BASIN 6, HOXTON PARK
BASIN PERFORMANCE & CHANNEL OPTIONS REPORT

Prepared for:

MIRVAC / HPAL FREEHOLD PTY LTD

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- DOCUMENT CONTROL SHEET -

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B	First Issue	DG (22-02-10)	PM (22-02-10)	PM (22-02-10)
C	References to Table 6.3 & Volumes made consistent.	DG (22-02-10)	PM (22-02-10)	PM (22-02-10)
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1 INTRODUCTION

This report details the procedures used and presents the results of an analysis of the hydraulic operation of the proposed regional stormwater detention basin, known as Basin 6, to be constructed adjacent to the M7 Motorway at the site of the former Hoxton Park Aerodrome.

The former Hoxton Park Aerodrome site was acquired by HPAL Freehold in May 2004 for rezoning to Industrial, Mixed Use Retail, Residential and Public Recreation areas. At this time the site was partially impacted by Basin 6, which is part of Liverpool City Council's detention basin strategy for the Cabramatta Creek catchment, developed in the 1980's. The original Basin 6 concept design developed by Kinhill (1992) needed to be revisited after the M7 Motorway bisected the proposed footprint.

In 2007 Liverpool City Council commissioned Bewsher Consulting to review the Basin 6 concept design, given the impact of the M7 Motorway on the Kinhill design and other changes that had occurred within the catchment. The revised design by Bewsher Consulting resulted in a significant loss of developable land from the design that had been previously proposed by Kinhill.

J Wyndham Prince were engaged in August 2007 to consider alternative arrangements for Basin 6 which are consistent with Liverpool City Council's Floodplain Management Strategy for Cabramatta Creek, but which reduce the affectation upon the Hoxton Park Aerodrome site.

As outlined above, significant hydrologic modelling has been undertaken over the past 20 to 30 years and most recently by Bewsher Consulting Pty Ltd, to determine required detention basin volumes and peak discharges necessary to minimise flooding within the catchment.

The basin and the outlet configuration have been designed to comply with the performance targets outlined in the recent review of the Cabramatta Creek Basin Strategy undertaken by Bewsher Consulting Pty Ltd (Reference 1).

The Basin 6 design also needed to consider the impact on a proposed road (the extension of Middleton Drive, referred to in this report as the link road) linking the Middleton Grange development to the west of the M7 and the Hoxton Park Aerodrome redevelopment site to the east of the M7. Liverpool Council generally require all roads to be flood free in all storm events up to and including the 100 year ARI event.

Accordingly, two possible options were considered for the provision of flood mitigation and traffic safety protection works adjacent to the proposed link road within the M7 corridor to render it flood free in the 100 year ARI flood for both the current and formerly proposed Basin 6 configurations. The options considered were:

1. Provide a flood wall adjacent to the link road. Due to the restricted space between the M7 bridge pylons and subsequently the proximity of the link road to these, it would be necessary to provide a safety barrier adjacent to the road regardless of the flooding issues.

2. Excavate the channel significantly to lower the 100 year ARI flood level.

The merits and constraints for each of these options were considered and are discussed in detail in Section 4.

This report has been prepared to support a Part 3A and rezoning application to define the extent of land required for Basin 6 and the remaining adjacent land for industrial and residential purposes, as well as either a Part 3A or development application for construction of the basin.

The purpose of the investigation and report is to:

- Describe the general arrangements, configuration and design features of Basin 6.
- Modify the XP-Rafts hydrologic model prepared previously for the Middleton Grange development to include Basin 6 and the additional catchments draining to it.
- Provide details on the hydraulic operation of the basin outlet which has been sized to restrict 100 year ARI post development stormwater discharges to the target levels nominated in the Review of Cabramatta Creek Basin Strategy Report (Reference 1).
- Prepare a HEC-RAS hydraulic model of the channel under the M7 Motorway to determine existing case 20 and 100 year ARI flood levels.
- Modify the HEC-RAS model to represent proposed channel modification works required to maintain 100 year ARI flood levels less than the proposed adjacent road or determine additional works required to maintain 100 year ARI flood free access.
- Provide concept design plans of the proposed basin and channel modification works, suitable to support a development application.

This report should be read in conjunction with the engineering concept design plans prepared by J. Wyndham Prince (Ref: 8240SK19-22), which are included in Attachment A.

2 PREVIOUS REPORTS / STUDIES

Two previous reports, which relate to the management of stormwater for Basin 6 and adjacent sites, have been prepared and are detailed as follows;

- *Bewsher Consulting Pty Ltd (2007) – Cabramatta Creek Basin Strategy, Basin 6 Review, Final Report* (Reference 1)

  This report reviews the work undertaken previously in developing Liverpool Council's Cabramatta Creek Basin Strategy and, more specifically, the previously proposed Detention Basin 6. The report analyses works that have been undertaken since the original concept was developed that have required reconfiguration of the basin and a reduction in the storage volume. The report also nominates the permissible peak discharge to be achieved from the basin.

- *J. Wyndham Prince Pty. Ltd. (2005) – Water Cycle Management Facilities Design Report – Middleton Grange* (Reference 2)

  This report details the procedures used and presents the results of an assessment of a hydrological and hydraulic analysis of the proposed detention basins within the proposed adjacent development of Middleton Grange.

- *J. Wyndham Prince Pty. Ltd. (2008) – Hydraulic Performance Report – Proposed Rehabilitation Works – Northern Creek, Middleton Grange* (Reference 3)

  This report outlined the background of the existing site and the design elements to be used to rehabilitate the watercourse and presents the results of investigations to integrate with and support the Construction Certificate for the proposed watercourse rehabilitation of Northern Creek, Middleton Grange.

3 THE PROPOSED DEVELOPMENT

3.1 The Site

The site of Basin 6 is located adjacent to the Hoxton Park Aerodrome and consists mainly of grasslands with some small stands of trees. The aerodrome has been decommissioned and is to be redeveloped as a mixture of residential and industrial allotments. The site is bounded by the M7 Motorway to the west, the Hoxton Park Aerodrome to the east and south and parklands to the north. The location of the Basin 6 site is shown in Plate 1.

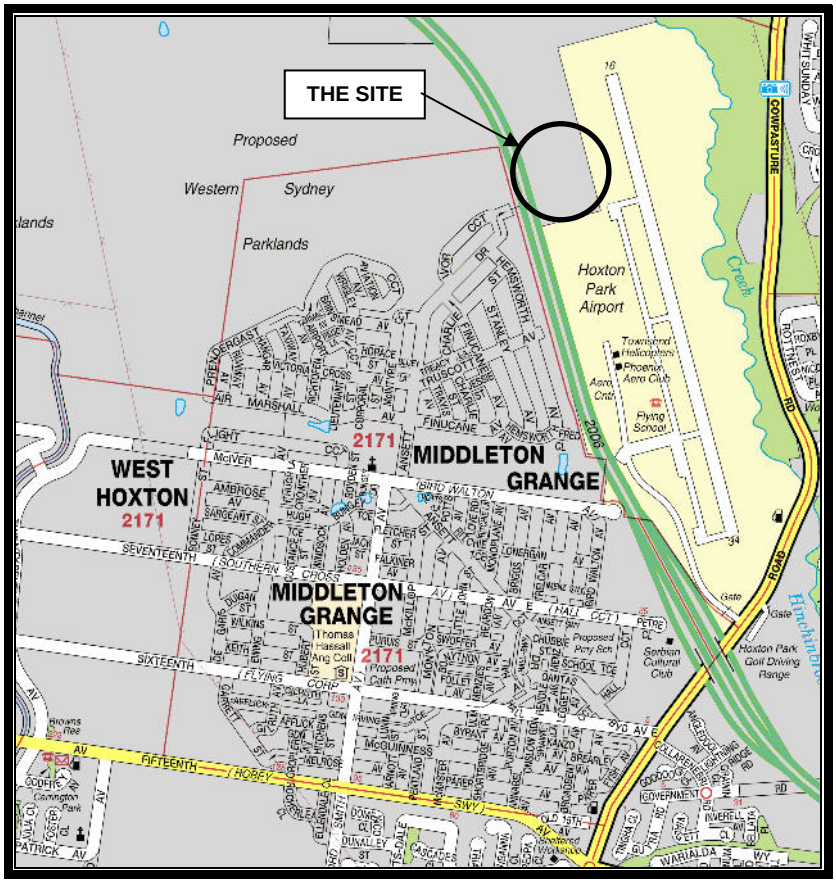

PLATE 1: BASIN 6 SITE LOCALITY

3.2 The Drainage System

The catchment area draining to Basin 6 is approximately 85 hectares. The catchment consists mainly of land within the Middleton Grange development and Western Sydney Parklands, which lie on the western side of the M7 Motorway. There is also a small catchment to the north of the basin on the eastern side of the M7 Motorway which currently consists mainly of grasslands.

Stormwater flows from the western side of the Motorway are conveyed to the proposed location of Basin 6 via a 30 m bridge under the M7 Motorway, and then discharge to Hinchinbrook Creek on the eastern side of the aerodrome site. A number of detention basins

are proposed within the Middleton Grange development to reduce local catchment peak post development discharges to pre development levels prior to discharging to the Basin 6 site. The hydraulic performance of the Middleton Grange basins has been detailed in the J. Wyndham Prince 2005 report (Reference 2).

4 HISTORY OF BASIN 6 AND DEVELOPMENT OF CONCEPT OPTIONS

4.1 General History

The former Hoxton Park Aerodrome site was acquired by HPAL Freehold in May 2004 for rezoning to Industrial, Mixed Use Retail, Residential and Public Recreation areas. At this time the site was partially impacted by Basin 6.

Basin 6 forms part of Liverpool Council's detention basin strategy for the Cabramatta Creek catchment. The strategy was developed in the 1980's to ensure that flood flows do not increase as a result of new urban development throughout the catchment area. The original Basin 6 concept design developed by Kinhill (1992) needed to be revisited after the M7 Motorway bisected the proposed footprint.

In 1999 Bewsher Consulting prepared a Floodplain Management Study for Cabramatta Creek which recommended that various basins, including Basin 6, may not need to be constructed and that a downstream basin, Basin 22, could be constructed larger than originally proposed. However, because of the uncertainties surrounding the M7 Motorway in 1999, an updated study by Bewsher Consulting in October 2004 then proposed a much smaller storage volume for Basin 22 and therefore a subsequent need to provide Basin 6.

In May 2007, because the M7 Motorway was constructed through the middle of the originally proposed Basin 6 footprint and other changes that had occurred within the catchment Liverpool City Council commissioned Bewsher Consulting to review the Basin 6 concept design. The revised design by Bewsher Consulting resulted in a significant loss of developable land from the design that had been previously proposed by Kinhill.

The general history of the Basin 6 options and their footprints are shown diagrammatically on Figure 1.

4.2 Alternate Basin 6 Concepts

In 2007, JWP were commissioned by HPAL Freehold to investigate alternate feasible options for the location and configuration of Basin 6. Locations on both the eastern and western side of the M7 were considered. Options of splitting Basin 6 into several basins were also considered. The preferred option of both HPAL Freehold and Council was to maintain Basin 6 in a similar location proposed by Bewsher on the eastern side of the M7.

Between 2007 and 2010 several basin concept options were developed and presented to Liverpool Council for consideration. During this iterative process the design constraints were resolved and the concepts refined accordingly.

One of the main design constraints established during this period was that the link road under the M7 Motorway joining the Hoxton Park and Middleton Grange development was to have a minimum clearance of 4.0 metres to the underside of the M7 bridge, to accommodate buses and to provide 20 year ARI flood free access. Generally, roads within the Liverpool Council are to be constructed at a level such that they are flood free in events up to and including the 100 year ARI event. However, in this case, given the need to lower the road to maintain the clearance, it was agreed at the time that 20 year flood free access was the design requirement. Additional design constraints are discussed in Section 5.

Hydraulic analysis of the Northern Creek, which runs adjacent to the link road, showed that the existing 20 year ARI flood level was higher than the maximum permissible road level. The creek channel would therefore need to be excavated to lower the 20 year flood to an acceptable level below the link road. Additionally, the hydraulic assessment also modelled 100 year ARI flows and

flood levels. The hydraulic analysis considered the tailwater affects from both the Bewsher and JWP basin concept designs.

As a result of the hydraulic analysis it was established that the Bewsher basin concept design may result in the link road being 100 year ARI flood free, with significant excavation in the channel (up to approximately 2 metres of excavation). The JWP basin could also provide 100 year flood free access to the link road with significant channel excavation and a small barrier / flood wall adjacent to the road. The extent of excavation required in the channel would potentially be an extremely problematic and expensive exercise. The RTA raised several concerns including the protection and founding of the bridge pylons and the location of major services running transverse to the channel.

As there is very limited space to fit the link road between the M7 bridge piers, it was generally agreed that a traffic safety barrier would be required on the northern side of the road. As the traffic barrier could also be constructed to act as a flood wall with no excavation in the adjacent channel and only a small increase in height over what would have been required if it were used as a traffic barrier only, this was considered to be the preferable option.

The two options are summarised as follows:

Option	Description of mitigation & traffic safety protection works		Comment
	Bewsher Basin	JW Prince Basin	
A	Provide drop structure & excavate channel within M7 corridor (approx 2 to 2.5m max)	Provide drop structure & excavate channel within M7 corridor (approx 2 to 2.5m max)	Bewsher & JWP basin require same extent of channel works within M7 corridor
	Traffic Barrier (approx 33m @ 0.82m high, between bridge pylons from Road CH 182 to 215)	Traffic/Flood Protection Barrier (approx 75m @ 1.2m max or 0.65m average high, between bridge pylons and beyond from Road CH 155 to 229)	JWP basin requires slightly increased extent of traffic barrier utilised as flood barrier
B	No channel excavation	No channel excavation	Drop structure outside M7 corridor
	Traffic/Flood Protection Barrier (approx 83m @ 1.7m max or 0.82m average high, between bridge pylons and beyond from Road CH 132 to 215)	Traffic/Flood Protection Barrier (approx 97m @ 1.7m max or 0.83 average high, between bridge pylons and beyond from Road CH 132 to 229)	JWP basin requires slightly increased extent of traffic barrier utilised as flood barrier

Both options would also require the provision of a 100 year ARI pipe system within the link road to drain the trapped sag under the M7 bridge. This system would need to extend east / south along the alignment of the link road rather than discharging to the creek as the pit will be lower than the 100 year ARI flood level.

The two options are also shown diagrammatically on Figures 3, 4 and 5.

In summary, although a higher (0.5m) and longer (22m) traffic / flood barrier is required for Option B, there are major constraints associated with Option A that may prevent its viability, including:

- Approval required from the Department of Environment, Climate Change and Water for the channel excavation works.
- Approval required from the RTA for works adjacent to the bridge pylons.
- Potential structural and foundation issues associated with excavating the channel to the depth required.
- Potential conflict of services running transverse to the channel and associated relocation costs.

