Cardno
Shaping the Future

Porters Creek Flood Study

Addendum 1

W4822

Prepared for Wyong Shire Council

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Cardno (NSW/ACT) Pty Ltd
ABN 95 001 145 035
Level 3, 910 Pacific Highway
Gordon NSW 2072
Australia
Telephone: 02 9496 7700
Facsimile: 02 9499 3902
International: +61 2 9496 7700
sydney@cardno.com.au
www.cardno.com.au

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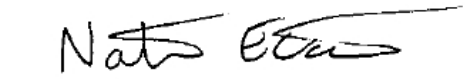
Signature:		
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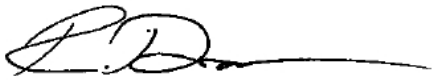
Signature:		
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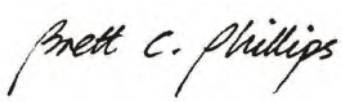
Signature:		
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Revision Schedule

Rev	Date	Description of Revision	Prepared	Reviewed	Approved
1	10/08/10	Client review	NME	RST	BCP
2	5/09/10	Client review	NME	RST	BCP
3	15/06/11	Climate change assessment	NME	RST	BCP

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Executive Summary

Cardno was commissioned by Wyong Shire Council to undertake a floodplain risk management study of the Porters Creek catchment in December 2009. As part of this project, Cardno undertook a review and update the Flood Study that was completed in July 2009. This addendum report, which details the updates, should be read in conjunction with the original Flood Study report. The Flood Study was undertaken to define the nature and extent of overland flow in the catchment, under existing catchment conditions, for a range of design rainfall events. The study has taken into account the principles set out in the NSW Government's "*Floodplain Development Manual (April 2005)".*

A number of changes are due to occur within the catchment and this addendum has been created to assess their impact, if any, upon the flood behaviour for various design rainfall events. The catchment comprises several growth areas with numerous commercial and residential land releases nominated within current planning controls. Vegetation has also been nominated as a factor likely to change and as such roughness values for flooodways and flood plains have been revised. Major changes proposed in the catchment include the Warner Industrial Park sub-division on Buttonderry Creek and the Lucca Rd industrial site in North Wyong. Infrastructure upgrade is planned for causeways/culverts on Warnervale Road, Minnesota road and Mataram Road. These development scenarios were assessed as part of the update.

Relevant available data was collated, and is detailed in this report.

The Flood Study utilised 2 mathematical models, hydrology (XP RAFTS) and hydraulics (TUFLOW), to simulate flood extents for 5 year, 10 year, 20 year, 50 year, 100 year, 200 year ARI and PMP design rainfall events. Estimation of change in flood behaviour was undertaken by interrogation of the existing 1D/2D hydraulic model TUFLOW. Sensitivity to climate change was also modelled by applying a 15% and 30% increase to the 100 year ARI rainfall intensity for the hydraulic model revisions. Details of the establishment and parameters used in each model as well as model results are reported in full in the Flood Study report.

Detailed maps of the model outputs have been produced for each design event and are attached in Appendix E of this study. It is envisaged that these maps will form the basis for the floodplain risk management study and plan, as per the recommendations of the *Floodplain Development Manual (April 2005).* Maps include peak flood depth and levels, and peak flow velocities for a range of design flood events, as well as changes in flood levels as a result of the climate change and sensitivity analysis.

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Abbreviations

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Average Recurrence Interval
AR&R	Australian Rainfall and Runoff (1999 Edition)
BOM	Bureau of Meteorology
DSM	Development Scenario Model
IFD	Intensity-Frequency-Duration
LEP	Local Environmental Plan
LGA	Local Government Area
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PMPDF	Probable Maximum Precipitation Design Flood
PWD	Public Works Department
TLECFMC	Tuggerah Lakes Estuary, Coastal and Floodplain Management Committee
XP_RAFTS	Rainfall / runoff program
xpswmm2D	Unsteady two dimensional (2D) flood routing program
WSC	Wyong Shire Council

1 Introduction

Cardno has been engaged by Wyong Shire Council (Council)to undertake a Floodplain Risk Management Study and Plan for the Porters Creek catchment. This report provides a review and update of the *Porters Creek Flood Study* carried out by Cardno in July 2009 (referred to as the Flood Study throughout this report). The Flood Study report documents the study inputs, assumptions, results and outcomes in full. This addendum must be read in conjunction with the Flood Study report and it should be noted that it may be necessary to use details of the Flood Study to fully appreciate the results included in this addendum.

Development is planned in the Porters Creek catchment that in turn will impact hydrology and hydraulics of the catchment. As such it is necessary to update the Flood Study in the form of a development scenario model to update results of the various design storm events. Council therefore requested a review and update of the Flood Study for the development scenario as a first step in the Floodplain Risk Management Study and Plan.

The addendum has taken into account the principles set out in the NSW Government's "*Floodplain Development Manual (April 2005)".*

This addendum will support the Flood Study to form the basis for a subsequent floodplain risk management study where detailed assessment of flood mitigation options will be determined in consideration of social, environmental and economic factors relating to flood risk management.

2 Study Principles

The principles of this addendum are as per those outlined in the Flood Study.

2.1 Study Methodology

The tasks undertaken for this addendum are summarised as follows:

Task 1 - *Compilation and review of available information* from the Flood Study and updates provided by Council. Identify data gaps and identify where further data/information is required.

Task 2 - *Acquisition of addition information* as required

- Collect proposed development information from Council and developers
- Assess vegetation change in floodplain during site visit

Task 3 - *Review hydrological (flood flow) model* to estimate catchment runoff due to the catchment changes during selected historical flood events as well as design and PMP floods.

- Ammendment of the XP_RAFTS model

Task 4 - *Undertake Hydraulic Modelling for the development scenario*

- update of the existing xpswmm2D / TUFLOW model

Task 5 – *Modelling of Design Floods* to estimate flood profiles, flood depths, flood velocities and flow distribution across the study area for updated existing conditions

- modelling of 5 year, 10 year, 20 year, 50 year, 100 year, 200 year ARI and PMF design rainfall events

Task 6 – *Assess results for the development scenario* by comparison of the existing model and the updated model for the areas where catchment change has occurred.

Task 7 – *Sensitivity Analysis* of various model parameters including major hydraulic structure blockage in key areas and roughness value increase along with analysis of the projected change to hydrology (rainfall intensity increase of 30% to 100 yr ARI) as a result of climate change

Task 8 – *Documentation of findings in* addendum report to the Flood Study.

2.2 Modelling Overview

Estimation of flooding behaviour was undertaken by interrogation of existing computer models to simulate the rainfall and runoff (hydrology) and the patterns of flood flow (hydraulics).

The hydrologic modelling package XP_RAFTS was used to estimate flood discharges from design rainfall, and to hydrologically route these flood discharges through the catchment.

Flood discharge hydrographs from XP_RAFTS were input to the 2D hydrodynamic model TUFLOW for the estimation of flood levels and velocities over the catchment.

The models were then run to estimate flooding behaviour for design rainfall events. The design rainfall events simulated were the 5, 10, 20, 50 and 100 yr and 200 yr ARI design storm bursts (corresponding respectively to 20%, 10%, 5%, 2%, 1%, and 0.5% AEP) and the PMP event. Plans showing flood levels, depths and velocities under updated catchment conditions were developed for each design event.

The hydrologic and hydraulic models are discussed in Sections 4 and 5 respectively.

3 Catchment Details

General details of the catchment can be found in the Flood Study.

Details of the catchment changes (Refer to Table 5.2 and Appendix A for details) that were included in the development scenario of the model include:

1. Industrial fill, north of Lucca Road

Lucca Road is situated adjacent to the lower section of Porters Creek floodplain to the east of the railway and experiences flood inundation during a range of events. Filling of the floodplain is proposed in order to develop industrial buildings and a proposed detention basin. Design drawings were obtained from the proponent documenting raised pads for building footprints, roads and drainage. The detention basin also utilises a large amount of fill to provide bunding that prevents influx of water from the floodplain.

2. Warner Industrial Park, Hue Hue Road Warnervale

Warner Industrial Park is a 104.2 hectare industrial sub-division bound by the F3 freeway, Sparks Road and Hue Hue Road that includes earthworks, roads and drainage, buildings and a road bridge over Buttonderry Ck. A considerable amount of cut and fill is proposed in order to create development lots in the floodplain.

3. Mataram Road culvert upgrade, Woongarrah Creek

The existing 3 cell culvert will be replaced with 5 cells along with minor road works to increase the level of service for the road during storm events.

4. Natural revegetation of floodplain

High hazard floodways in the catchment will be exempt from future development and will likely undergo change in vegetation type and density over time. Natural regeneration of floodplain species is expected to emerge in existing grazing areas.

5. Floodplain roughness zones

Roughness factors used in the Flood Study for various land uses were rural and light vegetation (0.065), road and highway (0.022) and heavy vegetation (0.1). Considering that the current land use includes rural/grazing areas it was necessary to provide additional roughness zones to include this use.

Please see Section 4 for details of what changes were made to the hydrology model to reflect the above changes and Section 5 where changes were made to the hydraulic model.

Several other changes are planned for the catchment that have not been finalised. Several of these were included in the original scope of work. These will be investigated separately in more detailed studies and include:

1. Precinct 7A proposed land use. Area is bounded by Sparks Road, Pacific Hwy and Louisiana Rd Warnervale

540 hectares of land, located to the east of the railway, planned for residential development with current rezoning investigations and masterplanning in progress. The aim of the masterplan for the site is to: maximise developable land, establish nil flood impact and consider floodplain restoration and stormwater harvesting. Cardno has been engaged to provide a concept design for the regional stormwater harvesting scheme for Precinct 7A and remaining catchments upstream of the railway culverts (i.e. east of the railway). This will include several rounds of flood model iterations to ensure flooding is managed in a sustainable manner. The timing and extent of work required for the iterations meant they were excluded from the Addendum.

2. Minnesota Road upgrade, Woongarrah Creek

Council is undertaking a project to upgrade Minnesota Road by replacing the existing causeway and culvert to improve the existing level of service for the road. Council have taken on the role to provide design in this case, Cardno has been engaged to undertake design model runs for various configurations of the road and culvert. The timing for completion of the design work was delayed and meant the exclusion from the Addendum.

3. Warnervale Road upgrade, Woongarrah ck

Upgrade of Warnervale Road culvert and flood causeway between Louisiana Road and Minnesota Road. The aim of the upgrade is to improve the current serviceability of the road. Council have taken on the role to provide design in this case, Cardno has been engaged to undertake design model runs for various configurations of the road and culvert. The timing for completion of the design has meant it has been excluded from this Addendum.

4 Hydrology

Hydrology in the Porters Creek catchment is described in the Flood Study. Changes to the hydrology will result from the following development sites:

1. Lucca Road Industrial Site
2. Warner industrial Park

The XP RAFTS model was updated to include the increase in impervious surfaces expected in these development areas. These values are defined by the development plans for these sites. An update of the results can be found in Table 4.1.

Table 4.1: Estimated Peak Flows and Critical Storm Durations at Selected Nodes – Design and PMP Storms

Location Description	Estimated Peak Flows m3/s and Critical Duration (hrs)												
	Node	5yr ARI		10yr ARI		20yr ARI		50yr ARI		100yr ARI		200yr ARI		PMF (90m)
Warnervale Rd (between Virginia Rd-Minnesota Rd)	WC11.0	12	12hr	14	12hr	17	12hr	20	2hr	23	2hr	27	2hr	113
Virginia Rd (between Minnesota Rd - Louisiana Rd)	WC1.08	40	2hr	46.7	2hr	54	2hr	61	2hr	69	2hr	77	2hr	267
Louisiana Rd (intersection Warnervale Rd)	WC6.05	30	2hr	35	2hr	41	2hr	47	2hr	54	2hr	61	2hr	172
Porters Ck Swamp Inflows from Warnervale Region	PC1	146	2hr	173	2hr	212	2hr	253	2hr	292	2hr	335	2hr	1300
Buttonderry Creek at Freeway	BU4	43	9hr	50	9hr	60	9hr	70	6hr	80	6hr	90	6hr	386
Buttonderry Ck at Sparks Rd (cnr Jack Grant Avenue)	BU9a	67	9hr	78	9hr	93	9hr	108	9hr	123	9hr	140	6hr	587
Hue Hue Creek at Freeway	PCA	49	9hr	57	9hr	68	6hr	80	6hr	92	6hr	104	6hr	380
Porters Creek Outflow	BU6d	311	9hr	363	9hr	435	9hr	506	9hr	575	9hr	644	9hr	2526

5 Hydraulics

5.1 Utilisation of existing 1D/2D Hydraulic Model

A fully dynamic one-dimensional/two-dimensional (1D/2D) TUFLOW hydraulic model developed for the Porters Creek Flood Study was used to update the model according to the changes in the catchment. The updated model is referred to as the development scenario model (DSM). Various changes made to the previous model are listed below:

1. **Reduction of ALS data by a uniform 0.3m in densely vegetated areas of the floodplain.**

   A survey was made available by Council for road and floodway details at the Woongarrah Creek crossing at Warnervale Road. A comparison of the survey was made to the ALS and it was clear that the ALS was generally higher than the ground survey in densely vegetated areas of the floodway. Vegetation in this area is typically low lying shrubs with a continual canopy approximately 1m in height from natural ground level. This vegetation type and characteristic is common within the floodways and floodplain throughout the catchment.

   In the absence of similar ground survey for other areas it was evident that the terrain produced by the ALS is questionable. The practicalities and cost of completing ground survey for the remaining floodways/floodplain was not considered feasible thus, in liaison with Council, it was considered appropriate to manipulate the ALS to reflect on-ground conditions. Discussions with Council, and investigation of other references, led to the reduction of the ALS by an agreed 0.3m over highly vegetated areas within the floodway/floodplain only. .A similar approach has been applied by others in similar studies of Porters Creek Wetland (EDAW, 2009).

   Figure 10 shows a map indicating the extent of the ALS reduction.

2. **Inclusion of additional roughness zones**

   Roughness zones used in the Flood Study model were broken down to include an additional 2 categories to provide greater detail when modelling the rural residential areas of the catchment. The majority of the rural area in the Porters Creek catchment is used for grazing, with limited areas of crops. A roughness zone for the rural areas was not provided in the Flood Study. See Table 5.1 for more details.

Table 5.1: Roughness Zones

Zone	Manning's n	Comment
General Urban	0.065	Applied to all low to high density residential areas
Roads	0.022	Applied to all major and minor roads
Heavy Vegetation	0.1	Applied to all vegetated areas defined by aerial photography
Grass/grazing	0.4	Applied to all open grass/grazing areas defined by aerial photography
Rural residential/Low density vegetation	0.5	Applied to all rural residential areas where grass and trees exist as defined by aerial photography

3. Adoption of 5m grid size for catchment to the east of the Railway.

Previously the Flood Study model included a 15m grid for the open space areas of the catchment and 4m grid for the urban areas. The 4m grid areas were mostly outside of the flood extents for all design storms. Thus it was important to investigate the potential to improve the results within overland flowpaths and floodways. The overland flows within urban zones was considered reasonably accurate to continue without further refinement.

In an effort to increase the accuracy of the results various grid sizes were tested and it was found that application of a 5m grid across the eastern part of the catchment provided the best outcome. Smaller grid sizes such as 3m and 4m proved to increase the size and complexity of the model considerably. This resulted in larger run times and model instabilities without adding significant benefit to the results.

4. Removal of existing 1D XPSWMM channel section upstream of Minnesota Road

The previous Flood Study model included a 1D channel to represent Woongarrah Creek. The channel was defined by cross-sections with spacings of 500m from Mataram Rd to the Railway.

Interrogation of Council records found that the survey completed for the Woongarrah Creek channel was undertaken in 1989. Since this survey, significant changes in the shape of the open channel has occurred downstream of the residential development in Warnervale, Lake Haven and Hamlyn Terrace. Mobilisation of sediment during construction of the housing has resulted in transport and deposition of sediments into the floodway. Over time the sediment has built up and become vegetated and as a result has changed the characteristics and dimensions of the channel.

A comparison of the 1989 survey was made to the ground survey undertaken in the vicinity of Warnervale Road and it is evident (**Appendix A**) that a reduction in the channel area has occurred. In light of these findings it was concluded that the 1D channel shape was irrelevant for all sections upstream of Minnesota road. The open channel downstream of Minnesota road has not been subject to physical change in

such a manner as areas receiving run-off directly from recent urban development. Therefore the 1D channel was retained for the reach downstream of Minnesota Road only.

5. **Inclusion of existing culverts to the model that were previously excluded in the vicinity of Warnervale Airport.**

   Council notified Cardno that 2 existing culverts were not included in the previous model. Details were obtained from available information (GIS) and Council site inspection that was presented in a map for inclusion into the updated model. Please see Appendix A for details.

6. **Additional data included into the model according to various proposed development in the catchment.**

   A description of the changes is provided in Section 3. The ground geometry of the model was updated using 3D breaklines to replicate the building pads, bunds, roads and constructed wetlands proposed. 1D elements were added where necessary to replicate proposed hydraulic structures. Please see Table 5.2 for details

The data used in the model is listed in Table 5.2 and are shown in Appendix A

Table 5.2: Data Used in Addendum 1 Modelling

Model Update Details	Data Used	Drawing/Document Names	Drawings Received from/date
Warnervale Industrial Park	Treahy Ingold Neate Site Drawings	Warnervale Industrial Park Subdivision in Precinct 14 19426 EA01-06 REV C	Council, Oct 2009
Mataram Rd Culvert	GHD Design Drawing	Mataram Rd Culvert and Road Works Detail Design 22-14501 C001-009	Council, Oct 2009
Central Coast Business Park - Lucca Rd Industrial Site	Hoolihan Partners Site Drawing	Proposed Site Development for Bitova P/L 14050 100-106 REV S34-A	Council, July 2010
Hamlyn Terrace Community Centre and Sports Facility	Northrop Masterplan Drawing	0868N SK.01 REV E	Council, May 2009
Warnervale Road Survey	Detailed Survey Files	Warnervale LiDAR.dxf and Warnervale LiDAR.xls	Council, Feb 2010
Culvert additions on Sparks Road at Warnervale Airport	Site plan	Pipe Culverts_Sparks Road.pdf	Council, May 2010

5.2 Mapping of Design Floods

5.2.1 Flood Extent, Depths and Levels

Maps showing predicted peak flood levels for the 200, 100, 50, 20, 10, 5 year ARI design storms and the PMP storm under updated catchment conditions are shown in Figures E1 to E7 respectively. Peak flood levels are shown with contours at 0.5 m intervals.

Also shown in these figures are the flood depths that are associated with the peak flood levels. The flood depths are shown using a colour-coded presentation.

5.2.2 Flood Velocities

Plans showing predicted peak flood velocity for 9 hour duration 200, 100, 50, 20, 10, 5 year ARI storms and the 1 hour duration PMP storm under updated catchment conditions are presented in Figures E8 to E14 respectively.

5.3 Discussion of Results

Predicted flood levels for the 100yr ARI event were recorded at various reference points defined in Appendix Figure D.3. These results were compared against previous models of the Porters Creek catchment. These are summarised in Appendix Table D.3. These results are summarised further for the Woongarrah Creek part of the catchment in Table 5.3.

Table 5.3: Summary of results from various models for 100yr ARI

Location	**Existing** m AHD (a)	**DRAFT** m AHD (b)	diff. (m) (b)-(a)	**DSM** m AHD (c)	diff. (m) (c)-(a)	**WSC no.38** 2008 (m AHD) (d)	diff. (m) (d)-(b)
Mataram Rd	17.59	17.13	-0.46	17.48	-0.11	17.57	0.09
d/s Mataram Rd	16.89	16.69	-0.20	17.04	0.15	16.88	-0.16
Sparks Rd	13.48	13.53	0.05	14.10	0.62	-	
d/s Sparks Rd	12.59	12.50	-0.09	12.91	0.32	12.67	-0.24
Warnervale Rd	9.75	9.53	-0.22	9.53	-0.22	9.02	-0.51
d/s Warnervale Rd	9.03	9.08	0.05	9.06	0.03	9.01	-0.05
Minnesota Rd	7.04	6.78	-0.26	6.80	-0.24	7.47	0.67
d/s Minnesota Rd	7.01	6.73	-0.28	6.74	-0.27	7.36	0.62
Virginia Rd	6.27	6.19	-0.08	6.19	-0.08	6.19	0
u/s Railway	6.22	6.18	-0.04	6.18	-0.04		

Note:

Existing - Flood Study Results 2009 that included a 15m grid for the floodway/floodplain for the whole catchment and a 1D element for the open channel upstream of the railway to Mataram Rd.

DRAFT - Updated model under development conditions with a 5m grid for the catchment to the east of the railway, 1D channel in place (as per existing) and the following developments:

- Industrial fill north of Lucca Road
- The proposed Warner Industrial Road
- Lower ALS ground levels by 0.3m in dense vegetated areas
- Mataram Road culvert upgrade
- Natural revegetation of high hazard floodways
- Differential roughness representations for rural and urban areas
- Hamlyn Terrace Community Centre and Sports Facility

DSM - Development Scenario Model with the above development updates, 5m grid on eastern side of the railway and without 1D channel upstream of Minnesota Rd

The results of the Flood Study model were estimated using the best available data at the time of the study. The various updates undertaken in the DSM case were necessary to improve the accuracy of the model. Council completed a ground survey of Warnervale Road that was useful in assessing the accuracy of the ALS data and the survey for the Woongarrah Creek channel. Both previous data sources were proven to be questionable as can be seen when referring to the cross sections in Appendix A. In response to these anomalies modifications were made to estimate more realistic ground conditions. Budget and timing constraints prevented the detailed update of the model terrain, by the

completion of ground survey of the whole catchment, which would have provided more confidence in the results estimated.

Comparison of cross sections from the Warnervale Road ground survey and ALS data indicated that reduction of the ALS data by 0.3m in densely vegetated areas is appropriate for the purposes of this study.

In the DRAFT scenario the results for the reference locations are generally lower than the Flood Study results by an average of 0.11m. It is evident due to the adjustment of the ALS that the results were generally lower across the floodplain in the range of 0.05 to 0.46m. In response to the difference in flood levels further investigation was undertaken into the elements of the model and it was found that the date of survey for the 1D channel upstream of the railway was circa 1989. As discussed in Section 5.1 the survey was not considered representative of current conditions and flood extents were considered to be inaccurate.

For the DSM scenario the 1D channel was removed from the model between Minnesota Rd and Mataram Road. The results indicate that a general increase in the flood levels has been estimated with greater confidence as an average difference in level of 8cm was recorded.

The modifications to the model are to such a magnitude that makes it difficult to compare results for specific locations where development scenarios have been added. However the following summary is provided to assess flood impact of the various changes proposed in the catchment:

1. Lucca Road Industrial Site

   The location of the site adjacent to the lower floodplain to the east of the railway lends itself to being naturally inundated by all design flood events modeled. Filling has been proposed to reduce flood risk along with construction of a levee to protect the influx of flood waters from the floodplain. The loss of flood storage volume as a result of the levee proposed is not sufficient to influence the level of flood waters in the adjacent floodplain. As a result it is clear that flood levels in the vicinity of the proposal are not influenced by the levee.

   Refer to Reference Point #W10 in Table D.3 for details of flood levels in the 100yr ARI.

2. Warner Industrial Park

   The proposed industrial park is located at a greenfield site adjacent to Buttondery Creek and directly upstream of the F3 freeway. General alignment of Buttonderry Creek is to remain as per existing with a proposed road bridge approx 400m upstream of the F3 freeway. General filling will occur on the floodplain to the east of Buttonderry Creek requiring re-alignment of an open channel connecting with the existing culvert under the F3 freeway at Kriar Ridge Road.

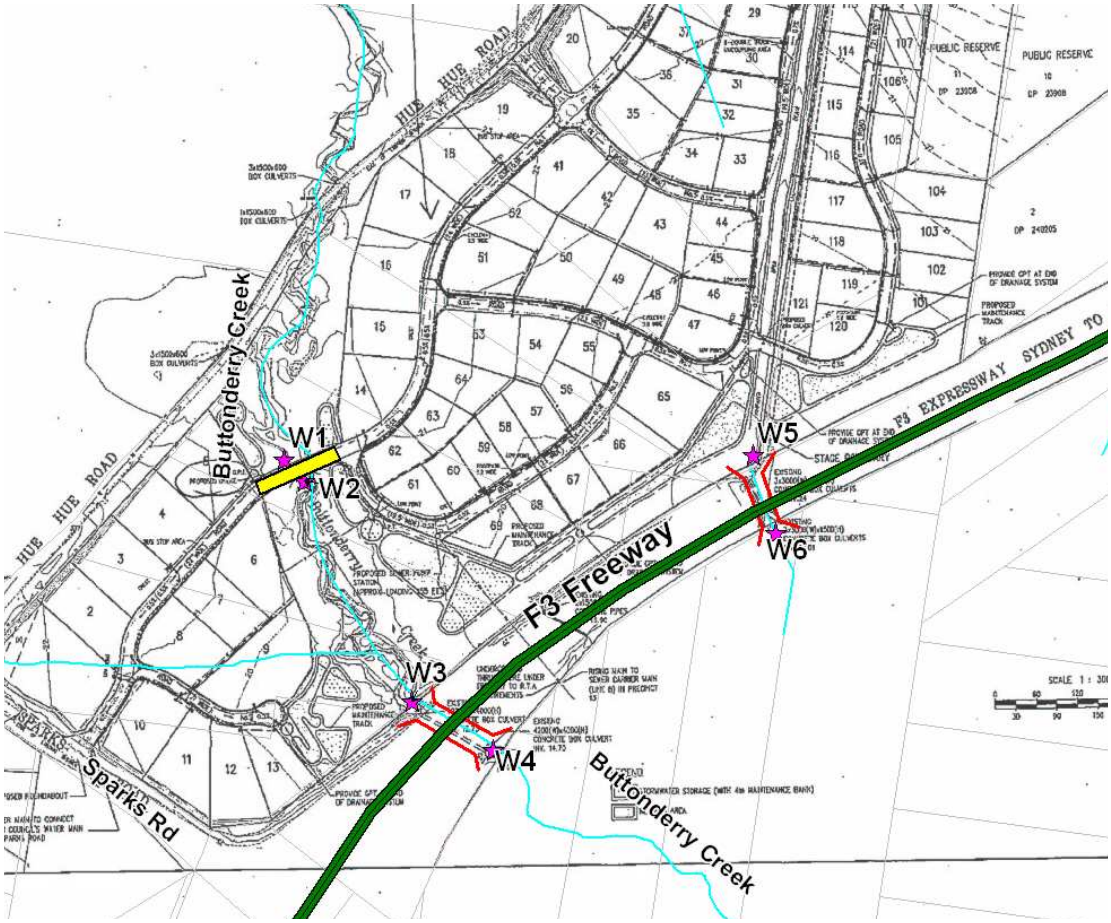

Figure 5.1 Warnervale Industrial Park Reference Points

The results shown in Table 5.3.1 indicate that there is negligible impact of the development on flood levels with some minor increases in 100yr ARI flood level in the order of 0.1m downstream of the F3 freeway in Buttonderry Creek. Refer to Appendix E for more details.

Table 5.3.1: Warnervale Industrial Park Results

Reference PTS	Existing Scenario 100yr ARI (m AHD)	DSM 100yr ARI (m AHD)	Difference (m)
W1	21.00	20.62	-0.38
W2	20.69	20.58	-0.11
W3	19.05	19.00	-0.04
W4	18.23	18.34	0.12
W5	19.08	19.12	0.04
W6	17.85	17.80	-0.05

3. Mataram Road Culvert

   The development scenario models, both DRAFT and DSM, indicate that the flood levels are lower upstream of the proposed culvert as a result of increased hydraulic capacity. This has a follow on effect of conveying a greater volume of flow downstream that results in higher flood extents upstream of Sparks Road. Mataram Road culvert is currently under construction. Although the culvert does improve serviceability of Mataram Road and lowers flood levels in the vicinity it may pose risk to properties downstream. This can be investigated further in the Floodplain Risk Management Study.

5.3.1 2011 model update

The TUFLOW model was updated in May 2011 to include some changes in the catchment that were not included in the previous scenarios discussed in **Section 5.3.** The model was run for the 100 year ARI plus 15% rainfall increase and included the following additions to the model terrain:

1. Pacific Highway Culvert

Previous models, both DRAFT and DSM, included twin box culverts 1.65m wide by 0.98m high adjacent to Wyong Hospital, numbered 55 in the Flood Study (Cardno 2009). This culvert was included using information from previous hydraulic models of the Porters Creek catchment and was not surveyed at the time of the flood study. At present there is an additional twin box culvert of the same size that was not included in the model. Therefore the model was updated to include the additional twin box culverts.

2. Skyhawke Avenue Detention Basin

A subdivision has taken place in this location that involved development of a detention basin upstream of Skyhawke Avenue. In addition a 3.3 x 0.9m box culvert was constructed in conjunction with a sub-division from Georgia Drive to Cessna Place. These two existing catchment changes were included.

3. Louisiana Road Crossing Upgrade

A subdivision has taken place on Louisiana Road that included a crossing over Bingarrah Creek. The crossing will be upgraded with 9 culverts x 2.1m wide x 1.2m high as per the Development Control Plan (DCP) Chapter 49. This upgrade proposal was based on the 'Louisiana Road Infill Precinct Flood Planning Study' by Cardno in August 2007.

5.4 Sensitivity Testing

5.4.1 Climate Change

A scenario was run to examine the sensitivity of the catchment to changes in rainfall intensity, where the 100 yr ARI design rainfall intensities were factored up by 15% and 30%. These values correspond to the most likely scenario (15%) and highest likely scenario (30%) according to DECCW (DECW 2007) guidelines that project changes in rainfall intensity of 10, 20 and 30%. The impact of climate change on rainfall intensity has

been modelled in more detail in regional studies that concluded increases of 10-20% are more appropriate for NSW coastal regions (CSIRO 2007).

The resulting flood levels are compared against the design 100 year ARI flood levels in Appendix D.6. The predicted increase in flood levels due to the 15% rainfall intensity increase is between 0.0 and 0.29m, with an average of 0.02m. The predicted increase in flood levels due to the 30% rainfall intensity increase is between 0.05 and 0.55m, with an average of 0.12m. The highest increase as a result of climate change is in the upper catchment, near Sparks Road. At the scale of the maps presented in this report, the difference in flood extents is not discernible. Incorporation of climate change in flood planning levels will be reviewed as part of the FPRMS. Figure E15A and Figure E15 indicates the areas where flood level differences is evident for the 100 year ARI due to the rainfall intensity increase of 15% and 30% respectively.

5.4.2 Culvert Blockage Analysis

A total of 7 culverts were chosen for a scenario where a 50% blockage factor was applied, the relevant culvert locations are displayed in Figure 11. These are generally major culverts throughout the catchment where major creek crossings occur. The PMF, 100yr ARI and 20yr ARI were chosen to test the sensitivity of the model. Results from the model runs are presented as water level differences when comparing the 50% blocked case to the unblocked case. Refer to Appendix D.6 and Figure E16, E16A and E16B for more details. It is clear that results for the 20yr and 100yr ARI design storms represent a similar pattern of water level increase upstream of the major culverts. Results for the PMF however are quite different as the majority of flow volume is directed over roads and the culvert blockage has less of an impact.

The 100yr ARI design storm results indicate that the flood levels increased to a maximum of 0.8m upstream of the Sparks Road culvert along with general increases of 0.1-0.15m for all other culverts. A slight decrease downstream of the culverts is experienced as a result of attenuation of flow through the culverts. Areas upstream of the F3 culverts also experienced an increase in flood levels of approx 0.5m as a result of the blockage.

5.4.3 Natural Floodplain Roughness Increase

Figure 9 indicates the areas of the floodplain where the natural roughness increase is likely to increase as a result of revegetation. In general the change in levels is in the range of 0-0.25m. Specific locations where the flood level increase was approx 0.2m was at The Warnervale and Mataram Road Crossings of Woongarrah Creek and upstream of Mataram Rd in Woongarrah Creek. The highest recorded increase in flood levels was in the vicinity of Minnesota Road (both up and downstream) with an increase of 0.23m. For further details please see Figure E17.

References

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Cardno 2009 *Porters Creek Flood Study*, July 2009

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DECC (2007) *Floodplain Risk Management Guideline, Practical Consideration of Climate Change*, October.

Wyong Shire Council (2008) *Flood Extents Plan no. 38*

Figures

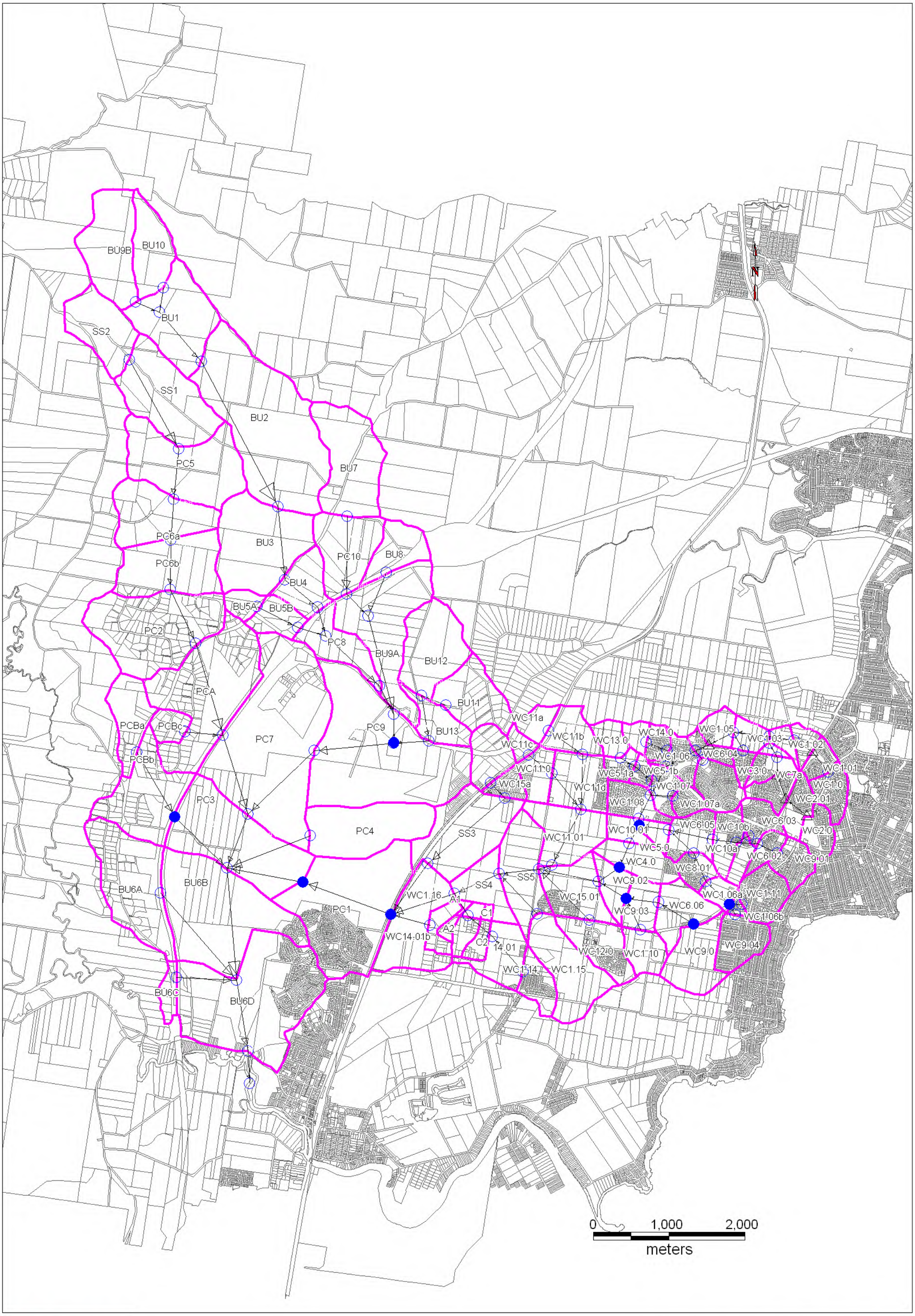


FIGURE 6 - XP_RAFTS model layout

Legends:-

- Rural Development and light vegetation (n = 0.065)
- Road and Highway (n = 0.022)
- Forest and Heavy Vegetation (n = 0.100)
- Grass and Low Density Vegetation (n=0.04-0.05)
- Sensitivity Analysis - Natural Floodplain Revegetation (n=0.1)

KIAR

JILLIBY

HALLORAN

WARNERVALE

WATANOBBI

WYONG

WALLARAH

WOONGARRAH

HAMLYN TERRACE

Adopted Floodplain Roughness Zones

FIGURE 9

N

LEGEND

Heavily Vegetated Zones where ALS reduced by 0.3m

Warnervale Region

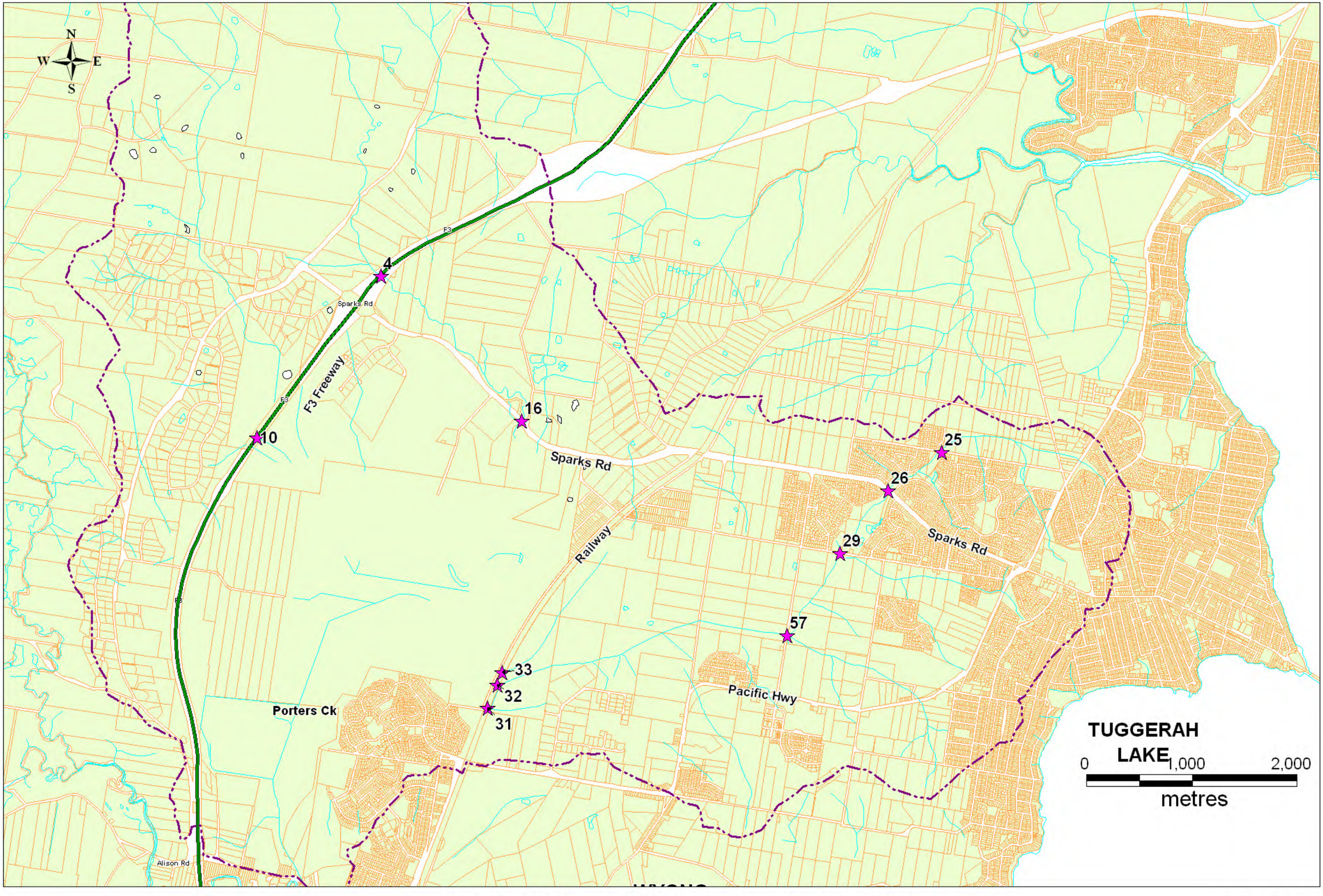
Porters Creek Wetland

Wyong

Cardno Willing

AREAS WITH ALS REDUCED BY 0.3M

FIGURE 10



Sensitivity Analysis - Location of Hydraulic Structures with 50% Blockage

FIGURE 11

Appendix A

Available Data

Appendix 15
General Arrangement Plan for Bridge over Buttonderry Creek

Trehy Ingold Neate

Drawing EC01A

Warner Industrial Park
Preferred Project Report
Concept Plan and Project Application

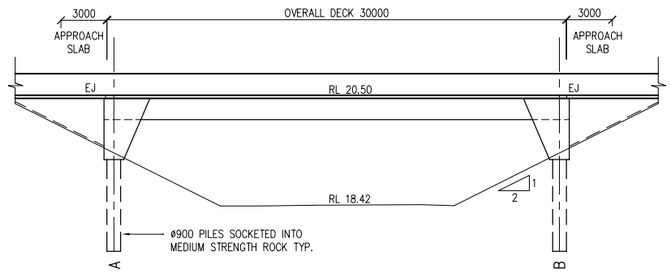
Precinct 14 WEZ

Sparks Rd and Hue Hue Rd
Warnervale
May 2009

80
TERRACE
TOWER
GROUP

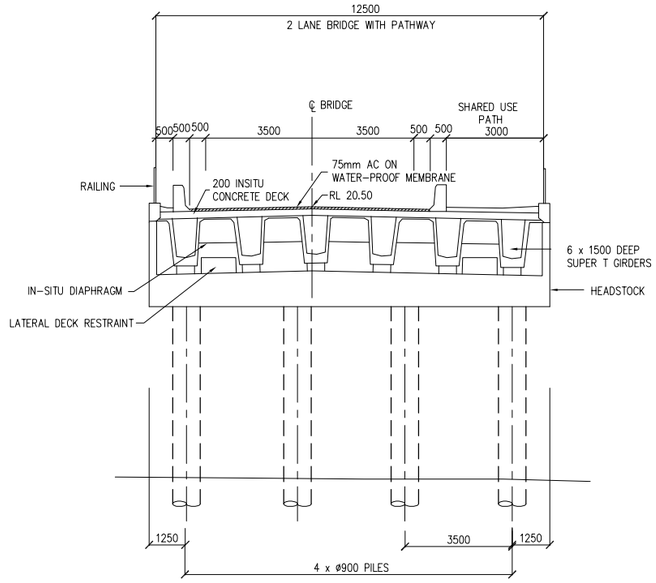
Warner Business Park Pty Ltd
Part of the Terrace Tower Group

Peter Andrews + Associates Pty Ltd
architecture planning urban design



ELEVATION
1:200

NOTES:
1. PRELIMINARY DESIGN DEVELOPED TO THE REQUIREMENTS OF AS 5100.
2. UNLESS NOTED OTHERWISE: ALL DIMENSIONS ARE GIVEN IN MILLIMETRES ALL CHAINAGES ARE GIVEN IN METRES ALL LEVELS ARE GIVEN TO AUSTRALIAN HEIGHT DATUM (AHD)
3. DO NOT OBTAIN DIMENSIONS BY SCALING FROM THE DRAWINGS.
4. ABBREVIATION EJ – EXPANSION JOINT
5. CONCEPT DESIGN BASED ON GEOTECHNICAL DESKTOP ASSESSMENT ONLY, CHANGES MAY OCCUR AS FURTHER INFORMATION BECOMES AVAILABLE.
6. PILES TO BE FOUNDED IN MEDIUM STRENGTH ROCK.
5. WATERWAY AREA TO BE CONFIRMED AT DETAIL DESIGN STAGE



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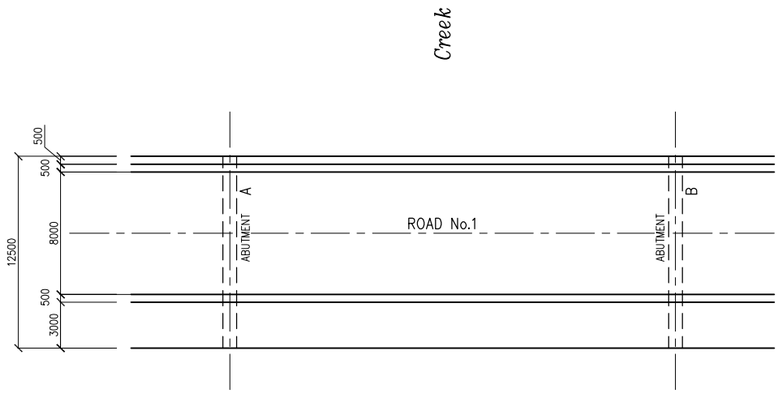

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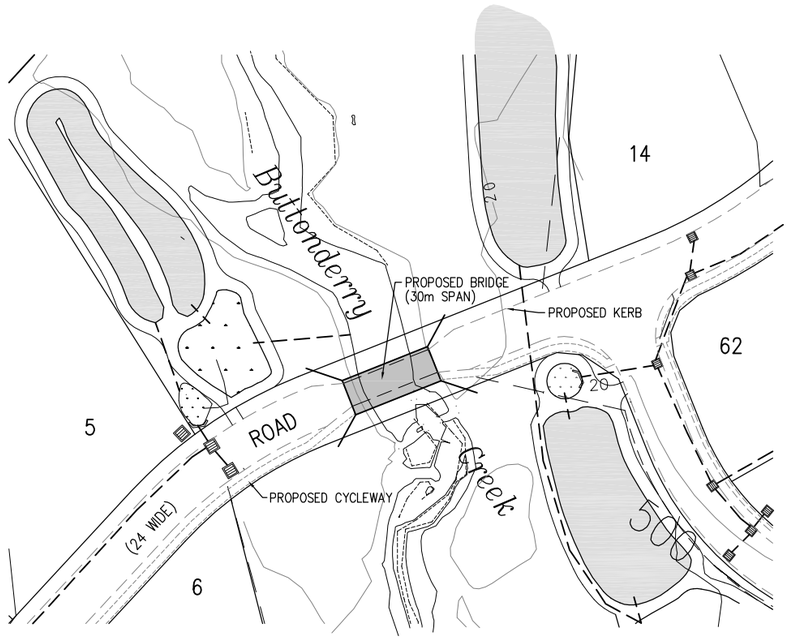

SITE PLAN

REV No.	REMARKS	DATE
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A	ISSUED TO CLIENT	12.05.09

CLIENT:

WARNER BUSINESS PARK PTY LTD
PO BOX 109
DOUBLE BAY
NSW 1360

TREHY INGOLD NEATE
CNR. RELIANCE DRIVE
AND COLONY CLOSE
TUGGERAH NSW 2259
Phone: (02) 4351 2233
Fax: (02) 4352 1559
Postal: P.O. BOX 3205
TUGGERAH NSW 2259
Email: wyong@tinsurvey.com.au
www.tinsurvey.com.au

PROJECT
PLAN OF PROPOSED WORKS ASSOCIATED WITH THE INDUSTRIAL DEVELOPMENT OF LOT 1–9 IN D.P. 239704, HUE HUE ROAD, WARNERVALE

DRAWING TITLE
GENERAL ARRANGEMENT PLAN FOR BRIDGE OVER BUTTONDERRY CK

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DESIGN:	P.B.	INSTRUCTION :	48
DRAWN:	C.A.	CAD FILE:	19426ECA
CHECKED:	P.B.	No. in SET:	1 of 1

ENGINEERING DESIGNER DATE	PROJECT NUMBER	DRAWING No	REVISION
	19426	EC01	A

Appendix 17

Water Sensitive Urban Design

Trehy Ingold Neate

Drawings JA01 - JA07

Warner Industrial Park
Preferred Project Report
Concept Plan and
Project Application

Precinct 14 WEZ

Sparks Rd and Hue Hue Rd
Warnervale
May 2009

80
TERRACE
TOWER
GROUP

Warner Business Park Pty Ltd
Part of the Terrace Tower Group

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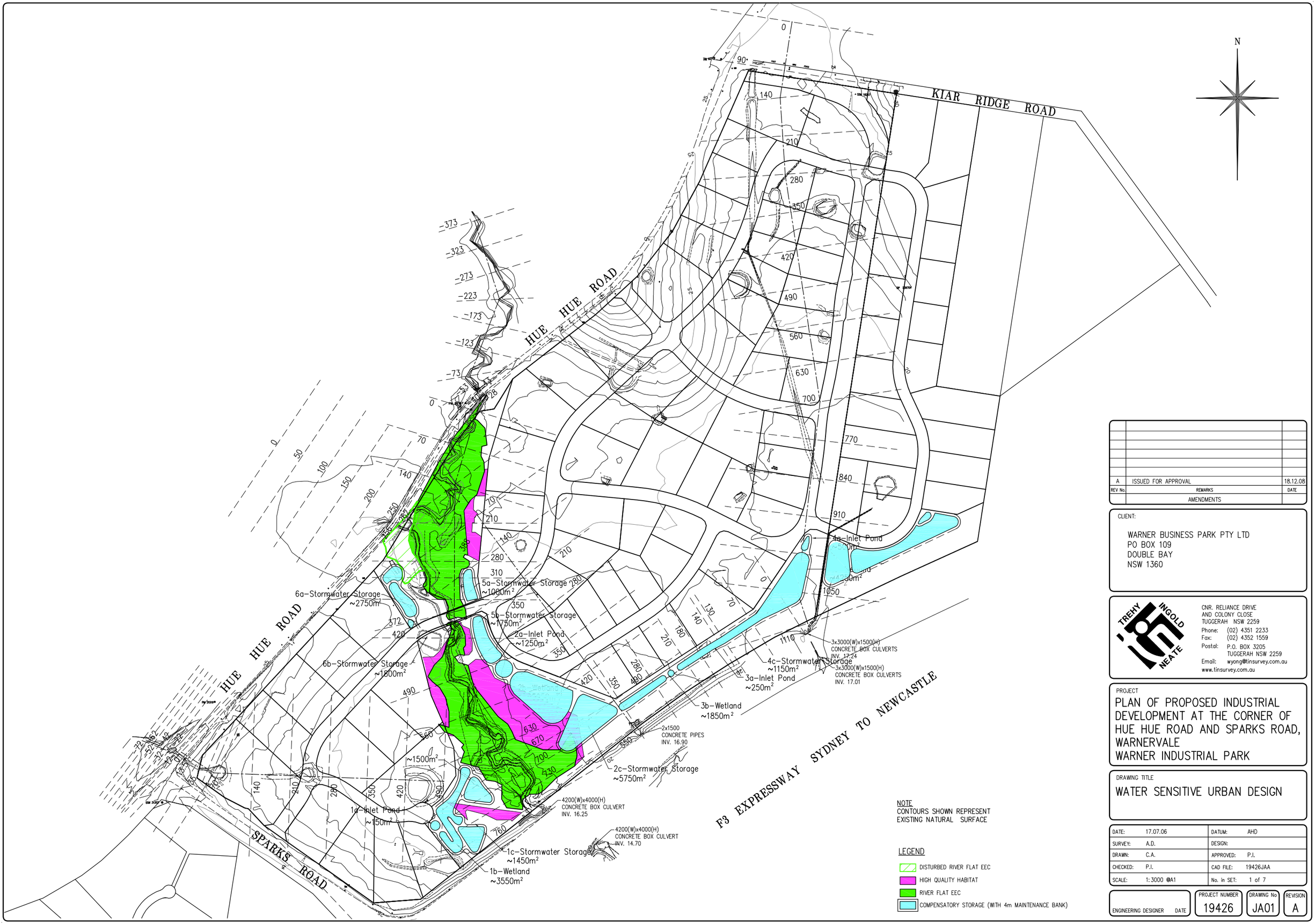
architecture planning urban design



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WARNER BUSINESS PARK PTY LTD
PO BOX 109
DOUBLE BAY
NSW 1360

TREHY INGOLD NEATE
CNR. RELIANCE DRIVE
AND COLONY CLOSE
TUGGERAH NSW 2259
Phone: (02) 4351 2233
Fax: (02) 4352 1559
Postal: P.O. BOX 3205
TUGGERAH NSW 2259
Email: wyong@tinsurvey.com.au
www.tinsurvey.com.au

PROJECT

PLAN OF PROPOSED INDUSTRIAL DEVELOPMENT AT THE CORNER OF HUE HUE ROAD AND SPARKS ROAD, WARNERVALE
WARNER INDUSTRIAL PARK

DRAWING TITLE

WATER SENSITIVE URBAN DESIGN

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ENGINEERING DESIGNER DATE	PROJECT NUMBER	DRAWING No	REVISION
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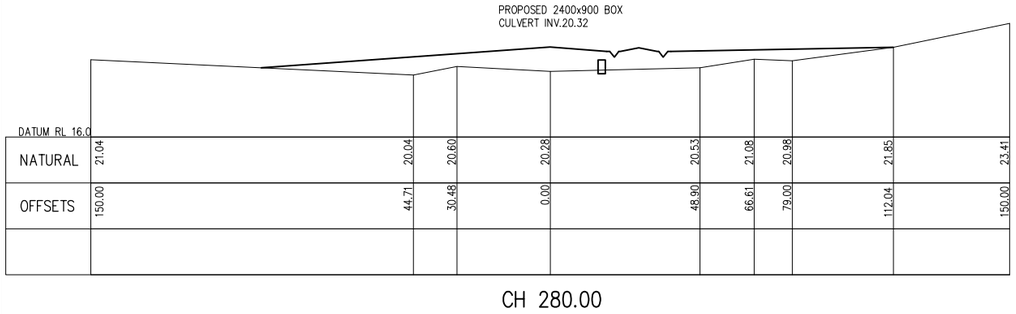

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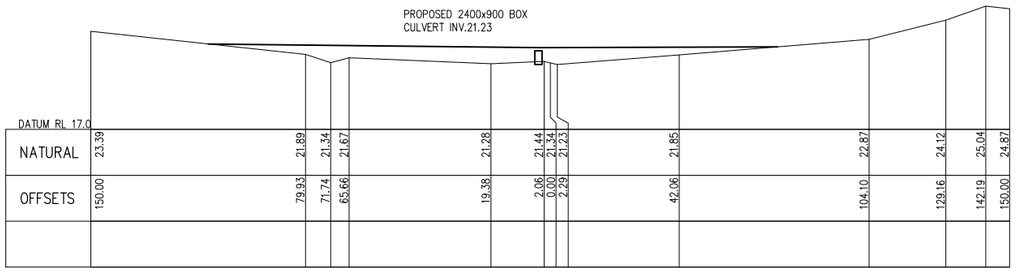

