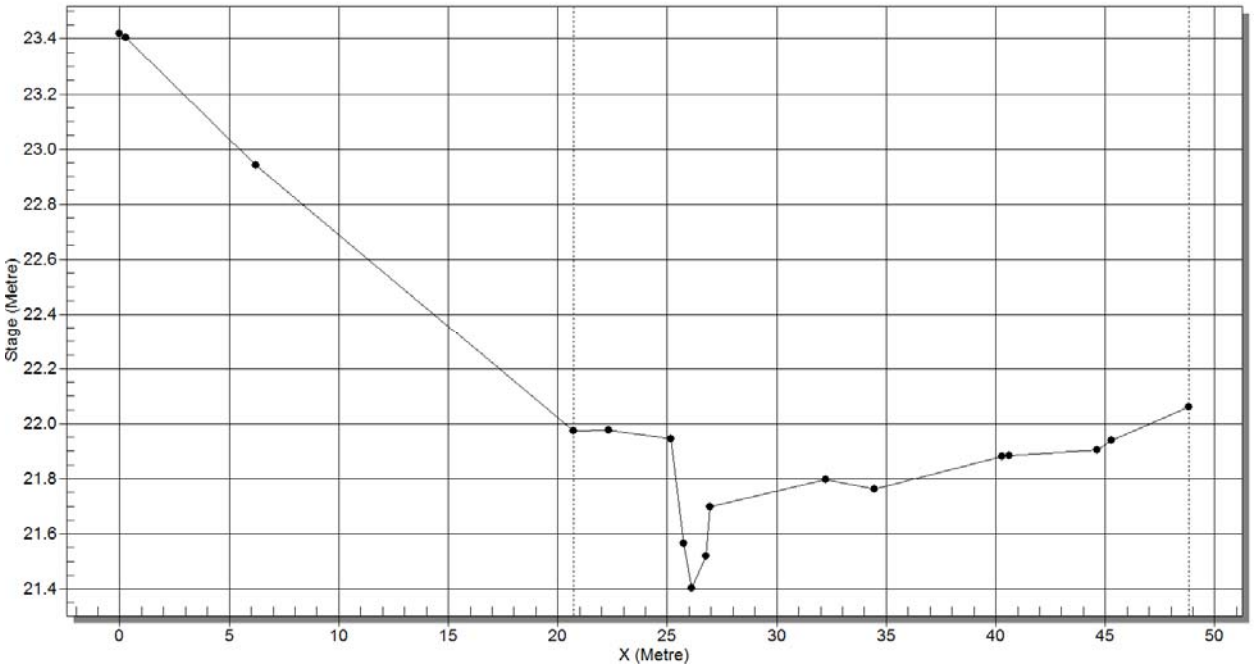
Stage (Metre)
X (Metre)
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23.2
23.0
22.8
22.6
22.4
22.2
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21.6
21.4
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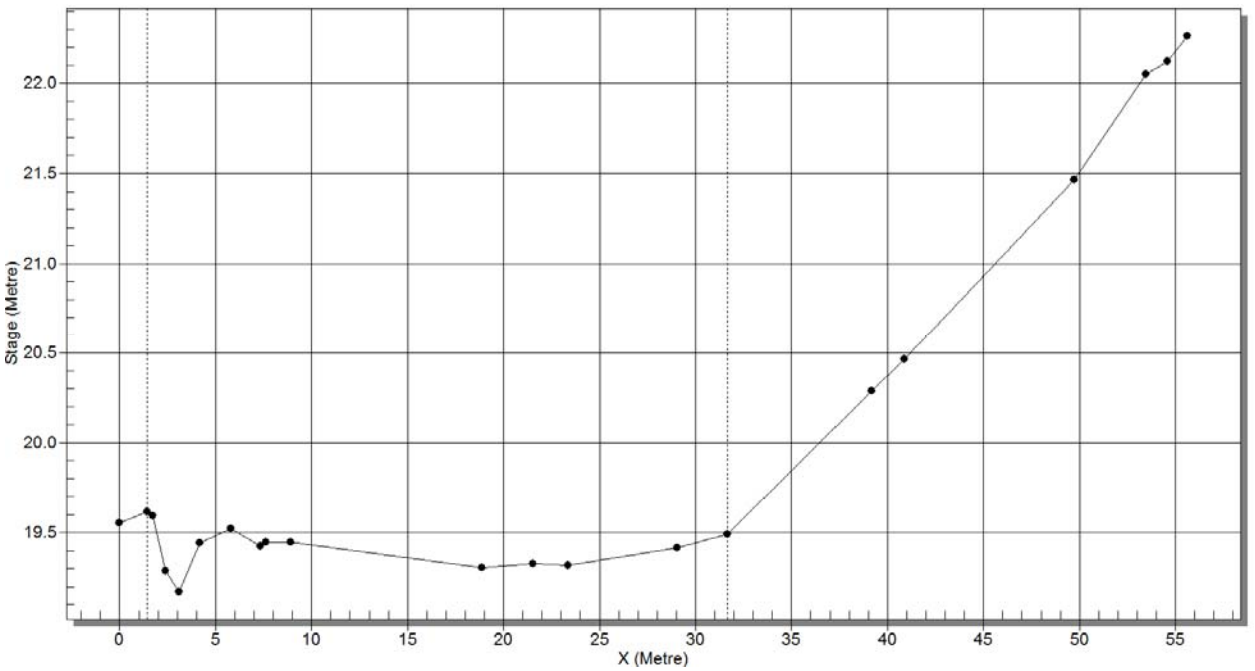
5
10
15
20
25
30
35
40
45
50

R1.2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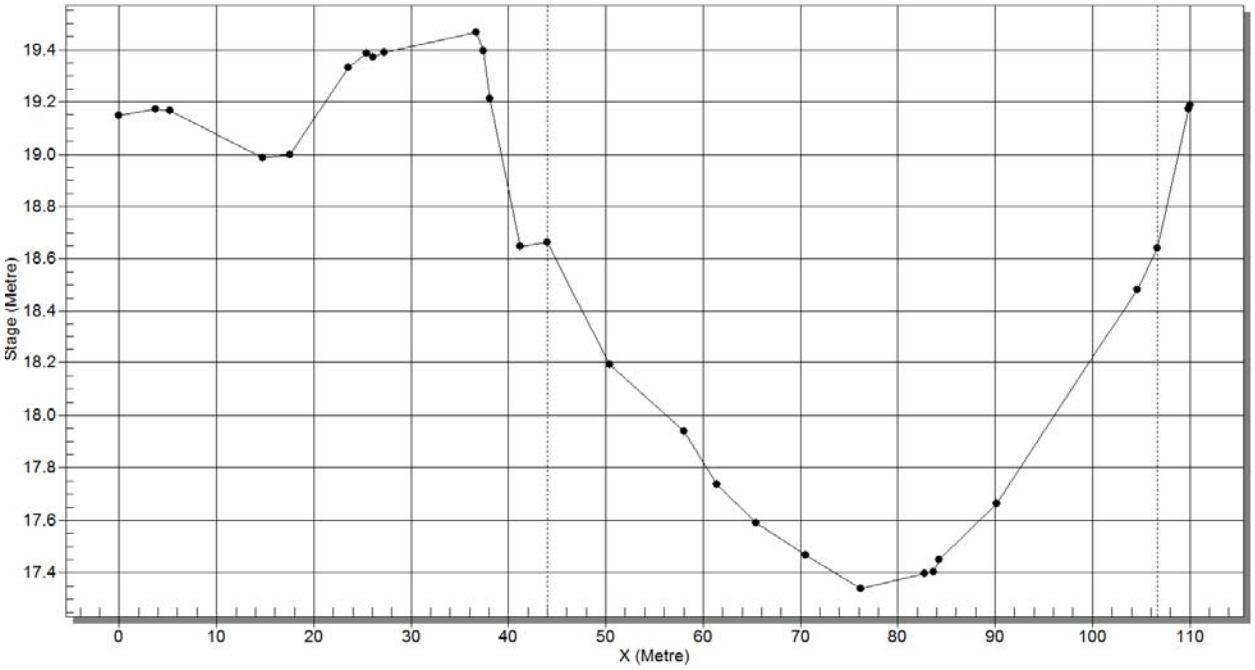
45
50
55

R1.3



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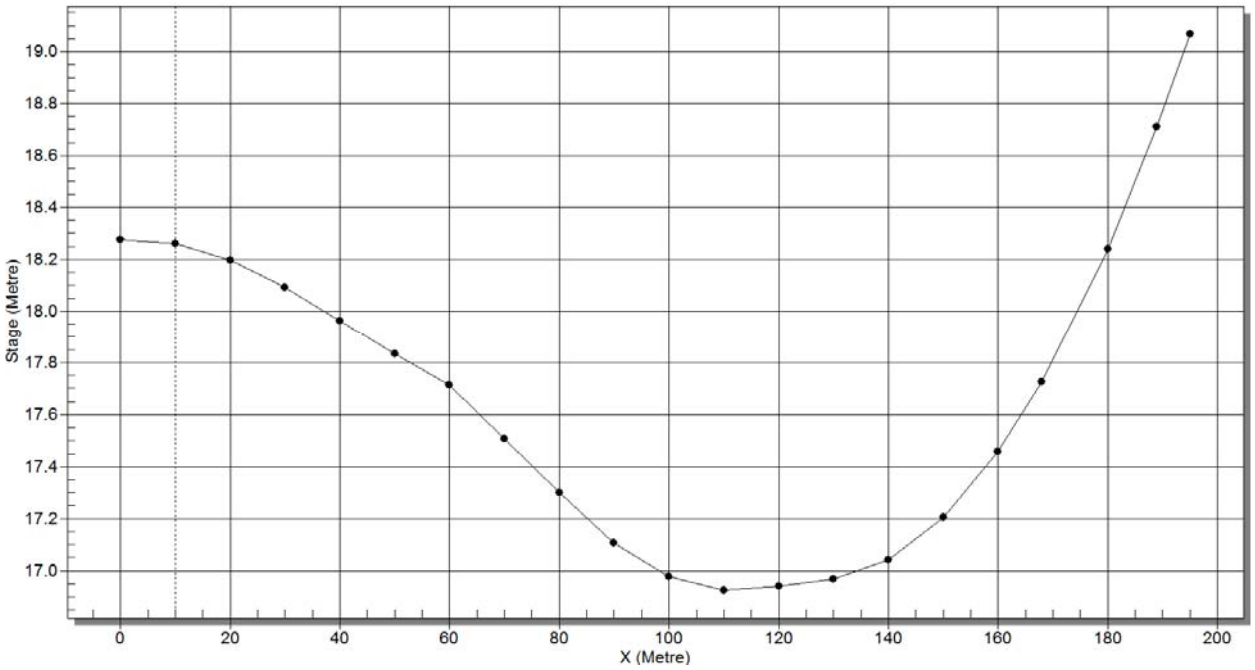
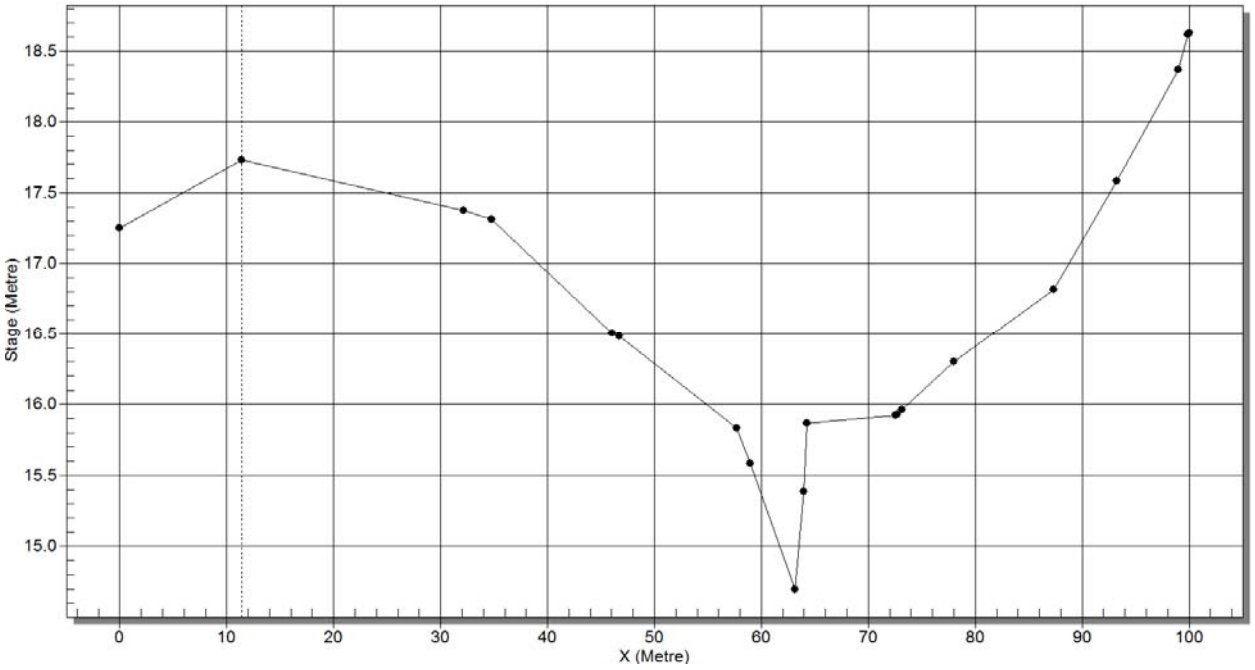