It is therefore recommended that Option B be adopted as the more practical basin / channel option.

5 BASIN CONSTRAINTS AND CONSIDERATIONS

A number of constraints and considerations were identified for Basin 6 that dictated the design. The constraints and considerations are summarised below.

5.1 Access For Maintenance and Safe Egress

Provision for access to the basin for maintenance purposes has been allowed for in the basin design. A 5 metre wide accessway has been provided around the perimeter of the northern and north eastern perimeters. Depending upon planning of the adjoining residential subdivision, the accessway, may comprise a dedicated public roadway designed to Liverpool Council's requirements. An accessway, suitable to Council's requirements, will also extend to the base of the basin to allow for maintenance purposes.

In order to provide for safe egress from within the basin, and as agreed with Liverpool Council, all internal basin batters have been designed at a maximum grade of 1:6. However, we understand Council may consider batters up to 1:4 or retaining walls in localised areas, to accommodate constraints that may arise during detailed design, provided safe egress is not compromised.

5.2 Dam Safety Considerations

Discussions were held with dam engineers of the Department of Commerce with regards to the general configuration of Basin 6. In particular, the configuration of the southern embankment was considered to minimise the hazard risk of the basin. Due to existing and planned development to the south of Basin 6, this land will not be filled to the top of the basin embankment. As a result, it is proposed to construct the southern embankment to a level 1.5 metres above the basin spillway level to ensure any flows surcharging from the basin are directed to the spillway. In the event of extreme flooding, such as a PMF, flows would be safely discharged over the entire length of the basins northern and eastern edges.

5.3 Vertical Clearance of Link Road to M7 Motorway Bridge & Horizontal Alignment

Liverpool Council have designated the road linking the Hoxton Park Aerodrome redevelopment and the Middleton Grange development as a bus route. Accordingly, the minimum clearance required from the underside of the M7 Motorway bridge to the proposed link road has been maintained at 4.0 metres, as required by Liverpool Council.

Additionally, the horizontal alignment of the road has been designed to allow bus manoeuvres at a minimum 40km/hr, as required by Liverpool Council. The swept vehicle paths relating to the bus travel movements are indicated on attached Drawing 8240SK22 (Attachment A).

5.4 Link Road to be a Minimum 100 Year ARI Flood Free

As discussed in detail in Section 4, Liverpool Council have specified that the link road is to be a minimum 100 year ARI flood free, both from flows within the creek discharging under the M7 Motorway to Basin 6 and from 100 year ARI tailwater levels in Basin 6. To comply with this requirement either the creek channel adjacent to the link road will need to be lowered significantly (refer to Section 3 for further discussion and Section 7 for the modelling results) or a flood barrier would need to be provided.

5.5 Existing RTA Water Quality Basin

An existing water quality control basin is located to the west of the proposed Basin 6. The basin collects and treats runoff from the M7 Motorway. This basin currently discharges in the area where the western embankment of Basin 6 is to be constructed. It is proposed to extend the outlet of the RTA basin under the Basin 6 embankment, as previously presented to the RTA.

5.6 Existing M7 Motorway Bridge Columns

A number of the M7 Motorway bridge concrete columns are located in the vicinity of the proposed link road alignment and creek channel modification works. Both the link road and channel works require excavation works adjacent to the columns. The design of these works will require consultation with the RTA.

Liverpool Council requires construction of the link road to connect the Hoxton Park and Middleton Grange developments. The alignment of the link road is constrained by the location of the existing bridge columns and embankment, the location of the proposed road it is to connect to within the Middleton Grange development and the adjacent creek. The bridge columns were located by detailed survey and show that the link road through the underpass would require a 7.2 metre carriageway width, which would allow a minimum clearance of 2.3 metres from the southern face of kerb to the column for provision of a pedestrian footway. There is a minimum clearance of 1 metre from the northern face of kerb to the column.

Similarly, the location of the modified creek channel, if provided, is constrained by its existing alignment, the bridge columns, the alignment and level of the proposed link road and the required hydraulic capacity.

5.7 Vegetation Link / Riparian Corridor

A vegetation link / riparian corridor was originally proposed in the vicinity of Basin 6, linking Hinchinbrook Creek to the Western Sydney Parklands. Construction of Basin 6 and the necessity to incorporate a highly restricted outlet configuration along with the basin spillway arrangement diminishes the ability to maintain a continuous vegetation / riparian corridor. A separate investigation was completed by GHD (Reference 4) which discusses this in more detail.

6 HYDROLOGIC & HYDRAULIC ANALYSIS

The hydrologic analyses for this study were undertaken using the rainfall - runoff flood routing model XP-RAFTS (Runoff and Flow Training Simulation with XP Graphical Interface). (References 5 & 6). Version 6.5 of this modelling software was used in the assessment. The XP-RAFTS model previously developed for assessment of the adjacent Middleton Grange development was extended to include Basin 6 and its other catchments.

6.1 Sub-catchments

Sub-catchment areas contributing to the overall drainage system were established through detail survey and grading design covering the Middleton Grange development and ALS contour data. Catchment boundaries for the developed area contributing to the drainage system are shown on Figure 2 and the catchment details are provided in Attachments B and C.

6.2 Rainfall Data

Design rainfall intensity-frequency-duration (I.F.D.) data for the site was obtained using methods set out in Australian Rainfall and Runoff (ARR.) 1987 (Reference 7). A summary of the rainfall intensities adopted in this study is provided in Table 6.1. The critical storm durations were determined using these values for each sub-catchment.

The models used to examine the performance of the catchment utilised temporal patterns for synthetic design storms as detailed in A.R.R. (Reference 7).

Table 6.1

LIVERPOOL RAINFALL INTENSITIES (mm/hr)

Storm Duration (min.)	Rainfall Intensities (mm/hr) Recurrence Interval (ARI)	
	20	100
5	169	218
10	129	166
15	108	139
20	94	121
25	84	108
30	76	98
45	61	78
60	52	66
90	40.6	52
120	34.1	44
180	26.6	34.6
270	20.7	27.1
360	17.3	22.8
540	13.5	17.9
720	11.4	15.0
1080	8.87	11.8
1440	7.44	9.94
2160	5.77	7.74
2880	4.77	6.43

6.3 XP-RAFTS Modelling Parameters

The pern (n) values and losses adopted for the catchments in the XP-RAFTS modelling, as summarised below in Table 6.2, are consistent with the values previously used in the Water Cycle Management Facilities Report (Reference 2).

Table 6.2

XP-RAFTS PARMETERS

Parameter	Catchment Condition	Adopted Value
Pern		
	Existing Pervious	0.05
	Urban Pervious	0.025
	Urban Impervious	0.015
Losses	**External Upstream Catchments**	
Initial Loss	Pervious Catchment	20.0
Continuing Loss	Pervious Catchment	2.5
	Developed Catchments	
Initial Loss	Pervious Catchment	10.0
Continuing Loss	Pervious Catchment	2.5
	Developed Catchments	
Initial Loss	Impervious Catchment	1.0
Continuing Loss	Impervious Catchment	0.0

6.4 Basin Outlet Hydraulic Modelling

In order to adequately assess the hydraulic influence of downstream controls on the basin performance, the hydraulic analysis of the designed outlet structure was undertaken using XP-Storm (Dynamic Flow Routing Model with XP Graphical User Interface), developed by Willing and Partners Pty Ltd. Version 9.5 of this computer modelling program was used for this study (Reference 8).

The XP-Storm model was used to develop an appropriate stage/discharge relationship which was entered into the basin outlet configuration of the retention basin node of the XP-RAFTS model. In this way the tailwater influence of Hinchinbrook Creek and hydraulic controls on the overall detention basin performance was able to be assessed and incorporated into the XP-RAFTS modelling results.

6.5 Basin Performance and Discharge Estimates

Discharge estimates were derived for the rural and developed catchments for storms with Average Recurrence Intervals (A.R.I.'s) of 20 and 100 years. A range of storm durations from 10 minutes to 36 hours were analysed to determine the critical storm duration for each sub-catchment.

XP-RAFTS modelling was undertaken to determine the estimated peak discharges from Basin 6 to demonstrate the performance of the basin in its proposed configuration is consistent with the 100 year ARI results previously determined by Bewsher Consulting (Reference 1). Modelling was also undertaken to determine the top 20 year ARI water level in the basin and ensure it will not inundate the proposed link road.

The 20 and 100 year A.R.I. peak flows and top water levels from Basin 6 are presented in Table 6.3.

Table 6.3

SUMMARY OF BASIN 6 PERFORMANCE

ARI	Max Inflow (m^3/sec)	Storm Dur (mins)	Max Outflow (m^3/sec)	Storm Dur (mins)	Storage Used (m^3)	RL Used
20 Year	12.1	540	3.32	2160	93396	44.42
100 Year	16.7	120	3.99	2160	136330	45.34

6.6 Discussion of Basin Modelling Results

The XP-RAFTS modelling undertaken shows that the incorporation of Basin 6 in the proposed configuration will;

- Result in a peak flow discharge of approximately 4.0m3/sec, which is consistent with the recent investigation undertaken by Bewsher Consulting (Reference 1).
- Result in a maximum 20 year ARI top water level of approximately RL 44.42, which is lower than the minimum link road level of RL 44.65.

6.7 Probable Maximum Flooding (PMF) and Spillway Design

PMP is defined as "...the greatest depth of precipitation for a given duration meteorologically possible for a given size storm area at a particular location at a particular time of year". PMF flows were calculated using the Hydrological Recipes – Section 7.6 (Roger B. Grayson et al) as 168m^3/sec. In accordance with the Dam Safety Committee guidelines, the spillway has been modelled and assessed for the 10,000 year ARI flows. The top water level in the basin for the 10,000 year ARI event is approximately RL 46.31, which would maintain a freeboard of approximately 0.19m to residential homes in this extreme event.

7 PROPOSED CHANNEL MODIFICATIONS & HYDRAULIC ANALYSIS

7.1 Introduction

As part of the Basin 6 design, consideration of a proposed road that links the Middleton Grange development (west of the M7 Motorway) to the Hoxton Park Aerodrome redevelopment site was required. The location of the proposed link road is shown on concept design plans in Attachment A.

Initially, the link road was to be designed to be flood free in storm events up to and including the 20 year ARI event, as discussed in Section 4. However, during the course of the hydraulic analysis described below, it was established that the link road may potentially remain flood free in events up to and including the 100 year ARI event with significant excavation of the adjacent channel. Therefore, the design criteria required by Liverpool Council was to maintain flood free access to the link road in storm events up to and including the 100 year ARI event. This criteria is applicable for both flooding in the Northern Creek from the Middleton Grange development and also from tailwater levels in Basin 6.

The link road is also to be designated as a bus route, therefore adding an additional constraint that a minimum clearance of 4.0 metres is required to the underside of the M7 overpass, or a maximum road height of RL 44.76. The link road was also designed with an appropriate horizontal alignment to allow buses to travel at a minimum speed of 40 km/hr.

7.2 Existing Channel Modelling Analysis

A HEC-RAS hydraulic model was established as part of a previous investigation for the Northern Creek within the Middleton Grange development (Reference 3). The model was prepared to represent proposed rehabilitation works within the creek corridor. This model was extended and adopted to establish 100 year ARI flood levels through the M7 underpass, adjacent to the proposed link road.

The previous HEC-RAS model terminated approximately 40 metres west of the M7 underpass and therefore had to be extended for use in this investigation. Additional detail survey information was obtained for the floodplain between where the previous model ended and the proposed location for Basin 6. A digital terrain model was then prepared incorporating the existing surveyed ground surface in the area.

Cross sections along the alignment of the Northern Creek were extracted from the digital terrain model for use in the HEC-RAS (Reference 9) hydraulic model. Manning's roughness parameters were consistent with those adopted in the previous model. Refer to Drawing 8240SK22 (Attachment A) for cross section locations.

100 year ARI flows at various locations along the Northern Creek were extracted from the XP-Rafts hydrologic model (refer Section 6). Refer to Table 7.1 below for a summary of the adopted flows. The corresponding 100 year ARI flood levels were then extracted from the HEC-RAS model for the existing channel profile adjacent to the proposed link road. The results of the analysis are shown in Table 7.2.

Table 7.1

SUMMARY OF PEAK FLOWRATES ADOPTED FOR HYDRAULIC ANALYSIS

River Station	100 Year ARI
1220	2.50
1120	2.80
886	3.30
785.496	6.50
550	8.00
380	9.50
200	10.20
50	11.20
-30	15.40

7.3 Option A Modelling Analysis – Channel Excavation Within M7 Corridor

Each section in the HEC-RAS model between the Middleton Grange development and Basin 6 was manually altered to represent the proposed lowered channel profile before being reanalysed. A rectangular channel profile with maximum top width of 12 metres and varying depth was used in the modelling. The maximum top width of 12 metres is necessary to fit the modified channel between the existing M7 Motorway bridge pylons. The results of the analysis are shown in Table 7.2.

7.4 Option B Modelling Analysis – No Channel Excavation Within M7 Corridor

The HEC-RAS model geometry and sections described in Section 7.2 were adopted for analysis of this option with the following amendments:

- Cross sections -105 and -120 were modified to reflect the proposed rock ramp transition to the lower channel within Basin 6.

- The 100 year ARI top water levels for both the Bewsher and JWP basins were adopted as the downstream control in the hydraulic model.

The results of the analysis are shown in Table 7.2.

Table 7.2

SUMMARY OF HEC-RAS RESULTS – 100 YEAR ARI EXISTING & PROPOSED CONDITIONS (FROM RIVER STATION 300)

Section	100 Year ARI Flood Levels				
	Existing	JWP Basin		Bewsher Basin	
		No Channel	With Channel	No Channel	With Channel
140	46.11	46.11	46.11	46.11	46.11
139	46.55	46.55	46.54	46.55	46.54
120	46.43	46.43	46.40	46.43	46.40
100	46.21	46.21	46.14	46.21	46.14
91	46.13	46.13	45.93	46.13	45.94
90	46.15	46.15	45.98	46.15	45.99
75	46.09	46.09	45.80	46.09	45.82
55	46.04	46.04	45.54	46.04	45.63
54	46.04	46.04	45.58	46.04	45.65
50	46.01	46.01	45.44	46.01	45.56
0	46.02	46.02	45.39	46.02	44.78
-30	45.95	45.95	45.36	45.95	44.58
-45	45.58	45.58	45.35	45.58	44.54
-60	45.40	45.45	45.34	45.40	44.52
-75	45.29	45.39	45.34	45.29	44.50
-90	44.93	45.33	45.34	44.93	44.49
-105	44.45	45.34	45.34	44.53	44.50
-120	44.26	45.34	45.34	44.50	44.50

7.5 Option A – M7 Corridor Channel and Traffic / Flood Barrier

Table 7.2 presents the results from the analysis of the lowered channel profile and a comparison of the existing channel results. The modelling shows that the channel needs to be lowered significantly (up to 2 metres). This will result in 100 year ARI flood levels in the channel lower than the adjacent link road for the Bewsher basin. The 100 year ARI top water level in the JWP basin is higher than the link road and therefore for this option a traffic barrier that also provided flood protection would be required to maintain 100 year ARI flood free access to the road.