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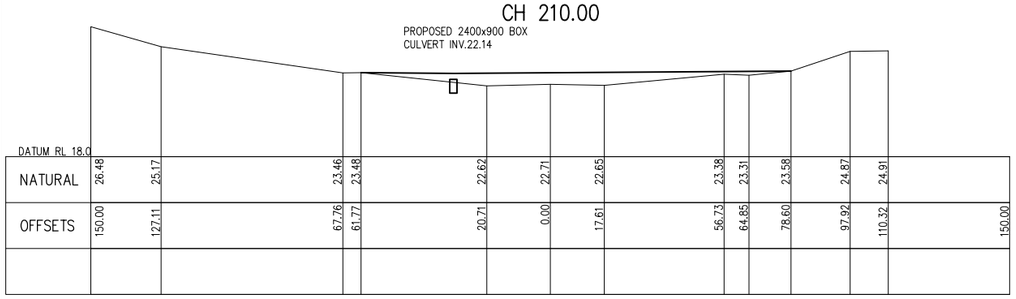

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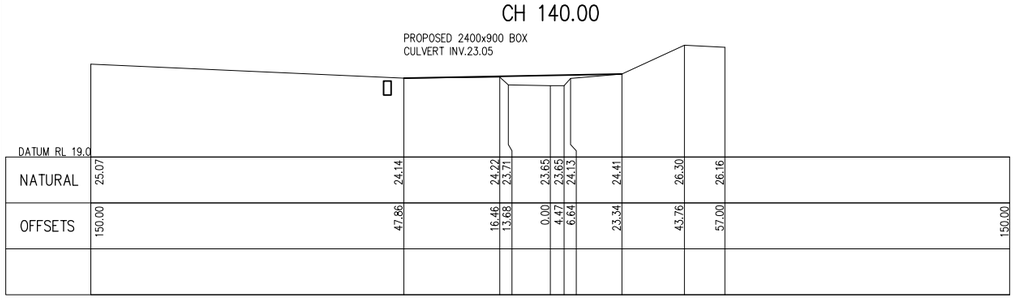

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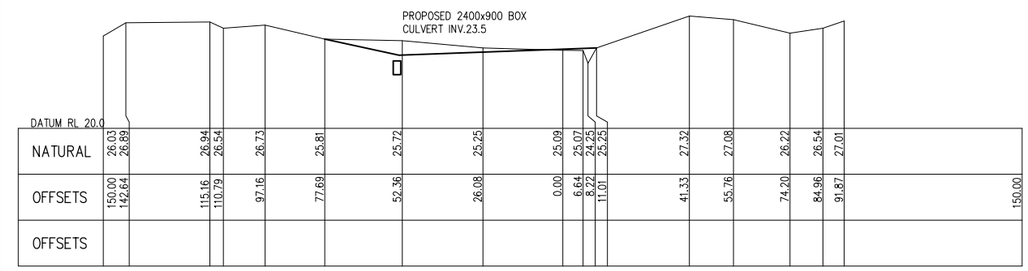

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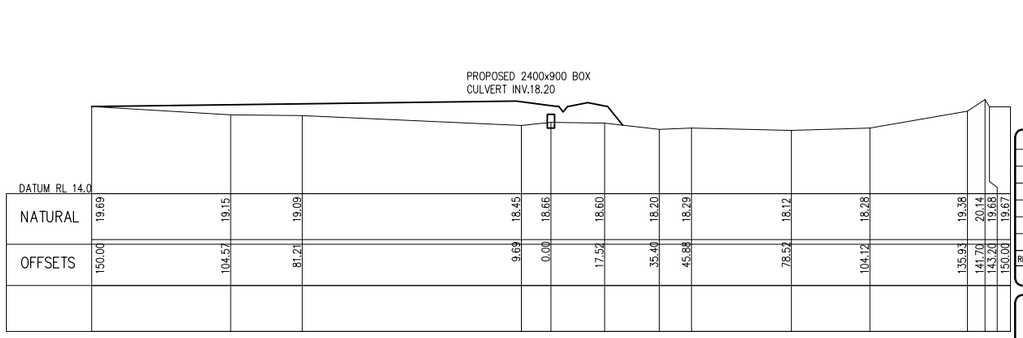

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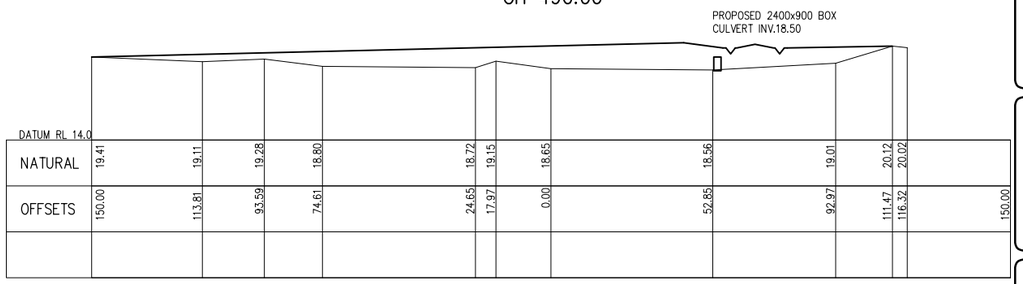

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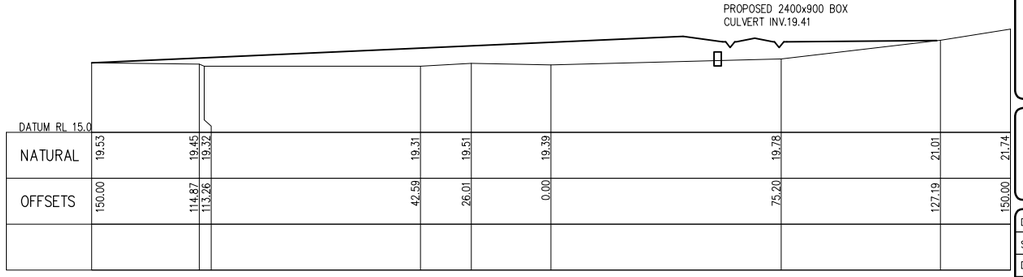

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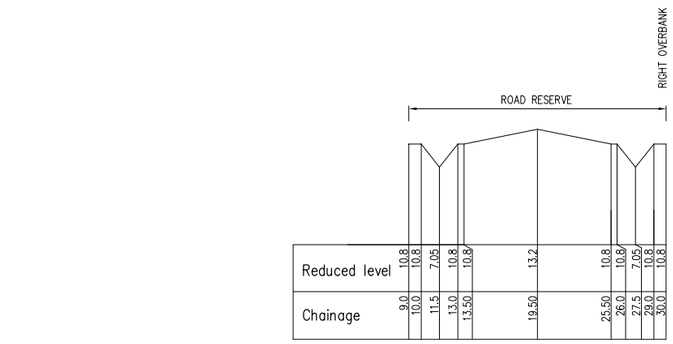

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WARNER BUSINESS PARK PTY LTD
PO BOX 109
DOUBLE BAY
NSW 1360

TREHY INGOLD NEATE
CNR. RELIANCE DRIVE
AND COLONY CLOSE
TUGGERAH NSW 2259
Phone: (02) 4351 2233
Fax: (02) 4352 1559
Postal: P.O. BOX 3205
TUGGERAH NSW 2259
Email: wyong@tinsurvey.com.au
www.tinsurvey.com.au

PROJECT

PLAN OF PROPOSED INDUSTRIAL DEVELOPMENT AT THE CORNER OF HUE HUE ROAD AND SPARKS ROAD, WARNERVALE
WARNER INDUSTRIAL PARK

DRAWING TITLE

CREEK CROSS SECTIONS
CATCHMENT B2

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DRAWN:	C.A.	APPROVED:	P.I.
CHECKED:	P.I.	CAD FILE:	19426JAA
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ENGINEERING DESIGNER DATE

PROJECT NUMBER 19426

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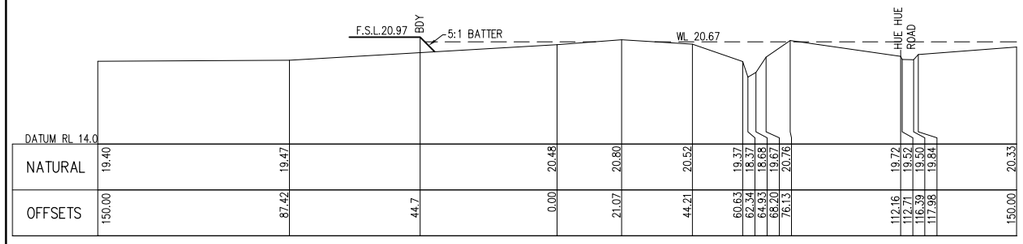

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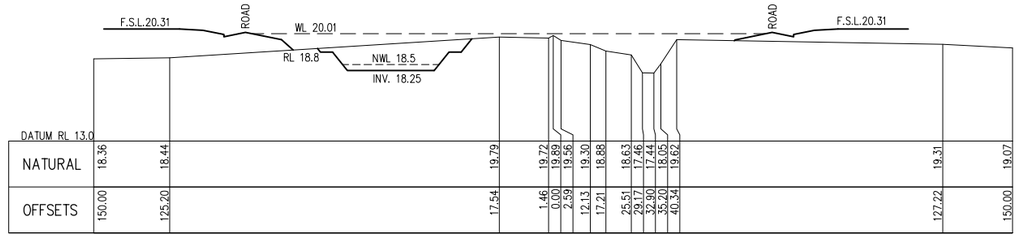

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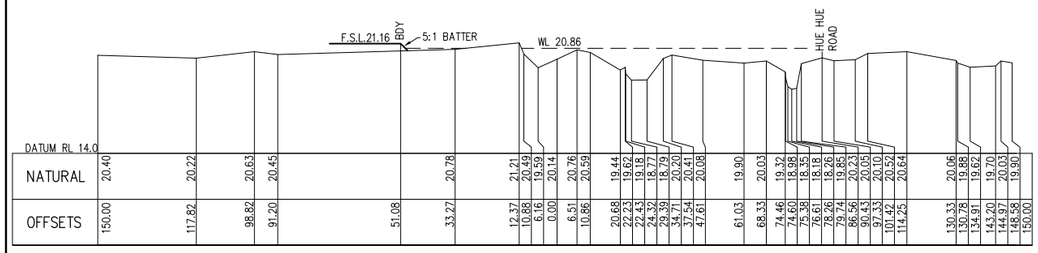

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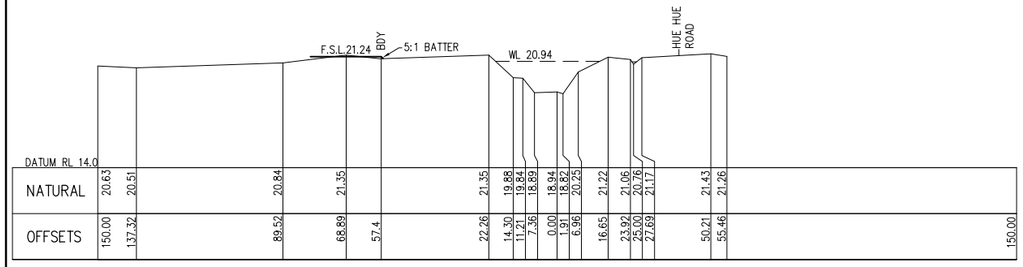

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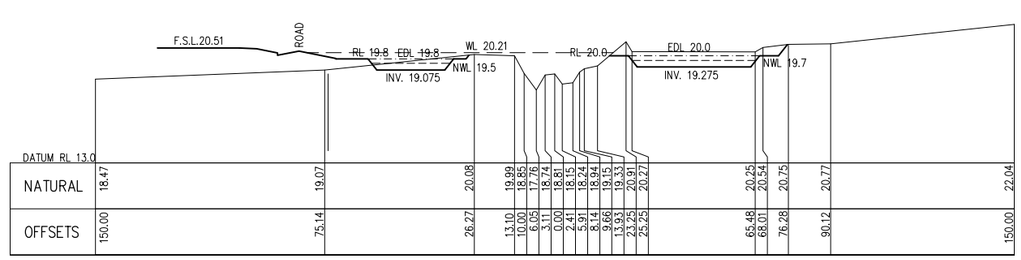

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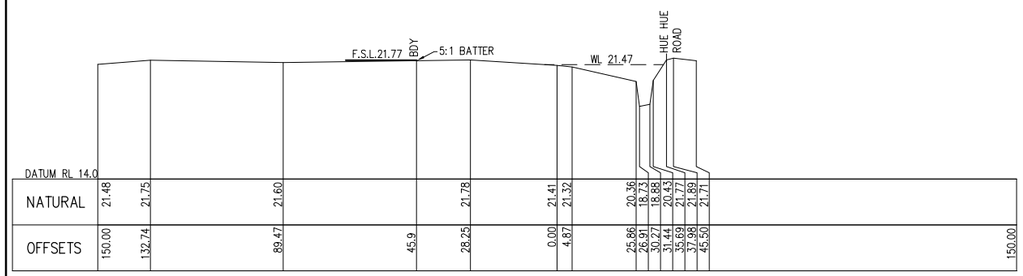

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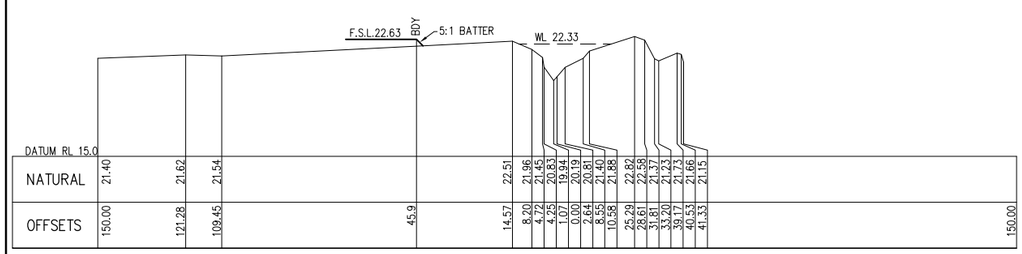

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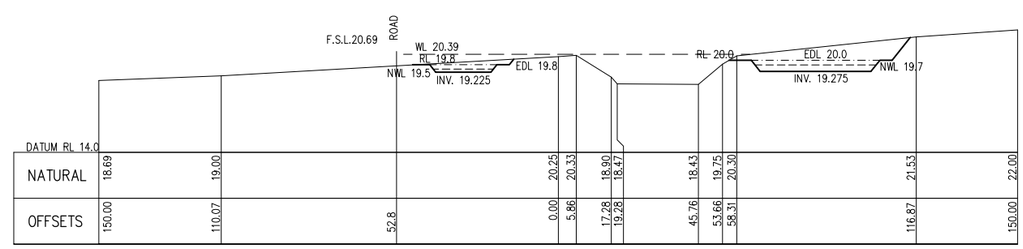

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SEE DRAWING JA04 FOR SECTION CH 310.00

REV No.	REMARKS	DATE
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PO BOX 109
DOUBLE BAY
NSW 1360

TREHY INGOLD NEATE
CNR. RELIANCE DRIVE
AND COLONY CLOSE
TUGGERAH NSW 2259
Phone: (02) 4351 2233
Fax: (02) 4352 1559
Postal: P.O. BOX 3205
TUGGERAH NSW 2259
Email: wyong@tinsurvey.com.au
www.tinsurvey.com.au

PROJECT

PLAN OF PROPOSED INDUSTRIAL DEVELOPMENT AT THE CORNER OF HUE HUE ROAD AND SPARKS ROAD, WARNERVALE (OPTIONS 1A & 1B)

DRAWING TITLE

CREEK CROSS SECTIONS
CATCHMENT B1 CH00 – CH490.0

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DRAWN:	C.A.	APPROVED:	P.I.
CHECKED:	P.I.	CAD FILE:	19426JAA
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ENGINEERING DESIGNER DATE	PROJECT NUMBER	DRAWING No	REVISION
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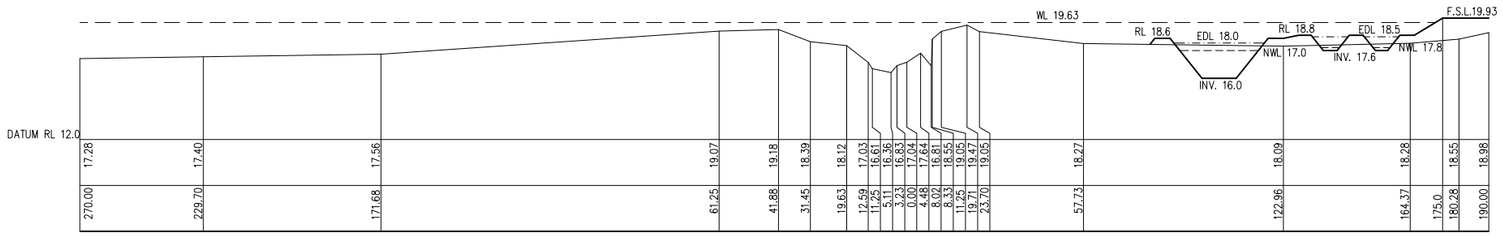

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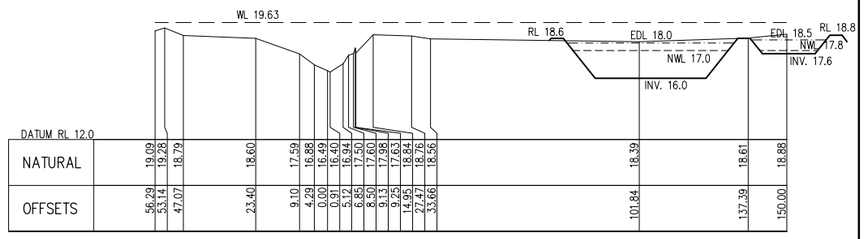

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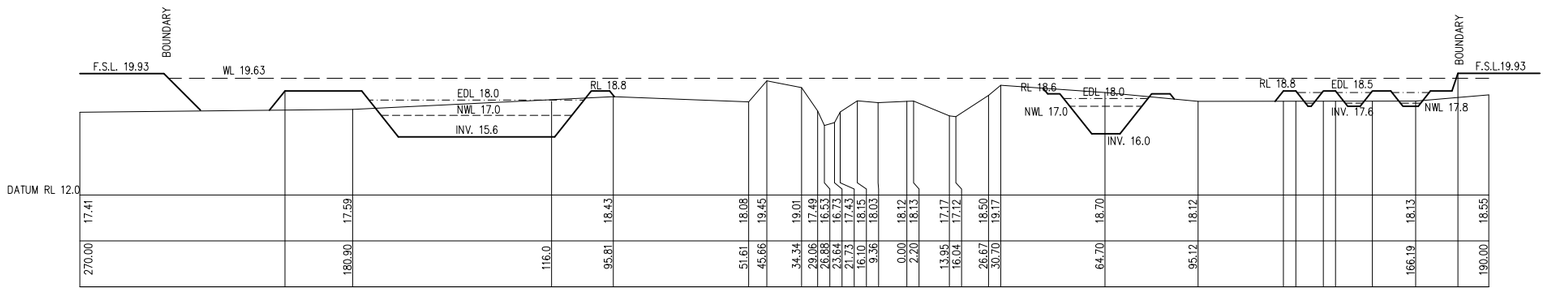

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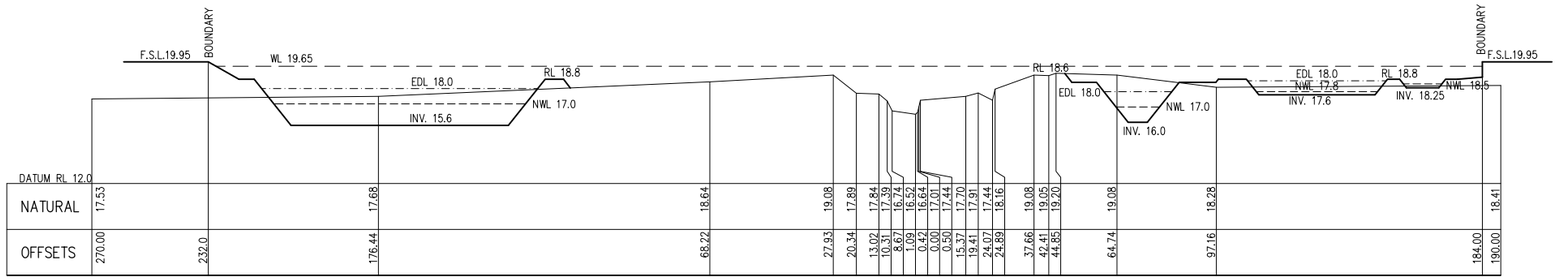

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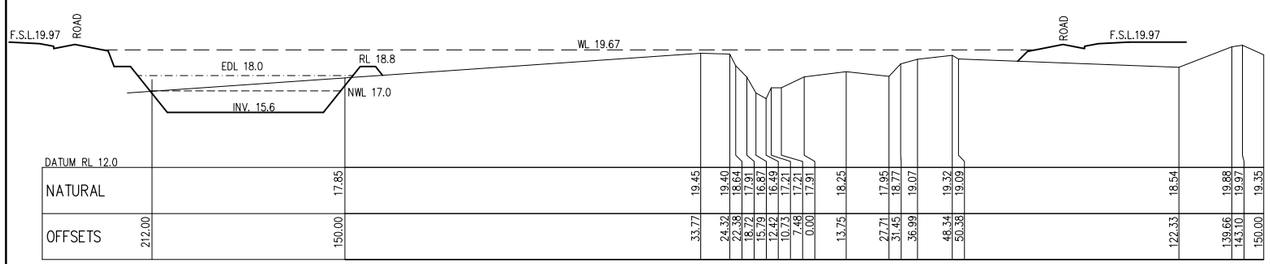

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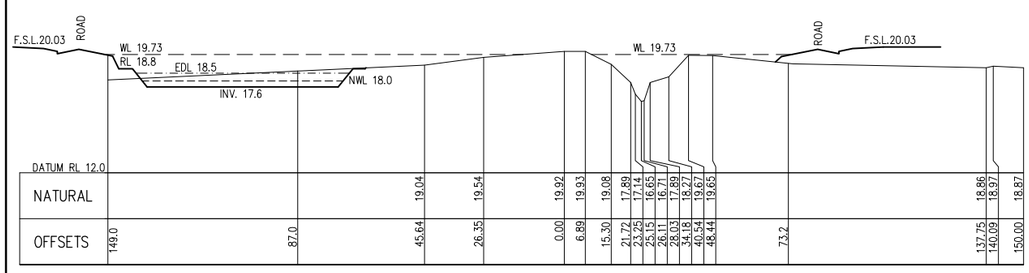

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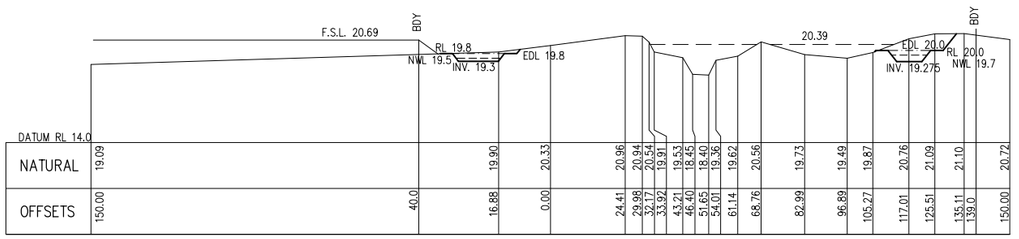

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REV No.	REMARKS	DATE
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CLIENT:

WARNER BUSINESS PARK PTY LTD
PO BOX 109
DOUBLE BAY
NSW 1360

TREHY INGOLD NEATE

CNR. RELIANCE DRIVE
AND COLONY CLOSE
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PROJECT

PLAN OF PROPOSED INDUSTRIAL DEVELOPMENT AT THE CORNER OF HUE HUE ROAD AND SPARKS ROAD, WARNERVALE
WARNER INDUSTRIAL PARK

DRAWING TITLE

CREEK CROSS SECTIONS
CATCHMENT B1 CH310.0 – CH760.0

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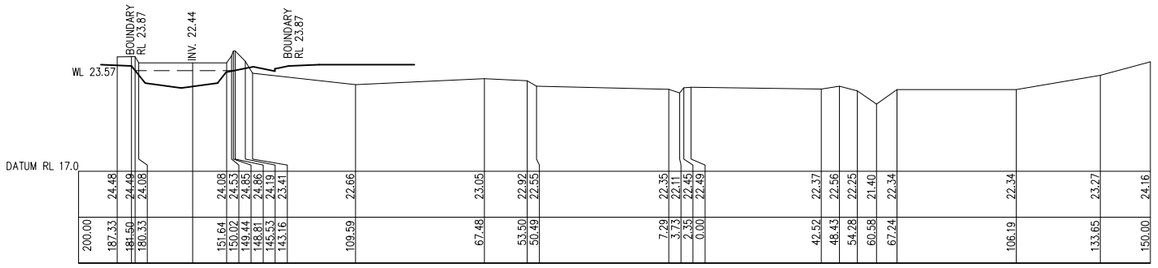
CHECKED:	P.I.	CAD FILE:	19426JAA
SCALE:	AS SHOWN @A1	No. in SET:	4 of 7

ENGINEERING DESIGNER DATE

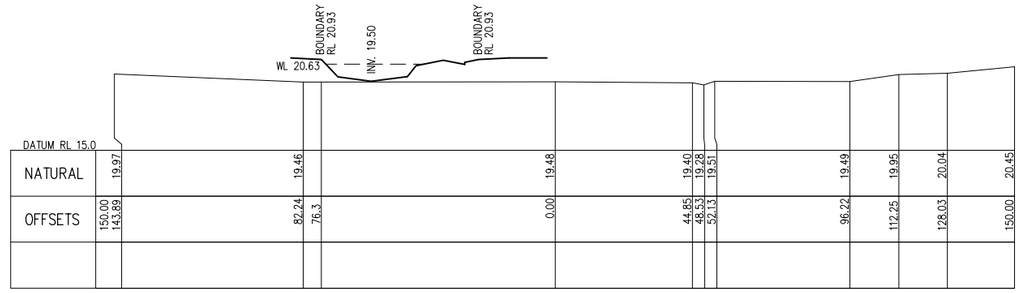
PROJECT NUMBER 19426

DRAWING No JA04

REVISION A



CH 280.00



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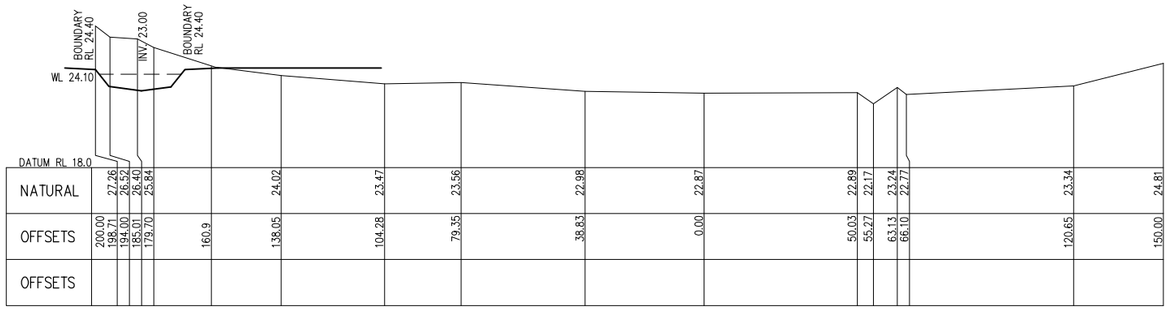

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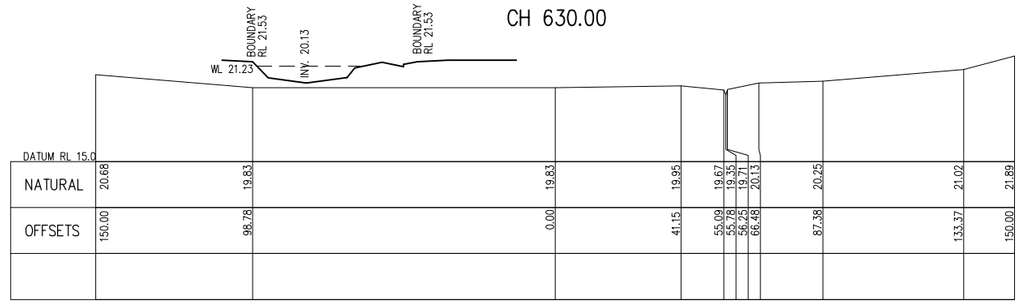

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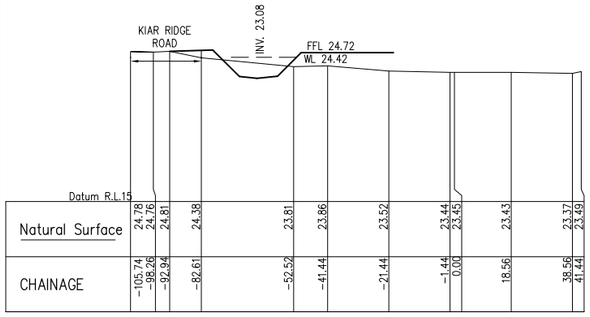

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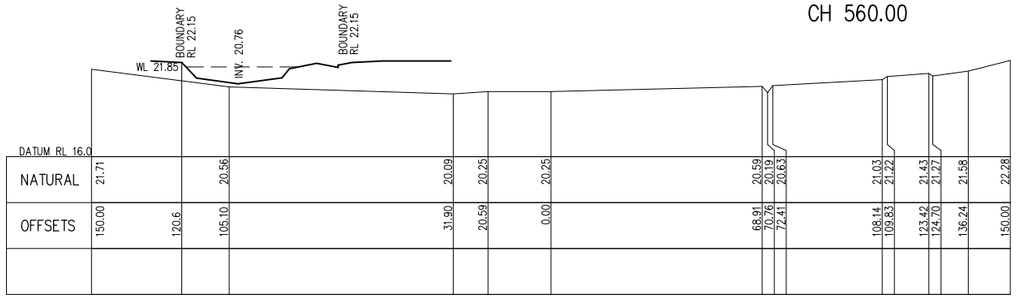

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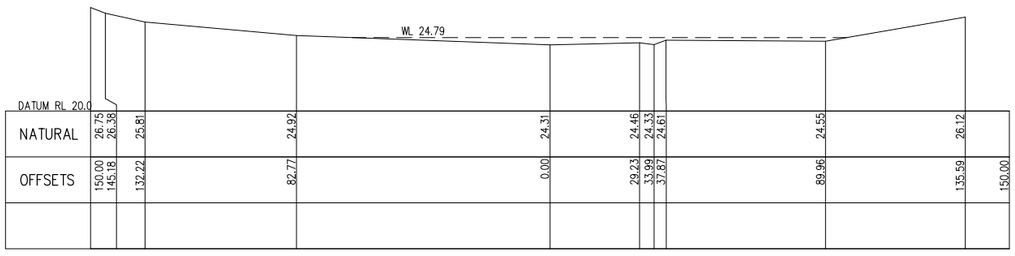

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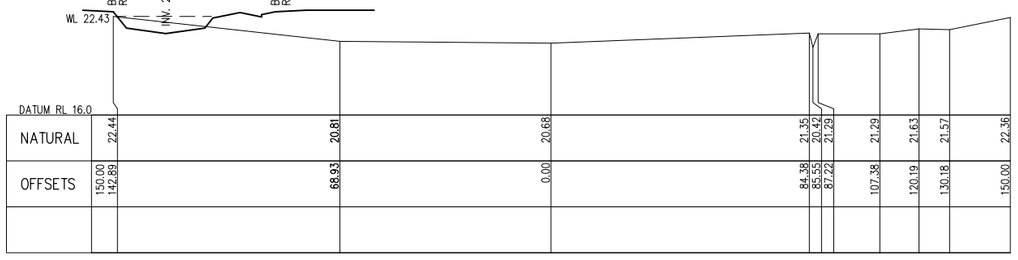

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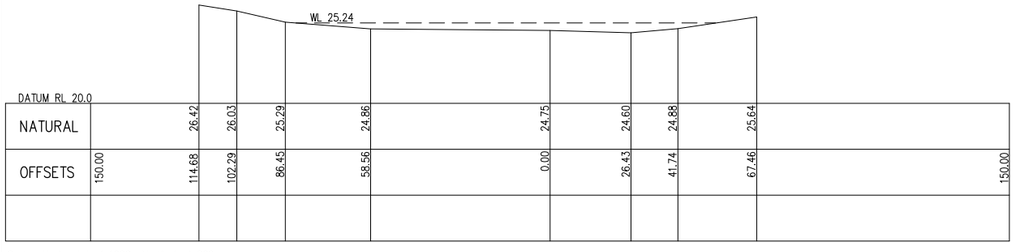

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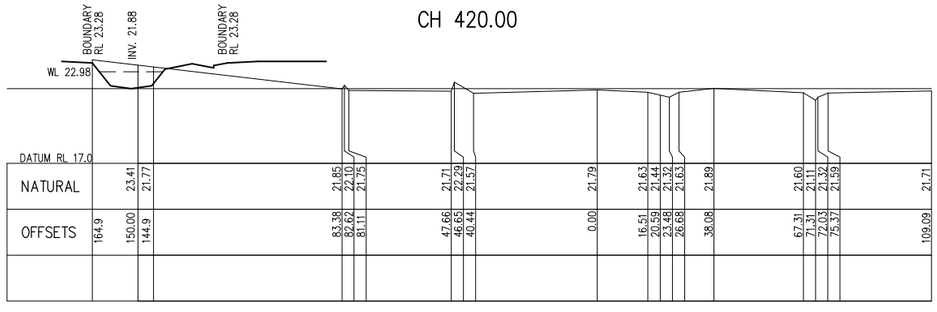
CH 0.00



CH 350.00

NOTE: EXTENT OF FILLING IS ONLY INDICATIVE FOR THE PURPOSES OF FLOOD MODELLING

REV No.	REMARKS	DATE
	AMENDMENTS	
A	ISSUED FOR APPROVAL	18.12.08

CLIENT:

WARNER BUSINESS PARK PTY LTD
PO BOX 109
DOUBLE BAY
NSW 1360

TREHY INGOLD NEATE
CNR. RELIANCE DRIVE
AND COLONY CLOSE
TUGGERAH NSW 2259
Phone: (02) 4351 2233
Fax: (02) 4352 1559
Postal: P.O. BOX 3205
TUGGERAH NSW 2259
Email: wyong@tinsurvey.com.au
www.tinsurvey.com.au

PROJECT

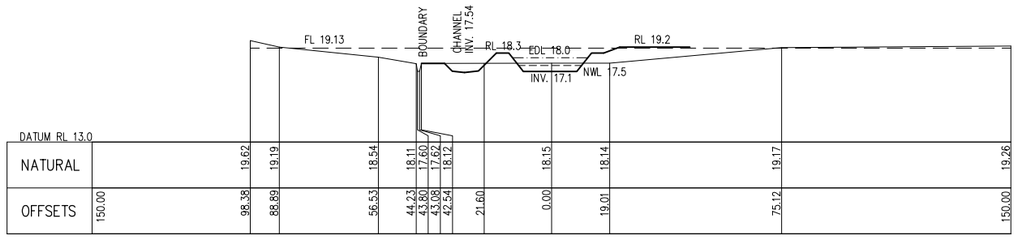
PLAN OF PROPOSED INDUSTRIAL DEVELOPMENT AT THE CORNER OF HUE HUE ROAD AND SPARKS ROAD, WARNERVALE
WARNER INDUSTRIAL PARK

DRAWING TITLE

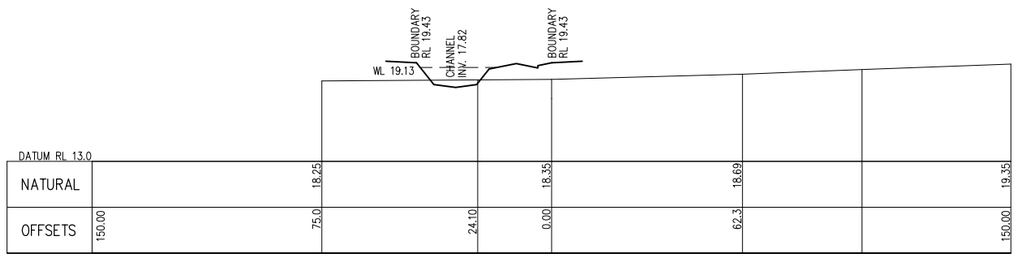
CREEK CROSS SECTIONS
CATCHMENT F2 CH00 – CH630.0

DATE:	16.03.05	DATUM:	AHD
SURVEY:	A.D.	DESIGN:	
DRAWN:	C.A.	APPROVED:	P.I.
CHECKED:	P.I.	CAD FILE:	19426JAA
SCALE:	AS SHOWN @A1	No. in SET:	5 of 7

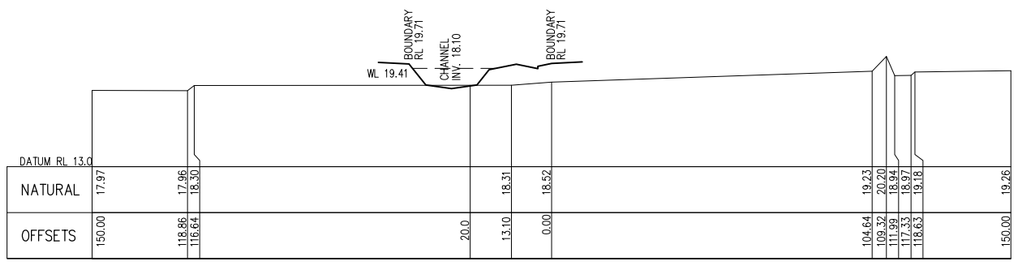
ENGINEERING DESIGNER DATE	PROJECT NUMBER	DRAWING No	REVISION
	19426	JA05	A



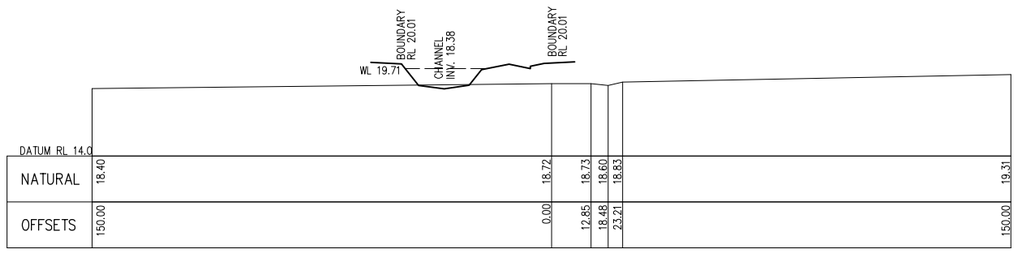
CH 980.00



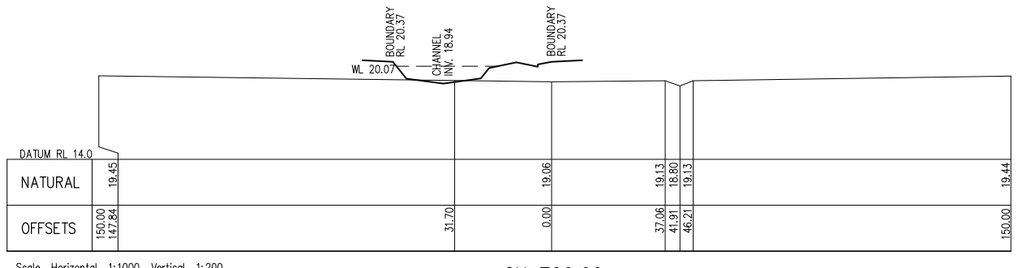
CH 910.00



CH 840.00



CH 770.00



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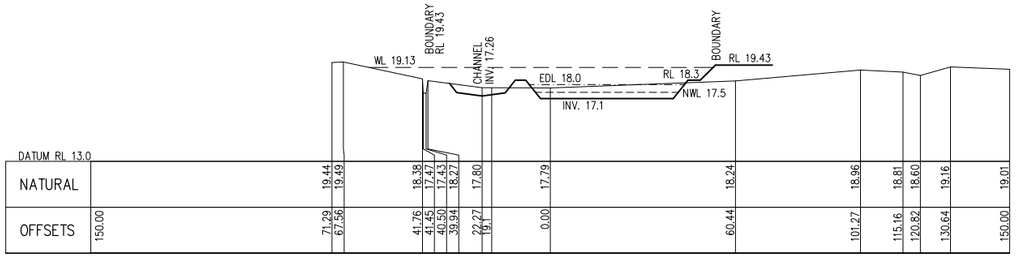
CH 700.00



CH 1050.00

NOTE: EXTENT OF FILLING IS ONLY INDICATIVE FOR THE PURPOSES OF FLOOD MODELLING

REV No.	REMARKS	DATE
	AMENDMENTS	
A	ISSUED FOR APPROVAL	18.12.08

CLIENT:

WARNER BUSINESS PARK PTY LTD
PO BOX 109
DOUBLE BAY
NSW 1360

TREHY INGOLD NEATE

CNR. RELIANCE DRIVE
AND COLONY CLOSE
TUGGERAH NSW 2259
Phone: (02) 4351 2233
Fax: (02) 4352 1559
Postal: P.O. BOX 3205
TUGGERAH NSW 2259
Email: wyong@tinsurvey.com.au
www.tinsurvey.com.au

PROJECT

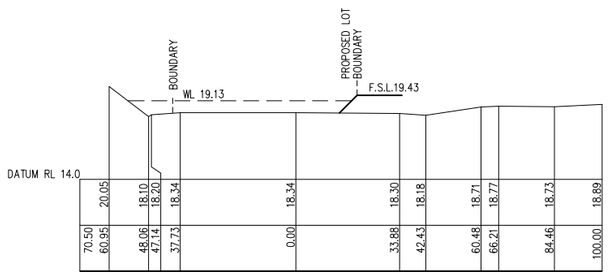
PLAN OF PROPOSED INDUSTRIAL DEVELOPMENT AT THE CORNER OF HUE HUE ROAD AND SPARKS ROAD, WARNERVALE
WARNER INDUSTRIAL PARK

DRAWING TITLE

CREEK CROSS SECTIONS
CATCHMENT F2 CH700.0 – CH1110.0

DATE:	16.03.05	DATUM:	AHD
SURVEY:	A.D.	DESIGN:	
DRAWN:	C.A.	APPROVED:	P.I.
CHECKED:	P.I.	CAD FILE:	19426JAA
SCALE:	AS SHOWN @A1	No. in SET:	6 of 7

ENGINEERING DESIGNER DATE	PROJECT NUMBER	DRAWING No	REVISION
	19426	JA06	A



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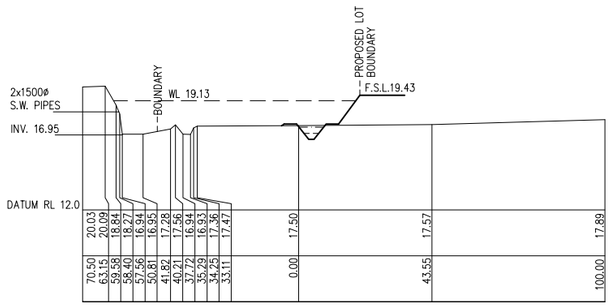

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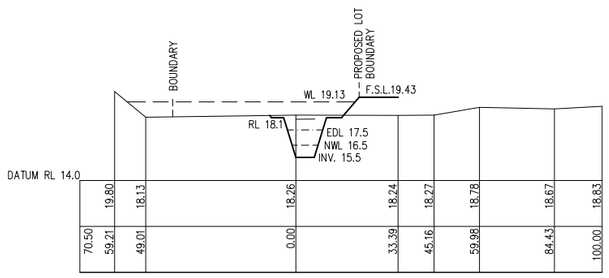

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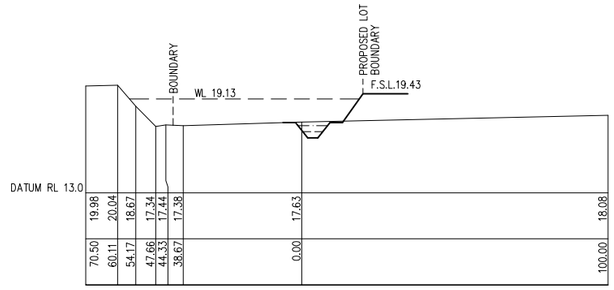

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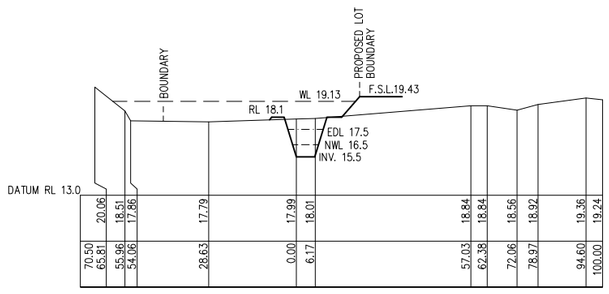

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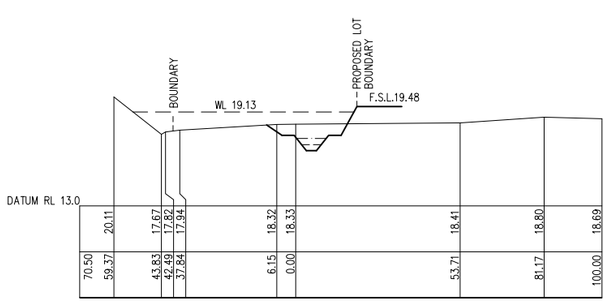

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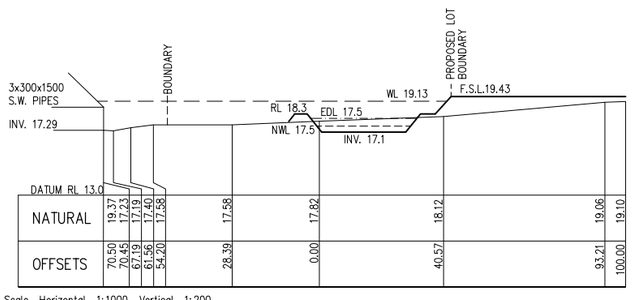

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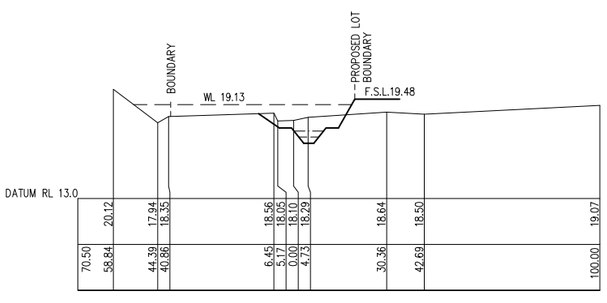

CH 180.00

NOTE: EXTENT OF FILLING IS ONLY INDICATIVE FOR THE PURPOSES OF FLOOD MODELLING

SCALE

HORIZONTAL 1:1000 — 0 10 20 30 40 50 60 70 80 METRES

VERTICAL 1:200 — 0 2 4 6 8 10 12 14 16 METRES

REV No.	REMARKS / AMENDMENTS	DATE
A	ISSUED FOR APPROVAL	18.12.08

CLIENT:

WARNER BUSINESS PARK PTY LTD
PO BOX 109
DOUBLE BAY
NSW 1360

TREHY INGOLD NEATE

CNR. RELIANCE DRIVE
AND COLONY CLOSE
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PROJECT

PLAN OF PROPOSED INDUSTRIAL DEVELOPMENT AT THE CORNER OF HUE HUE ROAD AND SPARKS ROAD, WARNERVALE
WARNER INDUSTRIAL PARK

DRAWING TITLE

CREEK CROSS SECTIONS
LINK BETWEEN F2 AND B1

DATE:	16.03.05	DATUM:	AHD
SURVEY:	A.D.	DESIGN:	
DRAWN:	C.A.	APPROVED:	P.I.
CHECKED:	P.I.	CAD FILE:	19426JAA
SCALE:	AS SHOWN @A1	No. in SET:	7 of 7

ENGINEERING DESIGNER DATE

PROJECT NUMBER 19426

DRAWING No JA07

REVISION A

CENTRAL COAST BUSINESS PARK

PROPOSED SITE DEVELOPMENT

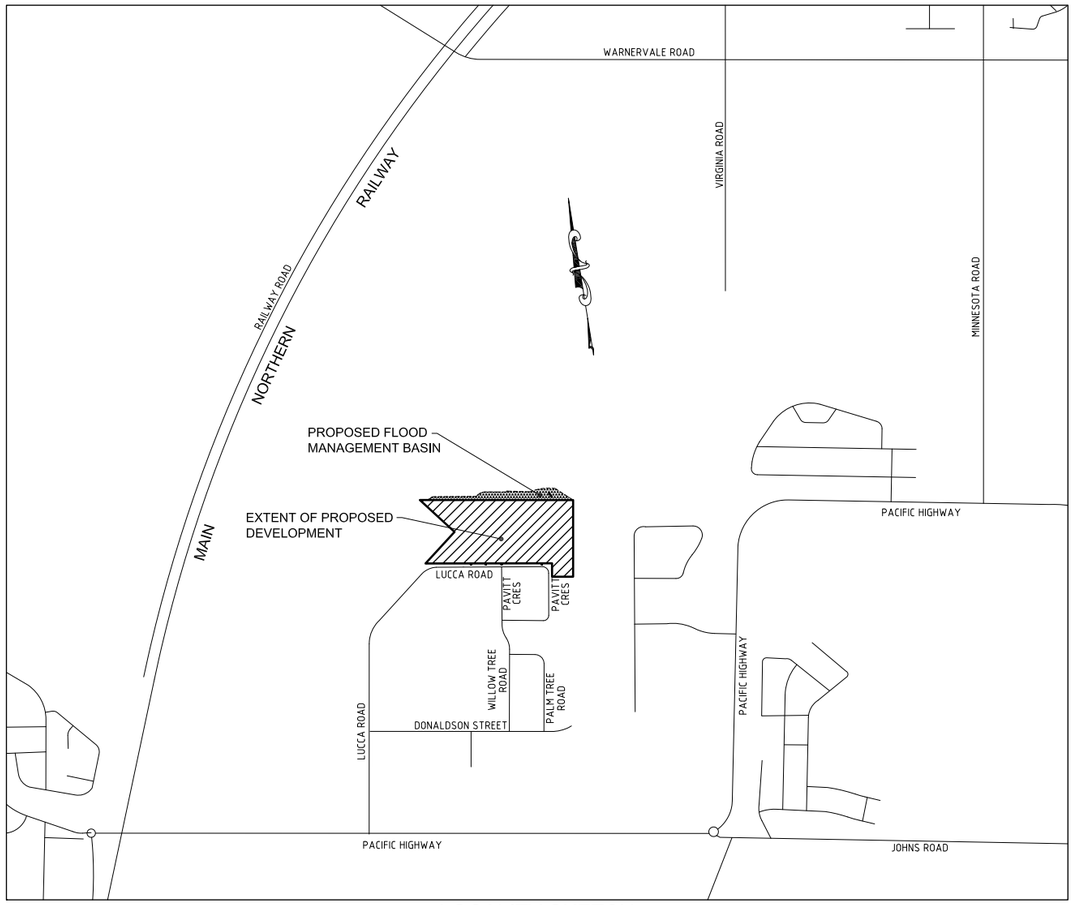
LOT 102 in DP.588421, LOT 3 in DP.1101086 & LOT 4 IN DP.250522

FOR

BITOVA Pty. Ltd.

DRAWING REGISTER

SHEET No :	SHEET TITLE.	REVISION:	DATE:
101	SITE PLAN	S34-A	02-02-10
102	SITE PLAN -SOUTH WEST	S34-A	02-02-10
103	SITE PLAN - SOUTH EAST	S34-A	02-02-10
104	SITE PLAN - NORTH WEST	S34-A	02-02-10
105	SITE PLAN - NORTH EAST	S34-A	02-02-10
106	SITE PLAN & SECTIONS	S34-A	02-02-10



LOCALITY SKETCH

1:10000

REV :	DATE :	REASON FOR REVISION :	Drafted :	Checked :
S34-A	02-02-10	REVISED BASIN TO SUITE NEW FLOOD CRITERIA	AAB	

THESE PLANS ARE UNCONTROLLED UNLESS THEY CARRY AN ORIGINAL SIGNATURE (NOT TYPED) IN THE APPROVAL SECTION OF THE TITLE BOX.

ANY UNCONTROLLED PLANS ARE ISSUED FOR INFORMATION ONLY AND ANY INFORMATION CONTAINED THEREON SHALL BE UTILISED AT THE USERS OWN RISK.

HOOLIHAN PARTNERS PTY LTD ACN 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 CENTRAL COAST BUSINESS PARK
LUCCA ROAD,
NORTH WYONG.

CLIENT : BITOVA Pty. Ltd.