Newly Formed Road Pavement over CULVERT 1
Culvert 1 consists of 3 x 900 RCP's


Stage (Metre)
X (Metre)
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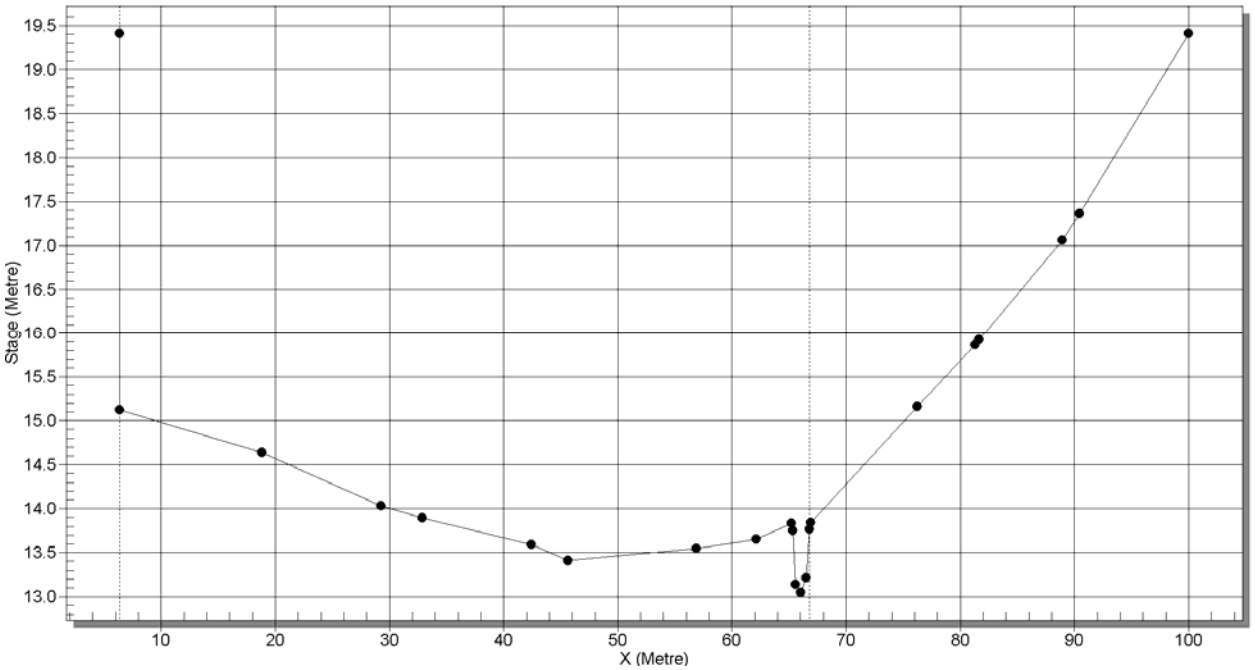
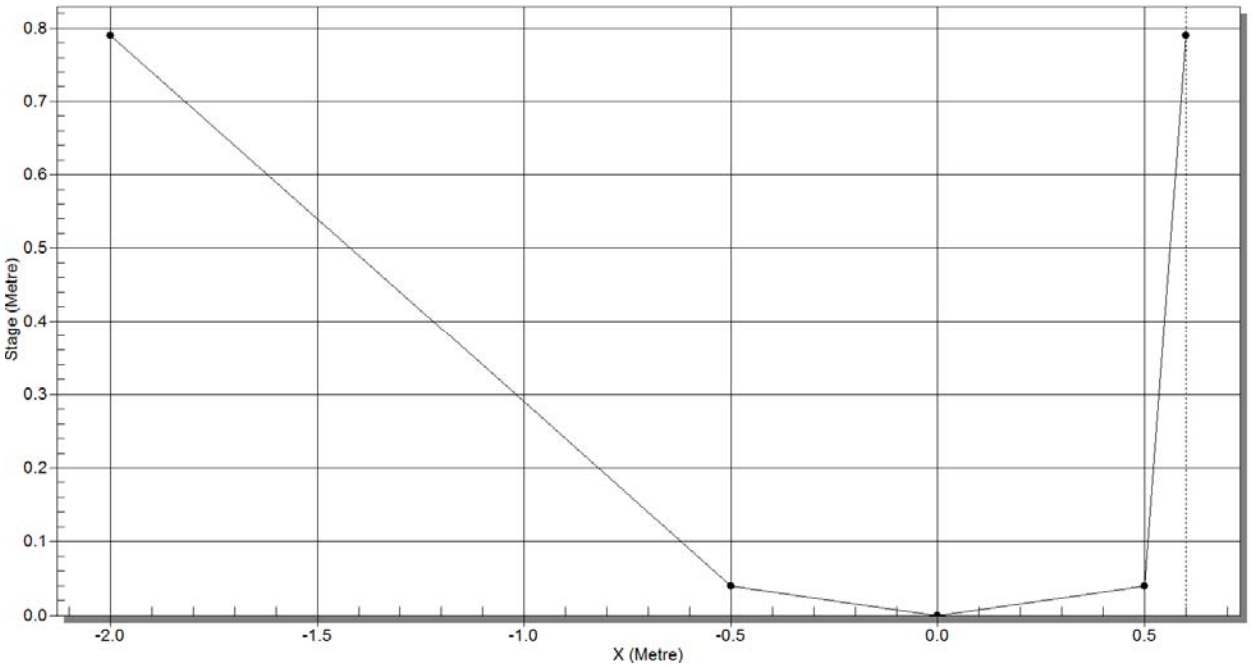
18.0
17.5
17.0
16.5
16.0
15.5
15.0
0
10
20
30
40
50
60
70
80
90
100

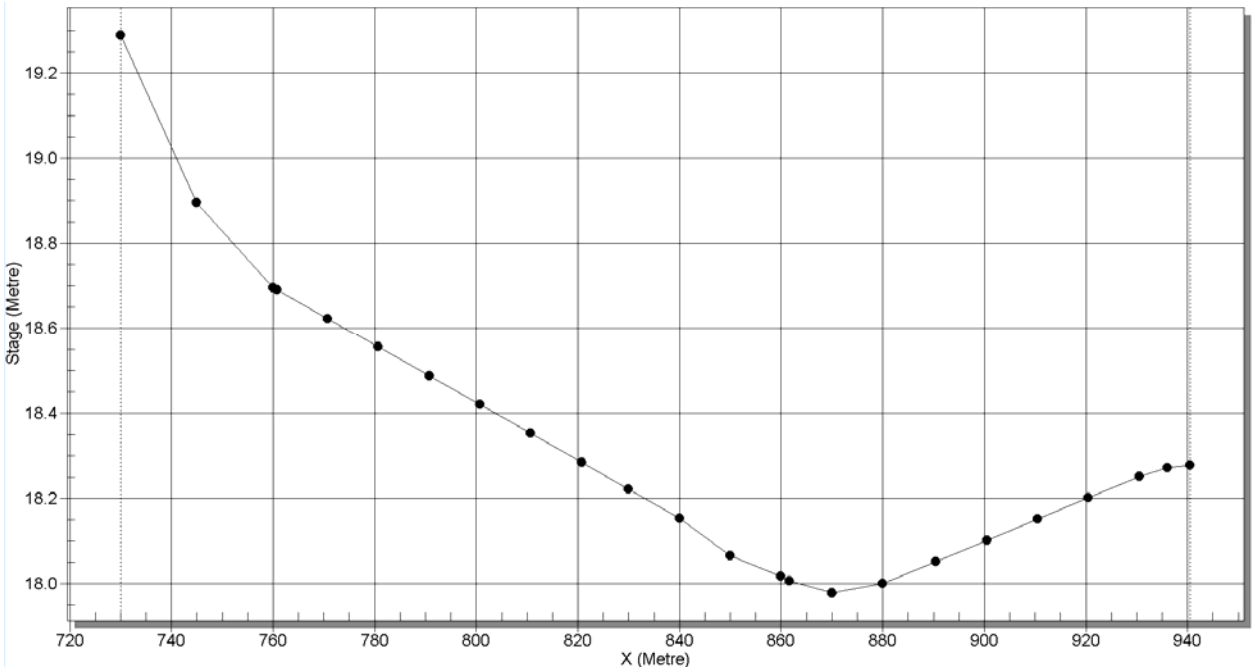
R1.6


Stage (Metre)
X (Metre)
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
15.0
14.5
14.0
13.5
13.0
10
20
30
40
50
60
70
80
90
100