The maximum height of the traffic / flood barrier required for the JWP basin, with an allowance of 500mm freeboard, is approximately 1.2 metres. The maximum height of the barrier for the Bewsher basin option is 0.82 metres, being the height required for the traffic barrier (jersey kerb) to protect the adjacent bridge pylons.

The length of traffic / flood barrier required for the Bewsher option would be approximately 33 metres and approximately 75 metres for the JWP basin option.

A rock ramp transition structure would be required from River Station 0 to River Station -30 to protect against high velocities and control the risk of erosion in this section of the creek.

The results of the analysis for Option A are shown diagrammatically on Figure 3.

7.6 Option B – Traffic / Flood Barrier (No M7 Corridor Channel)

Table 7.2 presents the results from the option of using an extended traffic / flood barrier in lieu of an excavated channel within the M7 corridor. The modelling shows that it is not possible to achieve 100 year ARI flood free access for the link road for either the Bewsher basin or JWP basin options without provision of a traffic / flood barrier. The maximum height of the barrier for both the Bewsher and JWP basin proposals, including a 500mm freeboard allowance, is approximately 1.7 metres.

The JWP basin option results in some slight increases in 100 year ARI flood levels within the M7 corridor land of up to 400mm at the eastern boundary.

The length of traffic / flood barrier required for the Bewsher option would be approximately 83 metres and approximately 97 metres for the JWP basin option.

A rock ramp transition structure would be required from River Station -105 to River Station -120 to control the risk of erosion in this section of the creek.

The results of the analysis for Option B are shown diagrammatically on Figure 4.

8 CONCLUSION

The Basin Performance and Channel Options Report has been prepared to support a Part 3A and rezoning application to define the extent of land required for Basin 6 and the remaining adjacent land for industrial and residential purposes and also to support a development application for construction of Basin 6.

The hydrologic/hydraulic modelling undertaken for the JWP basin option showed that the device will ensure that the peak 100 year ARI discharge is reduced to approximately 4.0m^3/sec, which is consistent with the results of the previous investigation undertaken by Bewsher Consulting (Reference 1).

A number of options were considered to provide a practical, cost effective solution for Basin 6 while also maintaining serviceability to the proposed link road. The hydrologic/hydraulic modelling undertaken for the basin shows that a traffic / flood barrier can be incorporated to ensure that the maximum 100 year ARI top water level in the basin will not inundate the proposed link road, as required by Liverpool Council.

The two final options considered for Basin 6 and conveyance of flows from the upstream catchment included a channel within the M7 corridor in conjunction with a traffic flood barrier (Option A) and a traffic flood barrier without a channel in the M7 corridor (Option B). Option B is the preferred alternative as it:

- Does not require extensive excavation within the M7 corridor.
- Will not require DECCW approval for excavation of the channel within the M7 corridor.
- Does not require approval from the RTA for excavation adjacent to the M7 bridge pylons for the channel works.
- Removes the risk of potential structural and foundation issues associated with excavating the channel to the depth required.
- Removes the potential conflict of existing services running transverse to the channel and associated relocation costs.

Option B also offers a solution which provides the following:

- the proposed 1:100 year ARI top water level in the basin does not impact upon the existing 1:100 year water level in the watercourse west of the southbound lanes of the M7 motorway or any other upstream landowner.
- the extent of traffic / flood barrier required to render the proposed link road flood free in the 100 year ARI flood, for the basin design by J Wyndham Prince, is only approximately 14m greater than that required for the Bewsher design.

We have assessed the operation of the basin during extreme events and identified likely flood levels.

This basin performance and channel modification report provides confidence to Mirvac / HPAL and Council that the proposed basin adequately meets the required criteria.

Basin 6 consists of the following elements (as indicated on the concept plans):

- 136,500m³ Detention Volume.
- A Top Water Level of RL 45.34 m AHD in the 100 yr ARI design event.
- Internal batter slopes no greater than 1:6.
- A single 1500 mm diameter outlet pipe with 1050 mm orifice plate.

9 REFERENCES

1. Bewsher Consulting Pty Ltd (2007) – Cabramatta Creek Basin Strategy, Basin 6 Review, Final Report

2. J. Wyndham Prince Pty. Ltd. (2005) – Water Cycle Management Facilities Design Report – Middleton Grange

3. J. Wyndham Prince Pty. Ltd. (2008) – Hydraulic Performance Report – Proposed Rehabilitation Works – Northern Creek, Middleton Grange

4. GHD (2010) – Hoxton Park Airport – Ecology Assessments

5. WILLING & PARTNERS PTY. LTD. (1994). Runoff Analysis & Flow Training Simulation. Detailed Documentation and User Manual, Version 4.0

6. WILLING & PARTNERS PTY. LTD. (1996). Runoff Analysis & Flow Training Simulation. Addendum, Version 5.0

7. Institution of Engineers, Australia (1987). Australian Rainfall and Runoff

8. WILLING & PARTNERS PTY. LTD. – XP-Storm – Installation Overview Worked Examples

9. US ARMY HYDROLOGIC ENGINEERING CENTRE (May 2003) - HEC River Analysis System, Version 3.1.1

Figures

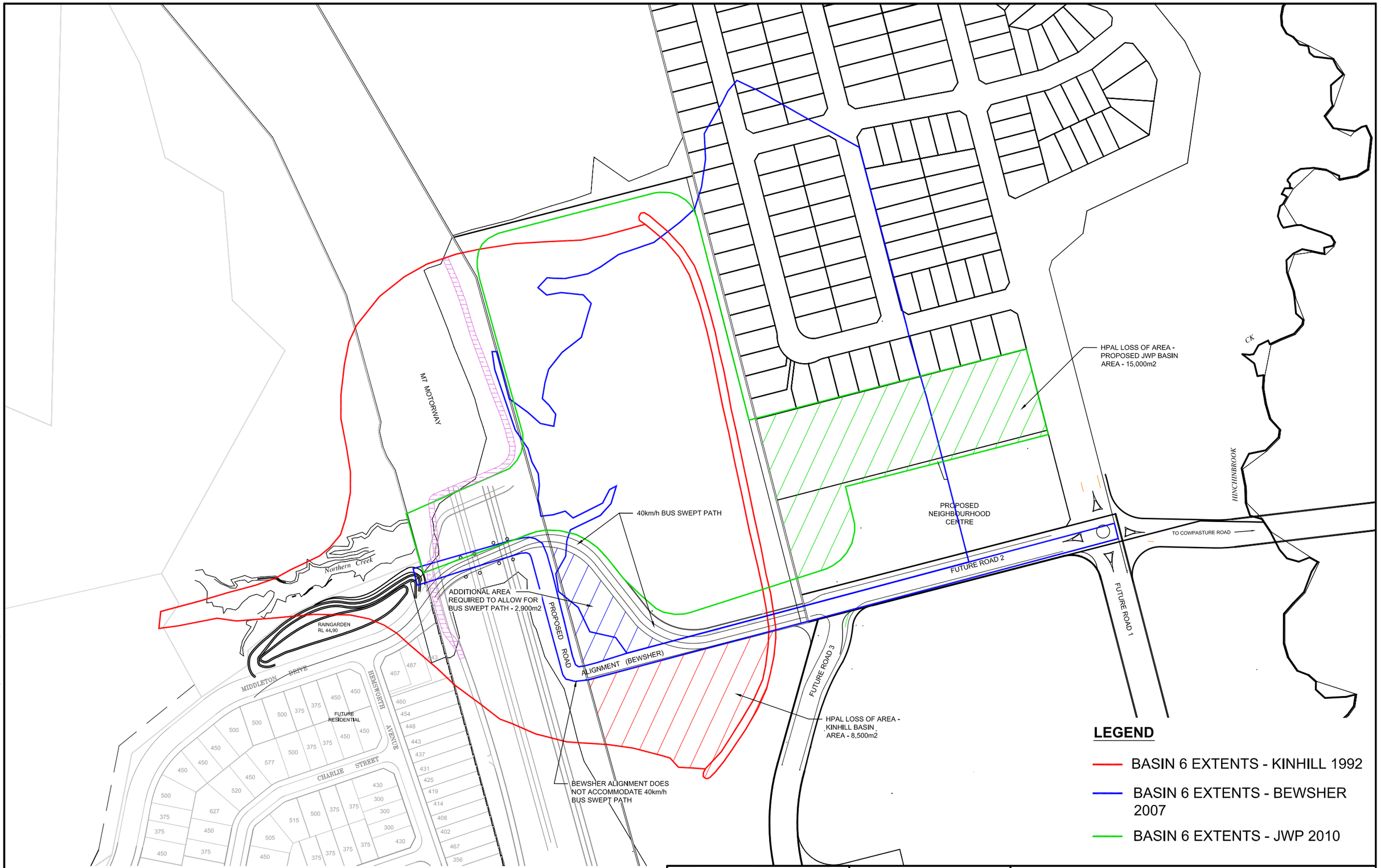

FIGURE 1

Plotted: 6 May 2010 12:33:12 PM File Name: J:\8240WSK-Concept Sketch Design\8240SW01.dwg

ISSUE	AMENDMENT	DATE	BY
F			
E			
D			
C			
B	NOTES & HATCHING ADDED	16/4/10	DG
A	ISSUED FOR INFORMATION	12/4/10	DG

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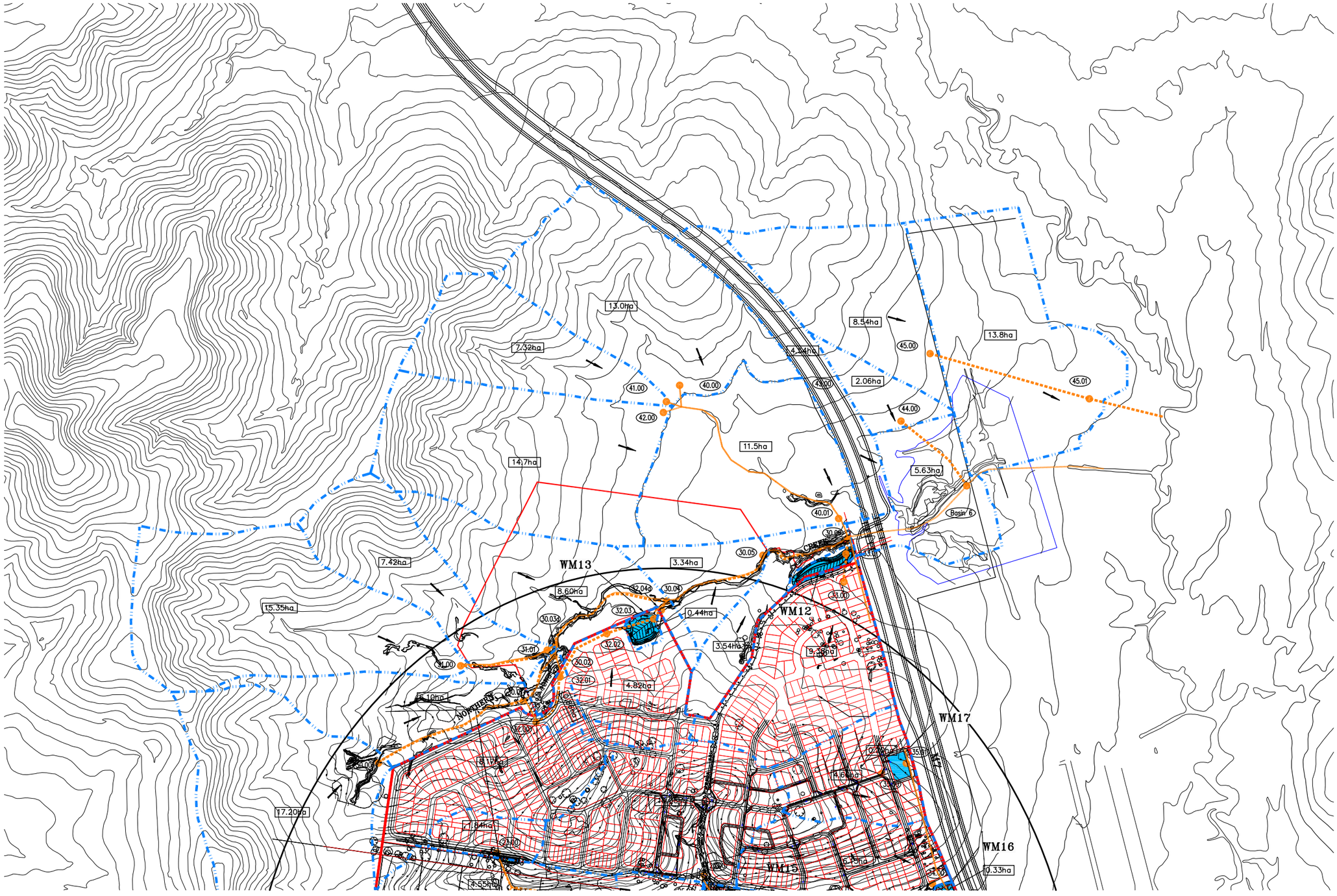
BASIN 6 HOXTON PARK

HISTORY OF BASIN OPTIONS

PLAN No. 8240SW01 B
FILE No. 8240SW01
SHEET 1 OF 5 SHEETS



LEGEND:

- 6.11ha — SUB-CATCHMENT BOUNDARY. AREA & FLOW DIRECTION
- 8.02 — NODE LABEL AND LOCATION
- LINK

1: 4000 — 100 0 100 200 300 400 METRES

FIGURE 2

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HOXTON PARK BASIN 6

CATCHMENT PLAN

PLAN No. 8240SW02 A
FILE No. 8240SW02
SHEET 2 OF 5 SHEETS

Plotted: 6 May 2010 12:36:25 PM File Name: J:\8240WSK-Concept Sketch Design\8240SW02.dwg