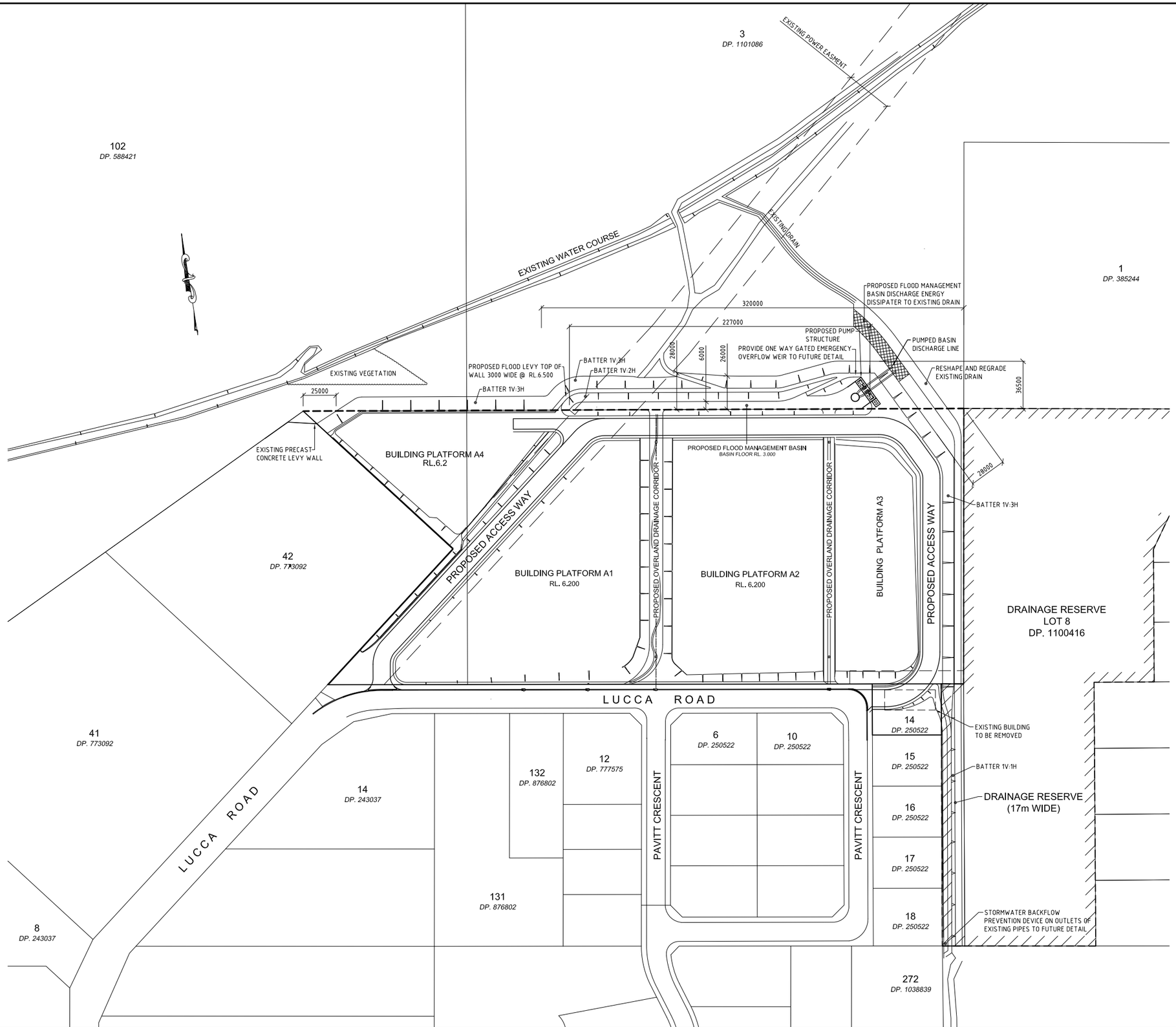
SHEET TITLE :

TITLE SHEET

JOB No. :	SHEET No. :	REV :
14050	100	S34-A
SCALES : 1:10000	SET OF :	DATE : 02-02-10

APPROVED :

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



WYONG SHIRE COUNCIL NOTES.

GENERAL NOTES.

WSC.1. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH WYONG SHIRE COUNCIL'S 'Engineering Requirements for Development' AND TO THE SATISFACTION OF THE DIRECTOR OF DEVELOPMENT.

EROSION CONTROL.

WSC.2. ALL EROSION AND SEDIMENTATION CONTROL MEASURES ARE TO BE CARRIED OUT IN ACCORDANCE WITH COUNCIL'S CODE OF PRACTICE FOR EROSION AND SEDIMENTATION CONTROL AND MUST BE IMPLEMENTED PRIOR TO THE COMMENCEMENT OF ANY BUILDING OF CIVIL WORKS.

PUBLIC UTILITIES.

WSC.3. ALL PUBLIC UTILITIES ARE TO BE CLEARLY IDENTIFIED IN THE FIELD PRIOR TO ANY CIVIL WORKS. COUNCIL DOES NOT ACCEPT ANY RESPONSIBILITY FOR DAMAGES OR RELOCATION COSTS TO PUBLIC UTILITIES DURING THE CONSTRUCTION OF THE DEVELOPMENT.

WSC.4. WYONG SHIRE COUNCIL ARE TO BE NOTIFIED 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY WORKS.

WSC.5. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE TO BE CARRIED OUT IN ACCORDANCE WITH THE 'OCCUPATIONAL HEALTH AND SAFETY ACT'.

WSC.6. PERMISSION TO ENTER, CONSTRUCT WORKS AND DISCHARGE STORMWATER ON ADJOINING PROPERTIES IS TO BE OBTAINED AND SUBMITTED TO COUNCIL PRIOR TO THE COMMENCEMENT OF ANY WORKS.

WSC.7. PAVEMENT TO BE DESIGNED AND CERTIFIED BY A PRACTICING GEOTECHNICAL ENGINEER AND SUBMITTED TO COUNCIL FOR APPROVAL PRIOR TO COMMENCEMENT OF ANY WORKS.

WSC.8. THE DEVELOPER MUST ENSURE DURING CONSTRUCTION, THAT THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION, AND NO PART OF THE STRUCTURE SHALL BE OVER STRESSED.

WSC.9. THE DEVELOPER IS RESPONSIBLE FOR ONGOING MAINTENANCE OF EROSION & SILTATION CONTROL MEASURES.

WSC.10. THE RECTIFICATION OF ALL MATTERS ARISING FROM INSUFFICIENT INFORMATION BEING SHOWN ON THE SUBMITTED PLANS IS TO BE CARRIED OUT TO THE ENGINEERS SATISFACTION.

WSC.11. THESE PLANS ARE TO BE READ IN CONJUNCTION WITH THE CONDITIONS STATED IN WYONG SHIRE COUNCIL'S ENGINEERING PLAN APPROVAL CORRESPONDENCE.

WSC.12. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE ARCHITECTURAL DRAWINGS.

WSC.13. ALL SET OUT DIMENSIONS ARE TO BE OBTAINED FROM THE ARCHITECTURAL DRAWINGS UNLESS SPECIFIC DIMENSIONS ARE GIVEN ON THE ENGINEERING DRAWINGS.

WSC.14. THESE DRAWINGS 'SHOULD NOT BE SCALED', IF IN DOUBT ASK.

WSC.15. ALL MATERIALS AND WORKMANSHIP ARE TO BE OF THE HIGHEST STANDARD AND IN ACCORDANCE WITH ANY RELEVANT 'AUSTRALIAN STANDARD CODE' RELATING TO THEIR APPLICATION. CERTIFICATES TO THIS EFFECT FROM A N.A.T.A. APPROVED LABORATORY SHALL BE FURNISHED ON REQUEST.

EROSION & SEDIMENTATION CONTROL NOTES.

ECS.1. ALL EROSION AND SEDIMENTATION CONTROL MEASURES ARE TO BE CARRIED OUT IN ACCORDANCE WITH WYONG SHIRE COUNCIL'S : 'ENGINEERING REQUIREMENTS FOR DEVELOPMENT' DCP. No.67 'DESIGN & CONSTRUCTION' - APPENDIX A - 'CONTROL OF EROSION & SEDIMENTATION'.

ECS.2. ALL DIVERSION WORKS AND SEDIMENT CONTROL STRUCTURES ARE TO BE CONSTRUCTED PRIOR TO COMMENCEMENT OF OTHER WORKS.

ECS.3. NO MANEUVERING OF VEHICLES OR STOCKPILING OF MATERIALS OUTSIDE THE CONSTRUCTION SITE.

ECS.4. ALL SEDIMENT CONTROL STRUCTURES ARE TO BE MAINTAINED BY SITE MANAGER DAILY.

ECS.5. ALL SEDIMENT RETAINING STRUCTURES TO BE CLEANED ON REACHING 50 % STORAGE CAPACITY. SEDIMENT REMOVED IS TO BE SPREAD WITHIN CONSTRUCTION SITE.

ECS.6. ALL EXISTING VEGETATION WILL BE RETAINED OUTSIDE THE CONSTRUCTION SITE.

ECS.7. DRAINAGE IS TO BE CONNECTED TO THE STORMWATER SYSTEM IMMEDIATELY UPON COMPLETION.

ECS.8. CONSTRUCTION SITE STABILISATION TO COMMENCE IMMEDIATELY UPON COMPLETION OF WORKS.

REV :	DATE :	REASON FOR REVISION :	Drafted :	Checked :
S34-0	21-01-10	MINIMUM BASIN FOOTPRINT FOR DISSCUSSION	AAB	
S34-A	02-02-10	REVISED BASIN TO SUITE NEW FLOOD CRITERIA	AAB	

0 30 60 90 120 150m

HOOLIHAN PARTNERS
PTY LTD ACN 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

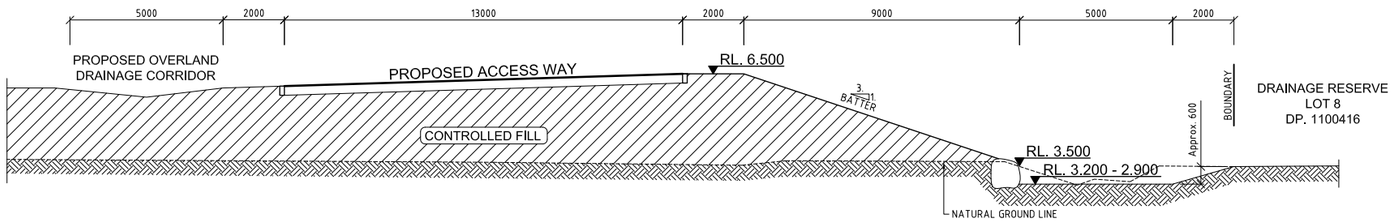
PROJECT DETAILS :
PROPOSED NORTH WYONG BUISNESS PARK
LOT 102 DP588421, LOT 3 DP1101086 & LOT 14 DP250522,
LUCCA ROAD, NORTH WYONG.

CLIENT : BITOVA Pty. Ltd.

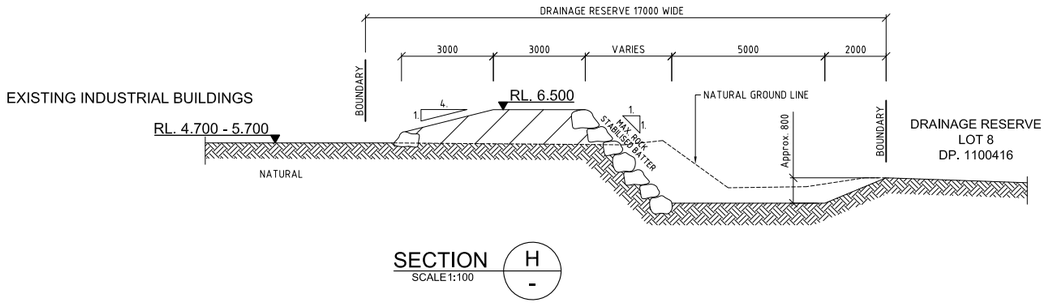
SHEET TITLE :
SITE PLAN - S34 SKETCH

JOB No. :	SHEET No. :	REV :
14050	101	S34-A
SCALES :	SET OF :	DATE :
1:1500	-	02-02-10

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



SECTION G
SCALE 1:100
103



SECTION H
SCALE 1:100
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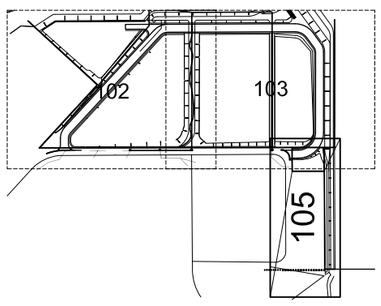

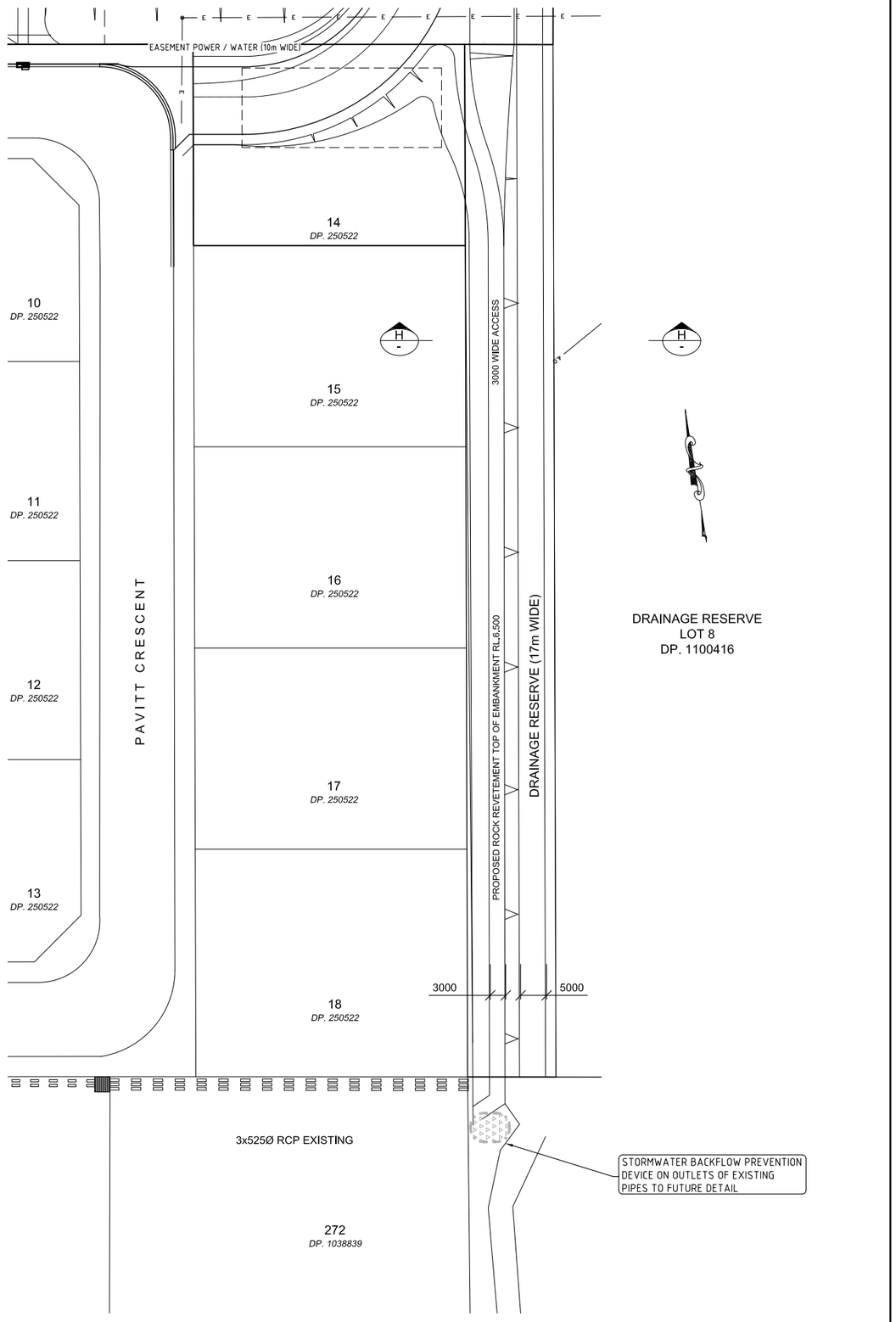

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-

REV :	DATE :	REASON FOR REVISION :	Drafted :	Checked :
S34-A	02-02-10	REVISED BASIN TO SUITE NEW FLOOD CRITERIA	AAB	

HOOLIHAN PARTNERS
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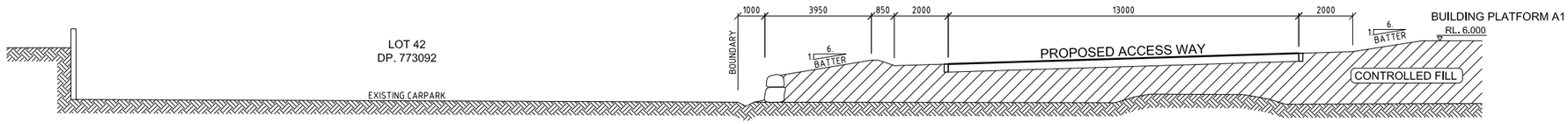
PROJECT DETAILS :
PROPOSED NORTH WYONG BUISNESS PARK
LOT 102 DP588421, LOT 3 DP1101086 & LOT 14 DP250522,
LUCCA ROAD, NORTH WYONG.

CLIENT : BITOVA Pty. Ltd.

SHEET TITLE :
SITE PLAN & SECTIONS

JOB No. :	SHEET No. :	REV :
14050	105	S34-A
SCALES :	SET OF :	DATE :
1:500	-	02-02-10

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



SECTION A
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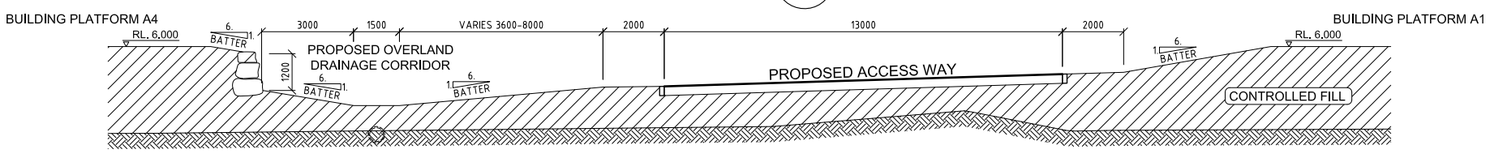

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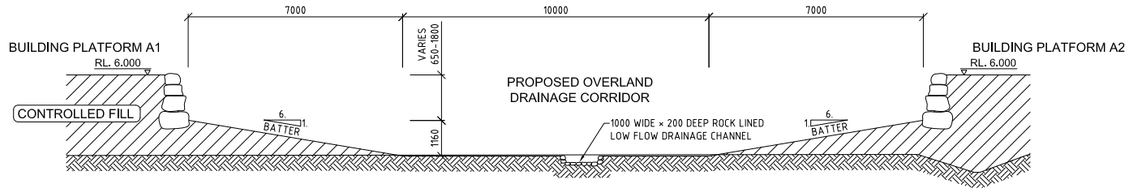

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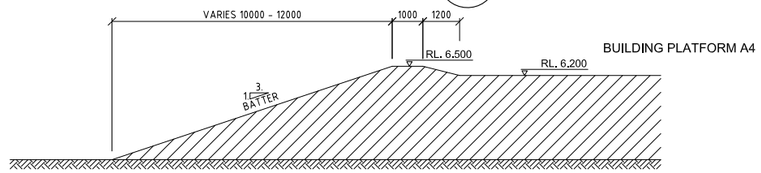

SECTION D
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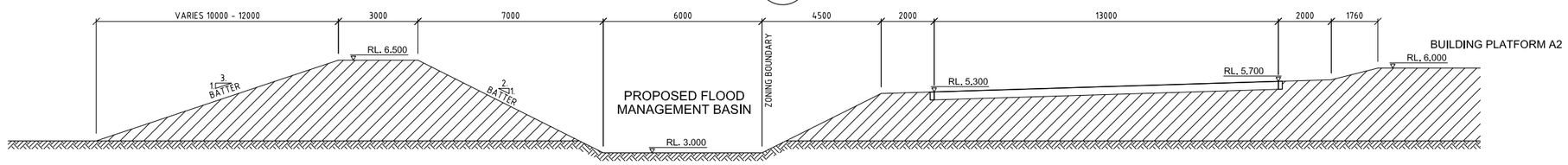

SECTION E
SCALE 1:100
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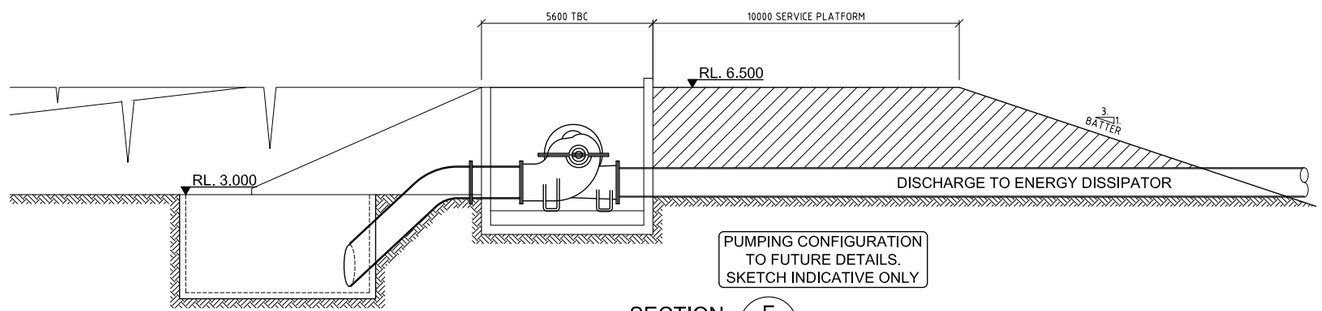

SECTION F
SCALE 1:100
104

REV :	DATE :	REASON FOR REVISION :	Drafted :	Checked :
S34-A	02-02-10	REVISED BASIN TO SUITE NEW FLOOD CRITERIA	AAB	

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PTY LTD ACN 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 NORTH WYONG BUISNESS PARK
LOT 102 DP588421, LOT 3 DP1101086 & LOT 14 DP250522,
LUCCA ROAD, NORTH WYONG.

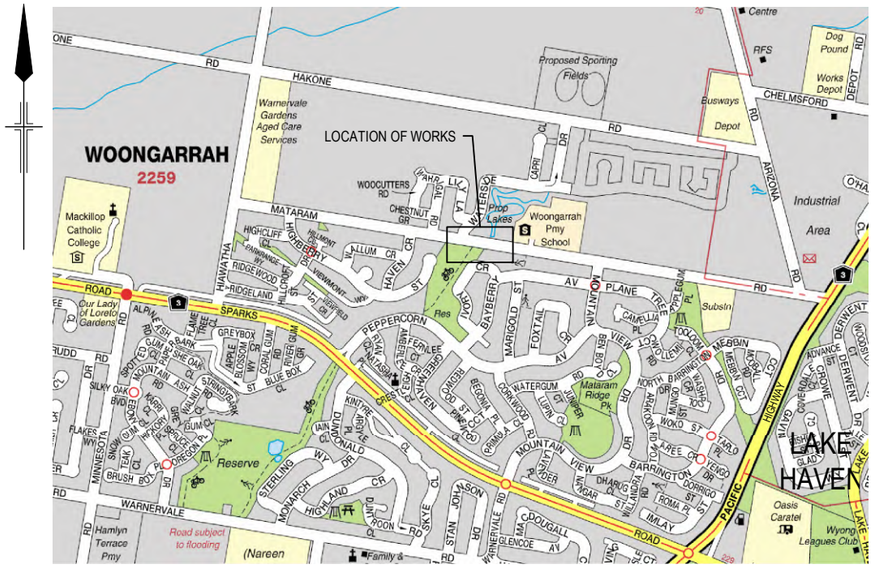
CLIENT : BITOVA Pty. Ltd.

SHEET TITLE :
SECTIONS

JOB No. :	SHEET No. :	REV :
14050	106	S34-A
SCALES :	SET OF :	DATE :
1:500	-	29-06-09

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

WYONG SHIRE COUNCIL
MATARAM ROAD CULVERTS AND ROAD WORKS
DETAIL DESIGN
22-14501



LOCALITY PLAN

DRAWING LIST

DRAWING No:	DRAWING TITLE:
22-14501-C001	COVER SHEET LOCALITY PLAN AND DRAWING LIST
22-14501-C002	PLAN
22-14501-C003	LONGITUDINAL SECTION
22-14501-C004	SIGNAGE AND LINEMARKING PLAN
22-14501-C005	CROSS SECTIONS - SHEET 1 OF 2
22-14501-C006	CROSS SECTIONS - SHEET 2 OF 2
22-14501-C007	CULVERT DETAILS - SHEET 1 OF 2
22-14501-C008	CULVERT DETAILS - SHEET 2 OF 2
22-14501-C009	SEDIMENT AND EROSION CONTROL - PLAN AND DETAILS
22-14501-S001	STRUCTURAL NOTES SHEET 1 OF 2
22-14501-S002	STRUCTURAL NOTES SHEET 2 OF 2

No	Revision	Drawn	Checked	Approved	Date
0	ISSUED FOR CONSTRUCTION	RJC	P.V*	G.M*	02.09.09

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Newcastle NSW 2300 Australia
T 61 2 4979 9999 F 61 2 4979 9988
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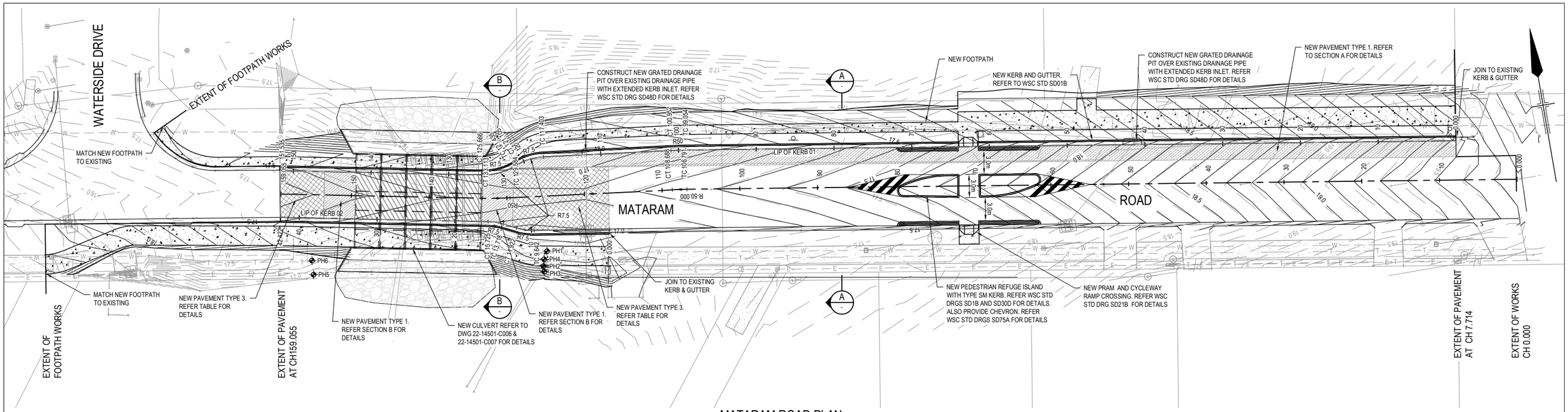
DO NOT SCALE

Drawn	J.M.KAMA	Designed	P.VAUGHAN
Drafting Check	P. VAUGHAN*	Design Check	G. MORGAN*
Approved	B. MILLERS*		
Date	02.09.09		
Scale	AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	

Client WYONG SHIRE COUNCIL
Project MATARAM ROAD CULVERTS AND ROAD WORKS
Title COVER SHEET LOCALITY PLAN AND DRAWING LIST

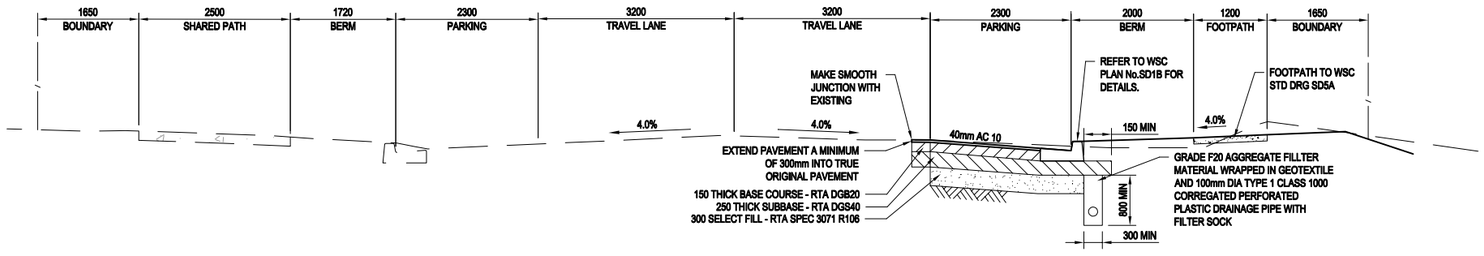
Original Size A1
Drawing No: 22-14501-C001
Rev: 0

Plot Date: 2 September 2009 - 2:17 PM Plotted by: Rebecca J. Cocks , Newcastle Cad File No: n:\AU\Tuggerah\Projects\22\14501\CADD\Drawings\22-14501-C001.dwg



MATARAM ROAD PLAN

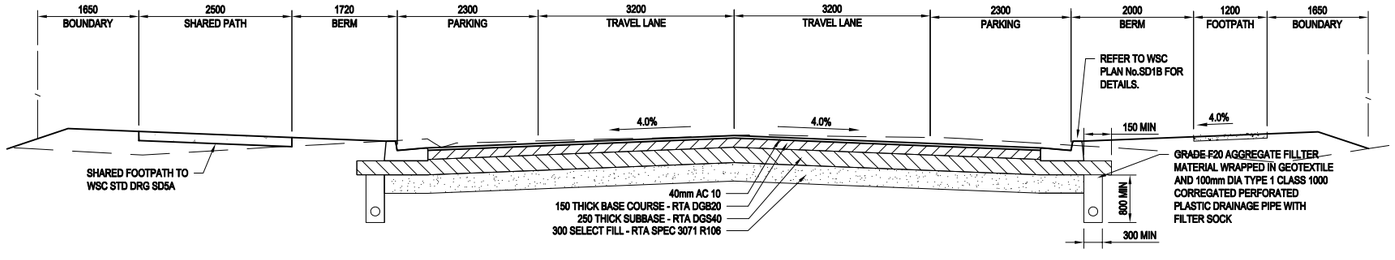
SCALE 1:250



TYPICAL ROAD CROSS SECTION OF PARTIAL PAVEMENT

A SECTION

SCALE 1 : 50



TYPICAL ROAD CROSS SECTION OF FULL PAVEMENT

B SECTION

SCALE 1 : 50

WARNING: PUBLIC UTILITY SERVICES MAY EXIST ON OR ADJACENT TO THE SITE OF WORKS. THESE SERVICES MAY NOT BE SITUATED WITHIN REGISTERED EASEMENTS OR WITHIN STANDARD FOOTPATH ALLOCATIONS.
IT IS THE CONTRACTORS RESPONSIBILITY TO IDENTIFY THE LOCATION OF ALL SERVICES PRIOR TO CONSTRUCTION WORKS AND TO AVOID DISTURBANCE OF THESE SERVICES

LIP OF KERB 01 SETOUT

CHAINAGE	EASTING	NORTHING
0.00	358683.50	6320824.40
99.05	358585.70	6320840.12
100.95	358583.83	6320840.38
117.40	358567.50	6320842.38
121.11	358563.86	6320841.92
121.43	358563.55	6320841.80
125.67	358559.39	6320841.42
151.54	358534.00	6320846.36

LIP OF KERB 02 SETOUT

CHAINAGE	EASTING	NORTHING
0.00	358574.26	6320831.76
9.64	358564.73	6320833.25
11.92	358562.57	6320833.94
13.72	358560.96	6320834.74
15.73	358559.06	6320835.38
42.42	358532.86	6320840.47

MATARAM ROAD CL SETOUT

CHAINAGE	EASTING	NORTHING
0.00	358690.44	6320818.17
106.79	358585.00	6320835.12
108.69	358583.12	6320835.38
129.58	358562.38	6320837.91
133.11	358558.89	6320838.46
159.05	358533.43	6320843.42

PAVEMENT DETAILS

PAVEMENT	PAVEMENT LAYERS	RTA SPECIFICATION
PAVEMENT TYPE 1	40mm AC 10	R116
	150mm BASECOURSE	DGB 20
	250mm SUBBASE	DGS 40
	300mm SELECT FILL	3071 R106
PAVEMENT TYPE 2	40mm AC 10	R116
	150mm BASECOURSE	DGB 20
PAVEMENT TYPE 3	40mm AC 10	R116

POTHOLE SCHEDULE

PH No.	EASTING	NORTHING	R.L	DESCRIPTION
PH1	358565.897	6320830.338	16.290	BHOLE W/MAIN O.L. 200 DIA
PH2	358565.355	6320829.372	15.080	BHOLE GAS O.L. 100 DIA
PH3	358565.111	6320828.525	15.910	BHOLE ELEC TOP OF TAPE
PH4	358565.096	6320827.802	15.530	BHOLE TELSTRA O.L. 2x100 DIA
PH5	358535.797	6320832.473	15.220	BHOLE ELEC TOP OF TAPE
PH6	358535.903	6320834.302	14.560	BHOLE W/MAIN O.L. 200 DIA

NOTES

1. REFER TO DRAWING 22-14501-C003 FOR ROAD AND KERB LONGITUDINAL SECTIONS

LEGEND

- CONTOUR (DESIGN)
- CONTOUR (EXISTING)
- EXISTING WATERMAIN
- EXISTING TELSTRA
- EXISTING ELECTRICITY
- PROPOSED OUTLET HEADWALL WITH ROCK PROTECTION
- NEW PAVEMENT - TYPE 1
- NEW PAVEMENT - TYPE 2
- NEW PAVEMENT - TYPE 3
- NEW FOOTPATH
- EXISTING FOOTPATH

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
0	ISSUED FOR CONSTRUCTION		RJC	P.V*	G.M*	02.09.09

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

0 500 1000 1500 2000 2500mm
SCALE 1:50 AT ORIGINAL SIZE

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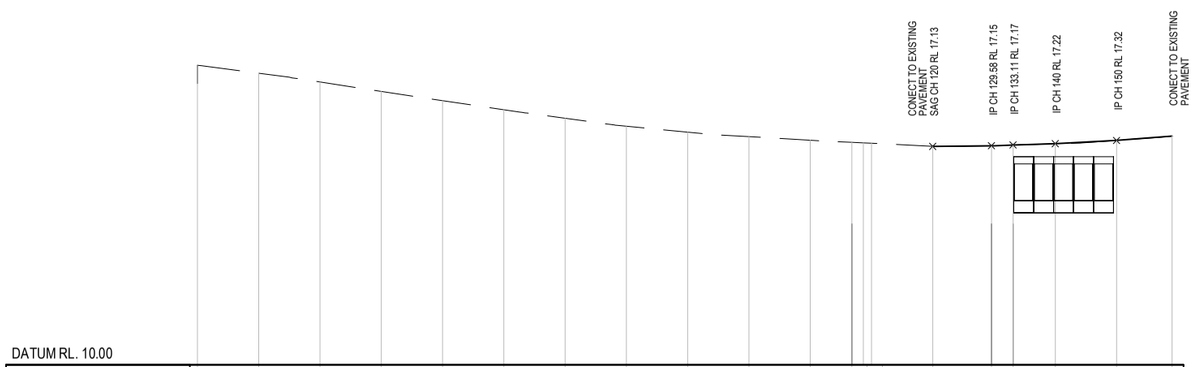
Drawn	J.M.KAMA	Designed	P.VAUGHAN
Drafting Check	P. VAUGHAN*	Design Check	G. MORGAN*
Approved	B. MILLERS*		
Date	02.09.09		
Scale	AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	

Client WYONG SHIRE COUNCIL
Project MATARAM ROAD CULVERTS AND ROAD WORKS
Title PLAN

Original Size A1
Drawing No: 22-14501-C002
Rev: 0

Plot Date: 2 September 2009 - 2:18 PM Plotted by: Rebecca J. Cocks , Newcastle Cad File No: n:\AU\Tuggerah\Projects\22\14501\CADD\Drawings\22-14501-C002.dwg

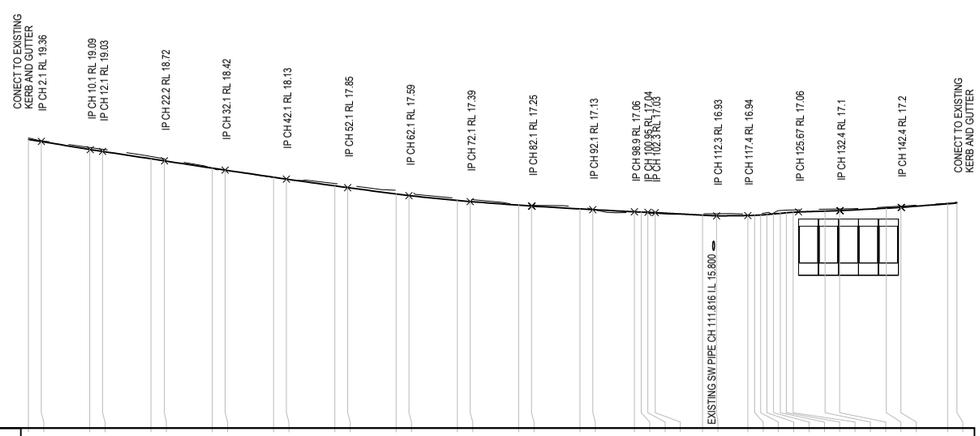


DATUM RL. 10.00

LEVEL DIFFERENCE CUT - / FILL +	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00	0.00		
DESIGN SURFACE LEVEL															17.128	17.149	17.175	17.217	17.324	17.465		
EXISTING SURFACE LEVEL	19.78	19.52	19.23	18.93	18.62	18.33	18.05	17.79	17.59	17.45	17.33	17.26	17.24	17.23	17.13	17.15	17.17	17.22	17.32	17.47		
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	106.79	108.69	110.00	120.00	129.58	133.11	140.00	150.00	159.05		

LONGITUDINAL SECTION - MATARAM ROAD CL

HORZ 1:500 VERT 1:100



DATUM RL. 10.00

LEVEL DIFFERENCE CUT - / FILL +	-0.05	-0.03	-0.07	-0.07	-0.08	-0.07	0.00	-0.03	0.01	-0.04	-0.08	-0.08	-0.12	-0.16	-0.07	-0.07	-0.00	-0.02	-0.07	-0.01	0.02	0.02
DESIGN SURFACE LEVEL	19.421	19.357	19.092	19.031	18.790	18.722	18.485	18.421	18.189	18.127	17.907	17.848	17.641	17.586	17.432	17.391	17.277	17.246	17.154	17.130	17.059	17.050
EXISTING SURFACE LEVEL	19.47	19.36	19.16	19.10	18.87	18.79	18.48	18.45	18.18	18.17	17.98	17.93	17.76	17.74	17.50	17.46	17.28	17.27	17.22	17.14	17.04	17.03
CHAINAGE	0.00	2.10	10.00	12.10	20.00	22.20	30.00	32.10	40.00	42.10	50.00	52.10	60.00	62.10	70.00	72.10	80.00	82.10	90.00	92.10	98.90	100.00

LEVEL DIFFERENCE CUT - / FILL +	0.02	0.02	0.02	0.02	-0.05	-0.07	-0.05	-0.04	-0.05	-0.06	-0.03	-0.03	-0.08	-0.07	-0.06	-0.06	-0.04	-0.04	-0.02	-0.03		
DESIGN SURFACE LEVEL	17.042	17.032	16.951	16.926	16.937	16.943	16.954	16.969	16.991	17.012	17.031	17.047	17.062	17.096	17.177	17.203	17.321	17.345				
EXISTING SURFACE LEVEL	17.02	17.01	17.00	17.00	16.99	16.99	17.00	17.03	17.02	17.10	17.11	17.12	17.14	17.15	17.22	17.25	17.34	17.38				
CHAINAGE	100.10	101.10	102.30	110.00	112.30	117.40	118.50	119.50	120.50	121.60	122.70	123.70	124.60	130.00	132.40	140.00	142.40	150.00	151.54			

LONGITUDINAL SECTION - LIP OF KERB 01

HORZ 1:500 VERT 1:200

DATUM RL. 10.00

LEVEL DIFFERENCE CUT - / FILL +	-0.05	-0.05	-0.04	-0.03																		
DESIGN SURFACE LEVEL	16.972	16.945	16.969	16.976																		
EXISTING SURFACE LEVEL	17.02	17.00	17.01	17.00																		
CHAINAGE	0.00	2.90	9.50	10.70																		

LONGITUDI

HORZ 1:500

0	ISSUED FOR CONSTRUCTION	RJC	P.V*	G.M*	02.09.09
No	Revision Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date

VERTICAL 1:100 AT ORIGINAL SIZE
HORIZONTAL 1:500 AT ORIGINAL SIZE
0 1 2 3 4 5m
0 5 10 15 20 25m

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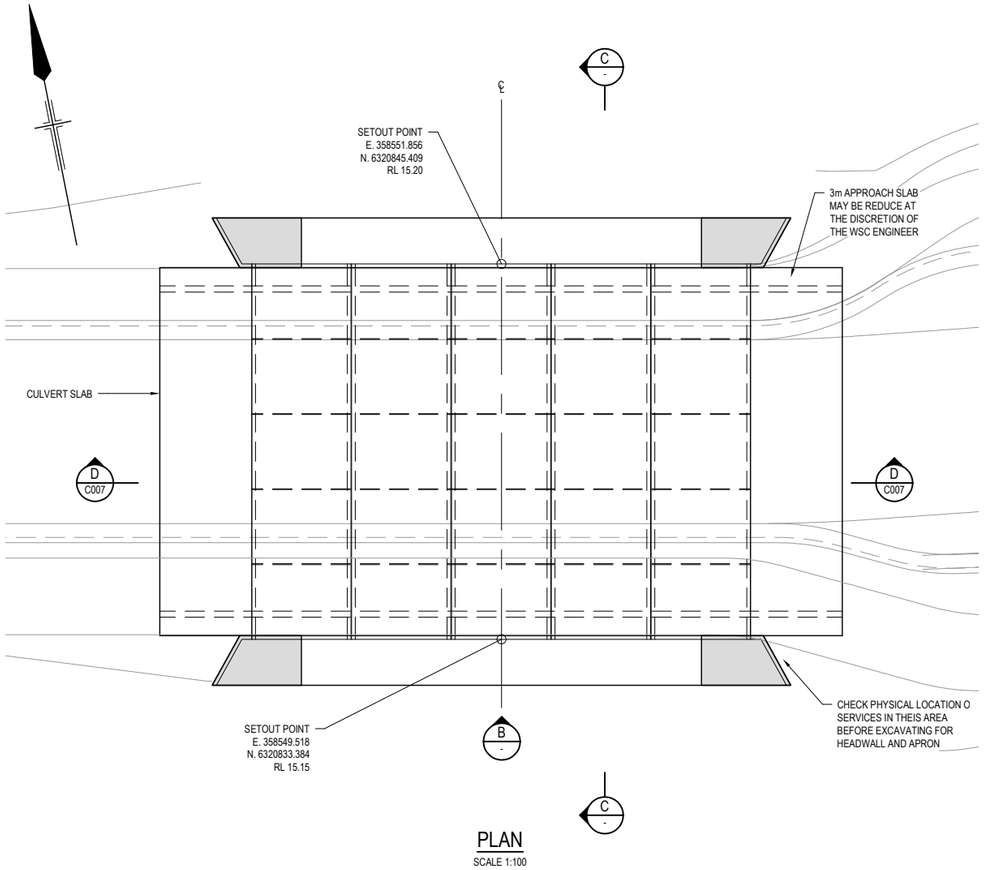
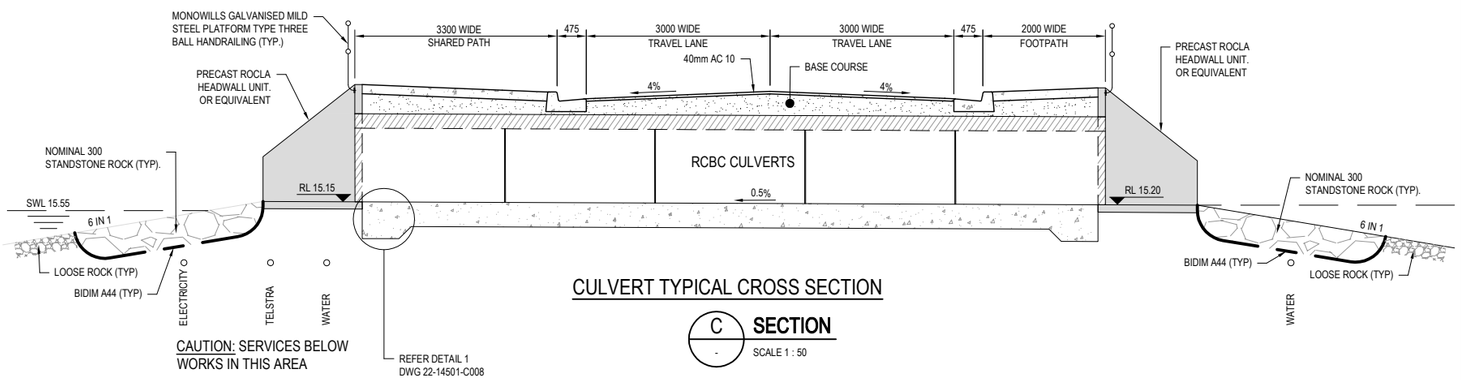
DO NOT SCALE

Drawn	J.M.KAMA
Drafting Check	P. VAUGHAN*
Approved	B. MILLERS*
Date	02.09.09
Scale	AS SHOWN

Plot Date: 2 September 2009 - 2:18 PM Plotted by: Rebecca J. Cocks, Newcastle Cad File No: n:\AU\Tuggerah\Projects\22\14501\CADD\Drawings\22-14501-C003.dwg

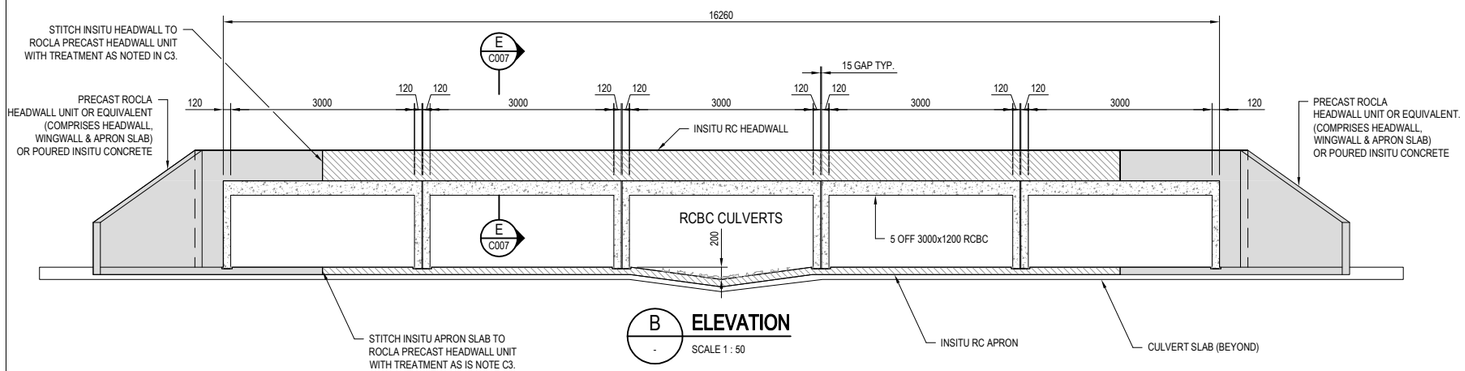


PLAN
SCALE 1:100



CULVERT TYPICAL CROSS SECTION

C - **SECTION**
SCALE 1 : 50



B - **ELEVATION**
SCALE 1 : 50

GENERAL

G1. READ THESE DRAWING IN CONJUNCTION WITH GENERAL ARRANGEMENT DRAWINGS AND GENRAL NOTES DRAWING.

G2. CONCRETE CULVERT SLAB STRUCTURE HAS BEEN DESIGNED IN ACCORDANCE WITH AS1597 AND AS5100

G3. CONCRETE CULVERT SLAB STRUCTURE HAS BEEN DESIGNED FOR THE FOLLOWING LOADS: ·

- CULVERT SELF WEIGHT ASSUMING NOMINAL 3000x1200 SIZING RCBC ·
- SM1600 VEHICULAR LIVE LOAD
- 400mm SOIL AND PAVEMENT OVERBURDEN USING $\gamma_{OVERBURDEN}$ = 20kN/m3

G4. PRECAST BOX CULVERTS ARE TO BE DESIGNED BY MANUFACTRER TO WITHSTAND CONSTRUCTION LOADS, A MAXIMUM SOIL AND PAVEMENT OVERBURDEN DEPTH OF 400mm AND SM1600 LOADING IN ACCORDANCE WITH AS5100.2.

G5. END CULVERT UNITS SHALL HAVE STARTER BARS FOR INSITU HEADWALL.

G6. MAINTAIN COVER TO REINFORCEMENT AT CULVERT REBATES.

FOUNDATION

F1. STRUCTURE HAS BEEN DESIGNED FOR A MINIMUM ALLOWABLE VERTICAL BEARING CAPACITY OF 50kPa.

F2. CAPACITY OF FOUNDATION MATERIAL SHALL BE CONFIRMED ONSITE BY SUPERINTENDANT. ANY AREAS FAILING TO MEET DESIGN CRITERIA SHALL BE REMOVED AND REPLACED WITH MATERIAL REFER NOTE F4.

F3. FOUNDATION TO BE INSPECTED BY A SUITABLY EXPERIENCE GEOTECHNICAL ENGINEER PRIOR TO COMMENCEMENT OF SLAB WORKS.

F4. SLAB SUBBASE TO COMPROMISE MATERIAL COMPLYING WITH RTA DGS40

CONCRETE

C1. QUALITY OF CONCRETE ELEMENTS TO BE AS FOLLOWS:

STRUCTURAL ELEMENT	ALL
STRENGTH GRADE (MPa)	B1
STRENGTH GRADE (MPa)	N40
MAX. 56 DAY DRYING SHRINKAGE	600x10

C2. PROVIDE MINIMUM CLEAR COVER TO REINFORCEMENT AS SHOWN IN TABLE BELOW, EXCEPT

LOCATION	COVER (mm)	COMMENTS
BASE SLAB	40	CAST IN FORMS OR UNIFORMED
	70	CAST AGAINST GROUND

C3. TO STITCH PRECAST ROCLA UNIT TO INSITU HEADWALL AND APRON APPLY PARCHEM 'NITOBOND EP' IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. ANY EXPOSED STEEL IN THE PRECAST UNIT SHOULD BE COATED WITH PARCHEM 'NITOPRIME ZINCRICH' IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
0	ISSUED FOR CONSTRUCTION		RJC	P.V*	G.M*	02.09.09

0 0.5 1.0 1.5 2.0 2.5m
SCALE 1:50 AT ORIGINAL SIZE

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

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Newcastle NSW 2300 Australia
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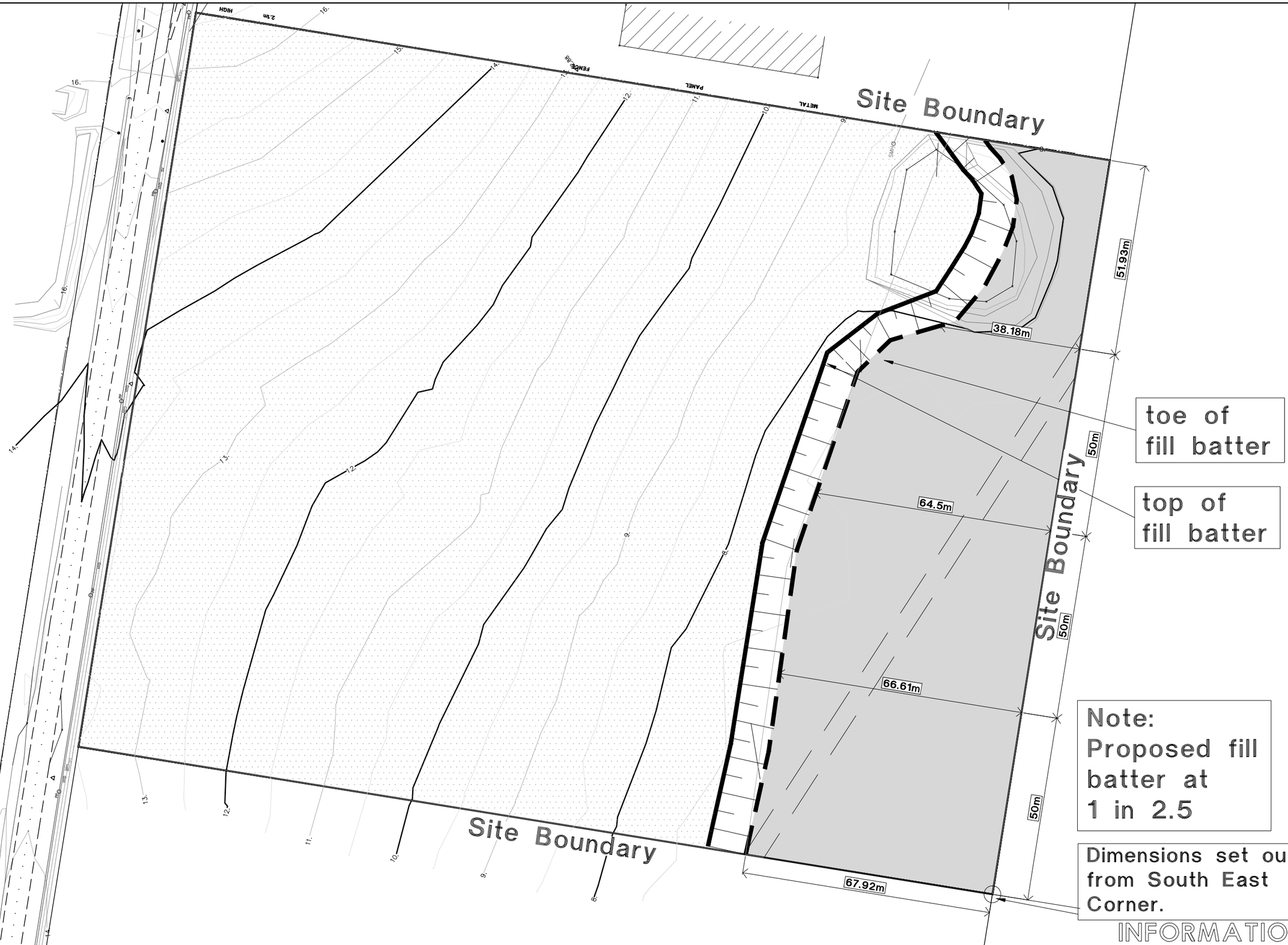
Drawn J.M.KAMA	Designed P.VAUGHAN	Client	WYONG SHIRE COUNCIL
Drafting Check P. VAUGHAN*	Design Check G. MORGAN*	Project	MATARAM ROAD CULVERTS AND ROAD WORKS
Approved B. MILLERS*		Title	CULVERT DETAILS SHEET 1 OF 2
Date 02.09.09			
Scale AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	Original Size A1	Drawing No: 22-14501-C007 Rev: 0

Plot Date: 2 September 2009 - 2:19 PM Plotted by: Rebecca J. Cocks , Newcastle Cad File No: n:\AU\Tuggerah\Projects\22\14501\CADD\Drawings\22-14501-C007.dwg



DRAWN:P. BURL DESIGNED:P. BURL JOB MANAGER:A. BROWN VERIFIER:A. BROWN

ISSUE	AMENDMENT	VERIFIED	APPROVED	DATE
1	FOR INFORMATION	-	-	21.05.09

CLIENT
WYONG SHIRE COUNCIL

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT
QUINN O'HANLON ARCHITECTS

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE MAKING ANY SHOP DRAWINGS OR COMMENCING ANY WORK.

