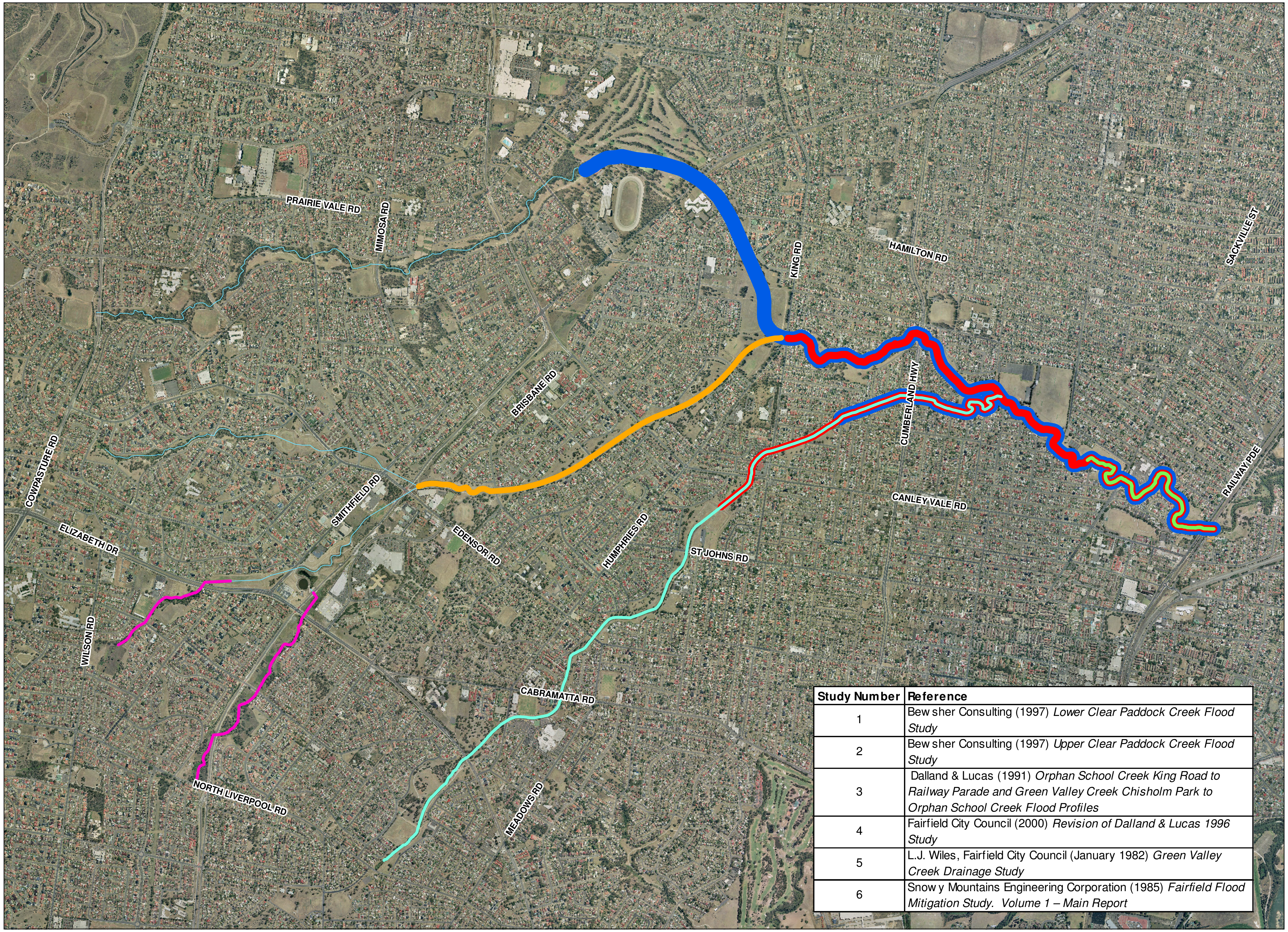

Study Number	Reference
1	Bewsher Consulting (1997) *Lower Clear Paddock Creek Flood Study*
2	Bewsher Consulting (1997) *Upper Clear Paddock Creek Flood Study*
3	Dalland & Lucas (1991) *Orphan School Creek King Road to Railway Parade and Green Valley Creek Chisholm Park to Orphan School Creek Flood Profiles*
4	Fairfield City Council (2000) *Revision of Dalland & Lucas 1996 Study*
5	L.J. Wiles, Fairfield City Council (January 1982) *Green Valley Creek Drainage Study*
6	Snowy Mountains Engineering Corporation (1985) *Fairfield Flood Mitigation Study. Volume 1 – Main Report*

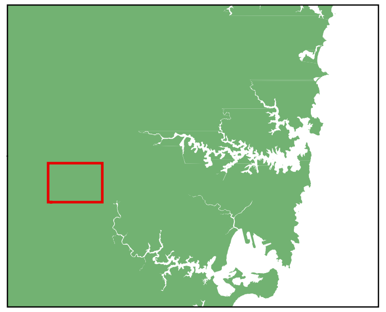

Figure 5-5 Spatial Coverage of Previous Studies

Flood Study for Orphan School Creek, Clear Paddock Creek and Green Valley Creek

GDA 1994 MGA Zone 56

January 22, 2008
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5.3.1 Orphan School Creek, Upstream of King Road

This reach of Orphan School Creek was previously assessed in SMEC (1985) between chainage 4100m and King Road, which currently includes Fairfield Golf Course and the concrete-lined channel between Smithfield Road and King Road.

Mapping in SMEC (1985) indicate that at the time of the previous study, Orphan School Creek was comprised of:

- A formalised grass lined channel through most of the Golf Course to 100m upstream of Smithfield Road. The construction of Fairfield Golf Course Detention Basin was recommended as flood mitigation works by SMEC (1985), and was completed following the previous study;
- A natural channel from 100m upstream of Smithfield Road to Bulls Road; and
- A formalised channel between Bulls Road and King Road. It is unknown whether the channel was concrete-lined at the time of the previous study.

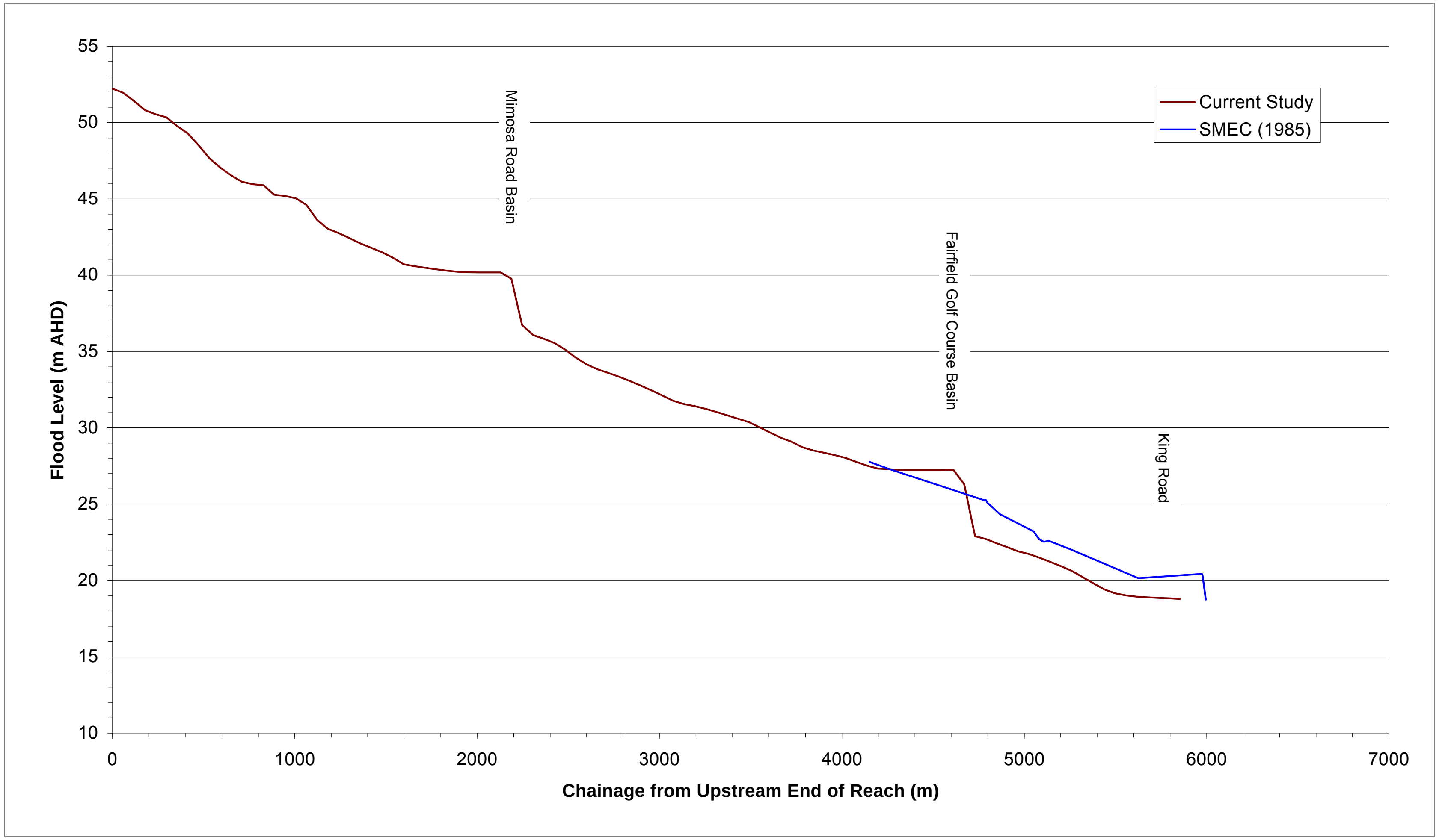
Refer to **Figure 5-6** for the long section flood profiles of Orphan School Creek upstream of King Road.

The flood levels in **Figure 5-6** for SMEC (1985) were taken from Table 10.2 of the previous study report for the scenario of “with retarding basins”. However, the previous study is unclear on whether only the flows were adjusted to reflect the inclusion of detention basins, or whether the hydraulic model cross sections were also modified to reflect the inclusion of the detention basin and formalisation of the creek. It is assumed from the flood profile that only the flows, and not the cross sections, were adjusted to represent the Basin, mainly due to the absence of a flat backwater profile upstream of the Fairfield Golf Course Basin outlet.

There is some difference between the flood profiles due to the construction of the Fairfield Golf Course Detention Basin and associated outlet works, causing flood levels to increase by approximately 1m in the Basin.

Flood levels downstream of the Basin are 1 – 2m higher in the SMEC (1985) report, due to a combination of the attenuation of flows by the Basin, the formalisation of the creek between the Basin and Bulls Road and possibly due to representation of the channel downstream of Bulls Road as a rougher earthen channel, rather than a smoother concrete channel as was done in the current study. The adopted flows in SMEC (1985) also appear to be around 14% lower that the current study, for the area downstream of the Basin.

▪ Figure 5-6 Comparison of Current 100 year ARI Flood Levels to Previous Studies - Orphan School Creek, Cowpasture Road to King Road



5.3.2 Orphan School Creek, King Road to Railway Parade

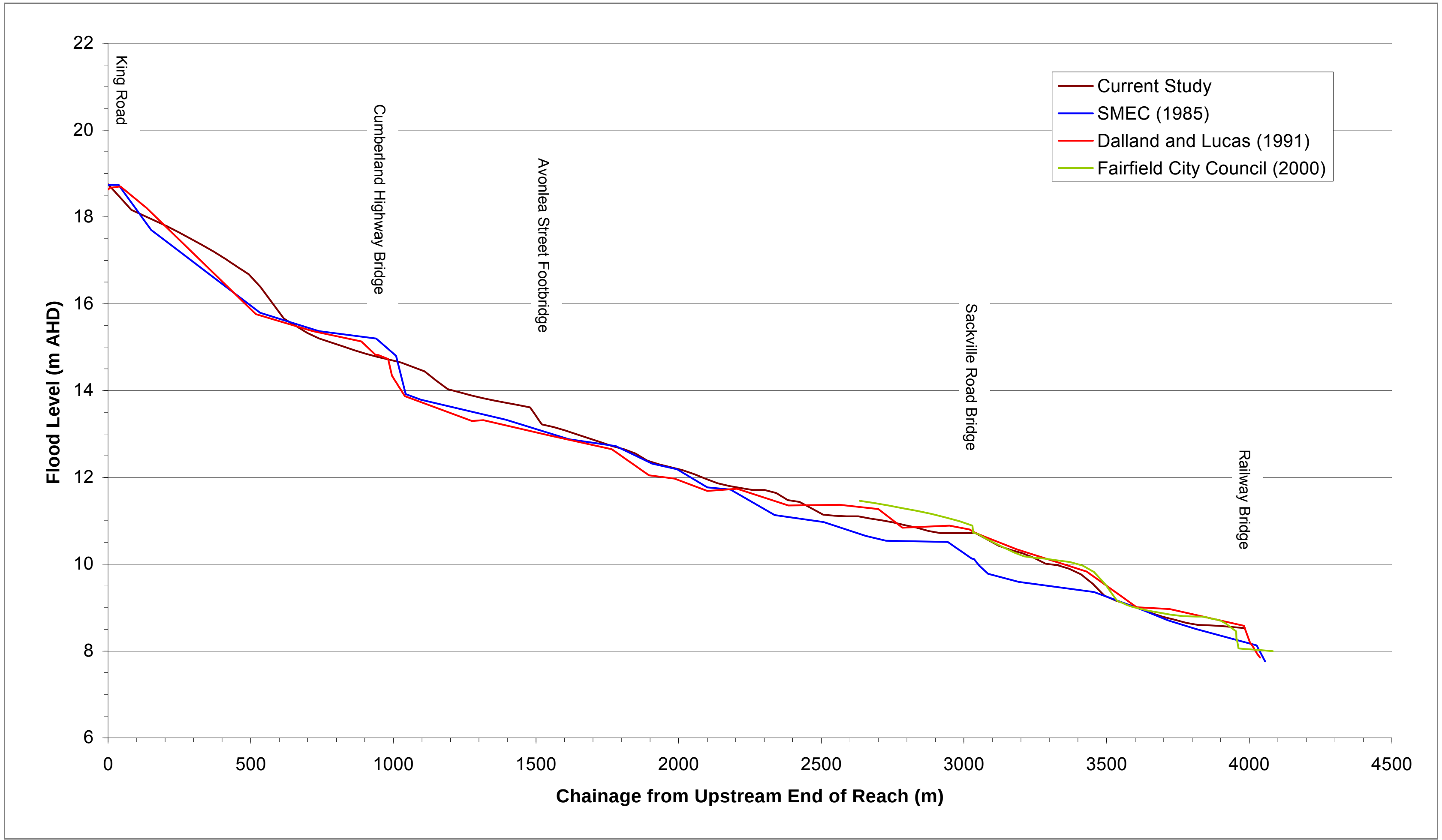
The reach of Orphan School Creek between King Road and Railway Parade was previously assessed by SMEC (1985), Dalland and Lucas (1991) and FCC (2000). The creek is a natural channel along the entire length of this reach at the time of the previous and current studies. Refer to **Figure 5-7** for the long section flood profiles of the previous and current studies.

The flood levels from the current flood study are up to 0.9m higher than those from SMEC (1985) and Dalland and Lucas (1991) from chainage 0 to 1500m, with exception of the backwater upstream of Cumberland Highway in the previous studies. The higher flood levels in the current study area may be due to higher adopted bend losses, in addition to backwater upstream of a footbridge at chainage 1500m at Avonlea Street, Canley Heights, which was included in the current TUFLOW model but may not have been constructed at the time of the previous studies. Adopted flow rates also appear to be approximately 10% lower in the current study when compared to SMEC (1985) and Dalland and Lucas (1991).

The backwater effects of the Cumberland Highway are evident in the SMEC (1985) and Dalland and Lucas (1991) flood profiles, while the backwater is absent in the current flood profile. This is likely to be due to the inclusion of the high flow bypass culvert under the southern bridge approach, which was recommended as a flood mitigation measure in SMEC (1985), although it is unclear whether the culvert was included in either of the previous studies.

The flood profiles between the current study and the three previous studies are relatively similar (within +/- 0.5m of the current flood levels) between chainage 1500m and 4000m, with exception of between chainage 3000m and 3500m, between Sackville Street and Railway Parade, where the flood levels from SMEC (1985) are up to 0.8m lower than the current study. This may be due to the inclusion of floodways across the creek meander loop at Freeman Avenue, Canley Heights, in the previous modelling. The proposed floodway is not discernible in the ALS data on which the current study is based, hence the flood levels are shown to be higher in this area.

■ **Figure 5-7 Comparison of Current 100 year ARI Flood Levels to Previous Studies - Orphan School Creek, King Road to Railway Parade**



5.3.3 Clear Paddock Creek, Main Branch, Edensor Road to King Road

Flooding in Clear Paddock Creek between Edensor Road and King Road was previously assessed by Bewsher Consulting (1997a). The study investigated flooding for the 1997 creek conditions, consisting of a concrete-lined channel along the entire reach between Edensor Road and King Road, and a “proposed condition” whereby the entire reach was reconstructed to include a naturalised, meandering pool-and-riffle sequence. To date, only the section between Edensor Road and Brisbane Road, at the upstream end of the reach, has been naturalised as a part of the “Restoring the Waters” project. The remaining section between Brisbane Road and King Road has been retained as a concrete-line channel.

The previous study was based on an XP-RAFTS hydrologic model and HEC-RAS flood hydraulic model, both developed by Bewsher consulting. Refer to **Figure 5-8** for the long section flood profiles of the previous and current studies. The profile for the Bewsher Consulting (1997a) flood modelling has been split into sections corresponding to the concrete-lined and naturalised creeks, as they were considered as separate scenarios.

The flood levels from the previous study are 1.5 – 2m higher than those from the current study due to significantly higher adopted flows – approximately 120m^3/s at Brisbane Road in the previous study compared to 50m^3/s in the current study for the 100 year ARI flood event. Bewsher Consulting (1997a) predicts a different flow regime in the channel, with the flows reaching the underside of each of the bridges, which in turn causes significant backwater and transitions between super-critical and sub-critical flow in a number of locations. Flows in the current study do not touch the bridge undersides at any location.

The reasons for this difference in adopted flows could not be deduced from a review of the previous study, although it does mention that Basin C and Basin W3 (Kalang Road Basin) were included in the modelling in their pre-upgraded configurations. Both these basins were upgraded after the 1997 study and were represented as such in the current study.

Bewsher Consulting (1997a) does not state whether the previous hydrologic and hydraulic models were calibrated. The study mentions that the XP-RAFTS model was adjusted to reproduce the flows at King Road originally derived by Willing and Partners (consulting engineers), however, Bewsher Consulting (1997a) does not give the full citation of the Willing and Partners Study or model and hence the basis for the Willing and Partners flows are unknown.

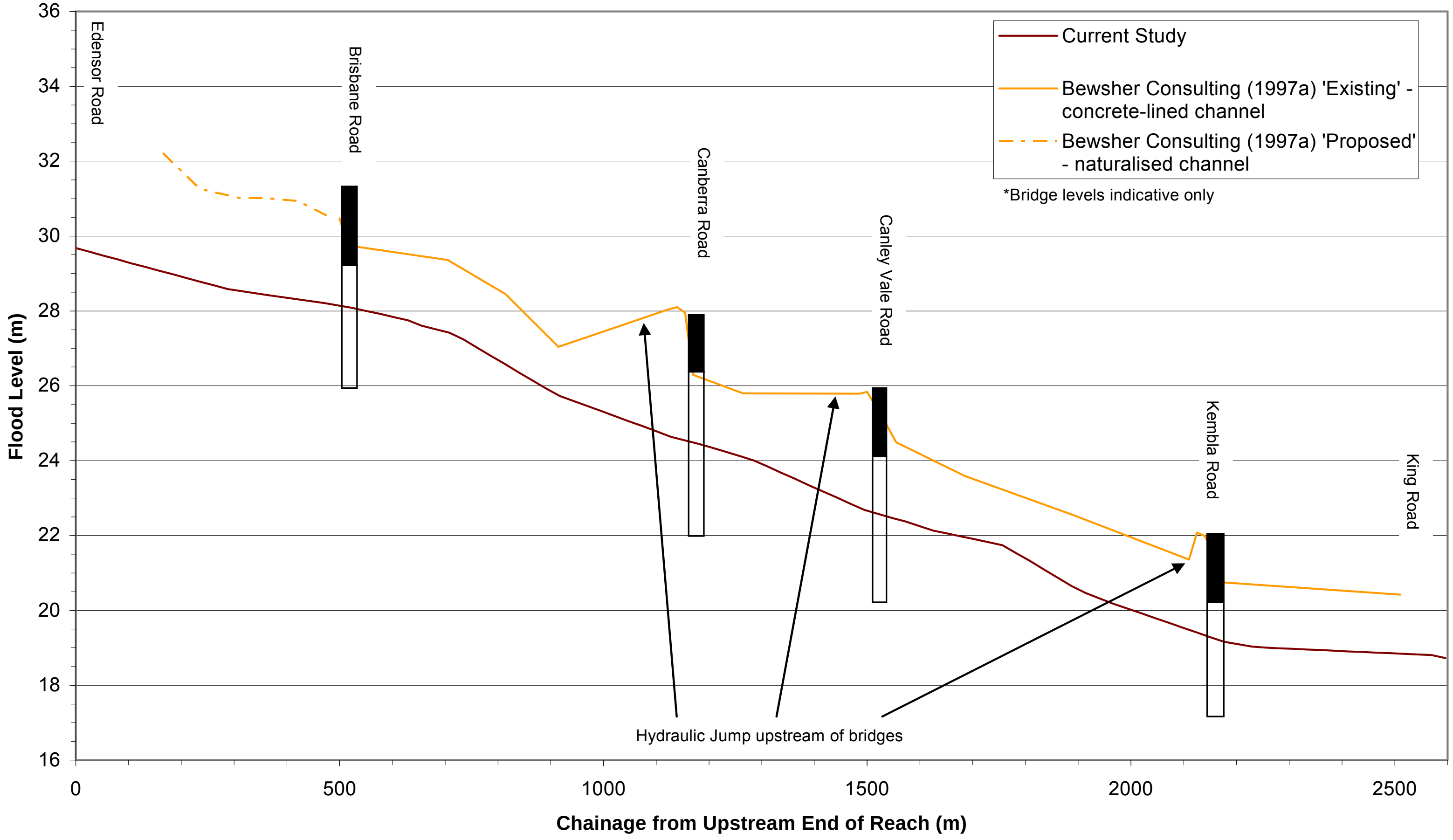
A comparison is made between the 2001 historic flood levels on Clear Paddock Creek and the 20 year ARI flood levels for the current and previous studies in **Table 5-2**.