Section	100 Year ARI Flood Levels				
	Existing	JWP Basin		Bewsher Basin	
		No Channel	With Channel	No Channel	With Channel
140	46.11	46.11	46.11	46.11	46.11
139	46.55	46.55	46.54	46.55	46.54
120	46.43	46.43	46.40	46.43	46.40
100	46.21	46.21	46.14	46.21	46.14
91	46.13	46.13	45.93	46.13	45.94
90	46.15	46.15	45.98	46.15	45.99
75	46.09	46.09	45.80	46.09	45.82
55	46.04	46.04	45.54	46.04	45.63
54	46.04	46.04	45.58	46.04	45.65
50	46.01	46.01	45.44	46.01	45.56
0	46.02	46.02	45.39	46.02	44.78
-30	45.95	45.95	45.36	45.95	44.58
-45	45.58	45.58	45.35	45.58	44.54
-60	45.40	45.45	45.34	45.40	44.52
-75	45.29	45.39	45.34	45.29	44.50
-90	44.93	45.33	45.34	44.93	44.49
-105	44.45	45.34	45.34	44.53	44.50
-120	44.26	45.34	45.34	44.50	44.50

NOTE: MAX. ROAD HEIGHT AT SECTION -45 TO ACHIEVE 4.0 m CLEARANCE TO M7 BRIDGE IS RL 44.76

MAX. ROAD HEIGHT AT SECTION -75 TO ACHIEVE 4.0m CLEARANCE TO M7 BRIDGE IS RL 45.38

PROPOSED DETENTION BASIN

VOL = 136,500 m³
100 Yr TWL 45.34

M7 MOTORWAY

BATTER 6:1

LIMIT OF WORKS (HPAL VPA)

LIMIT OF WORKS LIVERPOOL CONTRIBUTIONS PLAN 2009

EXCAVATE EXISTING WATERCOURSE

ROCK RAMP TRANSITION WORKS CONTAINED WITHIN M7 MOTORWAY BOUNDARY

NO CHANGES TO 100 YEAR ARI FLOOD EXTENTS WEST OF THIS SECTION AS A RESULT OF BASIN 6 WORKS

Northern Creek

RAINGARDEN RL 44.90

FUTURE LINK ROAD UNDER 45.5

47.0 x

EXISTING PYLONS

100 YEAR PIPE SYSTEM TO DRAIN SAG IN FUTURE LINK ROAD

LEGEND

- 100 YEAR ARI FLOOD EXTENTS PRIOR TO BASIN 6 (JWP REPORT REF: 7815Rpt1A)
- 100 YEAR ARI FLOOD EXTENTS WITH BASIN 6 (JWP REPORT REF: 8240Rpt1D)
- 1.2 PROPOSED TRAFFIC BARRIER & FLOOD WALL LOCATION & HEIGHTS (INCL. 500mm FREEBOARD) - JWP NOTE: MIN. 820mm HEIGHT FOR TRAFFIC BARRIER (JERSEY KERB) FOR PROTECTION OF ADJACENT BRIDGE PYLONS & AS REQUIRED FOR FLOOD PROTECTION
- 0.82 PROPOSED TRAFFIC BARRIER LOCATION & HEIGHTS - BEWSHER BASIN OPTION
- 50 HEC-RAS SECTION & STN NO.

FIGURE 3

1:500 (AT A1) 10 0 10 20 30 40 50 METRES

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ISSUE	AMENDMENT	DATE	BY
C	BEWSHER LEVELS ADDED	16/4/10	DG
B	100 YEAR FLOOD LEVELS ADDED	8/4/10	DG
A	FOR INFORMATION	19/02/10	DJH

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HOXTON PARK BASIN 6
OPTION A - EXCAVATE CHANNEL
100 YEAR ARI FLOOD EXTENTS & TRAFFIC BARRIER / FLOOD WALL EXTENTS

PLAN No. 8240SW03 C
FILE No. 8240SW03
SHEET 3 OF 5 SHEETS

Plotted: 11 May 2010 9:05:48 AM File Name: J:\8240W\SK-Concept Sketch Design\8240SW03.dwg

Section	100 Year ARI Flood Levels (No Channel Excavation)		
	Existing	JWP Basin	Bewsher Basin
140	46.11	46.11	46.11
139	46.55	46.55	46.55
120	46.43	46.43	46.43
100	46.21	46.21	46.21
91	46.13	46.13	46.13
90	46.15	46.15	46.15
75	46.09	46.09	46.09
55	46.04	46.04	46.04
54	46.04	46.04	46.04
50	46.01	46.01	46.01
0	46.02	46.02	46.02
-30	45.95	45.95	45.95
-45	45.58	45.58	45.58
-60	45.40	45.45	45.40
-75	45.29	45.39	45.29
-90	44.93	45.33	44.93
-105	44.45	45.34	44.53
-120	44.26	45.34	44.50

NOTE: MAX. ROAD HEIGHT AT SECTION -45 TO ACHIEVE 4.0 m CLEARANCE TO M7 BRIDGE IS RL 44.76

MAX. ROAD HEIGHT AT SECTION -75 TO ACHIEVE 4.0m CLEARANCE TO M7 BRIDGE IS RL 45.38

PROPOSED DETENTION BASIN

VOL = 136,500 m³
100 Yr TWL 45.34

M7 MOTORWAY

BATTER 6:1

LIMIT OF WORKS (HPAL VPA)

LIMIT OF WORKS LIVERPOOL CONTRIBUTIONS PLAN 2009

ROCK RAMP TRANSITION WORKS WITHIN HPAL BOUNDARY

EXCAVATE EXISTING WATERCOURSE

SW05 E

Northern Creek

RAINGARDEN RL 44.90

FUTURE ROAD UNDER

EXISTING PYLONS

100 YEAR PIPE SYSTEM TO DRAIN SAG IN FUTURE LINK ROAD

LEGEND

- 100 YEAR ARI FLOOD EXTENTS PRIOR TO BASIN 6 (JWP REPORT REF: 7815Rpt1A)
- 100 YEAR ARI FLOOD EXTENTS WITH BASIN 6 (JWP REPORT REF: 8240Rpt1D)
- 1.7 PROPOSED TRAFFIC BARRIER & FLOOD WALL LOCATION & HEIGHTS (INCL. 500mm FREEBOARD) - JWP NOTE: MIN. 820mm HEIGHT FOR TRAFFIC BARRIER (JERSEY KERB) FOR PROTECTION OF ADJACENT BRIDGE PYLONS & AS REQUIRED FOR FLOOD PROTECTION
- 1.7 TRAFFIC BARRIER & FLOOD WALL LOCATION & HEIGHTS - BEWSHER
- 50 HEC-RAS SECTION & STN NO.

FIGURE 4

1:500 (AT A1) 10 0 10 20 30 40 50 METRES

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HOXTON PARK BASIN 6
OPTION B - NO EXCAVATION TO CREEK
100 YEAR ARI FLOOD & TRAFFIC BARRIER / FLOOD WALL EXTENTS

PLAN No. 8240SW04 A
FILE No. 8240SW04
SHEET 4 OF 5 SHEETS

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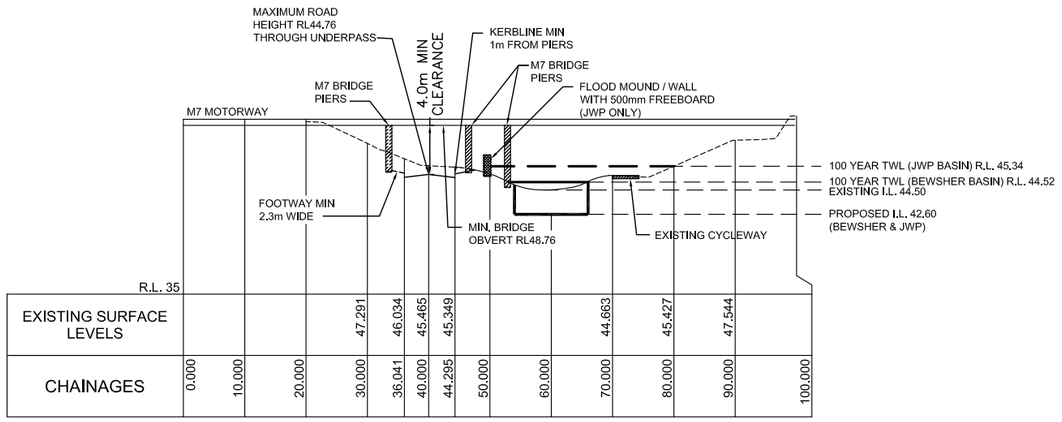
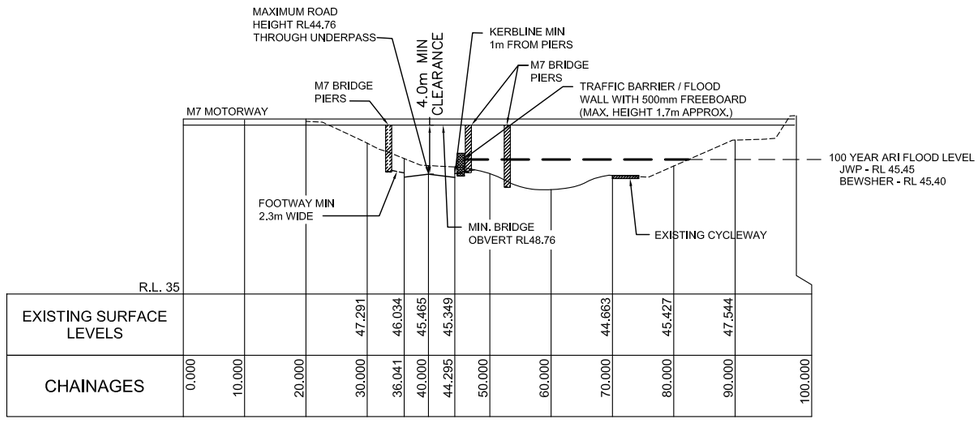


SECTION (–60) D SW03 WITH BEWSHER & JWP

SCALES: HORIZ 1:500
VERT 1:250

OPTION A – WITH CHANNEL EXCAVATION



SECTION (–60) E SW04 WITH BEWSHER & JWP

SCALES: HORIZ 1:500
VERT 1:250

OPTION B – NO CHANNEL EXCAVATION

1:250 (AT A1) 5 0 5 10 15 20 25 METRES

1:500 (AT A1) 10 0 10 20 30 40 50 METRES

FIGURE 5

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DATUM: AHD ORIGIN:
SCALES:
1:500@A1
1:250@A1

HOXTON PARK BASIN 6

SECTIONS AT HEC-RAS RIVER STATION -60
FOR OPTIONS A & B

PLAN No. 8240SW05 A
FILE No. 8240SW05
SHEET 5 OF 5 SHEETS

Plotted: 6 May 2010 2:17:27 PM File Names: J:\8240W\SK-Concept Sketch Design\8240SW05.dwg

Attachment A

Basin 6 Concept Design Plans

PROPOSED DETENTION BASIN

VOL = 136,500 m³
100 Yr TWL 45.34

BATTER 6:1

GRADE FLOOR OF BASIN TO CHANNEL @ 0.5%

M7 MOTORWAY

ROCK RAMP

REALIGNMENT OF CYCLEWAY BY OTHERS

7.2m WIDE CARRIAGEWAY

APPROXIMATE RELOCATED CHANNEL ALIGNMENT

FUTURE ROAD UNDER

EXISTING PYLONS

FUTURE TRAFFIC / FLOOD BARRIER

EXISTING M7 BASIN TO BE RETAINED

9.5m WIDE CARRIAGEWAY

MAX 1.5m HIGH RETAINING WALL ALONG BOUNDARY

REFER TO DWG 8240SK22 FOR SWEPT PATHS OF BUS MOVEMENTS ON ROAD 2

TOP OF 3m WIDE EMBANKMENT RL 47.0

PROVIDE PRAM RAMPS TO ENABLE CROSSING ACCESS FOR PEDESTRIANS

DWARF RETAINING WALL ALONG BOUNDARY

3m WIDE SPILLWAY RL 45.5

DWARF TRAINING WALL ALONG BOUNDARY

1050Ø OUTLET TO EXISTING CHANNEL @ 1%

ROCK OUTLET PROTECTION

DISCHARGE HEADWALL IL 39.50

EXISTING WATERCOURSE

100 YEAR FLOOD LEVEL HINCHINBROOK CK TWL 41.49

BASIN SPILLWAY TO BE REINFORCED TURF OR SIMILAR EROSION PROTECTION MEASURES

BASIN OUTLET IL 41.47

STACKED ROCK RETAINING WALL TOP WALL RL 47.0

PROPOSED NEIGHBOURHOOD CENTRE

RETAINING WALL ALONG BOUNDARY

TO COWPASTURE ROAD

FUTURE ROAD 2

FUTURE ROAD 1

FUTURE ROAD 3

HINCHINBROOK CK

Northern Creek

RAINGARDEN RL 44.90

MIDDLETON DRIVE

HEMSWORTH AVENUE

CHARLIE STREET

FUTURE RESIDENTIAL

1:1000 (AT A1)

20 10 0 10 20 30 40 50 60 70 80 90 100
METRES

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D	CHANNEL EXTENTS AMENDED	29/4/10	DG
C	SPILLWAY DETAIL ADDED	6/4/10	DG
B	ROAD CENTRELINE ADDED	22/02/10	JPC
A	FOR INFORMATION	19/02/10	DJH

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HOXTON PARK BASIN 6

BASIN 6 LAYOUT PLAN

PLAN No. 8240SK19 D
FILE No. 8240SK19
SHEET 1 OF 5 SHEETS

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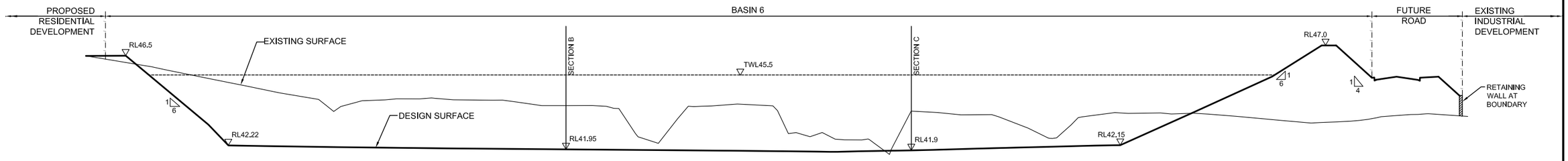
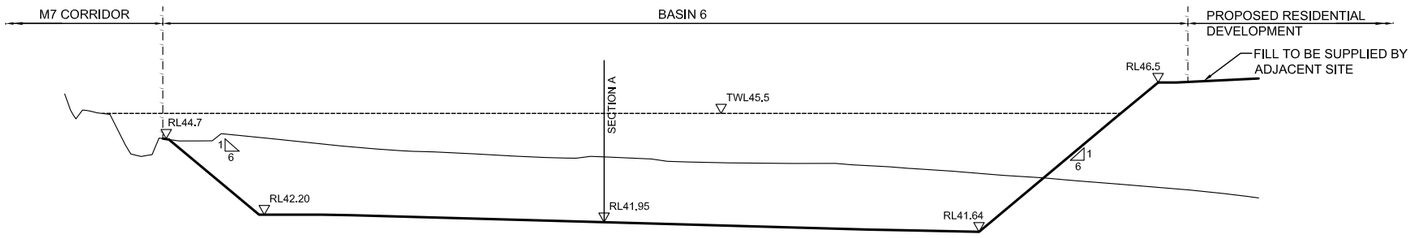