PLANS 1:250 0 2.5 5 7.5 10 12.5m

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Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT
COMMUNITY CENTRE AND SPORTING FACILITY MINNESOTA ROAD HAMLYN TERRACE

DRAWING TITLE
FILL BATTER EXTENTS

JOB NUMBER **NL080290**

DRAWING NUMBER	ISSUE
CSK02	1

DRAWING SHEET SIZE = A1

N

WYONG SHIRE COUNCIL

UNDERGROUND PLANT LOCATIONS

Not to Scale

LEGEND

DRAINAGE

Drainage Lines	———
Culvert Lines	- - - - - -
Culvert Head Wall	◠
Open Pit	□
Pit	■
Head Wall	△

Warning Note for Underground Plant Locations

This plan may not have been adjusted to take into account changes to boundaries, levels, fences or structures subsequent to the installation of the service/s. This plan is not to scale and all measurements are approximate only. The service/s indicated are expected to be in proximity to the location and depth shown on the plan. Where it is intended to rely on the accurate location of the service/s, the exact position and depth of the service/s should be ascertained onsite by careful hand excavation. Council can provide an on-site advisory service on request to assist in this process. Persons undertaking work will be held responsible for any damage caused to Council's services. Material type has not been indicated on the plan therefore some types may contain asbestos.

Base Cadastre is part of the Digital Cadastral Database supplied by the Department of Lands, Bathurst. Any person whose legal rights may be affected, or intends to act on any cadastral information shown on this plan should verify such information by consulting the Department of Lands before so acting.

Kerry Yates
General Manager

WYONG SHIRE
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salam

14/05/2010

Central culvert inlet side, note brick central walls with triangular front edge

Concrete wall in northernmost cell approximately 1.5m across with 45degree taper on leading edge protrudes about 1.2 m from face of culvert

Both sets of culverts inspected have wing walls on upstream and downstream side of culvert. On upstream side wing walls extended approximately 4m (perpendicular measurement)out from the culvert and approximately 2.4m laterally.

NORTH SURVEY
COORDINATE LISTING

FILE: W:_Current Projects\4822 Porters Creek FPRMS_Data In\Railway surface levels\[TCM DES
TRACK: Down & Up Mains
KILOMETRAGE: 103484 to 103955
SECTION: PORTERS CREEK

SURVEY OFFICE: HORNSBY
PHONE:
DATE OF SURVEY: 20/5/2010

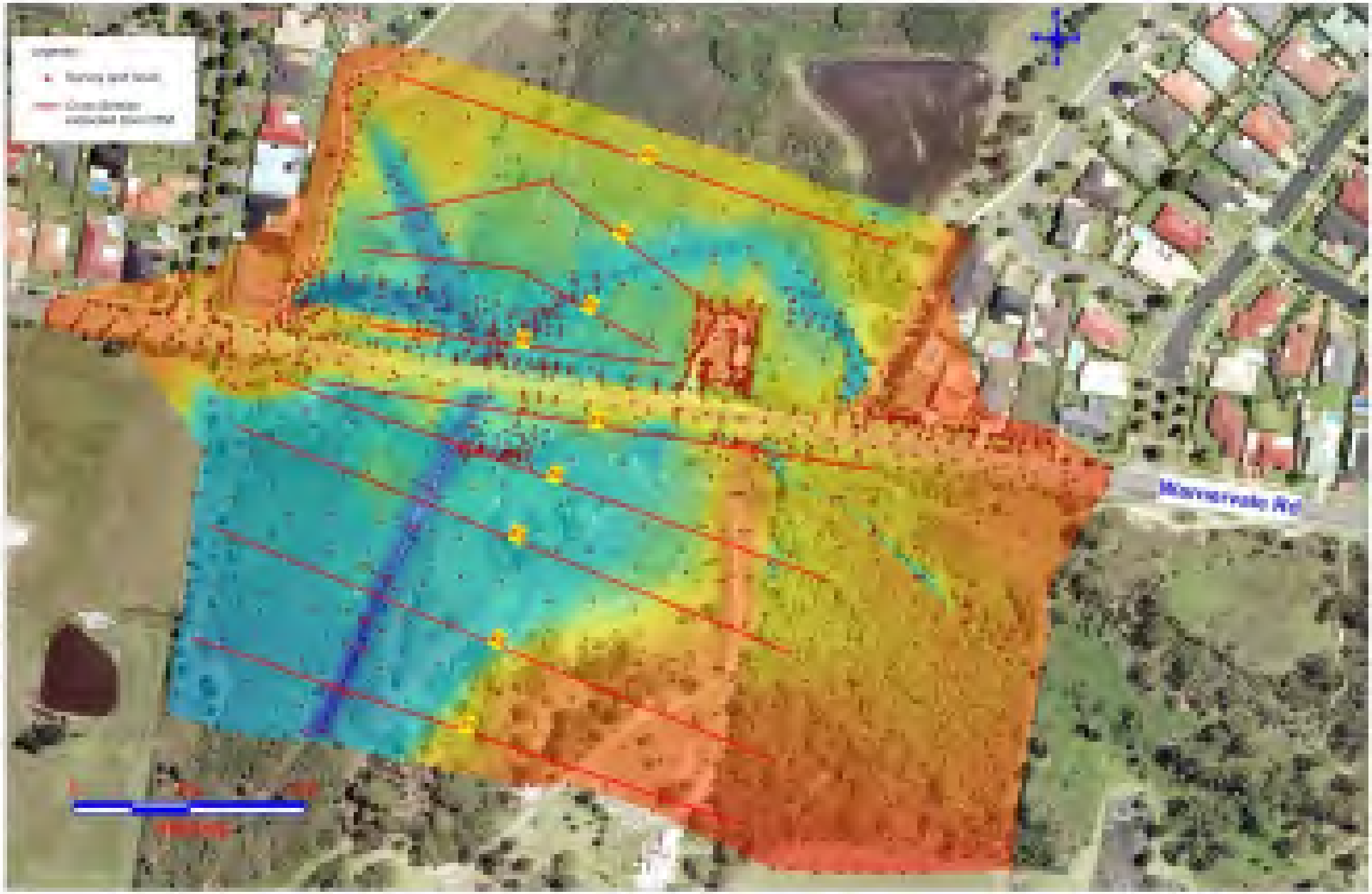
FILE REF#	EASTING ISG (m)	NORTHING ISG (m)	REDUCED LEVEL AHD (m)	CCAD CODE	DESCRIPTION
2	340411.735	1317928.612	6.121	ru1	des low rail up rail down main
12	340410.404	1317929.149	6.141	rd1	des high rail dn rail down main
3110	340408.022	1317930.110	6.497	ptcm1	TCM 103+521
13	340437.54	1317995.019	6.146	rd1	des high rail dn rail down main
3114	340435.177	1317996.013	6.482	ptcm1	TCM 103+590
3	340438.863	1317994.463	6.126	ru1	des low rail up rail down main
4	340464.405	1318054.068	6.132	ru1	des low rail up rail down main
3118	340460.783	1318055.649	6.450	ptcm1	TCM 103+655
14	340463.09	1318054.642	6.152	rd1	des high rail dn rail down main
15	340490.403	1318116.051	6.158	rd1	des high rail dn rail down main
5	340491.71	1318115.459	6.138	ru1	des low rail up rail down main
3122	340488.084	1318117.102	6.436	ptcm1	TCM 103+722
16	340518.459	1318176.844	6.164	rd1	des high rail dn rail down main
6	340519.758	1318176.234	6.144	ru1	des low rail up rail down main
3126	340516.212	1318177.900	6.434	ptcm1	TCM 103+789
1446	340522.61	1318189.101	5.843	ptcm1	TCM NAIL
17	340523.942	1318188.471	6.165	rd1	des high rail dn rail down main
7	340525.239	1318187.857	6.145	ru1	des low rail up rail down main
18	340547.264	1318237.057	6.122	rd1	des high rail dn rail down main
8	340548.554	1318236.429	6.102	ru1	des low rail up rail down main
3130	340544.973	1318238.172	6.379	ptcm1	TCM 103+856
3134	340574.826	1318298.462	6.416	ptcm1	TCM 103+923
19	340577.118	1318297.306	6.114	rd1	des high rail dn rail down main
9	340578.399	1318296.660	6.094	ru1	des low rail up rail down main
20	340607.656	1318356.846	6.391	rd1	des high rail dn rail down main
10	340608.929	1318356.182	6.371	ru1	des low rail up rail down main
3138	340605.405	1318358.020	6.713	ptcm1	TCM 103+990
3103	340393.561	1317866.302	6.310	ptcm2	TCM 103+454
2	340415.213	1317927.291	6.121	ru2	des low rail up rail up main
12	340413.883	1317927.828	6.141	rd2	des high rail dn rail up main
3107	340417.52	1317926.361	6.098	ptcm2	TCM 103+521
3	340442.252	1317992.925	6.126	ru2	des low rail up rail up main
13	340440.929	1317993.481	6.146	rd2	des high rail dn rail up main
3111	340444.546	1317991.960	6.068	ptcm2	TCM 103+590
3115	340469.956	1318051.416	6.036	ptcm2	TCM 103+655
4	340467.73	1318052.387	6.132	ru2	des low rail up rail up main
14	340466.415	1318052.961	6.152	rd2	des high rail dn rail up main
5	340495.098	1318113.921	6.138	ru2	des low rail up rail up main
3119	340497.343	1318112.904	6.024	ptcm2	TCM 103+722
15	340493.791	1318114.514	6.158	rd2	des high rail dn rail up main
3123	340525.337	1318173.644	5.995	ptcm2	TCM 103+789
6	340523.137	1318174.678	6.144	ru2	des low rail up rail up main
16	340521.838	1318175.288	6.164	rd2	des high rail dn rail up main
17	340527.328	1318186.930	6.165	rd2	des high rail dn rail up main
1447	340529.88	1318185.723	5.849	ptcm2	TCM PIN
7	340528.625	1318186.317	6.145	ru2	des low rail up rail up main
18	340550.707	1318235.630	6.122	rd2	des high rail dn rail up main
3127	340554.182	1318233.938	5.973	ptcm2	TCM 103+856
8	340551.997	1318235.002	6.102	ru2	des low rail up rail up main
19	340580.375	1318295.504	6.114	rd2	des high rail dn rail up main
3131	340583.84	1318293.757	6.415	ptcm2	TCM 103+923

NORTH SURVEY
COORDINATE LISTING

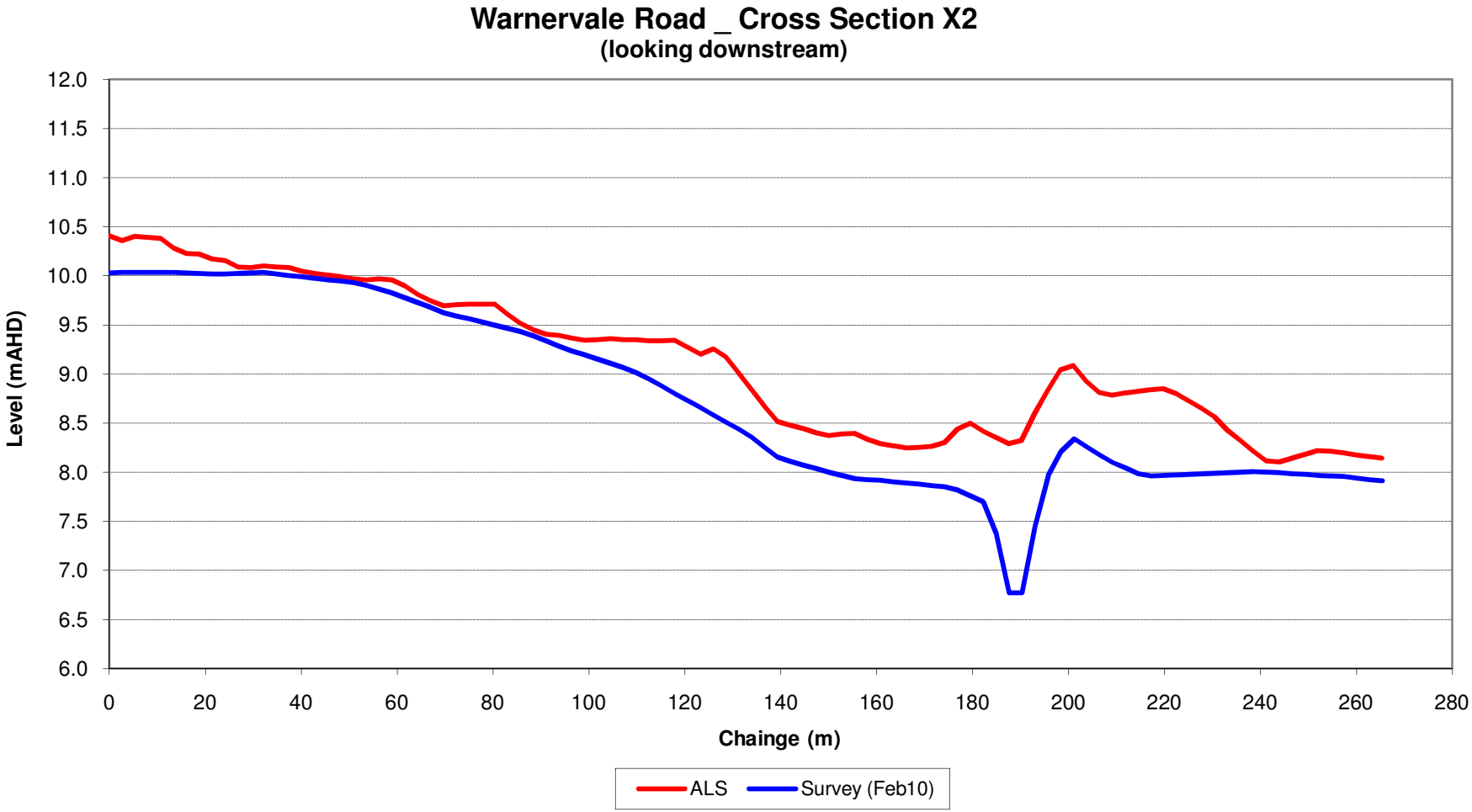
FILE: W:_Current Projects\4822 Porters Creek FPRMS_Data In\Railway surface levels\[TCM DES
TRACK: Down & Up Mains
KILOMETRAGE: 103484 to 103955
SECTION: PORTERS CREEK

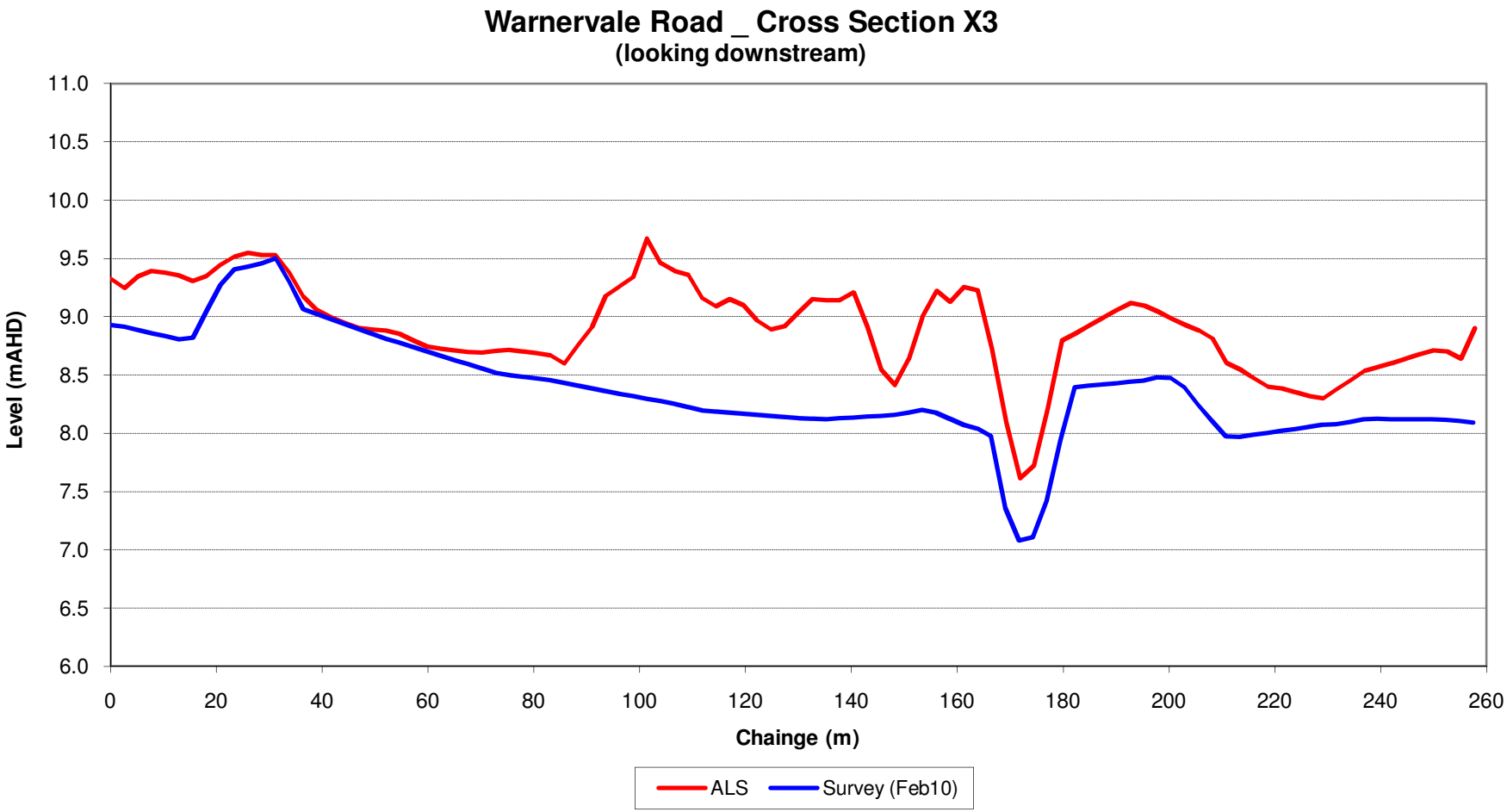
SURVEY OFFICE: HORNSBY
PHONE:
DATE OF SURVEY: 20/5/2010

FILE REF#	EASTING ISG (m)	NORTHING ISG (m)	REDUCED LEVEL AHD (m)	CCAD CODE	DESCRIPTION
9	340581.657	1318294.858	6.094	ru2	des low rail up rail up main
20	340610.841	1318354.906	6.390	rd2	des high rail dn rail up main
3135	340614.273	1318353.116	6.315	ptcm2	TCM 103+990
10	340612.113	1318354.243	6.370	ru2	des low rail up rail up main



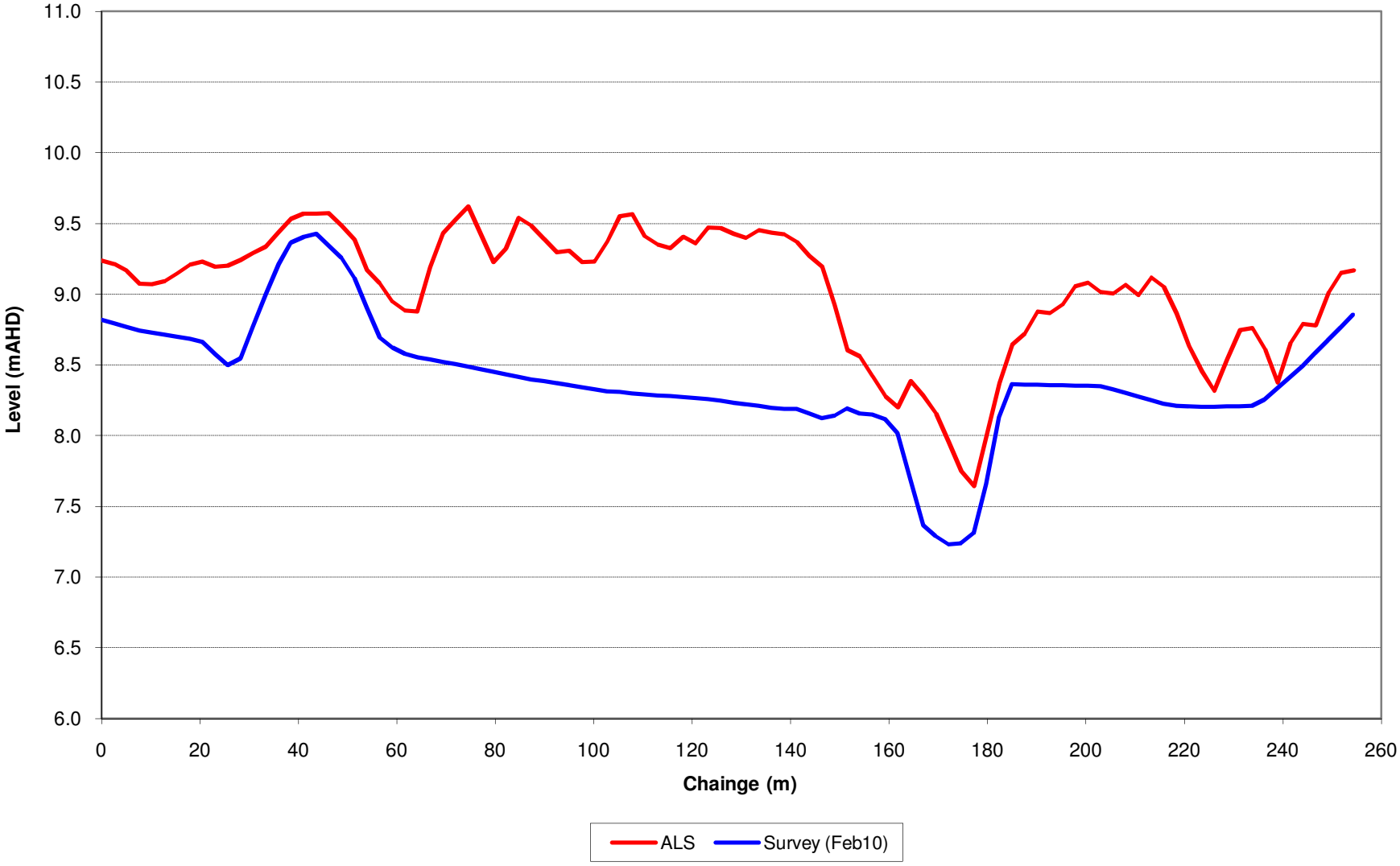
Warwick Road
DEM from Spot Level Survey taken in February 2015


Warnervale Road _ Cross Section X2
(looking downstream)
Level (mAHD)
12.0
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Chainge (m)
ALS
Survey (Feb10)


Warnervale Road _ Cross Section X3
(looking downstream)
Level (mAHD)
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
0
20
40
60
80
100
120
140
160
180
200
220
240
260
Chainge (m)
ALS
Survey (Feb10)

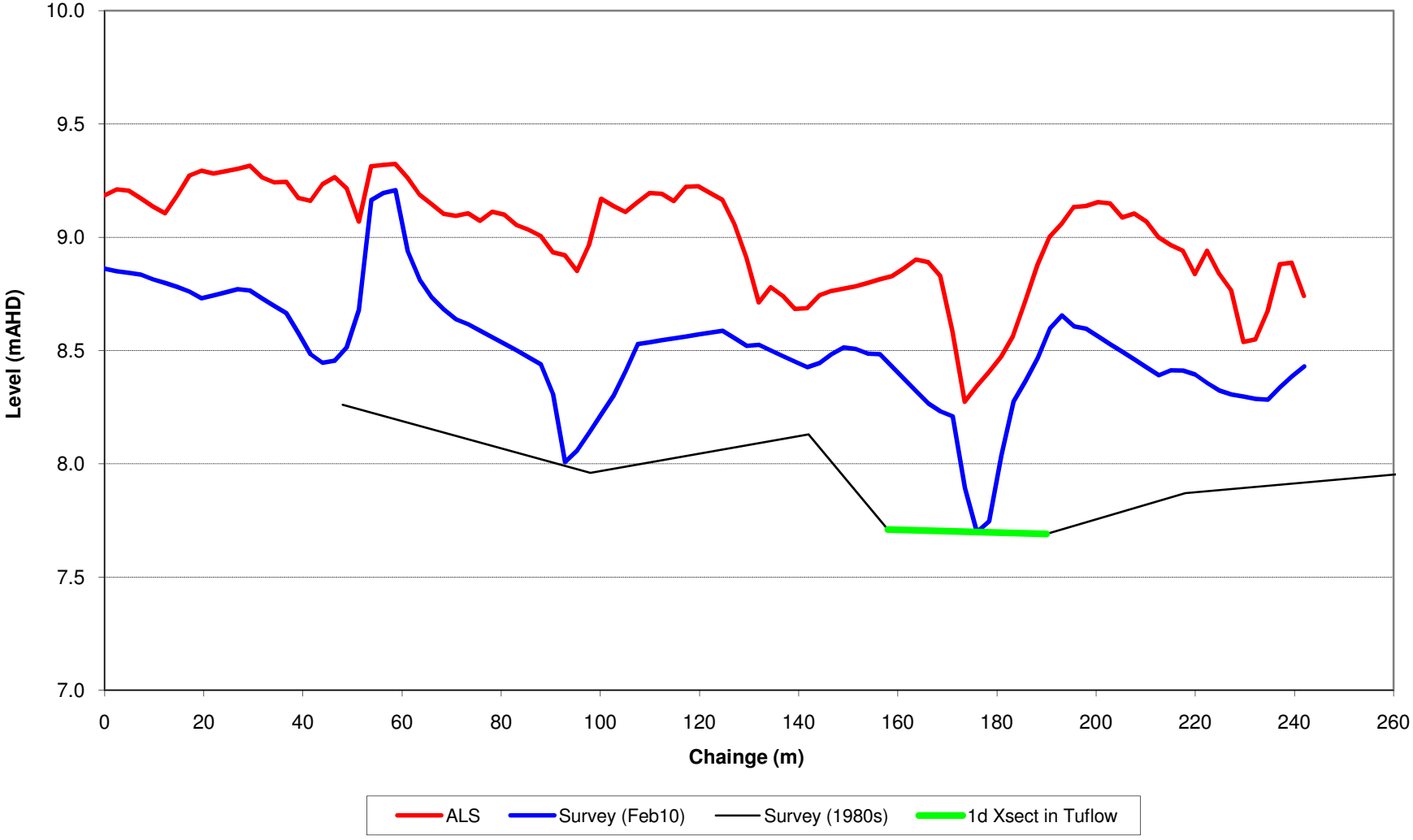
Warnervale Road _ Cross Section X4

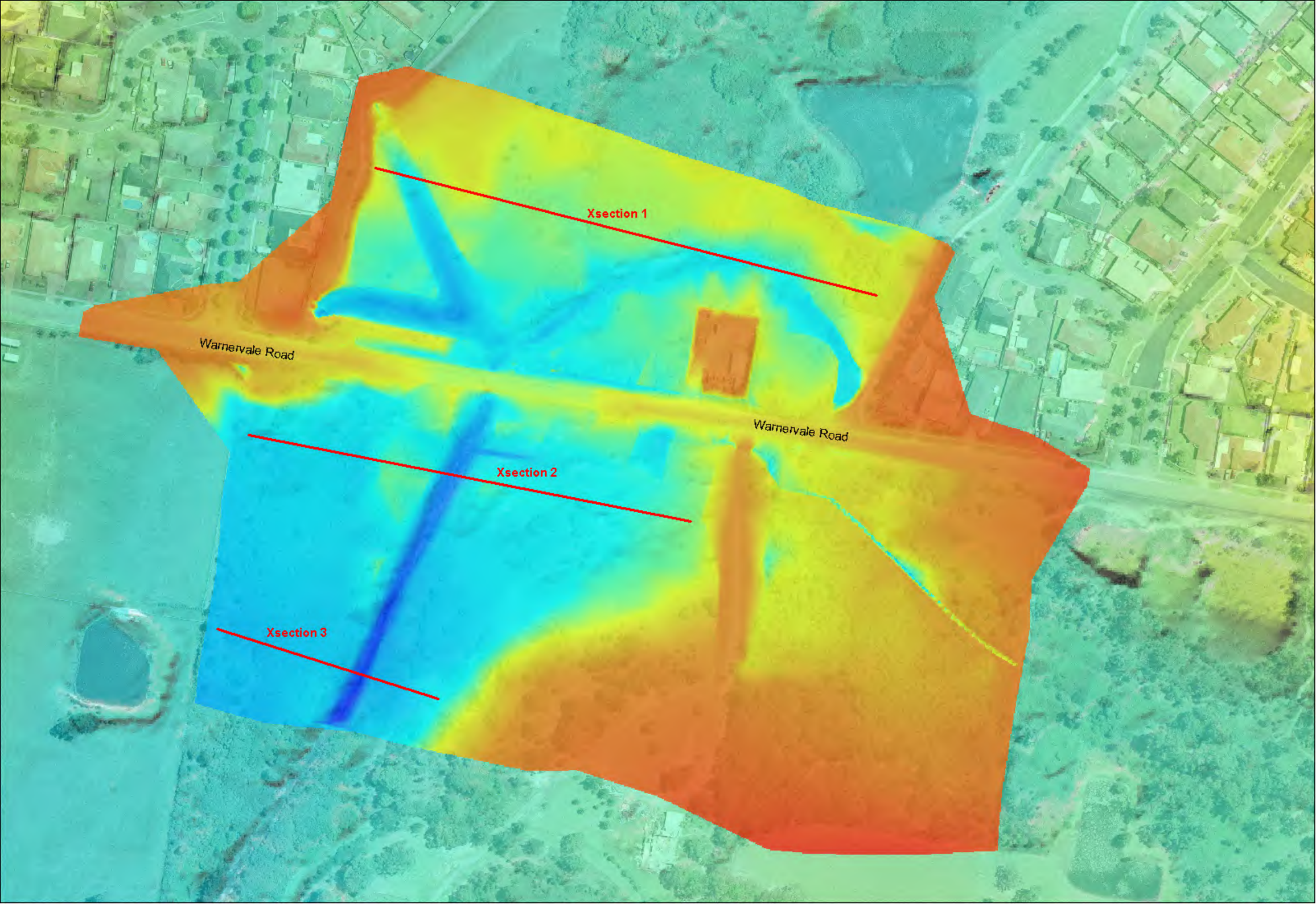
(looking downstream)

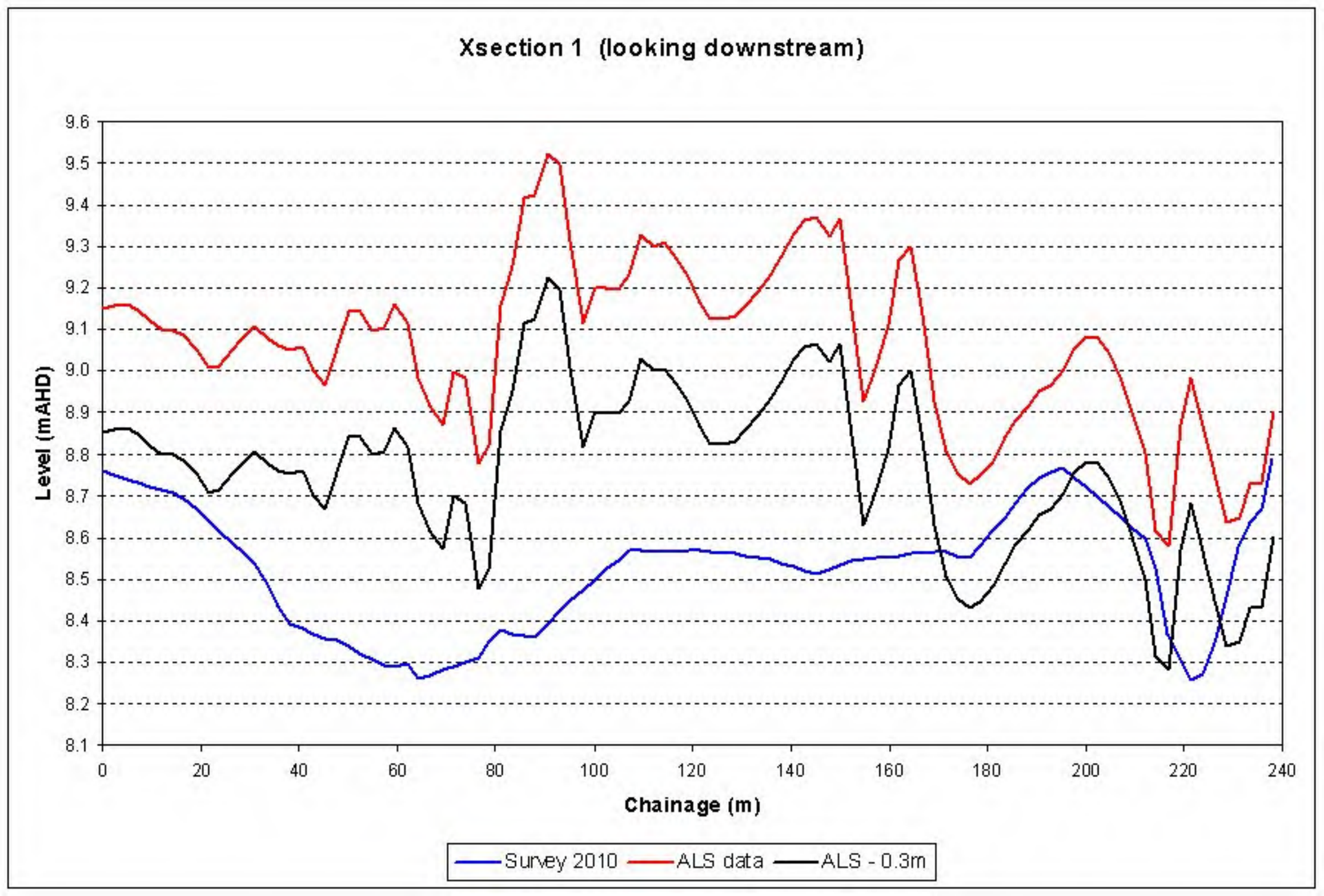


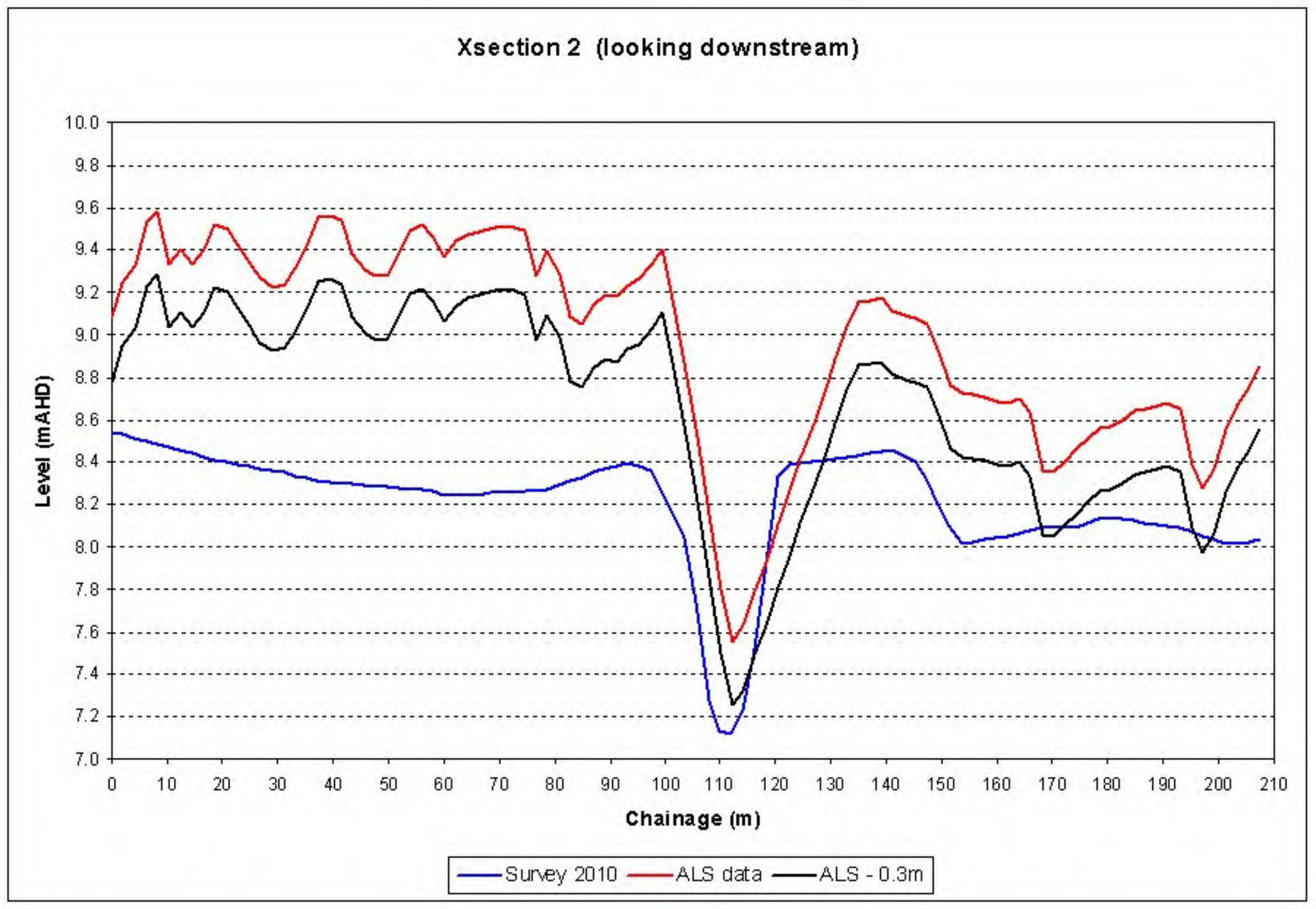
Warnervale Road _ Cross Section X5

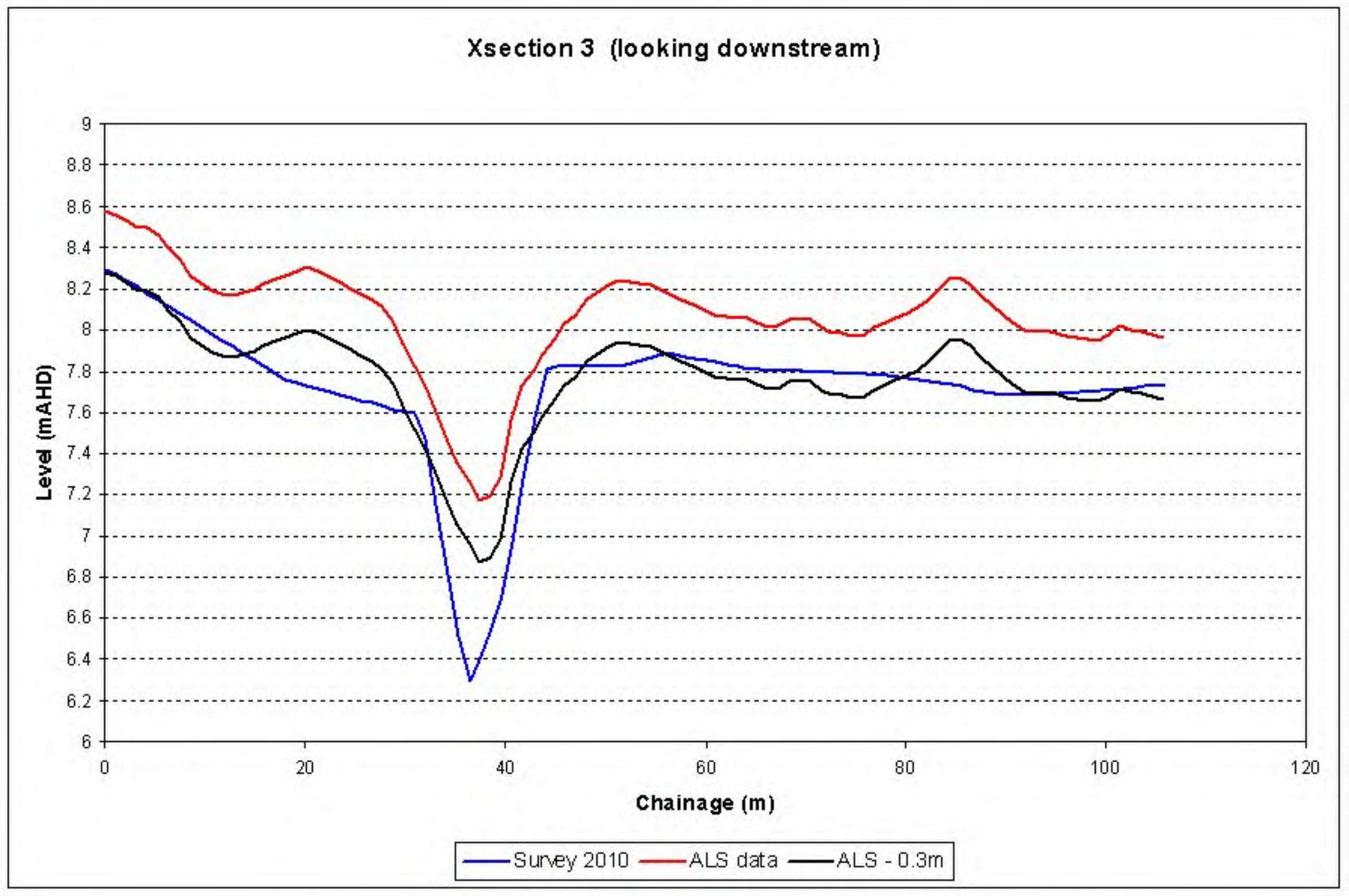
(looking downstream)




Xsection 1
Warnervale Road
Warnervale Road
Xsection 2
Xsection 3


Xsection 1 (looking downstream)
Level (mAHD)
9.6
9.5
9.4
9.3
9.2
9.1
9.0
8.9
8.8
8.7
8.6
8.5
8.4
8.3
8.2
8.1
0
20
40
60
80
100
120
140
160
180
200
220
240
Chainage (m)
Survey 2010
ALS data
ALS - 0.3m


Xsection 2 (looking downstream)
Level (mAHD)
10.0
9.8
9.6
9.4
9.2
9.0
8.8
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
Chainage (m)
Survey 2010
ALS data
ALS - 0.3m


Xsection 3 (looking downstream)
Level (mAHD)
9
8.8
8.6
8.4
8.2
8
7.8
7.6
7.4
7.2
7
6.8
6.6
6.4
6.2
6
0
20
40
60
80
100
120
Chainage (m)
Survey 2010
ALS data
ALS - 0.3m

Appendix B

Structure Survey Report

(Refer to Flood Study Report)

Appendix C

Hydrologic Model Setup and Results

Table C.1 Hydrologic Model Parameters

Link Label	Catchment Area (Ha)		Slope (%)		Impervious (%)		Initial Loss (mm)		Continuing Loss (mm)		Catchment Roughness (PERN)	
	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2
BU6c	11.18	3.726	3.58	3.58	5	100	10	1.5	2.5	0	0.06	0.015
BU6a	119.46	0	2.6	0	5	0	15	0	4	0	0.06	0
WC1.15	79.89	0	1.72	0	5	0	15	0	4	0	0.025	0
WC12.0	34.29	14.005	3.2	3.2	0	100	15	1.5	4	0	0.025	0.015
WC11c	10.92	0	2.68	0	0	0	15	0	4	0	0.025	0
WC11d	20.97	5.243	1.7	1.7	0	100	15	1.5	4	0	0.025	0.015
WC11a	17.75	0	2.88	0	0	0	15	0	4	0	0.025	0
WC11b	30.78	3.421	2.61	2.61	0	100	15	1.5	4	0	0.025	0.015
WC11.0	53.21	0	1.11	0	0	0	15	0	4	0	0.025	0
WC11.01	62.27	0	0.79	0	5	0	15	0	4	0	0.025	0
WC9.0	56.9	0	1.58	0	5	0	10	0	2.5	0	0.025	0
WC6.06	35.14	9.912	1.12	1.12	0	100	15	1.5	4	0	0.025	0.015
WC1.10	28.1	11.26	4.33	4.33	0	100	15	1.5	4	0	0.025	0.015

Link Label	Catchment Area (Ha)		Slope (%)		Impervious (%)		Initial Loss (mm)		Continuing Loss (mm)		Catchment Roughness (PERN)	
	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2
WC9.02	28.58	0	0.83	0	5	0	15	0	4	0	0.025	0
WC2.02	13.8	20.695	2.5	2.5	0	100	10	1.5	2.5	0	0.025	0.015
WC1.0	8.67	16.108	1.47	1.47	0	100	10	1.5	2.5	0	0.025	0.015
WC1.01	5.34	9.92	1.9	1.9	0	100	10	1.5	2.5	0	0.025	0.015
WC1.02	1.28	11.557	1.38	1.38	0	100	10	1.5	2.5	0	0.025	0.015
WC2.0	10.58	12.926	1.27	1.27	0	100	10	1.5	2.5	0	0.025	0.015
WC2.01	10.94	13.366	1.29	1.29	0	100	10	1.5	2.5	0	0.025	0.015
WC7a	6.94	12.884	2.06	2.06	0	100	10	1.5	2.5	0	0.025	0.015
WC7b	6.17	11.46	2.24	2.24	0	100	10	1.5	2.5	0	0.025	0.015
WC2.03	4.38	0	1.43	0	0	0	10	0	2.5	0	0.025	0
WC1.03	6.31	4.205	1.77	1.77	0	100	10	1.5	2.5	0	0.025	0.015
WC3.0	3.6	6.683	3.33	3.33	0	100	10	1.5	2.5	0	0.025	0.015
WC1.04	17.19	0	0.87	0	5	0	10	0	2.5	0	0.025	0
WC1.05	14.82	3.707	1.34	1.34	0	100	10	1.5	2.5	0	0.025	0.015

Link Label	Catchment Area (Ha)		Slope (%)		Impervious (%)		Initial Loss (mm)		Continuing Loss (mm)		Catchment Roughness (PERN)	
	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2
WC6.04	6.7	6.701	1.79	1.79	0	100	10	1.5	2.5	0	0.025	0.015
WC14.0	9.01	2.253	2.73	2.73	0	100	10	1.5	2.5	0	0.025	0.015
WC1.051	6.33	6.326	3.21	3.21	0	100	10	1.5	2.5	0	0.025	0.015
WC1.06	18.05	4.513	2	2	0	100	10	1.5	2.5	0	0.025	0.015
WC13.0	13.83	3.459	3.36	3.36	0	100	10	1.5	2.5	0	0.025	0.015
WC5.1a	6.03	7.377	1.64	1.64	0	100	10	1.5	2.5	0	0.025	0.015
WC5.1b	4.07	4.973	2.14	2.14	0	100	10	1.5	2.5	0	0.025	0.015
WC1.07a	4.82	8.945	2.59	2.59	0	100	10	1.5	2.5	0	0.025	0.015
WC1.07	8.99	10.984	1.29	1.29	0	100	10	1.5	2.5	0	0.025	0.015
WC1.08	16.14	13.208	1.38	1.38	0	100	10	1.5	2.5	0	0.025	0.015
WC9.04	17.72	21.654	1.98	1.98	0	100	10	1.5	2.5	0	0.025	0.015
WC1.11	12.98	24.11	1.83	1.83	0	100	10	1.5	2.5	0	0.025	0.015
WC1.06b	1.55	2.887	1.95	1.95	0	100	10	1.5	2.5	0	0.025	0.015
WC1.06a	12.92	1.436	2.35	2.35	0	100	10	1.5	2.5	0	0.025	0.015

Link Label	Catchment Area (Ha)		Slope (%)		Impervious (%)		Initial Loss (mm)		Continuing Loss (mm)		Catchment Roughness (PERN)	
	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2
WC8.01	11.35	7.569	1.49	1.49	0	100	10	1.5	2.5	0	0.025	0.015
WC6.03	14.28	8.385	2.13	2.13	0	100	15	1.5	4	0	0.025	0.015
WC9.01	9.02	16.745	2.16	2.16	0	100	10	1.5	2.5	0	0.025	0.015
WC6.02	7.54	7.541	1.85	1.85	0	100	10	1.5	2.5	0	0.025	0.015
WC10a	9.86	3.289	2.12	2.12	0	100	10	1.5	2.5	0	0.025	0.015
WC10b	20.38	6.793	1.54	1.54	0	100	10	1.5	2.5	0	0.025	0.015
WC6.05	27.88	5.311	1.38	1.38	0	100	15	1.5	4	0	0.025	0.015
WC5.0	8.99	2.249	1.36	1.36	0	100	15	1.5	4	0	0.025	0.015
WC10.01	16.47	0	1.22	0	0	0	15	0	4	0	0.025	0
WC4.0	35.26	3.919	1.03	1.03	0	100	15	1.5	4	0	0.025	0.015
WC9.03	25.12	0	0.7	0	5	0	15	0	4	0	0.025	0
WC15.01	39.85	17.08	0.59	0.59	0	100	15	1.5	4	0	0.025	0.015
SS5	71.9	0	0.69	0	5	0	15	0	4	0	0.06	0
WC14.00	21.84	5.46	2.73	2.73	5	100	15	1.5	4	0	0.025	0.015

Link Label	Catchment Area (Ha)		Slope (%)		Impervious (%)		Initial Loss (mm)		Continuing Loss (mm)		Catchment Roughness (PERN)	
	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2
WC14.01	34.31	9.68	1.39	1.39	5	100	15	1.5	4	0	0.025	0.015
WC14.01a	14.88	18.184	0.7	0.7	5	100	15	1.5	4	0	0.025	0.015
A2	0.24	4.56	1.5	1.5	5	100	15	1.5	4	0	0.025	0.015
A1	0.12	2.28	1	1	5	100	15	1.5	4	0	0.025	0.015
B2	0.64	12.16	1.5	1.5	5	100	15	1.5	4	0	0.025	0.015
B1	0.185	3.515	1	1	5	100	15	1.5	4	0	0.025	0.015
C2	0.545	10.355	1.5	1.5	5	100	15	1.5	4	0	0.025	0.015
C1	0.14	2.66	1	1	5	100	15	1.5	4	0	0.025	0.015
SS4	41.27	0	0.88	0	5	0	15	0	4	0	0.06	0
WC14.01b	5.23	12.19	0.77	0.77	5	100	15	1.5	4	0	0.025	0.015
WC15b	37.12	0	2.52	0	5	0	15	0	4	0	0.025	0
WC15a	5.28	9.809	2.68	2.68	0	100	15	1.5	4	0	0.025	0.015
SS3	103.66	0	0.83	0	5	0	15	0	4	0	0.06	0
WC1.16	68.66	17.167	0.4	0.4	5	100	15	1.5	4	0	0.025	0.015

Link Label	Catchment Area (Ha)		Slope (%)		Impervious (%)		Initial Loss (mm)		Continuing Loss (mm)		Catchment Roughness (PERN)	
	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2
PC1	191.01	0	1.49	0	5	0	15	0	4	0	0.06	0
BU11	56.42	6.27	1.79	1.79	0	100	15	1.5	4	0	0.06	0.015
BU12	81.28	0	2.01	0	5	0	15	0	4	0	0.06	0
BU13	29.39	3.266	1.29	1.29	0	100	15	1.5	4	0	0.06	0.015
BU5a	15.53	0	4.08	0	5	0	10	0	2.5	0	0.06	0
BU5b	11.172	16.758	1.18	0	0	100	15	1.5	4	0	0.06	0.015
BU10	53.91	0	6.44	0	5	0	10	0	2.5	0	0.06	0
BU9b	89.82	0	5.03	0	5	0	10	0	2.5	0	0.06	0
Dum3	0.00001	0	0.001	0	5	0	10	0	2.5	0	0.06	0
BU1	99.45	0	5.29	0	5	0	10	0	2.5	0	0.06	0
BU2	210.16	37.089	2.61	2.61	0	100	15	1.5	2.5	0	0.06	0.015
BU3	126.48	0	1.55	0	5	0	10	0	2.5	0	0.06	0
BU4	24.87	16.58	0.87	0.87	0	100	10	1.5	2.5	0	0.06	0.015
Dum2	0.00001	0	0.001	0	5	0	15	0	4	0	0.06	0

Link Label	Catchment Area (Ha)		Slope (%)		Impervious (%)		Initial Loss (mm)		Continuing Loss (mm)		Catchment Roughness (PERN)	
	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2
PC8	48.8	0	0.68	0	5	0	15	0	4	0	0.06	0
BU7	104.88	0	3.04	0	5	0	10	0	2.5	0	0.06	0
PC10	22.17	51.73	2.39	0	0	100	10	1.5	2.5	0	0.06	0.015
BU8	40.62	0	3.06	0	5	0	10	0	2.5	0	0.06	0
Dum4	0.00001	0	0.001	0	5	0	15	0	4	0	0.06	0
BU9a	127.84	0	1.2	0	5	0	15	0	4	0	0.06	0
Dum1	0.00001	0	0.001	0	5	0	15	0	4	0	0.06	0
PC9	204.43	51.109	0.62	0.62	5	100	15	1.5	4	0	0.06	0.015
PCBc	18.48	0	3.35	0	5	0	15	0	4	0	0.06	0
SS2	66.84	0	5.57	0	5	0	10	0	2.5	0	0.06	0
SS1	109.79	0	2.61	0	5	0	10	0	2.5	0	0.06	0
PC5	123.53	0	2.05	0	5	0	10	0	2.5	0	0.06	0
PC6a	82.15	0	2.85	0	5	0	10	0	2.5	0	0.06	0
PC6b	96.57	0	2.06	0	5	0	10	0	2.5	0	0.06	0

Link Label	Catchment Area (Ha)		Slope (%)		Impervious (%)		Initial Loss (mm)		Continuing Loss (mm)		Catchment Roughness (PERN)	
	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2	Subcatch 1	Subcatch 2
PC2	149.74	0	3.7	0	5	0	15	0	4	0	0.06	0
PCA	144.25	25.456	2.72	2.72	5	100	15	1.5	4	0	0.06	0.015
PC7	239.25	42.222	0.64	0.64	5	100	15	1.5	4	0	0.06	0.015
PC4	99.23	0	1.03	0	5	0	15	0	4	0	0.06	0
PCBa	48.43	0	5.21	0	5	0	10	0	2.5	0	0.06	0
PCBb	96.44	0	2.12	0	5	0	15	0	4	0	0.06	0
PC3	148.18	0	0.77	0	5	0	15	0	4	0	0.06	0
BU6b	182.19	0	1.13	0	5	0	15	0	4	0	0.06	0
BU6d	168.38	56.126	2.47	2.47	0	100	15	1.5	4	0	0.06	0.015
Out	0.00001	0	0.001	0	5	0	15	0	4	0	0.06	0