- **Table 5-2 Comparison of current and previous 20 year ARI flood levels to 2001 event flood levels on Clear Paddock Creek**

Location	2001 Event Flood Mark	20 year ARI Flood Level	
		Current Study	Bewsher Consulting (1997a)
Canley Vale Road, U/S	22.63	22.53	25.84
Canley Vale Road, D/S	22.27	22.17	24.49
Kembla Street, U/S	18.8	18.74	21.14
Kembla Street, D/S	18.51	18.51	19.81

The 2001 flood event was estimated to be between a 10 and 20 year ARI event (FCC, 2001). Greater confidence is placed in the current modelling as the resulting flood levels are similar to the high water marks during the 2001 event. The 20 year ARI flood levels from the previous study are significantly higher than the recorded high water marks.

■ **Figure 5-8 Comparison of Current 100 year ARI Flood Levels to Previous Studies – Clear Paddock Creek, Main Branch, Edensor Road to King Road**



5.3.4 Clear Paddock Creek, Wilson Creek Branch and Henty Creek Branch, upstream of Basin C

Flooding in these reaches of Clear Paddock Creek was previously assessed by Bewsher Consulting (1997b). The Henty Creek Branch is known as the Eastern Tributary, and the Wilson Creek Branch is known as the Western Tributary in the previous study. The creek branches appear to not have had any significant changes since the previous flood study, with exception of the construction of the Transitway and associated cross drainage structures on the Henty Creek Branch. The flood level profiles for the current and previous studies are shown in **Figure 5-9** and **Figure 5-10** for Wilson Creek and Henty Creek branches, respectively.

Figure 5-9 shows that, on the Wilson Creek Branch, flood levels from the previous study are up to 0.8m higher than those from the current study in the upstream half of the reach. It appears that this may be attributed to the difference in the magnitude and distribution of the adopted flows between the two studies. Although the flows at Simpsons Road are similar between the previous study (29m^3/s) and the current study (26m^3/s), the adopted flows upstream of Simpsons Road are significantly higher in the previous study due to differing assumed locations of inflow points in the previous and current hydraulic models. A proportionally greater discharge was assumed at the upstream end of the previous model (26m^3/s) when compared to the current model (6m^3/s).

Flood levels from the current and previous studies are similar for the reaches immediately upstream and downstream of Elizabeth Drive, although the adopted flows in the previous study (37m^3/s) are approximately 30% higher than those in the current study (29m^3/s). This may be due to the flows backing up upstream of Elizabeth Drive and spreading out as they flow over the road as weir flow into Kalang Road Basin.

Figure 5-10 shows that, on the Henty Creek Branch, the previous flood levels are up to 0.9m higher upstream of the Elizabeth Drive and Brown Road crossings than the current flood levels. As per the flood study for Lower Clear Paddock Creek (Bewsher Consulting, 1997a), the adopted flows for the Henty Creek Branch are significantly higher than those in the current study, since the flows in both studies were extracted from the same XP-RAFTS model of Clear Paddock Creek. Flows on Henty Creek at Elizabeth Drive were 54m^3/s in the previous study and 24m^3/s in the current study.

As discussed in **Section 5.3.3**, there was insufficient detail in the previous studies to ascertain the reasons for the differences between the previous and current adopted flows for Clear Paddock Creek.

■ Figure 5-9 Comparison of Current 100 year ARI Flood Levels to Previous Studies – Clear Paddock Creek, Wilson Creek, upstream of Simpson Road to Basin C

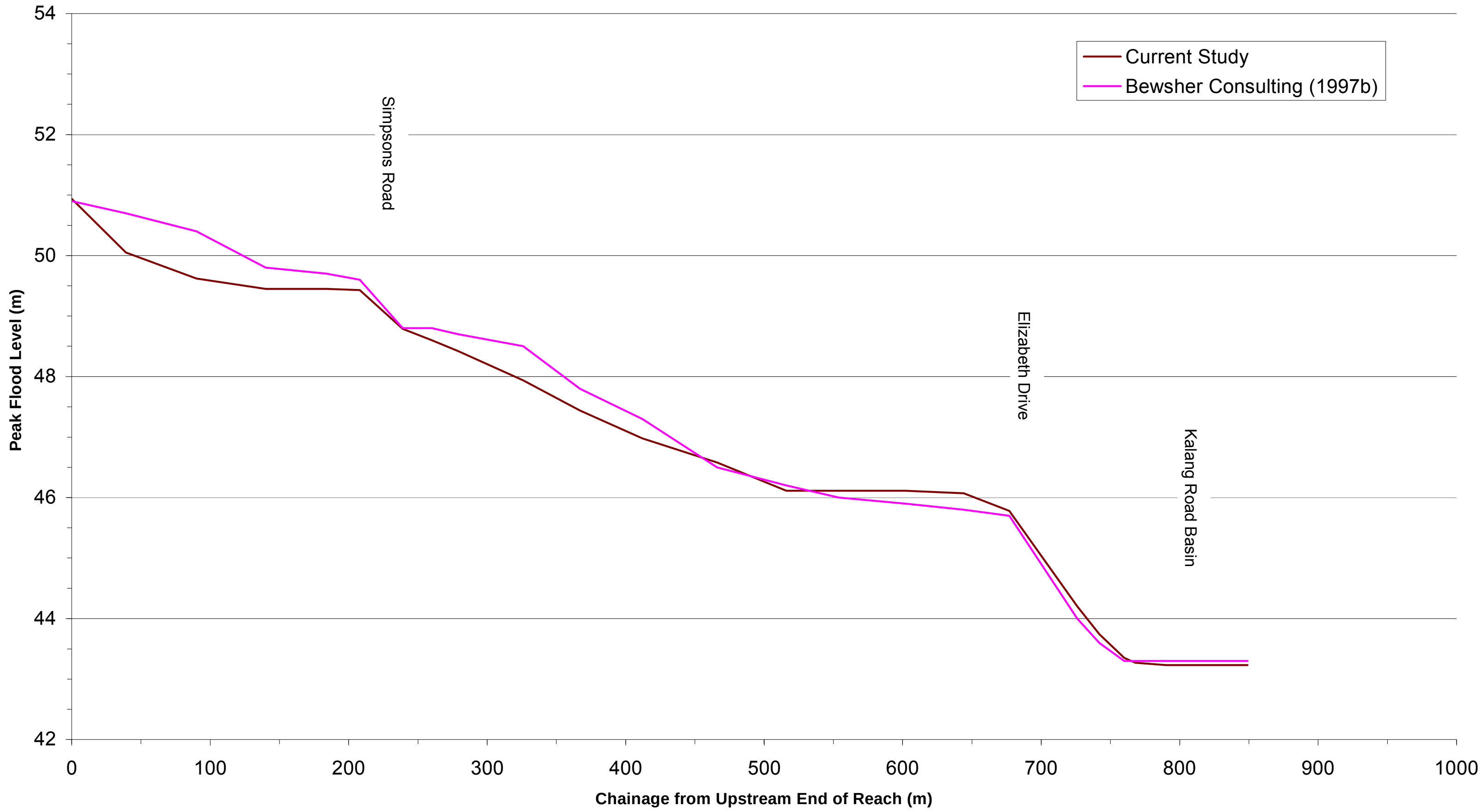
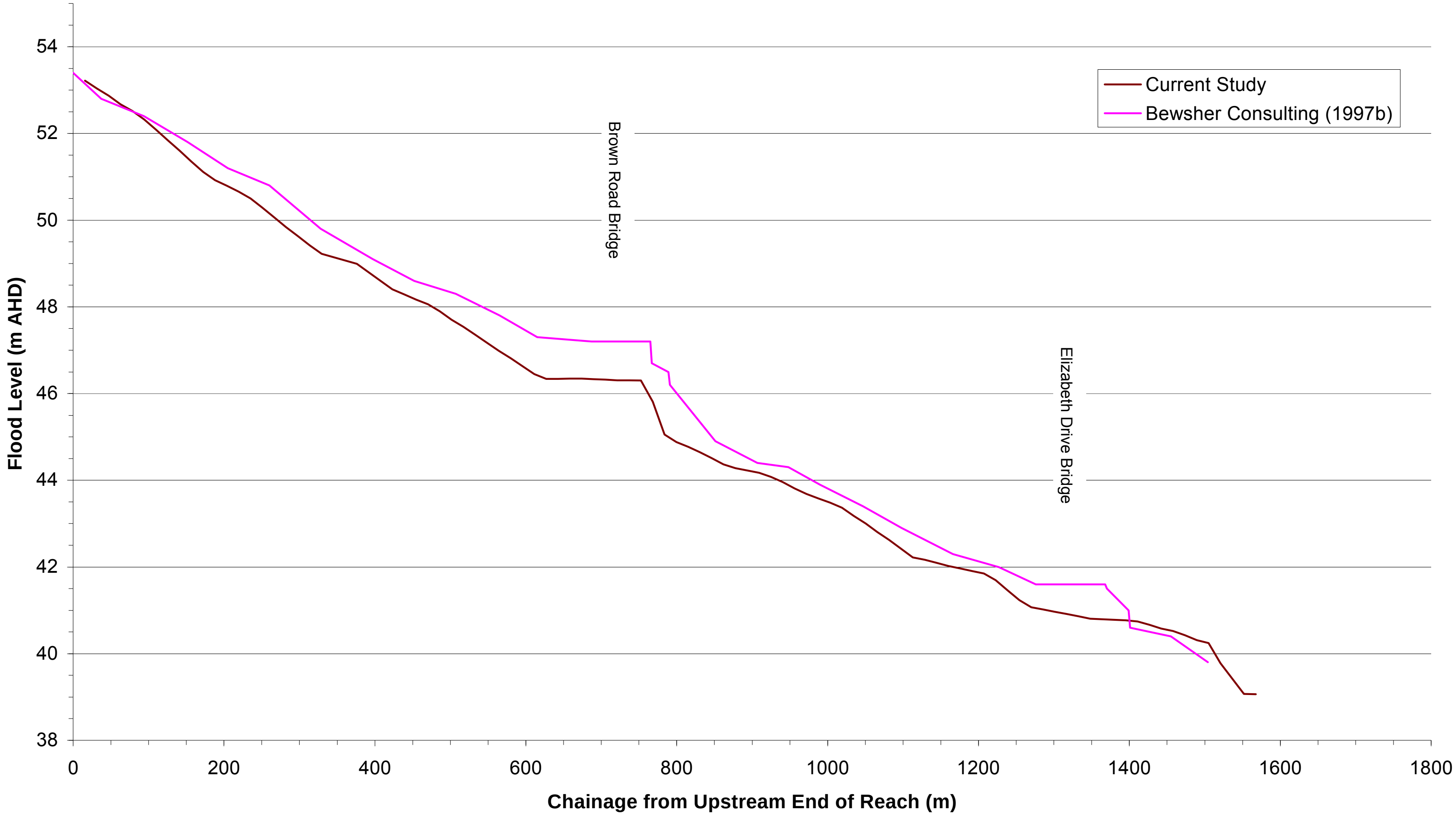


Figure 5-10 Comparison of Current 100 year ARI Flood Levels to Previous Studies – Clear Paddock Creek, Henty Creek Branch, North Liverpool Road to Basin C



5.3.5 Green Valley Creek, North Liverpool Road to Orphan School Creek Confluence

Flooding in Green Valley Creek was previously assessed by L.J. Wiles (1982), SMEC (1985) and Dalland and Lucas (1991). Review of L.J. Wiles (1982) report indicates that most of the creek at the time of this previous study had generally been cleared, widened and realigned in some areas to improve hydraulic efficiency. The creek banks were unlined and sparsely vegetated. The lower reaches of the creek were in a natural state as well as the reach between Edensor Road and St Johns Road. Hence, there appears to have been little change to the creek's condition since this previous study.

Refer to **Figure 5-11** for the long section flood profiles of the previous and current studies. The flood profile from L.J. Wiles (1982) closely matches that for the current study for the reach upstream of Cabramatta Road, although flood levels in the current study are lower than in the previous study between Edensor Road and St Johns Road, most likely due to stream clearing and channel formalisation that occurred following the previous study.

The L.J. Wiles (1982) flood profile shows backwater at Edensor Road, St Johns Road and Cumberland Highway. The current modelling shows a smoother flood profile with generally lower flood levels and a less distinct backwater, due to amplification of the crossings at these locations.

The flood profiles at Chisholm Park Basin are similar between the current study and L.J. Wiles (1982), although the basin outlet appears to have been modelled in a slightly different location, further downstream of the constructed outlet.

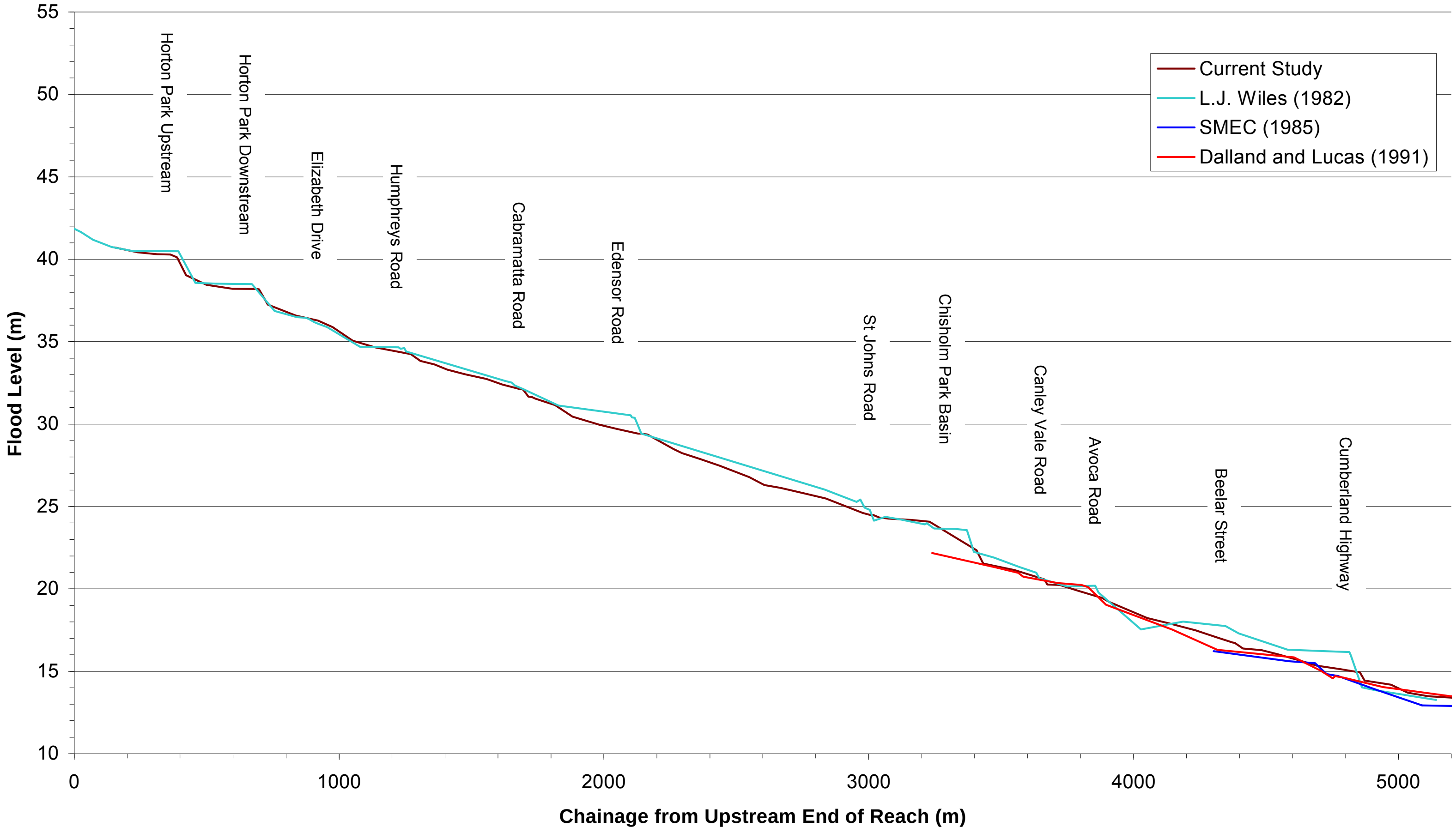
The flood profiles between Canley Vale Road and Avoca Road are similar between the current and the previous studies. Downstream of Avoca Road, the flood profile from L.J. Wiles (1982) deviates from the profile from the current study and Dalland and Lucas (1991), as the flow regime is indicated as going supercritical followed by a hydraulic jump upstream of Beelar Street.

Below Beelar Street the L.J. Wiles (1982) profile is affected by the old Cumberland Highway culvert (previously a 3 × 2.74m × 2.44m box culvert, currently an open span bridge). The flood profiles from SMEC (1985) and Dalland and Lucas (1991) are similar to the current flood profile between Beelar Street and Cumberland Highway.

Downstream of the Cumberland Highway, the SMEC (1985) flood profile is slightly lower than the current study, possibly because the previous model included proposed floodways on the creek meander loops, which from the current ALS data appear to only have been partly constructed.

Adopted 100 year ARI flows are 7 – 55% higher in L.J. Wiles (1982), possibly due to conservative assumptions about fully developed catchment conditions; and 5 – 16% higher in Dalland and Lucas (1991). The adopted flows were not stated in SMEC (1985).

■ **Figure 5-11 Comparison of Current 100 year ARI Flood Levels to Previous Studies – Green Valley Creek, North Liverpool Road to Orphan School Creek confluence**



5.4 Flood Hazard Mapping

Interim Flood Risk Precinct mapping has been prepared for the Three Tributaries study area. This mapping is based on GIS analysis of the 100 year and PMF peak depth and velocity grids. The GIS analysis is based on the FCC flood risk precinct categories described in **Table 5-3**.

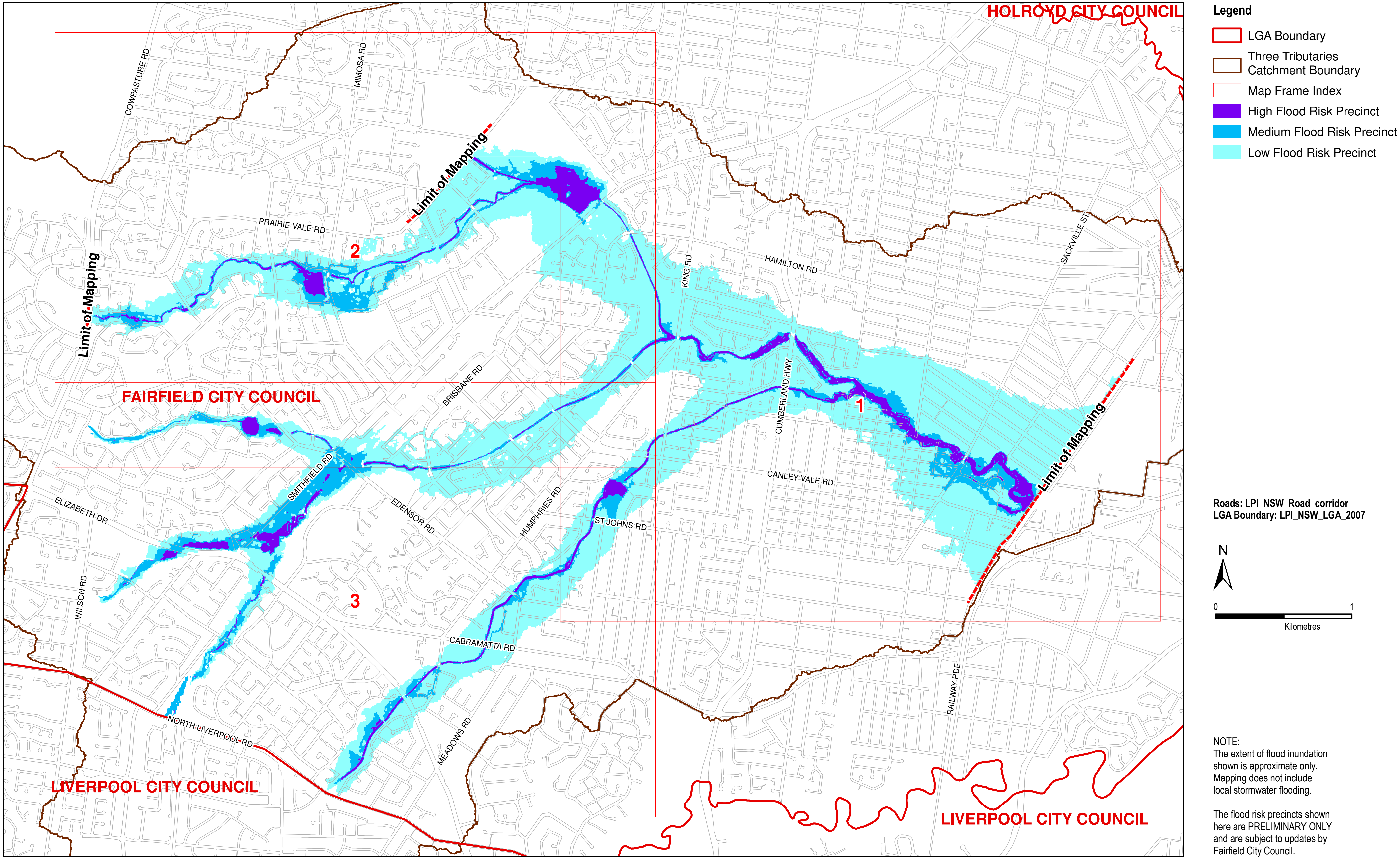
- **Table 5-3 FCC Flood Risk Precincts as (Fairfield City Wide DCP, 2006)**

Risk Precinct	Description
High	The area of land below the 100 year ARI flood outline that is subject to high hydraulic hazard (for preparation of the draft flood risk precincts, this has been taken as the provisional 'High Hazard' zone Figure L2 of Appendix L in the NSW Floodplain Development Manual (2005))
Medium	Land below the 100 year ARI flood outline that is not in the High Risk Flood Precinct
Low	All other land within the floodplain (i.e. within the extent of the PMF) but not identified within either the High Risk or Medium Risk Precincts.