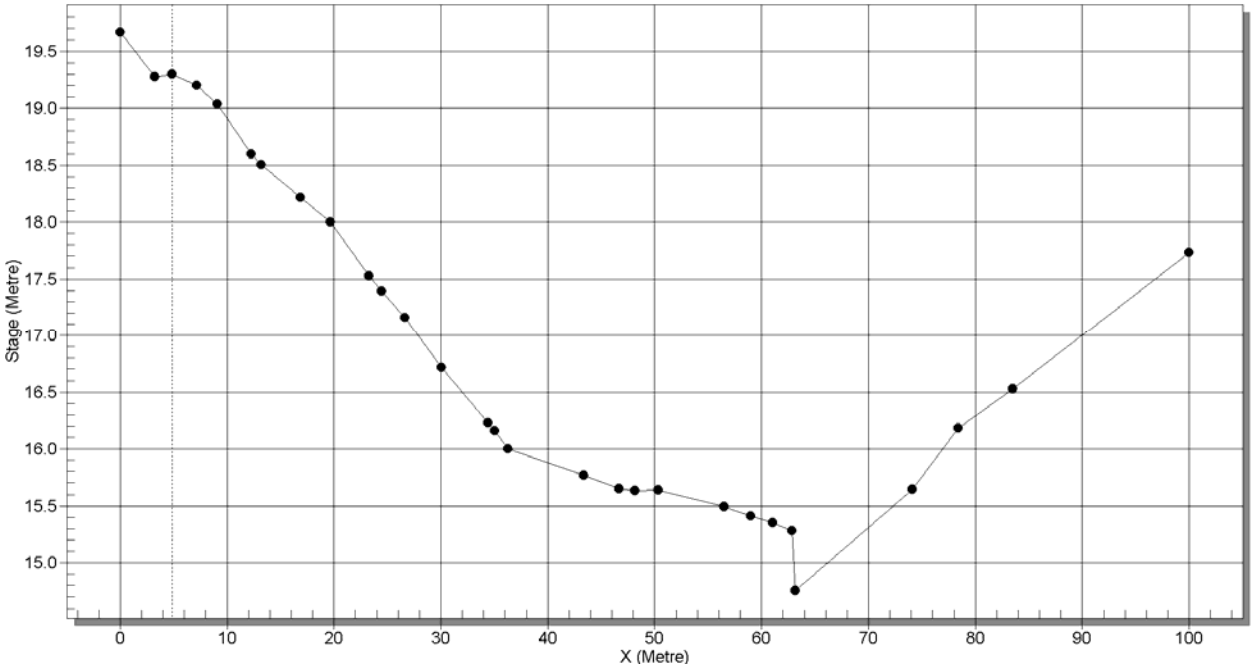
R1.7



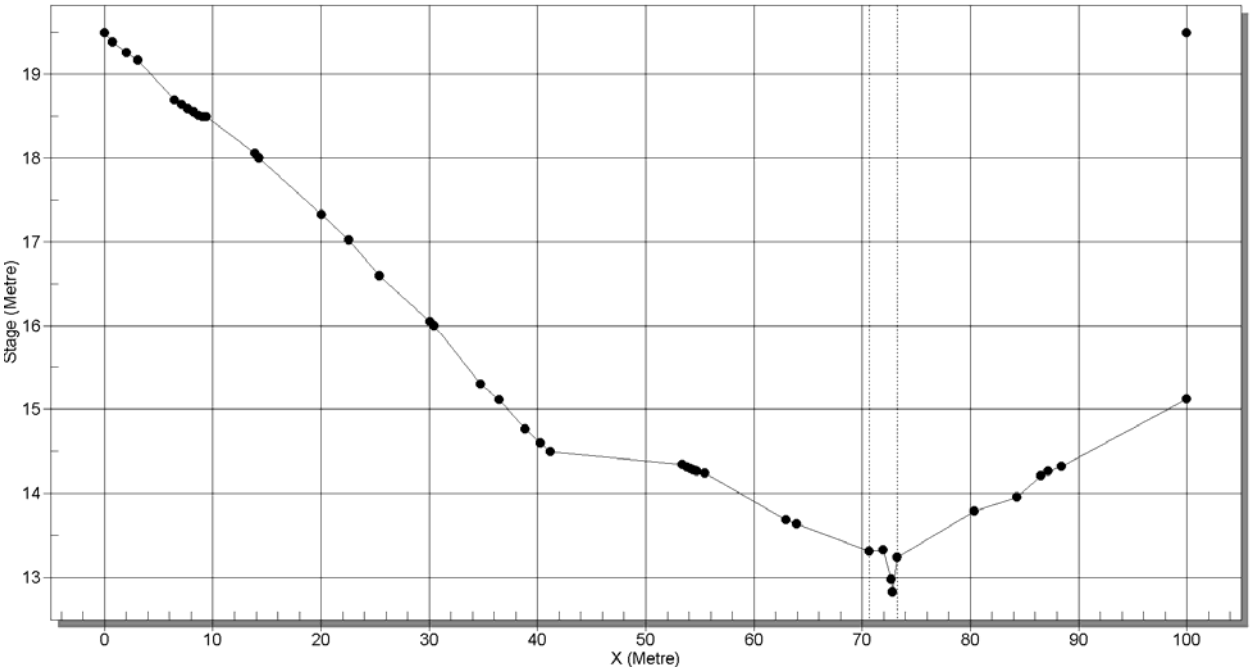
R2.0 & R3.4
(Newly Formed Open Drain on side of Berkeley Road)



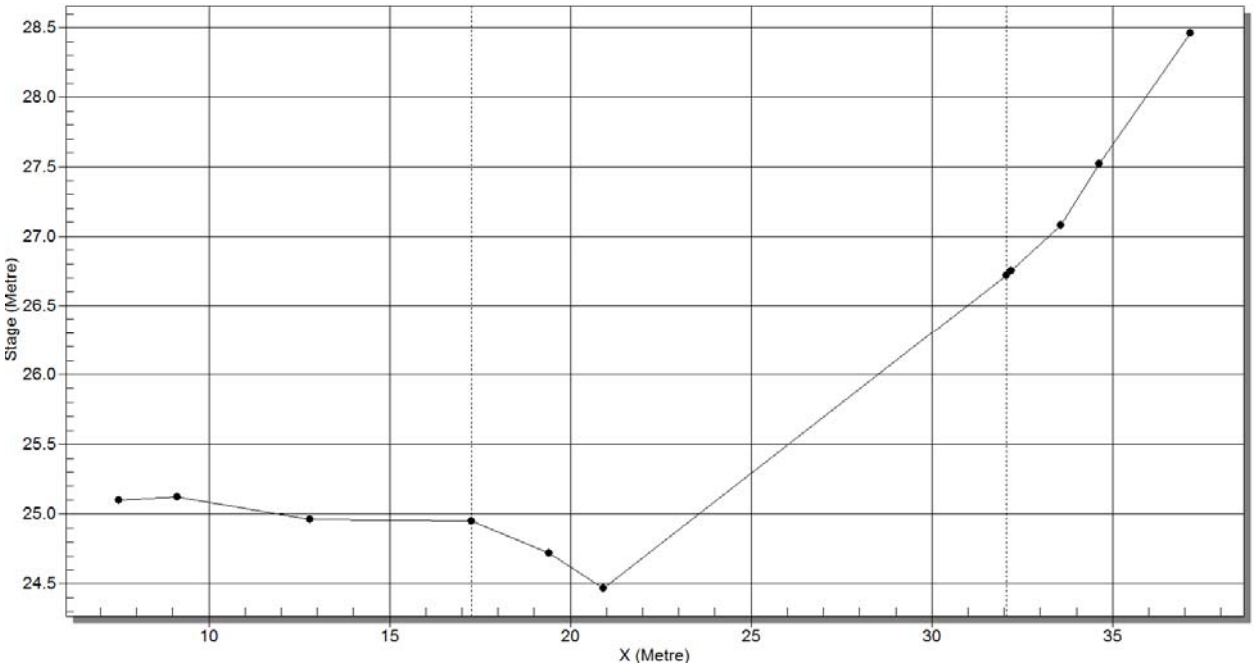
Newly Formed Road Pavement over CULVERT 2
Culvert 2 consists of 3 x 600 RCP's


Stage (Metre)
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
15.0
0
10
20
30
40
50
60
70
80
90
100
X (Metre)

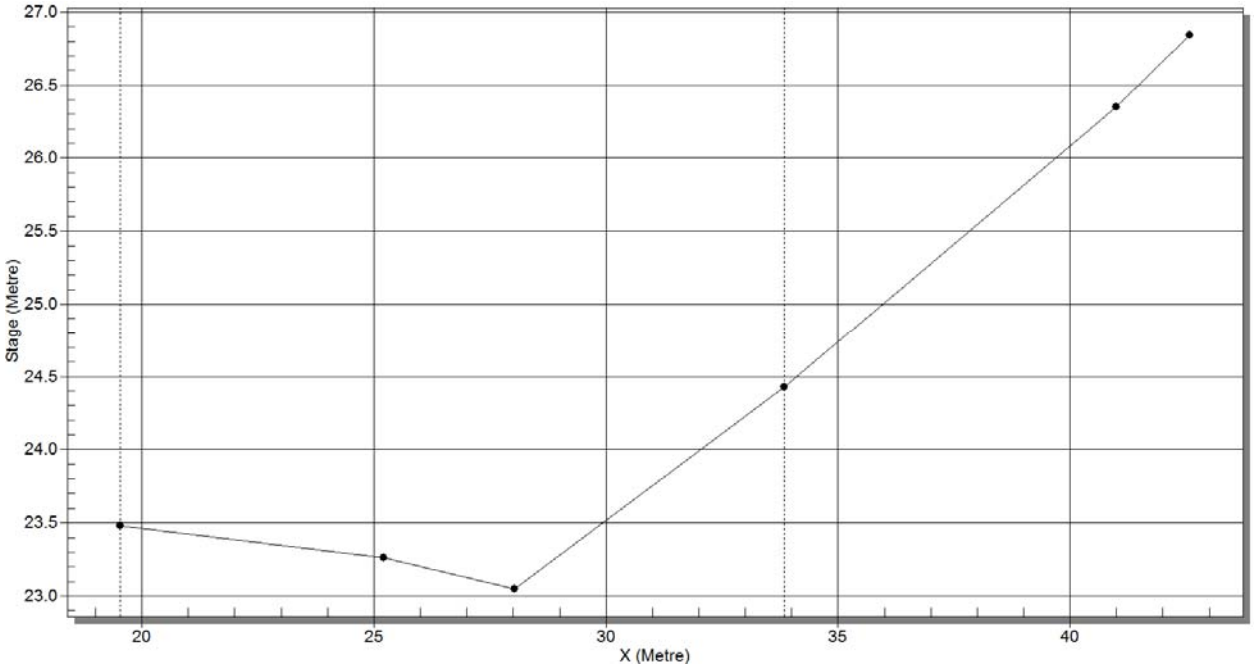
R2.2


Stage (Metre)
19
18
17
16
15
14
13
0
10
20
30
40
50
60
70
80
90
100
X (Metre)

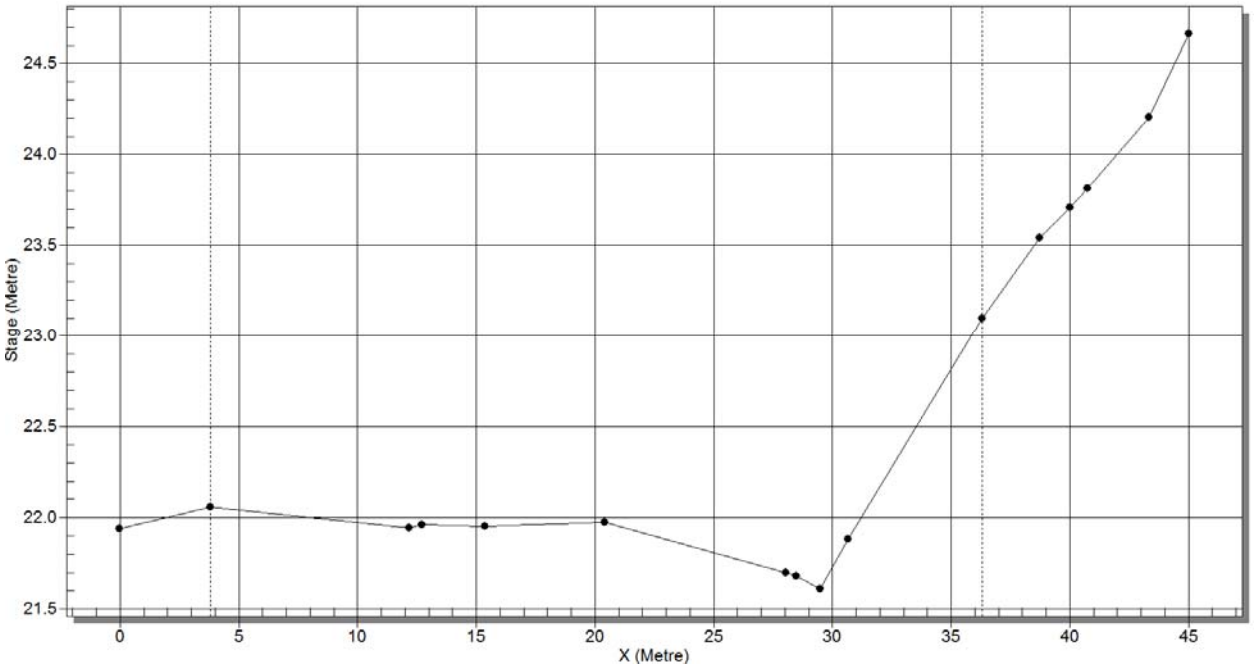
R2.3


Stage (Metre)
X (Metre)
28.5
28.0
27.5
27.0
26.5
26.0
25.5
25.0
24.5
10
15
20
25
30
35