Table C.2.2 Estimated Peak Discharges - Design and PMP Storms

Catch ID	5 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC1.15	4.7	6.1	6.0	6.9	6.8	6.8	5.2	**6.9**	6hr
WC12.0	5.9	6.3	4.7	5.0	4.6	5.1	3.7	**6.3**	2hr
WC11c	1.1	1.2	1.0	1.2	1.1	1.1	0.8	**1.2**	2hr
WC11d	2.7	3.3	3.1	3.4	3.3	3.7	2.7	**3.7**	12hr
WC11a	1.6	1.8	1.6	1.8	1.7	1.8	1.3	**1.8**	6hr
WC11b	4.1	4.9	4.5	5.0	4.7	5.1	3.8	**5.1**	12hr
WC11.0	8.6	10.7	10.2	11.4	11.6	12.3	9.2	**12.3**	12hr
WC11.01	11.0	13.9	13.5	15.6	16.1	16.3	12.3	**16.3**	12hr
WC9.04	8.4	8.9	5.6	4.7	4.2	4.5	3.2	**8.9**	2hr
WC9.0	10.3	11.0	9.0	9.5	8.7	9.7	7.2	**11.0**	2hr
WC6.06	12.6	13.5	11.7	12.5	12.3	12.6	9.6	**13.5**	2hr
WC1.10	5.0	5.4	4.3	4.5	4.1	4.3	3.1	**5.4**	2hr
WC9.02	16.8	19.4	17.1	18.4	18.1	18.9	14.4	**19.4**	2hr
WC2.02	8.0	8.5	5.4	4.4	3.9	4.1	2.9	**8.5**	2hr
WC1.0	6.0	6.4	3.9	3.1	2.7	2.9	2.0	**6.4**	2hr
WC1.01	8.2	9.4	6.3	5.0	4.5	4.7	3.3	**9.4**	2hr
WC1.02	8.0	7.8	6.6	5.7	5.3	5.5	4.3	**8.0**	1hr
WC2.0	4.9	5.2	3.3	2.7	2.5	2.6	1.9	**5.2**	2hr
WC2.01	7.4	7.5	5.7	5.0	4.7	5.0	3.8	**7.5**	2hr
WC7a	7.2	7.6	6.3	5.8	5.5	5.8	4.8	**7.6**	2hr
WC7b	7.6	9.4	8.2	7.5	7.0	7.6	6.1	**9.4**	2hr
WC2.03	7.9	9.8	8.5	8.0	7.4	8.0	6.4	**9.8**	2hr
WC1.03	16.7	19.0	16.0	14.7	13.6	14.5	11.5	**19.0**	2hr
WC3.0	2.7	2.8	1.9	1.4	1.2	1.3	0.9	**2.8**	2hr
WC1.04	19.1	21.5	18.0	17.3	16.0	16.6	13.3	**21.5**	2hr
WC1.05	20.4	23.0	19.3	19.0	17.6	18.2	14.6	**23.0**	2hr
WC6.04	21.7	23.9	22.3	22.5	21.7	22.0	17.6	**23.9**	2hr
WC14.0	1.4	1.6	1.4	1.4	1.2	1.3	0.9	**1.6**	2hr
WC1.051	3.3	3.9	3.1	2.9	2.6	2.7	1.9	**3.9**	2hr
WC1.06	26.3	28.9	26.9	27.1	26.1	27.0	21.3	**28.9**	2hr
WC13.0	2.1	2.5	2.1	2.1	1.8	2.0	1.4	**2.5**	2hr
WC5.1a	5.0	5.3	4.2	3.8	3.3	3.5	2.5	**5.3**	2hr
WC5.1b	7.0	7.5	5.7	4.9	4.4	4.6	3.2	**7.5**	2hr
WC1.07a	3.5	3.7	2.4	1.8	1.6	1.7	1.2	**3.7**	2hr
WC1.07	32.2	37.4	34.1	33.9	32.8	34.1	26.7	**37.4**	2hr
WC1.08	34.0	40.1	36.8	36.6	35.5	35.9	28.2	**40.1**	2hr
WC1.06b	1.1	1.2	0.8	0.6	0.5	0.5	0.4	**1.2**	2hr
WC1.06a	2.3	2.6	2.2	2.2	1.9	2.1	1.5	**2.6**	2hr

Catch ID	5 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC8.01	4.2	4.5	3.7	4.0	3.6	4.0	3.0	**4.5**	2hr
WC6.03	3.3	3.5	2.5	2.4	2.3	2.4	1.8	**3.5**	2hr
WC1.11	9.1	9.6	5.9	4.6	4.1	4.3	3.1	**9.6**	2hr
WC9.01	6.4	6.9	4.2	3.3	2.9	3.1	2.1	**6.9**	2hr
WC6.02	18.5	19.6	12.3	9.8	8.7	9.1	6.5	**19.6**	2hr
WC10a	22.3	23.0	16.0	13.6	12.2	13.0	9.2	**23.0**	2hr
WC10b	25.3	26.2	18.5	16.3	14.7	15.7	11.3	**26.2**	2hr
WC6.05	29.7	30.3	23.1	22.1	20.4	22.3	16.3	**30.3**	2hr
WC5.0	60.2	69.5	56.6	57.5	55.6	59.0	45.1	**69.5**	2hr
WC10.01	60.8	70.4	57.8	58.9	56.9	60.2	46.0	**70.4**	2hr
WC4.0	62.4	72.0	60.0	61.6	59.9	62.7	48.0	**72.0**	2hr
WC9.03	79.2	92.4	78.6	81.9	80.0	83.2	63.3	**92.4**	2hr
WC15.01	94.7	111.1	97.9	103.9	102.2	102.2	78.8	**111.1**	2hr
SS5	100.4	118.4	104.7	111.9	110.7	109.0	84.4	**118.4**	2hr
WC14.00	2.8	3.4	2.8	3.2	2.8	3.0	2.1	**3.4**	2hr
WC14.01	5.7	6.5	6.2	6.8	6.5	7.0	5.2	**7.0**	12hr
A2	1.7	1.7	1.0	0.7	0.6	0.6	0.4	**1.7**	2hr
A1	2.5	2.6	1.5	1.0	0.9	0.9	0.6	**2.6**	2hr
B2	4.4	4.6	2.6	1.8	1.6	1.6	1.1	**4.6**	2hr
B1	5.6	5.9	3.3	2.3	2.0	2.1	1.4	**5.9**	2hr
C2	3.6	3.8	2.1	1.4	1.2	1.3	0.8	**3.8**	2hr
C1	4.5	4.8	2.6	1.8	1.6	1.6	1.1	**4.8**	2hr
BasLucca	12.6	13.4	7.4	5.0	4.5	4.6	3.1	**13.4**	2hr
Bas_out	4.0	4.0	4.0	4.0	4.0	4.0	3.1	**4.0**	1hr
SS4	110.4	129.6	112.3	121.8	119.7	115.6	89.8	**129.6**	2hr
WC14.01b	4.5	4.7	2.7	2.1	1.9	2.0	1.4	**4.7**	2hr
WC15b	3.2	3.7	3.3	3.7	3.4	3.7	2.7	**3.7**	2hr
WC15a	4.3	5.1	4.7	5.2	4.8	5.3	3.9	**5.3**	12hr
SS3	5.7	7.2	6.9	7.7	8.9	8.6	6.3	**8.9**	9hr
WC1.16	118.0	140.8	123.2	134.3	133.6	126.2	98.6	**140.8**	2hr
PC1	121.1	146.1	129.6	141.5	142.9	132.9	104.2	**146.1**	2hr
BU11	2.5	2.7	2.5	2.8	3.6	3.4	2.6	**3.6**	9hr
BU12	4.3	5.6	6.4	7.1	8.6	7.6	5.7	**8.6**	9hr
BU13	5.0	6.6	7.6	8.6	10.3	9.0	6.9	**10.3**	9hr
BU5a	1.4	1.6	1.5	1.5	1.4	1.5	1.1	**1.6**	2hr
BU5b	6.1	6.5	4.1	3.8	3.7	4.1	3.0	**6.5**	2hr
BU10	4.4	5.4	5.0	5.2	4.9	5.1	3.9	**5.4**	2hr
BU9b	5.7	7.1	7.0	8.0	7.7	7.5	5.8	**8.0**	6hr
Dum3	10.1	12.4	11.9	13.1	12.6	12.6	9.6	**13.1**	6hr
BU1	16.1	20.3	19.7	21.6	20.6	19.9	15.5	**21.6**	6hr

Catch ID	5 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
BU2	21.1	29.6	29.9	33.0	34.0	30.1	24.2	**34.0**	9hr
BU3	24.2	34.7	35.7	39.6	41.3	35.8	29.0	**41.3**	9hr
BU4	24.8	35.9	37.3	41.3	43.2	36.9	30.3	**43.2**	9hr
Dum2	25.3	37.1	39.2	43.2	45.1	37.9	31.5	**45.1**	9hr
PC8	26.1	38.3	40.7	45.0	47.4	39.5	33.0	**47.4**	9hr
BU7	4.6	6.4	6.6	7.6	7.8	7.2	5.6	**7.8**	9hr
PC10	18.7	20.0	12.2	12.7	13.6	14.0	10.6	**20.0**	2hr
BU8	2.4	3.1	3.0	3.5	3.4	3.2	2.5	**3.5**	6hr
Dum4	19.6	20.9	13.7	16.2	16.9	17.2	13.1	**20.9**	2hr
BU9a	34.2	51.8	56.6	62.4	66.5	54.9	46.5	**66.5**	9hr
Dum1	38.5	58.1	64.2	70.9	76.4	63.7	52.6	**76.4**	9hr
PC9	40.8	61.2	69.0	77.8	84.7	68.9	60.5	**84.7**	9hr
PCBc	1.1	1.4	1.4	1.6	1.6	1.6	1.2	**1.6**	6hr
SS2	4.9	6.0	5.7	6.2	5.9	5.9	4.6	**6.2**	6hr
SS1	9.1	11.9	11.9	13.5	13.5	12.7	10.0	**13.5**	9hr
PC5	12.9	17.8	18.4	20.8	21.4	19.2	15.3	**21.4**	9hr
PC6a	16.1	22.3	23.3	26.1	26.9	23.6	19.0	**26.9**	9hr
PC6b	19.2	26.9	28.5	31.8	32.7	28.3	23.0	**32.7**	9hr
PC2	22.8	32.2	35.1	39.2	40.6	34.1	28.3	**40.6**	9hr
PCA	26.0	37.2	41.5	47.2	49.1	40.4	35.5	**49.1**	9hr
PC7	67.8	101.1	114.8	131.7	142.2	116.6	103.4	**142.2**	9hr
PC4	1.6	2.7	3.3	3.9	4.7	4.2	3.7	**4.7**	9hr
PCBa	3.6	4.5	4.3	4.6	4.3	4.4	3.4	**4.6**	6hr
PCBb	6.2	8.3	8.3	9.7	10.2	9.4	7.2	**10.2**	9hr
PC3	173.9	221.6	225.7	259.1	290.8	257.4	203.9	**290.8**	9hr
BU6c	1.8	1.9	1.5	1.6	1.4	1.6	1.2	**1.9**	2hr
BU6a	3.4	5.3	5.9	6.8	7.7	6.9	5.2	**7.7**	9hr
BU6b	179.7	231.1	235.3	271.6	303.8	267.8	214.5	**303.8**	9hr
BU6d	182.6	235.8	240.1	279.6	311.0	278.9	224.1	**311.0**	9hr
Out	182.6	235.8	240.1	279.6	311.0	278.9	224.1	**311.0**	9hr

Catch ID	10 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC1.15	6.0	7.6	7.3	8.1	7.8	8.0	6.1	**8.1**	6hr
WC12.0	6.9	7.3	5.7	5.9	5.4	5.8	4.2	**7.3**	2hr
WC11c	1.3	1.5	1.2	1.4	1.2	1.3	0.9	**1.5**	2hr
WC11d	3.4	4.0	3.8	4.1	3.8	4.2	3.1	**4.2**	12hr
WC11a	2.0	2.3	1.9	2.2	1.9	2.1	1.5	**2.3**	2hr
WC11b	5.1	5.9	5.4	5.8	5.4	5.9	4.4	**5.9**	12hr
WC11.0	10.8	13.0	12.3	13.4	13.4	14.4	10.8	**14.4**	12hr
WC11.01	13.9	17.1	16.5	18.6	18.7	19.1	14.5	**19.1**	12hr
WC9.04	9.6	10.1	6.5	5.4	4.8	5.1	3.7	**10.1**	2hr
WC9.0	12.0	12.8	10.5	11.2	10.0	11.1	8.4	**12.8**	2hr
WC6.06	14.9	15.7	13.8	14.6	14.1	14.6	11.2	**15.7**	2hr
WC1.10	6.0	6.4	5.2	5.3	4.7	5.0	3.5	**6.4**	2hr
WC9.02	20.1	23.0	20.2	21.6	20.8	21.9	16.8	**23.0**	2hr
WC2.02	9.2	9.7	6.3	5.0	4.4	4.6	3.3	**9.7**	2hr
WC1.0	6.9	7.3	4.5	3.5	3.1	3.3	2.3	**7.3**	2hr
WC1.01	9.4	10.8	7.2	5.7	5.1	5.3	3.8	**10.8**	2hr
WC1.02	8.8	8.6	7.2	6.3	5.8	6.1	4.8	**8.8**	1hr
WC2.0	5.7	6.0	3.8	3.1	2.8	3.0	2.2	**6.0**	2hr
WC2.01	8.2	8.3	6.3	5.6	5.2	5.5	4.3	**8.3**	2hr
WC7a	8.1	8.5	7.0	6.3	6.0	6.3	5.3	**8.5**	2hr
WC7b	8.8	10.8	9.3	8.4	7.8	8.4	6.8	**10.8**	2hr
WC2.03	9.1	11.3	9.8	9.0	8.3	8.9	7.2	**11.3**	2hr
WC1.03	18.8	21.6	18.1	16.5	15.1	16.1	12.9	**21.6**	2hr
WC3.0	3.1	3.3	2.2	1.6	1.4	1.4	1.0	**3.3**	2hr
WC1.04	21.7	24.6	20.5	19.4	17.9	18.7	15.0	**24.6**	2hr
WC1.05	23.3	26.3	22.0	21.4	19.7	20.5	16.5	**26.3**	2hr
WC6.04	24.1	27.0	24.8	25.1	24.1	24.4	20.3	**27.0**	2hr
WC14.0	1.7	2.0	1.7	1.6	1.4	1.5	1.0	**2.0**	2hr
WC1.051	3.8	4.6	3.7	3.3	3.0	3.1	2.2	**4.6**	2hr
WC1.06	29.5	32.7	30.1	30.2	28.8	30.2	24.5	**32.7**	2hr
WC13.0	2.6	3.1	2.6	2.4	2.1	2.2	1.6	**3.1**	2hr
WC5.1a	5.9	6.2	5.0	4.3	3.8	4.0	2.9	**6.2**	2hr
WC5.1b	8.2	8.7	6.7	5.7	5.0	5.2	3.7	**8.7**	2hr
WC1.07a	4.0	4.3	2.8	2.1	1.8	1.9	1.3	**4.3**	2hr
WC1.07	37.0	43.5	38.4	38.4	36.4	39.1	30.9	**43.5**	2hr
WC1.08	39.2	46.7	41.6	41.4	39.4	41.1	32.5	**46.7**	2hr
WC1.06b	1.3	1.4	0.9	0.7	0.6	0.6	0.4	**1.4**	2hr
WC1.06a	2.8	3.1	2.6	2.5	2.2	2.4	1.7	**3.1**	2hr
WC8.01	4.9	5.4	4.4	4.7	4.2	4.5	3.4	**5.4**	2hr

Catch ID	10 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC6.03	3.9	4.1	3.0	2.9	2.6	2.8	2.0	**4.1**	2hr
WC1.11	10.3	11.0	6.7	5.3	4.7	4.9	3.5	**11.0**	2hr
WC9.01	7.3	7.7	4.9	3.8	3.4	3.5	2.5	**7.7**	2hr
WC6.02	21.1	22.4	14.2	11.2	9.9	10.4	7.4	**22.4**	2hr
WC10a	25.5	26.3	18.6	15.7	14.0	14.8	10.6	**26.3**	2hr
WC10b	29.1	30.1	21.6	18.8	16.8	17.9	12.9	**30.1**	2hr
WC6.05	34.2	34.9	27.1	25.8	23.4	25.5	18.8	**34.9**	2hr
WC5.0	70.0	80.0	64.8	67.1	62.3	67.5	52.1	**80.0**	2hr
WC10.01	70.9	81.2	66.3	68.6	63.9	68.9	53.2	**81.2**	2hr
WC4.0	72.8	83.2	69.0	71.3	67.4	71.8	55.5	**83.2**	2hr
WC9.03	93.0	107.6	91.1	94.8	90.5	95.4	73.7	**107.6**	2hr
WC15.01	112.6	130.9	114.4	121.7	117.2	118.1	92.5	**130.9**	2hr
SS5	119.8	140.0	122.7	132.0	127.6	126.6	99.2	**140.0**	2hr
WC14.00	3.4	4.1	3.5	3.7	3.3	3.4	2.4	**4.1**	2hr
WC14.01	7.0	7.9	7.4	8.1	7.5	8.1	6.1	**8.1**	6hr
A2	1.9	2.0	1.1	0.7	0.7	0.7	0.5	**2.0**	2hr
A1	2.8	3.0	1.7	1.1	1.0	1.0	0.7	**3.0**	2hr
B2	4.9	5.3	2.9	2.0	1.8	1.8	1.2	**5.3**	2hr
B1	6.4	6.7	3.8	2.6	2.3	2.3	1.6	**6.7**	2hr
C2	4.1	4.3	2.4	1.6	1.4	1.4	0.9	**4.3**	2hr
C1	5.2	5.5	3.0	2.0	1.8	1.8	1.2	**5.5**	2hr
BasLucca	14.3	15.1	8.5	5.7	5.1	5.2	3.5	**15.1**	2hr
Bas_out	4.0	4.0	4.0	4.0	4.0	4.0	3.5	**4.0**	1hr
SS4	131.3	152.8	133.8	145.3	139.9	134.4	105.6	**152.8**	2hr
WC14.01b	5.1	5.3	3.1	2.4	2.2	2.3	1.6	**5.3**	2hr
WC15b	4.0	4.6	4.0	4.4	4.0	4.3	3.2	**4.6**	2hr
WC15a	5.3	6.2	5.6	6.2	5.6	6.1	4.5	**6.2**	2hr
SS3	7.2	8.7	8.2	9.1	10.7	10.3	7.6	**10.7**	9hr
WC1.16	140.8	166.4	146.9	160.3	157.0	146.8	116.1	**166.4**	2hr
PC1	145.0	173.0	155.0	169.4	168.2	155.1	123.1	**173.0**	2hr
BU11	3.0	3.2	3.1	3.4	4.3	4.0	3.0	**4.3**	9hr
BU12	5.3	6.9	7.7	8.7	10.2	9.2	7.0	**10.2**	9hr
BU13	6.2	8.2	9.3	10.5	12.2	10.8	8.3	**12.2**	9hr
BU5a	1.7	1.9	1.7	1.8	1.6	1.7	1.3	**1.9**	2hr
BU5b	7.0	7.5	4.8	4.4	4.3	4.7	3.5	**7.5**	2hr
BU10	5.5	6.4	5.9	6.1	5.6	5.9	4.5	**6.4**	2hr
BU9b	7.0	8.7	8.4	9.3	8.9	8.7	6.8	**9.3**	6hr
Dum3	12.4	15.0	14.3	15.1	14.4	14.6	11.3	**15.1**	6hr
BU1	20.0	24.4	23.5	25.3	23.8	23.2	18.1	**25.3**	6hr
BU2	26.1	35.6	35.7	38.9	39.6	35.2	28.5	**39.6**	9hr

Catch ID	10 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
BU3	30.1	41.9	42.8	46.8	48.1	41.9	34.3	**48.1**	9hr
BU4	30.7	43.2	44.7	48.9	50.3	43.2	35.8	**50.3**	9hr
Dum2	31.4	44.7	46.8	51.1	52.5	44.4	37.3	**52.5**	9hr
PC8	32.4	46.2	48.8	53.4	55.1	46.3	39.0	**55.1**	9hr
BU7	5.8	7.8	8.0	9.0	9.1	8.5	6.7	**9.1**	9hr
PC10	21.2	22.7	14.0	15.2	15.7	16.2	12.3	**22.7**	2hr
BU8	2.9	3.7	3.6	4.1	3.9	3.7	2.9	**4.1**	6hr
Dum4	22.4	24.0	16.2	19.3	19.6	19.9	15.3	**24.0**	2hr
BU9a	42.1	62.4	67.6	73.9	77.9	64.9	54.6	**77.9**	9hr
Dum1	47.0	70.1	76.8	84.1	89.5	75.5	62.0	**89.5**	9hr
PC9	49.4	74.1	82.9	92.4	99.8	82.0	71.6	**99.8**	9hr
PCBc	1.4	1.8	1.7	1.9	1.8	1.9	1.4	**1.9**	6hr
SS2	6.0	7.2	6.8	7.2	6.8	6.9	5.4	**7.2**	2hr
SS1	11.3	14.5	14.3	16.0	15.7	14.8	11.7	**16.0**	6hr
PC5	16.2	21.6	22.0	24.7	24.9	22.5	18.1	**24.9**	9hr
PC6a	20.1	27.1	27.9	31.1	31.2	27.8	22.4	**31.2**	9hr
PC6b	23.8	32.6	34.1	37.8	37.9	33.4	27.2	**37.9**	9hr
PC2	28.2	38.9	41.9	46.5	47.2	40.0	33.3	**47.2**	9hr
PCA	32.1	45.1	49.7	56.1	57.0	47.3	41.7	**57.0**	9hr
PC7	83.8	123.1	138.1	157.1	167.2	137.2	122.1	**167.2**	9hr
PC4	2.1	3.4	4.1	4.8	5.7	4.9	4.5	**5.7**	9hr
PCBa	4.5	5.4	5.1	5.3	5.0	5.1	3.9	**5.4**	2hr
PCBb	7.8	10.4	10.3	11.6	11.9	11.1	8.6	**11.9**	9hr
PC3	210.7	265.0	269.8	308.4	339.0	302.9	243.8	**339.0**	9hr
BU6c	2.1	2.2	1.8	1.8	1.6	1.8	1.3	**2.2**	2hr
BU6a	4.4	6.7	7.3	8.3	9.1	8.3	6.3	**9.1**	9hr
BU6b	217.8	276.9	282.6	323.3	354.3	314.9	256.5	**354.3**	9hr
BU6d	221.4	282.9	289.5	332.6	363.0	327.8	267.7	**363.0**	9hr
Out	221.4	282.9	289.5	332.6	363.0	327.8	267.7	**363.0**	9hr

Catch ID	20 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC1.15	8.0	9.7	9.1	9.8	9.3	9.6	7.4	**9.8**	6hr
WC12.0	8.5	9.0	7.1	7.3	6.4	6.9	5.0	**9.0**	2hr
WC11c	1.7	1.9	1.6	1.7	1.5	1.5	1.1	**1.9**	2hr
WC11d	4.4	5.1	4.5	5.1	4.6	5.0	3.7	**5.1**	2hr
WC11a	2.6	2.9	2.4	2.6	2.3	2.5	1.8	**2.9**	2hr
WC11b	6.6	7.4	6.5	7.2	6.4	7.0	5.2	**7.4**	2hr
WC11.0	14.0	16.2	15.2	16.4	15.9	17.2	13.0	**17.2**	12hr
WC11.01	18.1	21.6	20.7	22.9	22.4	23.0	17.5	**23.0**	12hr
WC9.04	11.2	11.9	7.8	6.4	5.7	6.0	4.3	**11.9**	2hr
WC9.0	14.4	15.3	12.9	13.4	11.9	13.2	9.9	**15.3**	2hr
WC6.06	18.0	19.1	16.6	17.8	16.6	17.3	13.4	**19.1**	2hr
WC1.10	7.4	7.9	6.6	6.3	5.5	5.8	4.1	**7.9**	2hr
WC9.02	24.6	28.5	24.5	26.3	24.5	26.0	20.1	**28.5**	2hr
WC2.02	10.7	11.3	7.5	5.8	5.2	5.4	3.8	**11.3**	2hr
WC1.0	8.0	8.5	5.3	4.1	3.7	3.8	2.7	**8.5**	2hr
WC1.01	11.0	12.6	8.5	6.6	5.9	6.2	4.4	**12.6**	2hr
WC1.02	9.8	9.7	8.1	7.0	6.5	6.8	5.5	**9.8**	1hr
WC2.0	6.6	7.0	4.5	3.7	3.3	3.5	2.5	**7.0**	2hr
WC2.01	9.2	9.5	7.1	6.3	5.8	6.1	4.9	**9.5**	2hr
WC7a	9.3	9.8	7.9	7.1	6.6	7.1	5.9	**9.8**	2hr
WC7b	10.5	12.6	10.8	9.6	8.8	9.5	7.7	**12.6**	2hr
WC2.03	10.9	13.3	11.4	10.3	9.4	10.2	8.2	**13.3**	2hr
WC1.03	21.9	25.1	20.9	18.7	17.2	18.3	14.7	**25.1**	2hr
WC3.0	3.7	3.9	2.6	1.8	1.6	1.7	1.1	**3.9**	2hr
WC1.04	25.4	28.9	23.9	22.2	20.5	21.4	17.3	**28.9**	2hr
WC1.05	27.4	31.1	25.8	24.6	22.7	23.5	19.0	**31.1**	2hr
WC6.04	27.9	31.5	28.7	28.9	27.5	27.4	23.2	**31.5**	2hr
WC14.0	2.1	2.5	2.1	1.8	1.6	1.7	1.2	**2.5**	2hr
WC1.051	4.6	5.6	4.6	3.9	3.5	3.6	2.6	**5.6**	2hr
WC1.06	34.5	38.4	35.0	34.9	33.0	34.3	28.1	**38.4**	2hr
WC13.0	3.2	3.8	3.3	2.8	2.5	2.6	1.9	**3.8**	2hr
WC5.1a	7.1	7.5	6.1	5.1	4.5	4.7	3.3	**7.5**	2hr
WC5.1b	9.9	10.5	8.1	6.6	5.9	6.1	4.3	**10.5**	2hr
WC1.07a	4.7	5.1	3.3	2.4	2.1	2.2	1.5	**5.1**	2hr
WC1.07	43.2	50.4	44.6	44.7	41.7	44.3	35.8	**50.4**	2hr
WC1.08	47.0	54.4	48.4	48.4	45.3	46.6	38.1	**54.4**	2hr
WC1.06b	1.6	1.6	1.1	0.8	0.7	0.7	0.5	**1.6**	2hr
WC1.06a	3.4	3.9	3.3	3.0	2.6	2.8	2.0	**3.9**	2hr
WC8.01	6.0	6.4	5.4	5.6	4.9	5.3	4.0	**6.4**	2hr

Catch ID	20 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC6.03	4.7	5.0	3.7	3.5	3.1	3.3	2.4	**5.0**	2hr
WC1.11	12.0	12.8	8.0	6.2	5.5	5.7	4.1	**12.8**	2hr
WC9.01	8.5	9.0	5.8	4.4	3.9	4.1	2.9	**9.0**	2hr
WC6.02	24.7	26.1	16.8	13.1	11.6	12.1	8.6	**26.1**	2hr
WC10a	29.9	31.1	22.3	18.5	16.4	17.3	12.4	**31.1**	2hr
WC10b	34.2	35.6	26.0	22.2	19.8	21.0	15.2	**35.6**	2hr
WC6.05	40.4	41.3	32.8	30.8	27.6	29.9	22.2	**41.3**	2hr
WC5.0	83.5	94.8	76.7	80.6	72.7	77.6	60.8	**94.8**	2hr
WC10.01	84.7	96.3	78.1	82.6	74.5	79.3	62.3	**96.3**	2hr
WC4.0	87.2	99.0	81.6	86.1	78.2	82.8	65.2	**99.0**	2hr
WC9.03	112.4	129.5	108.4	114.4	105.5	110.8	87.3	**129.5**	2hr
WC15.01	138.0	159.6	137.4	147.3	137.6	139.3	110.4	**159.6**	2hr
SS5	147.5	171.2	147.6	159.8	151.3	149.8	118.7	**171.2**	2hr
WC14.00	4.4	5.2	4.4	4.3	3.8	4.0	2.9	**5.2**	2hr
WC14.01	8.8	9.8	9.0	9.8	8.9	9.5	7.2	**9.8**	2hr
A2	2.2	2.3	1.3	0.9	0.8	0.8	0.5	**2.3**	2hr
A1	3.2	3.4	1.9	1.3	1.2	1.2	0.8	**3.4**	2hr
B2	5.7	6.1	3.4	2.3	2.1	2.1	1.4	**6.1**	2hr
B1	7.4	7.9	4.4	3.0	2.7	2.7	1.9	**7.9**	2hr
C2	4.8	5.1	2.8	1.8	1.6	1.7	1.1	**5.1**	2hr
C1	6.0	6.4	3.5	2.3	2.1	2.1	1.4	**6.4**	2hr
BasLucca	16.6	17.6	9.8	6.6	5.9	6.0	4.1	**17.6**	2hr
Bas_out	4.0	4.0	4.0	4.0	4.0	4.0	4.0	**4.0**	1hr
SS4	160.9	186.0	160.2	174.9	166.9	160.9	126.6	**186.0**	2hr
WC14.01b	5.9	6.3	3.7	2.9	2.6	2.7	1.9	**6.3**	2hr
WC15b	5.3	5.9	4.9	5.4	4.8	5.1	3.8	**5.9**	2hr
WC15a	7.0	7.8	6.8	7.6	6.7	7.3	5.4	**7.8**	2hr
SS3	9.5	10.9	10.1	11.2	13.0	12.7	9.4	**13.0**	9hr
WC1.16	173.4	203.0	176.3	193.4	187.5	176.5	139.5	**203.0**	2hr
PC1	179.0	211.8	186.7	205.1	201.3	186.6	148.4	**211.8**	2hr
BU11	3.6	3.8	3.9	4.4	5.2	4.9	3.7	**5.2**	9hr
BU12	6.6	9.0	9.7	11.1	12.3	11.3	8.8	**12.3**	9hr
BU13	7.8	10.7	11.7	13.3	14.9	13.3	10.5	**14.9**	9hr
BU5a	2.1	2.3	2.1	2.2	1.9	2.1	1.6	**2.3**	2hr
BU5b	8.1	8.7	5.7	5.4	5.1	5.5	4.1	**8.7**	2hr
BU10	6.9	7.8	7.0	7.3	6.6	7.0	5.4	**7.8**	2hr
BU9b	9.0	10.8	10.4	11.1	10.5	10.4	8.2	**11.1**	6hr
Dum3	15.7	18.5	17.3	18.0	17.0	17.4	13.6	**18.5**	2hr
BU1	25.4	29.9	28.4	30.2	28.3	27.5	21.7	**30.2**	6hr
BU2	33.4	44.0	43.8	47.2	47.1	42.2	34.5	**47.2**	6hr

Catch ID	20 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
BU3	38.6	51.9	52.6	56.9	57.3	50.3	41.5	**57.3**	9hr
BU4	39.4	53.5	54.9	59.4	59.9	51.8	43.4	**59.9**	9hr
Dum2	40.3	55.2	57.5	62.1	62.4	53.2	45.2	**62.4**	9hr
PC8	41.5	57.3	60.0	64.9	65.7	55.6	47.4	**65.7**	9hr
BU7	7.5	9.8	9.8	11.1	10.9	10.2	8.2	**11.1**	6hr
PC10	24.6	26.6	16.6	18.4	18.6	19.2	14.8	**26.6**	2hr
BU8	3.7	4.6	4.5	4.9	4.6	4.5	3.5	**4.9**	6hr
Dum4	26.2	28.1	20.0	23.3	23.2	23.7	18.3	**28.1**	2hr
BU9a	53.8	77.6	82.8	90.0	93.4	78.6	65.3	**93.4**	9hr
Dum1	60.2	88.0	94.4	103.1	107.5	91.6	74.8	**107.5**	9hr
PC9	63.3	93.4	102.5	113.4	120.3	100.0	86.3	**120.3**	9hr
PCBc	1.8	2.3	2.1	2.3	2.2	2.2	1.7	**2.3**	6hr
SS2	7.6	8.9	8.3	8.6	8.0	8.2	6.4	**8.9**	2hr
SS1	14.5	18.2	17.7	19.4	18.8	17.8	14.1	**19.4**	6hr
PC5	20.7	27.1	27.2	30.1	29.8	27.1	21.8	**30.1**	6hr
PC6a	25.7	33.7	34.3	37.7	37.1	33.3	27.4	**37.7**	6hr
PC6b	30.2	40.4	41.8	45.8	45.2	39.9	33.2	**45.8**	6hr
PC2	35.7	49.0	51.4	56.5	56.2	47.7	40.5	**56.5**	6hr
PCA	40.5	56.4	61.4	68.3	67.8	56.5	50.4	**68.3**	6hr
PC7	106.7	155.6	172.0	193.0	201.1	165.2	148.0	**201.1**	9hr
PC4	2.7	4.5	5.3	6.0	7.0	5.8	5.5	**7.0**	9hr
PCBa	5.7	6.6	6.1	6.3	5.8	6.0	4.7	**6.6**	2hr
PCBb	10.2	13.1	12.8	14.3	14.4	13.4	10.6	**14.4**	9hr
PC3	262.3	327.9	333.1	378.0	406.9	365.3	297.7	**406.9**	9hr
BU6c	2.5	2.6	2.2	2.2	1.9	2.1	1.6	**2.6**	2hr
BU6a	6.1	8.7	9.1	10.4	11.1	10.1	8.0	**11.1**	9hr
BU6b	270.8	342.9	348.0	396.0	425.2	379.9	313.2	**425.2**	9hr
BU6d	275.4	350.4	357.0	407.2	435.3	394.8	326.6	**435.3**	9hr
Out	275.4	350.4	357.0	407.2	435.3	394.8	326.6	**435.3**	9hr

Catch ID	50 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC1.15	10.4	12.1	11.0	11.3	10.5	10.8	8.4	**12.1**	2hr
WC12.0	9.8	10.3	8.4	8.2	7.2	7.7	5.6	**10.3**	2hr
WC11c	2.1	2.4	1.9	1.9	1.6	1.7	1.2	**2.4**	2hr
WC11d	5.6	6.4	5.3	5.8	5.1	5.6	4.2	**6.4**	2hr
WC11a	3.3	3.5	2.9	2.9	2.6	2.7	2.0	**3.5**	2hr
WC11b	8.5	9.1	7.7	8.3	7.2	7.9	5.8	**9.1**	2hr
WC11.0	18.2	19.9	18.1	18.9	18.0	19.5	14.7	**19.9**	2hr
WC11.01	23.8	26.8	25.0	26.5	25.5	26.2	20.0	**26.8**	2hr
WC9.04	12.6	13.2	8.8	7.0	6.3	6.6	4.7	**13.2**	2hr
WC9.0	16.8	18.0	15.0	15.3	13.4	14.7	11.0	**18.0**	2hr
WC6.06	21.2	22.2	19.8	20.5	18.8	19.5	15.1	**22.2**	2hr
WC1.10	8.7	9.7	7.9	7.0	6.2	6.5	4.6	**9.7**	2hr
WC9.02	29.8	34.2	29.1	30.4	27.6	29.3	22.5	**34.2**	2hr
WC2.02	12.0	12.6	8.5	6.4	5.7	5.9	4.2	**12.6**	2hr
WC1.0	8.9	9.4	5.9	4.6	4.0	4.2	3.0	**9.4**	2hr
WC1.01	12.4	14.2	9.6	7.4	6.5	6.8	4.9	**14.2**	2hr
WC1.02	10.6	10.7	8.6	7.5	6.9	7.2	6.0	**10.7**	2hr
WC2.0	7.4	7.8	5.1	4.1	3.7	3.9	2.8	**7.8**	2hr
WC2.01	10.1	10.4	7.8	6.8	6.3	6.6	5.3	**10.4**	2hr
WC7a	10.3	10.8	8.6	8.1	7.5	7.6	6.4	**10.8**	2hr
WC7b	12.2	14.4	12.0	10.5	9.7	10.4	8.4	**14.4**	2hr
WC2.03	12.7	15.3	12.8	11.3	10.3	11.1	8.9	**15.3**	2hr
WC1.03	24.8	28.4	23.1	20.4	18.7	19.9	16.0	**28.4**	2hr
WC3.0	4.2	4.4	2.9	2.0	1.8	1.8	1.3	**4.4**	2hr
WC1.04	29.2	32.9	26.8	24.4	22.4	23.4	18.9	**32.9**	2hr
WC1.05	31.8	35.6	29.2	27.1	24.9	25.9	20.9	**35.6**	2hr
WC6.04	32.7	35.9	32.6	32.0	30.2	30.3	25.1	**35.9**	2hr
WC14.0	2.6	3.0	2.5	2.1	1.8	1.9	1.3	**3.0**	2hr
WC1.051	5.4	6.6	5.3	4.3	3.8	4.0	2.9	**6.6**	2hr
WC1.06	40.8	44.1	39.8	38.8	36.5	37.9	30.6	**44.1**	2hr
WC13.0	3.8	4.5	3.8	3.1	2.8	2.9	2.1	**4.5**	2hr
WC5.1a	8.2	8.7	7.0	5.6	5.0	5.2	3.7	**8.7**	2hr
WC5.1b	11.4	12.0	9.3	7.3	6.5	6.8	4.8	**12.0**	2hr
WC1.07a	5.3	5.6	3.7	2.6	2.4	2.4	1.7	**5.6**	2hr
WC1.07	51.4	56.7	50.8	49.5	46.3	48.8	39.0	**56.7**	2hr
WC1.08	55.0	61.3	55.2	53.6	50.2	51.5	41.6	**61.3**	2hr
WC1.06b	1.7	1.8	1.2	0.9	0.8	0.8	0.5	**1.8**	2hr
WC1.06a	4.0	4.6	3.8	3.3	2.9	3.1	2.2	**4.6**	2hr
WC8.01	7.2	7.6	6.4	6.3	5.5	5.9	4.4	**7.6**	2hr

Catch ID	50 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC6.03	5.3	5.6	4.3	3.9	3.5	3.7	2.6	**5.6**	2hr
WC1.11	13.4	14.2	9.0	6.8	6.1	6.3	4.5	**14.2**	2hr
WC9.01	9.5	10.0	6.5	4.8	4.3	4.5	3.2	**10.0**	2hr
WC6.02	27.5	29.0	19.0	14.5	12.9	13.4	9.5	**29.0**	2hr
WC10a	33.7	34.8	25.4	20.6	18.2	19.1	13.7	**34.8**	2hr
WC10b	38.7	40.0	29.7	24.8	22.0	23.2	16.8	**40.0**	2hr
WC6.05	45.9	47.4	37.7	34.8	30.8	33.2	24.6	**47.4**	2hr
WC5.0	97.0	109.0	87.8	90.1	81.0	86.0	66.9	**109.0**	2hr
WC10.01	98.6	111.0	90.1	92.3	83.1	87.9	68.6	**111.0**	2hr
WC4.0	101.8	114.4	94.4	96.6	87.4	91.9	72.0	**114.4**	2hr
WC9.03	132.2	151.1	126.2	129.6	118.0	123.4	96.8	**151.1**	2hr
WC15.01	165.5	188.8	161.3	168.1	154.7	155.7	123.6	**188.8**	2hr
SS5	178.1	203.3	173.6	182.5	170.6	168.1	133.4	**203.3**	2hr
WC14.00	5.5	6.5	5.3	4.8	4.3	4.5	3.2	**6.5**	2hr
WC14.01	11.4	12.4	10.5	11.1	10.0	10.7	8.0	**12.4**	2hr
A2	2.4	2.5	1.4	0.9	0.8	0.9	0.6	**2.5**	2hr
A1	3.6	3.8	2.1	1.4	1.3	1.3	0.9	**3.8**	2hr
B2	6.3	6.7	3.7	2.5	2.3	2.3	1.6	**6.7**	2hr
B1	8.1	8.6	4.8	3.2	2.9	3.0	2.1	**8.6**	2hr
C2	5.3	5.6	3.1	2.0	1.8	1.8	1.2	**5.6**	2hr
C1	6.6	7.0	3.9	2.6	2.3	2.3	1.6	**7.0**	2hr
BasLucca	18.3	19.3	10.8	7.2	6.5	6.6	4.5	**19.3**	2hr
Bas_out	4.0	4.0	4.0	4.0	4.0	4.0	4.0	**4.0**	1hr
SS4	194.1	220.3	188.0	199.3	187.7	181.7	143.9	**220.3**	2hr
WC14.01b	6.5	6.9	4.2	3.2	2.9	3.0	2.1	**6.9**	2hr
WC15b	6.7	7.4	6.0	6.1	5.4	5.7	4.2	**7.4**	2hr
WC15a	8.9	9.6	8.1	8.6	7.6	8.1	6.0	**9.6**	2hr
SS3	12.2	13.5	12.1	13.2	15.4	15.0	11.2	**15.4**	9hr
WC1.16	210.2	241.6	207.9	221.3	212.0	199.9	160.6	**241.6**	2hr
PC1	217.9	253.3	221.4	235.8	228.3	211.8	171.6	**253.3**	2hr
BU11	4.2	4.6	5.0	5.3	6.2	5.9	4.5	**6.2**	9hr
BU12	8.4	11.6	12.2	13.5	14.4	13.4	10.5	**14.4**	9hr
BU13	9.9	13.9	14.7	16.2	17.4	15.9	12.5	**17.4**	9hr
BU5a	2.7	2.8	2.4	2.4	2.2	2.3	1.8	**2.8**	2hr
BU5b	9.1	9.7	6.5	6.1	5.7	6.2	4.6	**9.7**	2hr
BU10	8.8	9.4	8.2	8.2	7.5	7.9	6.1	**9.4**	2hr
BU9b	11.5	13.4	12.4	12.6	11.8	11.8	9.3	**13.4**	2hr
Dum3	20.0	22.6	20.5	20.6	19.1	19.7	15.3	**22.6**	2hr
BU1	32.3	36.4	33.6	34.5	32.0	31.1	24.5	**36.4**	2hr
BU2	42.8	54.6	52.7	54.9	54.0	48.8	39.8	**54.9**	6hr

Catch ID	50 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
BU3	49.5	64.7	63.7	66.6	65.7	58.3	48.1	**66.6**	6hr
BU4	50.6	66.8	66.6	69.6	68.8	60.1	50.3	**69.6**	6hr
Dum2	51.7	69.1	69.8	72.8	71.9	61.8	52.6	**72.8**	6hr
PC8	53.4	71.8	73.0	76.3	75.8	64.8	55.2	**76.3**	6hr
BU7	9.8	12.2	11.9	13.1	12.5	11.9	9.4	**13.1**	6hr
PC10	27.3	29.4	18.8	21.6	21.2	21.8	16.9	**29.4**	2hr
BU8	4.8	5.6	5.4	5.6	5.2	5.2	4.0	**5.6**	2hr
Dum4	29.4	31.5	24.1	27.1	26.4	27.0	20.9	**31.5**	2hr
BU9a	69.1	98.0	101.5	106.5	108.4	93.0	76.8	**108.4**	9hr
Dum1	77.4	111.6	116.3	122.1	124.8	108.6	88.4	**124.8**	9hr
PC9	81.6	118.8	127.0	135.0	140.7	119.6	100.8	**140.7**	9hr
PCBc	2.4	2.8	2.5	2.6	2.4	2.5	2.0	**2.8**	2hr
SS2	9.6	10.8	9.8	9.7	9.0	9.3	7.3	**10.8**	2hr
SS1	18.7	22.4	21.3	22.6	21.5	20.4	16.2	**22.6**	6hr
PC5	27.0	33.7	33.0	35.4	34.1	31.2	25.2	**35.4**	6hr
PC6a	33.2	41.8	41.6	44.2	42.6	38.7	31.5	**44.2**	6hr
PC6b	39.1	50.4	50.7	53.8	52.0	46.3	38.2	**53.8**	6hr
PC2	46.0	61.0	62.5	66.5	64.8	55.6	46.9	**66.5**	6hr
PCA	51.9	70.2	75.1	80.4	78.2	65.7	58.3	**80.4**	6hr
PC7	137.7	197.2	212.9	229.7	235.3	195.6	173.9	**235.3**	9hr
PC4	3.7	6.0	6.8	7.4	8.5	7.3	6.3	**8.5**	9hr
PCBa	7.3	8.0	7.2	7.2	6.6	6.8	5.3	**8.0**	2hr
PCBb	13.4	16.6	15.7	16.8	16.5	15.5	12.3	**16.8**	6hr
PC3	330.8	403.9	407.2	446.1	471.4	426.8	348.1	**471.4**	9hr
BU6c	2.9	3.1	2.5	2.5	2.2	2.3	1.7	**3.1**	2hr
BU6a	8.4	11.2	11.3	12.6	12.9	12.0	9.4	**12.9**	9hr
BU6b	341.7	420.6	425.1	467.9	493.1	443.8	366.5	**493.1**	9hr
BU6d	347.3	428.9	434.6	481.4	505.6	461.0	381.9	**505.6**	9hr
Out	347.3	428.9	434.6	481.4	505.6	461.0	381.9	**505.6**	9hr

Catch ID	100 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC1.15	12.5	14.1	12.7	12.9	11.9	12.4	9.6	**14.1**	2hr
WC12.0	11.3	12.1	10.0	9.3	8.2	8.7	6.3	**12.1**	2hr
WC11c	2.5	2.8	2.3	2.1	1.9	2.0	1.4	**2.8**	2hr
WC11d	6.6	7.5	6.4	6.6	5.8	6.3	4.7	**7.5**	2hr
WC11a	3.8	4.2	3.4	3.3	2.9	3.1	2.3	**4.2**	2hr
WC11b	10.0	10.8	8.9	9.5	8.2	8.9	6.6	**10.8**	2hr
WC11.0	21.7	23.2	20.9	21.8	20.4	22.2	16.8	**23.2**	2hr
WC11.01	28.4	31.5	29.0	30.4	28.9	29.9	22.9	**31.5**	2hr
WC9.04	14.2	14.9	10.0	7.9	7.0	7.4	5.3	**14.9**	2hr
WC9.0	19.5	20.9	17.6	17.4	15.2	16.6	12.5	**20.9**	2hr
WC6.06	24.7	25.9	22.8	23.5	21.2	22.1	17.2	**25.9**	2hr
WC1.10	10.1	11.4	9.4	7.9	7.0	7.3	5.2	**11.4**	2hr
WC9.02	35.1	39.9	33.5	34.8	31.3	33.3	25.6	**39.9**	2hr
WC2.02	13.6	14.2	9.6	7.2	6.4	6.6	4.7	**14.2**	2hr
WC1.0	10.1	10.6	6.7	5.1	4.5	4.7	3.4	**10.6**	2hr
WC1.01	14.0	15.9	10.8	8.2	7.3	7.6	5.5	**15.9**	2hr
WC1.02	11.5	11.6	9.3	8.0	7.5	7.8	6.5	**11.6**	2hr
WC2.0	8.3	8.7	5.8	4.7	4.1	4.4	3.2	**8.7**	2hr
WC2.01	11.1	11.5	8.5	7.5	6.8	7.2	5.8	**11.5**	2hr
WC7a	11.4	11.9	9.6	9.5	9.0	8.5	6.9	**11.9**	2hr
WC7b	13.8	16.2	13.4	11.8	11.0	11.4	9.1	**16.2**	2hr
WC2.03	14.5	17.2	14.3	12.5	11.6	12.2	9.7	**17.2**	2hr
WC1.03	27.7	31.8	25.7	22.4	20.5	21.7	17.5	**31.8**	2hr
WC3.0	4.7	4.9	3.2	2.2	2.0	2.0	1.4	**4.9**	2hr
WC1.04	32.7	36.9	29.8	26.9	24.6	25.8	20.8	**36.9**	2hr
WC1.05	35.7	40.1	32.7	29.9	27.5	28.6	23.1	**40.1**	2hr
WC6.04	36.4	39.7	36.2	35.3	33.4	33.7	27.9	**39.7**	2hr
WC14.0	2.9	3.4	2.9	2.3	2.0	2.1	1.5	**3.4**	2hr
WC1.051	6.3	7.5	6.0	4.9	4.3	4.5	3.2	**7.5**	2hr
WC1.06	45.6	48.9	44.4	42.9	40.4	42.1	34.1	**48.9**	2hr
WC13.0	4.5	5.3	4.4	3.5	3.1	3.3	2.3	**5.3**	2hr
WC5.1a	9.4	9.9	8.0	6.3	5.6	5.8	4.1	**9.9**	2hr
WC5.1b	13.0	13.7	10.7	8.2	7.3	7.6	5.4	**13.7**	2hr
WC1.07a	6.0	6.3	4.2	3.0	2.6	2.7	1.9	**6.3**	2hr
WC1.07	58.0	63.4	56.7	55.3	51.4	54.4	43.4	**63.4**	2hr
WC1.08	62.0	68.7	61.7	60.0	55.8	57.4	46.1	**68.7**	2hr
WC1.06b	2.0	2.1	1.4	1.0	0.9	0.9	0.6	**2.1**	2hr
WC1.06a	4.7	5.3	4.4	3.7	3.3	3.5	2.5	**5.3**	2hr
WC8.01	8.5	8.8	7.4	7.1	6.2	6.7	5.0	**8.8**	2hr

Catch ID	100 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC6.03	6.1	6.5	5.0	4.4	3.9	4.1	3.0	**6.5**	2hr
WC1.11	15.0	15.9	10.1	7.7	6.8	7.1	5.1	**15.9**	2hr
WC9.01	10.7	11.2	7.4	5.4	4.8	5.0	3.5	**11.2**	2hr
WC6.02	31.0	32.5	21.6	16.2	14.4	14.9	10.7	**32.5**	2hr
WC10a	38.1	39.4	29.1	23.1	20.5	21.4	15.4	**39.4**	2hr
WC10b	43.8	45.4	34.0	27.9	24.8	26.0	18.9	**45.4**	2hr
WC6.05	52.1	54.2	43.5	39.4	34.8	37.4	27.8	**54.2**	2hr
WC5.0	110.9	123.2	102.5	101.2	90.4	96.3	74.7	**123.2**	2hr
WC10.01	112.9	125.7	104.6	103.8	92.8	98.5	76.6	**125.7**	2hr
WC4.0	116.7	129.7	108.1	108.9	97.6	103.1	80.6	**129.7**	2hr
WC9.03	152.0	172.5	143.2	146.9	132.4	138.8	108.8	**172.5**	2hr
WC15.01	191.7	217.4	183.9	191.2	174.4	175.4	139.3	**217.4**	2hr
SS5	206.6	234.2	197.9	207.8	192.5	189.7	150.6	**234.2**	2hr
WC14.00	6.5	7.7	6.4	5.5	4.8	5.0	3.6	**7.7**	2hr
WC14.01	13.6	14.8	12.5	12.7	11.4	12.1	9.1	**14.8**	2hr
A2	2.7	2.8	1.6	1.1	0.9	1.0	0.7	**2.8**	2hr
A1	4.0	4.2	2.3	1.6	1.4	1.4	1.0	**4.2**	2hr
B2	7.0	7.4	4.2	2.8	2.5	2.6	1.8	**7.4**	2hr
B1	9.0	9.5	5.4	3.6	3.2	3.3	2.3	**9.5**	2hr
C2	5.9	6.3	3.4	2.3	2.0	2.1	1.4	**6.3**	2hr
C1	7.4	7.8	4.3	2.9	2.6	2.6	1.8	**7.8**	2hr
BasLucca	20.4	21.5	12.1	8.1	7.3	7.4	5.1	**21.5**	2hr
Bas_out	4.0	4.0	4.0	4.0	4.0	4.0	4.0	**4.0**	1hr
SS4	224.5	253.0	215.1	226.3	211.4	204.5	163.5	**253.0**	2hr
WC14.01b	7.4	7.8	4.7	3.6	3.2	3.3	2.4	**7.8**	2hr
WC15b	8.0	8.8	7.1	7.0	6.1	6.5	4.7	**8.8**	2hr
WC15a	10.6	11.4	9.4	9.8	8.6	9.2	6.8	**11.4**	2hr
SS3	14.5	16.0	14.1	15.3	17.6	17.3	13.1	**17.6**	9hr
WC1.16	243.7	277.9	239.1	251.8	239.1	225.4	182.8	**277.9**	2hr
PC1	253.0	292.0	253.7	269.0	257.7	239.1	195.6	**292.0**	2hr
BU11	4.8	5.5	6.0	6.3	7.1	6.8	5.2	**7.1**	9hr
BU12	10.2	13.9	14.3	15.9	16.5	15.5	12.2	**16.5**	9hr
BU13	12.0	16.6	17.3	19.1	19.8	18.4	14.6	**19.8**	9hr
BU5a	3.1	3.2	2.8	2.7	2.5	2.6	2.0	**3.2**	2hr
BU5b	10.2	10.9	7.4	6.9	6.5	7.0	5.3	**10.9**	2hr
BU10	10.3	10.9	9.4	9.4	8.4	8.9	6.9	**10.9**	2hr
BU9b	13.6	15.5	14.3	14.3	13.3	13.5	10.6	**15.5**	2hr
Dum3	23.6	26.0	23.5	23.4	21.6	22.4	17.5	**26.0**	2hr
BU1	38.2	42.1	38.6	39.2	36.2	35.3	27.9	**42.1**	2hr
BU2	50.7	63.1	60.9	63.0	61.4	55.7	45.5	**63.1**	2hr