The Interim Flood Risk Precinct maps are included in **Figure 5-12** to **Figure 5-15**. These maps show solid precinct outlines, which have been created based on the GIS analysis and analysis of the flood outlines. For the purposes of this study, the Interim Flood Risk Precincts have not been adjusted to account for any areas (e.g. 'islands') inundated in a 100 year ARI event and for which access/evacuation can only be through 'High' areas. Such adjustments of the Interim Flood Risk Precincts are planned for the subsequent Floodplain Risk Management Study for the Three Tributaries.

The Interim Flood Risk Precinct mapping indicates that the interim high flood risk areas in the middle and upper reaches of the system (upstream of the Orphan School Creek/Green Valley Creek confluence) are generally confined to the creek corridor and the detention basins. There are isolated areas of high flood risk on and adjacent to Smithfield Road and Edensor Road on Clear Paddock Creek. In the lower reach of Orphan School Creek, the high flood risk precinct affects areas outside the creek corridor, including some roads and properties. The draft high flood risk precinct reflects areas of excessively hazardous high flood depth or flow velocity, or a combination of both.

The interim medium and low flood risk precincts follow the same spatial extents as the 100 year ARI and PMF event flood inundation patterns, respectively, as per their definition in **Table 5-3**.



NOTE:
The extent of flood inundation shown is approximate only. Mapping does not include local stormwater flooding.

The flood risk precincts shown here are PRELIMINARY ONLY and are subject to updates by Fairfield City Council.

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Figure 5-12 Interim Flood Risk Precinct Map Index

Flood Study for Orphan School Creek, Clear Paddock Creek and Green Valley Creek

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May 5, 2008

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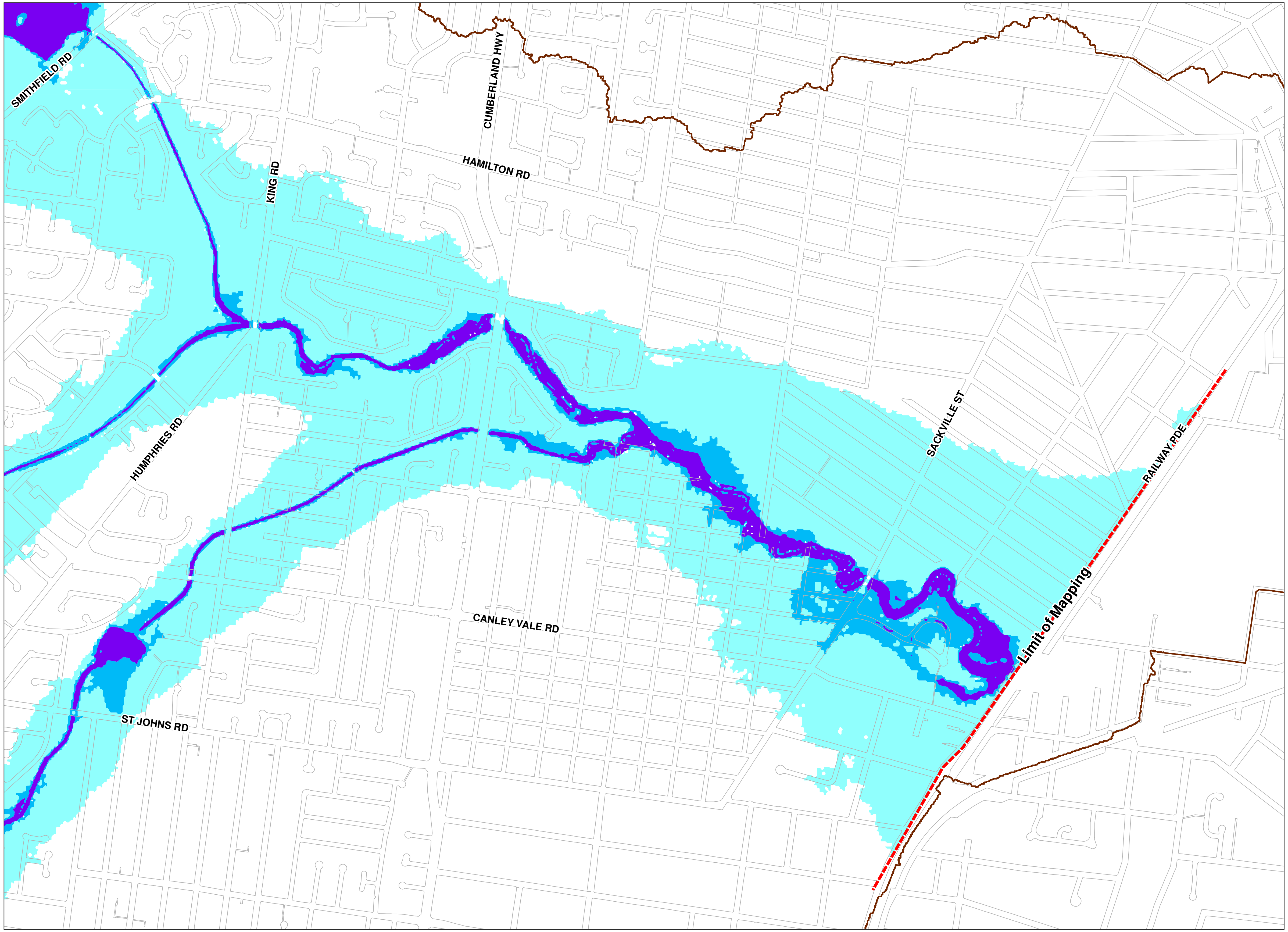

Legend

- High Flood Risk Precinct
- Medium Flood Risk Precinct
- Low Flood Risk Precinct
- Three Tributaries Catchment Boundary

Roads: LPI_NSW_Road_corridor

N

0 500

Metres

A3 1:14,000

NOTE:
The extent of flood inundation shown is approximate only. Mapping does not include local stormwater flooding.

The flood risk precincts shown here are PRELIMINARY ONLY and are subject to updates by Fairfield City Council.

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Figure 5-13 Interim Flood Risk Precinct Map - Sheet 1

Flood Study for Orphan School Creek, Clear Paddock Creek and Green Valley Creek

GDA_1994_MGA_Zone_56

January 22, 2008
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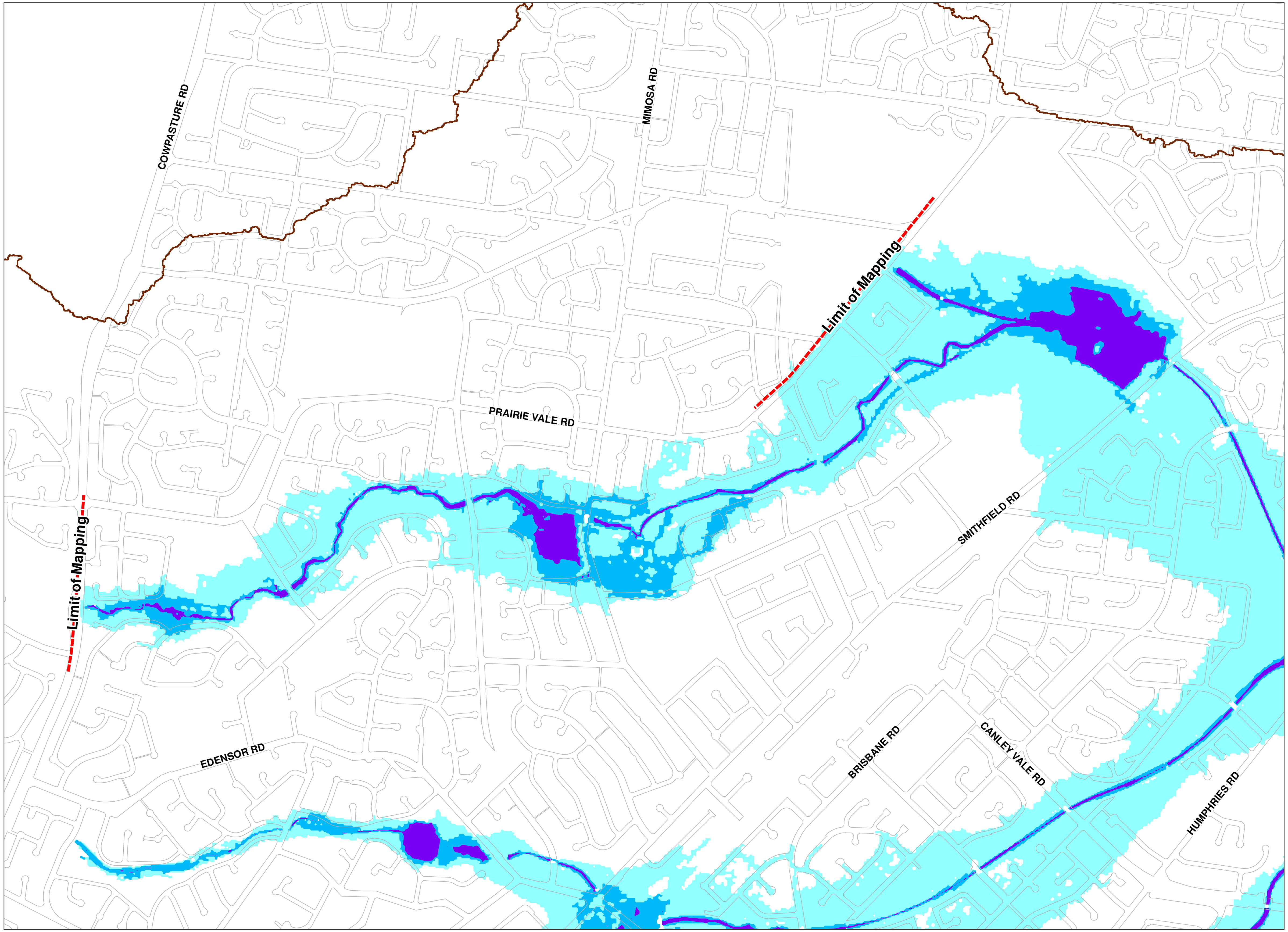

NOTE:
The extent of flood inundation shown is approximate only. Mapping does not include local stormwater flooding.

The flood risk precincts shown here are PRELIMINARY ONLY and are subject to updates by Fairfield City Council.

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Figure 5-14 Interim Flood Risk Precinct Map - Sheet 2

Flood Study for Orphan School Creek, Clear Paddock Creek and Green Valley Creek

GDA_1994_MGA_Zone_56

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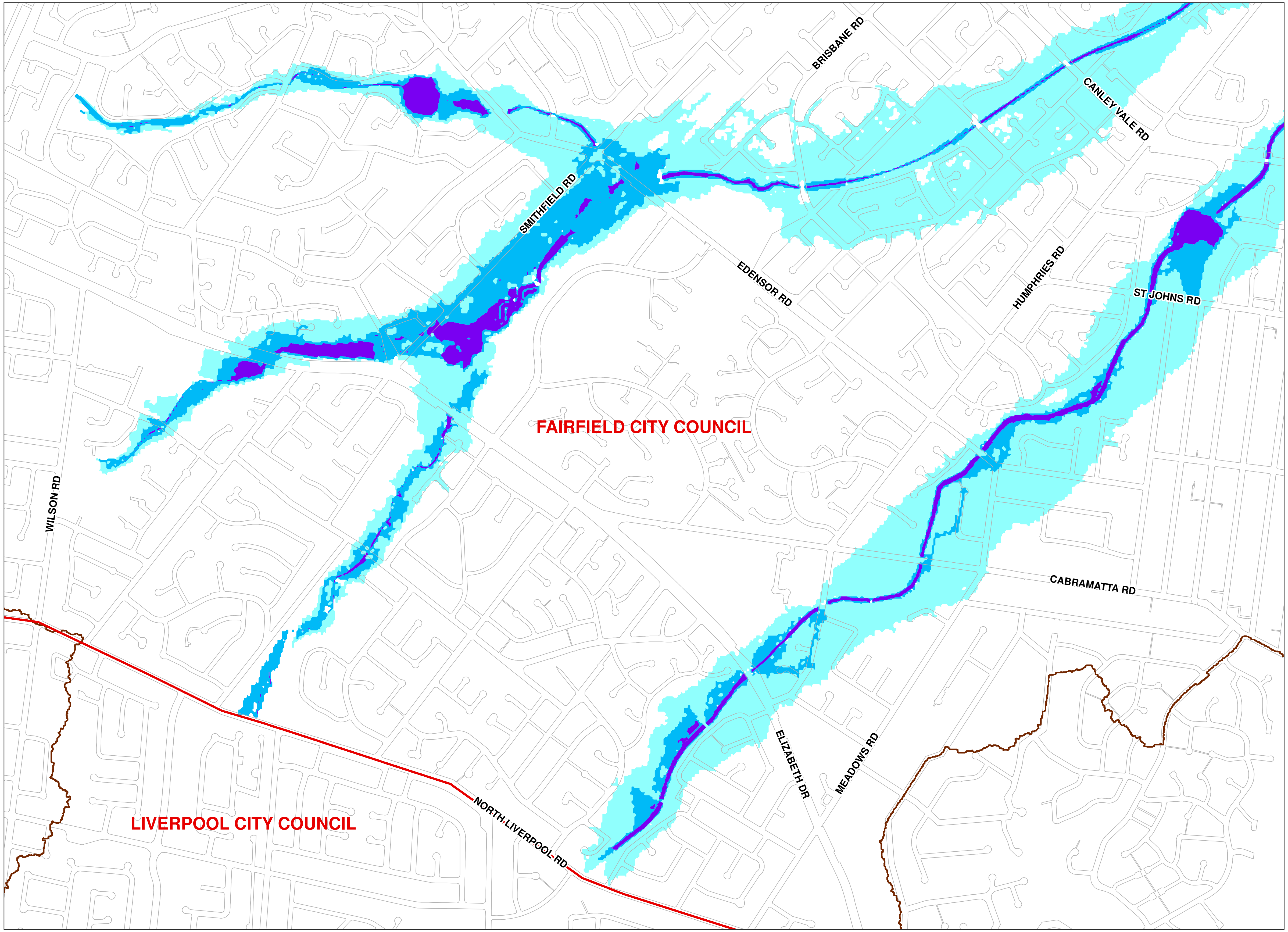

Legend

- High Flood Risk Precinct
- Medium Flood Risk Precinct
- Low Flood Risk Precinct
- Three Tributaries Catchment Boundary
- LGA Boundary

Roads: LPI_NSW_Road_corridor
LGA Boundary: LPI_NSW_LGA_2007

N

0 500
Metres

A3 1:14,000

NOTE:
The extent of flood inundation shown is approximate only. Mapping does not include local stormwater flooding.

The flood risk precincts shown here are PRELIMINARY ONLY and are subject to updates by Fairfield City Council.

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Figure 5-15 Interim Flood Risk Precinct Map - Sheet 3

Flood Study for Orphan School Creek, Clear Paddock Creek and Green Valley Creek

GDA_1994_MGA_Zone_56

January 22, 2008
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5.5 Blockage Analysis

An analysis of the impact of culvert blockage on flood behaviour was undertaken in TUFLOW. It is assumed that, during a flood event, culverts become blocked to varying degrees by debris, thus potentially causing localised increases in flood levels and changes in flow patterns.

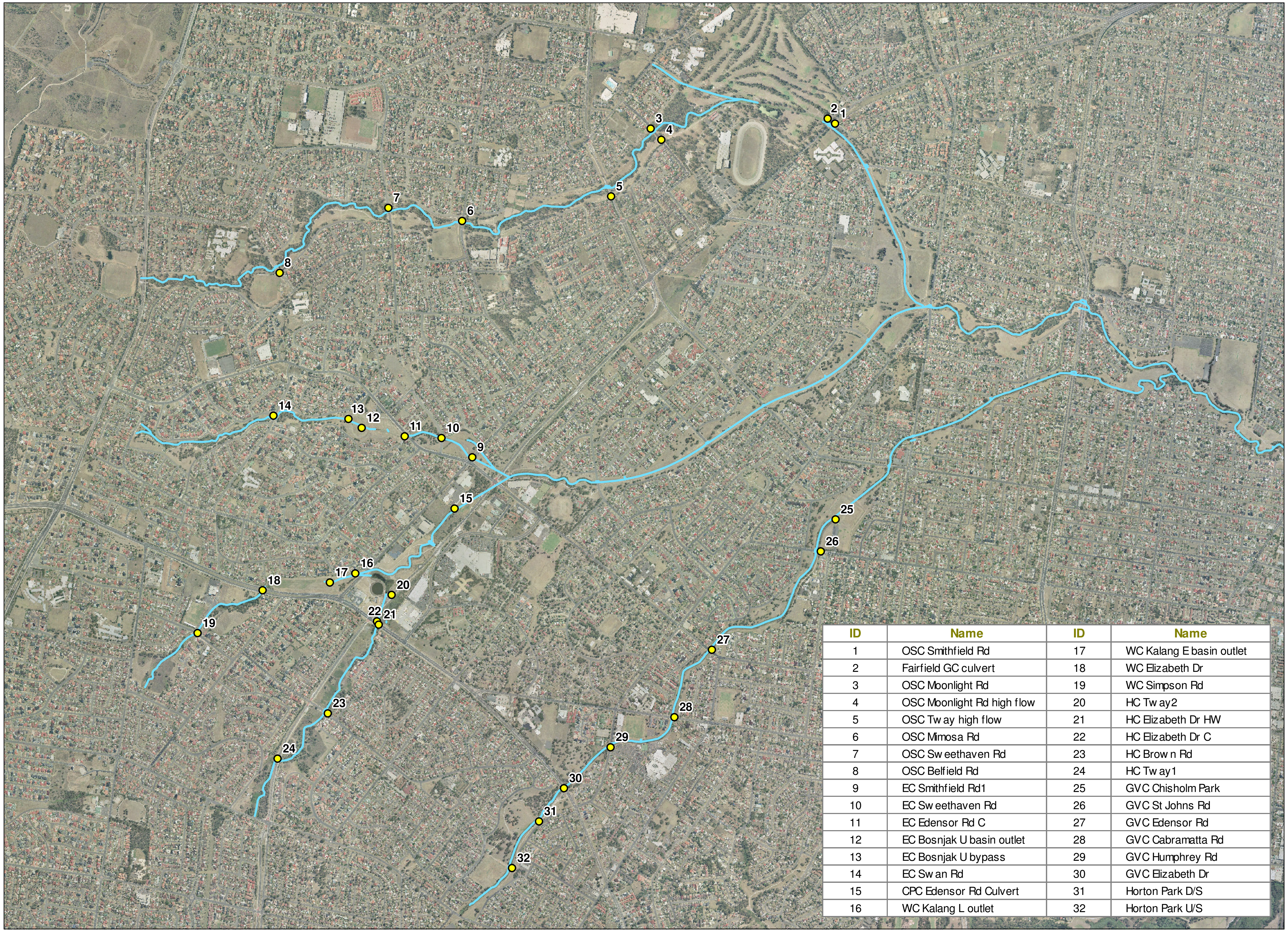
In this analysis, the culvert waterway crossings were identified and a likely degree of blockage assigned, based on:

- The dimensions of the culvert and presence of grated coverings. Smaller culverts were considered more susceptible to becoming blocked. Grated sump outlets of detention basins and grated coverings of culvert inlets were also considered highly susceptible to blockage;
- The type and density of vegetation in the upstream vicinity of the culvert, including in-channel and bank vegetation; and
- The occurrence of other culverts immediately upstream which are likely to become blocked, thus preventing the trapped debris from flowing further downstream to block the next culvert.

Blockage in the TUFLOW culvert objects was defined as a percentage blockage of the culvert waterway area. Open span bridges were considered unlikely to become significantly blocked and hence were excluded from this analysis.

The locations of culverts identified and assessed in the blockage analysis tend to occur in the mid to upper reaches of the creek system, are shown and numbered in **Figure 5-16**. The culvert names, dimensions and assumed blockage factors are given in **Table 5-4**.

The TUFLOW model was run with the above culvert blockages for the 100 year ARI 2 hour event, which is the critical 100 year ARI event, or produces peak flows that are similar to those for the critical event, at these locations. The increase in flood levels caused by the adopted blockage factors are given in **Table 5-4**. The peak water level longitudinal profile is plotted for the reaches of the creeks where the blockages have impacted on water levels in **Figure 5-17** to **Figure 5-21**.