SECTION A
SCALES: HORIZ 1:500
VERT 1:100
SK19



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VERT 1:100
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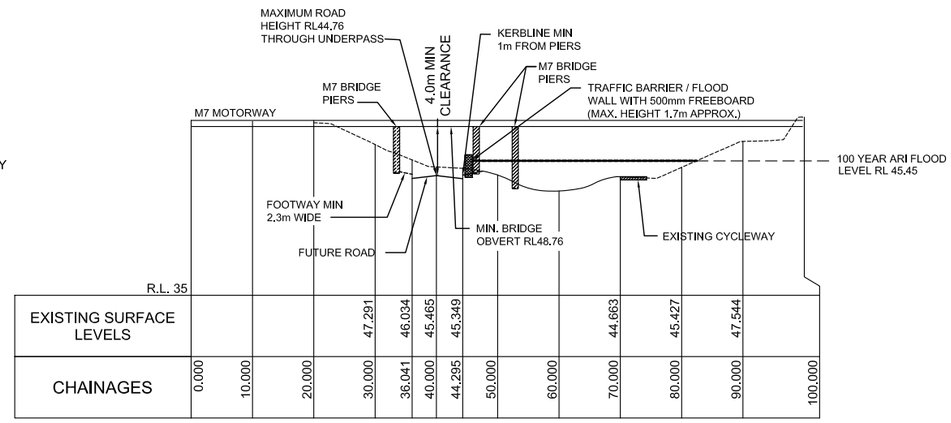
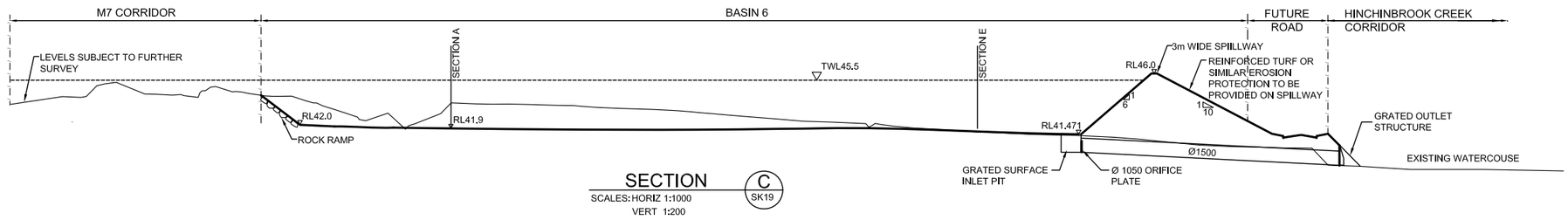


CHAINAGES	0.000	10.000	20.000	30.000	36.041	40.000	44.295	50.000	60.000	70.000	80.000	90.000	100.000
EXISTING SURFACE LEVELS				47.291	46.034	45.465	45.349			44.663	45.427	47.544	

SECTION D
SCALES: HORIZ 1:500
VERT 1:250
SK19



SECTION C
SCALES: HORIZ 1:1000
VERT 1:200
SK19

1:200 (AT A1) 4 2 0 4 8 12 16 20 METRES

1:250 (AT A1) 5 0 5 10 15 20 25 METRES

1:1000 (AT A1) 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

1:500 (AT A1) 10 0 10 20 30 40 50 METRES

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D	SECTIONS C AND D AMENDED	29/4/10	DG
C	OUTLET ARRANGEMENT & SPILLWAY DETAIL UPDATED	6/4/10	DG
B	BOUNDARY INFORMATION ADDED TO SECTIONS	22/02/10	JPC
A	FOR INFORMATION	19/02/10	DJH

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1:1000@A1
1:500@A1
1:250@A1
1:200@A1

HOXTON PARK BASIN 6

SECTIONS

PLAN No. 8240SK20 D
FILE No. 8240SK20
SHEET 2 OF 5 SHEETS

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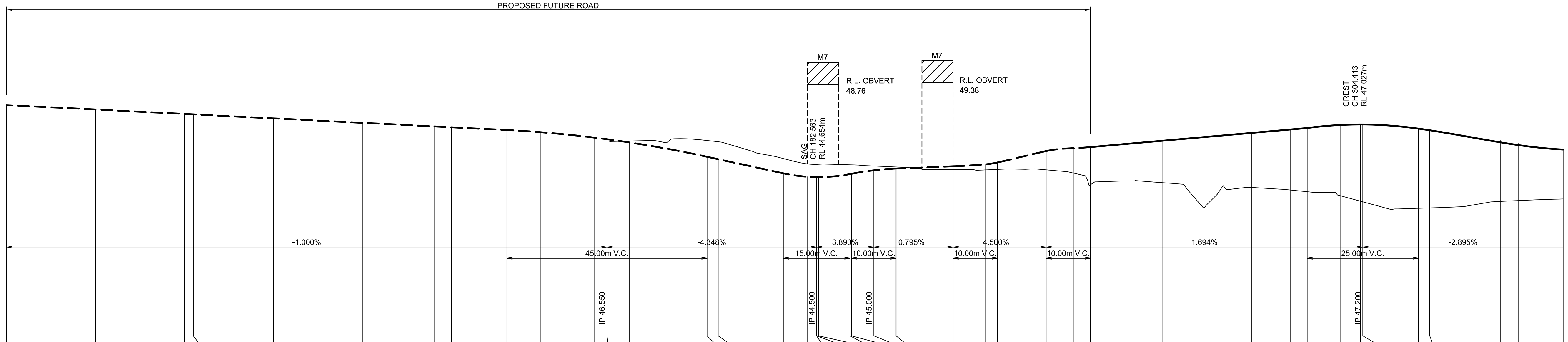
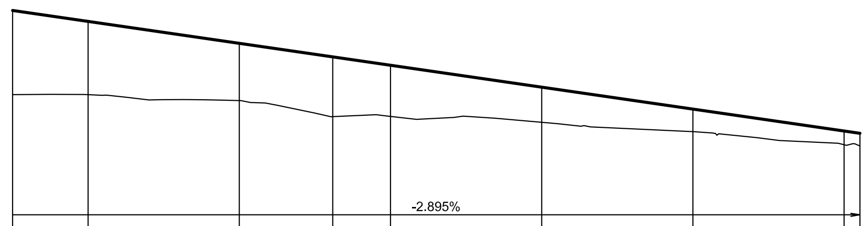


DATUM 37.0

CHAINAGE	DESIGN LINE GRADING	EXISTING SURFACE
0	47.9	
20	47.7	
40	47.5	
41.975	47.48	
60	47.3	
80	47.1	
96.118	46.939	
100	46.9	
112.5	46.775	
120	46.679	
132.097	46.436	
135	46.362	
140	46.219	46.281
155.925	45.639	46.336
157.5	45.572	46.302
160	45.463	46.246
174.645	44.826	45.489
180	44.672	45.251
182.145	44.654	45.228
182.145	44.654	45.228
182.563	44.654	45.232
189.645	44.792	45.21
190	44.806	45.208
195	44.961	45.155
200	45.04	45.113
212.831	45.142	45.002
220	45.225	44.979
222.831	45.314	45.004
233.739	45.830	44.983
240	45.958	44.829
243.738	46.007	44.313
260	46.294	44.403
280	46.648	44.189
288.729	46.802	44.071
292.449	46.868	43.998
300	47.005	43.812
304.413	47.027	43.572
304.949	47.026	43.543
317.449	46.838	43.251
320	46.764	43.267
335.969	46.302	43.559
340	46.185	43.602
350	45.896	43.67

LONGITUDINAL SECTION ROAD 2

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

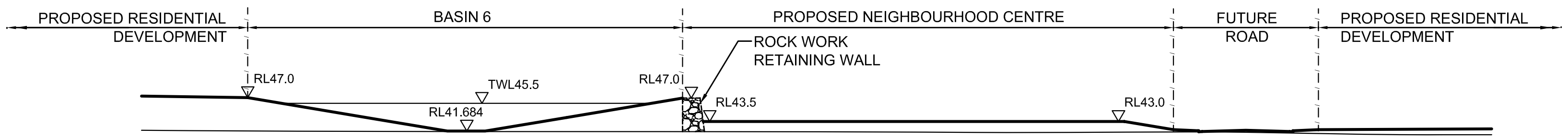


DATUM 36.0

CHAINAGE	DESIGN LINE GRADING	EXISTING SURFACE
350	45.896	43.67
360	45.606	43.672
380	45.027	43.516
392.353	44.669	43.09
400	44.448	43.099
420	43.869	42.943
440	43.29	42.695
460	42.711	42.349
462.1	42.65	42.318

LONGITUDINAL SECTION ROAD 2

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



SECTION E (SK19)

SCALES: HORIZ 1:500
VERT 1:500

Plotted: 11 May 2010 5:50:16 PM File Name: J:\8240\WSK-Concept Sketch Design\8240SK21C.dwg

1:500 (AT A1) 10 0 10 20 30 40 50 METRES

1:100 (AT A1) 2 1 0 1 2 3 4 5 6 7 8 9 10 METRES

CLIENT: HPAL FREEHOLD PTY LTD

ADVANCE COPY ONLY
NOT FOR CONSTRUCTION

ISSUE	AMENDMENT	DATE	BY
C	LONG SECTION AMENDED	29/4/10	DG
B	BOUNDARY INFORMATION ADDED TO SECTIONS	22/02/10	JPC
A	FOR INFORMATION	19/02/10	DJH

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS
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P 02 4720 3300 F 02 4721 7638 W www.jwprince.com.au E jwp@jwprince.com.au

DESIGNED DJH
DRAWN DJH
CHECKED

DATUM: AHD ORIGIN:
SCALES: 1:500@A1 1:100@A1

THIS DRAWING MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS PART OF AN APPROVED CONSTRUCTION CERTIFICATE.

HOXTON PARK BASIN 6

LONGSECTION ROAD 2 & SECTION E

PLAN No. 8240SK21 C
FILE No. 8240SK21
SHEET 3 OF 5 SHEETS

M7 MOTORWAY

MINIMUM GAP BETWEEN SWEPT PATHS APPROX. 0.25m

MINIMUM GAP BETWEEN SWEPT PATHS APPROX. 0.25m

SWEPT PATHS OF HEAVY RIGID VEHICLE AT 40 km/hr EQUIVALENT TO REGULAR 12.5m LONG PASSENGER BUS

ROAD 2

ROAD 2

0.000
41.975
50.000
96.118
100.000
132.097
150.000
155.925
182.145
200.000
229.141
250.000
288.729
300.000
339.969
350.000
392.353
400.000

1:500 (AT A1) 10 0 10 20 30 40 50 METRES

CLIENT:
HPAL FREEHOLD PTY LTD

ADVANCE COPY ONLY
NOT FOR CONSTRUCTION

ISSUE	AMENDMENT	DATE	BY
C	M7 BASIN OUTLET REMOVED	29/4/10	DG
B	DWG NAME ALTERED & ADDITIONAL INFORMATION	23/02/10	JPC
A	FIRST ISSUE	21/02/10	DJH

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DESIGNED DJH
DRAWN JC
CHECKED

DATUM: AHD ORIGIN:
SCALES: 1:500@A1

THIS DRAWING MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS PART OF AN APPROVED CONSTRUCTION CERTIFICATE.

HOXTON PARK BASIN 6

SWEPT PATHS

PLAN No. 8240SK22 C
FILE No. 8240SK22
SHEET 4 OF 5 SHEETS

Plotted: 11 May 2010 10:04:26 AM File Name: J:\8240WSK-Concept Sketch Design\8240SK22C.dwg

Section	100 Year ARI Flood Levels	
	Existing	JWP Basin
140	46.11	46.11
139	46.55	46.55
120	46.43	46.43
100	46.21	46.21
91	46.13	46.13
90	46.15	46.15
75	46.09	46.09
55	46.04	46.04
54	46.04	46.04
50	46.01	46.01
0	46.02	46.02
-30	45.95	45.95
-45	45.58	45.58
-60	45.40	45.45
-75	45.29	45.39
-90	44.93	45.33
-105	44.45	45.34
-120	44.26	45.34

NOTE: MAX. ROAD HEIGHT AT SECTION -45 TO ACHIEVE 4.0 m CLEARANCE TO M7 BRIDGE IS RL 44.76

MAX. ROAD HEIGHT AT SECTION -75 TO ACHIEVE 4.0m CLEARANCE TO M7 BRIDGE IS RL 45.38

PROPOSED DETENTION BASIN

VOL = 136,500 m³
100 Yr TWL 45.34

M7 MOTORWAY

BATTER 6:1

LIMIT OF WORKS (HPAL VPA)

LIMIT OF WORKS LIVERPOOL CONTRIBUTIONS PLAN 2009

SW05 E

ROCK RAMP TRANSITION WORKS WITHIN HPAL BOUNDARY

EXCAVATE EXISTING WATERCOURSE

STAGE 1 BASIN 6

STAGE 2 FUTURE LINK ROAD

FUTURE ROAD UNDER

EXISTING PYLONS

TEMPORARY FILL EMBANKMENT TO DIVERT CREEK FLOW TO BASIN

TAIL OUT DRAIN TO ROAD DRAINAGE

RAINGARDEN RL 44.90

Northern Creek

-105 -120 -90 -75 -60 -45 -30 0 50 139

155,925 150,000 132,097 100,000 96,118 300,000 47.0 45.5 45.0

LEGEND

- 100 YEAR ARI FLOOD EXTENTS PRIOR TO BASIN 6 (JWP REPORT REF: 7815Rpt1A)
- 100 YEAR ARI FLOOD EXTENTS WITH BASIN 6 AND FUTURE ROAD (JWP REPORT REF: 8240Rpt1E)
- 100 YEAR ARI FLOOD EXTENTS WITH BASIN 6 AND TEMPORARY BARRIER ONLY
- LIMIT OF BASIN 6 WORKS
- FUTURE ROAD
- 50 HEC-RAS SECTION & STN NO.