Catch ID	100 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
BU3	58.7	74.8	73.7	76.4	74.7	66.4	55.2	**76.4**	6hr
BU4	60.0	77.3	77.0	79.9	78.2	68.5	57.7	**79.9**	6hr
Dum2	61.3	80.0	80.6	83.6	81.7	70.5	60.2	**83.6**	6hr
PC8	63.4	83.2	84.4	87.7	86.2	73.9	63.3	**87.7**	6hr
BU7	11.6	14.3	13.9	15.0	14.2	13.6	10.8	**15.0**	6hr
PC10	30.7	32.9	21.9	24.7	24.0	24.7	19.2	**32.9**	2hr
BU8	5.7	6.6	6.2	6.3	5.9	5.9	4.7	**6.6**	2hr
Dum4	33.2	35.5	28.0	31.0	29.9	30.6	23.8	**35.5**	2hr
BU9a	81.8	114.6	118.0	123.0	123.1	106.2	88.3	**123.1**	9hr
Dum1	91.7	130.7	135.2	141.6	141.9	124.2	101.9	**141.9**	9hr
PC9	97.0	139.5	148.0	156.5	160.4	137.3	115.5	**160.4**	9hr
PCBc	2.9	3.3	2.9	3.0	2.8	2.8	2.2	**3.3**	2hr
SS2	11.3	12.5	11.2	11.1	10.2	10.5	8.3	**12.5**	2hr
SS1	22.1	26.1	24.7	25.9	24.4	23.2	18.5	**26.1**	2hr
PC5	31.9	39.4	38.3	40.6	38.8	35.5	28.9	**40.6**	6hr
PC6a	38.9	48.9	48.0	50.6	48.4	44.3	36.1	**50.6**	6hr
PC6b	45.6	58.8	58.6	61.7	59.1	53.0	43.7	**61.7**	6hr
PC2	53.7	71.2	72.3	76.4	73.5	63.3	53.7	**76.4**	6hr
PCA	60.4	81.5	86.7	92.0	88.7	74.4	66.5	**92.0**	6hr
PC7	162.4	230.7	247.4	265.6	267.9	224.0	199.6	**267.9**	9hr
PC4	4.7	7.2	8.1	8.7	9.8	8.6	7.2	**9.8**	9hr
PCBa	8.5	9.3	8.2	8.1	7.4	7.8	6.1	**9.3**	2hr
PCBb	16.0	19.4	18.3	19.5	18.9	17.8	14.1	**19.5**	6hr
PC3	385.9	468.7	469.6	512.9	535.4	485.9	401.3	**535.4**	9hr
BU6c	3.3	3.6	3.0	2.8	2.5	2.7	2.0	**3.6**	2hr
BU6a	10.1	13.4	13.3	14.8	14.8	13.9	10.9	**14.8**	9hr
BU6b	398.5	488.0	490.6	537.7	560.1	505.0	422.4	**560.1**	9hr
BU6d	404.9	498.6	502.7	552.9	574.5	524.2	439.9	**574.5**	9hr
Out	404.9	498.6	502.7	552.9	574.5	524.2	439.9	**574.5**	9hr

Catch ID	**Climate Change 100 yr + 15% ARI Design Storms**			
	Estimated Peak Discharge (m^3/s)			
	2hr	**9hr**	**Max**	Duration
WC1.15	17.257	13.843	**17.3**	2hr
WC12.0	14.978	9.514	**15.0**	2hr
WC11c	3.482	2.181	**3.5**	2hr
WC11d	9.406	6.823	**9.4**	2hr
WC11a	5.34	3.418	**5.3**	2hr
WC11b	13.763	9.676	**13.8**	2hr
WC11.0	29.021	23.85	**29.0**	2hr
WC11.01	38.588	33.721	**38.6**	2hr
WC9.04	17.408	8.1	**17.4**	2hr
WC9.0	25.53	17.668	**25.5**	2hr
WC6.06	31.969	24.604	**32.0**	2hr
WC1.10	13.986	8.15	**14.0**	2hr
WC9.02	49.367	36.591	**49.4**	2hr
WC2.02	16.68	7.38	**16.7**	2hr
WC1.0	12.363	5.243	**12.4**	2hr
WC1.01	18.714	8.46	**18.7**	2hr
WC1.02	13.042	8.259	**13.0**	2hr
WC2.0	10.199	4.779	**10.2**	2hr
WC2.01	13.038	8.059	**13.0**	2hr
WC7a	13.611	10.837	**13.6**	2hr
WC7b	18.826	13.404	**18.8**	2hr
WC2.03	20.147	14.137	**20.1**	2hr
WC1.03	36.834	24.019	**36.8**	2hr
WC3.0	5.763	2.29	**5.8**	2hr
WC1.04	43.094	28.245	**43.1**	2hr
WC1.05	46.959	31.275	**47.0**	2hr
WC6.04	45.503	37.83	**45.5**	2hr
WC14.0	4.154	2.374	**4.2**	2hr
WC1.051	9.027	5.015	**9.0**	2hr

Catch ID	**Climate Change 100 yr + 15% ARI Design Storms**			
	Estimated Peak Discharge (m^3/s)			
	2hr	**9hr**	**Max**	Duration
WC1.06	56.081	45.756	**56.1**	2hr
WC13.0	6.496	3.62	**6.5**	2hr
WC5.1a	11.835	6.465	**11.8**	2hr
WC5.1b	16.272	8.439	**16.3**	2hr
WC1.07a	7.371	3.043	**7.4**	2hr
WC1.07	75.452	58.227	**75.5**	2hr
WC1.08	81.644	63.298	**81.6**	2hr
WC1.06b	2.466	0.9841	**2.5**	2hr
WC1.06a	6.427	3.832	**6.4**	2hr
WC8.01	10.608	7.224	**10.6**	2hr
WC6.03	7.813	4.529	**7.8**	2hr
WC1.11	18.609	7.859	**18.6**	2hr
WC9.01	13.173	5.585	**13.2**	2hr
WC6.02	38.154	16.626	**38.2**	2hr
WC10a	46.631	23.696	**46.6**	2hr
WC10b	53.69	28.622	**53.7**	2hr
WC6.05	64.915	40.442	**64.9**	2hr
WC5.0	149.06	104.1	**149.1**	2hr
WC10.01	152.17	106.86	**152.2**	2hr
WC4.0	157.5	112.68	**157.5**	2hr
WC9.03	210.71	152.6	**210.7**	2hr
WC15.01	266.4	202.54	**266.4**	2hr
SS5	286.81	223.96	**286.8**	2hr
WC14.00	9.673	5.637	**9.7**	2hr
WC14.01	18.663	13.308	**18.7**	2hr
A2	3.297	1.082	**3.3**	2hr
A1	4.893	1.623	**4.9**	2hr
B2	8.569	2.885	**8.6**	2hr
B1	11.049	3.719	**11.0**	2hr
C2	7.208	2.342	**7.2**	2hr

Catch ID	**Climate Change 100 yr + 15% ARI Design Storms**			
	Estimated Peak Discharge (m^3/s)			
	2hr	**9hr**	**Max**	Duration
C1	9.051	2.973	**9.1**	2hr
BasLuca	24.962	8.315	**25.0**	2hr
Bas_out	3.961	3.957	**4.0**	2hr
SS4	308.35	245.25	**308.4**	2hr
WC14.01b	9.066	3.702	**9.1**	2hr
WC15b	11.031	7.162	**11.0**	2hr
WC15a	14.281	10.003	**14.3**	2hr
SS3	20.022	20.807	**20.8**	9hr
WC1.16	338.74	277.8	**338.7**	2hr
PC1	356.8	299.89	**356.8**	2hr
BU11	6.891	8.368	**8.4**	9hr
BU12	17.291	19.439	**19.4**	9hr
BU13	20.681	23.367	**23.4**	9hr
BU5a	3.982	2.864	**4.0**	2hr
BU5b	12.818	7.471	**12.8**	2hr
BU10	13.361	9.805	**13.4**	2hr
BU9b	18.91	15.491	**18.9**	2hr
Dum3	31.423	25.073	**31.4**	2hr
BU1	51.512	42.147	**51.5**	2hr
BU2	76.249	71.457	**76.2**	2hr
BU3	90.974	87.145	**91.0**	2hr
BU4	94.339	91.217	**94.3**	2hr
Dum2	98.086	95.687	**98.1**	2hr
PC8	102.3	101.11	**102.3**	2hr
BU7	17.39	16.638	**17.4**	2hr
PC10	38.374	27.959	**38.4**	2hr
BU8	8.139	6.906	**8.1**	2hr
Dum4	41.715	34.865	**41.7**	2hr
BU9a	141.78	144.21	**144.2**	9hr
Dum1	161.69	166.14	**166.1**	9hr

Catch ID	**Climate Change 100 yr + 15% ARI Design Storms**			
	Estimated Peak Discharge (m^3/s)			
	2hr	**9hr**	**Max**	Duration
PC9	172.85	188.32	**188.3**	9hr
PCBc	3.988	3.207	**4.0**	2hr
SS2	15.088	11.799	**15.1**	2hr
SS1	31.764	28.571	**31.8**	2hr
PC5	48.042	45.447	**48.0**	2hr
PC6a	59.526	56.53	**59.5**	2hr
PC6b	71.672	69.074	**71.7**	2hr
PC2	86.455	85.59	**86.5**	2hr
PCA	98.737	103.21	**103.2**	9hr
PC7	283.93	313.81	**313.8**	9hr
PC4	9.093	11.671	**11.7**	9hr
PCBa	11.233	8.634	**11.2**	2hr
PCBb	23.962	22.339	**24.0**	2hr
PC3	571.54	624.83	**624.8**	9hr
BU6c	4.297	2.873	**4.3**	2hr
BU6a	16.745	17.526	**17.5**	9hr
BU6b	599.15	654.23	**654.2**	9hr
BU6d	612.29	670.79	**670.8**	9hr
Out	612.29	670.79	**670.8**	9hr

Catch ID	Climate Change 100 yr + 30% ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC1.15	19.0	20.3	17.7	17.7	16.0	16.9	13.1	**20.3**	2hr
WC12.0	16.2	17.6	14.6	12.5	11.0	11.6	8.4	**17.6**	2hr
WC11c	3.7	4.1	3.3	2.8	2.5	2.6	1.9	**4.1**	2hr
WC11d	9.9	11.3	9.5	9.1	7.9	8.5	6.3	**11.3**	2hr
WC11a	5.8	6.4	5.2	4.5	4.0	4.2	3.0	**6.4**	2hr
WC11b	15.0	16.5	13.6	12.9	11.2	12.0	8.8	**16.5**	2hr
WC11.0	32.4	35.0	28.8	30.8	27.6	30.2	22.8	**35.0**	2hr
WC11.01	42.7	45.9	40.4	42.3	39.0	40.7	31.2	**45.9**	2hr
WC9.04	18.8	19.8	13.7	10.5	9.3	9.7	7.0	**19.8**	2hr
WC9.0	27.2	30.2	25.4	23.5	20.4	22.2	16.6	**30.2**	2hr
WC6.06	35.0	37.9	32.2	32.3	28.5	29.7	23.2	**37.9**	2hr
WC1.10	14.8	16.5	13.6	10.6	9.4	9.7	6.8	**16.5**	2hr
WC9.02	51.3	58.1	47.6	47.8	42.4	44.8	34.5	**58.1**	2hr
WC2.02	18.1	18.9	13.0	9.4	8.4	8.7	6.2	**18.9**	2hr
WC1.0	13.3	14.0	9.1	6.7	6.0	6.2	4.4	**14.0**	2hr
WC1.01	18.8	21.3	14.6	10.9	9.7	10.0	7.2	**21.3**	2hr
WC1.02	14.1	15.0	11.6	10.9	10.1	9.7	7.8	**15.0**	2hr
WC2.0	11.0	11.6	7.9	6.2	5.5	5.7	4.2	**11.6**	2hr
WC2.01	14.1	14.6	11.7	10.6	9.3	10.5	7.4	**14.6**	2hr
WC7a	15.6	16.1	14.4	14.0	13.1	13.0	9.6	**16.1**	2hr
WC7b	18.7	21.1	17.7	17.2	16.2	16.2	11.8	**21.1**	2hr
WC2.03	19.8	22.7	18.8	18.1	17.0	17.2	12.5	**22.7**	2hr
WC1.03	36.1	41.1	33.0	30.9	28.9	29.0	22.0	**41.1**	2hr
WC3.0	6.4	6.5	4.3	2.9	2.6	2.7	1.8	**6.5**	2hr
WC1.04	43.1	48.5	38.9	36.5	33.6	33.4	26.0	**48.5**	2hr
WC1.05	47.6	53.1	42.9	40.3	37.0	36.9	29.0	**53.1**	2hr
WC6.04	47.0	52.8	47.5	46.7	43.4	42.6	35.5	**52.8**	2hr
WC14.0	4.2	4.8	4.0	3.1	2.7	2.8	2.0	**4.8**	2hr
WC1.051	8.9	10.4	8.4	6.5	5.8	6.0	4.2	**10.4**	2hr
WC1.06	59.0	63.5	57.4	55.7	52.4	53.9	43.7	**63.5**	2hr
WC13.0	6.4	7.6	6.2	4.7	4.2	4.3	3.0	**7.6**	2hr
WC5.1a	13.1	13.7	11.2	8.3	7.4	7.7	5.4	**13.7**	2hr
WC5.1b	18.0	18.8	14.7	10.9	9.7	10.0	7.1	**18.8**	2hr
WC1.07a	8.1	8.4	5.6	3.9	3.5	3.5	2.5	**8.4**	2hr
WC1.07	76.5	88.4	75.3	72.4	66.2	70.4	56.0	**88.4**	2hr
WC1.08	83.3	95.6	81.0	78.5	71.6	74.3	59.8	**95.6**	2hr
WC1.06b	2.7	2.8	1.8	1.3	1.1	1.1	0.8	**2.8**	2hr
WC1.06a	6.7	7.6	6.3	5.0	4.4	4.6	3.3	**7.6**	2hr

Catch ID	Climate Change 100 yr + 30% ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC8.01	11.9	12.4	10.5	9.4	8.3	8.8	6.6	**12.4**	2hr
WC6.03	8.6	9.0	7.1	5.9	5.2	5.5	3.9	**9.0**	2hr
WC1.11	20.0	21.1	13.6	10.1	9.0	9.3	6.6	**21.1**	2hr
WC9.01	14.3	15.0	9.9	7.1	6.4	6.6	4.6	**15.0**	2hr
WC6.02	41.5	43.4	29.0	21.3	19.0	19.6	13.9	**43.4**	2hr
WC10a	51.7	53.3	39.7	30.5	27.1	28.2	20.2	**53.3**	2hr
WC10b	59.5	61.4	46.7	37.1	32.8	34.4	24.8	**61.4**	2hr
WC6.05	71.1	75.3	60.5	52.9	46.6	49.7	36.8	**75.3**	2hr
WC5.0	151.8	173.9	144.0	133.9	119.3	125.8	97.8	**173.9**	2hr
WC10.01	154.9	177.7	147.2	137.5	122.5	128.8	100.4	**177.7**	2hr
WC4.0	160.8	184.2	152.8	144.9	129.3	135.2	105.8	**184.2**	2hr
WC9.03	212.7	247.1	203.1	197.5	175.6	183.2	143.9	**247.1**	2hr
WC15.01	273.4	313.3	260.4	258.8	233.4	234.2	185.5	**313.3**	2hr
SS5	295.0	337.0	282.9	281.9	258.2	253.4	201.2	**337.0**	2hr
WC14.00	9.5	11.5	9.4	7.3	6.5	6.7	4.7	**11.5**	2hr
WC14.01	20.0	22.2	18.7	17.4	15.4	16.3	12.2	**22.2**	2hr
A2	3.5	3.7	2.0	1.4	1.2	1.3	0.9	**3.7**	2hr
A1	5.2	5.5	3.1	2.0	1.8	1.9	1.3	**5.5**	2hr
B2	9.2	9.7	5.4	3.6	3.3	3.3	2.3	**9.7**	2hr
B1	11.8	12.5	7.0	4.7	4.2	4.3	3.0	**12.5**	2hr
C2	7.8	8.2	4.5	3.0	2.7	2.7	1.9	**8.2**	2hr
C1	9.8	10.3	5.7	3.8	3.4	3.5	2.4	**10.3**	2hr
BasLucca	26.8	28.3	15.7	10.5	9.5	9.6	6.7	**28.3**	2hr
Bas_out	4.0	4.0	4.0	4.0	4.0	4.0	4.0	**4.0**	2hr
SS4	318.4	361.2	306.7	305.7	282.1	271.8	217.5	**361.2**	2hr
WC14.01b	9.8	10.3	6.4	4.7	4.2	4.4	3.1	**10.3**	2hr
WC15b	11.9	13.2	10.6	9.4	8.3	8.7	6.3	**13.2**	2hr
WC15a	15.6	17.2	14.3	13.2	11.6	12.3	9.0	**17.2**	2hr
SS3	21.8	23.9	20.2	21.7	24.3	23.8	18.3	**24.3**	9hr
WC1.16	346.7	396.7	341.0	341.4	319.9	300.1	244.3	**396.7**	2hr
PC1	361.4	418.5	363.4	366.6	345.6	319.1	262.2	**418.5**	2hr
BU11	6.8	8.2	8.6	9.4	9.8	9.6	7.4	**9.8**	9hr
BU12	16.0	20.5	20.6	22.9	22.8	21.5	17.1	**22.9**	6hr
BU13	18.8	24.6	25.0	27.4	27.4	25.4	20.4	**27.4**	6hr
BU5a	4.5	4.8	3.9	3.7	3.3	3.5	2.7	**4.8**	2hr
BU5b	13.7	14.7	10.3	9.4	8.6	9.3	7.0	**14.7**	2hr
BU10	14.9	15.8	13.2	12.7	11.3	12.0	9.2	**15.8**	2hr
BU9b	20.1	22.0	19.9	19.4	17.8	18.4	14.4	**22.0**	2hr

Catch ID	Climate Change 100 yr + 30% ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
Dum3	34.8	36.7	32.2	31.8	28.9	30.4	23.6	**36.7**	2hr
BU1	55.8	60.7	53.6	53.1	48.6	47.5	37.8	**60.7**	2hr
BU2	75.1	90.2	84.1	86.5	82.5	75.5	62.4	**90.2**	2hr
BU3	86.9	107.7	102.2	105.5	100.8	90.5	75.6	**107.7**	2hr
BU4	88.9	111.6	107.1	110.4	105.6	93.4	79.0	**111.6**	2hr
Dum2	90.6	115.8	112.6	115.7	111.2	96.0	82.3	**115.8**	2hr
PC8	93.8	120.9	118.2	121.8	117.6	100.5	86.6	**121.8**	6hr
BU7	17.4	20.4	19.7	20.6	19.4	18.8	14.9	**20.6**	6hr
PC10	40.4	43.5	31.3	34.1	32.4	33.3	25.9	**43.5**	2hr
BU8	8.5	9.5	8.7	8.5	8.0	8.1	6.4	**9.5**	2hr
Dum4	44.4	47.7	40.0	42.5	40.3	41.4	32.3	**47.7**	2hr
BU9a	120.3	166.9	166.3	172.2	167.1	146.1	121.6	**172.2**	6hr
Dum1	135.5	190.3	190.9	198.1	192.4	171.2	140.5	**198.1**	6hr
PC9	143.9	203.9	210.6	220.4	218.5	190.5	158.4	**220.4**	6hr
PCBc	4.4	4.7	4.1	4.1	3.7	3.9	3.0	**4.7**	2hr
SS2	16.7	17.6	15.3	15.0	13.6	14.3	11.1	**17.6**	2hr
SS1	33.1	37.2	34.6	35.5	33.2	31.5	25.2	**37.2**	2hr
PC5	47.8	56.9	54.1	56.3	52.7	48.6	39.8	**56.9**	2hr
PC6a	57.7	70.5	67.4	70.4	65.7	60.2	49.5	**70.5**	2hr
PC6b	67.5	84.9	82.3	85.9	80.4	71.6	59.7	**85.9**	6hr
PC2	78.0	101.5	101.3	105.4	99.1	86.0	73.4	**105.4**	6hr
PCA	86.8	115.4	121.2	126.1	119.3	100.6	89.9	**126.1**	6hr
PC7	238.9	334.3	352.2	371.7	363.9	308.6	273.4	**371.7**	6hr
PC4	7.5	10.9	11.9	12.7	13.8	12.2	9.8	**13.8**	9hr
PCBa	12.5	13.2	11.3	11.0	9.9	10.5	8.1	**13.2**	2hr
PCBb	24.4	28.2	26.2	27.6	26.0	24.2	19.4	**28.2**	2hr
PC3	556.3	673.2	659.0	711.3	722.0	659.4	547.4	**722.0**	9hr
BU6c	4.7	5.0	4.3	3.7	3.3	3.5	2.6	**5.0**	2hr
BU6a	15.9	20.1	19.6	21.4	20.5	19.6	15.4	**21.4**	6hr
BU6b	574.0	705.2	687.9	745.8	755.8	684.7	575.9	**755.8**	9hr
BU6d	582.6	720.1	705.6	766.5	774.5	709.6	599.1	**774.5**	9hr
Out	582.6	720.1	705.6	766.5	774.5	709.6	599.1	**774.5**	9hr

Catch ID	200 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC1.15	14.6	16.2	14.4	14.6	13.3	14.0	10.8	**16.2**	2hr
WC12.0	12.9	14.0	11.5	10.4	9.1	9.7	7.1	**14.0**	2hr
WC11c	2.9	3.3	2.6	2.4	2.1	2.2	1.6	**3.3**	2hr
WC11d	7.6	8.7	7.4	7.5	6.6	7.1	5.3	**8.7**	2hr
WC11a	4.5	5.0	4.0	3.7	3.3	3.5	2.5	**5.0**	2hr
WC11b	11.8	12.8	10.3	10.6	9.3	10.0	7.4	**12.8**	2hr
WC11.0	25.2	26.9	23.6	24.9	22.9	25.1	18.9	**26.9**	2hr
WC11.01	33.3	36.2	33.0	34.4	32.4	33.8	25.8	**36.2**	2hr
WC9.04	15.8	16.5	11.2	8.8	7.8	8.2	5.9	**16.5**	2hr
WC9.0	22.0	23.8	20.2	19.5	17.0	18.5	14.0	**23.8**	2hr
WC6.06	28.0	29.8	25.9	26.5	23.6	24.7	19.4	**29.8**	2hr
WC1.10	11.7	13.2	10.8	8.8	7.8	8.1	5.8	**13.2**	2hr
WC9.02	40.2	45.9	37.8	39.4	35.2	37.3	28.8	**45.9**	2hr
WC2.02	15.1	15.8	10.7	8.0	7.1	7.4	5.2	**15.8**	2hr
WC1.0	11.2	11.8	7.6	5.7	5.1	5.2	3.8	**11.8**	2hr
WC1.01	15.7	17.8	12.1	9.2	8.2	8.5	6.1	**17.8**	2hr
WC1.02	12.4	12.6	10.0	8.6	8.0	8.3	7.0	**12.6**	2hr
WC2.0	9.2	9.7	6.5	5.2	4.6	4.8	3.5	**9.7**	2hr
WC2.01	12.1	12.5	9.5	8.3	7.7	8.0	6.2	**12.5**	2hr
WC7a	12.4	13.1	11.3	11.1	10.3	10.0	7.4	**13.1**	2hr
WC7b	15.4	18.0	14.8	13.7	12.8	12.8	9.9	**18.0**	2hr
WC2.03	16.3	19.2	15.9	14.4	13.5	13.6	10.5	**19.2**	2hr
WC1.03	30.5	35.1	28.2	24.4	23.0	23.8	19.0	**35.1**	2hr
WC3.0	5.3	5.5	3.6	2.5	2.2	2.3	1.6	**5.5**	2hr
WC1.04	36.2	41.0	32.9	29.3	27.0	28.1	22.7	**41.0**	2hr
WC1.05	39.7	44.6	36.2	32.8	30.1	31.3	25.3	**44.6**	2hr
WC6.04	39.8	43.6	39.6	38.6	36.5	37.1	30.7	**43.6**	2hr
WC14.0	3.4	3.9	3.3	2.6	2.3	2.4	1.7	**3.9**	2hr
WC1.051	7.2	8.5	6.9	5.4	4.8	5.0	3.6	**8.5**	2hr
WC1.06	50.2	53.8	48.7	47.0	44.2	46.5	37.6	**53.8**	2hr
WC13.0	5.1	6.1	5.0	3.9	3.5	3.6	2.6	**6.1**	2hr
WC5.1a	10.6	11.2	9.1	7.0	6.2	6.5	4.6	**11.2**	2hr
WC5.1b	14.7	15.4	12.0	9.1	8.1	8.4	6.0	**15.4**	2hr
WC1.07a	6.7	7.0	4.7	3.3	2.9	3.0	2.1	**7.0**	2hr
WC1.07	64.3	71.6	62.4	61.3	56.4	60.2	48.0	**71.6**	2hr
WC1.08	68.8	76.7	67.9	66.5	61.3	63.6	51.1	**76.7**	2hr
WC1.06b	2.2	2.3	1.5	1.1	0.9	1.0	0.7	**2.3**	2hr
WC1.06a	5.4	6.0	5.1	4.2	3.7	3.9	2.8	**6.0**	2hr
WC8.01	9.6	10.0	8.4	7.9	7.0	7.4	5.6	**10.0**	2hr

Catch ID	200 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
WC6.03	7.0	7.4	5.7	4.9	4.4	4.6	3.3	**7.4**	2hr
WC1.11	16.7	17.7	11.3	8.5	7.6	7.9	5.6	**17.7**	2hr
WC9.01	11.9	12.5	8.3	6.0	5.4	5.5	3.9	**12.5**	2hr
WC6.02	34.5	36.3	24.1	18.0	16.0	16.6	11.8	**36.3**	2hr
WC10a	42.7	44.3	32.8	25.7	22.8	23.8	17.1	**44.3**	2hr
WC10b	49.1	50.9	38.4	31.1	27.6	29.0	21.0	**50.9**	2hr
WC6.05	58.6	61.3	49.3	44.2	38.9	41.8	31.0	**61.3**	2hr
WC5.0	125.1	140.2	117.1	112.7	100.3	106.9	83.1	**140.2**	2hr
WC10.01	127.5	143.1	119.6	115.6	103.0	109.4	85.2	**143.1**	2hr
WC4.0	131.9	147.9	123.7	121.6	108.6	114.6	89.7	**147.9**	2hr
WC9.03	172.5	197.4	163.0	164.6	146.9	154.5	121.5	**197.4**	2hr
WC15.01	219.4	249.4	208.2	215.0	194.8	196.0	155.8	**249.4**	2hr
SS5	236.6	268.7	226.3	233.9	215.4	212.1	168.7	**268.7**	2hr
WC14.00	7.6	9.0	7.5	6.1	5.4	5.6	4.0	**9.0**	2hr
WC14.01	15.8	17.3	14.6	14.3	12.8	13.6	10.2	**17.3**	2hr
A2	3.0	3.1	1.7	1.2	1.0	1.1	0.7	**3.1**	2hr
A1	4.4	4.7	2.6	1.7	1.6	1.6	1.1	**4.7**	2hr
B2	7.8	8.2	4.6	3.1	2.8	2.8	2.0	**8.2**	2hr
B1	10.0	10.5	5.9	4.0	3.6	3.7	2.5	**10.5**	2hr
C2	6.5	6.9	3.8	2.5	2.3	2.3	1.6	**6.9**	2hr
C1	8.2	8.7	4.8	3.2	2.9	2.9	2.0	**8.7**	2hr
BasLucca	22.6	23.8	13.3	8.9	8.0	8.2	5.7	**23.8**	2hr
Bas_out	4.0	4.0	4.0	4.0	4.0	4.0	4.0	**4.0**	1hr
SS4	256.4	289.3	246.6	254.3	236.0	228.0	182.7	**289.3**	2hr
WC14.01b	8.2	8.6	5.3	4.0	3.6	3.7	2.6	**8.6**	2hr
WC15b	9.3	10.3	8.3	7.9	6.9	7.3	5.3	**10.3**	2hr
WC15a	12.3	13.3	11.0	11.0	9.6	10.3	7.6	**13.3**	2hr
SS3	17.0	18.7	16.1	17.5	19.9	19.5	14.9	**19.9**	9hr
WC1.16	278.8	317.8	274.1	283.3	267.2	251.6	204.7	**317.8**	2hr
PC1	289.9	334.6	291.4	303.4	288.4	267.0	219.3	**334.6**	2hr
BU11	5.4	6.5	6.9	7.3	8.0	7.7	6.1	**8.0**	9hr
BU12	12.2	16.2	16.3	18.3	18.6	17.6	14.0	**18.6**	9hr
BU13	14.3	19.4	19.8	21.9	22.4	20.8	16.7	**22.4**	9hr
BU5a	3.5	3.7	3.2	3.1	2.8	2.9	2.2	**3.7**	2hr
BU5b	11.4	12.2	8.4	7.8	7.2	7.8	5.9	**12.2**	2hr
BU10	11.8	12.5	10.6	10.5	9.4	10.0	7.7	**12.5**	2hr
BU9b	15.7	17.8	16.3	16.0	14.9	15.2	12.0	**17.8**	2hr
Dum3	27.2	29.6	26.5	26.3	24.1	25.1	19.7	**29.6**	2hr
BU1	44.0	48.4	43.6	44.0	40.5	39.6	31.4	**48.4**	2hr
BU2	58.7	71.7	68.8	71.0	68.7	62.7	51.5	**71.7**	2hr

Catch ID	200 yr ARI Design Storms								
	Estimated Peak Discharge (m^3/s)								
	1hr	2hr	3hr	6hr	9hr	12hr	18hr	**Max**	Duration
BU3	68.0	85.3	83.5	86.4	83.7	74.9	62.4	**86.4**	6hr
BU4	69.6	88.5	87.3	90.4	87.7	77.4	65.3	**90.4**	6hr
Dum2	71.0	92.0	91.3	94.5	91.8	79.6	68.1	**94.5**	6hr
PC8	73.4	95.9	95.7	99.2	97.0	83.3	71.6	**99.2**	6hr
BU7	13.6	16.3	15.9	17.0	16.0	15.4	12.3	**17.0**	6hr
PC10	33.9	36.5	25.1	28.0	26.9	27.8	21.5	**36.5**	2hr
BU8	6.6	7.6	7.1	7.1	6.6	6.7	5.3	**7.6**	2hr
Dum4	37.0	39.6	32.1	35.0	33.5	34.4	26.8	**39.6**	2hr
BU9a	94.5	132.8	134.9	140.1	138.4	120.1	100.4	**140.1**	6hr
Dum1	106.0	151.4	154.5	161.3	159.5	140.5	115.8	**161.3**	6hr
PC9	112.4	161.7	169.6	178.7	180.7	155.8	130.9	**180.7**	9hr
PCBc	3.4	3.8	3.3	3.4	3.1	3.2	2.5	**3.8**	2hr
SS2	13.1	14.2	12.6	12.4	11.4	11.8	9.3	**14.2**	2hr
SS1	25.9	29.9	28.1	29.2	27.4	26.1	20.9	**29.9**	2hr
PC5	37.3	45.2	43.7	46.0	43.6	40.1	32.8	**46.0**	6hr
PC6a	45.4	56.0	54.6	57.3	54.3	49.8	40.9	**57.3**	6hr
PC6b	53.4	67.4	66.6	69.9	66.3	59.5	49.5	**69.9**	6hr
PC2	62.2	81.5	82.1	86.3	82.2	71.2	60.8	**86.3**	6hr
PCA	69.6	93.2	98.4	103.7	99.2	83.3	75.0	**103.7**	6hr
PC7	188.2	266.4	283.3	302.3	301.2	252.7	226.1	**302.3**	6hr
PC4	5.6	8.5	9.4	10.1	11.1	9.8	8.1	**11.1**	9hr
PCBa	9.9	10.6	9.2	9.2	8.3	8.7	6.8	**10.6**	2hr
PCBb	18.9	22.4	20.9	22.4	21.4	20.0	16.0	**22.4**	2hr
PC3	443.2	535.5	534.2	580.9	600.3	546.5	453.6	**600.3**	9hr
BU6c	3.8	4.1	3.5	3.1	2.8	2.9	2.2	**4.1**	2hr
BU6a	12.0	15.7	15.4	17.1	16.8	15.8	12.6	**17.1**	6hr
BU6b	457.7	561.5	558.2	608.8	628.5	567.8	477.4	**628.5**	9hr
BU6d	464.9	573.8	572.4	626.3	644.5	589.1	496.9	**644.5**	9hr
Out	464.9	573.8	572.4	626.3	644.5	589.1	496.9	**644.5**	9hr

Catch ID	PMP Design Storms		
	Estimated Peak Discharge (m^3/s)		
	90m	**Max**	Duration
WC1.15	75.5	**75.5**	90m
WC12.0	44.2	**44.2**	90m
WC11c	11.3	**11.3**	90m
WC11d	34.0	**34.0**	90m
WC11a	16.1	**16.1**	90m
WC11b	46.6	**46.6**	90m
WC11.0	113.1	**113.1**	90m
WC11.01	160.0	**160.0**	90m
WC9.04	33.5	**33.5**	90m
WC9.0	77.1	**77.1**	90m
WC6.06	112.0	**112.0**	90m
WC1.10	36.4	**36.4**	90m
WC9.02	167.2	**167.2**	90m
WC2.02	29.8	**29.8**	90m
WC1.0	21.3	**21.3**	90m
WC1.01	32.8	**32.8**	90m
WC1.02	43.3	**43.3**	90m
WC2.0	19.7	**19.7**	90m
WC2.01	37.4	**37.4**	90m
WC7a	52.0	**52.0**	90m
WC7b	62.4	**62.4**	90m
WC2.03	65.7	**65.7**	90m
WC1.03	114.5	**114.5**	90m
WC3.0	9.0	**9.0**	90m
WC1.04	135.2	**135.2**	90m
WC1.05	149.1	**149.1**	90m
WC6.04	167.4	**167.4**	90m
WC14.0	10.5	**10.5**	90m
WC1.051	22.3	**22.3**	90m
WC1.06	200.8	**200.8**	90m
WC13.0	16.2	**16.2**	90m
WC5.1a	28.6	**28.6**	90m
WC5.1b	37.2	**37.2**	90m
WC1.07a	13.1	**13.1**	90m
WC1.07	249.4	**249.4**	90m
WC1.08	266.8	**266.8**	90m
WC1.06b	3.9	**3.9**	90m
WC1.06a	15.9	**15.9**	90m

Catch ID	PMP Design Storms		
	Estimated Peak Discharge (m^3/s)		
	90m	**Max**	Duration
WC8.01	31.3	**31.3**	90m
WC6.03	19.1	**19.1**	90m
WC1.11	31.9	**31.9**	90m
WC9.01	22.3	**22.3**	90m
WC6.02	67.1	**67.1**	90m
WC10a	95.9	**95.9**	90m
WC10b	117.5	**117.5**	90m
WC6.05	171.6	**171.6**	90m
WC5.0	423.7	**423.7**	90m
WC10.01	436.5	**436.5**	90m
WC4.0	466.0	**466.0**	90m
WC9.03	646.8	**646.8**	90m
WC15.01	881.9	**881.9**	90m
SS5	976.6	**976.6**	90m
WC14.00	25.4	**25.4**	90m
WC14.01	69.1	**69.1**	90m
A2	5.8	**5.8**	90m
A1	8.7	**8.7**	90m
B2	15.3	**15.3**	90m
B1	19.8	**19.8**	90m
C2	12.9	**12.9**	90m
C1	16.3	**16.3**	90m
BasLucca	44.8	**44.8**	90m
Bas_out	4.0	**4.0**	90m
SS4	1057.9	**1057.9**	90m
WC14.01b	18.3	**18.3**	90m
WC15b	37.7	**37.7**	90m
WC15a	53.3	**53.3**	90m
SS3	105.0	**105.0**	90m
WC1.16	1211.1	**1211.1**	90m
PC1	1300.0	**1300.0**	90m
BU11	42.0	**42.0**	90m
BU12	100.0	**100.0**	90m
BU13	119.7	**119.7**	90m
BU5a	13.8	**13.8**	90m
BU5b	33.4	**33.4**	90m
BU10	42.8	**42.8**	90m
BU9b	66.3	**66.3**	90m
Dum3	107.8	**107.8**	90m

Catch ID	PMP Design Storms		
	Estimated Peak Discharge (m^3/s)		
	90m	**Max**	Duration
BU1	178.1	**178.1**	90m
BU2	307.2	**307.2**	90m
BU3	374.7	**374.7**	90m
BU4	386.1	**386.1**	90m
Dum2	396.2	**396.2**	90m
PC8	417.4	**417.4**	90m
BU7	77.2	**77.2**	90m
PC10	124.3	**124.3**	90m
BU8	32.2	**32.2**	90m
Dum4	155.5	**155.5**	90m
BU9a	586.5	**586.5**	90m
Dum1	692.5	**692.5**	90m
PC9	761.0	**761.0**	90m
PCBc	15.4	**15.4**	90m
SS2	51.0	**51.0**	90m
SS1	128.6	**128.6**	90m
PC5	205.5	**205.5**	90m
PC6a	252.7	**252.7**	90m
PC6b	300.4	**300.4**	90m
PC2	346.4	**346.4**	90m
PCA	379.5	**379.5**	90m
PC7	1209.5	**1209.5**	90m
PC4	57.7	**57.7**	90m
PCBa	41.2	**41.2**	90m
PCBb	105.2	**105.2**	90m
PC3	2424.0	**2424.0**	90m
BU6c	13.5	**13.5**	90m
BU6a	82.2	**82.2**	90m
BU6b	2497.6	**2497.6**	90m
BU6d	2525.8	**2525.8**	90m
Out	2525.8	**2525.8**	90m

Note: these discharges are unrouted flows from a hydrological model. A more accurate estimate of discharge can be obtained from the hydraulic model, described in Appendix D.

Appendix D

Hydraulic Model Results

TABLE D.3 Estimated Flood Levels – Comparison with Past Flood Models 100 yr ARI

Location	Model node	July 09 Exist m AHD	May-10 DRAFT m AHD	diff. (m)	Jul-10 DSM m AHD	diff. (m)	WSC Plan 38 2008 m AHD	diff. (m)
		(a)	(b)	(b)-(a)	(c)	(c)-(a)	(d)	(d)-(b)
Mataram Rd	W5276	17.59	17.13	-0.46	17.48	-0.11	17.18	-0.30
d/s Mataram Rd	W5260	16.89	16.69	-0.20	17.04	0.15	16.88	-0.16
	W5177	16.10	16.05	-0.05	16.26	0.16	16.12	-0.14
	W5085	15.35	15.29	-0.06	15.94	0.59	15.7	-0.24
	W4965	14.74	14.68	-0.06	15.04	0.30	14.92	-0.12
	W4910	14.41	14.26	-0.15	14.41	0.00	14.61	0.20
	W4790	14.02	13.93	-0.09	14.32	0.30	14.38	0.06
	W4635	13.49	13.54	0.05	14.25	0.76	14.33-14.38	
	W4622	13.48	13.53	0.05	14.21	0.73	14.08	-0.13
Sparks Rd	W4611	13.48	13.53	0.05	14.10	0.62	-	
d/s Sparks Rd	W4600	12.59	12.50	-0.09	12.91	0.32	12.67	-0.24
	W4570	12.07	12.05	-0.02	12.58	0.50	-	
	W4496	11.75	11.74	-0.01	12.11	0.36	12.08	-0.02
	W4376	11.51	11.46	-0.05	11.29	-0.22	11.35	0.06
	W4260	10.58	10.56	-0.02	10.93	0.35	10.69	-0.24
	W4096	9.88	9.77	-0.11	9.81	-0.07	9.7	-0.11
	W3974	9.79	9.62	-0.17	9.59	-0.20	9.51	-0.08
Warnervale Rd	W3840	9.75	9.53	-0.22	9.53	-0.22	9.02	-0.51
d/s Warnervale Rd	W3860	9.03	9.08	0.05	9.06	0.03	9.01	-0.05
	W3720	9.01	9.01	0.00	8.90	-0.11	8.99	0.09
	W3610	8.67	8.46	-0.21	8.57	-0.10	8.85	0.28
	W3510	8.28	8.14	-0.14	8.26	-0.02	8.61	0.35
	W3408	7.79	7.65	-0.14	7.92	0.13	8.36	0.44
	W3318	7.57	7.42	-0.15	7.73	0.16	8.16	0.43
	W3190	7.36	7.21	-0.15	7.62	0.26	8.05	0.43
	W3060	7.29	7.13	-0.16	7.29	0.00	7.99	0.70
	W2930	7.26	7.10	-0.16	7.08	-0.18	7.47	0.39
Minnesota Rd	W2900	7.04	6.78	-0.26	6.80	-0.24	7.47	0.67
d/s Minnesota Rd	W2880	7.01	6.73	-0.28	6.74	-0.27	7.36	0.62
	W29-1	6.63	6.42	-0.21	6.43	-0.20	6.54	0.11
	W28-1	6.45	6.25	-0.20	6.25	-0.20	6.37	0.12
	W23	6.35	6.21	-0.14	6.21	-0.14	-	
	W22	6.29	6.20	-0.09	6.20	-0.09	6.23	0.03
	W21.1	6.28	6.20	-0.08	6.20	-0.08	-	
	W21	6.27	6.20	-0.07	6.19	-0.08	-	
Virginia Rd	W20	6.27	6.19	-0.08	6.19	-0.08	6.19	0.00
	W19	6.26	6.19	-0.07	6.19	-0.07		MAX

Location	Model node	July 09 Exist m AHD	May-10 DRAFT m AHD	diff. (m)	Jul-10 DSM m AHD	diff. (m)	WSC Plan 38 2008 m AHD	diff. (m)
		(a)	(b)	(b)-(a)	(c)	(c)-(a)	(d)	(d)-(b)
	W18	6.26	6.19	-0.07	6.19	-0.07		MIN
	W17	6.25	6.19	-0.06	6.19	-0.06		
	W16	6.25	6.19	-0.06	6.19	-0.06		
	W15	6.25	6.19	-0.06	6.19	-0.06		
	W14	6.25	6.19	-0.06	6.19	-0.06		
	W13	6.24	6.19	-0.05	6.19	-0.05		
	W12	6.24	6.19	-0.05	6.19	-0.05		
	W11	6.24	6.19	-0.05	6.19	-0.05		
	W10	6.24	6.19	-0.05	6.19	-0.05		
	W9	6.24	6.19	-0.05	6.19	-0.05		
	W8	6.24	6.19	-0.05	6.19	-0.05		
	W7	6.24	6.18	-0.06	6.19	-0.05		
	W6	6.24	6.18	-0.06	6.19	-0.05		
	W5	6.23	6.18	-0.05	6.18	-0.05		
	W4	6.23	6.18	-0.05	6.18	-0.05		
u/s Railway	W3	6.23	6.18	-0.05	6.18	-0.05		
u/s Railway	W2	6.23	6.18	-0.05	6.18	-0.05		
u/s Railway	W1	6.22	6.18	-0.04	6.18	-0.04		
d/s Lake Haven Dr	P1	31.63	-	-	31.26	-0.38		
	P2	31.20	31.00	-0.20	31.14	-0.06		
	P3	30.38	30.17	-0.21	30.34	-0.04		
u/s Pacific Hwy	P5	31.95	-	-	29.73	-2.22		
d/s Pacific Hwy	P4	29.70	-	-	29.60	-0.09		
	P6	27.85	-	-	27.60	-0.25		
u/s Arizona Rd	P7	26.75	-	-	26.74	-0.02		
d/s Arizona Rd	P8	25.47	25.40	-0.07	25.55	0.09		
	P9	24.12	24.07	-0.06	24.18	0.06		
	P10	22.94	-	-	23.09	0.15		
	P11	21.97	21.84	-0.14	21.93	-0.05		
	P12	21.20	20.96	-0.24	21.05	-0.15		
	P13	20.75	20.52	-0.23	20.62	-0.14		
	P14	20.19	19.99	-0.21	20.09	-0.10		
	P15	19.56	19.38	-0.18	19.50	-0.07		
	P16	18.81	18.70	-0.12	18.80	-0.02		
	P17	18.40	18.38	-0.03	18.48	0.07		
	P18	17.95	17.60	-0.36	17.72	-0.23		
	P19	17.92	17.47	-0.46	17.62	-0.30		
	P20	17.91	17.35	-0.56	17.56	-0.35		
u/s Mataram Rd	P21	17.87	17.24	-0.63	17.50	-0.37		

Location	Model node	July 09 Exist m AHD	May-10 DRAFT m AHD	diff. (m)	Jul-10 DSM m AHD	diff. (m)	WSC Plan 38 2008 m AHD	diff. (m)
		(a)	(b)	(b)-(a)	(c)	(c)-(a)	(d)	(d)-(b)
Nth of Wallarah Rd	P22	35.60	35.59	0.00	35.70	0.10		
	P23	32.71	32.35	-0.36	32.41	-0.30		
	P24	31.95	31.55	-0.40	31.55	-0.40		
	P25	30.70	30.51	-0.19	30.55	-0.15		
u/s Pacific Hwy	P26	30.17	30.48	0.31	30.50	0.34		
d/s Pacific Hwy	P27	28.36	28.36	0.00	28.40	0.04		
adj to Mebbin Cct	P28	27.61	27.61	0.00	27.66	0.05		
	P29	26.59	26.59	0.00	26.63	0.04		
u/s North Barrington Dr.	P30	25.15	25.11	-0.04	25.19	0.04		
d/s North Barrington Dr	P31	24.97	24.77	-0.20	24.97	0.01		
	P32	24.52	24.34	-0.18	24.17	-0.35		
	P33	23.38	23.22	-0.16	23.28	-0.10		
	P34	23.07	23.10	0.03	23.18	0.11		
Sth of Mataram Rd	P35	22.79	22.99	0.21	23.07	0.29		
Nth of Mataram Rd	P36	22.56	22.65	0.09	22.69	0.13		
	P37	22.06	21.97	-0.09	22.05	-0.02		
d/s Walker Ave	P38	21.78	21.86	0.08	21.86	0.08		
	P39	21.75	21.85	0.11	21.85	0.11		
	P40	21.74	21.85	0.11	21.85	0.11		
u/s Pacific Hwy	P41	21.36	21.52	0.15	21.52	0.15		
d/s Pacific Hwy	P42	18.98	18.72	-0.26	19.39	0.41		
Sth of Lomandra Tce	P43	18.17	-	-	17.84	-0.33		
	P44	17.64	17.50	-0.14	17.50	-0.14		
Sth of Kite Cr	P45	16.92	16.92	0.01	16.92	0.01		
Sth of Pardalote Way	P46	16.62	16.66	0.04	16.66	0.04		
	P47	16.24	16.13	-0.11	16.13	-0.11		
	P48	15.96	15.74	-0.22	15.74	-0.22		
	P49	15.74	15.48	-0.26	15.48	-0.26		
	P50	15.59	15.34	-0.25	15.34	-0.25		
	P51	15.52	15.24	-0.28	15.24	-0.28		
	P52	13.66	13.42	-0.24	13.42	-0.24		
	P53	12.69	12.38	-0.30	12.38	-0.30		
	P54	12.12	11.88	-0.23	11.88	-0.23		
u/s Louisiana Rd	P55	11.70	11.58	-0.11	11.58	-0.11		
d/s Louisiana Rd	P56	11.37	11.00	-0.37	11.00	-0.37		
	P57	10.93	10.47	-0.45	10.47	-0.45		
	P58	10.35	9.85	-0.50	9.85	-0.50		

Location	Model node	July 09 Exist m AHD	May-10 DRAFT m AHD	diff. (m)	Jul-10 DSM m AHD	diff. (m)	WSC Plan 38 2008 m AHD	diff. (m)
		(a)	(b)	(b)-(a)	(c)	(c)-(a)	(d)	(d)-(b)
	P59	9.81	9.36	-0.45	9.28	-0.53		
adj to Park Range Way	P60	17.35	17.34	-0.01	17.43	0.08		
	P61	16.36	16.36	0.00	16.44	0.07		
	P62	15.88	15.88	0.00	16.02	0.15		
	P63	15.25	15.27	0.02	15.57	0.32		
adj to Oakridge PL	P64	14.74	14.75	0.00	14.88	0.14		
	P65	14.45	14.45	0.00	14.62	0.17		
	P66	14.36	14.36	0.00	14.54	0.18		
	P67	13.49	13.54	0.05	14.26	0.77		
adj to Alpine Ash Rd	P68	15.52	15.52	0.00	15.61	0.10		
	P69	14.41	14.41	0.00	14.48	0.07		
	P70	13.67	13.67	0.01	13.85	0.19		
adj to Paperbark St	P71	12.96	12.96	-0.01	13.09	0.13		
	P72	12.59	12.60	0.00	12.76	0.17		
	P73	12.18	12.18	0.00	12.38	0.20		
	P74	11.62	11.62	0.00	12.08	0.47		
	P75	10.29	10.31	0.02	11.48	1.19		
u/s Nikko Rd	P76	21.88	22.39	0.51	22.62	0.73		
d/s Nikko Rd	P77	19.44	19.38	-0.07	19.38	-0.06		
	P78	18.19	18.17	-0.01	18.17	-0.01		
u/s Sparks Rd	P79	17.92	17.76	-0.16	17.80	-0.12		
d/s Sparks Rd	P80	15.24	15.25	0.01	15.27	0.04		
	P81	14.00	13.97	-0.03	13.98	-0.02		
u/s Railway Rd	P82	21.87	21.73	-0.14	21.75	-0.11		
d/s Nikko Rd	P83	19.29	19.46	0.17	19.50	0.21		
	P84	16.76	16.93	0.16	16.99	0.22		
	P85	14.68	14.70	0.02	14.72	0.05		
u/s Virginia Rd	P86	13.55	13.59	0.04	13.62	0.07		
d/s Virginia Rd	P87	12.48	12.40	-0.08	12.42	-0.06		
	P88	12.16	12.15	-0.01	12.16	0.00		
	P89	11.53	11.53	0.00	11.54	0.01		
	P90	10.49	10.18	-0.31	10.21	-0.28		
	P91	10.06	9.91	-0.15	9.91	-0.15		
u/s Warnervale Rd	P92	9.94	9.85	-0.09	9.85	-0.09		
d/s Warnervale Rd	P93	8.83	8.57	-0.26	8.57	-0.26		
	P94	8.36	8.11	-0.25	8.11	-0.25		
	P95	7.83	7.63	-0.20	7.63	-0.20		
	P96	7.22	6.94	-0.28	6.94	-0.28		
	P97	6.61	6.33	-0.28	6.33	-0.28		

Location	Model node	July 09 Exist m AHD	May-10 DRAFT m AHD	diff. (m)	Jul-10 DSM m AHD	diff. (m)	WSC Plan 38 2008 m AHD	diff. (m)
		(a)	(b)	(b)-(a)	(c)	(c)-(a)	(d)	(d)-(b)
	P98	6.31	6.21	-0.11	6.20	-0.11		
	P99	6.30	6.20	-0.10	6.20	-0.10		
u/s Sparks Rd	P100	15.42	15.46	0.04	15.62	0.20		
d/s Sparks Rd	P101	13.34	13.30	-0.04	13.34	0.00		
	P102	11.49	11.46	-0.03	11.50	0.01		
u/s Railway Rd	P103	10.95	10.84	-0.11	10.85	-0.10		
d/s Nikko Rd	P104	8.75	8.83	0.09	8.82	0.07		
	P105	7.99	8.02	0.03	8.04	0.05		
	P106	6.95	6.75	-0.20	6.75	-0.20		
	P107	6.24	6.19	-0.06	6.19	-0.05		
	P108	6.24	6.19	-0.05	6.19	-0.05		
	P109	6.24	6.19	-0.05	6.19	-0.05		
	P110	6.24	6.19	-0.05	6.19	-0.05		
	P111	6.24	6.19	-0.05	6.19	-0.05		
	P112	6.24	6.19	-0.05	6.19	-0.05		
	P113	6.24	6.19	-0.05	6.19	-0.05		
	P114	6.24	6.18	-0.05	6.19	-0.05		
d/s Pacific Hwy	P115	12.45	-	-	11.32	-1.13		
	P116	10.28	10.11	-0.17	10.24	-0.05		
	P117	8.26	8.14	-0.13	8.12	-0.15		
	P118	7.53	7.39	-0.14	7.42	-0.11		
	P119	6.90	-	-	6.47			
	P120	6.29	6.19	-0.10	6.19	-0.10		
	P121	6.24	6.19	-0.05	6.19	-0.05		
	P122	6.24	6.19	-0.05	6.19	-0.05		
	P123	6.24	-	-	6.19			
	P124	6.24	-	-	6.19			
u/s Pacific Hwy	P125	7.43	7.47	0.04	7.47	0.04		
west of Cherry Blossom Cr	P126	6.26	6.19	-0.06	6.19	-0.06		
west of Virgina Rd	P127	6.25	6.19	-0.06	6.19	-0.06		
	P128	6.25	6.19	-0.06	6.19	-0.06		
east of Bougainvillea Rd E	P129	8.71	8.56	-0.16	8.63	-0.08		
	P130	7.98	7.88	-0.09	7.95	-0.03		
east of Birch Dr	P131	7.25	7.19	-0.06	7.19	-0.06		
	P132	6.87	6.70	-0.17	6.72	-0.15		
	P133	6.85	6.67	-0.18	6.69	-0.16		
	P134	6.83	6.62	-0.21	6.63	-0.20		
	P135	6.74	6.52	-0.21	6.53	-0.21		

Location	Model node	July 09 Exist m AHD	May-10 DRAFT m AHD	diff. (m)	Jul-10 DSM m AHD	diff. (m)	WSC Plan 38 2008 m AHD	diff. (m)
		(a)	(b)	(b)-(a)	(c)	(c)-(a)	(d)	(d)-(b)
sth of Pacific Hwy	P136	14.87	14.93	0.07	15.03	0.16		
	P137	13.53	13.51	-0.02	13.54	0.02		
	P138	11.70	11.35	-0.35	11.40	-0.30		
	P139	10.20	9.91	-0.28	9.95	-0.24		
	P140	8.55	8.21	-0.34	8.23	-0.32		
	P141	8.04	7.75	-0.29	7.76	-0.28		
	P142	7.48	7.23	-0.25	7.26	-0.22		
	P143	7.35	7.14	-0.21	7.20	-0.16		
	P144	7.23	7.08	-0.15	7.14	-0.09		
west of Dalton Ave	P145	25.81	-	-	23.82	-1.98		
west of Rolfe Ave	P146	23.44	-	-	22.28	-1.16		
west of Hughes Ave	P147	20.35	20.36	0.01	20.47	0.13		
	P148	19.61	19.61	0.00	19.73	0.12		
	P149	18.65	18.67	0.02	18.75	0.10		
west of Pearce Rd	P150	17.34	17.27	-0.08	17.36	0.02		
	P151	16.53	16.53	0.00	16.59	0.06		
	P152	15.43	15.22	-0.21	15.31	-0.12		
	P153	14.95	14.68	-0.27	14.80	-0.15		
	P154	14.42	14.43	0.01	14.49	0.06		
u/s Pacific Hwy	P155	14.37	14.43	0.05	14.48	0.11		
west of Cesca St	P156	12.99	12.96	-0.03	12.98	-0.01		
	P157	11.96	11.73	-0.23	11.78	-0.18		
u/s Bingarrah Rd	P158	11.02	10.81	-0.21	10.86	-0.16		
d/s Bingarrah Rd	P159	10.42	10.17	-0.25	10.21	-0.21		
u/s Louisiana Rd	P160	9.85	9.82	-0.03	9.85	0.00		
d/s Louisiana Rd	P161	9.00	8.93	-0.07	8.95	-0.05		
	P162	8.70	8.61	-0.09	8.64	-0.07		
	P163	8.57	8.30	-0.27	8.33	-0.24		
d/s Pacific Hwy	P164	28.92	28.80	-0.12	28.82	-0.10		
	P165	26.10	-	-	25.09	-1.01		
	P166	24.00	23.92	-0.08	23.96	-0.03		
	P167	22.03	21.92	-0.10	21.99	-0.03		
	P168	20.54	20.41	-0.13	20.49	-0.04		
East of Sabre Pl	P169	19.14	18.82	-0.33	18.90	-0.25		
East of Georgia Dr	P170	17.12	17.16	0.04	17.19	0.06		
	P171	15.36	15.38	0.03	15.46	0.11		
Nth of De Havilland Cct	P172	13.38	-	-	13.12	-0.26		
	P173	12.52	12.25	-0.27	12.25	-0.27		

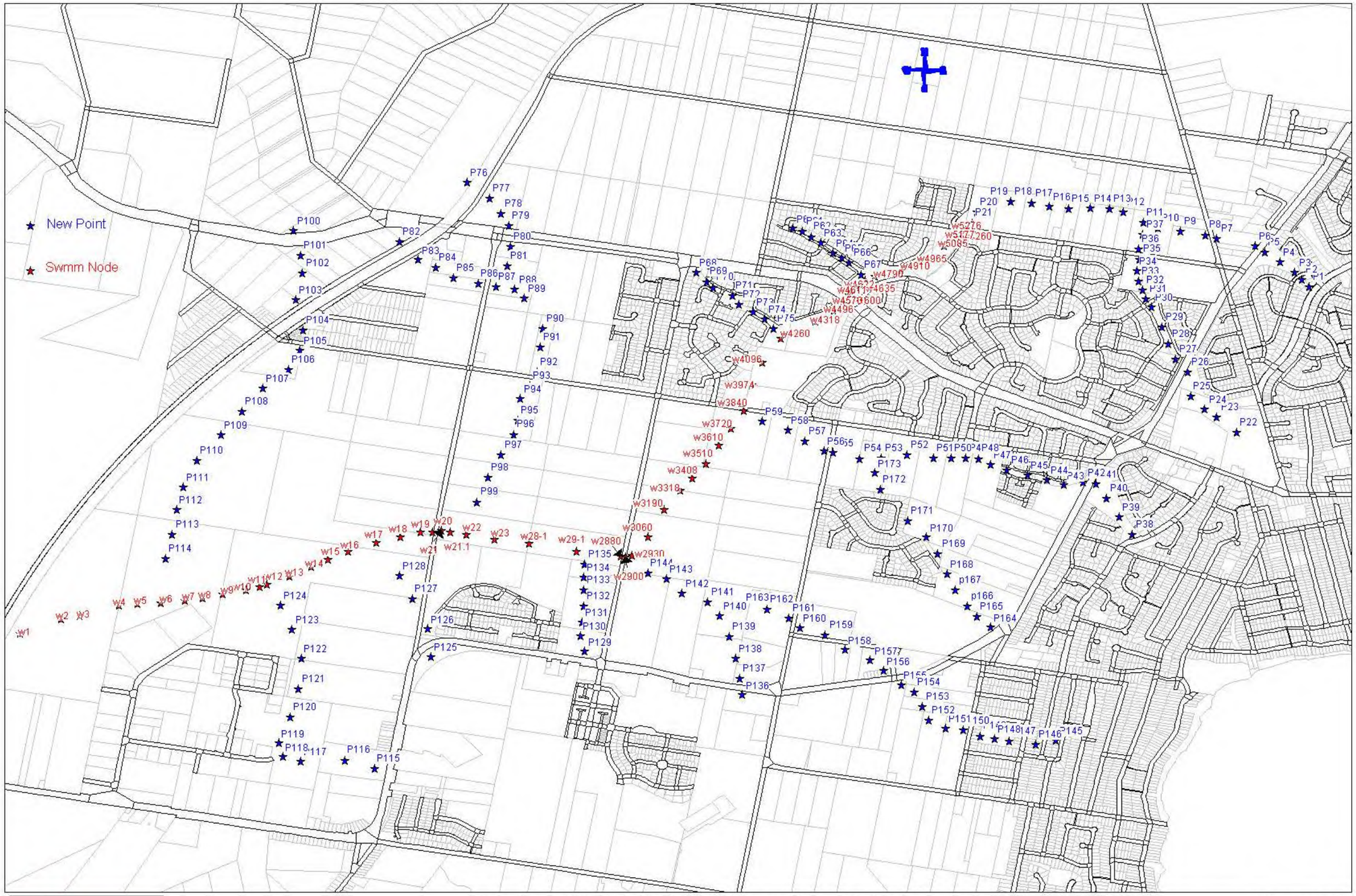
Existing - Flood Study Results 2009

DRAFT - Development Scenario Model with 1D channel in place (as per existing) and the following developments:

- Industrial fill north of Lucca Road
- The proposed Warner Industrial Road
- Lower ALS ground levels by 0.3m in dense vegetated areas
- Mataram Road culvert upgrade
- Natural revegetation of high hazard floodways
- Differential roughness representations for rural and urban areas
- Culvert losses for railway culverts were 0.5 entrance and 1.0 exit for 5m grid model
- Hamlyn Terrace Sports Facility

DSM - Development Scenario Model without 1D channel upstream of Minnesota Rd and the developments above.