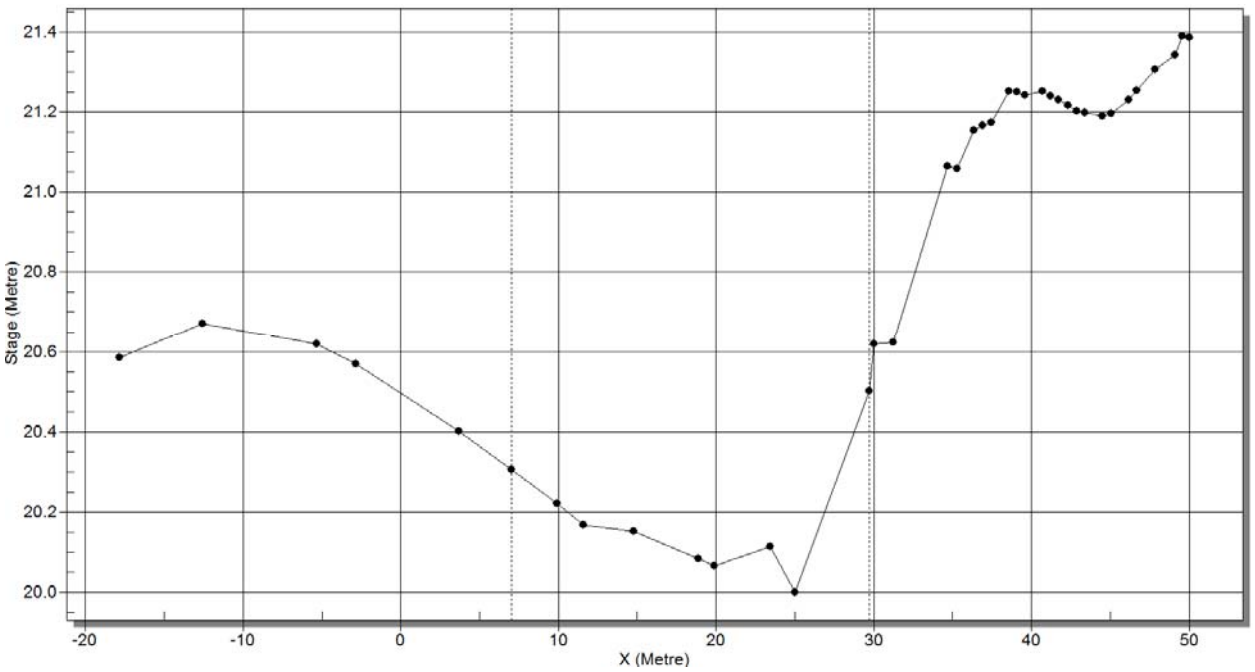
R3.0


Stage (Metre)
X (Metre)
27.0
26.5
26.0
25.5
25.0
24.5
24.0
23.5
23.0
20
25
30
35
40

R3.1


Stage (Metre)
X (Metre)
24.5
24.0
23.5
23.0
22.5
22.0
21.5
0
5
10
15
20
25
30
35
40
45

R3.2

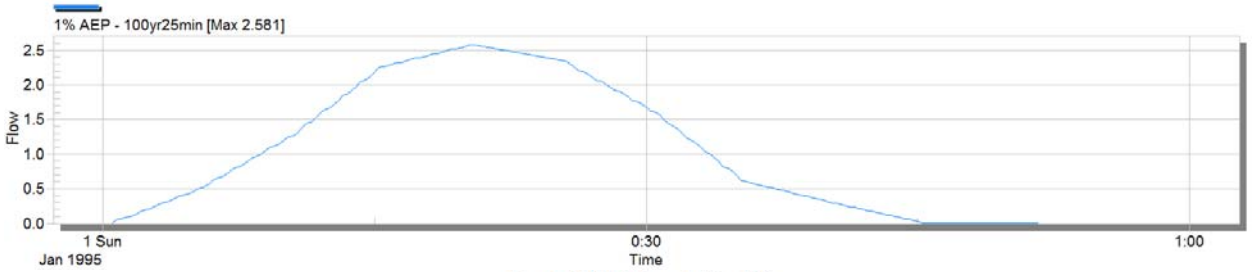

Stage (Metre)
X (Metre)
21.4
21.2
21.0
20.8
20.6
20.4
20.2
20.0
-20
-10
0
10
20
30
40
50