1:500 (AT A1) 10 0 10 20 30 40 50 METRES

CLIENT: HPAL FREEHOLD PTY LTD

ADVANCE COPY ONLY
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ISSUE	AMENDMENT	DATE	BY
C			
B	SECOND ISSUE	10/5/10	DG
A	FOR INFORMATION	19/04/10	DG

J. WYNDHAM PRINCE CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS
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DESIGNED DG
DRAWN DG
CHECKED

DATUM: AHD ORIGIN:
SCALES: 1:1000@A1

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HOXTON PARK BASIN 6

STAGING AND TEMPORARY WORKS IN M7 CORRIDOR

PLAN No. 8240SK23 B
FILE No. 8240SK23
SHEET 5 OF 5 SHEETS

Plotted: 11 May 2010 2:34:03 PM File Name: J:\8240\WSK-Concept Sketch Design\8240SK23B.dwg

Attachment B

XP-Rafts Results – 20 year ARI, 2160 Minute Storm

HOXTON PARK - Design Catchment - With Detention (100yr)

Results for period from 0: 0.0 7/ 4/2002
to 2: 0.0 9/ 4/2002

ROUTING INCREMENT (MINS) = 10.00
STORM DURATION (MINS) = 2160.
RETURN PERIOD (YRS) = 20.
BX = 1.5000
TOTAL OF FIRST SUB-AREAS (ha) = 252.61
TOTAL OF SECOND SUB-AREAS (ha) = 142.90
TOTAL OF ALL SUB-AREAS (ha) = 395.50

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area (ha) #1	#2	Slope (%) #1	#2	% Impervious (%) #1	#2	Pern #1	#2	B #1	#2	Link No.
2.00	5.150	.00001	3.500	.0010	8.000	0.000	.050	.025	.0582	.0031	1.000
2.01	0.5430	1.008	2.500	2.500	5.000	100.0	.035	.015	.0183	.0014	1.001
1.00	15.380	0.000	8.000	0.000	5.000	0.000	.050	0.00	.0767	0.000	2.000
1.01	4.590	0.000	8.000	0.000	5.000	0.000	.050	0.00	.0409	0.000	2.001
1.02	0.3960	0.7350	3.500	3.500	5.000	100.0	.035	.015	.0131	.0010	2.002
1.03d	.00001	0.000	3.500	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.002
1.04	1.195	2.035	3.500	3.500	5.000	100.0	.035	.015	.0233	.0017	1.003
3.00	3.390	0.000	10.00	0.000	5.000	0.000	.050	0.00	.0313	0.000	3.000
3.01	6.010	0.000	12.00	0.000	5.000	0.000	.050	0.00	.0384	0.000	3.001
3.02	1.880	4.634	4.500	4.500	5.000	100.0	.035	.015	.0260	.0023	3.002
3.03	0.1720	4.608	4.600	4.600	5.000	100.0	.035	.015	.0074	.0023	3.003
1.05d	.00001	0.000	1.000	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.004
1.06	2.265	5.285	3.000	3.000	5.000	100.0	.035	.015	.0351	.0031	1.005
5.00	2.460	0.000	8.000	0.000	5.000	0.000	.050	0.00	.0296	0.000	4.000
1.07d	.00001	0.000	3.000	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.006
1.08d	.00001	.00001	2.500	2.500	5.000	100.0	.035	.015	0.000	0.000	1.007
1.09	1.201	2.230	2.500	2.500	5.000	100.0	.035	.015	.0277	.0021	1.008
4.00	0.2000	4.685	4.000	4.000	5.000	100.0	.035	.015	.0086	.0025	5.000
4.01	0.2000	6.566	4.000	4.000	5.000	100.0	.035	.015	.0086	.0030	5.001
1.10d	.00001	0.000	2.500	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.009
1.11	1.288	5.152	4.000	4.000	5.000	100.0	.035	.015	.0227	.0026	1.010
1.12	0.5140	3.156	3.600	3.600	5.000	100.0	.035	.015	.0148	.0021	1.011
6.00	3.894	9.086	2.500	2.500	5.000	100.0	.035	.015	.0510	.0045	6.000
6.01	0.1600	1.070	1.200	1.200	5.000	100.0	.035	.015	.0140	.0021	6.001
1.13d	.00001	0.000	1.000	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.012
1.14	2.912	6.188	2.000	2.000	5.000	100.0	.035	.015	.0490	.0041	1.013
8.00	2.384	5.066	3.000	3.000	5.000	100.0	.035	.015	.0361	.0030	7.000
1.15	1.800	1.110	1.000	1.000	5.000	100.0	.035	.015	.0539	.0024	1.014
7.00	3.100	0.000	1.000	0.000	10.00	0.000	.035	0.00	.0588	0.000	8.000
1.16d	.00001	0.000	1.250	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.015
24.00	0.9400	2.310	3.500	3.500	5.000	100.0	.035	.015	.0206	.0018	9.000
23.00	0.5300	1.310	4.400	4.400	5.000	100.0	.035	.015	.0136	.0012	10.00
23.01	4.100	0.4500	5.000	5.000	5.000	100.0	.050	.015	.0488	.0007	9.001
23.02	1.930	0.0200	2.000	2.000	10.00	100.0	.050	.015	.0428	.0002	9.002
19.00	0.2400	0.4800	4.600	4.600	5.000	100.0	.035	.015	.0088	.0007	11.00
18.00	1.280	2.620	5.800	5.800	5.000	100.0	.035	.015	.0188	.0015	12.00
14.00	0.5400	0.0600	4.000	4.000	5.000	100.0	.050	.015	.0190	.0003	13.00
15.00	2.750	3.490	4.500	4.500	5.000	100.0	.035	.015	.0317	.0020	14.00
15.01d	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0025	0.000	14.00
15.02	0.5500	1.400	6.000	6.000	5.000	100.0	.035	.015	.0119	.0011	14.00
13.00	1.220	2.270	5.500	5.500	5.000	100.0	.035	.015	.0188	.0015	15.00
13.01	0.7900	1.750	4.000	4.000	5.000	100.0	.050	.015	.0232	.0015	15.00
12.00	0.9100	1.860	4.500	4.500	5.000	100.0	.035	.015	.0179	.0015	16.00
10.00	7.470	0.8300	9.200	9.200	5.000	100.0	.050	.015	.0491	.0007	17.00
11.00	3.000	0.3300	12.50	12.50	5.000	100.0	.050	.015	.0262	.0004	18.00
10.01d	.00001	.00001	9.200	9.200	5.000	100.0	.050	.015	0.000	0.000	17.00
10.02	1.310	2.550	.0010	.0010	5.000	100.0	.035	.015	1.435	.1141	16.00
10.03	0.0180	0.1600	1.000	1.000	5.000	100.0	.035	.015	.0049	.0009	16.00
10.04d	.00001	.00001	.0010	.0010	5.000	100.0	.025	.025	.0025	.0004	13.00
16.00	0.5400	1.060	4.300	4.300	5.000	100.0	.035	.015	.0139	.0011	19.00
17.00	0.3300	0.6800	6.000	6.000	5.000	100.0	.035	.015	.0091	.0007	20.00
10.05d	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0025	0.000	13.00
10.06	0.2000	0.0200	4.300	4.300	5.000	100.0	.050	.015	.0109	.0001	13.00
10.07d	.00001	.00001	.0010	.0010	5.000	100.0	.035	.015	.0031	.0002	11.00
20.00	0.4500	1.110	4.300	4.300	5.000	100.0	.035	.015	.0127	.0011	21.00
21.00	0.6400	1.300	3.000	3.000	5.000	100.0	.035	.015	.0182	.0015	22.00
22.00	0.3200	0.7200	4.300	4.300	5.000	100.0	.035	.015	.0106	.0009	23.00
10.08	0.9400	0.1000	2.000	2.000	5.000	100.0	.035	.015	.0272	.0005	11.00
10.09	0.5400	0.000	.0010	0.000	5.000	0.000	.035	0.00	.9056	0.000	9.003
25.00	2.920	7.160	3.500	3.500	5.000	100.0	.035	.015	.0371	.0033	24.00
25.01	0.5500	0.0610	2.000	2.000	5.000	100.0	.035	.015	.0206	.0004	24.00
10.10d	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0025	0.000	9.004
10.11	2.800	0.3000	1.000	1.000	5.000	100.0	.035	.015	.0679	.0012	9.005
10.12	6.120	0.6800	1.000	1.000	5.000	100.0	.035	.015	.1019	.0018	9.006

26.00	0.2700	0.5900	2.800	2.800	5.000	100.0	.035	.015	.0120	.0010	25.00
26.01	1.250	4.440	2.800	2.800	5.000	100.0	.035	.015	.0267	.0029	25.00
27.00	1.430	3.300	3.000	3.000	5.000	100.0	.035	.015	.0277	.0024	26.00
26.02	0.4900	0.000	1.000	0.000	100.0	0.000	.035	0.00	.0039	0.000	25.00
10.13	3.770	0.4200	1.000	1.000	5.000	100.0	.035	.015	.0792	.0014	9.007
10.14d	.00001	0.000	.0010	0.000	5.000	0.000	.035	0.00	.0031	0.000	9.008
35.00	1.380	3.220	4.800	4.800	5.000	100.0	.035	.015	.0215	.0019	27.00
35.01	.00001	0.2000	1.000	1.000	5.000	100.0	.035	.015	0.000	.0010	27.00
34.00	1.850	4.300	4.000	4.000	5.000	100.0	.035	.015	.0274	.0024	28.00
34.02	.00001	0.3300	1.000	1.000	5.000	100.0	.035	.015	0.000	.0013	28.00
34.03d	.00001	0.000	.0010	0.000	0.000	0.000	.050	0.00	.0051	0.000	27.00
40.00	12.500	0.000	4.000	0.000	1.000	0.000	.050	0.00	.1156	0.000	29.00
41.00	7.320	0.000	3.400	0.000	1.000	0.000	.050	0.00	.0949	0.000	30.00
42.00	14.670	0.000	3.400	0.000	1.000	0.000	.050	0.00	.1363	0.000	31.00
40.01	11.480	0.000	1.000	0.000	1.000	0.000	.050	0.00	.2209	0.000	29.00
30.00	17.200	0.000	7.300	0.000	1.000	0.000	.050	0.00	.1011	0.000	32.00
30.01	6.100	0.000	3.400	0.000	1.000	0.000	.050	0.00	.0863	0.000	32.00
30.02	0.4900	0.000	5.000	0.000	1.000	0.000	.050	0.00	.0192	0.000	32.00
31.00	15.350	0.000	5.800	0.000	1.000	0.000	.050	0.00	.1069	0.000	33.00
31.01	7.420	0.000	5.800	0.000	1.000	0.000	.050	0.00	.0732	0.000	33.00
30.03d	.00001	0.000	4.000	0.000	1.000	0.000	.050	0.00	0.000	0.000	32.00
32.00	2.700	5.470	3.000	3.000	5.000	100.0	.035	.015	.0385	.0031	34.00
32.01	0.2740	0.5810	3.000	3.000	5.000	100.0	.035	.015	.0117	.0010	34.00
32.02	1.980	2.840	6.000	6.000	5.000	100.0	.035	.015	.0232	.0016	34.00
32.03	.00001	0.4000	1.000	1.000	5.000	100.0	.035	.015	0.000	.0014	34.00
32.04d	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0031	0.000	34.00
30.04	8.600	0.000	5.600	0.000	1.000	0.000	.050	0.00	.0805	0.000	32.00
30.05	3.340	0.000	2.700	0.000	1.000	0.000	.050	0.00	.0708	0.000	32.01
33.00	2.280	6.100	3.500	3.500	5.000	100.0	.035	.015	.0326	.0031	35.00
33.01	.00001	0.3900	1.000	1.000	5.000	100.0	.035	.015	0.000	.0014	35.00
30.06	3.540	0.000	3.600	0.000	5.000	0.000	.050	0.00	.0532	0.000	32.01
30.07d	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0031	0.000	29.00
43.00	2.270	2.270	1.700	1.700	5.000	100.0	.025	.015	.0369	.0026	36.00
44.00	2.060	0.000	1.700	0.000	1.000	0.000	.050	0.00	.0694	0.000	37.00
Basin6	5.630	0.000	.0100	0.000	100.0	0.000	.015	0.00	.0546	0.000	29.00
45.00	8.500	0.000	1.700	0.000	1.000	0.000	.035	0.00	.1102	0.000	38.00
45.01	3.450	10.350	1.500	1.500	5.000	100.0	.025	.015	.0488	.0062	38.00
HinchBkCk	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0031	0.000	1.016

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
2.00	5.767	20.00	1.000	2.500	0.000	133.23	206.62	0.3042	1080.	1.000
2.01	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.4032	1060.	0.000
1.00	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.9086	1060.	0.000
1.01	5.767	20.00	0.000	2.500	0.000	133.23	0.000	1.180	1060.	2.000
1.02	5.767	10.00	1.000	2.500	0.000	137.89	206.62	1.252	1060.	0.000
1.03d	5.767	10.00	0.000	2.500	0.000	137.89	0.000	1.655	1060.	1.500
1.04	5.767	10.00	1.000	2.500	0.000	137.89	206.62	1.860	1060.	0.000
3.00	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.2013	1020.	1.000
3.01	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.5571	1020.	1.500
3.02	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.9798	1020.	2.000
3.03	5.767	10.00	1.000	2.500	0.000	137.89	206.62	1.300	1020.	0.000
1.05d	5.767	10.00	0.000	2.500	0.000	137.89	0.000	3.151	1040.	3.330
1.06	5.767	10.00	1.000	2.500	0.000	137.89	206.62	3.636	1040.	.4200
5.00	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.1455	1010.	0.000
1.07d	5.767	10.00	0.000	2.500	0.000	137.89	0.000	3.781	1040.	.8300
1.08d	5.767	10.00	1.000	2.500	0.000	137.89	206.62	3.781	1040.	2.500
1.09	5.767	10.00	1.000	2.500	0.000	137.89	206.62	3.998	1040.	0.000
4.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.3446	980.0	2.000
4.01	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.8276	980.0	0.000
1.10d	5.767	10.00	0.000	2.500	0.000	137.89	0.000	4.772	1040.	1.500
1.11	5.767	10.00	1.000	2.500	0.000	137.89	206.62	5.191	1040.	1.000
1.12	5.767	10.00	1.000	2.500	0.000	137.89	206.62	5.430	1040.	0.000
6.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.8354	1070.	2.000
6.01	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.9152	1070.	0.000
1.13d	5.767	10.00	0.000	2.500	0.000	137.89	0.000	6.336	1040.	2.000
1.14	5.767	10.00	1.000	2.500	0.000	137.89	206.62	6.917	1040.	0.000
8.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.4803	1020.	0.000
1.15	5.767	10.00	1.000	2.500	0.000	137.89	206.62	7.568	1050.	0.000
7.00	5.767	10.00	0.000	2.500	0.000	137.89	0.000	0.1831	1080.	0.000
1.16d	5.767	10.00	0.000	2.500	0.000	137.89	0.000	7.065	1090.	0.000
24.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.2100	1020.	0.000
23.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.1224	1000.	2.400
23.01	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.6006	1040.	1.400
23.02	5.767	20.00	1.000	2.500	0.000	133.23	206.62	0.7159	1040.	0.000
19.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.0472	1000.	0.000
18.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.2546	1000.	0.000
14.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.0360	1020.	0.000
15.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.3973	1020.	1.500
15.01d	5.767	10.00	0.000	2.500	0.000	137.89	0.000	0.3973	1020.	.5000
15.02	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.5257	1020.	0.000
13.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.2268	1000.	.5000
13.01	5.767	20.00	1.000	2.500	0.000	133.23	206.62	0.3891	1020.	0.000