ID	Name	ID	Name
1	OSC Smithfield Rd	17	WC Kalang E basin outlet
2	Fairfield GC culvert	18	WC Elizabeth Dr
3	OSC Moonlight Rd	19	WC Simpson Rd
4	OSC Moonlight Rd high flow	20	HC Tway2
5	OSC Tway high flow	21	HC Elizabeth Dr HW
6	OSC Mimosa Rd	22	HC Elizabeth Dr C
7	OSC Sweethaven Rd	23	HC Brown Rd
8	OSC Belfield Rd	24	HC Tway1
9	EC Smithfield Rd1	25	GVC Chisholm Park
10	EC Sweethaven Rd	26	GVC St Johns Rd
11	EC Edensor Rd C	27	GVC Edensor Rd
12	EC Bosnjak U basin outlet	28	GVC Cabramatta Rd
13	EC Bosnjak U bypass	29	GVC Humphrey Rd
14	EC Swan Rd	30	GVC Elizabeth Dr
15	CPC Edensor Rd Culvert	31	Horton Park D/S
16	WC Kalang L outlet	32	Horton Park U/S

Legend

Culvert Blockage Locations

TUFLOW 1D stream network

Aerial: AUSIMAGE

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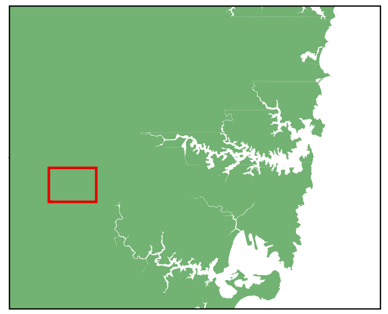

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Figure 5-16 Blockage Analysis - Culvert Blockage Locations

Flood Study for Orphan School Creek, Clear Paddock Creek and Green Valley Creek

GDA_1994_MGA_Zone_56

January 22, 2008

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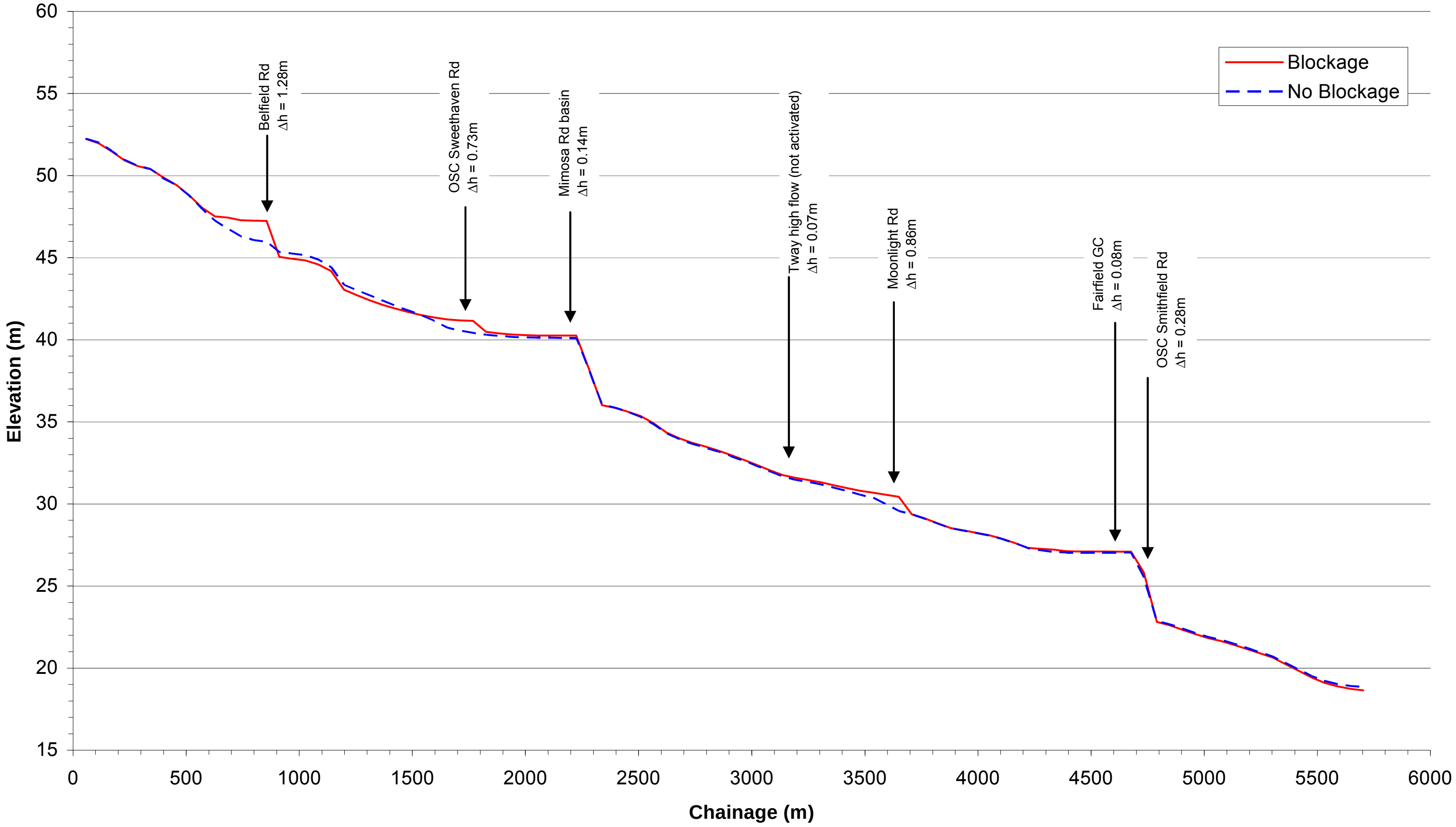
Table 5-4 Blockage analysis culvert data

ID	Name	Dimensions	% Blockage	Increase in Flood Levels (m)[1]
ORPHAN SCHOOL CREEK				
1	OSC Smithfield Rd	2 x 3.45m x 2.65m + 3.45m x 2.85m	25	0.28
2	Fairfield GC culvert	4.2m x 1.15m	100	0.08
3	OSC Moonlight Rd	2 x 3.2m x 2.7m + 3.2m x 2.1m	50	0.86
4	OSC Moonlight Rd high flow	5 x 1.05m dia	50	0.86[3]
5	OSC Tway high flow	7 x 0.675m dia	100	0.07
6	OSC Mimosa Rd	2.45m dia	50	0.14
7	OSC Sweethaven Rd	3 x 3.7m x 2.15m	50	0.73
8	OSC Belfield Rd	3 x 2.1m x 2.1m	50	1.28
CLEAR PADDOCK CREEK[2]				
9	EC Smithfield Rd1	1 x 1.8m dia	50	0.19
10	EC Sweethaven Rd	3 x 1.2m dia	50	0.36
11	EC Edensor Rd C	2 x 1.2m dia with trash rack	25	0.59
12	EC Bosnjak U basin outlet	Grated sump pit 4m x 2m	100	0.15
13	EC Bosnjak U bypass	2 x 0.9m dia	100	0.15[3]
14	EC Swan Rd	4 x 1.5m dia	50	0.39
15	CPC Edensor Rd Culvert	2 x 2.05m dia	50	0.25
16	WC Kalang L outlet	Grated sump pit 4m x 2m	100	0.14
17	WC Kalang E basin outlet	Grated sump pit 4m x 2m	100	0.12
18	WC Elizabeth Dr	3 x 1.8m x 1m	100	0.40
19	WC Simpson Rd	3 x 1.1m dia	100	0.11
20	HC Tway2	8 x 3.3m x 0.75m	0[4]	0.28
21	HC Elizabeth Dr HW	8 x 3.3m x 0.75m	100	1.24
22	HC Elizabeth Dr C	2 x 1.8m dia	50	1.24[3]
23	HC Brown Rd	2 x 1.35m dia	50	0.14
24	HC Tway1	6 x 3.3m x 1.5m	50	0.12
GREEN VALLEY CREEK				
25	GVC Chisholm Park	3 x 1.5m dia	50	0
26	GVC St Johns Rd	4 x 3.3m x 1.85m	25	0.02
27	GVC Edensor Rd	5 x 2.75m x 2m	50	0.18
28	GVC Cabramatta Rd	5 x 2.34m x 1.85m	50	0.78
29	GVC Humphries Rd	3 x 4m x 1.66m	50	0.57
30	GVC Elizabeth Dr	6 x 3.05m x 1.5m	50	0.5
31	Horton Park D/S	3 x 2.5m x 2.2m	0[5]	0
32	Horton Park U/S	3 x 2.5m x 2.2m	0[5]	0

1 In 100 year ARI 2 hour flood event.
2 EC = Edensor Creek; WC = Wilson Creek; HC = Henty Creek.
3 Denotes combined flood level impact of this blocked structure and the previous blocked structure in the table.
4 HC Tway2 assumed to be unblocked. The culverts immediately upstream at Elizabeth Drive are assumed to trap the debris arriving from upstream, and there is only a short reach with little vegetation between Elizabeth Drive and Tway2 crossings.
5 These culverts are located near the upstream end of the open channel of Green Valley Creek, hence little debris expected to arrive at the culverts. Additionally, culverts are relatively large, hence were assumed to be unblocked.

■ **Figure 5-17 Blockage analysis water surface profiles, 100 year ARI 2 hour event – Orphan School Creek, Belfield Road to Bull Road**



■ Figure 5-18 Blockage analysis water surface profiles, 100 year ARI 2 hour event – Clear Paddock Creek, Edensor Creek Branch, Swan Street to Brisbane Road

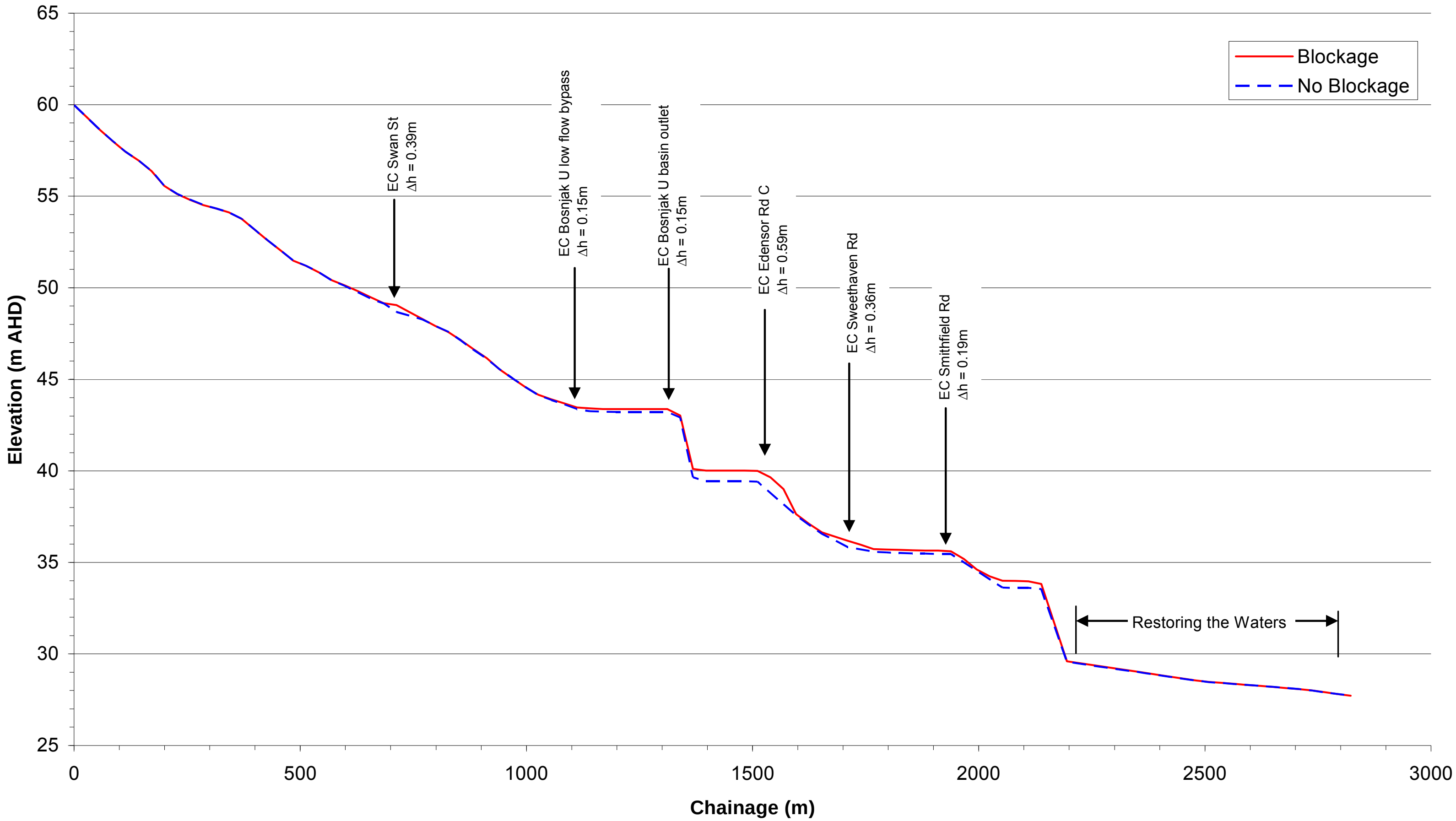
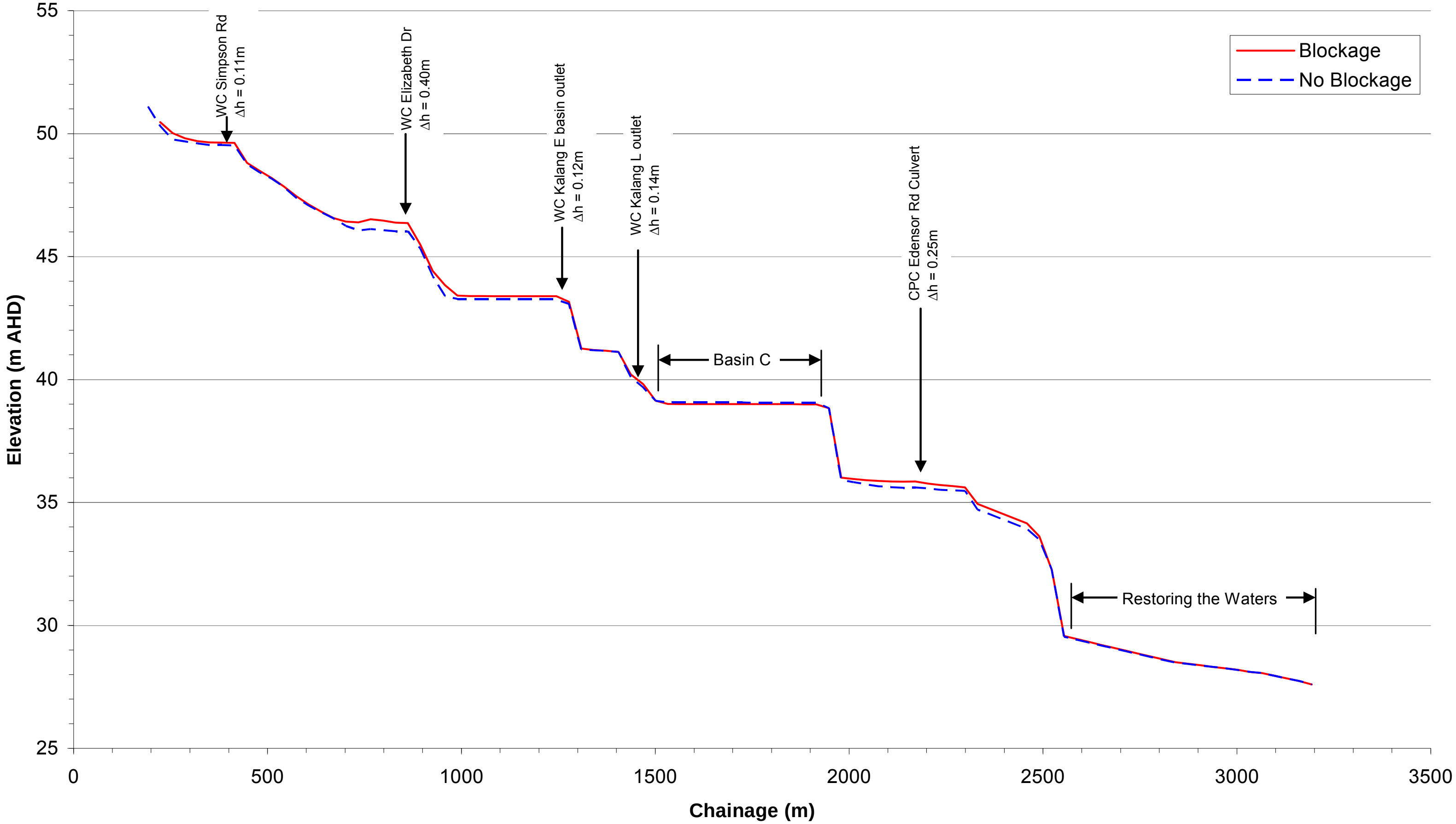
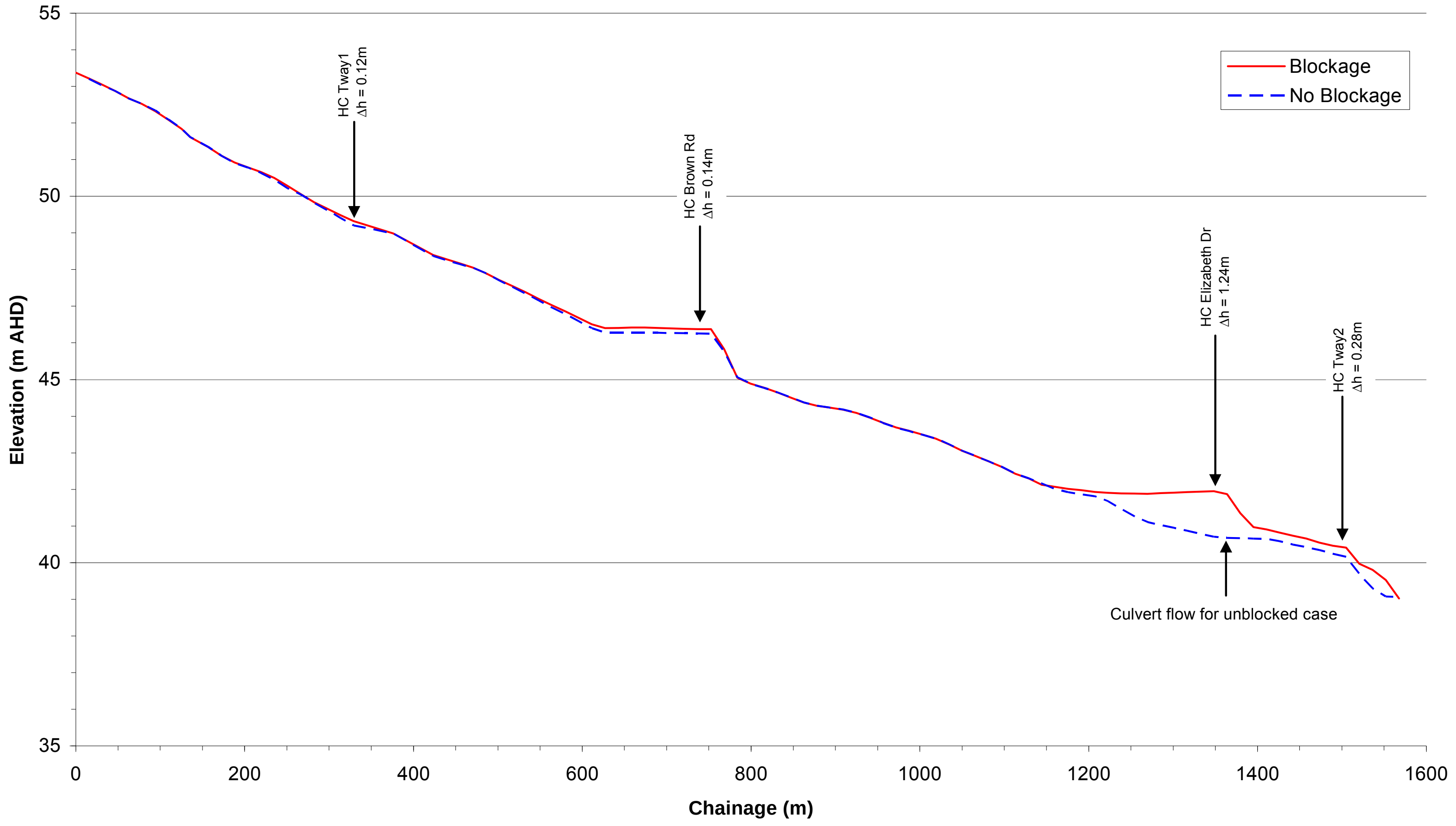