R3.3

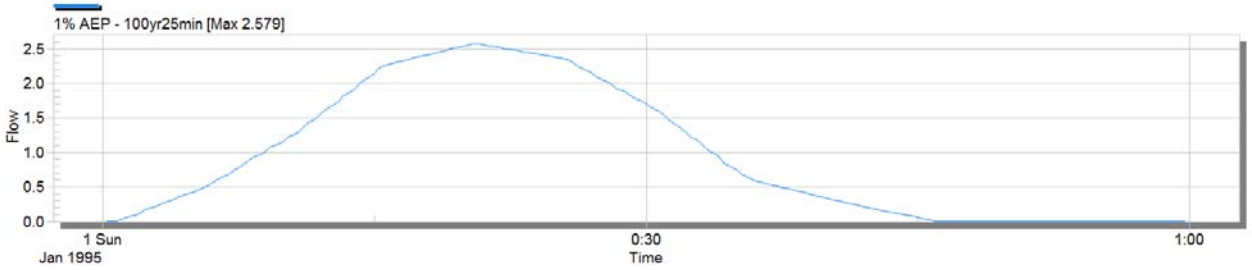
APPENDIX C

1.0% AEP FLOW IN REACH

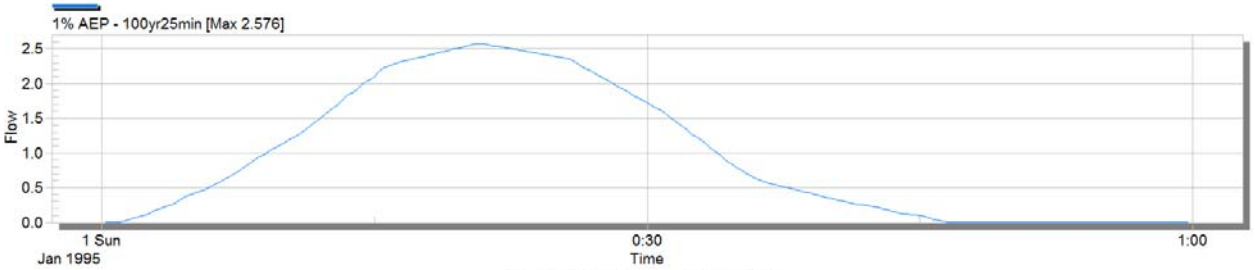
Conduit R1.0 from C1 to 1.1



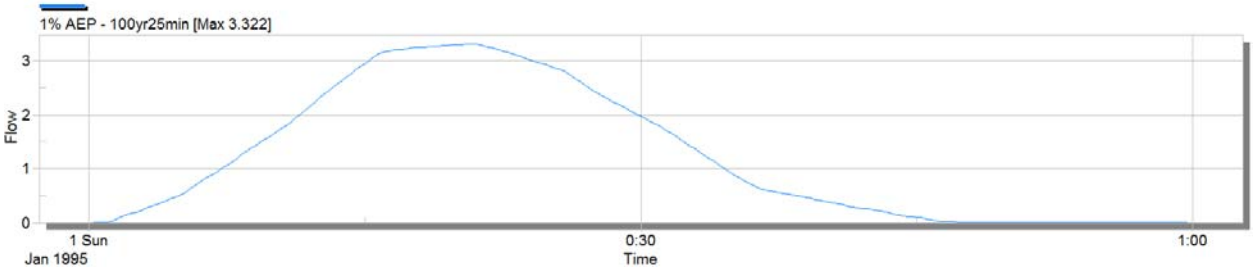
Conduit R1.1 from 1.1 to 1.2



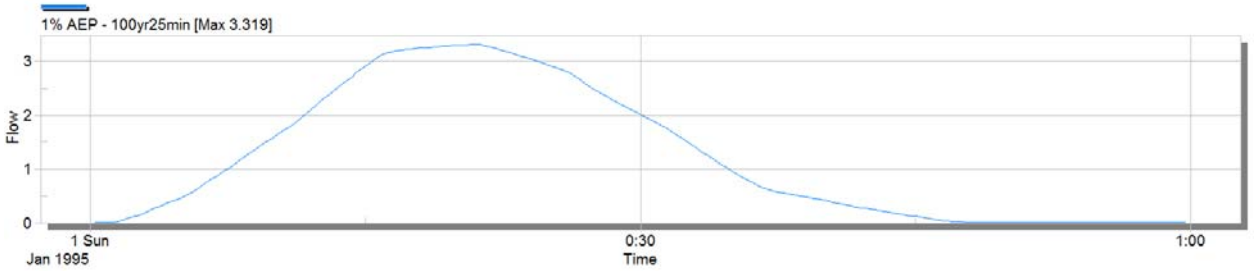
Conduit R1.2 from 1.2 to 1.3



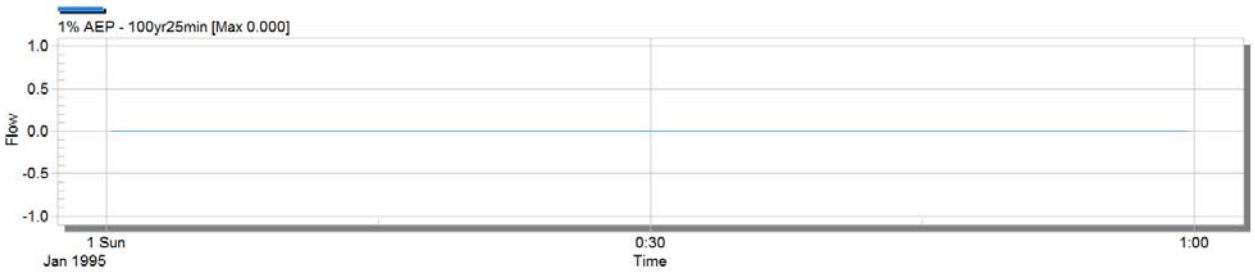
Conduit R1.3 from 1.3 to 1.4



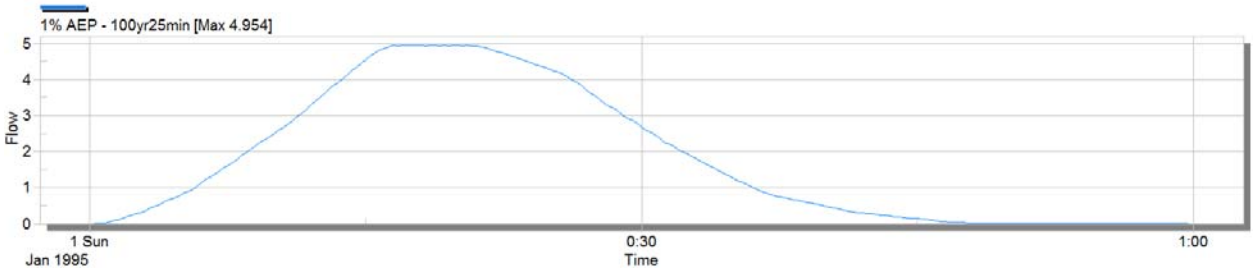
Conduit R1.4 from 1.4 to 1.5



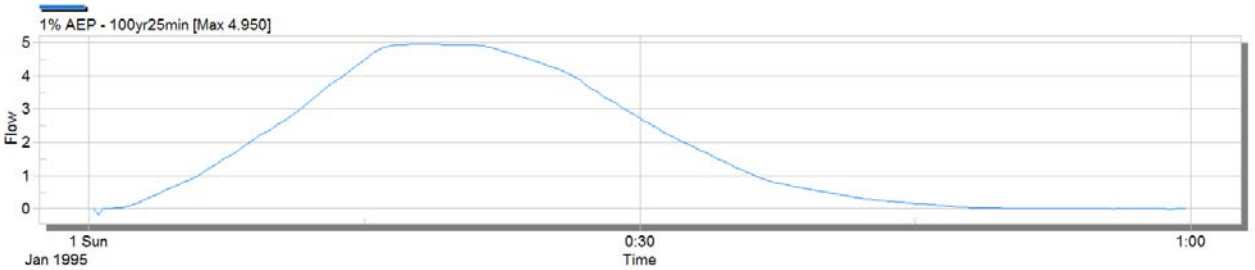
Conduit RCL1 from 1.5 to 1.6



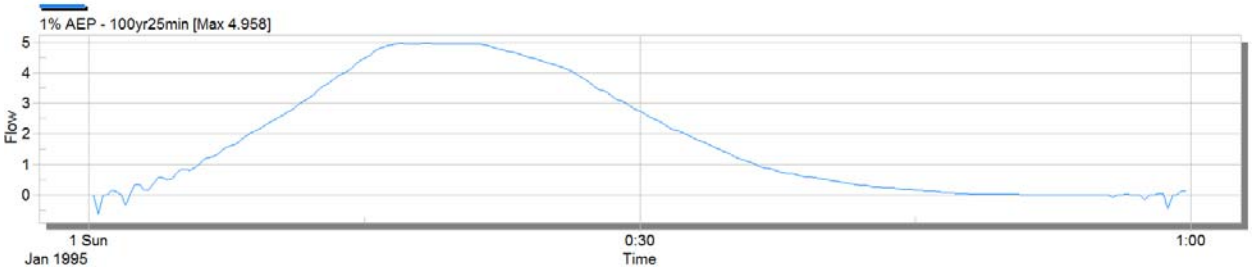
Conduit RCP1.1 from 1.5 to 1.6



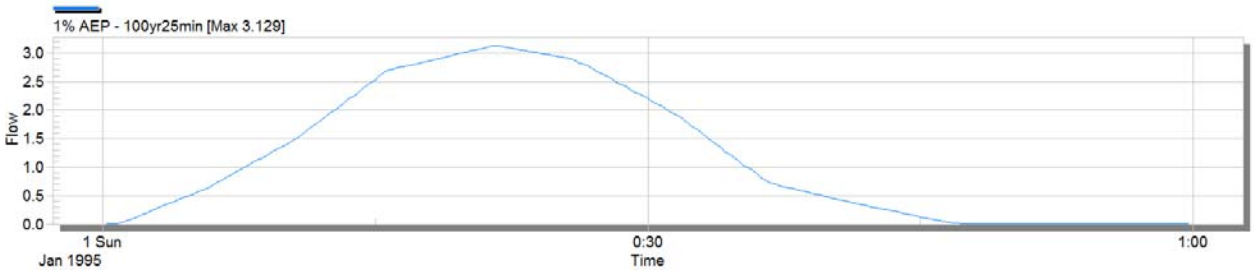
Conduit R1.6 from 1.6 to 1.7



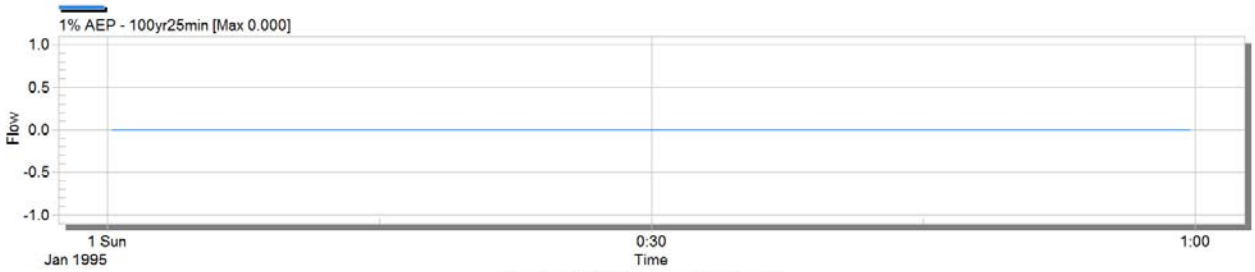
Conduit R1.7 from 1.7 to OUT



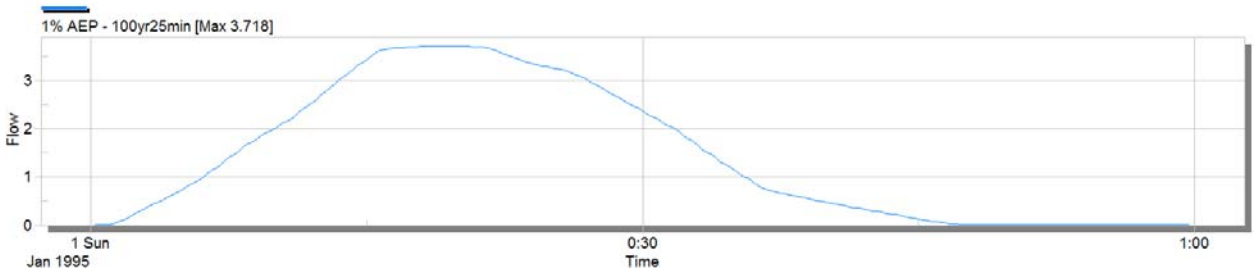
Conduit R2.0 from C2 to 2.1



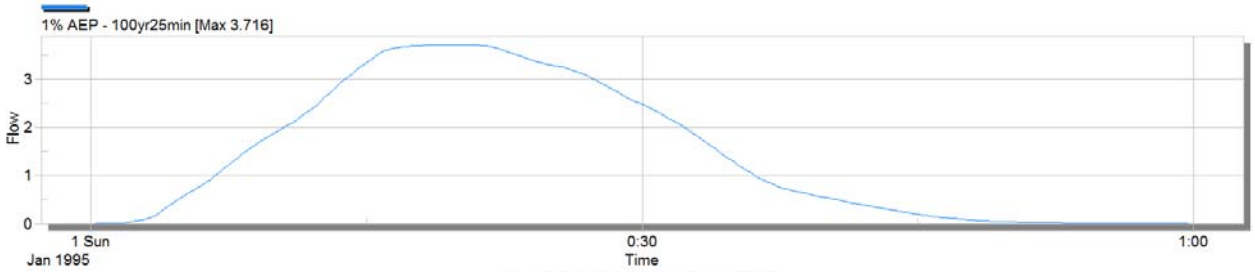
Conduit RCL2 from 2.1 to 2.2