12.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.1803	1000.	.5000
10.00	5.767	20.00	1.000	2.500	0.000	133.23	206.62	0.4978	1020.	0.000
11.00	5.767	20.00	1.000	2.500	0.000	133.23	206.62	0.1999	1010.	1.130
10.01d	5.767	20.00	1.000	2.500	0.000	133.23	206.62	0.6975	1020.	0.000
10.02	5.767	10.00	1.000	2.500	0.000	137.89	206.62	1.034	1080.	0.000
10.03	5.767	10.00	1.000	2.500	0.000	137.89	206.62	1.045	1080.	0.000
10.04d	5.767	10.00	1.000	2.500	0.000	137.89	206.62	1.985	1080.	0.000
16.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.1052	1000.	0.000
17.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.0665	1000.	0.000
10.05d	5.767	10.00	0.000	2.500	0.000	137.89	0.000	2.152	1080.	0.000
10.06	5.767	10.00	1.000	2.500	0.000	137.89	206.62	2.165	1080.	0.000
10.07d	5.767	10.00	1.000	2.500	0.000	137.89	206.62	2.459	1080.	0.000
20.00	5.767	20.00	1.000	2.500	0.000	133.23	206.62	0.1038	1000.	0.000
21.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.1272	1020.	0.000
22.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.0687	1000.	0.000
10.08	5.767	10.00	1.000	2.500	0.000	137.89	206.62	2.813	1080.	0.000
10.09	5.767	20.00	0.000	2.500	0.000	133.23	0.000	3.355	1080.	0.000
25.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.6565	1020.	0.000
25.01	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.6930	1020.	0.000
10.10d	5.767	20.00	0.000	2.500	0.000	133.23	0.000	3.952	1080.	1.600
10.11	5.767	10.00	1.000	2.500	0.000	137.89	206.62	4.136	1080.	3.000
10.12	5.767	10.00	1.000	2.500	0.000	137.89	206.62	4.538	1080.	.5000
26.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.0564	1000.	4.300
26.01	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.4271	1000.	.5000
27.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.3050	1020.	3.000
26.02	5.767	10.00	0.000	2.500	0.000	137.89	0.000	0.7605	1020.	1.500
10.13	5.767	10.00	1.000	2.500	0.000	137.89	206.62	5.540	1080.	0.000
10.14d	5.767	10.00	0.000	2.500	0.000	137.89	0.000	5.540	1080.	0.000
35.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.3012	1000.	0.000
35.01	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.3148	1000.	3.000
34.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.4022	1000.	1.500
34.02	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.4246	1000.	1.000
34.03d	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.7020	1080.	0.000
40.00	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.7349	1080.	3.000
41.00	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.4310	1080.	3.000
42.00	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.8569	1080.	3.000
40.01	5.767	20.00	0.000	2.500	0.000	133.23	0.000	2.597	1080.	0.000
30.00	5.767	20.00	0.000	2.500	0.000	133.23	0.000	1.016	1080.	3.000
30.01	5.767	20.00	0.000	2.500	0.000	133.23	0.000	1.375	1080.	1.000
30.02	5.767	20.00	0.000	2.500	0.000	133.23	0.000	1.404	1080.	0.000
31.00	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.9062	1080.	1.500
31.01	5.767	20.00	0.000	2.500	0.000	133.23	0.000	1.345	1080.	0.000
30.03d	5.767	20.00	0.000	2.500	0.000	133.23	0.000	2.749	1080.	2.000
32.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.5254	1020.	1.000
32.01	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.5808	1020.	1.250
32.02	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.8888	1020.	0.000
32.03	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.9155	1020.	0.000
32.04d	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.6741	1100.	.5000
30.04	5.767	20.00	0.000	2.500	0.000	133.23	0.000	3.925	1080.	2.000
30.05	5.767	20.00	0.000	2.500	0.000	133.23	0.000	4.122	1080.	2.000
33.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.5483	1000.	1.000
33.01	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.5748	1000.	.5000
30.06	5.767	20.00	0.000	2.500	0.000	133.23	0.000	4.736	1080.	0.000
30.07d	5.767	1.000	0.000	0.000	0.000	206.62	0.000	7.333	1080.	0.000
43.00	5.767	10.00	1.000	2.500	0.000	137.89	206.62	0.2856	1050.	0.000
44.00	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.1212	1080.	0.000
Basin6	5.767	20.00	0.000	2.500	0.000	133.23	0.000	8.069	1080.	0.000
45.00	5.767	20.00	0.000	2.500	0.000	133.23	0.000	0.4994	1080.	0.000
45.01	5.767	10.00	1.000	2.500	0.000	137.89	206.62	1.387	1070.	0.000
HinchBkCk	5.767	20.00	0.000	2.500	0.000	133.23	0.000	17.139	1080.	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
1.14	1040.	6.916	1050.	6.914	189019.	0.0000	1818.8	37.565
1.15	1050.	7.567	1090.	6.888	207541.	0.0000	12998.0	35.429
10.08	1080.	2.813	1080.	2.639	77879.0	0.0000	6043.2	47.672
25.01	1020.	.6930	1090.	.5980	19699.2	0.0000	1105.9	47.868
26.02	1020.	.7605	1080.	.7529	21947.5	0.0000	646.37	37.132
35.01	1000.	.3148	1010.	.3074	8966.4	0.0000	6.6970	49.606
34.02	1000.	.4246	1080.	.3946	12113.4	0.0000	675.67	43.054
32.03	1020.	.9155	1100.	.6741	26020.2	0.0000	2554.5	51.550
33.01	1000.	.5748	1100.	.4128	16548.6	0.0000	3036.0	46.587
Basin6	1080.	8.069	1340.	3.324	204485.	0.0000	93396.2	44.420

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
1.14	3.0		1.200	3.300	20.320	0.5000
1.15	2.0	1.000		0.000	15.000	0.5000

10.08	1.0	1.000	0.000	15.000	0.2000
25.01	1.0	1.000	0.000	15.000	0.2000
26.02	2.0	1.000	0.000	15.000	0.2000
35.01	1.0	1.000	0.000	20.000	0.2000
34.02	1.0	1.000	0.000	15.000	0.2000
32.03	1.0	1.000	0.000	15.000	0.2000
33.01	1.0	1.000	0.000	20.000	0.5000
Basin6	1.0	1.000	0.000	50.000	1.000

Run completed at: 22nd February 2010 7:19:15

mik open 0

Attachment C

XP-RAFTS Results –100 year ARI, 2160 Minute Storm

HOXTON PARK - Design Catchment - With Detention (100yr)

Results for period from 0: 0.0 7/ 4/2002
to 2: 0.0 9/ 4/2002

ROUTING INCREMENT (MINS) = 10.00
STORM DURATION (MINS) = 2160.
RETURN PERIOD (YRS) = 100.
BX = 1.5000
TOTAL OF FIRST SUB-AREAS (ha) = 252.61
TOTAL OF SECOND SUB-AREAS (ha) = 142.90
TOTAL OF ALL SUB-AREAS (ha) = 395.50

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area (ha) #1	#2	Slope (%) #1	#2	% Impervious (%) #1	#2	Pern #1	#2	B #1	#2	Link No.
2.00	5.150	.00001	3.500	.0010	8.000	0.000	.050	.025	.0582	.0031	1.000
2.01	0.5430	1.008	2.500	2.500	5.000	100.0	.035	.015	.0183	.0014	1.001
1.00	15.380	0.000	8.000	0.000	5.000	0.000	.050	0.00	.0767	0.000	2.000
1.01	4.590	0.000	8.000	0.000	5.000	0.000	.050	0.00	.0409	0.000	2.001
1.02	0.3960	0.7350	3.500	3.500	5.000	100.0	.035	.015	.0131	.0010	2.002
1.03d	.00001	0.000	3.500	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.002
1.04	1.195	2.035	3.500	3.500	5.000	100.0	.035	.015	.0233	.0017	1.003
3.00	3.390	0.000	10.00	0.000	5.000	0.000	.050	0.00	.0313	0.000	3.000
3.01	6.010	0.000	12.00	0.000	5.000	0.000	.050	0.00	.0384	0.000	3.001
3.02	1.880	4.634	4.500	4.500	5.000	100.0	.035	.015	.0260	.0023	3.002
3.03	0.1720	4.608	4.600	4.600	5.000	100.0	.035	.015	.0074	.0023	3.003
1.05d	.00001	0.000	1.000	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.004
1.06	2.265	5.285	3.000	3.000	5.000	100.0	.035	.015	.0351	.0031	1.005
5.00	2.460	0.000	8.000	0.000	5.000	0.000	.050	0.00	.0296	0.000	4.000
1.07d	.00001	0.000	3.000	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.006
1.08d	.00001	.00001	2.500	2.500	5.000	100.0	.035	.015	0.000	0.000	1.007
1.09	1.201	2.230	2.500	2.500	5.000	100.0	.035	.015	.0277	.0021	1.008
4.00	0.2000	4.685	4.000	4.000	5.000	100.0	.035	.015	.0086	.0025	5.000
4.01	0.2000	6.566	4.000	4.000	5.000	100.0	.035	.015	.0086	.0030	5.001
1.10d	.00001	0.000	2.500	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.009
1.11	1.288	5.152	4.000	4.000	5.000	100.0	.035	.015	.0227	.0026	1.010
1.12	0.5140	3.156	3.600	3.600	5.000	100.0	.035	.015	.0148	.0021	1.011
6.00	3.894	9.086	2.500	2.500	5.000	100.0	.035	.015	.0510	.0045	6.000
6.01	0.1600	1.070	1.200	1.200	5.000	100.0	.035	.015	.0140	.0021	6.001
1.13d	.00001	0.000	1.000	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.012
1.14	2.912	6.188	2.000	2.000	5.000	100.0	.035	.015	.0490	.0041	1.013
8.00	2.384	5.066	3.000	3.000	5.000	100.0	.035	.015	.0361	.0030	7.000
1.15	1.800	1.110	1.000	1.000	5.000	100.0	.035	.015	.0539	.0024	1.014
7.00	3.100	0.000	1.000	0.000	10.00	0.000	.035	0.00	.0588	0.000	8.000
1.16d	.00001	0.000	1.250	0.000	5.000	0.000	.035	0.00	0.000	0.000	1.015
24.00	0.9400	2.310	3.500	3.500	5.000	100.0	.035	.015	.0206	.0018	9.000
23.00	0.5300	1.310	4.400	4.400	5.000	100.0	.035	.015	.0136	.0012	10.00
23.01	4.100	0.4500	5.000	5.000	5.000	100.0	.050	.015	.0488	.0007	9.001
23.02	1.930	0.0200	2.000	2.000	10.00	100.0	.050	.015	.0428	.0002	9.002
19.00	0.2400	0.4800	4.600	4.600	5.000	100.0	.035	.015	.0088	.0007	11.00
18.00	1.280	2.620	5.800	5.800	5.000	100.0	.035	.015	.0188	.0015	12.00
14.00	0.5400	0.0600	4.000	4.000	5.000	100.0	.050	.015	.0190	.0003	13.00
15.00	2.750	3.490	4.500	4.500	5.000	100.0	.035	.015	.0317	.0020	14.00
15.01d	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0025	0.000	14.00
15.02	0.5500	1.400	6.000	6.000	5.000	100.0	.035	.015	.0119	.0011	14.00
13.00	1.220	2.270	5.500	5.500	5.000	100.0	.035	.015	.0188	.0015	15.00
13.01	0.7900	1.750	4.000	4.000	5.000	100.0	.050	.015	.0232	.0015	15.00
12.00	0.9100	1.860	4.500	4.500	5.000	100.0	.035	.015	.0179	.0015	16.00
10.00	7.470	0.8300	9.200	9.200	5.000	100.0	.050	.015	.0491	.0007	17.00
11.00	3.000	0.3300	12.50	12.50	5.000	100.0	.050	.015	.0262	.0004	18.00
10.01d	.00001	.00001	9.200	9.200	5.000	100.0	.050	.015	0.000	0.000	17.00
10.02	1.310	2.550	.0010	.0010	5.000	100.0	.035	.015	1.435	.1141	16.00
10.03	0.0180	0.1600	1.000	1.000	5.000	100.0	.035	.015	.0049	.0009	16.00
10.04d	.00001	.00001	.0010	.0010	5.000	100.0	.025	.025	.0025	.0004	13.00
16.00	0.5400	1.060	4.300	4.300	5.000	100.0	.035	.015	.0139	.0011	19.00
17.00	0.3300	0.6800	6.000	6.000	5.000	100.0	.035	.015	.0091	.0007	20.00
10.05d	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0025	0.000	13.00
10.06	0.2000	0.0200	4.300	4.300	5.000	100.0	.050	.015	.0109	.0001	13.00
10.07d	.00001	.00001	.0010	.0010	5.000	100.0	.035	.015	.0031	.0002	11.00
20.00	0.4500	1.110	4.300	4.300	5.000	100.0	.035	.015	.0127	.0011	21.00
21.00	0.6400	1.300	3.000	3.000	5.000	100.0	.035	.015	.0182	.0015	22.00
22.00	0.3200	0.7200	4.300	4.300	5.000	100.0	.035	.015	.0106	.0009	23.00
10.08	0.9400	0.1000	2.000	2.000	5.000	100.0	.035	.015	.0272	.0005	11.00
10.09	0.5400	0.000	.0010	0.000	5.000	0.000	.035	0.00	.9056	0.000	9.003
25.00	2.920	7.160	3.500	3.500	5.000	100.0	.035	.015	.0371	.0033	24.00
25.01	0.5500	0.0610	2.000	2.000	5.000	100.0	.035	.015	.0206	.0004	24.00
10.10d	.00001	0.000	.0010	0.000	5.000	0.000	.025	0.00	.0025	0.000	9.004
10.11	2.800	0.3000	1.000	1.000	5.000	100.0	.035	.015	.0679	.0012	9.005
10.12	6.120	0.6800	1.000	1.000	5.000	100.0	.035	.015	.1019	.0018	9.006