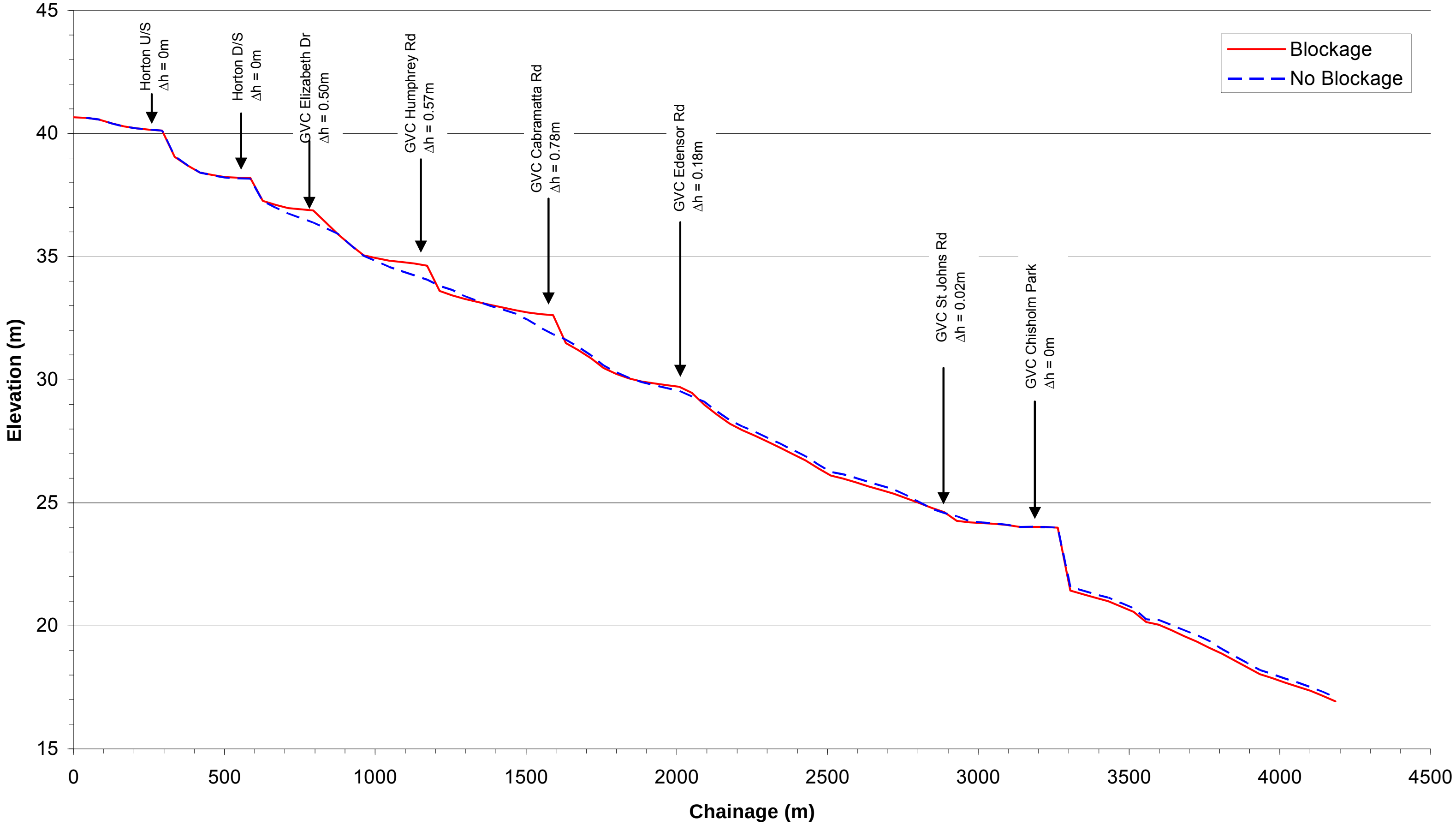
Figure 5-19 Blockage analysis water surface profiles, 100 year ARI 2 hour event – Clear Paddock Creek, Wilson Creek Branch, Simpson Road to Brisbane Road



■ **Figure 5-20 Blockage analysis water surface profiles, 100 year ARI 2 hour event – Clear Paddock Creek, Henty Creek Branch, North Liverpool Road to Basin C**



■ **Figure 5-21 Blockage analysis water surface profiles, 100 year ARI 2 hour event – Green Valley Creek, Elizabeth Dr to Avoca Road**



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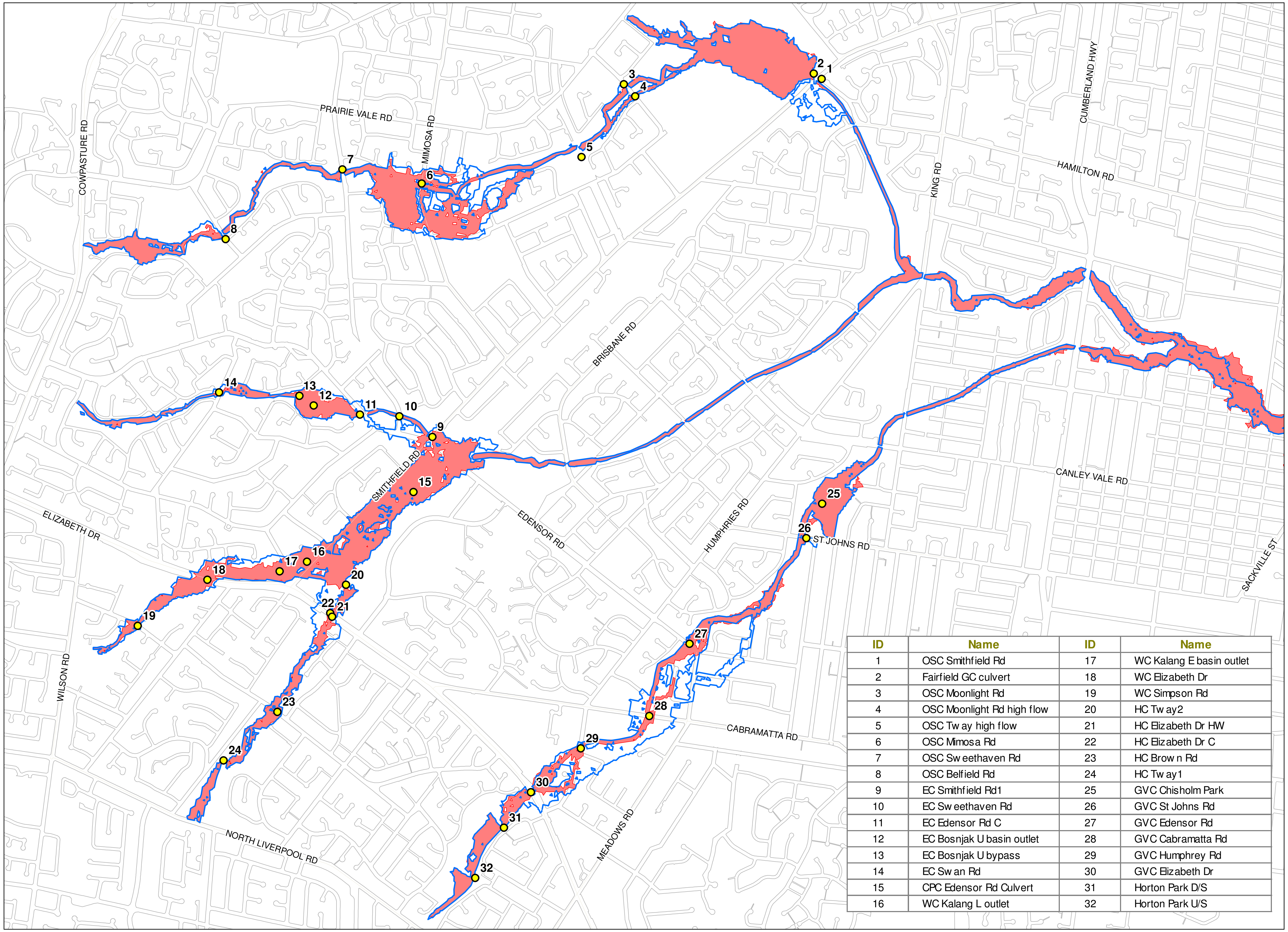
Analysis of the plots indicates that, in general:

- Blockages at basin outlets have a smaller impact when compared to on-stream culvert blockages, due to the increased flood volume upstream of the blockage being stored over a larger surface area.
- A number of culvert blockages cause an increase in flow breakout from the channel, resulting in a greater flood volume to be redistributed and stored on the floodplain and hence leading to decreases in flood levels downstream of the blockage. This occurs on:
  - Wilson Creek branch on Clear Paddock Creek, where blockages on the Kalang Road Basins cause lowered water levels in Basin C (blockages on Henty Creek branch may also contribute to lowered flood levels in Basin C);
  - Henty Creek branch on Clear Paddock Creek, downstream of Elizabeth Drive; and
  - Green Valley Creek, downstream of Elizabeth Drive, Humphries Road and Cabramatta Road. The culvert blockage on Cabramatta Road causes significant redistribution of flows onto the floodplain, and probably contributes to the relatively low impact of the blockage at Edensor Road and St Johns Road. It is also the likely cause of the persistent reduced flood levels downstream of Chisholm Park basin. Refer to **Figure 5-22** for a comparison in the extent of flooding and distribution of flow on the floodplain.

Figure 5-22 also indicates other exacerbated flow breakout areas and redistribution of flows downstream of Mimosa Road Basin, Fairfield Golf Course, Edensor Road at Edensor Creek and Elizabeth Drive at Henty Creek.

Photograph 4 illustrates a grated culvert at Bosnjak Park Downstream Basin, which was considered susceptible to blockage. **Photograph 5** shows the build up of debris and partial blockage at the Cabramatta Road crossing on Green Valley Creek following a minor storm event.

- **Photograph 4 Grated culvert susceptible to blockage, Bosnjak Park Downstream Basin**



ID	Name	ID	Name
1	OSC Smithfield Rd	17	WC Kalang E basin outlet
2	Fairfield GC culvert	18	WC Elizabeth Dr
3	OSC Moonlight Rd	19	WC Simpson Rd
4	OSC Moonlight Rd high flow	20	HC Tway2
5	OSC Tway high flow	21	HC Elizabeth Dr HW
6	OSC Mimosa Rd	22	HC Elizabeth Dr C
7	OSC Sweethaven Rd	23	HC Brown Rd
8	OSC Belfield Rd	24	HC Tway1
9	EC Smithfield Rd1	25	GVC Chisholm Park
10	EC Sweethaven Rd	26	GVC St Johns Rd
11	EC Edensor Rd C	27	GVC Edensor Rd
12	EC Bosnjak U basin outlet	28	GVC Cabramatta Rd
13	EC Bosnjak U bypass	29	GVC Humphrey Rd
14	EC Swan Rd	30	GVC Elizabeth Dr
15	CPC Edensor Rd Culvert	31	Horton Park D/S
16	WC Kalang L outlet	32	Horton Park U/S

Legend

- Culvert Blockage Locations
- 100yr ARI 2hr Flood with Blockage
- 100yr 2hr ARI Flood No Blockage

Roads: LPI_NSW_Road_corridor

N

0 1
Kilometres

NOTE:
The extent of flood inundation shown is approximate only. Mapping does not include local stormwater flooding.

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A Division of Fairfield City Council

Figure 5-22 Blockage Analysis - Comparison of Flood Extents

Flood Study for Orphan School Creek, Clear Paddock Creek and Green Valley Creek

GDA_1994_MGA_Zone_56

December 6, 2007
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- **Photograph 5 Partial blockage of Cabramatta Road crossing, Green Valley Creek, by debris**

5.6 Sensitivity Analysis

Sensitivity testing of the TUFLOW model was undertaken for the 100 year ARI event. The analysis was carried out to assess the effect of changes to model parameters on flood behaviour in the 1D and 2D domains. The following scenarios were assessed:

1) **Varied catchment roughness**: increase and decrease in base case Manning's 'n' values in the 2D domain;
2) **Varied rainfall losses**: increased and decreased rainfall losses in the XP-RAFTS hydrologic model, resulting in decreased and increase inflows, respectively; and
3) **Increased initial detention storage**: the initial water level in the model and initial storage content in the detention basins by starting the model run with an initial 20 year ARI event flood level across the catchment.

5.6.1 Varied Catchment Roughness

The Manning's n of the 2D domain was varied by 5%. The effect of both an increase and a decrease in the roughness was investigated. Refer to **Table 4-3** for adopted Manning's n for various land uses in the base case modelling.

5.6.2 Varied Rainfall Losses

The rainfall losses adopted in the XP-RAFTS model for the sensitivity analysis are tabulated below. Only the pervious area losses were varied. The impervious area losses were not varied as they are small in magnitude and any proportional variation in the impervious area losses (i.e. say, 50% increase or decrease) would not result in any significant change in runoff rates.

▪ **Table 5-5 Rainfall losses adopted in sensitivity analysis**

	Initial Loss (mm)	Continuing Loss (mm/hr)
Increased Losses	20	3
Decreased Losses	10	1
Base Case	15	1.5

* Pervious area losses only. Impervious area losses not varied.

5.6.3 Increased Initial Detention Basin Stored Volume

The sensitivity of the model to an increase in initial stored flood volume in the detention basins, in addition to the creek system in general, was assessed. The 20 year ARI 2 hour event, which is the critical 20 year ARI event at most of the detention basins, was initially run in the model and a restart file written at the flood peak in the basins. The restart file was written at 0.8 hours into the model simulation, when the majority of basins are approximately 20 – 30% full. The restart file was then used to define the initial conditions for running the 100 year ARI 2 hour flood event in the model. The initial percentage full at each basin during the sensitivity runs is summarised below.

Table 5-6 Initial basin water levels during sensitivity analysis

Basin Name	Initial Water Level[1] (m AHD)	% Full by Volume[2]
Bosnjak Park Upstream	42.39	60%
Bosnjak Park Downstream	39.21	52%
Mimosa Road Basin	38.89	20%
Fairfield Golf Course	25.99	28%
Kalang Road	42.70	39%
Basin C	37.46	34%
Horton Park Upstream	39.79	3%
Horton Park Downstream	37.88	18%
Chisholm Park	23.30	19%

1. 20 year ARI 2 hour event water level at 0.8 hours simulation time.
2. Based on basin volumes in **Table 4-1**.

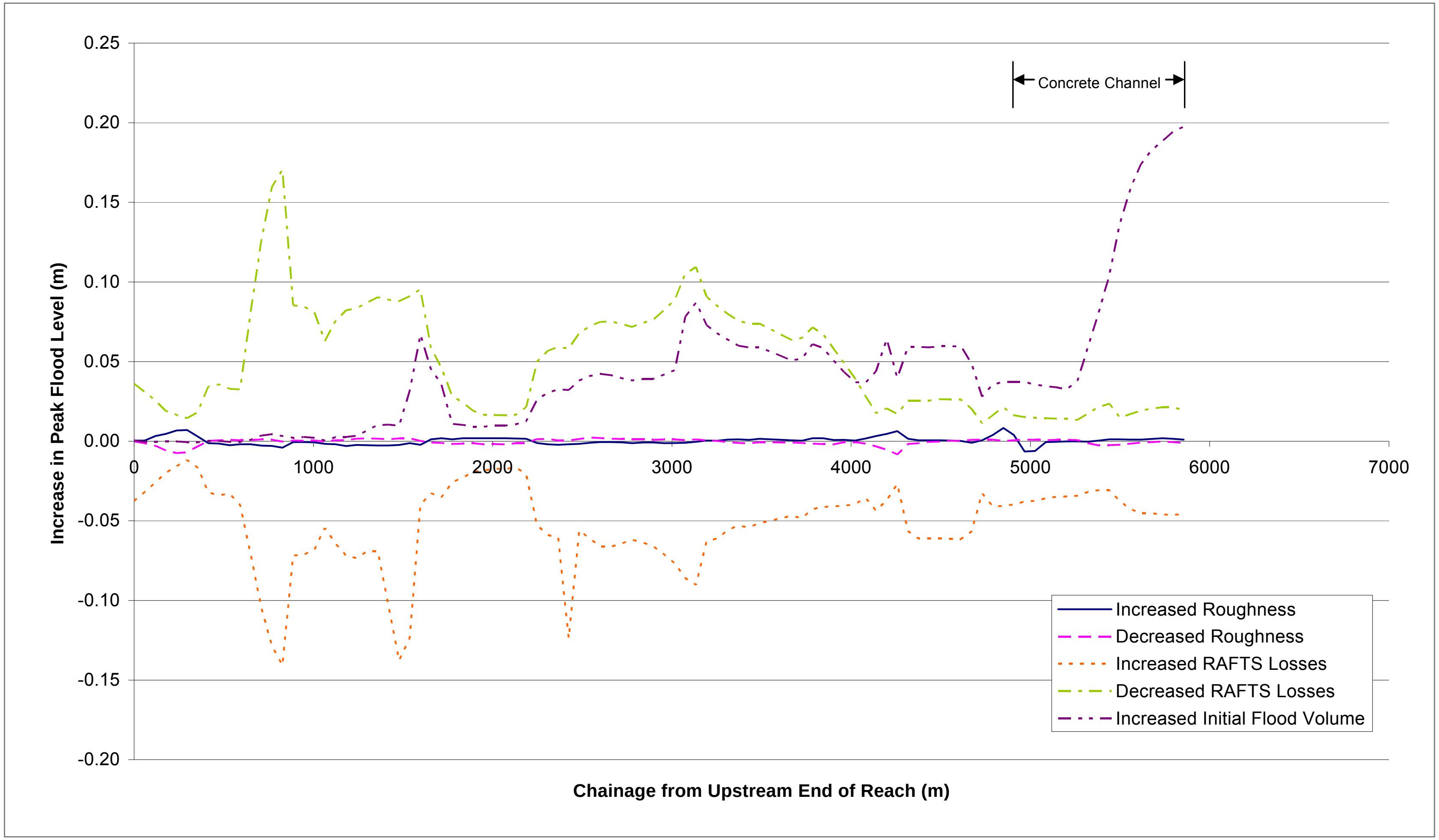
5.6.4 Sensitivity Analysis Results and Discussion

Longitudinal sections of the base case and sensitivity analysis results were extracted from the 2D results and the differences in water levels plotted in **Figure 5-23** to **Figure 5-28**. Discussion of the results is given below.

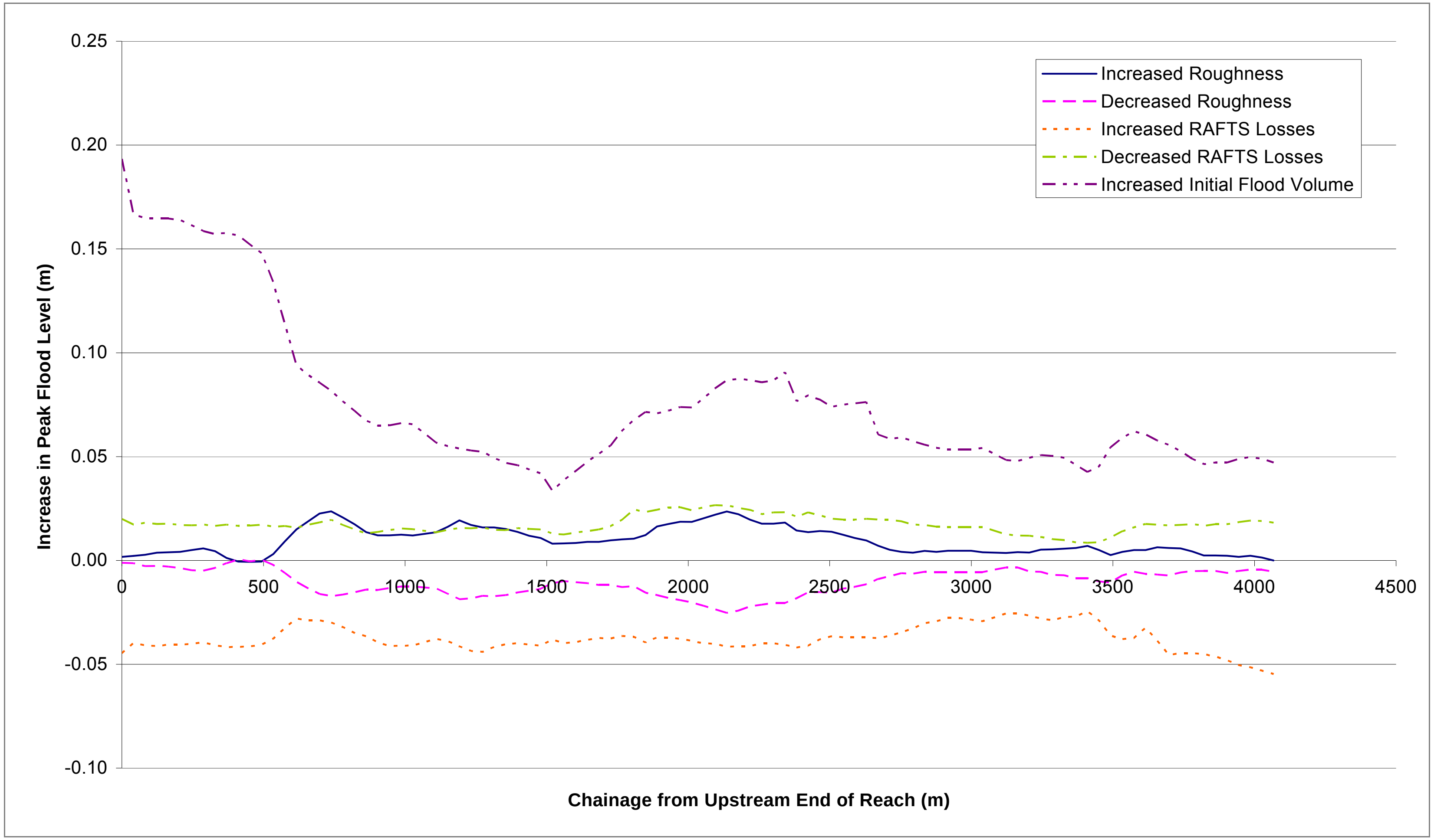
5.6.4.1 Sensitivity to Varied Catchment Roughness

The modelled flood levels are not sensitive to the adopted variations in the catchment roughness, with differences in levels of less than +/- 0.03m. This is attributed to the relatively minor variations in roughness, and also due to the majority of flows in the 100 year ARI event being conveyed in-channel (in the 1D domain), where the Manning's n was not varied. More significant differences in flood levels could be expected if the in-channel roughness was varied.