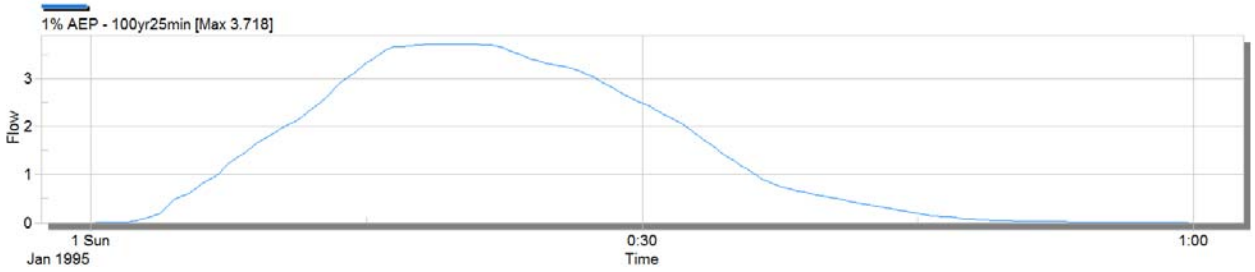
Conduit RCP2.1 from 2.1 to 2.2



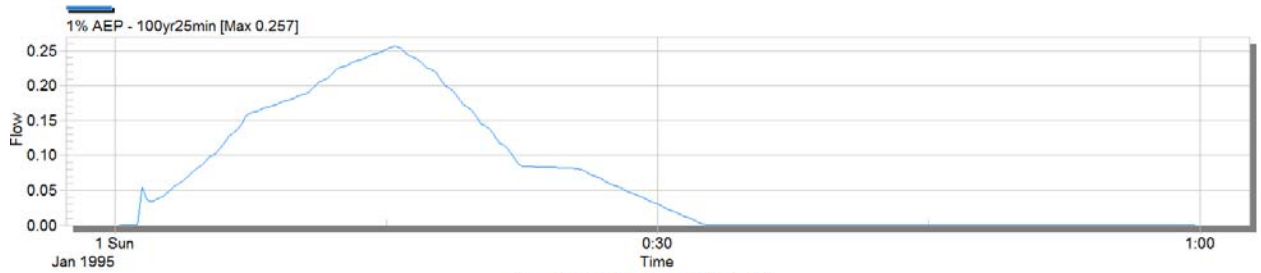
Conduit R2.2 from 2.2 to 2.3



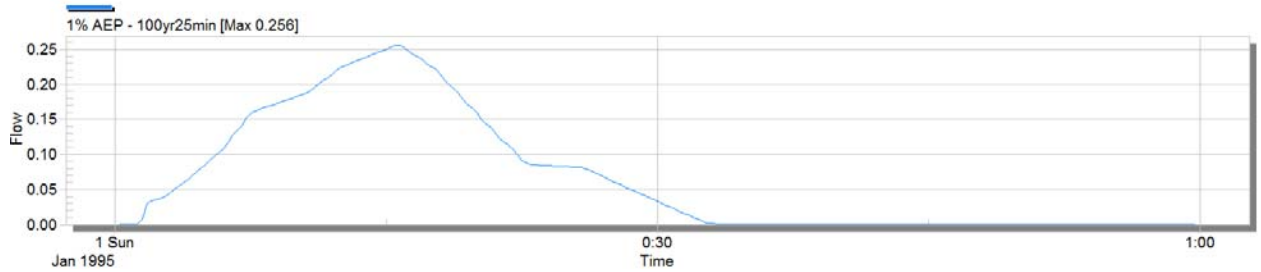
Conduit R2.3 from 2.3 to OUT



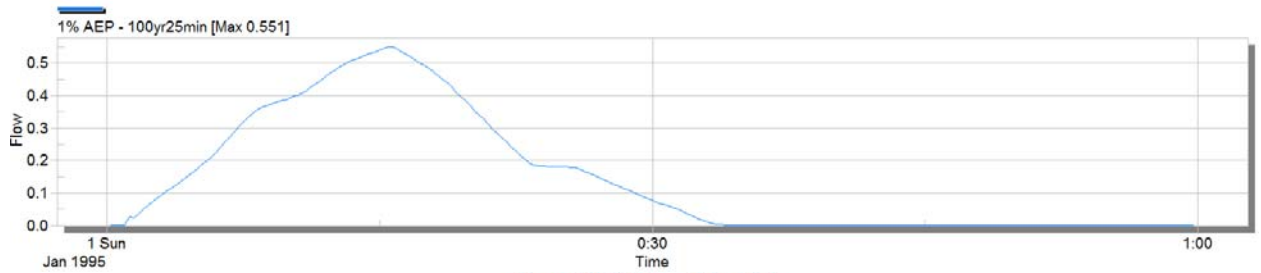
Conduit R3.0 from C3 to 3.1



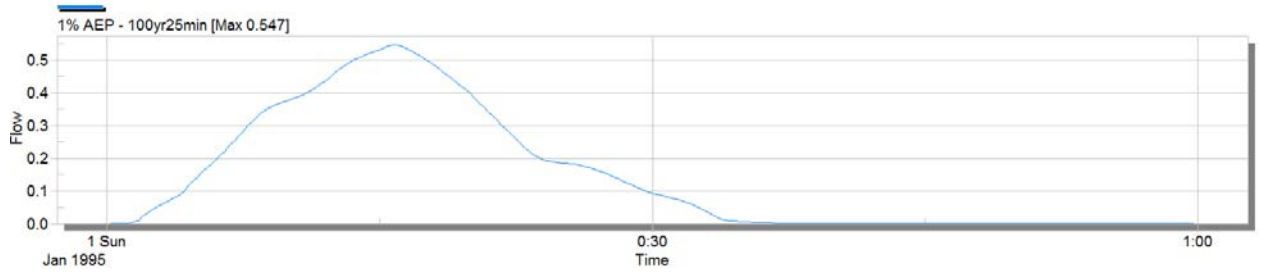
Conduit R3.1 from 3.1 to 3.2



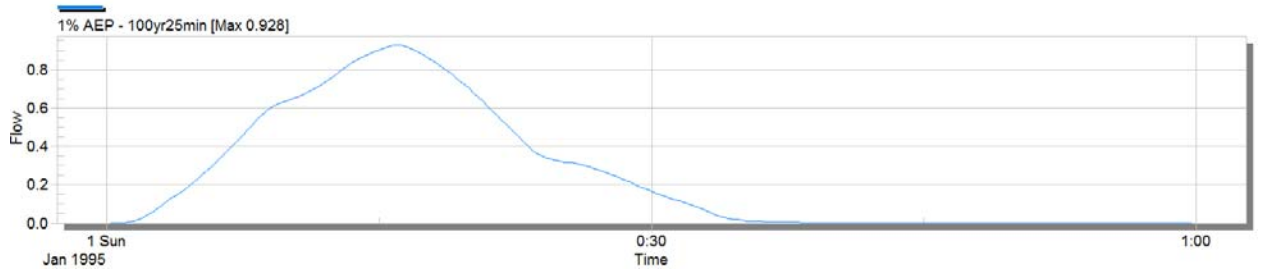
Conduit R3.2 from 3.2 to 3.3



Conduit R3.3 from 3.3 to 3.4

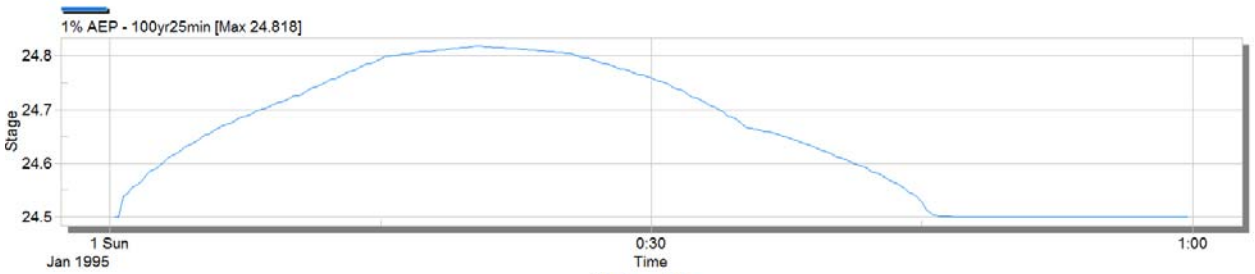


Conduit R3.4 from 3.4 to 2.1

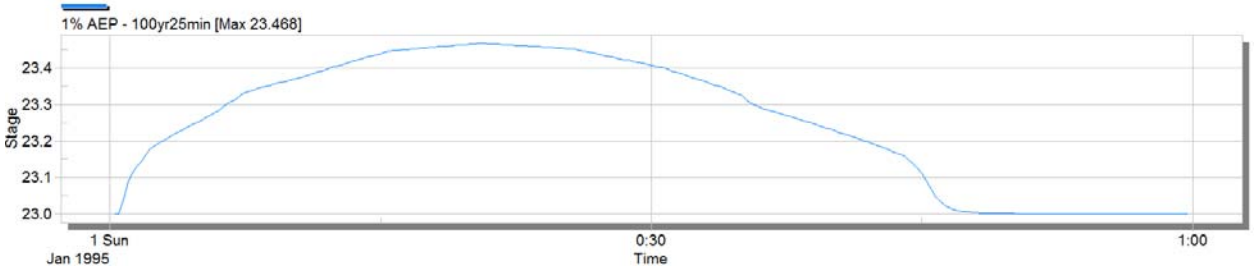


1% AEP WATER SURFACE LEVELS AT NODES

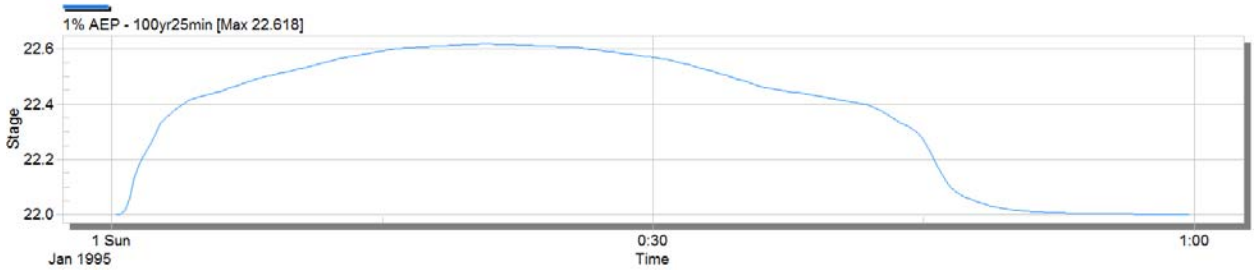
Node - C1



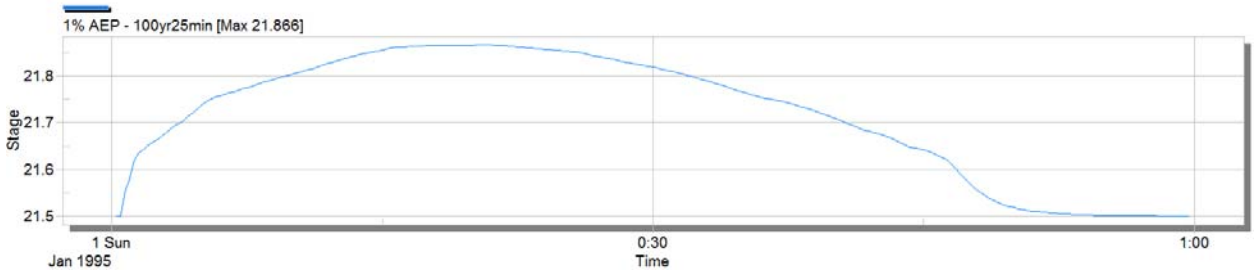
Node - 1.1



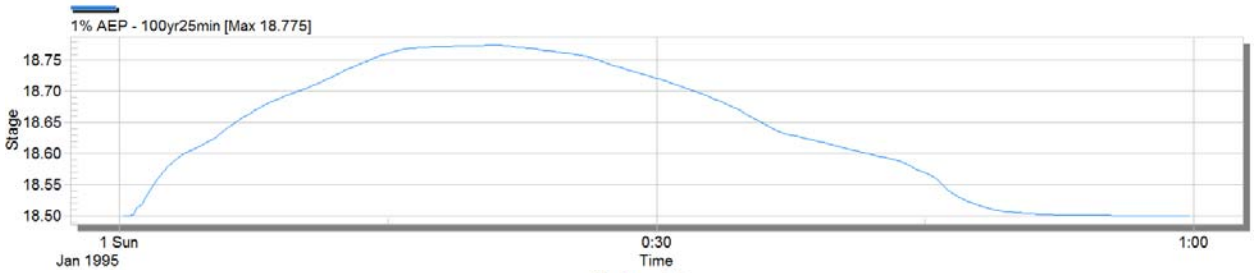
Node - 1.2



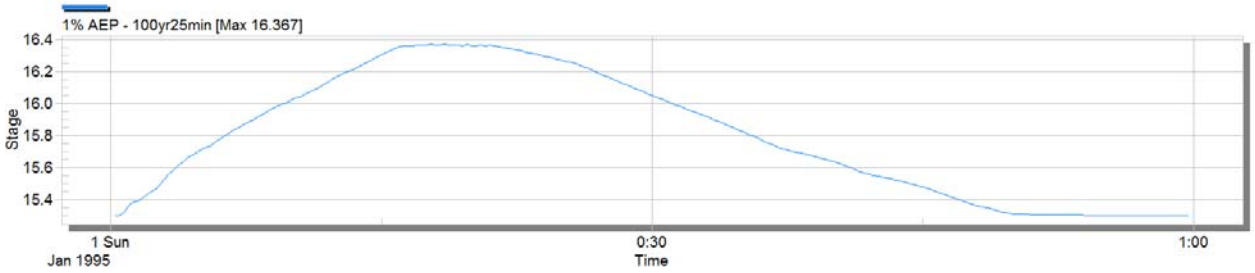
Node - 1.3



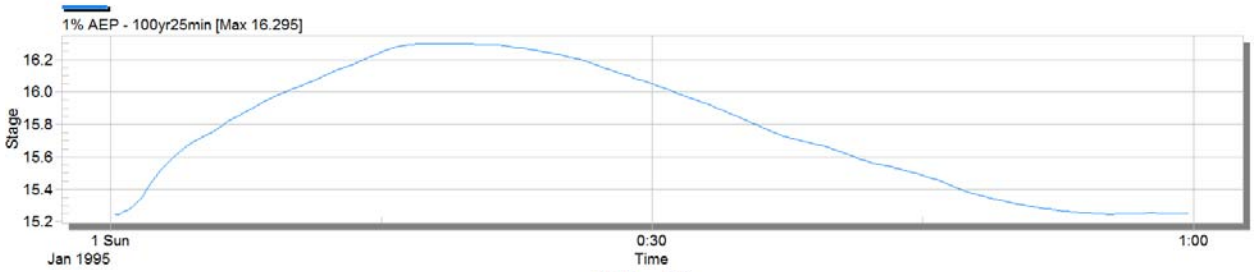