See **Figure D3** for locations of nodes.



Previous SWMM Model Nodes and New Point Locations Figure D3

TABLE D.4 Estimated Flood Levels in Design Events and PMP

Location (see Figs D2, D3)	Model node / Point	Design Flood Level (m AHD)						
		5yr ARI	10 yr ARI	20 yr ARI	50 yr ARI	100 yr ARI	200 yr ARI	PMF
Mataram Rd	W5276	17.00	17.07	17.33	17.43	17.48	17.52	18.22
d/s Mataram Rd	W5260	16.72	16.79	16.96	16.98	17.04	17.10	17.99
	W5177	15.97	16.05	16.13	16.19	16.26	16.32	17.18
	W5085	15.70	15.75	15.82	15.88	15.94	15.99	16.88
	W4965	14.80	14.85	14.91	14.97	15.04	15.10	16.42
	W4910	14.02	14.13	14.21	14.31	14.41	14.53	16.22
	W4790	13.95	14.05	14.13	14.22	14.32	14.44	16.18
	W4635	13.90	14.00	14.07	14.15	14.25	14.38	16.14
	W4622	13.88	13.97	14.04	14.12	14.21	14.34	16.11
Sparks Rd	W4611	13.72	13.81	13.89	13.98	14.10	14.27	16.08
d/s Sparks Rd	W4600	12.69	12.75	12.79	12.85	12.91	12.96	13.83
	W4570	12.36	12.42	12.47	12.52	12.58	12.62	13.46
	W4496	11.86	11.92	11.97	12.03	12.11	12.17	12.85
	W4376	11.07	11.14	11.18	11.24	11.29	11.34	12.07
	W4260	10.70	10.78	10.83	10.87	10.93	10.97	11.58
	W4096	9.60	9.67	9.73	9.77	9.81	9.85	10.72
	W3974	9.42	9.49	9.53	9.56	9.59	9.62	10.56
Warnervale Rd	W3840	9.38	9.45	9.48	9.51	9.53	9.56	10.40
d/s Warnervale Rd	W3860	8.74	8.87	8.96	9.01	9.06	9.14	10.37
	W3720	8.57	8.70	8.79	8.84	8.90	8.98	10.20
	W3610	8.26	8.39	8.46	8.51	8.57	8.64	9.80
	W3510	7.97	8.08	8.16	8.21	8.26	8.32	9.42
	W3408	7.62	7.73	7.81	7.86	7.92	7.99	9.11
	W3318	7.40	7.52	7.61	7.67	7.73	7.80	8.92
	W3190	7.31	7.42	7.51	7.56	7.62	7.68	8.68
	W3060	7.07	7.15	7.21	7.25	7.29	7.33	8.21
	W2930	6.93	6.99	7.02	7.05	7.08	7.11	7.92
Minnesota Rd	W2900	6.54	6.64	6.70	6.75	6.80	6.85	7.85
d/s Minnesota Rd	W2880	6.48	6.57	6.64	6.69	6.74	6.80	7.77
	W29-1	6.11	6.21	6.28	6.34	6.43	6.52	7.55
	W28-1	5.85	5.94	6.00	6.07	6.25	6.39	7.38
	W23	5.67	5.76	5.82	5.92	6.21	6.35	7.30
	W22	5.59	5.66	5.73	5.86	6.20	6.34	7.25

Location (see Figs D2, D3)	Model node / Point	Design Flood Level (m AHD)						
		5yr ARI	10 yr ARI	20 yr ARI	50 yr ARI	100 yr ARI	200 yr ARI	PMF
	W21.1	5.57	5.65	5.72	5.85	6.20	6.34	7.24
	W21	5.57	5.64	5.71	5.85	6.19	6.34	7.23
Virginia Rd	W20	5.56	5.63	5.71	5.84	6.19	6.34	7.22
	W19	5.56	5.63	5.70	5.84	6.19	6.34	7.22
	W18	5.56	5.63	5.70	5.84	6.19	6.33	7.21
	W17	5.56	5.63	5.70	5.84	6.19	6.33	7.20
	W16	5.55	5.63	5.70	5.84	6.19	6.33	7.19
	W15	5.55	5.62	5.70	5.84	6.19	6.33	7.19
	W14	5.55	5.62	5.70	5.83	6.19	6.33	7.18
	W13	5.55	5.62	5.69	5.83	6.19	6.33	7.18
	W12	5.55	5.62	5.69	5.83	6.19	6.33	7.17
	W11	5.55	5.62	5.69	5.83	6.19	6.33	7.17
	W10	5.55	5.62	5.69	5.83	6.19	6.33	7.17
	W9	5.55	5.62	5.69	5.83	6.19	6.33	7.17
	W8	5.55	5.62	5.69	5.83	6.19	6.33	7.16
	W7	5.55	5.62	5.69	5.83	6.19	6.33	7.15
	W6	5.55	5.62	5.69	5.83	6.19	6.33	7.14
	W5	5.55	5.62	5.69	5.83	6.18	6.33	7.12
	W4	5.55	5.62	5.69	5.83	6.18	6.32	7.12
u/s Railway	W3	5.55	5.62	5.68	5.82	6.18	6.32	7.07
u/s Railway	W2	5.55	5.62	5.68	5.82	6.18	6.32	7.06
u/s Railway	W1	5.55	5.61	5.68	5.82	6.18	6.32	7.04
d/s Lake Haven Dr	P1	31.13	31.16	31.20	31.23	31.26	31.29	31.51
	P2	31.04	31.07	31.09	31.11	31.14	31.16	31.32
	P3	30.23	30.25	30.29	30.31	30.34	30.36	30.54
u/s Pacific Hwy	P5	29.39	29.40	29.45	29.49	29.73	29.80	30.15
d/s Pacific Hwy	P4	29.46	29.49	29.52	29.54	29.60	29.66	30.14
	P6	27.31	27.37	27.49	27.58	27.60	27.65	28.02
u/s Arizona Rd	P7	26.30	26.44	26.61	26.70	26.74	26.77	27.13
d/s Arizona Rd	P8	25.34	25.37	25.46	25.52	25.55	25.58	25.81
	P9	24.01	24.04	24.11	24.16	24.18	24.20	24.41
	P10	22.91	22.94	23.01	23.06	23.09	23.11	23.31
	P11	21.77	21.80	21.86	21.90	21.93	21.95	22.31
	P12	20.90	20.92	20.97	21.02	21.05	21.07	21.46

Location (see Figs D2, D3)	Model node / Point	Design Flood Level (m AHD)						
		5yr ARI	10 yr ARI	20 yr ARI	50 yr ARI	100 yr ARI	200 yr ARI	PMF
	P13	20.46	20.49	20.54	20.59	20.62	20.65	21.03
	P14	19.91	19.95	20.00	20.06	20.09	20.12	20.56
	P15	19.30	19.34	19.40	19.45	19.50	19.54	19.97
	P16	18.60	18.64	18.71	18.76	18.80	18.83	19.28
	P17	18.28	18.32	18.38	18.44	18.48	18.51	18.94
	P18	17.41	17.48	17.57	17.65	17.72	17.78	18.56
	P19	17.31	17.37	17.45	17.55	17.62	17.68	18.47
	P20	17.18	17.24	17.36	17.48	17.56	17.62	18.39
u/s Mataram Rd	P21	17.10	17.16	17.29	17.42	17.50	17.56	18.30
Nth of Wallarah Rd	P22	35.56	35.59	35.64	35.67	35.70	35.73	36.02
	P23	32.34	32.35	32.38	32.39	32.41	32.43	32.61
	P24	31.44	31.45	31.49	31.51	31.55	31.57	31.75
	P25	30.23	30.34	30.43	30.50	30.55	30.59	30.94
u/s Pacific Hyw	P26	30.12	30.29	30.39	30.47	30.50	30.55	30.85
d/s Pacific Hyw	P27	28.24	28.28	28.31	28.35	28.40	28.42	28.82
adj to Mebbin Cct	P28	27.46	27.51	27.55	27.60	27.66	27.69	28.11
	P29	26.46	26.50	26.54	26.59	26.63	26.67	27.09
u/s North Barrington Dr.	P30	24.93	24.96	25.01	25.11	25.19	25.26	26.29
d/s North Barrington Dr	P31	24.82	24.85	24.89	24.92	24.97	25.01	25.44
	P32	24.08	24.09	24.12	24.13	24.17	24.20	24.63
	P33	23.09	23.11	23.17	23.21	23.28	23.35	24.25
	P34	22.96	23.00	23.06	23.12	23.18	23.25	24.21
Sth of Mataram Rd	P35	22.74	22.85	22.90	22.99	23.07	23.28	24.16
Nth of Mataram Rd	P36	22.59	22.62	22.64	22.67	22.69	22.74	23.11
	P37	21.90	21.92	21.97	22.02	22.05	22.07	22.53
d/s Walker Ave	P38	21.74	21.78	21.82	21.84	21.86	21.89	22.39
	P39	21.74	21.77	21.81	21.83	21.85	21.87	22.30
	P40	21.74	21.77	21.81	21.83	21.85	21.87	22.29
u/s Pacific Hyw	P41	21.44	21.47	21.49	21.50	21.52	21.53	21.82
d/s Pacific Hyw	P42	19.23	19.29	19.34	19.37	19.39	19.43	19.83
Sth of Lomandra Tce	P43	17.41	17.56	17.74	17.79	17.84	17.90	18.70

Location (see Figs D2, D3)	Model node / Point	Design Flood Level (m AHD)						
		5yr ARI	10 yr ARI	20 yr ARI	50 yr ARI	100 yr ARI	200 yr ARI	PMF
	P44	17.18	17.31	17.42	17.46	17.50	17.55	18.26
Sth of Kite Cr	P45	16.66	16.77	16.84	16.88	16.92	16.97	17.67
Sth of Pardalote Way	P46	16.42	16.51	16.58	16.62	16.66	16.69	17.35
	P47	15.91	15.99	16.05	16.09	16.13	16.16	16.90
	P48	15.56	15.62	15.67	15.70	15.74	15.77	16.73
	P49	15.23	15.30	15.35	15.41	15.48	15.56	16.65
	P50	14.85	14.96	15.07	15.22	15.34	15.47	16.57
	P51	14.25	14.55	14.81	15.09	15.24	15.39	16.50
	P52	13.19	13.29	13.35	13.38	13.42	13.45	14.09
	P53	12.26	12.32	12.35	12.36	12.38	12.40	13.02
	P54	11.64	11.75	11.81	11.84	11.88	11.92	12.71
u/s Louisiana Rd	P55	11.41	11.48	11.53	11.56	11.58	11.61	12.19
d/s Louisiana Rd	P56	10.68	10.82	10.90	10.95	11.00	11.04	11.94
	P57	10.25	10.35	10.41	10.44	10.47	10.51	11.29
	P58	9.62	9.72	9.78	9.81	9.85	9.88	10.74
	P59	8.92	9.06	9.16	9.21	9.28	9.40	10.46
adj to Park Range Way	P60	17.29	17.32	17.36	17.40	17.43	17.46	17.73
	P61	16.33	16.36	16.38	16.43	16.44	16.46	16.68
	P62	15.84	15.87	15.91	16.01	16.02	16.04	16.40
	P63	15.25	15.27	15.40	15.50	15.57	15.63	16.28
adj to Oakridge PL	P64	14.71	14.76	14.80	14.84	14.88	14.92	16.16
	P65	14.42	14.47	14.52	14.58	14.62	14.67	16.16
	P66	14.33	14.38	14.43	14.49	14.54	14.58	16.16
	P67	13.91	14.00	14.08	14.16	14.26	14.39	16.15
adj to Alpine Ash Rd	P68	15.49	15.52	15.55	15.58	15.61	15.65	15.89
	P69	14.38	14.41	14.44	14.45	14.48	14.55	14.86
	P70	13.63	13.68	13.74	13.78	13.85	13.95	14.67
adj to Paperbark St	P71	12.92	12.96	13.01	13.06	13.09	13.13	13.51
	P72	12.55	12.60	12.66	12.71	12.76	12.81	13.23
	P73	12.13	12.18	12.26	12.32	12.38	12.43	12.88
	P74	11.88	11.92	11.98	12.04	12.08	12.12	12.55
	P75	11.36	11.39	11.42	11.46	11.48	11.51	11.74
u/s Nikko Rd	P76	22.02	22.10	22.25	22.42	22.62	22.73	25.22

Location (see Figs D2, D3)	Model node / Point	Design Flood Level (m AHD)						
		5yr ARI	10 yr ARI	20 yr ARI	50 yr ARI	100 yr ARI	200 yr ARI	PMF
d/s Nikko Rd	P77	19.36	19.36	19.37	19.38	19.38	19.39	19.46
	P78	18.14	18.15	18.17	18.17	18.17	18.17	19.41
u/s Sparks Rd	P79	17.65	17.68	17.73	17.77	17.80	17.82	19.40
d/s Sparks Rd	P80	15.19	15.21	15.23	15.25	15.27	15.28	15.41
	P81	13.93	13.95	13.96	13.97	13.98	14.00	14.11
u/s Railway Rd	P82	21.68	21.70	21.72	21.74	21.75	21.77	22.58
d/s Nikko Rd	P83	19.45	19.45	19.46	19.49	19.50	19.51	19.59
	P84	16.90	16.92	16.93	16.98	16.99	17.00	17.09
	P85	14.67	14.68	14.70	14.71	14.72	14.73	14.90
u/s Virginia Rd	P86	13.43	13.49	13.54	13.58	13.62	13.65	13.98
d/s Virginia Rd	P87	12.38	12.38	12.39	12.40	12.42	12.44	12.69
	P88	12.12	12.14	12.15	12.15	12.16	12.17	12.23
	P89	11.49	11.50	11.52	11.53	11.54	11.55	11.65
	P90	10.07	10.11	10.14	10.18	10.21	10.24	10.66
	P91	9.64	9.74	9.82	9.87	9.91	9.96	10.53
u/s Warnervale Rd	P92	9.36	9.64	9.75	9.80	9.85	9.89	10.43
d/s Warnervale Rd	P93	8.43	8.47	8.51	8.54	8.57	8.60	9.12
	P94	7.95	8.01	8.05	8.08	8.11	8.14	8.59
	P95	7.52	7.56	7.59	7.61	7.63	7.65	7.93
	P96	6.83	6.87	6.90	6.92	6.94	6.97	7.43
	P97	6.21	6.25	6.27	6.29	6.33	6.39	7.30
	P98	5.64	5.71	5.78	5.88	6.20	6.35	7.28
	P99	5.59	5.67	5.74	5.86	6.20	6.34	7.27
u/s Sparks Rd	P100	15.41	15.45	15.55	15.59	15.62	15.66	17.28
d/s Sparks Rd	P101	13.27	13.28	13.31	13.33	13.34	13.36	13.47
	P102	11.44	11.45	11.47	11.48	11.50	11.51	12.84
u/s Railway Rd	P103	10.59	10.73	10.77	10.81	10.85	10.90	12.84
d/s Nikko Rd	P104	8.69	8.75	8.78	8.80	8.82	8.84	9.02
	P105	7.93	7.96	8.00	8.02	8.04	8.05	8.21
	P106	6.63	6.66	6.70	6.73	6.75	6.76	7.18
	P107	5.63	5.66	5.70	5.84	6.19	6.33	7.16
	P108	5.55	5.62	5.69	5.83	6.19	6.33	7.16
	P109	5.55	5.62	5.69	5.83	6.19	6.33	7.16
	P110	5.55	5.62	5.69	5.83	6.19	6.33	7.16
	P111	5.55	5.62	5.69	5.83	6.19	6.33	7.16

Location (see Figs D2, D3)	Model node / Point	Design Flood Level (m AHD)						
		5yr ARI	10 yr ARI	20 yr ARI	50 yr ARI	100 yr ARI	200 yr ARI	PMF
	P112	5.55	5.62	5.69	5.83	6.19	6.33	7.16
	P113	5.55	5.62	5.69	5.83	6.19	6.33	7.16
	P114	5.55	5.62	5.69	5.83	6.19	6.33	7.15
d/s Pacific Hwy	P115	11.03	11.08	11.16	11.24	11.32	11.36	11.95
	P116	9.99	10.05	10.12	10.18	10.24	10.26	10.41
	P117	8.10	8.11	8.11	8.11	8.12	8.12	8.34
	P118	7.37	7.37	7.39	7.40	7.42	7.42	7.58
	P119	6.40	6.42	6.43	6.45	6.47	6.48	7.19
	P120	5.64	5.67	5.72	5.84	6.19	6.33	7.19
	P121	5.55	5.63	5.70	5.84	6.19	6.33	7.19
	P122	5.55	5.62	5.70	5.84	6.19	6.33	7.19
	P123	5.55	5.62	5.70	5.84	6.19	6.33	7.19
	P124	5.55	5.62	5.69	5.83	6.19	6.33	7.18
u/s Pacific Hwy	P125	6.79	7.02	7.18	7.32	7.47	7.63	8.20
west of Cherry Blossom Cr	P126	5.61	5.66	5.72	5.85	6.19	6.33	7.20
west of Virgina Rd	P127	5.56	5.63	5.70	5.84	6.19	6.33	7.20
	P128	5.56	5.63	5.70	5.84	6.19	6.33	7.20
east of Bougainvillea Rd E	P129	8.54	8.55	8.58	8.61	8.63	8.66	8.91
	P130	7.85	7.85	7.89	7.91	7.95	7.97	8.20
east of Birch Dr	P131	7.13	7.14	7.16	7.18	7.19	7.21	7.69
	P132	6.54	6.60	6.64	6.68	6.72	6.76	7.69
	P133	6.50	6.56	6.61	6.65	6.69	6.74	7.68
	P134	6.42	6.49	6.54	6.58	6.63	6.69	7.65
	P135	6.26	6.35	6.41	6.46	6.53	6.61	7.62
sth of Pacific Hwy	P136	14.79	14.88	14.94	14.99	15.03	15.06	15.35
	P137	13.47	13.49	13.51	13.53	13.54	13.56	13.71
	P138	11.29	11.31	11.34	11.37	11.40	11.43	11.71
	P139	9.86	9.89	9.91	9.94	9.95	9.98	10.18
	P140	8.16	8.17	8.19	8.21	8.23	8.26	8.81
	P141	7.55	7.64	7.68	7.72	7.76	7.81	8.45
	P142	7.04	7.13	7.18	7.22	7.26	7.29	8.12
	P143	7.00	7.08	7.12	7.16	7.20	7.23	8.08
	P144	6.96	7.02	7.07	7.10	7.14	7.17	8.00

Location (see Figs D2, D3)	Model node / Point	Design Flood Level (m AHD)						
		5yr ARI	10 yr ARI	20 yr ARI	50 yr ARI	100 yr ARI	200 yr ARI	PMF
west of Dalton Ave	P145	23.73	23.75	23.78	23.80	23.82	23.84	24.01
west of Rolfe Ave	P146	22.25	22.26	22.27	22.27	22.28	22.28	22.37
west of Hughes Ave	P147	20.38	20.40	20.43	20.45	20.47	20.49	20.65
	P148	19.64	19.66	19.69	19.71	19.73	19.75	19.91
	P149	18.69	18.71	18.72	18.74	18.75	18.77	18.92
west of Pearce Rd	P150	17.29	17.31	17.32	17.34	17.36	17.38	17.52
	P151	16.54	16.56	16.57	16.58	16.59	16.60	16.68
	P152	15.22	15.24	15.26	15.29	15.31	15.34	15.56
	P153	14.67	14.70	14.74	14.77	14.80	14.83	15.08
	P154	14.35	14.38	14.41	14.45	14.49	14.52	14.81
u/s Pacific Hwy	P155	14.35	14.38	14.41	14.45	14.48	14.51	14.80
west of Cesca St	P156	12.92	12.93	12.95	12.97	12.98	13.00	13.27
	P157	11.64	11.68	11.72	11.75	11.78	11.81	12.15
u/s Bingarrah Rd	P158	10.71	10.75	10.79	10.83	10.86	10.89	11.29
d/s Bingarrah Rd	P159	10.10	10.12	10.15	10.18	10.21	10.24	10.65
u/s Louisiana Rd	P160	9.70	9.74	9.78	9.82	9.85	9.88	10.24
d/s Louisiana Rd	P161	8.83	8.86	8.89	8.93	8.95	8.97	9.42
	P162	8.48	8.53	8.56	8.60	8.64	8.67	9.24
	P163	8.08	8.16	8.22	8.28	8.33	8.38	9.06
d/s Pacific Hwy	P164	28.81	28.81	28.81	28.82	28.82	28.82	28.85
	P165	25.04	25.05	25.06	25.08	25.09	25.10	25.16
	P166	23.93	23.94	23.95	23.96	23.96	23.97	24.03
	P167	21.94	21.95	21.97	21.98	21.99	22.01	22.08
	P168	20.39	20.42	20.45	20.47	20.49	20.52	20.70
East of Sabre Pl	P169	18.79	18.82	18.84	18.87	18.90	18.92	19.12
East of Georgia Dr	P170	17.15	17.16	17.17	17.18	17.19	17.20	17.31
	P171	15.34	15.37	15.40	15.44	15.46	15.49	15.71
Nth of De Havilland Cct	P172	12.97	12.99	13.02	13.09	13.12	13.14	13.45
	P173	12.05	12.13	12.19	12.21	12.25	12.28	13.05

TABLE D.6 - Sensitivity Analysis Results – Climate Change and Roughness Increase

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 15% *m AHD*	Difference to 100yr ARI *(m)*	100 yr ARI + 30% *m AHD*	Difference to 100yr ARI *(m)*	Nat Rough inc to n=0.1 *m AHD*	Difference to 100yr ARI *(m)*
Mataram Rd	W5276	17.48	17.54	0.05	17.60	0.11	17.53	0.04
d/s Mataram Rd	W5260	17.04	17.13	0.09	17.21	0.17	17.17	0.13
	W5177	16.26	16.34	0.08	16.41	0.16	16.22	-0.03
	W5085	15.94	16.02	0.08	16.09	0.15	15.90	-0.04
	W4965	15.04	15.12	0.09	15.21	0.17	15.00	-0.04
	W4910	14.41	14.58	0.17	14.81	0.40	14.48	0.07
	W4790	14.32	14.51	0.19	14.76	0.44	14.29	-0.02
	W4635	14.25	14.45	0.20	14.72	0.47	14.19	-0.06
	W4622	14.21	14.42	0.21	14.69	0.48	14.15	-0.06
Sparks Rd	W4611	14.10	14.35	0.25	14.64	0.54	14.04	-0.07
d/s Sparks Rd	W4600	12.91	12.97	0.07	13.03	0.12	12.88	-0.02
	W4570	12.58	12.63	0.06	12.69	0.11	12.55	-0.02
	W4496	12.11	12.18	0.07	12.23	0.11	12.11	-0.01
	W4376	11.29	11.35	0.06	11.40	0.11	11.31	0.02
	W4260	10.93	10.98	0.05	11.02	0.10	11.00	0.08
	W4096	9.81	9.87	0.06	9.91	0.10	9.96	0.14
	W3974	9.59	9.63	0.04	9.66	0.07	9.76	0.17
Warnervale Rd	W3840	9.53	9.56	0.03	9.58	0.05	9.71	0.18
d/s Warnervale Rd	W3860	9.06	9.15	0.09	9.22	0.16	9.06	0.00
	W3720	8.90	8.99	0.09	9.07	0.17	8.89	-0.01
	W3610	8.57	8.65	0.08	8.72	0.15	8.56	-0.01
	W3510	8.26	8.34	0.08	8.40	0.15	8.25	-0.01
	W3408	7.92	8.00	0.09	8.08	0.16	7.91	-0.01
	W3318	7.73	7.82	0.09	7.89	0.16	7.73	0.00
	W3190	7.62	7.70	0.08	7.76	0.14	7.63	0.01
	W3060	7.29	7.35	0.06	7.40	0.11	7.35	0.06
	W2930	7.08	7.12	0.04	7.16	0.08	7.19	0.11
Minnesota Rd	W2900	6.80	6.87	0.07	6.93	0.13	7.03	0.23
d/s Minnesota Rd	W2880	6.74	6.81	0.07	6.87	0.13	6.94	0.20
	W29-1	6.43	6.51	0.08	6.58	0.15	6.52	0.09

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 15% *m AHD*	Difference to 100yr ARI *(m)*	100 yr ARI + 30% *m AHD*	Difference to 100yr ARI *(m)*	Nat Rough inc to n=0.1 *m AHD*	Difference to 100yr ARI *(m)*
	W28-1	6.25	6.34	0.09	6.42	0.17	6.36	0.11
	W23	6.21	6.30	0.09	6.39	0.17	6.28	0.06
	W22	6.20	6.29	0.09	6.37	0.17	6.23	0.04
	W21.1	6.20	6.29	0.09	6.37	0.17	6.23	0.03
	W21	6.19	6.28	0.09	6.37	0.17	6.22	0.03
Virginia Rd	W20	6.19	6.28	0.09	6.36	0.17	6.22	0.02
	W19	6.19	6.28	0.09	6.36	0.17	6.21	0.02
	W18	6.19	6.28	0.09	6.36	0.17	6.21	0.02
	W17	6.19	6.28	0.09	6.36	0.17	6.20	0.01
	W16	6.19	6.28	0.09	6.36	0.17	6.20	0.01
	W15	6.19	6.28	0.09	6.36	0.17	6.19	0.01
	W14	6.19	6.28	0.09	6.36	0.17	6.19	0.00
	W13	6.19	6.28	0.09	6.36	0.17	6.19	0.00
	W12	6.19	6.28	0.09	6.36	0.17	6.19	0.00
	W11	6.19	6.28	0.09	6.36	0.17	6.19	0.00
	W10	6.19	6.28	0.09	6.36	0.17	6.18	0.00
	W9	6.19	6.28	0.09	6.35	0.17	6.18	-0.01
	W8	6.19	6.28	0.09	6.35	0.17	6.18	-0.01
	W7	6.19	6.27	0.09	6.35	0.17	6.18	-0.01
	W6	6.19	6.27	0.09	6.35	0.17	6.18	-0.01
	W5	6.18	6.27	0.09	6.35	0.17	6.18	-0.01
	W4	6.18	6.27	0.09	6.35	0.17	6.18	-0.01
u/s Railway	W3	6.18	6.27	0.09	6.34	0.16	6.17	-0.01
u/s Railway	W2	6.18	6.27	0.09	6.34	0.16	6.17	-0.01
u/s Railway	W1	6.18	6.26	0.09	6.34	0.16	6.17	-0.01
d/s Lake Haven Dr	P1	31.26	31.30	0.04	31.34	0.08	31.40	0.14
	P2	31.14	31.17	0.04	31.20	0.07	31.25	0.12
	P3	30.34	30.37	0.03	30.40	0.07	30.41	0.07
u/s Pacific Hwy	P5	29.73	29.83	0.10	29.90	0.17	29.69	-0.04
d/s Pacific Hwy	P4	29.60	29.68	0.08	29.75	0.15	29.63	0.02
	P6	27.60	27.67	0.07	27.71	0.11	27.60	0.00

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 15% *m AHD*	Difference to 100yr ARI *(m)*	100 yr ARI + 30% *m AHD*	Difference to 100yr ARI *(m)*	Nat Rough inc to n=0.1 *m AHD*	Difference to 100yr ARI *(m)*
u/s Arizona Rd	P7	26.74	26.79	0.06	26.85	0.12	26.73	-0.01
d/s Arizona Rd	P8	25.55	25.59	0.04	25.64	0.08	25.55	-0.01
	P9	24.18	24.21	0.03	24.25	0.06	24.18	-0.01
	P10	23.09	23.11	0.03	23.14	0.06	23.09	0.00
	P11	21.93	21.96	0.03	22.00	0.07	22.00	0.07
	P12	21.05	21.09	0.04	21.13	0.08	21.17	0.12
	P13	20.62	20.66	0.04	20.70	0.08	20.73	0.11
	P14	20.09	20.14	0.05	20.18	0.09	20.25	0.16
	P15	19.50	19.55	0.05	19.60	0.10	19.64	0.14
	P16	18.80	18.84	0.05	18.89	0.10	18.91	0.11
	P17	18.48	18.53	0.05	18.57	0.10	18.55	0.08
	P18	17.72	17.81	0.09	17.89	0.17	17.85	0.13
	P19	17.62	17.71	0.08	17.79	0.16	17.71	0.09
	P20	17.56	17.64	0.08	17.72	0.16	17.64	0.09
u/s Mataram Rd	P21	17.50	17.58	0.08	17.66	0.15	17.58	0.08
Nth of Wallarah Rd	P22	35.70	35.74	0.04	35.78	0.08	35.70	0.00
	P23	32.41	32.44	0.03	32.46	0.05	32.41	0.00
	P24	31.55	31.58	0.04	31.60	0.06	31.55	0.00
	P25	30.55	30.62	0.07	30.68	0.13	30.55	0.00
u/s Pacific Hyw	P26	30.50	30.57	0.06	30.62	0.11	30.50	0.00
d/s Pacific Hyw	P27	28.40	28.44	0.04	28.49	0.09	28.40	0.00
adj to Mebbin Cct	P28	27.66	27.71	0.06	27.77	0.12	27.66	0.00
	P29	26.63	26.68	0.05	26.74	0.11	26.63	0.00
u/s North Barrington Dr.	P30	25.19	25.29	0.10	25.41	0.22	25.19	0.00
d/s North Barrington Dr	P31	24.97	25.03	0.05	25.09	0.11	24.97	0.00
	P32	24.17	24.21	0.04	24.26	0.09	24.17	0.00
	P33	23.28	23.38	0.10	23.46	0.18	23.37	0.09
	P34	23.18	23.29	0.11	23.37	0.19	23.23	0.06
Sth of Mataram Rd	P35	23.07	23.19	0.11	23.26	0.19	23.10	0.02
Nth of Mataram Rd	P36	22.69	22.72	0.03	22.76	0.07	22.82	0.13

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 15% *m AHD*	Difference to 100yr ARI *(m)*	100 yr ARI + 30% *m AHD*	Difference to 100yr ARI *(m)*	Nat Rough inc to n=0.1 *m AHD*	Difference to 100yr ARI *(m)*
	P37	22.05	22.09	0.04	22.13	0.09	22.20	0.16
d/s Walker Ave	P38	21.86	21.90	0.03	21.93	0.06	21.92	0.06
	P39	21.85	21.88	0.03	21.91	0.06	21.90	0.04
	P40	21.85	21.88	0.03	21.91	0.06	21.90	0.04
u/s Pacific Hyw	P41	21.52	21.54	0.02	21.56	0.04	21.55	0.03
d/s Pacific Hyw	P42	19.39	19.44	0.05	19.47	0.08	19.42	0.03
Sth of Lomandra Tce	P43	17.84	17.92	0.08	18.00	0.16	18.04	0.20
	P44	17.50	17.56	0.06	17.63	0.12	17.63	0.13
Sth of Kite Cr	P45	16.92	16.98	0.06	17.03	0.11	17.07	0.14
Sth of Pardalote Way	P46	16.66	16.71	0.05	16.76	0.10	16.79	0.13
	P47	16.13	16.17	0.05	16.22	0.09	16.12	-0.01
	P48	15.74	15.79	0.05	15.87	0.13	15.73	0.00
	P49	15.48	15.61	0.13	15.74	0.26	15.50	0.02
	P50	15.34	15.52	0.19	15.68	0.34	15.38	0.04
	P51	15.24	15.45	0.22	15.62	0.38	15.23	0.00
	P52	13.42	13.47	0.04	13.51	0.09	13.42	0.00
	P53	12.38	12.41	0.03	12.44	0.05	12.38	0.00
	P54	11.88	11.93	0.05	11.98	0.09	11.88	0.00
u/s Louisiana Rd	P55	11.58	11.62	0.03	11.65	0.07	11.58	-0.01
d/s Louisiana Rd	P56	11.00	11.06	0.06	11.11	0.12	10.99	-0.01
	P57	10.47	10.52	0.04	10.56	0.09	10.47	0.00
	P58	9.85	9.89	0.04	9.93	0.09	9.90	0.05
	P59	9.28	9.41	0.13	9.47	0.20	9.36	0.09
adj to Park Range Way	P60	17.43	17.47	0.04	17.51	0.08	17.43	0.00
	P61	16.44	16.47	0.03	16.50	0.06	16.44	0.00
	P62	16.02	16.05	0.03	16.08	0.06	16.02	0.00
	P63	15.57	15.64	0.07	15.73	0.16	15.57	0.00
adj to Oakridge PL	P64	14.88	14.93	0.05	14.97	0.09	14.90	0.02
	P65	14.62	14.69	0.06	14.76	0.14	14.63	0.00
	P66	14.54	14.60	0.07	14.74	0.20	14.54	0.00

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 15% *m AHD*	Difference to 100yr ARI *(m)*	100 yr ARI + 30% *m AHD*	Difference to 100yr ARI *(m)*	Nat Rough inc to n=0.1 *m AHD*	Difference to 100yr ARI *(m)*
	P67	14.26	14.46	0.20	14.73	0.47	14.20	-0.06
adj to Alpine Ash Rd	P68	15.61	15.66	0.04	15.70	0.08	15.61	0.00
	P69	14.48	14.56	0.08	14.60	0.12	14.48	0.00
	P70	13.85	13.99	0.14	14.12	0.27	13.85	0.00
adj to Paperbark St	P71	13.09	13.15	0.06	13.20	0.11	13.10	0.00
	P72	12.76	12.83	0.07	12.89	0.13	12.76	0.00
	P73	12.38	12.46	0.08	12.53	0.15	12.37	0.00
	P74	12.08	12.14	0.06	12.20	0.12	12.10	0.02
	P75	11.48	11.52	0.04	11.56	0.07	11.58	0.10
u/s Nikko Rd	P76	22.62	22.78	0.16	22.95	0.33	22.62	0.00
d/s Nikko Rd	P77	19.38	19.39	0.01	19.39	0.01	19.41	0.03
	P78	18.17	18.17	0.00	18.17	0.00	18.19	0.02
u/s Sparks Rd	P79	17.80	17.83	0.04	17.87	0.07	17.80	0.00
d/s Sparks Rd	P80	15.27	15.28	0.01	15.30	0.03	15.35	0.08
	P81	13.98	14.00	0.02	14.02	0.04	14.06	0.07
u/s Railway Rd	P82	21.75	21.78	0.02	21.88	0.13	21.75	0.00
d/s Nikko Rd	P83	19.50	19.51	0.01	19.51	0.01	19.50	0.00
	P84	16.99	17.00	0.01	17.01	0.02	16.99	0.00
	P85	14.72	14.74	0.02	14.77	0.05	14.72	0.00
u/s Virginia Rd	P86	13.62	13.67	0.04	13.70	0.08	13.69	0.07
d/s Virginia Rd	P87	12.42	12.44	0.02	12.47	0.05	12.52	0.10
	P88	12.16	12.17	0.01	12.18	0.02	12.21	0.05
	P89	11.54	11.55	0.01	11.56	0.02	11.57	0.03
	P90	10.21	10.25	0.04	10.29	0.08	10.21	0.00
	P91	9.91	9.98	0.07	10.05	0.13	9.91	0.00
u/s Warnervale Rd	P92	9.85	9.91	0.07	9.98	0.13	9.84	0.00
d/s Warnervale Rd	P93	8.57	8.62	0.05	8.67	0.10	8.57	0.00
	P94	8.11	8.16	0.05	8.20	0.09	8.10	0.00
	P95	7.63	7.66	0.03	7.69	0.06	7.63	0.00
	P96	6.94	6.98	0.04	7.01	0.07	6.94	0.00

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 15% *m AHD*	Difference to 100yr ARI *(m)*	100 yr ARI + 30% *m AHD*	Difference to 100yr ARI *(m)*	Nat Rough inc to n=0.1 *m AHD*	Difference to 100yr ARI *(m)*
	P97	6.33	6.37	0.04	6.42	0.09	6.33	0.01
	P98	6.20	6.29	0.09	6.38	0.17	6.24	0.04
	P99	6.20	6.29	0.09	6.37	0.17	6.24	0.04
u/s Sparks Rd	P100	15.62	15.68	0.06	15.75	0.13	15.62	0.00
d/s Sparks Rd	P101	13.34	13.36	0.02	13.37	0.04	13.34	0.00
	P102	11.50	11.52	0.03	11.54	0.04	11.50	0.00
u/s Railway Rd	P103	10.85	10.92	0.07	11.00	0.15	10.85	0.00
d/s Nikko Rd	P104	8.82	8.85	0.03	8.88	0.06	8.82	0.00
	P105	8.04	8.07	0.03	8.08	0.05	8.04	0.00
	P106	6.75	6.77	0.02	6.78	0.04	6.75	0.00
	P107	6.19	6.28	0.09	6.35	0.17	6.18	-0.01
	P108	6.19	6.28	0.09	6.35	0.17	6.18	-0.01
	P109	6.19	6.28	0.09	6.35	0.17	6.18	-0.01
	P110	6.19	6.28	0.09	6.35	0.17	6.18	-0.01
	P111	6.19	6.27	0.09	6.35	0.17	6.18	-0.01
	P112	6.19	6.27	0.09	6.35	0.17	6.18	-0.01
	P113	6.19	6.27	0.09	6.35	0.17	6.18	-0.01
	P114	6.19	6.27	0.09	6.35	0.17	6.18	-0.01
d/s Pacific Hwy	P115	11.32	11.33	0.01	11.36	0.04	11.32	0.00
	P116	10.24	10.25	0.01	10.26	0.03	10.24	0.00
	P117	8.12	8.12	0.00	8.12	0.00	8.12	0.00
	P118	7.42	7.42	0.00	7.42	0.01	7.42	0.00
	P119	6.47	6.47	0.00	6.48	0.01	6.47	0.00
	P120	6.19	6.28	0.09	6.36	0.17	6.19	0.00
	P121	6.19	6.28	0.09	6.36	0.17	6.19	0.00
	P122	6.19	6.28	0.09	6.36	0.17	6.19	0.00
	P123	6.19	6.28	0.09	6.36	0.17	6.19	0.00
	P124	6.19	6.28	0.09	6.36	0.17	6.19	0.00
u/s Pacific Hwy	P125	7.47	7.69	0.22	7.83	0.36	7.49	0.02
west of Cherry Blossom Cr	P126	6.19	6.28	0.09	6.36	0.17	6.21	0.02
west of Virgina Rd	P127	6.19	6.28	0.09	6.36	0.17	6.20	0.01

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 15% *m AHD*	Difference to 100yr ARI *(m)*	100 yr ARI + 30% *m AHD*	Difference to 100yr ARI *(m)*	Nat Rough inc to n=0.1 *m AHD*	Difference to 100yr ARI *(m)*
	P128	6.19	6.28	0.09	6.36	0.17	6.20	0.01
east of Bougainvillea Rd E	P129	8.63	8.67	0.04	8.68	0.05	8.70	0.06
	P130	7.95	7.98	0.04	7.99	0.05	7.99	0.04
east of Birch Dr	P131	7.19	7.21	0.02	7.22	0.03	7.22	0.02
	P132	6.72	6.77	0.05	6.82	0.10	6.85	0.13
	P133	6.69	6.75	0.06	6.80	0.11	6.77	0.08
	P134	6.63	6.69	0.06	6.75	0.12	6.74	0.11
	P135	6.53	6.60	0.07	6.67	0.14	6.67	0.14
sth of Pacific Hwy	P136	15.03	15.07	0.05	15.12	0.09	15.03	0.00
	P137	13.54	13.57	0.02	13.59	0.04	13.58	0.04
	P138	11.40	11.44	0.04	11.48	0.08	11.45	0.05
	P139	9.95	9.99	0.03	10.01	0.06	9.95	0.00
	P140	8.23	8.27	0.03	8.31	0.08	8.23	0.00
	P141	7.76	7.82	0.05	7.88	0.12	7.75	-0.01
	P142	7.26	7.31	0.05	7.35	0.10	7.30	0.04
	P143	7.20	7.25	0.05	7.29	0.09	7.26	0.06
	P144	7.14	7.18	0.05	7.22	0.09	7.22	0.08
west of Dalton Ave	P145	23.82	23.85	0.03	23.88	0.06	23.82	0.00
west of Rolfe Ave	P146	22.28	22.29	0.01	22.31	0.03	22.28	0.00
west of Hughes Ave	P147	20.47	20.50	0.03	20.52	0.05	20.47	0.00
	P148	19.73	19.76	0.03	19.78	0.06	19.73	0.00
	P149	18.75	18.78	0.02	18.80	0.05	18.75	0.00
west of Pearce Rd	P150	17.36	17.39	0.02	17.41	0.05	17.42	0.06
	P151	16.59	16.60	0.01	16.61	0.02	16.58	-0.01
	P152	15.31	15.35	0.04	15.38	0.07	15.32	0.00
	P153	14.80	14.84	0.04	14.88	0.07	14.80	0.00
	P154	14.49	14.50	0.02	14.57	0.08	14.49	0.00
u/s Pacific Hwy	P155	14.48	14.50	0.02	14.56	0.08	14.48	0.00
west of Cesca	P156	12.98	13.02	0.04	13.05	0.06	12.98	0.00

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 15% *m AHD*	Difference to 100yr ARI *(m)*	100 yr ARI + 30% *m AHD*	Difference to 100yr ARI *(m)*	Nat Rough inc to n=0.1 *m AHD*	Difference to 100yr ARI *(m)*
St								
	P157	11.78	11.83	0.05	11.87	0.09	11.78	0.00
u/s Bingarrah Rd	P158	10.86	10.91	0.05	10.95	0.09	10.86	0.00
d/s Bingarrah Rd	P159	10.21	10.25	0.04	10.30	0.09	10.21	0.00
u/s Louisiana Rd	P160	9.85	9.91	0.07	9.93	0.09	9.89	0.04
d/s Louisiana Rd	P161	8.95	9.00	0.05	9.02	0.07	9.09	0.14
	P162	8.64	8.68	0.04	8.73	0.10	8.77	0.13
	P163	8.33	8.39	0.06	8.47	0.14	8.32	-0.01
d/s Pacific Hwy	P164	28.82	28.82	0.01	28.83	0.01	28.83	0.01
	P165	25.09	25.11	0.02	25.12	0.03	25.13	0.04
	P166	23.96	23.98	0.01	23.99	0.03	24.00	0.03
	P167	21.99	22.29	0.29	22.03	0.04	22.03	0.04
	P168	20.49	20.63	0.14	20.55	0.06	20.49	0.00
East of Sabre Pl	P169	18.90	18.88	-0.01	18.95	0.06	18.90	0.00
East of Georgia Dr	P170	17.19	17.18	-0.01	17.22	0.03	17.22	0.03
	P171	15.46	15.28	-0.18	15.54	0.07	15.47	0.00
Nth of De Havilland Cct	P172	13.12	13.13	0.01	13.18	0.06	13.12	0.00
	P173	12.25	12.29	0.04	12.33	0.08	12.25	0.00

Note: There are some reductions in levels when comparing the 100yr ARI + 15% case to the 100 year ARI due to the change in model terrain and culverts as discussed in **Section 5.3.1**.