■ **Figure 5-23 Sensitivity analysis – difference in water level from base case - Orphan School Creek, Cowpasture Road to King Road**

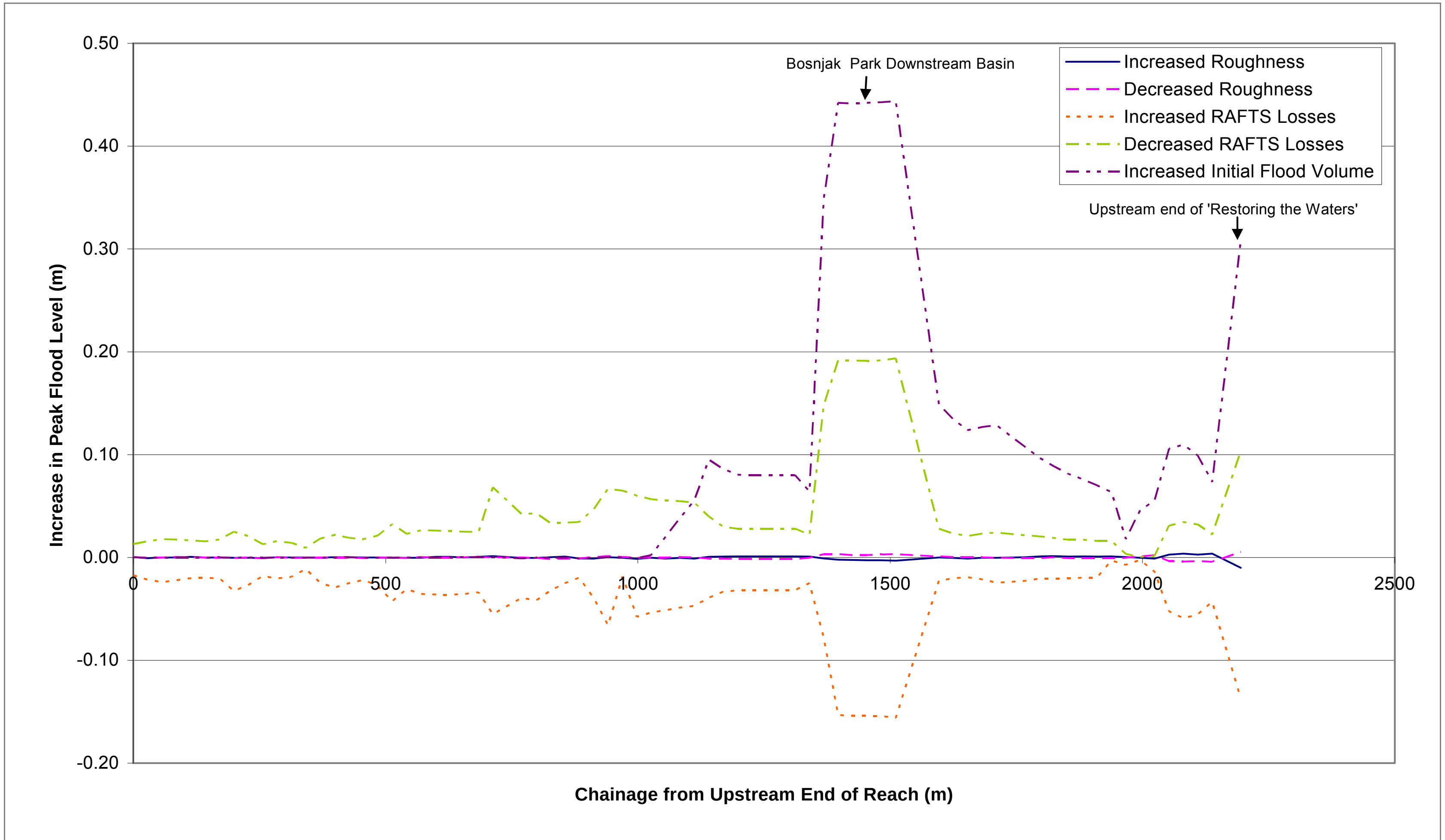


■ **Figure 5-24 Sensitivity analysis – difference in water level from base case - Orphan School Creek, King Road to Railway Parade**

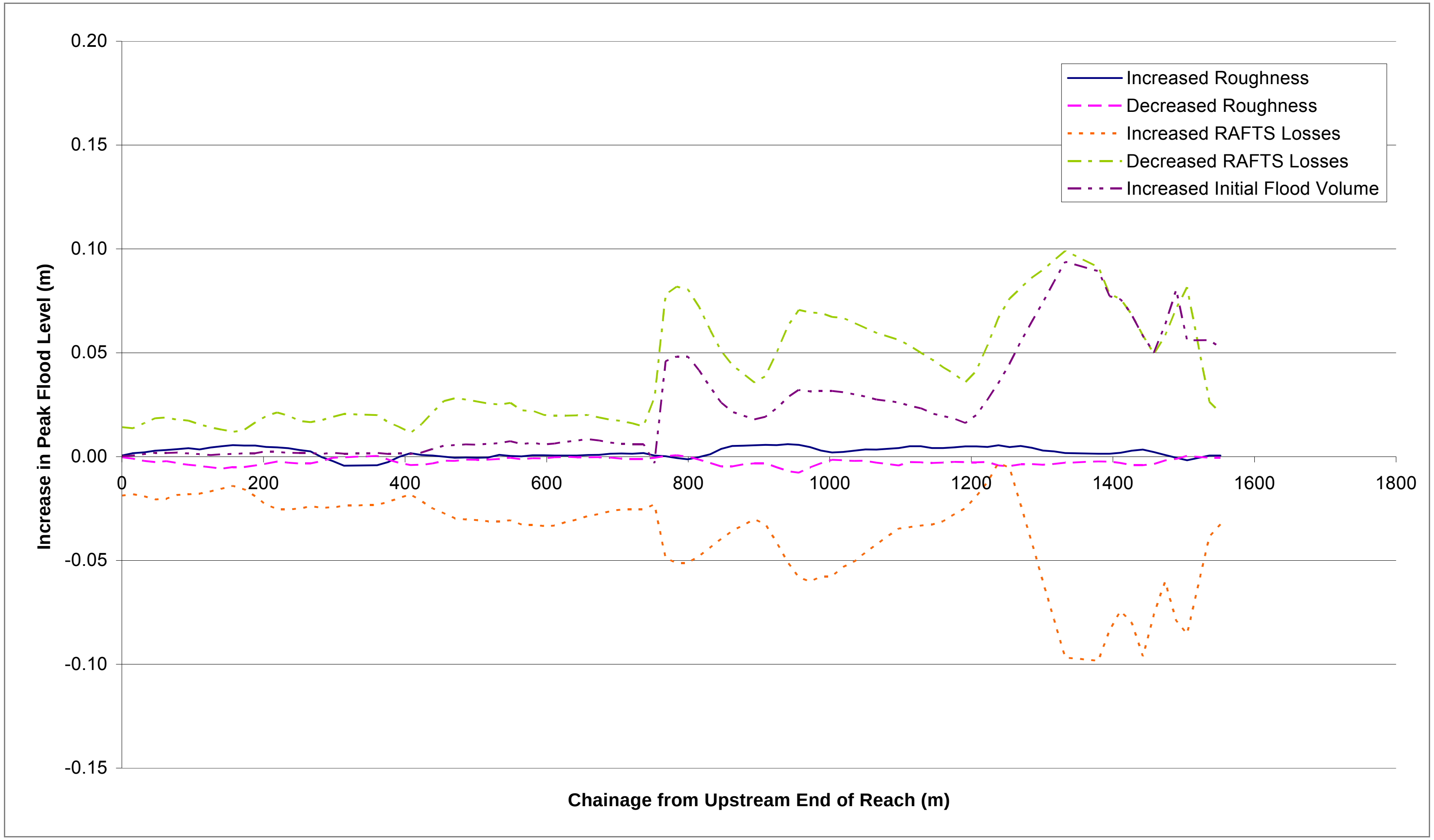


▪ **Figure 5-25 Sensitivity analysis – difference in water level from base case – Clear Paddock Creek, Wilson Creek and Main Branch, upstream of Simpson Road to King Road**

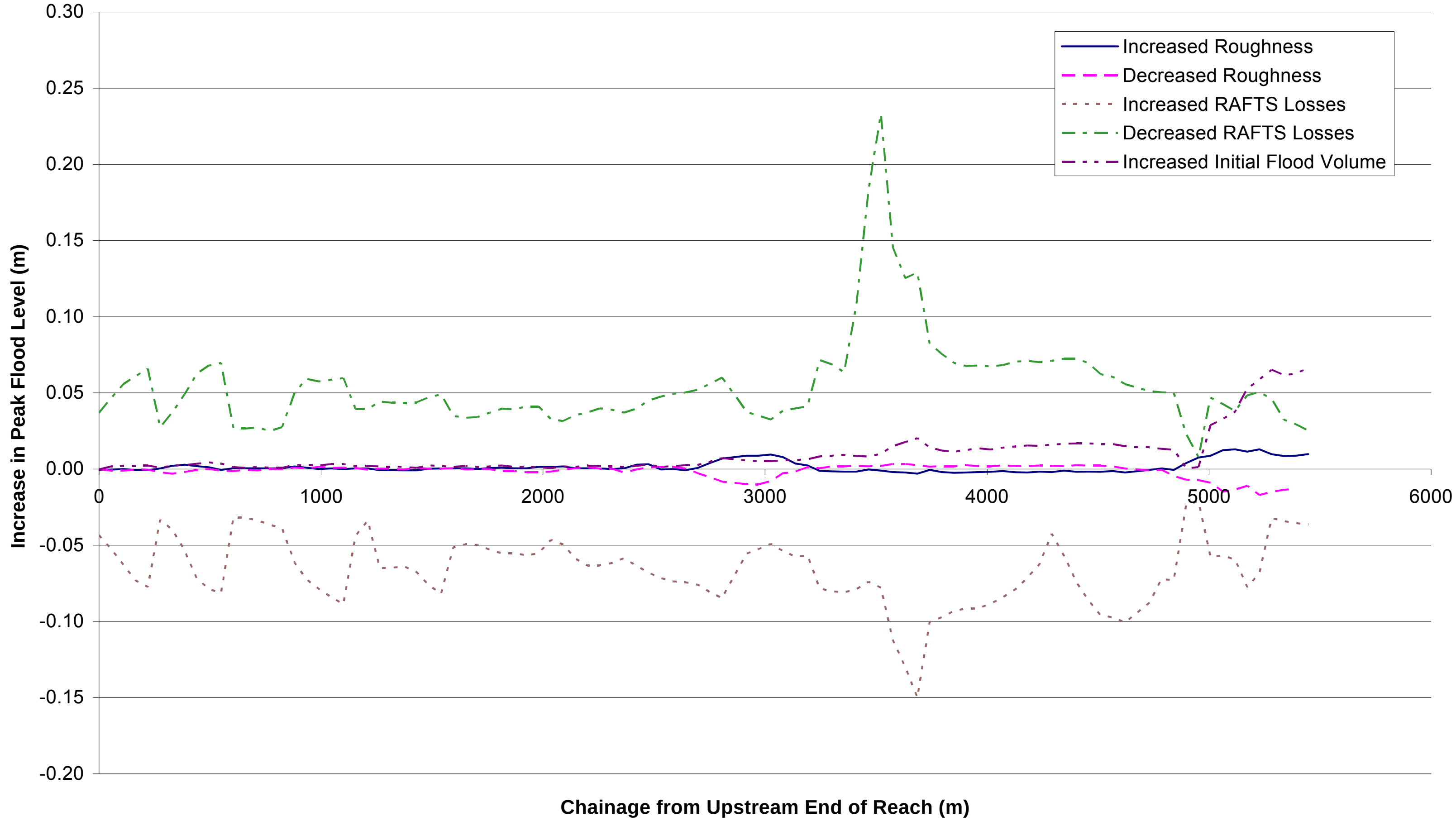
▪ Figure 5-26 Sensitivity analysis – difference in water level from base case – Clear Paddock Creek, Edensor Creek branch, Kalang Road to Restoring the Waters



■ **Figure 5-27 Sensitivity analysis – difference in water level from base case – Clear Paddock Creek, Henty Creek Branch, North Liverpool Road to Basin C**



- **Figure 5-28 Sensitivity analysis – difference in water level from base case – Green Valley Creek, North Liverpool Road to Orphan School Creek confluence**



5.6.4.2 Sensitivity to Varied Rainfall Losses

Flood levels in the upstream reaches of the TUFLOW model (upstream of Orphan School Creek/Green Valley Creek confluence) are relatively sensitive to the variation in rainfall losses in the XP-RAFTS model, and hence to the resulting change in inflow rates. Localised variations of up to +/- 0.25m (typically +/- 0.1 – 0.15m) in flood level result from the sensitivity analysis runs. These appear to coincide with the 1D inflow points in the TUFLOW model, since the XP-RAFTS inflow hydrographs were input into the model as point inflows rather than dispersed inflows. It is expected that the differences in flood levels would be less if the inflow hydrographs were represented as dispersed inflows.

Flood levels in the lower reaches of the model (downstream of Orphan School Creek/Green Valley Creek confluence) appear to be less sensitive to the variation in rainfall losses, with differences in flood levels of less than +/- 0.03m. This may be due to the greater cross section area in the downstream reaches resulting in greater storage in the model nodes and hence buffering the impact of the varying inflow rates on flood levels.

5.6.4.3 Sensitivity to Initial Basin Water Levels and Initial Flood Volume

The effect of the increased initial detention basin water levels and flood volume in the model varies throughout the model. In general, the increase in flood levels is less than 0.1m. However, there are a number of locations where the flood levels are particularly sensitive to the initial flood volume, including:

- Bonsjak Park downstream detention basin (Clear Paddock Creek, Edensor Road branch) – up to 0.44m increase in flood levels;
- Concrete channel and naturalised channel (Restoring the Waters) on Clear Paddock Creek (Main Branch) – up to 0.3m increase in flood levels;
- Lower reach of concrete channel on Orphan School Creek – up to 0.2m increase in flood levels; and
- Downstream reach of Orphan School Creek to 500m downstream of King Road.

The large increase in flood levels in Bosnjak Park Downstream Basin is due to the basin initially being relatively full prior to the 100 year ARI flood occurring in the model run.

The increased water levels at the latter three locations are likely to be caused by the increased discharge rates from the upstream detention basins at the early stages of the simulation, due to the elevated initial water levels in the basins. The basins are initially empty and there is initially no basin outflow during the base case runs.

6. Conclusions & Recommendations

6.1 Summary of Study Outcomes

The existing flooding conditions in the Three Tributaries Catchment were assessed utilising XP-RAFTS and TUFLOW computer modelling packages, using up-to-date topographic and survey data and design data on existing hydraulic structures, including bridges, culverts and detention basins. The models were calibrated using stream gauging data and high water marks from the 31 January 2001 flood event. Catchment flows and flood levels were subsequently estimated using the calibrated models for the 20, 50 and 100 year ARI and PMF events for a range of storm durations.

The 100 year ARI flood levels and discharges were compared to those from a number of previous studies undertaken in the catchment. Flood levels are generally considered comparable, with some differences attributed to changes to the creek conditions, such as upgraded hydraulic structures and implemented channel works, in addition to differences in modelling assumptions. The adopted flows are typically lower in the current study when compared to previous studies.

Review of the patterns of flood inundation for events up to and including the 100 year ARI event indicate that flooding in the middle to upper reaches of the system is generally confined to the channel and a narrow strip of the floodplain on either side of the creek, and may affect a number of properties adjacent to the creek. Flooding in the lower reaches of Orphan School Creek, between Railway Parade and the Green Valley Creek confluence, tends to break out onto the floodplain to a greater extent in events from the 20 year ARI event and upward. During the PMF, a corridor up to 1.4km wide becomes inundated by floodwaters.

Several roads are flood affected in events from the 20 year ARI up to the 100 year ARI events due to overtopping of bridge crossings or from flow breakouts, leading to flow along roads and through properties. All road crossings and numerous other roads on the floodplain, in addition to the Canley Vale – Fairfield Railway line, are affected by the PMF.

During the 100 year ARI event, flows break out onto the floodplain in several locations. Most significantly, flows overtop the detention basin walls at the Mimosa Road and Kalang Road Basins, causing flow along roads and through private properties.

The Interim Flood Risk Precinct Mapping indicates that the interim high flood risk areas in the middle and upper reaches of the system (upstream of the Orphan School Creek/Green Valley Creek confluence) are generally confined to the creek corridor and the detention basins. There are isolated areas of high flood risk on and adjacent to Smithfield Road and Edensor Road on Clear Paddock Creek. In the lower reach of Orphan School Creek, the high flood risk precinct includes areas outside the creek corridor, including some roads and properties. The interim high flood risk precinct reflects areas of excessively hazardous high flood depth or flow velocity, or a combination of both.

The interim medium and low flood risk precincts follow the same spatial extents as the 100 year ARI and PMF event flood inundation patterns, respectively.

A blockage analysis indicates that impacts on flood levels upstream of culvert blockages are generally less for blockages at basin outlets when compared to in-stream culvert blockages. The blockages would also cause or exacerbate flow breakout at a number of locations on each creek.

Sensitivity analysis indicates that flood levels are not sensitive to the adopted variations in Manning's n in the 2D domain; relatively sensitive to variations in rainfall losses and subsequent changes in inflows, particularly at model inflow points; and sensitive to changes in initial detention basin water levels at a number of locations.

6.2 Recommendations Based on Study Outcomes

- Using the flood modelling results produced by this study, FCC can identify those properties in the study area affected by flooding from the Three Tributaries and update the Section 149 Certificates for these properties.
- The findings and outcomes from this study can be used as a basis for development of management strategies in the subsequent Three Tributaries Floodplain Risk Management Study.
- As a part of the subsequent Floodplain Risk Management Study, the interim flood risk precincts should be adjusted to remove 'islands' in each precinct, upgrading each of these isolated areas to match the surrounding flood risk precinct, as per FCC's requirements. The adjusted flood risk in these locations would have implications on flood evacuation planning.
- To reduce the occurrence of flow breakouts and overland flooding, FCC should consider works at or in the vicinity of the Kalang Road Detention Basin and Mimosa Road Detention Basin to eliminate overtopping of the basin walls in the 100 year ARI flood event. In the case of Kalang Road Basin, several additional detention basins are proposed for the creek upstream of the basin, which is expected to reduce peak flows and reduce the discharge rates of the breakouts at the Kalang Road Basin. It is recommended that the design flows and water levels for the existing and proposed basins be verified against the current TUFLOW model results to ensure that the proposed basin designs are adequate, prior to construction of the proposed basins.

7. Glossary

Term	Description
Annual Exceedance Probability (AEP)	Term used to describe the chance of a flood of a given or larger size occurring in any one year, expressed as a percentage. Eg. a 1% AEP flood means there is a 1% (ie. one-in-100) chance of a flood of that size or larger occurring in any one year (see ARI).
Australian Height Datum (AHD)	A common national plain of level corresponding approximately to mean sea level. All flood levels, floor levels and ground levels are normally provided in metres AHD (m AHD)
Average Recurrence Interval (ARI)	The long-term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods with a discharge as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event.
catchment	A catchment is the area of land from which rainwater drains into a common point such as a reservoir, pond, lake, river or creek. In urban areas such as Fairfield, the majority of the rainwater is collected by gutters and pipes and then flows through stormwater drains into the stormwater system.
conveyance	A direct measure of the flow carrying capacity of a particular cross-section of a stream or stormwater channel. (For example, if the conveyance of a channel cross-section is reduced by half, then the flow carrying capacity of that channel cross-section will also be halved).
discharge	The rate of flow of water measured in terms of volume per unit time, eg. cubic metres per second (m^3/s). Also known as **flow**. Discharge is different from the speed/velocity of flow which is a measure of how fast the water is moving.
extreme flood	An estimate of the probable maximum flood, which is the largest flood likely to ever occur.
flood	A relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage as defined by the FDM before entering a watercourse.
flood awareness	An appreciation of the likely effects of flooding and a knowledge of the relevant flood warning and evacuation procedures.
flood hazard	The potential for damage to property or harm to persons during a flood or a situation with a potential to cause loss. In relation to this plan, the hazard is flooding which has the potential to cause harm or loss to the community. Flood hazard is a key tool used to determine flood severity and is used for assessing the suitability of future types of land use.
flood level	The height of the flood described as either a depth of water above a particular location (eg. 1m above floor level) or as a depth of water related to a standard level such as Australian Height Datum (eg. flood level is 5m AHD).
flood liable/flood prone land	Land susceptible to flooding up to the PMF. The term flood liable or flood prone land covers the entire floodplain.

Term	Description
floodplain	The area of land that is subject to inundation by floods up to and including the PMF event.
Floodplain Development Manual (FDM)	Refers to the document dated April 2005, published by the New South Wales Government and entitled "Floodplain Development Manual: the management of flood liable land".
Floodplain Risk Management Plan (FRMP)	A plan prepared for one or more floodplains in accordance with the requirements of the FDM or its predecessors.
Floodplain Risk Management Study (FRMS)	A study prepared for one or more floodplains in accordance with the requirements of the FDM or its predecessors.
flood risk	The chance of something happening that will have an impact. It is measured in terms of consequences and probability (likelihood). In the context of this plan, it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
flood risk precinct	An area of land with similar flood risks and where similar development controls may be applied by a Council to manage the flood risk. The flood risk is determined based on the existing development in the precinct or assuming the precinct is developed with normal residential uses. Usually the floodplain is categorised into three flood risk precincts 'low', 'medium' and 'high', although other classifications can sometimes be used. *High Flood Risk: T*his has been defined as the area of land below the 100 year ARI flood event that is either subject to a high hydraulic hazard or where there are significant evacuation difficulties. *Medium Flood Risk:* This has been defined as land below the 100 year ARI flood level that is not within a High Flood Risk Precinct. This is land that is not subject to a high hydraulic hazard or where there are no significant evacuation difficulties. *Low Flood Risk:* This has been defined as all land within the floodplain (i.e. within the extent of the probable maximum flood) but not identified within either a High Flood Risk or a Medium Flood Risk Precinct. The Low Flood Risk Precinct is that area above the 100 year ARI flood event.
flood study	A study that investigates flood behaviour, including identification of flood extents, flood levels and flood velocities for a range of flood events.
hydraulics	The study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity.
hydraulic hazard	The hazard as determined by the provisional criteria outlined in the FDM in a 100 year ARI flood event.
hydrology	The study of rainfall and runoff process; in particular, the evaluation of peak discharges, flow volumes and the derivation of hydrographs (graphs that show how the discharge or stage/flood level at any particular location varies with time during a flood).