Node - 1.4



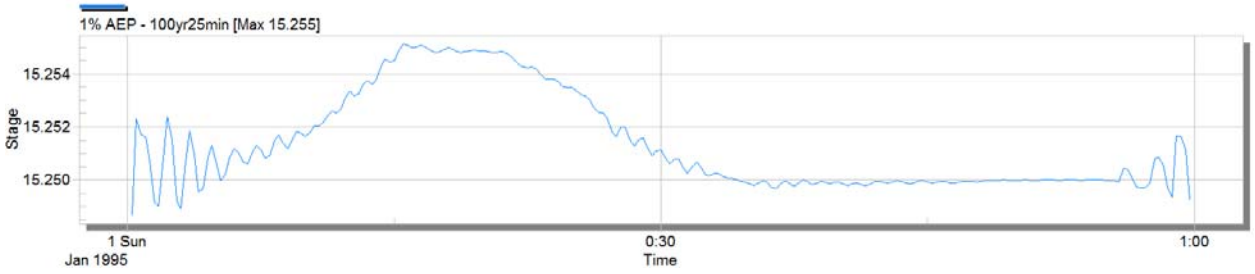
Node - 1.5



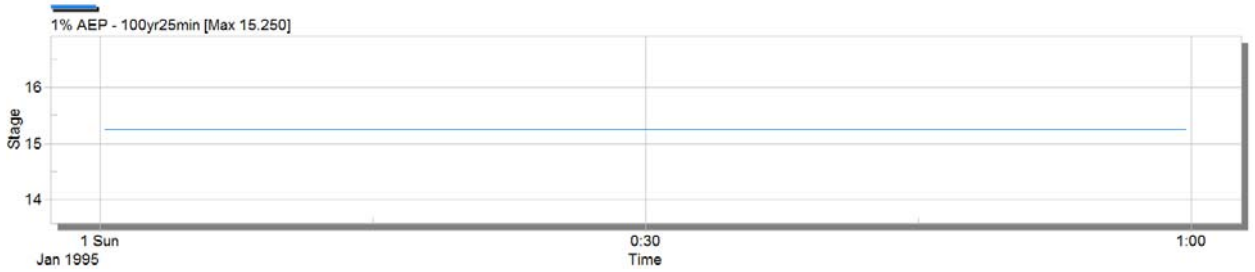
Node - 1.6



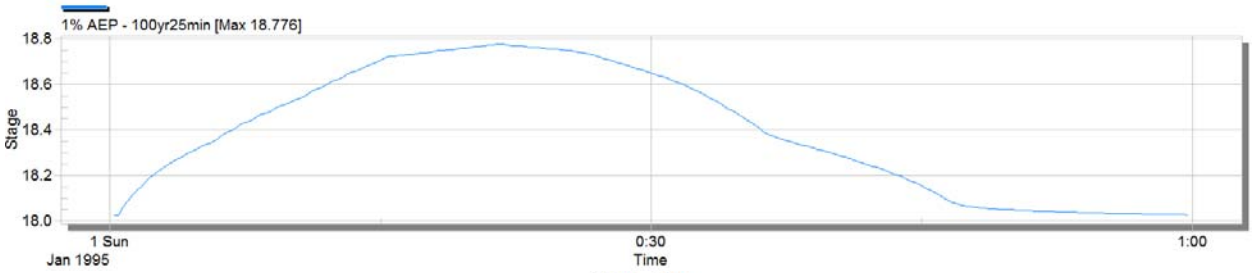
Node - 1.7



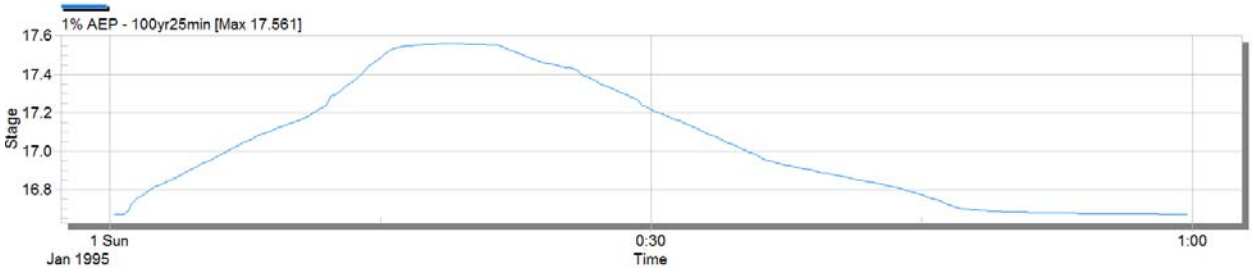
Node - OUT



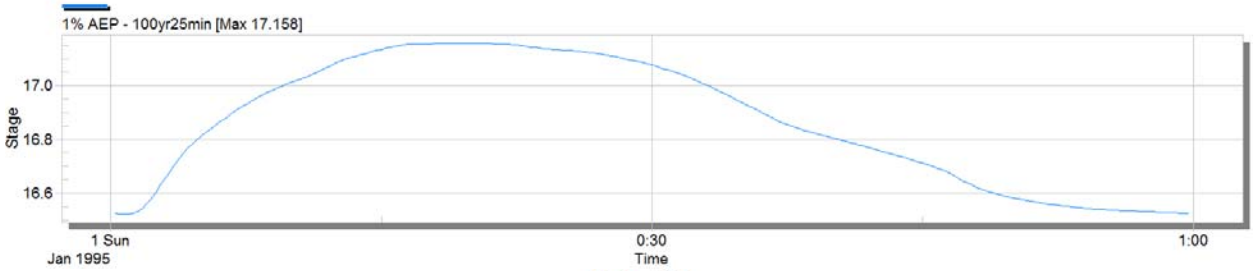
Node - C2



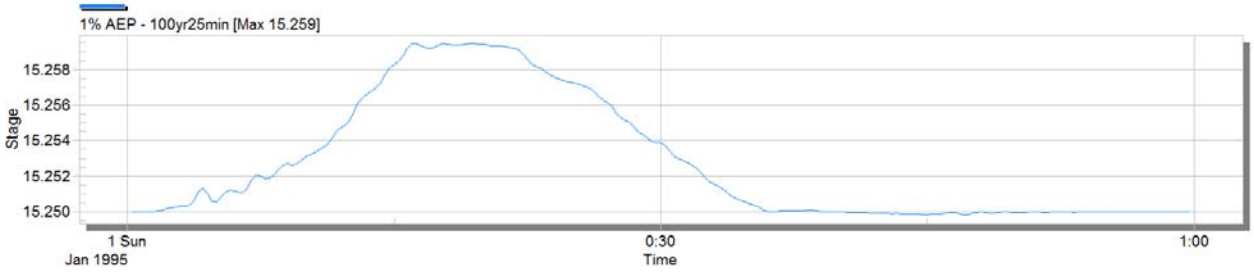
Node - 2.1



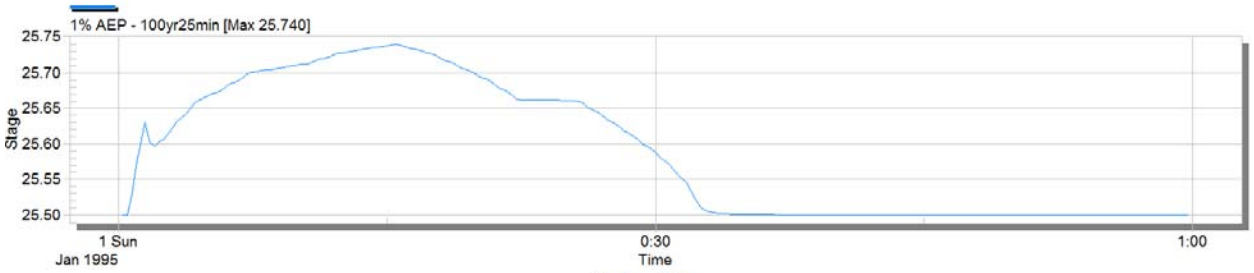
Node - 2.2



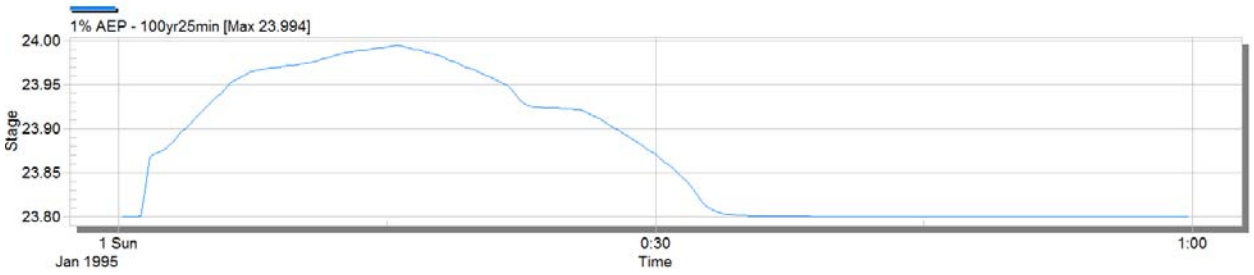
Node - 2.3



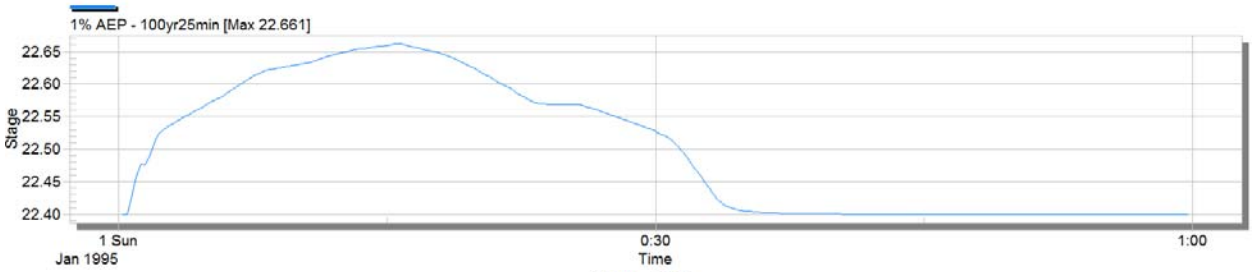
Node - C3



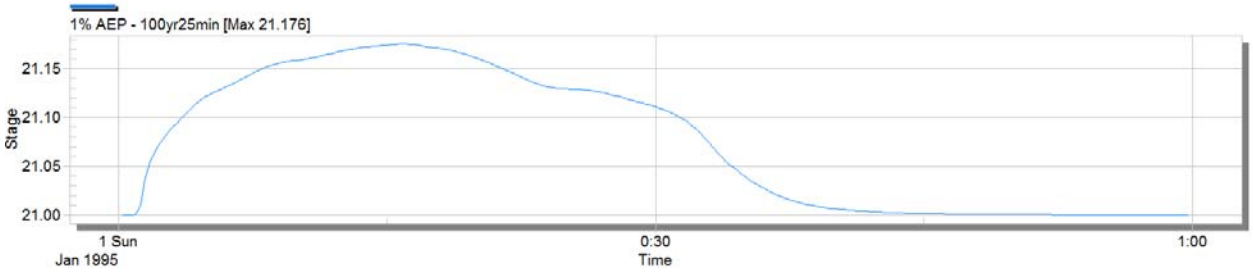
Node - 3.1



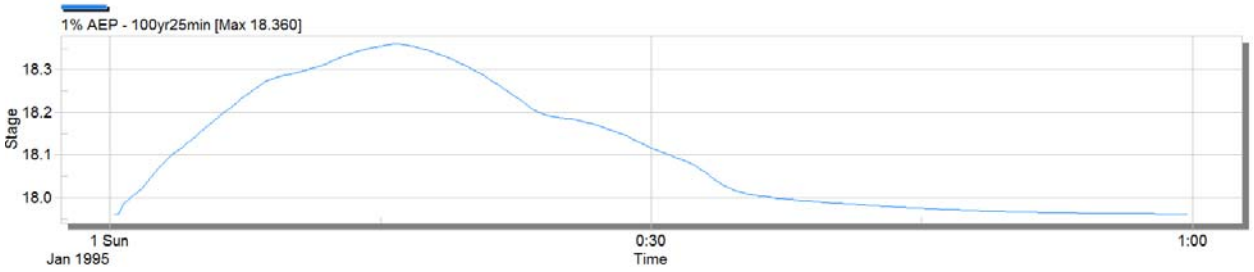
Node - 3.2



Node - 3.3



Node - 3.4



APPENDIX D

1% AEP WATER SURFACE PLAN,

5% AEP WATER SURFACE PLAN,

20% AEP WATER SURFACE PLAN,

SURVEY INFORMATION

SUPPLIED BY	:	EVERITT & EVERITT SURVEYORS
JOB REF. NO.	:	16984
DATUM	:	A.H.D
BENCHMARK	:	UNKNOWN
DATE OF SURVEY	:	27/06/08