TABLE D.7 Sensitivity Analysis Results – Culvert Blockage

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 50% block *m AHD*	Diff to 100yr ARI *(m)*	PMF + 50% block *m AHD*	Diff to PMF *(m)*	20 yr ARI + 50% block *m AHD*	Diff to 20yr ARI *(m)*
Mataram Rd	W5276	17.48	17.60	0.12	18.31	0.08	17.55	0.22
d/s Mataram Rd	W5260	17.04	17.05	0.01	17.99	0.00	16.94	-0.02
	W5177	16.26	16.24	-0.01	17.17	-0.01	16.09	-0.05
	W5085	15.94	15.93	-0.01	16.90	0.02	15.79	-0.03
	W4965	15.04	15.07	0.04	16.47	0.06	14.88	-0.03
	W4910	14.41	14.95	0.54	16.31	0.09	14.38	0.18
	W4790	14.32	14.94	0.62	16.27	0.10	14.35	0.22
	W4635	14.25	14.93	0.68	16.24	0.10	14.33	0.26
	W4622	14.21	14.92	0.72	16.22	0.11	14.31	0.28
Sparks Rd	W4611	14.10	14.92	0.81	16.21	0.12	14.29	0.40
d/s Sparks Rd	W4600	12.91	12.80	-0.11	13.74	-0.09	12.75	-0.04
	W4570	12.58	12.48	-0.09	13.45	-0.01	12.43	-0.04
	W4496	12.11	11.99	-0.13	12.84	-0.01	11.93	-0.04
	W4376	11.29	11.20	-0.10	12.06	-0.01	11.14	-0.04
	W4260	10.93	10.85	-0.08	11.58	0.00	10.79	-0.04
	W4096	9.81	9.75	-0.06	10.71	0.00	9.70	-0.03
	W3974	9.59	9.56	-0.02	10.55	0.00	9.52	-0.01
Warnervale Rd	W3840	9.53	9.51	-0.02	10.40	0.00	9.47	-0.01
d/s Warnervale Rd	W3860	9.06	9.02	-0.04	10.37	0.00	8.93	-0.03
	W3720	8.90	8.86	-0.04	10.20	0.00	8.76	-0.03
	W3610	8.57	8.53	-0.04	9.80	0.00	8.44	-0.03
	W3510	8.26	8.22	-0.04	9.41	0.00	8.13	-0.03
	W3408	7.92	7.88	-0.04	9.10	0.00	7.78	-0.02
	W3318	7.73	7.69	-0.04	8.91	0.00	7.59	-0.02
	W3190	7.62	7.58	-0.03	8.68	0.00	7.49	-0.02
	W3060	7.29	7.27	-0.02	8.21	0.00	7.20	-0.01
	W2930	7.08	7.07	-0.01	7.92	0.00	7.02	-0.01
Minnesota Rd	W2900	6.80	6.79	-0.01	7.85	0.00	6.70	0.00
d/s Minnesota Rd	W2880	6.74	6.72	-0.02	7.76	0.00	6.63	-0.01
	W29-1	6.43	6.45	0.03	7.55	0.00	6.27	-0.01
	W28-1	6.25	6.38	0.13	7.39	0.01	6.01	0.00
	W23	6.21	6.36	0.15	7.31	0.01	5.88	0.06
	W22	6.20	6.36	0.16	7.26	0.01	5.86	0.13
	W21.1	6.20	6.36	0.16	7.25	0.01	5.86	0.14
	W21	6.19	6.36	0.16	7.24	0.01	5.86	0.15
Virginia Rd	W20	6.19	6.36	0.16	7.23	0.01	5.86	0.15
	W19	6.19	6.35	0.16	7.23	0.01	5.86	0.16
	W18	6.19	6.35	0.16	7.22	0.01	5.86	0.16

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 50% block *m AHD*	Diff to 100yr ARI *(m)*	PMF + 50% block *m AHD*	Diff to PMF *(m)*	20 yr ARI + 50% block *m AHD*	Diff to 20yr ARI *(m)*
	W17	6.19	6.35	0.16	7.21	0.01	5.86	0.16
	W16	6.19	6.35	0.16	7.21	0.01	5.86	0.16
	W15	6.19	6.35	0.16	7.20	0.01	5.86	0.16
	W14	6.19	6.35	0.16	7.20	0.01	5.86	0.16
	W13	6.19	6.35	0.16	7.19	0.01	5.86	0.16
	W12	6.19	6.35	0.16	7.19	0.01	5.86	0.16
	W11	6.19	6.35	0.16	7.18	0.01	5.86	0.16
	W10	6.19	6.35	0.16	7.18	0.01	5.86	0.16
	W9	6.19	6.35	0.16	7.18	0.01	5.86	0.16
	W8	6.19	6.35	0.16	7.18	0.01	5.86	0.16
	W7	6.19	6.35	0.16	7.16	0.01	5.86	0.16
	W6	6.19	6.35	0.17	7.15	0.01	5.86	0.17
	W5	6.18	6.35	0.17	7.14	0.01	5.86	0.17
	W4	6.18	6.35	0.17	7.13	0.01	5.86	0.17
u/s Railway	W3	6.18	6.35	0.17	7.09	0.01	5.85	0.17
u/s Railway	W2	6.18	6.35	0.17	7.08	0.02	5.85	0.17
u/s Railway	W1	6.18	6.35	0.17	7.06	0.02	5.85	0.17
d/s Lake Haven Dr	P1	31.26	31.26	0.00	31.51	0.00	31.20	0.00
	P2	31.14	31.14	0.00	31.32	0.00	31.09	0.00
	P3	30.34	30.34	0.00	30.54	0.00	30.29	0.00
u/s Pacific Hwy	P5	29.73	29.73	0.00	30.15	0.00	29.45	0.00
d/s Pacific Hwy	P4	29.60	29.60	0.00	30.14	0.00	29.52	0.00
	P6	27.60	27.60	0.00	28.02	0.00	27.49	0.00
u/s Arizona Rd	P7	26.74	26.74	0.00	27.13	0.00	26.61	0.00
d/s Arizona Rd	P8	25.55	25.55	0.00	25.81	0.00	25.46	0.00
	P9	24.18	24.18	0.00	24.41	0.00	24.11	0.00
	P10	23.09	23.09	0.00	23.31	0.00	23.01	0.00
	P11	21.93	21.93	0.00	22.31	0.00	21.86	0.00
	P12	21.05	21.05	0.00	21.46	0.00	20.97	0.00
	P13	20.62	20.62	0.00	21.03	0.00	20.54	0.00
	P14	20.09	20.09	0.00	20.56	0.00	20.00	0.00
	P15	19.50	19.50	0.00	19.97	0.00	19.40	0.00
	P16	18.80	18.80	0.00	19.28	0.00	18.71	0.00
	P17	18.48	18.48	0.00	18.95	0.00	18.38	0.00
	P18	17.72	17.75	0.03	18.60	0.04	17.59	0.02
	P19	17.62	17.68	0.05	18.52	0.05	17.51	0.06
	P20	17.56	17.63	0.07	18.45	0.06	17.46	0.11
u/s Mataram Rd	P21	17.50	17.59	0.09	18.37	0.07	17.43	0.14

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 50% block *m AHD*	Diff to 100yr ARI *(m)*	PMF + 50% block *m AHD*	Diff to PMF *(m)*	20 yr ARI + 50% block *m AHD*	Diff to 20yr ARI *(m)*
Nth of Wallarah Rd	P22	35.70	35.70	0.00	36.02	0.00	35.64	0.00
	P23	32.41	32.41	0.00	32.61	0.00	32.38	0.00
	P24	31.55	31.55	0.00	31.75	0.00	31.49	0.00
	P25	30.55	30.55	0.00	30.94	0.00	30.43	0.00
u/s Pacific Hyw	P26	30.50	30.50	0.00	30.85	0.00	30.39	0.00
d/s Pacific Hyw	P27	28.40	28.40	0.00	28.82	0.00	28.31	0.00
adj to Mebbin Cct	P28	27.66	27.66	0.00	28.11	0.00	27.55	0.00
	P29	26.63	26.63	0.00	27.09	0.00	26.54	0.00
u/s North Barrington Dr.	P30	25.19	25.19	0.00	26.29	0.00	25.01	0.00
d/s North Barrington Dr	P31	24.97	24.97	0.00	25.44	0.00	24.89	0.00
	P32	24.17	24.17	0.00	24.63	0.00	24.12	0.00
	P33	23.28	23.28	0.00	24.25	0.00	23.17	0.00
	P34	23.18	23.18	0.00	24.21	0.00	23.06	0.00
Sth of Mataram Rd	P35	23.07	23.07	0.00	24.16	0.00	22.90	0.00
Nth of Mataram Rd	P36	22.69	22.69	0.00	23.11	0.00	22.64	0.00
	P37	22.05	22.05	0.00	22.53	0.00	21.97	0.00
d/s Walker Ave	P38	21.86	21.86	0.00	22.39	0.00	21.82	0.00
	P39	21.85	21.85	0.00	22.30	0.00	21.81	0.00
	P40	21.85	21.85	0.00	22.29	0.00	21.81	0.00
u/s Pacific Hyw	P41	21.52	21.52	0.00	21.82	0.00	21.49	0.00
d/s Pacific Hyw	P42	19.39	19.39	0.00	19.83	0.00	19.34	0.00
Sth of Lomandra Tce	P43	17.84	17.84	0.00	18.70	0.00	17.74	0.00
	P44	17.50	17.50	0.00	18.26	0.00	17.42	0.00
Sth of Kite Cr	P45	16.92	16.92	0.00	17.67	0.00	16.84	0.00
Sth of Pardalote Way	P46	16.66	16.66	0.00	17.35	0.00	16.58	0.00
	P47	16.13	16.13	0.00	16.90	0.00	16.05	0.00
	P48	15.74	15.74	0.00	16.73	0.00	15.67	0.00
	P49	15.48	15.48	0.00	16.65	0.00	15.35	0.00
	P50	15.34	15.34	0.00	16.57	0.00	15.07	0.00
	P51	15.24	15.24	0.00	16.50	0.00	14.81	0.00
	P52	13.42	13.42	0.00	14.09	0.00	13.35	0.00
	P53	12.38	12.38	0.00	13.02	0.00	12.35	0.00
	P54	11.88	11.88	0.00	12.71	0.00	11.81	0.00
u/s Louisiana Rd	P55	11.58	11.58	0.00	12.19	0.00	11.53	0.00
d/s Louisiana Rd	P56	11.00	11.00	0.00	11.94	0.00	10.90	0.00
	P57	10.47	10.48	0.00	11.29	0.00	10.41	0.00

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 50% block *m AHD*	Diff to 100yr ARI *(m)*	PMF + 50% block *m AHD*	Diff to PMF *(m)*	20 yr ARI + 50% block *m AHD*	Diff to 20yr ARI *(m)*
	P58	9.85	9.84	0.00	10.74	0.00	9.78	0.00
	P59	9.28	9.24	-0.04	10.46	0.00	9.12	-0.03
adj to Park Range Way	P60	17.43	17.43	0.00	17.73	0.00	17.36	0.00
	P61	16.44	16.44	0.00	16.68	0.00	16.38	0.00
	P62	16.02	16.02	0.00	16.42	0.03	15.91	0.00
	P63	15.57	15.57	0.00	16.34	0.06	15.40	0.00
adj to Oakridge PL	P64	14.88	15.06	0.18	16.26	0.10	14.80	0.00
	P65	14.62	15.01	0.39	16.26	0.10	14.52	0.00
	P66	14.54	15.00	0.46	16.26	0.10	14.43	0.00
	P67	14.26	14.93	0.68	16.25	0.10	14.33	0.25
adj to Alpine Ash Rd	P68	15.61	15.61	0.00	15.89	0.00	15.55	0.00
	P69	14.48	14.48	0.00	14.86	0.00	14.44	0.00
	P70	13.85	13.85	0.00	14.67	0.00	13.74	0.00
adj to Paperbark St	P71	13.09	13.09	0.00	13.51	0.00	13.01	0.00
	P72	12.76	12.76	0.00	13.23	0.00	12.66	0.00
	P73	12.38	12.38	0.00	12.88	0.00	12.26	0.00
	P74	12.08	12.08	0.00	12.55	0.00	11.98	0.00
	P75	11.48	11.48	0.00	11.74	0.00	11.42	0.00
u/s Nikko Rd	P76	22.62	22.62	0.00	25.22	0.00	22.25	0.00
d/s Nikko Rd	P77	19.38	19.38	0.00	19.46	0.00	19.37	0.00
	P78	18.17	18.17	0.00	19.41	0.00	18.17	0.00
u/s Sparks Rd	P79	17.80	17.80	0.00	19.40	0.00	17.73	0.00
d/s Sparks Rd	P80	15.27	15.27	0.00	15.41	0.00	15.23	0.00
	P81	13.98	13.98	0.00	14.11	0.00	13.96	0.00
u/s Railway Rd	P82	21.75	21.75	0.00	22.58	0.00	21.72	0.00
d/s Nikko Rd	P83	19.50	19.50	0.00	19.59	0.00	19.46	0.00
	P84	16.99	16.99	0.00	17.09	0.00	16.93	0.00
	P85	14.72	14.72	0.00	14.90	0.00	14.70	0.00
u/s Virginia Rd	P86	13.62	13.62	0.00	13.98	0.00	13.54	0.00
d/s Virginia Rd	P87	12.42	12.42	0.00	12.69	0.00	12.39	0.00
	P88	12.16	12.16	0.00	12.23	0.00	12.15	0.00
	P89	11.54	11.54	0.00	11.65	0.00	11.52	0.00
	P90	10.21	10.21	0.00	10.66	0.00	10.14	0.00
	P91	9.91	9.91	0.00	10.53	0.00	9.82	0.00
u/s Warnervale Rd	P92	9.85	9.85	0.00	10.43	0.00	9.75	0.00
d/s Warnervale Rd	P93	8.57	8.57	0.00	9.12	0.00	8.51	0.00
	P94	8.11	8.11	0.00	8.59	0.00	8.05	0.00
	P95	7.63	7.63	0.00	7.93	0.00	7.59	0.00
	P96	6.94	6.94	0.00	7.44	0.00	6.90	0.00

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 50% block *m AHD*	Diff to 100yr ARI *(m)*	PMF + 50% block *m AHD*	Diff to PMF *(m)*	20 yr ARI + 50% block *m AHD*	Diff to 20yr ARI *(m)*
	P97	6.33	6.38	0.05	7.31	0.01	6.27	0.00
	P98	6.20	6.36	0.16	7.29	0.01	5.87	0.10
	P99	6.20	6.36	0.16	7.28	0.01	5.87	0.13
u/s Sparks Rd	P100	15.62	15.62	0.00	17.28	0.00	15.55	0.00
d/s Sparks Rd	P101	13.34	13.34	0.00	13.47	0.00	13.31	0.00
	P102	11.50	11.50	0.00	12.84	0.00	11.47	0.00
u/s Railway Rd	P103	10.85	10.85	0.00	12.84	0.00	10.77	0.00
d/s Nikko Rd	P104	8.82	8.82	0.00	9.02	0.00	8.78	0.00
	P105	8.04	8.04	0.00	8.21	0.00	8.00	0.00
	P106	6.75	6.75	0.00	7.19	0.01	6.70	0.00
	P107	6.19	6.35	0.16	7.18	0.01	5.86	0.15
	P108	6.19	6.35	0.16	7.18	0.01	5.86	0.16
	P109	6.19	6.35	0.16	7.18	0.01	5.86	0.16
	P110	6.19	6.35	0.16	7.18	0.01	5.86	0.16
	P111	6.19	6.35	0.16	7.17	0.01	5.86	0.16
	P112	6.19	6.35	0.16	7.17	0.01	5.86	0.16
	P113	6.19	6.35	0.16	7.17	0.01	5.86	0.16
	P114	6.19	6.35	0.16	7.16	0.01	5.86	0.16
d/s Pacific Hwy	P115	11.32	11.32	0.00	11.95	0.00	11.16	0.00
	P116	10.24	10.24	0.00	10.41	0.00	10.12	0.00
	P117	8.12	8.12	0.00	8.34	0.00	8.11	0.00
	P118	7.42	7.42	0.00	7.58	0.00	7.39	0.00
	P119	6.47	6.47	0.00	7.20	0.01	6.43	0.00
	P120	6.19	6.35	0.16	7.20	0.01	5.86	0.14
	P121	6.19	6.35	0.16	7.20	0.01	5.86	0.16
	P122	6.19	6.35	0.16	7.20	0.01	5.86	0.16
	P123	6.19	6.35	0.16	7.20	0.01	5.86	0.16
	P124	6.19	6.35	0.16	7.19	0.01	5.86	0.16
u/s Pacific Hwy	P125	7.47	7.48	0.01	8.20	0.00	7.18	0.00
west of Cherry Blossom Cr	P126	6.19	6.35	0.16	7.21	0.01	5.86	0.14
west of Virgina Rd	P127	6.19	6.35	0.16	7.21	0.01	5.86	0.16
	P128	6.19	6.35	0.16	7.21	0.01	5.86	0.16
east of Bougainvillea Rd E	P129	8.63	8.63	0.00	8.91	0.00	8.58	0.00
	P130	7.95	7.95	0.00	8.20	0.00	7.89	0.00
east of Birch Dr	P131	7.19	7.19	0.00	7.69	0.00	7.16	0.00
	P132	6.72	6.71	-0.01	7.69	0.00	6.64	-0.01
	P133	6.69	6.68	-0.01	7.68	0.00	6.60	-0.01
	P134	6.63	6.62	-0.01	7.65	0.00	6.53	-0.01

Location (See Figure D2, D3)	Model Node/ Point	Sensitivity Analysis Results						
		100 yr ARI *m AHD*	100 yr ARI + 50% block *m AHD*	Diff to 100yr ARI *(m)*	PMF + 50% block *m AHD*	Diff to PMF *(m)*	20 yr ARI + 50% block *m AHD*	Diff to 20yr ARI *(m)*
	P135	6.53	6.53	0.01	7.62	0.00	6.40	-0.01
sth of Pacific Hwy	P136	15.03	15.03	0.00	15.35	0.00	14.94	0.00
	P137	13.54	13.54	0.00	13.71	0.00	13.51	0.00
	P138	11.40	11.40	0.00	11.71	0.00	11.34	0.00
	P139	9.95	9.95	0.00	10.18	0.00	9.91	0.00
	P140	8.23	8.23	0.00	8.81	0.00	8.19	0.00
	P141	7.76	7.76	0.00	8.45	0.00	7.68	0.00
	P142	7.26	7.25	-0.01	8.12	0.00	7.18	0.00
	P143	7.20	7.19	-0.01	8.08	0.00	7.12	-0.01
	P144	7.14	7.12	-0.01	8.00	0.00	7.06	-0.01
west of Dalton Ave	P145	23.82	23.82	0.00	24.01	0.00	23.78	0.00
west of Rolfe Ave	P146	22.28	22.28	0.00	22.37	0.00	22.27	0.00
west of Hughes Ave	P147	20.47	20.47	0.00	20.65	0.00	20.43	0.00
	P148	19.73	19.73	0.00	19.91	0.00	19.69	0.00
	P149	18.75	18.75	0.00	18.92	0.00	18.72	0.00
west of Pearce Rd	P150	17.36	17.36	0.00	17.52	0.00	17.32	0.00
	P151	16.59	16.59	0.00	16.68	0.00	16.57	0.00
	P152	15.31	15.31	0.00	15.56	0.00	15.26	0.00
	P153	14.80	14.80	0.00	15.08	0.00	14.74	0.00
	P154	14.49	14.49	0.00	14.81	0.00	14.41	0.00
u/s Pacific Hwy	P155	14.48	14.48	0.00	14.80	0.00	14.41	0.00
west of Cesca St	P156	12.98	12.98	0.00	13.27	0.00	12.95	0.00
	P157	11.78	11.78	0.00	12.15	0.00	11.72	0.00
u/s Bingarrah Rd	P158	10.86	10.86	0.00	11.29	0.00	10.79	0.00
d/s Bingarrah Rd	P159	10.21	10.21	0.00	10.65	0.00	10.15	0.00
u/s Louisiana Rd	P160	9.85	9.85	0.00	10.24	0.00	9.78	0.00
d/s Louisiana Rd	P161	8.95	8.95	0.00	9.42	0.00	8.89	0.00
	P162	8.64	8.64	0.00	9.24	0.00	8.56	0.00
	P163	8.33	8.33	0.00	9.06	0.00	8.22	0.00
d/s Pacific Hwy	P164	28.82	28.82	0.00	28.85	0.00	28.81	0.00
	P165	25.09	25.09	0.00	25.16	0.00	25.06	0.00
	P166	23.96	23.96	0.00	24.03	0.00	23.95	0.00
	P167	21.99	21.99	0.00	22.08	0.00	21.97	0.00
	P168	20.49	20.49	0.00	20.70	0.00	20.45	0.00
East of Sabre Pl	P169	18.90	18.90	0.00	19.12	0.00	18.84	0.00
East of Georgia Dr	P170	17.19	17.19	0.00	17.31	0.00	17.17	0.00
	P171	15.46	15.46	0.00	15.71	0.00	15.40	0.00
Nth of De Havilland Cct	P172	13.12	13.12	0.00	13.45	0.00	13.02	0.00
	P173	12.25	12.25	0.00	13.05	0.00	12.19	0.00

Appendix E

Flood Maps – Development Scenario Model

Note: The plotted flood contours are for guidance only. Design flood levels at any location on the flood plain can be obtained from Wyong Shire Council's water RIDE system.

N
W E
S

Peak Water Depth (m)

- >5.10
- 4.10 to 5.00
- 3.10 to 4.00
- 2.10 to 3.00
- 1.10 to 2.00
- 0.51 to 1.00
- 0.10 to 0.50

Water Level Contours 0.5m Increments

0 1 2
kilometres

Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E1
200yr ARI Flood Depth & Flood Level
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E1-200yr Depth and Level.wor

Note: The plotted flood contours are for guidance only. Design flood levels at any location on the flood plain can be obtained from Wyong Shire Council's water RIDE system.

N
W E
S

Peak Water Depth (m)

- >5.10
- 4.10 to 5.00
- 3.10 to 4.00
- 2.10 to 3.00
- 1.10 to 2.00
- 0.51 to 1.00
- 0.10 to 0.50

Water Level Contours 0.5m Increments

0 1 2
kilometres

Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E2
100yr ARI Flood Depth & Flood Level
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E2-100yr Depth and Level.wor

Note: The plotted flood contours are for guidance only. Design flood levels at any location on the flood plain can be obtained from Wyong Shire Council's water RIDE system.

N
W E
S

Peak Water Depth (m)

- >5.10
- 4.10 to 5.00
- 3.10 to 4.00
- 2.10 to 3.00
- 1.10 to 2.00
- 0.51 to 1.00
- 0.10 to 0.50

Water Level Contours 0.5m Increments

0 1 2
kilometres

Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E3
50yr ARI Flood Depth & Flood Level
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E3-50yr Depth and Level.wor

Note: The plotted flood contours are for guidance only. Design flood levels at any location on the flood plain can be obtained from Wyong Shire Council's water RIDE system.

N
W E
S

Peak Water Depth (m)

- >5.10
- 4.10 to 5.00
- 3.10 to 4.00
- 2.10 to 3.00
- 1.10 to 2.00
- 0.51 to 1.00
- 0.10 to 0.50

Water Level Contours 0.5m Increments

0 1 2
kilometres

Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E4
20yr ARI Flood Depth & Flood Level
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E4-20yr Depth and Level.wor

Note: The plotted flood contours are for guidance only. Design flood levels at any location on the flood plain can be obtained from Wyong Shire Council's water RIDE system.

N
W E
S

Peak Water Depth (m)

- >5.10
- 4.10 to 5.00
- 3.10 to 4.00
- 2.10 to 3.00
- 1.10 to 2.00
- 0.51 to 1.00
- 0.10 to 0.50

Water Level Contours 0.5m Increments

0 1 2
kilometres

Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E5
10yr ARI Flood Depth & Flood Level Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E5-10yr Depth and Level.wor

Note: The plotted flood contours are for guidance only. Design flood levels at any location on the flood plain can be obtained from Wyong Shire Council's water RIDE system.

N
W E
S

Peak Water Depth (m)

- >5.10
- 4.10 to 5.00
- 3.10 to 4.00
- 2.10 to 3.00
- 1.10 to 2.00
- 0.51 to 1.00
- 0.10 to 0.50

Water Level Contours 0.5m Increments

0 1 2
kilometres

Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E6
5yr ARI Flood Depth & Flood Level
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E6-5yr Depth and Level.wor

Note: The plotted flood contours are for guidance only. Design flood levels at any location on the flood plain can be obtained from Wyong Shire Council's water RIDE system.

N
W E
S

Peak Water Depth (m)

- >5.10
- 4.10 to 5.00
- 3.10 to 4.00
- 2.10 to 3.00
- 1.10 to 2.00
- 0.51 to 1.00
- 0.10 to 0.50

Water Level Contours
0.5m Increments

0 1 2
kilometres

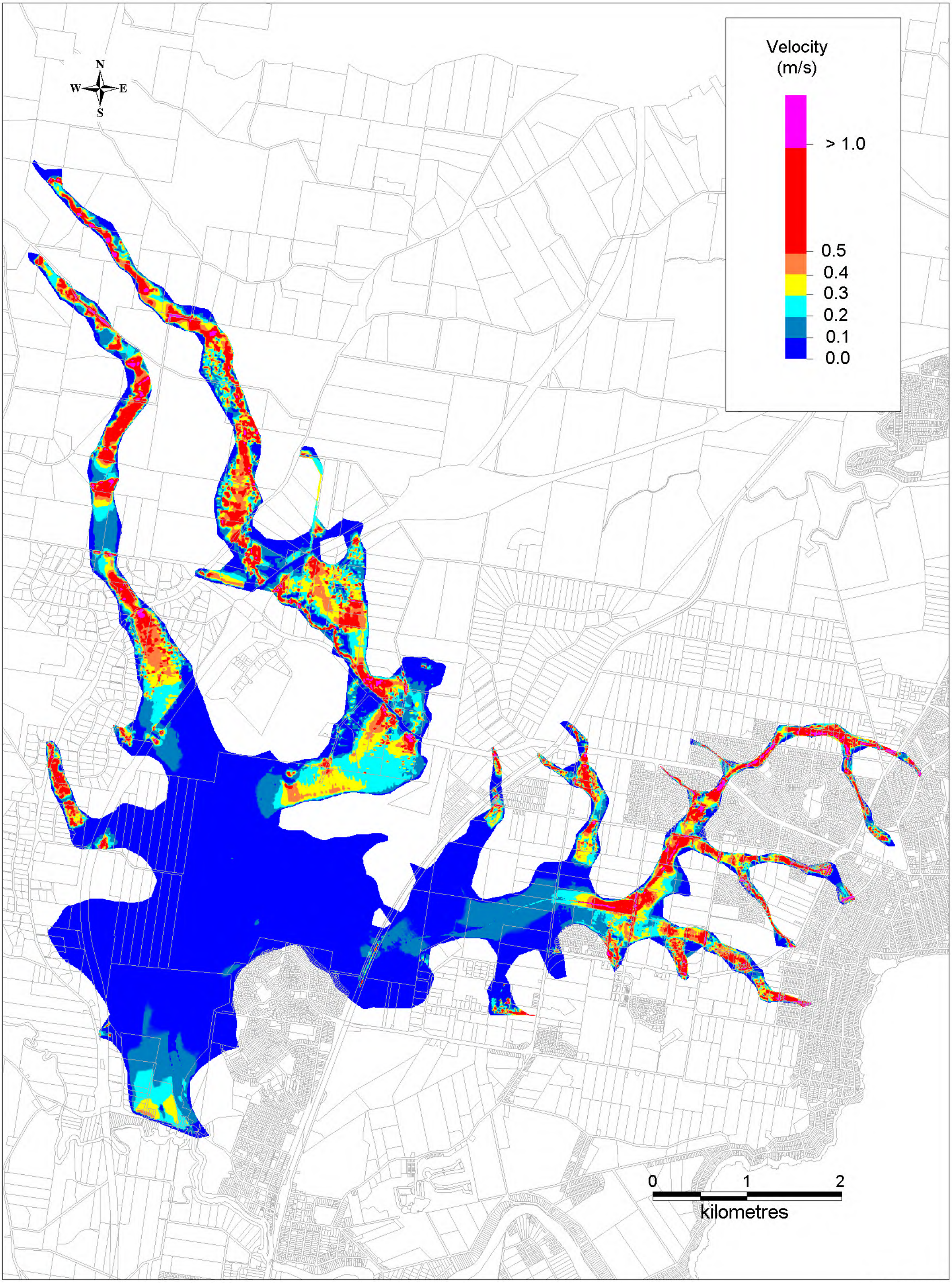
Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E7
PMF Flood Depth & Flood Level
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E7-PMF Depth and Level.wor



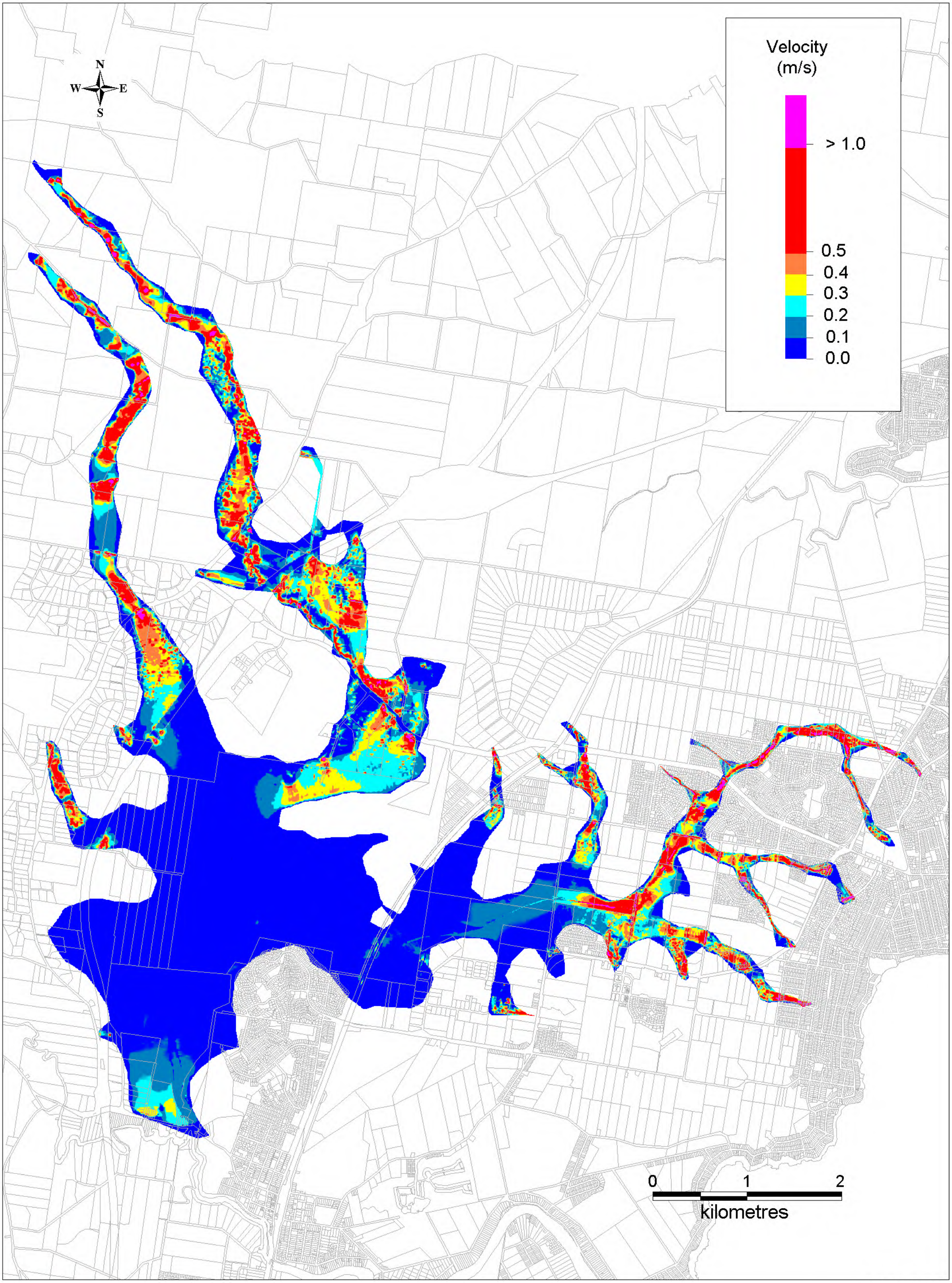
Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E8
200yr ARI Peak Water Velocity
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E8-200yr_Velocity.wor



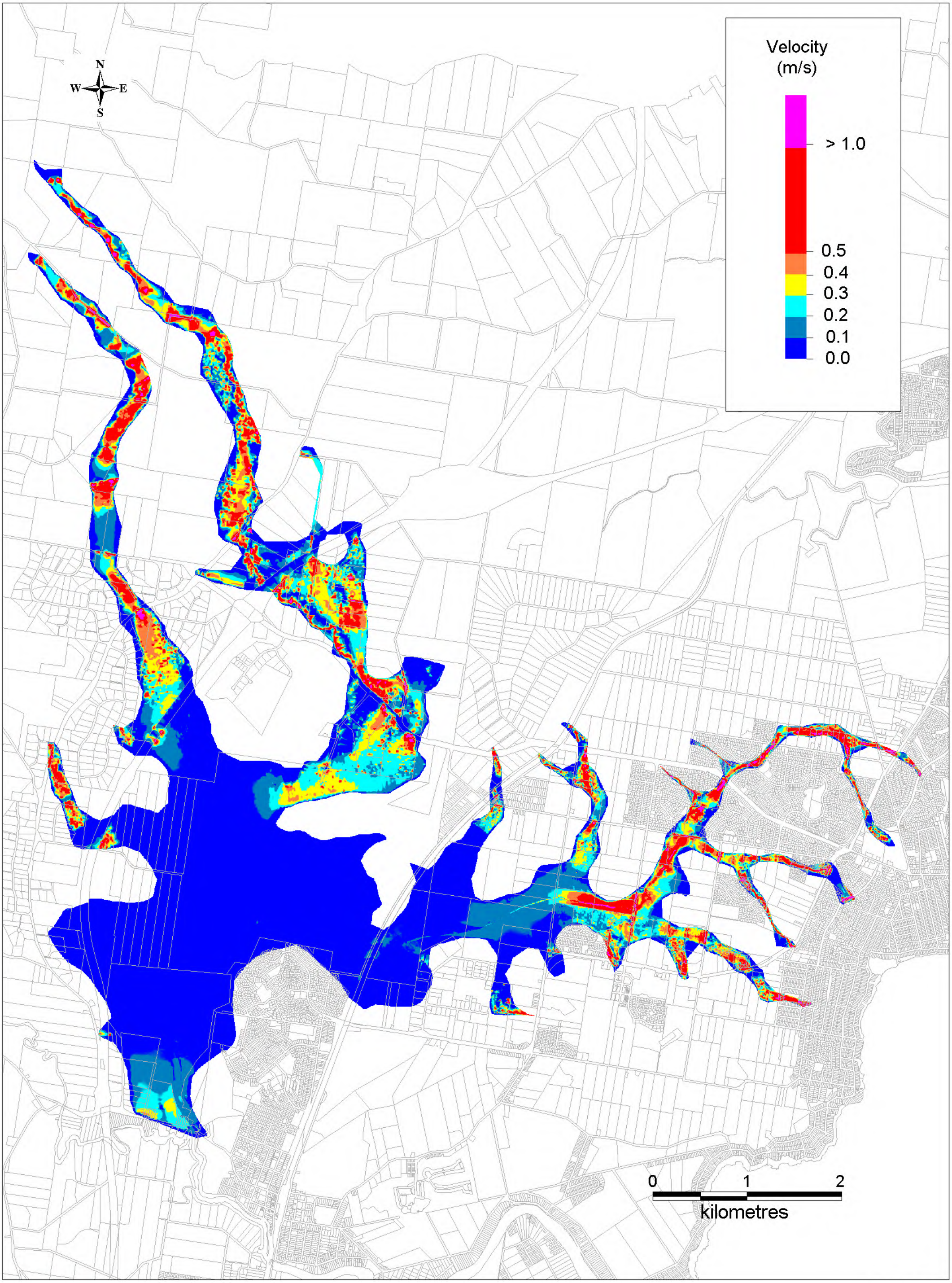
Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E9
100yr ARI Peak Water Velocity
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E9-100yr_Velocity.wor



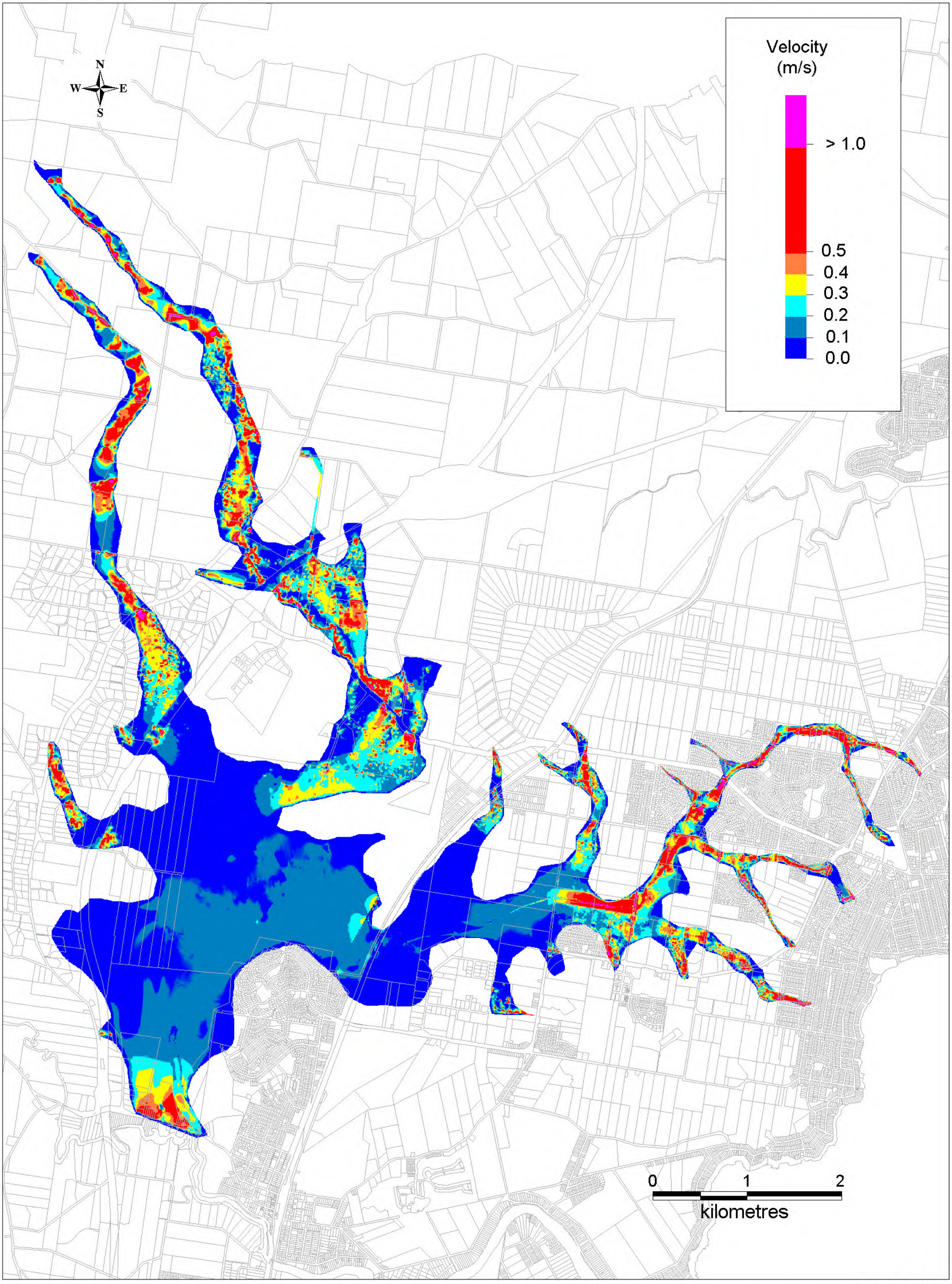
Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E10
50yr ARI Peak Water Velocity
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E10-50yr_Velocity.wor



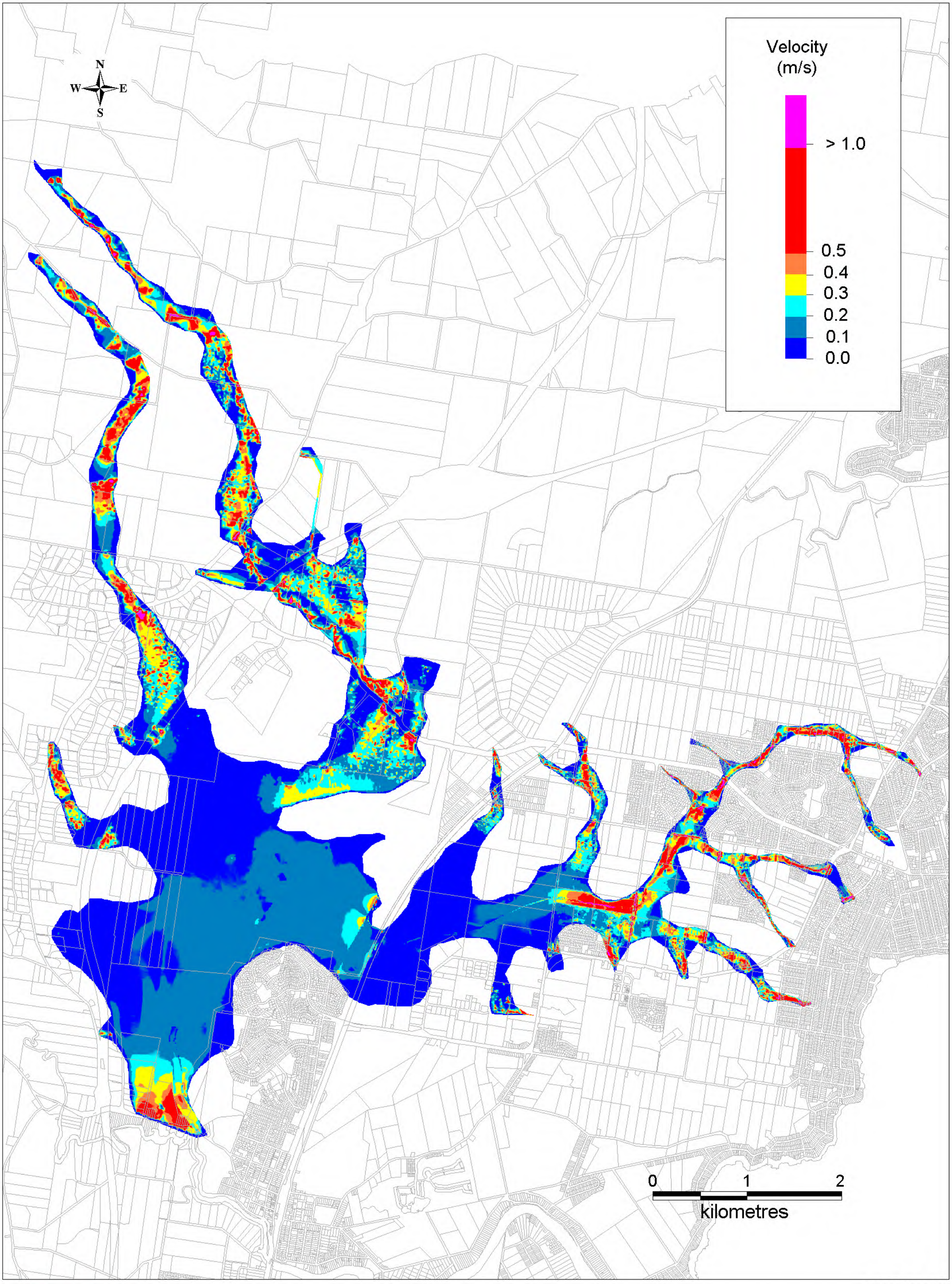
Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E11
20yr ARI Peak Water Velocity
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E11-20yr_Velocity.wor



Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E12
10yr ARI Peak Water Velocity
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E12-10yr_Velocity.wor

N
W E
S

Velocity
(m/s)

> 1.0
0.5
0.4
0.3
0.2
0.1
0.0

0 1 2
kilometres

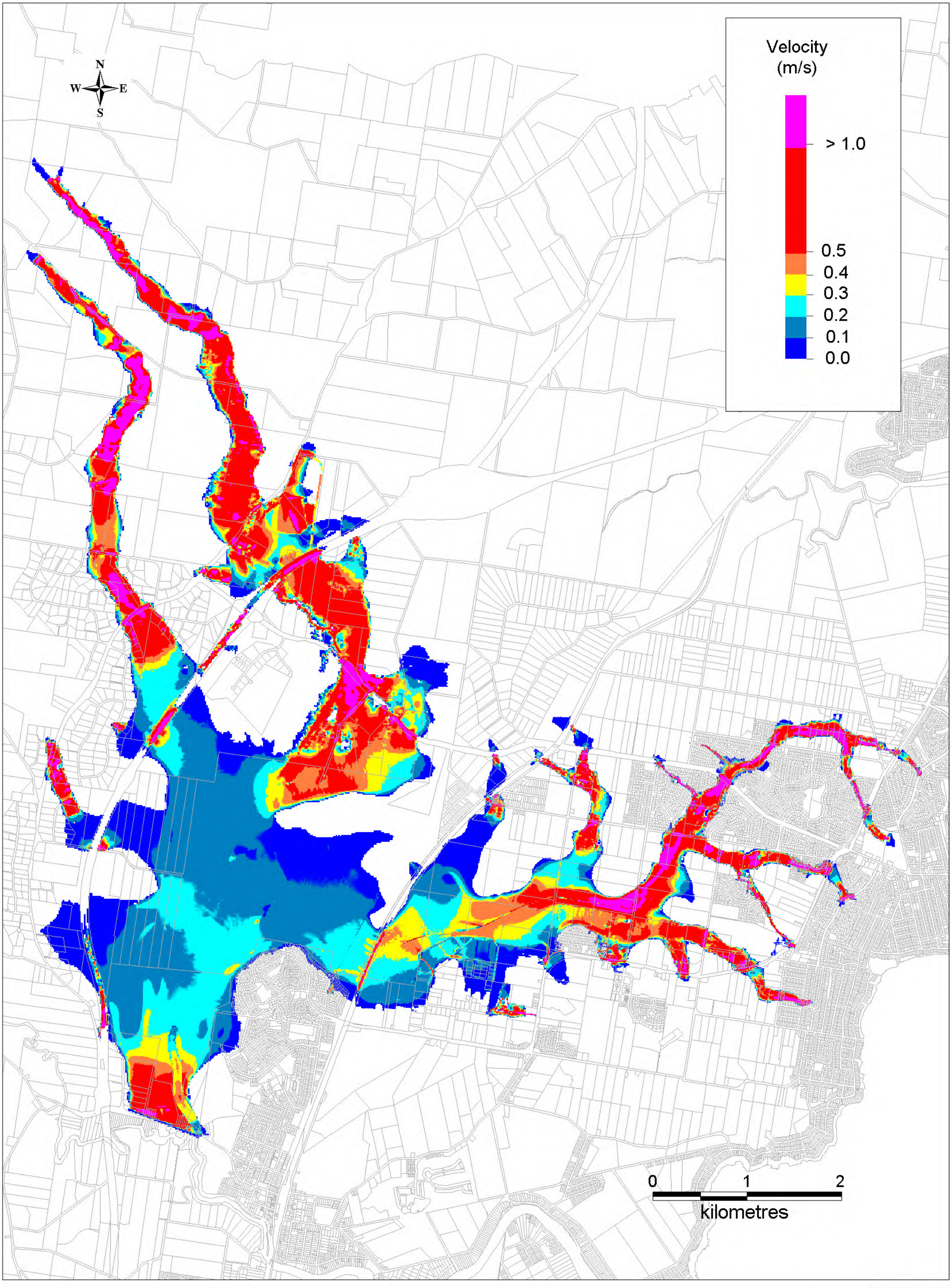
Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E13
5yr ARI Peak Water Velocity
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E13-5yr_Velocity.wor



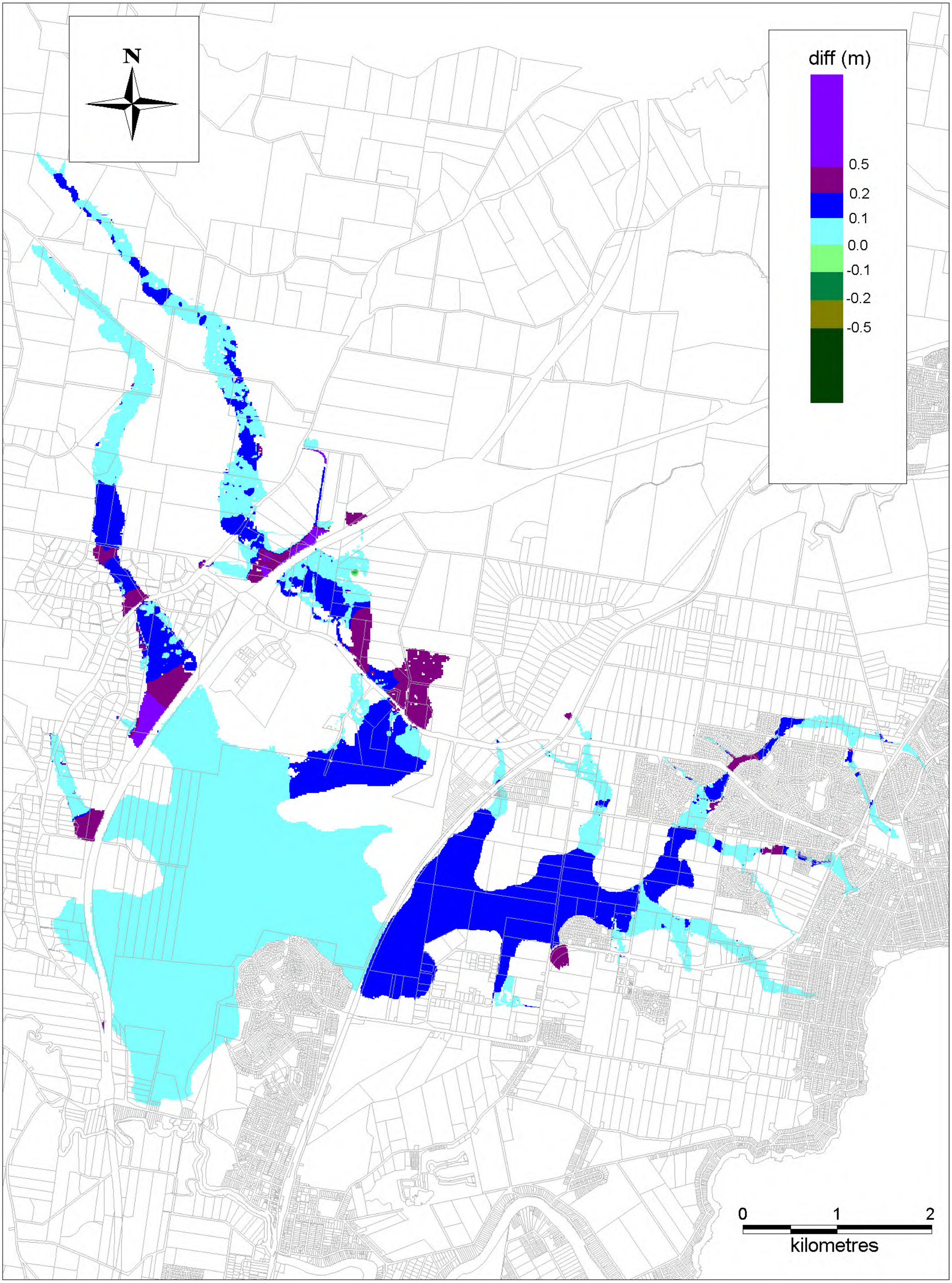
Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E14
PMF Peak Water Velocity
Under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters CK FS\MapInfo\Workspaces\Figures\Figure E14-PMF_Velocity.wor



Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E15
100 year ARI Flood Level Differences
(30% Increased Rainfall minus Design Rainfall)
under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters Creek FPRMS\MapInfo\Workspaces\FiguresE15.wor

N

Peak WL Difference
metres

- >0.5
- 0.2 to 0.5
- 0.1 to 0.2
- 0.01 to 0.1
- -0.01 to -0.1
- -0.1 to -0.2
- -0.2 to -0.5
- <-0.5

0 1 2
kilometres

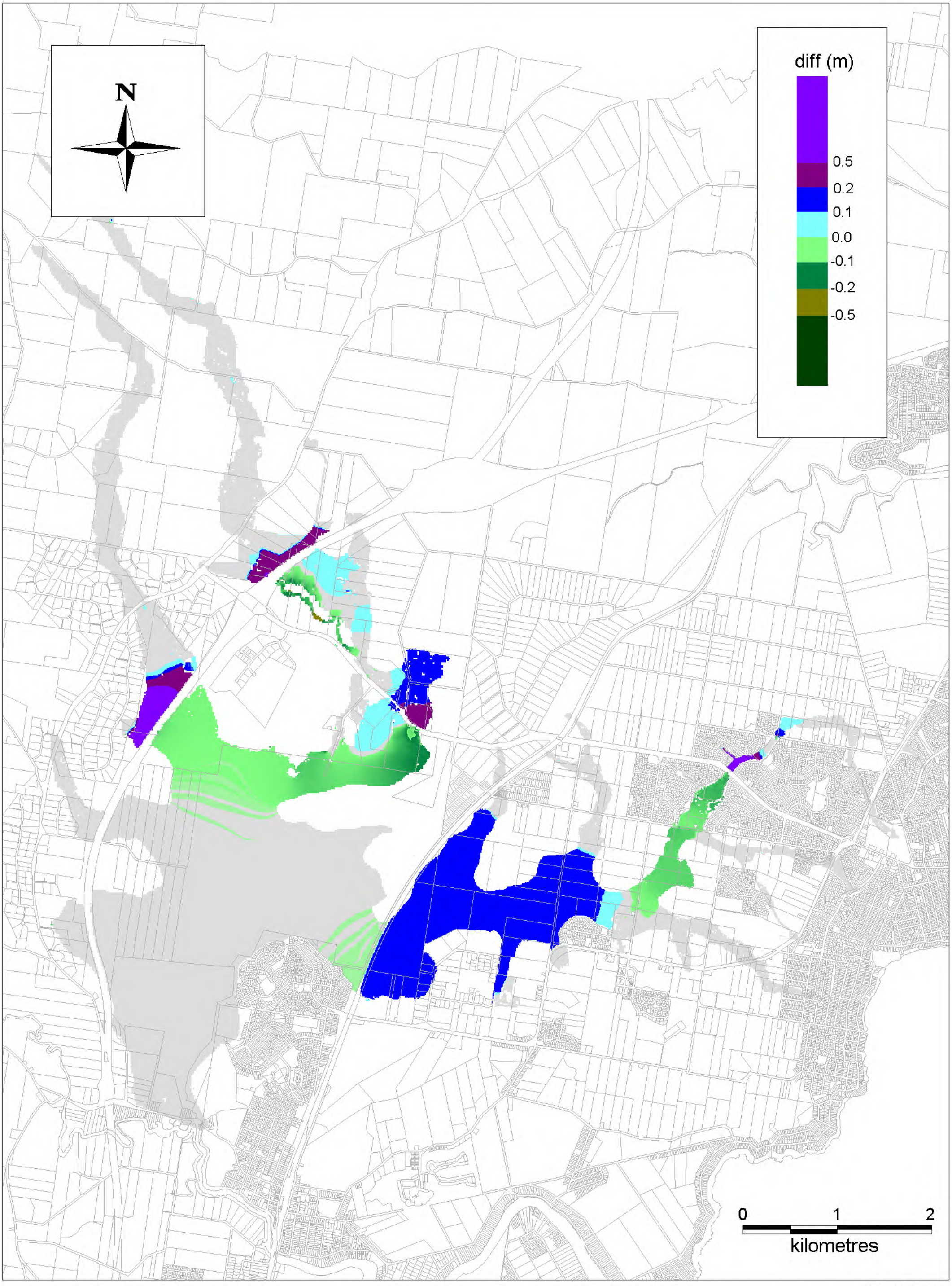
Cardno

Porters Creek FPRMS&P

FIGURE E15A
Flood Level Differences
100yr +15% Less 100yr ARI under Development Scenario

W4822
June 2011

W4822 \Reports\FPRMSP\Figures\Workspace\Figure E15A-WL Difference -100yr+15%_Less_100yr ARI.wor



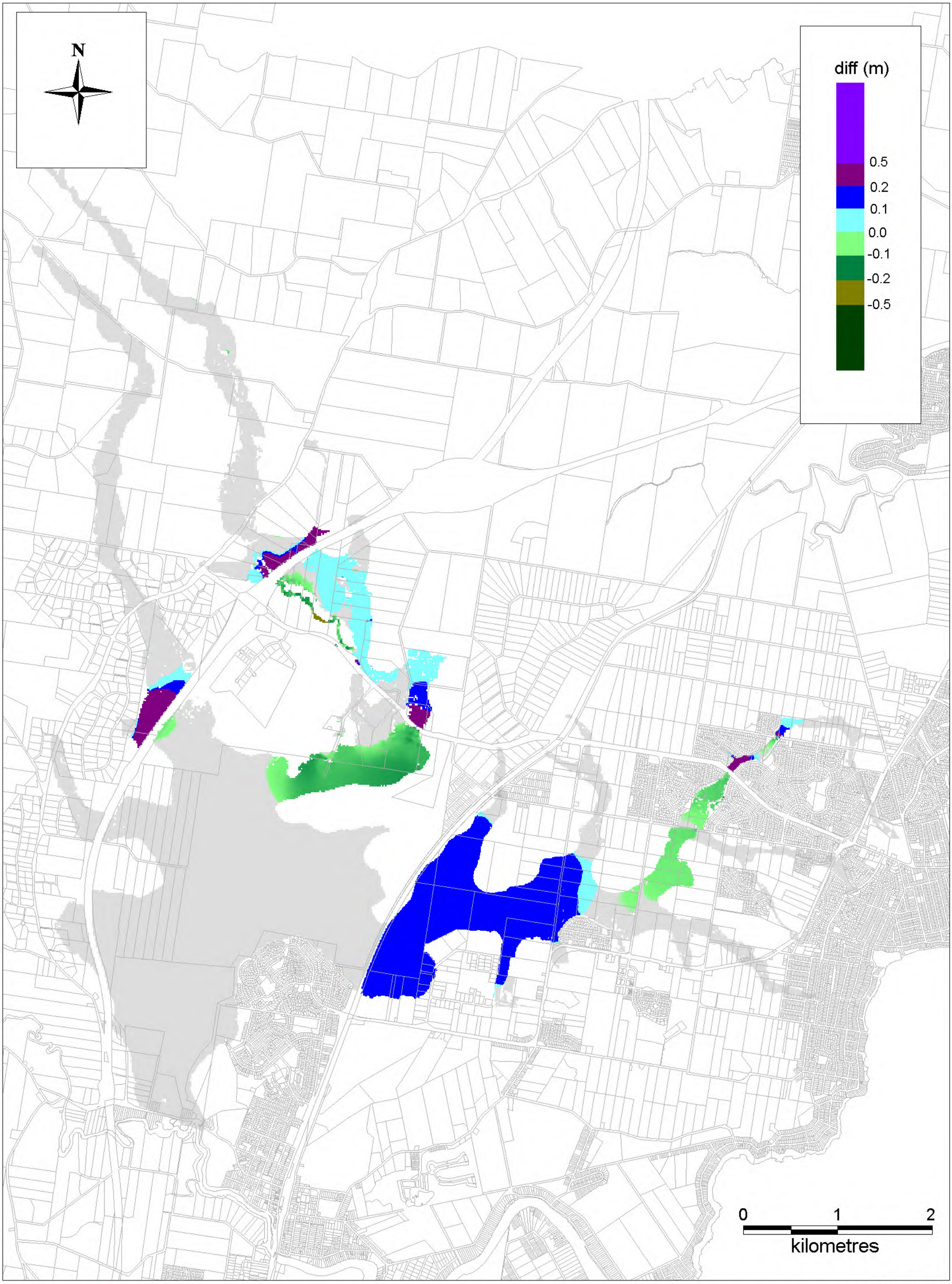
Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E16
100 year ARI Flood Level Differences
(50% Blockage minus Design Capacity)
under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters Creek FPRMS\MapInfo\Workspaces\FiguresE16.wor



Cardno

Porters Creek
Flood Study - Addendum-1

FIGURE E16A
20 year ARI Flood Level Differences
(50% Blockage minus Design Capacity)
under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters Creek FPRMS\MapInfo\Workspaces\FiguresE16.wor

N

diff (m)

0.5
0.2
0.1
0.0
-0.1
-0.2
-0.5

0 1 2
kilometres

Cardno

W4822
August 2010

Porters Creek
Flood Study - Addendum-1

FIGURE E16B
PMF Flood Level Differences
(50% Blockage minus Design Capacity)
under Development Scenario

W:_Current Projects\4822 Porters Creek FPRMS\MapInfoWorkspaces\FiguresE16.wor

N

diff (m)

0.5
0.2
0.1
0.0
-0.1
-0.2
-0.5

0 1 2
kilometres

Cardno

Porters Creek
Flood Management Study

FIGURE E17
100 year ARI Flood Level Differences
(Increased Roughness minus Design Roughness)
under Development Scenario

W4822
August 2010

W:_Current Projects\4822 Porters Creek FPRMS\MapInfo\Workspaces\FiguresE17.wor