Term	Description
local drainage	Term given to small scale inundation in urban areas outside the definition of major drainage as defined in the FDM. Local drainage problem invariably involve shallow depths (less than 0.3m) with generally little danger to personal safety.
local overland flooding	The inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
mainstream flooding	The inundation of normally dry land by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
overland flow path	The path that floodwaters can follow if they leave the confines of the main flow channel or pipe system. Overland flow paths can occur through private properties or along roads.
peak discharge	The maximum discharge or flow during a flood measured in cubic metres per second (m^3/s).
probable maximum flood (PMF)	The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation.
probable maximum precipitation (PMP)	The greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to the estimation of the probable maximum flood.
probability	A statistical measure of the expected chance of flooding (see ARI).
risk	See *flood risk.*
runoff	The amount of rainfall that ends up as flow in a stream. Also known as rainfall excess.
velocity	The term used to describe the speed of floodwaters, usually in metres per second (m/s).
water level	See *flood level.*
water surface profile	A graph showing the height of the flood (ie. water level or flood level) at any given location along a watercourse at a particular time.

8. References

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Appendix A FCC report on 30-31 January 2001 flood event

SERVICES COMMITTEE

61

Meeting Date: 6 March 2001 | Item Number: [#]

SUBJECT:

Storms of 30-31 January 2001

FILE NUMBER: G03-26-005

SUMMARY:

During the 24-hour period from 9 am on 30 January to 9am 31 January 2001, Fairfield was subjected to a storm that resulted in 161 mm of rainfall. This is the most significant storm event in the Fairfield area, since the floods of 1986 and 1988 and is classified as a minor flood. A table which compares the observed flood levels of 1986 and 1988 with this recent storm has been included as Attachment "A". Except for an isolated number of locations, this flood was not as severe as in 1986 and 1988. Preliminary examination of the flood levels indicate that this event was between a 1 in 10 year and 1 in 20-year Average Recurrence Interval storm.

The water level in all creeks in the Fairfield area was high with some localised flooding in certain areas that resulted in flood damage to residents properties. The damage would have been significantly worse if not for the flood mitigation works carried out by Council. This report details the flooding and flood damage on each creek and the investigation carried out by the Engineering Services Division in the aftermath of the flood.

REPORT BY: **N. DESILVA, SENIOR PROFESSIONAL ENGINEER CATCHMENT MANAGEMENT**

BACKGROUND

On the morning of 31 January 2001, Council officers from the Engineering Services Division visited the creeks, detention basins and other locations where construction works are currently being carried out, to document the flooding. Photos were taken and high water levels and debris marks were noted at bridges and channel banks. These marks will be levelled and documented as part of our historic flood database. This will serve as a useful resource in the future and help us to better predict flood levels in our creeks.

Council officers also visited the residents who live alongside the creeks and documented the flooding that occurred both internally and externally on their properties. These results will be passed on to the Department of Land and Water Conservation for use in their flood damages data base.

Upper Prospect Creek

The Upper Prospect Creek catchment extends from the Prospect Reservoir to the Fairfield railway crossing. A flood study was completed in September 1993 after the 1986 and 1988 floods. The study recommended that flood mitigation works be carried out to minimise the impact of flooding in the Upper Prospect Creek catchment. These included modifications to the Hassal Street and Rosford Street basins, stream clearing, and waterway improvements in the form of a by-pass floodway at Justin Street. This work is now complete.

Due to the flood mitigation work carried out on Upper Prospect Creek, a new flood study was commissioned last year to review the work carried out. This is almost complete. The new study will help refine flood levels in this creek and give us a better indication of flood levels through here.

Flood waters on Upper Prospect Creek broke the banks at several locations and some residents and small businesses experienced flooding above the floor levels of their houses and buildings. The creek overtopped the road crossings at Widemere Road and Fairfield Road but did not overtop at Gipps Road and the Cumberland Highway. However, the Cumberland Highway did experience flooding at Kenyons bridge due to local overland flow. The creek did not overtop the railway crossing.

The investigation has shown that in many residential areas, flooding was due to the stormwater pipes surcharging. As the floodwaters in the creeks rose, the stormwater pipes could not discharge into the creek and this resulted in water ponding in the adjacent streets till the floodwaters receded. At Ace Avenue the stormwater pipeline from the low point in the road to the creek was blocked, which did not allow stormwater from the road to drain to the creek.

The following table lists the properties adjacent to Upper Prospect Creek that were flood affected above floor level:

42 Ace Avenue	0.36m
44 Ace Avenue	0.40m
46 Ace Avenue	0.40m
48 Ace Avenue	0.25m
7 Cawarra Place	(1.59m above garage floor level)
19 Vineyard Avenue	0.15m (rumpus room)
303 The Horsley Drive	0.34m (commercial)
51 Justin Street	1 m from ground level (repair shed)
Little Street	1.8m above ground level at end of street

Lower Prospect Creek

Lower Prospect Creek extends from the Cabramatta-Granville railway line to the Georges River. Major flooding occurred along Lower Prospect Creek in August 1986 and April-May 1988. The 1986 flood caused a total damage of approximately $4.8 million on Prospect Creek. The 1986 and 1988 floods produced strong community pressures for measures to control flooding in the area.

A Floodplain Management Study was also carried out for the Lower Prospect Creek in 1990 and a number of strategies were proposed to improve the flooding problems here. The recommended works included a levee at Vincent Crescent, channel improvements and dredging on Orphan School Creek and Prospect Creek, widening of the channel of Prospect Creek, construction of a floodway at Fairfield Park, and improvements to Burns Creek, downstream of Normanby Street. The report also recommended that homes in Sandal Crescent be flood proofed and other flood affected properties were recommended for voluntary purchase and house raising. These works will reduce flood damage and were estimated to benefit 130 properties.

Most of the flood mitigation works recommended have now been completed and as a result of these works the flooding in Lower Prospect Creek was a lot less severe than might have been expected. Most of the residents adjacent to the creek were visited and the information gathered indicates than no internal flooding was experienced in this area. No major road crossings were overtopped although the creek did break its banks in places and residents did have flooded garages and grounds. Knight Street was cut off but residents were able to access Hollywood Drive, which had been raised some years ago to provide high level access out of the Lansvale peninsula.

The nets around the hammer throw rings at the Little Athletic Group grounds in the Makepeace Oval were damaged from the floods, mainly due to the fact that they are in a high level floodway. The damage was mostly due to debris getting caught in the nets. This blockage caused water to build up behind them which resulted in them being pushed over.

Orphan School Creek

Orphan School Creek extends from Cowpasture Road to its confluence with Prospect Creek just upstream of the Carramar railway line. There are two upstream detention basins on Orphan School Creek, both of which were working well. The Stockdale Reserve detention basin filled up to R.L. 54.63m AHD, approximately 1.2m below the spillway level. This basin just starts to spill during the 1-50 year ARI event. Construction of the Comin Place detention basin was completed just before the January flood. This proved to be quite fortunate for the residents in the area who would have experienced significant flooding if the basin had not been in place. The basin filled up to R.L. 66.5 m AHD, approximately 1m below the spillway level. The basin is expected to provide flood protection up to the 100-year ARI storm event. These upstream detention basins help to detain the flood waters and delay its release into Orphan School Creek.

We have not had any reported incidents of internal flooding on properties adjacent to Orphan School Creek, although some properties experienced external flooding to grounds and garages. The creek did not overtop any of the major bridge crossings.

Clear Paddock Creek

Clear Paddock Creek extends from just upstream of Elizabeth Drive to its confluence with Orphan School Creek. The most recent project on Clear Paddock Creek was "Restoring the Waters", where part of the concrete channel was converted to a natural stream. The project performed well during the recent storms and functioned according to design. A few properties experienced external flooding but no internal flooding was reported.

Green Valley Creek

Green Valley Creek extends from North Liverpool Road to its confluence with Orphan School Creek. Flood mitigation works to widen the waterway area have been completed for some years. No major problems were experienced along Green Valley Creek. A few properties experienced flooding of the grounds, but no internal flooding was reported.

Cabramatta Creek

Cabramatta Creek is the southern border of the local government area of Fairfield City Council. There was some flooding experienced along Cabramatta Creek but no major bridge crossings were overtopped. Our investigations indicate that no residents experienced internal flooding although a few properties are likely to have experienced external flooding. The most serious flooding along Cabramatta Creek was in the vicinity of the Cabramatta Leagues Club. They had a significant amount of flooding in their parking lot and some of their gym equipment, which was housed in the ground floor area of the building, was affected. We did not receive any calls from residents along Cabramatta Creek.

Burns Creek

Burns Creek is located in the eastern part of Fairfield City Council's local government area and flows into Prospect Creek just upstream of the Vine Street bridge. Engineering consultants were commissioned in 1993 to prepare flood mitigation options for Burns Creek. Several options were investigated and it was decided to construct a high level floodway at Hanson Street. In addition, channel improvement by means of stream clearing with some minor modifications to the creek alignment were also recommended. The improvements were intended to ensure that floor levels were above the 100-year flood elevation although the grounds outside might be flooded.

Most of the damage from the recent storm was to peoples backyards, fences and garages. One property on Malta Street and an industrial property had flooding above floor level. These properties are located very close to the creek. There was also some damage to residents' fences on Spring Street as they back on to Burns Creek.

The following table lists the properties adjacent to Burns Creek that were flood affected above floor level:

93-94 Malta (industrial workshop)	0.06 m
66 Malta	Internal flooding

CONCLUSION

As mentioned previously, preliminary examination of the flood levels indicate that this was between a 1 in 10 year and 1 in 20-year Average Recurrence Interval storm. This was the most severe storm event since the floods experienced in 1986 and 1988. The flooding that resulted from this storm was much less than it might have been due to the flood mitigation works carried out by Fairfield City Council. However, localised flooding was experienced in Ace Avenue and Malta Street and these areas are currently being investigated to determine the reason for the flooding.

During the next few weeks, all of the information resulting from this recent storm will be collated and analysed. This information will be an invaluable resource for future flood mitigation planning. It will also be forwarded to the Department of Land and Water Conservation (DLWC) for use in their flood damages data base and to the State Emergency Service (SES) for use in their emergency planning.

RECOMMENDATION:

1. That this report be received and noted.

SUPPORTING DOCUMENTS ATTACHED:

AT-A Flood levels of January 2001, 1986 and 1988 storm events.

N. DESILVA
SENIOR PROFESSIONAL ENGINEER CATCHMENT MANAGEMENT
27 February 2001

Catchment Management Co-ordinator 28/2/01
Manager Engineering Services

Services Committee - 6 March 2001

SECTION B

FN:C066NBAX.530 ****** END OF ITEM [#] ******

ATTACHMENT 'A' - Flood Levels of Jan 2001, 1986 and 1988 Storm Events

LOCALITY	Storm of 31/01/2001 (Levels to A.H.D)	1986 Flood	1988 Flood
GEORGES RIVER			
Fairlawn Cres, Lansvale	2.13	5.50	5.81
PROSPECT CREEK			
Day Street, Lansvale	3.62	5.06	5.72
Lansdowne Bridge, Lansvale	4.23	5.06	-
Sandal Cres, Carramar	5.02	6.08	6.24
Vine Street, Fairfield	6.44	7.29	6.86
The Horsley Drive, Fairfield	8.62	9.97	8.80
Polding Street North, Fairfield	12.18	12.55	11.93
Cumberland Hwy, Smithfield	17.77	18.75	18.72
CABRAMATTA CREEK			
Hume Hwy, Cabramatta	4.07	5.77	6.32
Sussex Street, Cabramata	5.81	5.96	6.66
Elizabeth Drive, Mt Pritchard	11.75	12.46	12.27
ORPHAN SCHOOL CREEK			
Railway Parade, Canley Vale	7.52	8.92	8.97
Sackville Street, Canley Vale	10.32	10.39	11.00
Cumberland Hwy, Canley Heights	14.15	14.68	14.15
King Road, Wakeley	18.17	19.64	-
Smithfield Road, Prairiewood	26.09	-	-
Stockdale Cres Reserve, Abbotsbury	54.60	-	-
GREEN VALLEY CREEK			
Avoca Road, Wakeley	18.51	18.91	-
Canley Vale Road, Wakeley	20.05	20.62	-
CLEAR PADDOCK CREEK			
Kembla Street, Wakeley	18.80	19.19	-
Canley Vale Road, St Johns Park	20.05	22.64	-
Brisbane Road, St Johns Park	28.89	28.54	-

Appendix B Rainfall Intensity-Frequency-Duration for Fairfield LGA

FAIRFIELD CITY COUNCIL

Rainfall Intensity (mm/hr) for Various Durations and Return Periods

Based on data for location 33.875 S 150.925 E (near Fairfield) issued April 1997 by Hydrometeorological Advisory Service (Melbourne). (C) Commonwealth of Australia, Bureau of Meteorology, 1987.

DURATION		RETURN PERIOD						
Min	Hrs	1 Year	2 Year	5 Year	10 Year	20 Year	50 Year	100 Year
5	0.083	82.47	105.54	133.59	149.43	170.89	198.58	219.37
6	0.100	77.14	98.63	125.09	140.05	160.24	186.25	205.89
7	0.117	72.78	93.02	118.04	132.20	151.25	175.79	194.38
8	0.133	69.11	88.30	112.05	125.48	143.54	166.80	184.44
9	0.150	65.94	84.25	106.85	119.64	136.82	158.97	175.76
10	0.167	63.16	80.69	102.28	114.49	130.91	152.06	168.11
11	0.183	60.69	77.53	98.22	109.92	125.65	145.92	161.30
12	0.200	58.47	74.70	94.58	105.81	120.92	140.41	155.19
13	0.217	56.46	72.13	91.28	102.10	116.66	135.43	149.66
14	0.233	54.63	69.79	88.27	98.72	112.77	130.90	144.64
15	0.250	52.95	67.64	85.52	95.62	109.22	126.76	140.04
16	0.267	51.40	65.66	82.99	92.77	105.95	122.95	135.82
17	0.283	49.96	63.83	80.64	90.14	102.93	119.43	131.92
18	0.300	48.63	62.13	78.46	87.69	100.12	116.17	128.31
19	0.317	47.38	60.54	76.44	85.42	97.52	113.14	124.95
20	0.333	46.22	59.05	74.54	83.29	95.08	110.30	121.81
21	0.350	45.12	57.65	72.76	81.29	92.80	107.65	118.88
22	0.367	44.09	56.33	71.09	79.42	90.65	105.16	116.12
23	0.383	43.12	55.09	69.51	77.65	88.64	102.82	113.53
24	0.400	42.20	53.91	68.02	75.99	86.73	100.60	111.09
25	0.417	41.32	52.80	66.61	74.41	84.93	98.51	108.78
26	0.433	40.50	51.74	65.27	72.92	83.23	96.53	106.59
27	0.450	39.71	50.74	64.00	71.50	81.61	94.65	104.51
28	0.467	38.96	49.78	62.80	70.15	80.06	92.87	102.54
29	0.483	38.25	48.87	61.64	68.86	78.60	91.16	100.66
30	0.500	37.56	48.00	60.55	67.63	77.20	89.54	98.87
31	0.517	36.91	47.16	59.50	66.46	75.86	87.99	97.16
32	0.533	36.28	46.37	58.49	65.34	74.58	86.51	95.52
33	0.550	35.69	45.60	57.53	64.26	73.36	85.09	93.96
34	0.567	35.11	44.87	56.60	63.23	72.18	83.73	92.46
35	0.583	34.56	44.16	55.72	62.25	71.06	82.43	91.02
36	0.600	34.03	43.48	54.86	61.30	69.98	81.17	89.64
37	0.617	33.51	42.83	54.04	60.38	68.93	79.97	88.31
38	0.633	33.02	42.20	53.25	59.50	67.93	78.81	87.03
39	0.650	32.55	41.59	52.49	58.65	66.97	77.69	85.80
40	0.667	32.09	41.01	51.76	57.83	66.04	76.61	84.61
41	0.683	31.64	40.44	51.05	57.05	65.14	75.57	83.46
42	0.700	31.22	39.90	50.36	56.28	64.27	74.57	82.36
43	0.717	30.80	39.37	49.70	55.55	63.43	73.60	81.29
44	0.733	30.40	38.86	49.06	54.83	62.62	72.66	80.25
45	0.750	30.01	38.36	48.44	54.14	61.83	71.75	79.25
46	0.767	29.64	37.88	47.84	53.47	61.07	70.87	78.28
47	0.783	29.27	37.42	47.26	52.83	60.34	70.02	77.34
48	0.800	28.92	36.97	46.69	52.20	59.62	69.19	76.43
49	0.817	28.58	36.53	46.15	51.59	58.93	68.39	75.55

DURATION		RETURN PERIOD						
Min	Hrs	1 Year	2 Year	5 Year	10 Year	20 Year	50 Year	100 Year
50	0.833	28.24	36.10	45.61	50.99	58.25	67.61	74.69
51	0.850	27.92	35.69	45.10	50.42	57.60	66.86	73.86
52	0.867	27.60	35.29	44.59	49.86	56.96	66.12	73.05
53	0.883	27.30	34.90	44.11	49.32	56.35	65.41	72.26
54	0.900	27.00	34.52	43.63	48.79	55.74	64.71	71.50
55	0.917	26.71	34.15	43.17	48.27	55.16	64.04	70.75
56	0.933	26.43	33.79	42.72	47.77	54.59	63.38	70.03
57	0.950	26.15	33.44	42.28	47.28	54.03	62.74	69.32
58	0.967	25.88	33.10	41.85	46.81	53.49	62.11	68.63
59	0.983	25.62	32.76	41.43	46.34	52.97	61.50	67.96
60	1.000	25.37	32.44	41.03	45.89	52.45	60.91	67.31
61	1.017	25.12	32.12	40.63	45.45	51.95	60.33	66.67
62	1.033	24.87	31.81	40.24	45.02	51.46	59.76	66.05
63	1.050	24.64	31.51	39.86	44.60	50.98	59.21	65.44
64	1.067	24.40	31.21	39.49	44.19	50.52	58.67	64.85
65	1.083	24.18	30.92	39.13	43.79	50.06	58.15	64.27
66	1.100	23.96	30.64	38.78	43.40	49.61	57.63	63.70
67	1.117	23.74	30.36	38.44	43.01	49.18	57.13	63.15
68	1.133	23.53	30.09	38.10	42.64	48.75	56.64	62.60
69	1.150	23.32	29.83	37.77	42.27	48.33	56.15	62.07
70	1.167	23.12	29.57	37.44	41.91	47.93	55.68	61.55
71	1.183	22.92	29.32	37.13	41.56	47.53	55.22	61.05
72	1.200	22.72	29.07	36.82	41.22	47.14	54.77	60.55
73	1.217	22.53	28.83	36.52	40.88	46.75	54.33	60.06
74	1.233	22.35	28.59	36.22	40.55	46.38	53.89	59.59
75	1.250	22.17	28.36	35.93	40.23	46.01	53.47	59.12
76	1.267	21.99	28.13	35.64	39.91	45.65	53.05	58.66
77	1.283	21.81	27.91	35.36	39.60	45.30	52.65	58.21
78	1.300	21.64	27.69	35.09	39.29	44.95	52.25	57.77
79	1.317	21.47	27.47	34.82	38.99	44.61	51.85	57.34
80	1.333	21.30	27.26	34.56	38.70	44.28	51.47	56.92
81	1.350	21.14	27.05	34.30	38.41	43.95	51.09	56.50
82	1.367	20.98	26.85	34.05	38.13	43.63	50.72	56.09
83	1.383	20.83	26.65	33.80	37.85	43.31	50.36	55.69
84	1.400	20.67	26.46	33.55	37.58	43.01	50.00	55.30
85	1.417	20.52	26.26	33.31	37.32	42.70	49.65	54.91
86	1.433	20.37	26.08	33.08	37.05	42.40	49.31	54.53
87	1.450	20.23	25.89	32.84	36.80	42.11	48.97	54.16
88	1.467	20.08	25.71	32.62	36.54	41.82	48.64	53.80
89	1.483	19.94	25.53	32.39	36.29	41.54	48.31	53.44
90	1.500	19.81	25.35	32.17	36.05	41.26	47.99	53.08
91	1.517	19.67	25.18	31.96	35.81	40.99	47.67	52.74
92	1.533	19.54	25.01	31.74	35.57	40.72	47.36	52.39
93	1.550	19.40	24.84	31.53	35.34	40.46	47.06	52.06
94	1.567	19.28	24.68	31.33	35.11	40.20	46.76	51.73
95	1.583	19.15	24.52	31.13	34.89	39.94	46.46	51.40
96	1.600	19.02	24.36	30.93	34.66	39.69	46.17	51.08
97	1.617	18.90	24.20	30.73	34.45	39.44	45.88	50.77
98	1.633	18.78	24.05	30.54	34.23	39.20	45.60	50.46
99	1.650	18.66	23.89	30.35	34.02	38.96	45.33	50.15
100	1.667	18.54	23.74	30.16	33.81	38.72	45.05	49.85
101	1.683	18.43	23.60	29.98	33.61	38.49	44.78	49.56