THESE PLANS ARE TO BE READ IN CONJUNCTION WITH THE ABOVE MENTIONED SURVEY.
THE BOUNDARIES SHOWN HEREON HAVE BEEN PLOTTED FROM INFORMATION CONTAINED IN DP.1159704

REV :	DATE :	REASON FOR REVISION :	Drafted :	Checked :
O	05-05-11	ORIGINAL	BDM	
A	19-05-11	AMENDED CALCULATION OF 1% AEP	BDM	
B	06-06-12	INCLUDE 1%, 5% and 20% AEP FLOOD PLANS	DJH	
C	24-09-12	MINIMUM FINISHED FLOOR LEVEL LOT 3	DJH	

HOOLIHAN PARTNERS
PTY LTD ABN 17 068 013 927
www.hoolihan.com.au
SUITE 6, 34-36 PACIFIC HWY, WYONG, NSW, 2259
PO BOX 158, WYONG, NSW, 2259
TEL (02) 4353 5352
FAX (02) 4353 5354

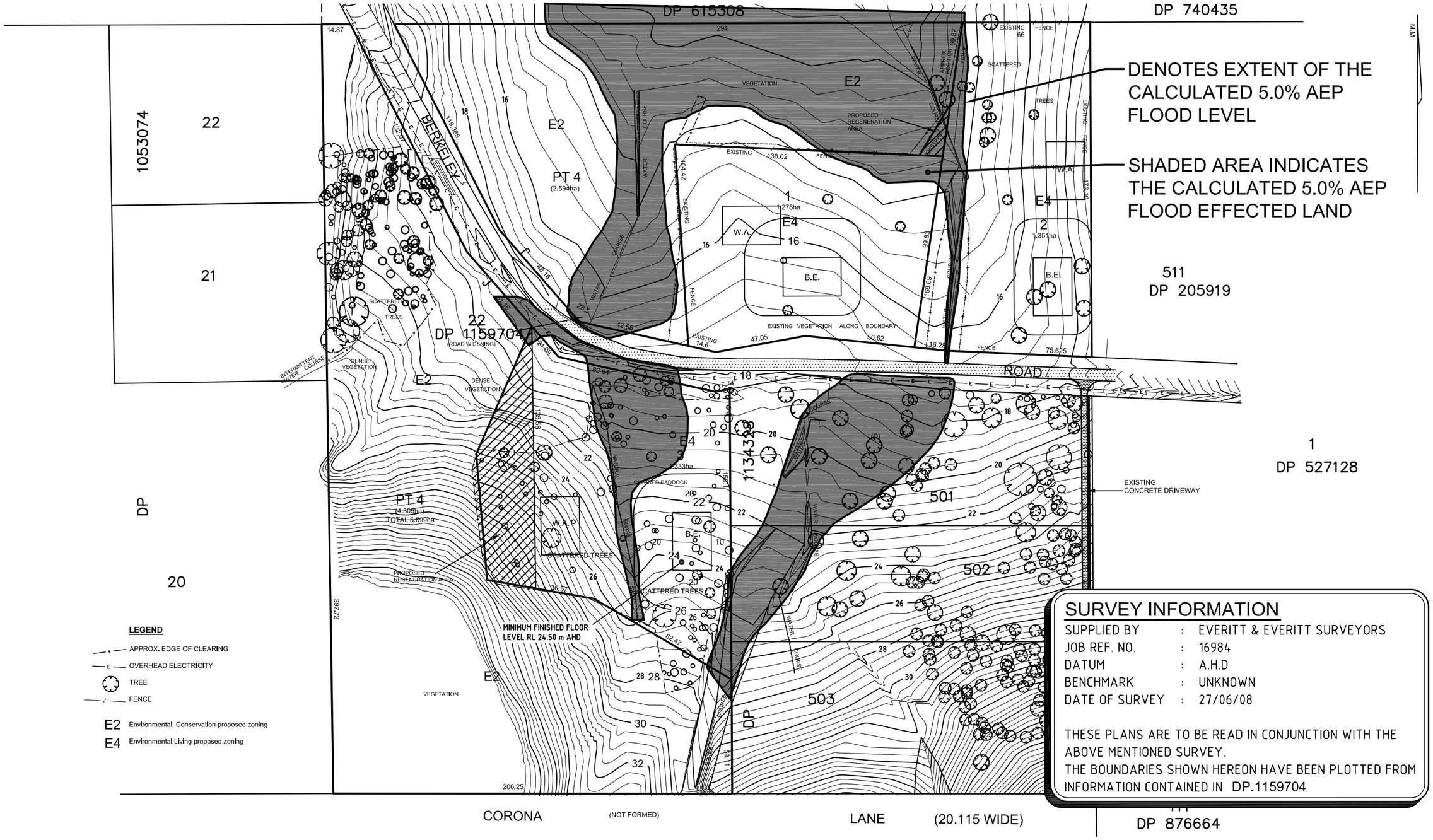
PROJECT DETAILS :
PROPOSED SUBDIVISION.
LOT 23 DP1159704 BERKELEY ROAD, FOUNTAINDALE.

CLIENT :
HAPIDO PTY LTD, TSM PTY LTD.

DRAWING NAME :
CALCULATED 1% AEP FLOOD PLAN

JOB No.:	SHEET No.:	REVISION :
16323	1	C
SCALES :	SET OF :	DATE :
1:2000	3	24-09-12

APPROVED :
DARREN HOOLIHAN B.E. M.I.E.Aust. C.P.Eng.



SURVEY INFORMATION

SUPPLIED BY	:	EVERITT & EVERITT SURVEYORS
JOB REF. NO.	:	16984
DATUM	:	A.H.D
BENCHMARK	:	UNKNOWN
DATE OF SURVEY	:	27/06/08

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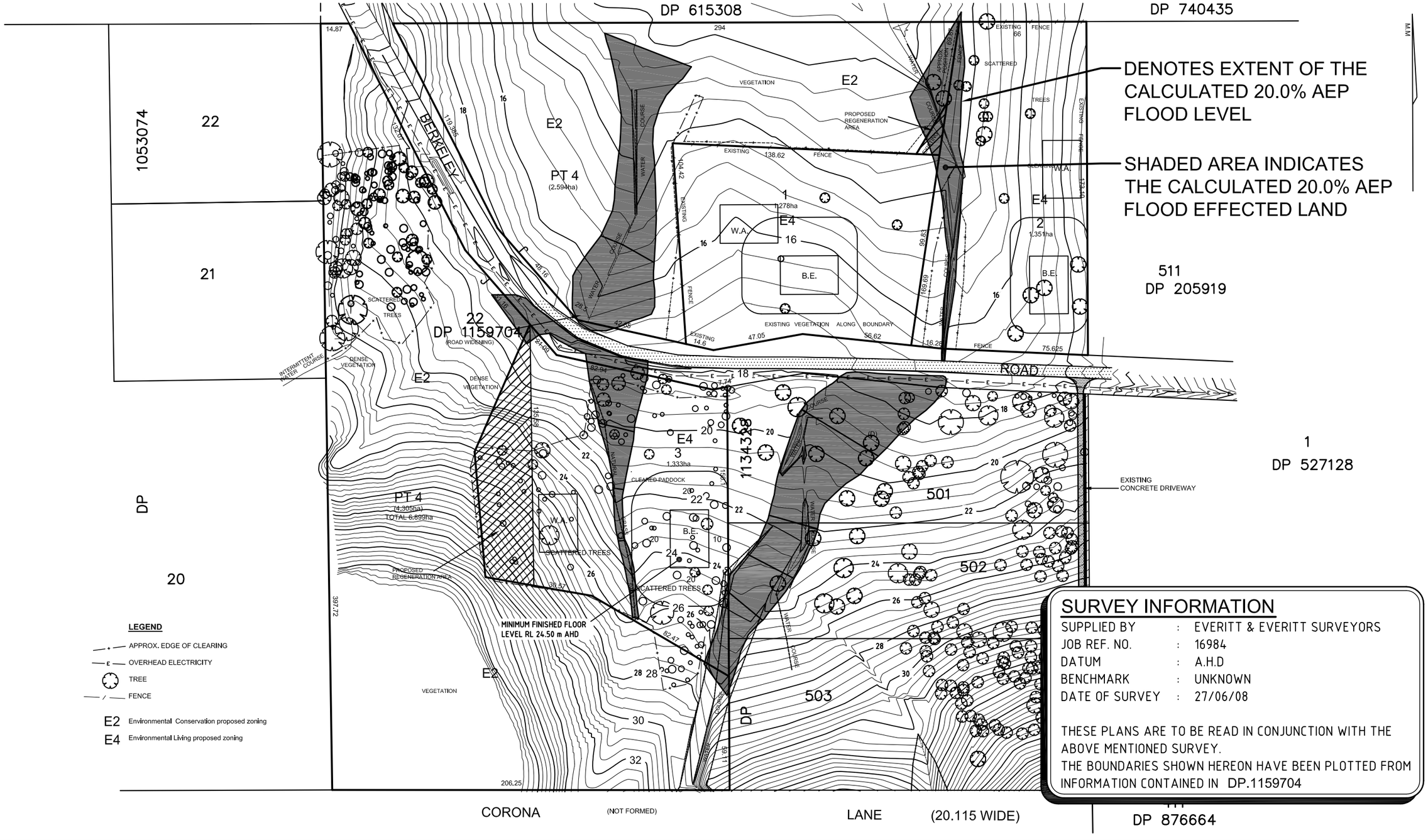
PROJECT DETAILS :
PROPOSED SUBDIVISION.
LOT 23 DP1159704 BERKELEY ROAD, FOUNTAINDALE.

CLIENT :
HAPIDO PTY LTD, TSM PTY LTD.

DRAWING NAME :
CALCULATED 5% AEP FLOOD PLAN

JOB No.:	SHEET No.:	REVISION :
16323	2	C
SCALES :	SET OF :	DATE :
1:2000	3	24-09-12

APPROVED :
DARREN HOOLIHAN B.E. M.I.E.Aust. C.P.Eng.



SURVEY INFORMATION

SUPPLIED BY	:	EVERITT & EVERITT SURVEYORS
JOB REF. NO.	:	16984
DATUM	:	A.H.D
BENCHMARK	:	UNKNOWN
DATE OF SURVEY	:	27/06/08

THESE PLANS ARE TO BE READ IN CONJUNCTION WITH THE ABOVE MENTIONED SURVEY.
THE BOUNDARIES SHOWN HEREON HAVE BEEN PLOTTED FROM INFORMATION CONTAINED IN DP.1159704

REV :	DATE :	REASON FOR REVISION :	Drafted :	Checked :
O	05-05-11	ORIGINAL	BDM	
A	19-05-11	AMENDED CALCULATION OF 1% AEP	BDM	
B	06-06-12	INCLUDE 1%, 5% and 20% AEP FLOOD PLANS	DJH	
C	24-09-12	MINIMUM FINISHED FLOOR LEVEL LOT 3	DJH	

HOOLIHAN PARTNERS
PTY LTD ABN 17 068 013 927
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TEL (02) 4353 5352
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PROJECT DETAILS :
PROPOSED SUBDIVISION.
LOT 23 DP1159704 BERKELEY ROAD, FOUNTAINDALE.
CLIENT : HAPIDO PTY LTD, TSM PTY LTD.

DRAWING NAME :
CALCULATED 20% AEP FLOOD PLAN

JOB No.:	SHEET No.:	REVISION :
16323	3	C
SCALES :	SET OF :	DATE :
1:2000	3	24-09-12

APPROVED :
DARREN HOOLIHAN B.E. M.I.E.Aust. C.P.Eng.