26.00	0.2700	0.5900	2.800	2.800	5.000	100.0	.035	.015	.0120	.0010	25.00
26.01	1.250	4.440	2.800	2.800	5.000	100.0	.035	.015	.0267	.0029	25.00
27.00	1.430	3.300	3.000	3.000	5.000	100.0	.035	.015	.0277	.0024	26.00
26.02	0.4900	0.000	1.000	0.000	100.0	0.000	.035	0.00	.0039	0.000	25.00
10.13	3.770	0.4200	1.000	1.000	5.000	100.0	.035	.015	.0792	.0014	9.007
10.14d	.00001	0.000	.0010	0.000	5.000	0.000	.035	0.00	.0031	0.000	9.008
35.00	1.380	3.220	4.800	4.800	5.000	100.0	.035	.015	.0215	.0019	27.00
35.01	.00001	0.2000	1.000	1.000	5.000	100.0	.035	.015	0.000	.0010	27.00
34.00	1.850	4.300	4.000	4.000	5.000	100.0	.035	.015	.0274	.0024	28.00
34.02	.00001	0.3300	1.000	1.000	5.000	100.0	.035	.015	0.000	.0013	28.00
34.03d	.00001	0.000	.0010	0.000	0.000	0.000	.050	0.00	.0051	0.000	27.00
40.00	12.500	0.000	4.000	0.000	1.000	0.000	.050	0.00	.1156	0.000	29.00
41.00	7.320	0.000	3.400	0.000	1.000	0.000	.050	0.00	.0949	0.000	30.00
42.00	14.670	0.000	3.400	0.000	1.000	0.000	.050	0.00	.1363	0.000	31.00
40.01	11.480	0.000	1.000	0.000	1.000	0.000	.050	0.00	.2209	0.000	29.00
30.00	17.200	0.000	7.300	0.000	1.000	0.000	.050	0.00	.1011	0.000	32.00
30.01	6.100	0.000	3.400	0.000	1.000	0.000	.050	0.00	.0863	0.000	32.00
30.02	0.4900	0.000	5.000	0.000	1.000	0.000	.050	0.00	.0192	0.000	32.00
31.00	15.350	0.000	5.800	0.000	1.000	0.000	.050	0.00	.1069	0.000	33.00
31.01	7.420	0.000	5.800	0.000	1.000	0.000	.050	0.00	.0732	0.000	33.00
30.03d	.00001	0.000	4.000	0.000	1.000	0.000	.050	0.00	0.000	0.000	32.00
32.00	2.700	5.470	3.000	3.000	5.000	100.0	.035	.015	.0385	.0031	34.00
32.01	0.2740	0.5810	3.000	3.000	5.000	100.0	.035	.015	.0117	.0010	34.00
32.02	1.980	2.840	6.000	6.000	5.000	100.0	.035	.015	.0232	.0016	34.00
32.03	.00001	0.4000	1.000	1.000	5.000	100.0	.035	.015	0.000	.0014	34.00
32.04d	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0031	0.000	34.00
30.04	8.600	0.000	5.600	0.000	1.000	0.000	.050	0.00	.0805	0.000	32.00
30.05	3.340	0.000	2.700	0.000	1.000	0.000	.050	0.00	.0708	0.000	32.01
33.00	2.280	6.100	3.500	3.500	5.000	100.0	.035	.015	.0326	.0031	35.00
33.01	.00001	0.3900	1.000	1.000	5.000	100.0	.035	.015	0.000	.0014	35.00
30.06	3.540	0.000	3.600	0.000	5.000	0.000	.050	0.00	.0532	0.000	32.01
30.07d	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0031	0.000	29.00
43.00	2.270	2.270	1.700	1.700	5.000	100.0	.025	.015	.0369	.0026	36.00
44.00	2.060	0.000	1.700	0.000	1.000	0.000	.050	0.00	.0694	0.000	37.00
Basin6	5.630	0.000	.0100	0.000	100.0	0.000	.015	0.00	.0546	0.000	29.00
45.00	8.500	0.000	1.700	0.000	1.000	0.000	.035	0.00	.1102	0.000	38.00
45.01	3.450	10.350	1.500	1.500	5.000	100.0	.025	.015	.0488	.0062	38.00
HinchBkCk	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0031	0.000	1.016

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
2.00	7.747	20.00	1.000	2.500	0.000	196.65	277.88	0.3890	1080.	1.000
2.01	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.5145	1060.	0.000
1.00	7.747	20.00	0.000	2.500	0.000	196.65	0.000	1.163	1040.	0.000
1.01	7.747	20.00	0.000	2.500	0.000	196.65	0.000	1.509	1040.	2.000
1.02	7.747	10.00	1.000	2.500	0.000	201.33	277.88	1.601	1040.	0.000
1.03d	7.747	10.00	0.000	2.500	0.000	201.33	0.000	2.115	1040.	1.500
1.04	7.747	10.00	1.000	2.500	0.000	201.33	277.88	2.374	1040.	0.000
3.00	7.747	20.00	0.000	2.500	0.000	196.65	0.000	0.2578	1010.	1.000
3.01	7.747	20.00	0.000	2.500	0.000	196.65	0.000	0.7139	1010.	1.500
3.02	7.747	10.00	1.000	2.500	0.000	201.33	277.88	1.243	1020.	2.000
3.03	7.747	10.00	1.000	2.500	0.000	201.33	277.88	1.651	1000.	0.000
1.05d	7.747	10.00	0.000	2.500	0.000	201.33	0.000	4.011	1040.	3.330
1.06	7.747	10.00	1.000	2.500	0.000	201.33	277.88	4.623	1040.	.4200
5.00	7.747	20.00	0.000	2.500	0.000	196.65	0.000	0.1865	1020.	0.000
1.07d	7.747	10.00	0.000	2.500	0.000	201.33	0.000	4.809	1040.	.8300
1.08d	7.747	10.00	1.000	2.500	0.000	201.33	277.88	4.809	1040.	2.500
1.09	7.747	10.00	1.000	2.500	0.000	201.33	277.88	5.084	1040.	0.000
4.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.4302	980.0	2.000
4.01	7.747	10.00	1.000	2.500	0.000	201.33	277.88	1.028	980.0	0.000
1.10d	7.747	10.00	0.000	2.500	0.000	201.33	0.000	6.057	1020.	1.500
1.11	7.747	10.00	1.000	2.500	0.000	201.33	277.88	6.591	1020.	1.000
1.12	7.747	10.00	1.000	2.500	0.000	201.33	277.88	6.895	1020.	0.000
6.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	1.049	1050.	2.000
6.01	7.747	10.00	1.000	2.500	0.000	201.33	277.88	1.147	1050.	0.000
1.13d	7.747	10.00	0.000	2.500	0.000	201.33	0.000	8.037	1020.	2.000
1.14	7.747	10.00	1.000	2.500	0.000	201.33	277.88	8.768	1020.	0.000
8.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.6073	1020.	0.000
1.15	7.747	10.00	1.000	2.500	0.000	201.33	277.88	9.556	1050.	0.000
7.00	7.747	10.00	0.000	2.500	0.000	201.33	0.000	0.2341	1080.	0.000
1.16d	7.747	10.00	0.000	2.500	0.000	201.33	0.000	9.709	1080.	0.000
24.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.2666	1000.	0.000
23.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.1527	1000.	2.400
23.01	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.7602	1040.	1.400
23.02	7.747	20.00	1.000	2.500	0.000	196.65	277.88	0.9075	1040.	0.000
19.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.0594	1000.	0.000
18.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.3210	1000.	0.000
14.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.0460	1020.	0.000
15.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.5023	1020.	1.500
15.01d	7.747	10.00	0.000	2.500	0.000	201.33	0.000	0.5023	1020.	.5000
15.02	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.6638	1000.	0.000
13.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.2866	1000.	.5000
13.01	7.747	20.00	1.000	2.500	0.000	196.65	277.88	0.4906	1000.	0.000

12.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.2271	1000.	.5000
10.00	7.747	20.00	1.000	2.500	0.000	196.65	277.88	0.6354	1020.	0.000
11.00	7.747	20.00	1.000	2.500	0.000	196.65	277.88	0.2574	1000.	1.130
10.01d	7.747	20.00	1.000	2.500	0.000	196.65	277.88	0.8895	1020.	0.000
10.02	7.747	10.00	1.000	2.500	0.000	201.33	277.88	1.315	1080.	0.000
10.03	7.747	10.00	1.000	2.500	0.000	201.33	277.88	1.329	1080.	0.000
10.04d	7.747	10.00	1.000	2.500	0.000	201.33	277.88	2.511	1080.	0.000
16.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.1327	1000.	0.000
17.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.0839	1000.	0.000
10.05d	7.747	10.00	0.000	2.500	0.000	201.33	0.000	2.723	1080.	0.000
10.06	7.747	10.00	1.000	2.500	0.000	201.33	277.88	2.739	1080.	0.000
10.07d	7.747	10.00	1.000	2.500	0.000	201.33	277.88	3.110	1080.	0.000
20.00	7.747	20.00	1.000	2.500	0.000	196.65	277.88	0.1304	1000.	0.000
21.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.1589	1000.	0.000
22.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.0866	1000.	0.000
10.08	7.747	10.00	1.000	2.500	0.000	201.33	277.88	3.557	1080.	0.000
10.09	7.747	20.00	0.000	2.500	0.000	196.65	0.000	4.102	1080.	0.000
25.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.8199	1000.	0.000
25.01	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.8655	1020.	0.000
10.10d	7.747	20.00	0.000	2.500	0.000	196.65	0.000	4.762	1080.	1.600
10.11	7.747	10.00	1.000	2.500	0.000	201.33	277.88	4.998	1080.	3.000
10.12	7.747	10.00	1.000	2.500	0.000	201.33	277.88	5.514	1080.	.5000
26.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.0714	1000.	4.300
26.01	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.5452	1000.	.5000
27.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.3881	1000.	3.000
26.02	7.747	10.00	0.000	2.500	0.000	201.33	0.000	0.9698	1000.	1.500
10.13	7.747	10.00	1.000	2.500	0.000	201.33	277.88	6.778	1080.	0.000
10.14d	7.747	10.00	0.000	2.500	0.000	201.33	0.000	6.778	1080.	0.000
35.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.3796	1000.	0.000
35.01	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.3966	1000.	3.000
34.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.5079	1000.	1.500
34.02	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.5361	1000.	1.000
34.03d	7.747	20.00	0.000	2.500	0.000	196.65	0.000	0.8501	1080.	0.000
40.00	7.747	20.00	0.000	2.500	0.000	196.65	0.000	0.9431	1080.	3.000
41.00	7.747	20.00	0.000	2.500	0.000	196.65	0.000	0.5523	1080.	3.000
42.00	7.747	20.00	0.000	2.500	0.000	196.65	0.000	1.102	1080.	3.000
40.01	7.747	20.00	0.000	2.500	0.000	196.65	0.000	3.360	1080.	0.000
30.00	7.747	20.00	0.000	2.500	0.000	196.65	0.000	1.299	1080.	3.000
30.01	7.747	20.00	0.000	2.500	0.000	196.65	0.000	1.760	1080.	1.000
30.02	7.747	20.00	0.000	2.500	0.000	196.65	0.000	1.797	1080.	0.000
31.00	7.747	20.00	0.000	2.500	0.000	196.65	0.000	1.159	1080.	1.500
31.01	7.747	20.00	0.000	2.500	0.000	196.65	0.000	1.720	1080.	0.000
30.03d	7.747	20.00	0.000	2.500	0.000	196.65	0.000	3.516	1080.	2.000
32.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.6658	1020.	1.000
32.01	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.7356	1020.	1.250
32.02	7.747	10.00	1.000	2.500	0.000	201.33	277.88	1.125	1000.	0.000
32.03	7.747	10.00	1.000	2.500	0.000	201.33	277.88	1.159	1000.	0.000
32.04d	7.747	20.00	0.000	2.500	0.000	196.65	0.000	0.7963	1120.	.5000
30.04	7.747	20.00	0.000	2.500	0.000	196.65	0.000	4.941	1080.	2.000
30.05	7.747	20.00	0.000	2.500	0.000	196.65	0.000	5.193	1080.	2.000
33.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.6898	1000.	1.000
33.01	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.7231	1000.	.5000
30.06	7.747	20.00	0.000	2.500	0.000	196.65	0.000	6.012	1080.	0.000
30.07d	7.747	1.000	0.000	0.000	0.000	277.88	0.000	9.372	1080.	0.000
43.00	7.747	10.00	1.000	2.500	0.000	201.33	277.88	0.3596	1020.	0.000
44.00	7.747	20.00	0.000	2.500	0.000	196.65	0.000	0.1551	1080.	0.000
Basin6	7.747	20.00	0.000	2.500	0.000	196.65	0.000	10.310	1080.	0.000
45.00	7.747	20.00	0.000	2.500	0.000	196.65	0.000	0.6390	1080.	0.000
45.01	7.747	10.00	1.000	2.500	0.000	201.33	277.88	1.754	1080.	0.000
HinchBkCk	7.747	20.00	0.000	2.500	0.000	196.65	0.000	22.212	1080.	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
1.14	1020.	8.768	1030.	8.739	263340.	0.0000	2119.9	37.609
1.15	1050.	9.555	1080.	9.474	288918.	0.0000	15340.2	35.581
10.08	1080.	3.557	1090.	3.203	108846.	0.0000	8434.3	47.984
25.01	1020.	.8655	1090.	.6654	27044.5	0.0000	2026.1	48.270
26.02	1000.	.9698	1080.	.9451	30063.6	0.0000	877.16	37.247
35.01	1000.	.3966	1080.	.3602	12278.2	0.0000	292.86	49.880
34.02	1000.	.5361	1080.	.4899	16585.4	0.0000	968.60	43.267
32.03	1000.	1.158	1120.	.7963	35781.7	0.0000	3966.7	52.105
33.01	1000.	.7231	1090.	.5758	22618.6	0.0000	3896.2	46.885
Basin6	1080.	10.31	1350.	3.994	296722.	0.0000	136330.	45.340

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
1.14	3.0		1.200	3.300	20.320	0.5000
1.15	2.0	1.000		0.000	15.000	0.5000

10.08	1.0	1.000	0.000	15.000	0.2000
25.01	1.0	1.000	0.000	15.000	0.2000
26.02	2.0	1.000	0.000	15.000	0.2000
35.01	1.0	1.000	0.000	20.000	0.2000
34.02	1.0	1.000	0.000	15.000	0.2000
32.03	1.0	1.000	0.000	15.000	0.2000
33.01	1.0	1.000	0.000	20.000	0.5000
Basin6	1.0	1.000	0.000	50.000	1.000

Run completed at: 22nd February 2010 7:20:38

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