DURATION		RETURN PERIOD						
Min	Hrs	1 Year	2 Year	5 Year	10 Year	20 Year	50 Year	100 Year
102	1.700	18.31	23.45	29.80	33.41	38.26	44.52	49.26
103	1.717	18.20	23.31	29.62	33.21	38.03	44.26	48.98
104	1.733	18.09	23.17	29.44	33.01	37.81	44.00	48.69
105	1.750	17.98	23.03	29.27	32.82	37.59	43.75	48.42
106	1.767	17.87	22.89	29.10	32.63	37.38	43.50	48.14
107	1.783	17.77	22.76	28.93	32.44	37.16	43.25	47.87
108	1.800	17.67	22.63	28.76	32.26	36.95	43.01	47.60
109	1.817	17.56	22.50	28.60	32.08	36.75	42.77	47.34
110	1.833	17.46	22.37	28.44	31.90	36.54	42.54	47.08
111	1.850	17.36	22.24	28.28	31.72	36.34	42.31	46.83
112	1.867	17.26	22.12	28.13	31.55	36.14	42.08	46.58
113	1.883	17.17	21.99	27.97	31.38	35.95	41.85	46.33
114	1.900	17.07	21.87	27.82	31.21	35.76	41.63	46.08
115	1.917	16.98	21.75	27.67	31.04	35.57	41.41	45.84
116	1.933	16.88	21.63	27.52	30.88	35.38	41.19	45.60
117	1.950	16.79	21.52	27.37	30.71	35.19	40.98	45.37
118	1.967	16.70	21.40	27.23	30.55	35.01	40.77	45.14
119	1.983	16.61	21.29	27.09	30.39	34.83	40.56	44.91
120	2	16.52	21.18	26.95	30.24	34.65	40.36	44.68
150	2.5	14.33	18.38	23.44	26.34	30.22	35.23	39.04
180	3	12.74	16.35	20.91	23.51	27.00	31.51	34.94
210	3.5	11.53	14.81	18.97	21.36	24.54	28.67	31.81
240	4	10.57	13.59	17.44	19.65	22.59	26.42	29.32
270	4.5	9.79	12.60	16.19	18.25	21.00	24.59	27.30
300	5	9.14	11.77	15.15	17.09	19.68	23.05	25.61
360	6	8.12	10.47	13.50	15.26	17.59	20.63	22.94
420	7	7.34	9.48	12.26	13.87	16.00	18.80	20.91
480	8	6.73	8.70	11.28	12.77	14.75	17.35	19.31
540	9	6.24	8.07	10.48	11.88	13.73	16.17	18.01
600	10	5.83	7.54	9.81	11.14	12.89	15.19	16.92
660	11	5.48	7.09	9.25	10.51	12.17	14.36	16.01
720	12	5.18	6.71	8.76	9.97	11.55	13.64	15.21
780	13	4.92	6.37	8.34	9.49	11.01	13.01	14.52
840	14	4.69	6.08	7.97	9.08	10.53	12.46	13.91
900	15	4.48	5.81	7.63	8.71	10.11	11.97	13.37
960	16	4.30	5.58	7.34	8.37	9.73	11.53	12.88
1020	17	4.13	5.36	7.07	8.07	9.38	11.13	12.44
1080	18	3.98	5.17	6.82	7.80	9.07	10.76	12.04
1140	19	3.84	4.99	6.60	7.55	8.78	10.43	11.68
1200	20	3.71	4.83	6.39	7.32	8.52	10.13	11.34
1260	21	3.60	4.68	6.20	7.10	8.28	9.84	11.03
1320	22	3.49	4.54	6.02	6.90	8.05	9.58	10.74
1380	23	3.39	4.41	5.86	6.72	7.84	9.34	10.47
1440	24	3.29	4.28	5.70	6.55	7.65	9.11	10.22
1500	25	3.20	4.17	5.56	6.39	7.46	8.90	9.98
1560	26	3.12	4.06	5.43	6.24	7.29	8.69	9.76
1620	27	3.04	3.96	5.30	6.09	7.13	8.50	9.55
1680	28	2.97	3.87	5.18	5.96	6.97	8.33	9.35
1740	29	2.90	3.78	5.06	5.83	6.83	8.16	9.16
1800	30	2.83	3.69	4.96	5.71	6.69	8.00	8.99
1860	31	2.77	3.61	4.85	5.59	6.56	7.84	8.82
1920	32	2.71	3.54	4.76	5.48	6.43	7.70	8.65

DURATION		RETURN PERIOD						
Min	Hrs	1 Year	2 Year	5 Year	10 Year	20 Year	50 Year	100 Year
1980	33	2.66	3.46	4.66	5.38	6.31	7.56	8.50
2040	34	2.60	3.39	4.57	5.28	6.20	7.42	8.35
2100	35	2.55	3.33	4.49	5.19	6.09	7.30	8.21
2160	36	2.50	3.26	4.41	5.09	5.98	7.17	8.08
2220	37	2.45	3.20	4.33	5.01	5.88	7.06	7.95
2280	38	2.41	3.14	4.25	4.92	5.79	6.94	7.82
2340	39	2.36	3.09	4.18	4.84	5.69	6.84	7.70
2400	40	2.32	3.03	4.11	4.76	5.60	6.73	7.59
2460	41	2.28	2.98	4.05	4.69	5.52	6.63	7.48
2520	42	2.24	2.93	3.98	4.61	5.43	6.53	7.37
2580	43	2.20	2.88	3.92	4.54	5.35	6.44	7.26
2640	44	2.17	2.84	3.86	4.48	5.28	6.35	7.16
2700	45	2.13	2.79	3.80	4.41	5.20	6.26	7.07
2760	46	2.10	2.75	3.75	4.35	5.13	6.17	6.97
2820	47	2.07	2.71	3.69	4.29	5.06	6.09	6.88
2880	48	2.03	2.66	3.64	4.23	4.99	6.01	6.79
2940	49	2.00	2.63	3.59	4.17	4.92	5.93	6.70
3000	50	1.97	2.59	3.54	4.11	4.86	5.86	6.62
3060	51	1.94	2.55	3.49	4.06	4.79	5.78	6.54
3120	52	1.92	2.51	3.44	4.00	4.73	5.71	6.46
3180	53	1.89	2.48	3.40	3.95	4.67	5.64	6.38
3240	54	1.86	2.44	3.35	3.90	4.61	5.57	6.30
3300	55	1.84	2.41	3.31	3.85	4.56	5.51	6.23
3360	56	1.81	2.38	3.27	3.80	4.50	5.44	6.16
3420	57	1.79	2.35	3.23	3.76	4.45	5.38	6.09
3480	58	1.76	2.32	3.19	3.71	4.40	5.32	6.02
3540	59	1.74	2.29	3.15	3.67	4.34	5.26	5.95
3600	60	1.72	2.26	3.11	3.62	4.29	5.20	5.89
3660	61	1.69	2.23	3.07	3.58	4.25	5.14	5.82
3720	62	1.67	2.20	3.04	3.54	4.20	5.08	5.76
3780	63	1.65	2.18	3.00	3.50	4.15	5.03	5.70
3840	64	1.63	2.15	2.97	3.46	4.11	4.97	5.64
3900	65	1.61	2.12	2.93	3.42	4.06	4.92	5.58
3960	66	1.59	2.10	2.90	3.38	4.02	4.87	5.52
4020	67	1.57	2.07	2.87	3.35	3.97	4.82	5.47
4080	68	1.55	2.05	2.84	3.31	3.93	4.77	5.41
4140	69	1.53	2.03	2.80	3.28	3.89	4.72	5.36
4200	70	1.52	2.00	2.77	3.24	3.85	4.67	5.30
4260	71	1.50	1.98	2.74	3.21	3.81	4.63	5.25
4320	72	1.48	1.96	2.71	3.17	3.77	4.58	5.20

Appendix C Hydrologic Modelling Data

- **Table C-1 XP-RAFTS sub-catchment data**

Sub-Catchment Name	Total Area (ha)	Impervious %	Slope %	Mannings n Impervious	Mannings n Pervious
2.00	201.929	45	1.23	0.02	0.025
2.01	86.344	27	1.00	0.02	0.04
2.01A	18.939	27	0.68	0.02	0.025
2.01B	84.261	53	1.32	0.02	0.025
2.01C	23.216	40	0.70	0.02	0.025
2.01D	15.933	42	0.70	0.02	0.025
2.01E	59.267	43	1.06	0.02	0.025
2.01F	11.714	27	0.9	0.02	0.025
2.02	153.973	46	0.69	0.02	0.025
2.02A	17.517	39	0.72	0.02	0.025
2.02B	22.566	49	0.67	0.02	0.025
2.02C	11.865	51	2.91	0.02	0.025
2.03	37.749	35	1.73	0.02	0.025
2.03A	3.786	16	0.46	0.02	0.025
2.03B	21.151	33	0.29	0.02	0.025
2.03C	134.707	43	0.61	0.02	0.025
2.04	20.614	43	1.17	0.02	0.025
2.04A	7.609	24	0.79	0.02	0.025
2.04B	334.183	48	0.79	0.02	0.025
2.04C	19.263	45	1.15	0.02	0.025
2.04D	50.847	37	1.17	0.02	0.025
2.05	110.092	38	0.44	0.02	0.025
2.05A	32.563	31	0.36	0.02	0.025
2.05B	11.068	47	0.38	0.02	0.025
2.06	231.818	46	0.74	0.02	0.025
2.07	41.800	15	0.46	0.02	0.025
3.00	194.052	29	2.05	0.02	0.05
3.01	67.098	44	1.13	0.02	0.025
3.01A	88.866	48	1.96	0.02	0.025
3.01B	46.899	50	1.82	0.02	0.025
3.01C	30.467	51	1.79	0.02	0.025
3.01D	4.620	58	3.52	0.02	0.025
3.01E	20.115	53	1.76	0.02	0.025

- **Table C-1 XP-RAFTS sub-catchment data (con't)**

Sub-Catchment Name	Total Area (ha)	Impervious %	Slope %	Mannings n Impervious	Mannings n Pervious
3.01F	51.741	4	3.33	0.02	0.07
4.00	34.342	39	1.73	0.02	0.025
4.00A	23.255	34	2.42	0.02	0.025
4.00B	29.594	38	2.04	0.02	0.025
4.00C	54.395	41	1.46	0.02	0.025
4.00D	31.436	47	2.02	0.02	0.025
4.01	17.402	45	3.47	0.02	0.025
4.01A	7.836	41	2.54	0.02	0.025
4.01B	10.411	38	4.49	0.02	0.025
4.01C	75.026	44	2.99	0.02	0.025
4.01D	15.029	37	3.39	0.02	0.025
4.01E	41.549	41	1.54	0.02	0.025
4.01F	19.346	46	3.34	0.02	0.025
4.02	6.073	57	3.57	0.02	0.025
4.02A	4.424	32	3.14	0.02	0.025
4.03	32.682	50	1.5	0.02	0.025
4.03A	40.171	39	2.12	0.02	0.025
4.04	39.864	43	2.00	0.02	0.025
4.04A	17.894	41	3.38	0.02	0.025
4.05	3.271	28	3.92	0.02	0.025
4.05A	8.650	35	4.00	0.02	0.025
4.05B	29.492	43	3.13	0.02	0.025
4.06	33.143	39	1.51	0.02	0.025
4.06A	14.776	42	1.88	0.02	0.025
4.06B	11.627	38	2.51	0.02	0.025
4.07	38.293	50	0.97	0.02	0.025
4.07A	20.771	35	0.54	0.02	0.025
4.07B	165.858	39	0.87	0.02	0.025
4.07C	51.833	43	0.69	0.02	0.025
4.07D	6.472	16	1.50	0.02	0.025
5.00	208.583	40	1.02	0.02	0.025
5.01	22.997	35	2.22	0.02	0.025
5.01A	12.204	40	1.54	0.02	0.025

- **Table C-1 XP-RAFTS sub-catchment data (con't)**

Sub-Catchment Name	Total Area (ha)	Impervious %	Slope %	Mannings n Impervious	Mannings n Pervious
5.01B	29.270	39	1.62	0.02	0.025
5.02	74.535	41	1.31	0.02	0.025
5.02A	13.639	29	0.91	0.02	0.025
5.02B	11.220	47	0.77	0.02	0.025
5.02C	14.831	47	1.46	0.02	0.025
5.02D	21.377	34	1.47	0.02	0.025
5.02E	4.762	43	2.18	0.02	0.025
5.02F	43.378	33	1.56	0.02	0.025
5.02G	22.924	37	2.10	0.02	0.025
5.02H	21.855	46	1.85	0.02	0.025
5.02I	26.577	52	1.71	0.02	0.025
5.02J	21.215	36	1.18	0.02	0.025
5.02K	56.502	45	1.78	0.02	0.025
5.02L	3.041	7	1.81	0.02	0.025
5.03	21.500	37	1.17	0.02	0.025
5.03A	26.817	44	1.75	0.02	0.025
5.03B	18.302	43	0.69	0.02	0.025
5.03C	53.351	39	1.22	0.02	0.025
5.03D	6.435	35	0.87	0.02	0.025
5.03E	4.559	45	2.44	0.02	0.025
5.03F	10.599	41	0.82	0.02	0.025
5.03G	16.118	47	1.16	0.02	0.025
Total Area	**3920.1**				

Appendix D Hydraulic Modelling Results

Table D-1 Peak Water Level at Selected Locations

Location*	20 year ARI Event	50 year ARI Event	100 year ARI Event	PMF Event
Orphan School Creek				
OSC Railway Parade	8.06	8.25	8.46	11.58
OSC Sackville Street	10.35	10.53	10.64	12.69
OSC Sackville Gauge	10.66	10.89	11.02	13.10
100m D/S of OSC GVC confluence	12.11	12.31	12.45	14.69
OSC Cumberland Highway	14.27	14.47	14.63	18.05
OSC King Road U/S face	18.33	18.59	18.75	21.75
OSC King Road D/S face	18.06	18.28	18.43	20.91
OSC Bulls Road	21.63	21.73	21.83	24.26
OSC Fairfield GC	26.87	27.01	27.17	28.09
OSC Christie Street	28.52	28.58	28.65	29.57
OSC Moonlight Rd	29.34	29.42	29.61	31.79
OSC Canley Vale Rd Tway	31.10	31.25	31.56	34.67
OSC Mimosa Road	39.19	39.46	39.56	40.66
OSC Sweethaven Road	40.01	40.30	40.46	42.80
OSC Belfield Road	45.34	45.60	45.85	48.49
Clear Paddock Creek				
CPC Kembla Street	18.78	18.96	19.08	22.44
CPC Canley Vale Road	22.42	22.51	22.59	25.78
CPC Canberra Street	24.37	24.46	24.54	27.53
CPC Brisbane Road	27.95	28.02	28.16	31.28
CPC Edensor Ck Edensor Road	35.42	35.48	35.56	36.39
CPC Edensor Ck Sweethaven Road	35.70	35.78	35.90	37.55
CPC Edensor Ck Bosnjak U/S basin	42.78	43.11	43.23	43.94
CPC Edensor Ck Bosnjak D/S basin	37.72	37.75	37.81	39.17
CPC Edensor Ck Swan Street	48.33	48.44	48.53	50.13
CPC D/S Basin C	34.73	35.62	35.74	37.31
CPC Basin C	38.70	38.96	39.04	39.90
CPC Kalang Road Basin	43.06	43.15	43.21	44.19
CPC Wilson Ck Elizabeth Drive	45.56	45.92	46.07	47.04
CPC Henty Ck Elizabeth Drive	40.20	40.70	40.84	43.22
CPC Henty Ck Brown Road	46.21	46.26	46.30	47.18
CPC Wilson Ck Simpson Road	49.37	49.37	49.43	50.43
CPC Henty Ck Tway	49.17	49.27	49.30	50.09

* Water levels at road crossing locations reported for upstream face, unless stated otherwise.

Table D-1 Peak Water Level at Selected Locations (con't)

Location*	20 year ARI Event	50 year ARI Event	100 year ARI Event	PMF Event
Green Valley Creek				
GVC Cumberland Highway	14.56	14.79	14.98	17.65
GVC Harden Street footbridge	16.39	16.61	16.76	18.97
GVC Avoca Road	18.94	19.18	19.45	21.61
GVC Canley Vale Road	20.32	20.47	20.60	22.96
GVC D/S Chisholm Park	21.24	21.41	21.55	23.43
GVC U/S Chisholm Park	23.90	24.00	24.08	25.09
GVC St Johns Road	24.17	24.32	24.48	25.86
GVC Edensor Road	29.24	29.35	29.43	30.79
GVC Cabramatta Road	31.85	32.00	32.14	33.68
GVC Humphries Road	34.03	34.18	34.32	35.76
GVC Elizabeth Drive	36.16	36.24	36.30	38.04
GVC D/S Lalich Reserve	37.93	38.06	38.19	39.76
GVC U/S Lalich Reserve	40.01	40.13	40.28	41.76

* Water levels at road crossing locations reported for upstream face, unless stated otherwise.

Table D-2 Peak Flow and Critical Storm Duration[1]

Location	20 year ARI event		50 year ARI event		100 year ARI event		PMF Event	
	Peak Flow (m^3/s)	Critical Storm Duration	Peak Flow (m^3/s)	Critical Storm Duration	Peak Flow (m^3/s)	Critical Storm Duration	Peak Flow (m^3/s)	Critical Storm Duration
Orphan School Creek								
OSC Railway Pde	229	9 hr	255	9 hr	281	9 hr	1983	2 hr
OSC Sackville St	211	9 hr	232	9 hr	255	9 hr	1928	2 hr
OSC U/S Sackville	207	9 hr	232	9 hr	256	9 hr	1966	2 hr
OSC D/S GVC Confluence	214	9 hr	242	9 hr	267	9 hr	2039	2 hr
OSC Cumberland Hwy[2]	227	9 hr	255	9 hr	277	9 hr	-	-
Cumberland Hwy[2]	-	-	-	-	-	-	2306	2 hr
OSC D/S CPC Confluence	127	9 hr	143	9 hr	154	9 hr	1452	2 hr
OSC D/S of King Rd	128	9 hr	144	9 hr	155	9 hr	1496	2 hr
OSC U/S King Rd Basin	59	9 hr	65	9 hr	72	9 hr	709	2 hr
OSC Bulls Rd	57	9 hr	63	9 hr	71	9 hr	636	2 hr
OSC_Smithfield Rd	57	9 hr	63	9 hr	71	9 hr	771	2 hr
Fairfield Golf Course	62	2 hr	68	2 hr	82	2 hr	521	2 hr
OSC Christie St	32	25 min	35	25 min	39	25 min	171	2 hr
OSC Moonlight Rd	67	6 hr	74	9 hr	89	9 hr	607	2 hr
OSC Canley Vale Rd Tway	66	9 hr	75	9 hr	93	9 hr	696	2 hr
OSC Mimosa Rd	28	9 hr	35	9 hr	43	9 hr	427	2 hr
OSC U/S Mimosa Rd Basin	37	30 min	45	2 hr	53	2 hr	356	2 hr
OSC Sweethaven Rd	42	2 hr	46	30 min	51	30 min	366	2 hr
OSC Belfield Rd	75	2 hr	83	30 min	93	30 min	356	2 hr
OSC Bossley Park High	37	25 min	39	25 min	43	25 min	228	2 hr
Clear Paddock Creek								
CPC Kembla St	55	12 hr	61	12 hr	67	12 hr	695	2 hr
CPC Canley Vale Rd	56	12 hr	62	12 hr	68	12 hr	727	2 hr
CPC Canberra St	52	9 hr	57	6 hr	63	12 hr	682	2 hr
CPC Brisbane Rd	38	9 hr	41	6 hr	51	6 hr	641	2 hr
CPC Edensor Rd	35	6 hr	45	6 hr	67	2 hr	1199	2 hr
Edensor Ck Sweethaven Rd	6	12 hr	7	2 hr	8	2 hr	163	2 hr
Edensor Ck D/S Bosnjak Park	6	12 hr	7	90 min	8	2 hr	167	2 hr
Edensor Ck U/S Bosnjak Park	14	2 hr	16	2 hr	18	2 hr	127	2 hr
Edensor Ck Swan St	4	2 hr	4	2 hr	5	2 hr	67	2 hr
CPC D/S Basin C	27	6 hr	36	2 hr	70	6 hr	505	2 hr
CPC U/S Basin C	37	2 hr	44	2 hr	53	2 hr	499	2 hr
Wilson Ck Kalang Rd	4	2 hr	8	2 hr	12	2 hr	247	2 hr
Wilson Ck Elizabeth Dr	20	2 hr	22	2 hr	29	2 hr	238	2 hr
Wilson Ck Simpson Rd	21	25 min	21	25 min	26	2 hr	111	2 hr
Henty Ck Elizabeth Dr	21	2 hr	27	2 hr	29	25 min	373	2 hr
Henty Ck Brown Rd	17	2 hr	20	2 hr	24	2 hr	161	2 hr
Henty Ck Tway	6	25 min	6	2 hr	7	2 hr	29	2 hr

Table D-2 Peak Flow and Critical Storm Duration (con't)[1]

Location	20 year ARI event		50 year ARI event		100 year ARI event		PMF Event	
	Peak Flow (m^3/s)	Critical Storm Duration	Peak Flow (m^3/s)	Critical Storm Duration	Peak Flow (m^3/s)	Critical Storm Duration	Peak Flow (m^3/s)	Critical Storm Duration
Green Valley Creek								
GVC Cumberland Hwy[2]	67	2 hr	80	2 hr	91	2 hr	-	-
GVC Harden St footbridge	64	2 hr	76	2 hr	86	2 hr	516	2 hr
GVC Avoca Rd	60	2 hr	71	2 hr	80	2 hr	511	2 hr
GVC Canley Vale Rd	58	2 hr	68	2 hr	78	2 hr	479	2 hr
GVC St Johns Rd	54	2 hr	62	2 hr	69	2 hr	424	2 hr
GVC Edensor Rd	46	60 min	52	60 min	57	60 min	412	2 hr
GVC Cabramatta Rd	41	2 hr	46	30 min	51	2 hr	396	2 hr
GVC Humphries Rd	38	2 hr	43	30 min	48	2 hr	399	2 hr
GVC Elizabeth Dr	36	2 hr	41	30 min	45	2 hr	414	2 hr
GVC D/S Lalich Reserve	32	25 min	35	25 min	38	25 min	322	2 hr
GVC Lalich Reserve	33	30 min	36	30 min	39	30 min	292	2 hr

1 Peak flow estimates presented above were derived from TUFLOW model 1D and 2D flow results at each location for each ARI /duration storm event. The critical storm duration at each location was then determined for each ARI event by comparing the peak flows over the range of storm durations.

2 During the PMF, the extent of inundation is continuous across both Orphan School Creek and Green Valley Creek floodplains at this location. Combined Orphan School Creek/Green Valley Creek flows are reported for PMF only. Flows on Green Valley Creek and Orphan School Creek are reported as un-combined flows for the 20, 50 and 100 year ARI flood events.