WOOLLAHRA MUNICIPAL COUNCIL

RUSHCUTTERS BAY CATCHMENT FLOOD STUDY

OCTOBER 2007

WEBB, McKEOWN & ASSOCIATES PTY LTD

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FOREWORD

The NSW State Government's Flood Policy provides a framework to ensure the sustainable use of floodplain environments. The policy is specifically structured to provide solutions to existing flooding problems in rural and urban areas. In addition, the Policy provides a means of ensuring that any new development is compatible with the flood hazard and does not create additional flooding problems in other areas.

Under the Policy, the management of flood liable land remains the responsibility of local government. The State Government subsidises flood mitigation works to alleviate existing problems and provides specialist technical advice to assist Councils in the discharge of their floodplain management responsibilities.

The Policy provides for technical and financial support by the Government through four sequential stages:

1. *Flood Study*
   - determine the nature and extent of the flood problem.
2. *Floodplain Risk Management Study*
   - evaluates management options for the floodplain in respect of both existing and proposed development.
3. *Floodplain Risk Management Plan*
   - involves formal adoption by Council of a plan of management for the floodplain.
4. *Implementation of the Plan*
   - construction of flood mitigation works to protect existing development,
   - use of Local Environmental Plans to ensure new development is compatible with the flood hazard.

The Rushcutters Bay Catchment Flood Study constitutes the first stage of the management process for the Rushcutters Bay Catchment. Webb, McKeown & Associates were commissioned by Woollahra Municipal Council to prepare this flood study on behalf of Council's Floodplain Risk Management Committee. Funding for this study was provided from the State Governments Flood Risk Management Program and Woollahra Municipal Council on a 2:1 basis. The following report documents the work undertaken and presents outcomes that define flood behaviour for existing catchment conditions.

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EXECUTIVE SUMMARY

The NSW Government's Flood Policy provides for:

- a framework to ensure the sustainable use of floodplain environments,
- solutions to flooding problems,
- a means of ensuring new development is compatible with the flood hazard.

Implementation of the Policy requires a four stage approach, the first of which is preparation of a Flood Study to determine the nature and extent of the flood problem.

The Rushcutters Bay Catchment Flood Study was initiated as a result of road and residential area flooding, most recently in March 2003, February 2001, August 1998 and April 1998, as well as major catchment wide flooding in January 1991, January, March and April 1989, November 1984 and August 1983. This report was prepared by Webb, McKeown & Associates for Woollahra Municipal Council in 2006.

The specific aims of the Rushcutters Bay Flood Study were to:

- define flood behaviour in the Rushcutters Bay catchment,
- prepare flood hazard and flood extent mapping,
- prepare suitable models of the catchment and floodplain for use in a subsequent Floodplain Risk Management Study and Plan.

Rushcutters Bay has a catchment area of approximately 2.4 km^2. The area drains to Sydney Harbour (Figure 1) and includes the suburbs of Paddington, Rushcutters Bay and parts of Edgecliff, Woollahra and Darlinghurst. The catchment is characterised by an upper and a lower section.

The upper section of the catchment comprises medium density urban developments, including terrace and free-standing residences, commercial developments and limited areas of open space. Stormwater is carried within an underground piped network, or when this is exceeded, along roads or into private property. There have been several instances of flooding of roads and property in the past 20 years. It should be noted that most of the drainage infrastructure was built in the 1930's.

The lower section comprises the lower slopes where stormwater travels across Trumper Park and into the open channel through the White City tennis complex. Craigend Street and New South Head Road form significant barriers to flow as all stormwater is channelled into twin culverts under the roads. One culvert connects to a sandstone lined channel which enters Rushcutters Bay, the other exits directly into Rushcutters Bay. The channel is tidal to upstream of Craigend Street.

Hydrologic and hydraulic investigations were undertaken to determine the response of the drainage system to 5 year, 10 year, 20 year, 50 year, 100 year ARI events, and the Probable Maximum Flood (PMF). The results of these investigations were quantified as peak pipe capacities and peak overland flows in the upper reaches and peak flood levels, flows and velocities in the lower catchment.

The key Flood Study phases undertaken were:

Review all available data, namely:

- reports, photographs, Council records,
- newsletter and questionnaire response,
- review of Council's database of resident reports,
- review of rainfall data,
- a comprehensive Airborne Laser Scanning (ALS) survey was undertaken in 2006 to obtain ground levels across the entire catchment,
- review and updating of Council's pit and pipe database,
- field survey of the open channel sections and the culverts under Craigend Street and New South Head Road.

Determine Approach: A rainfall-runoff approach was adopted due to the absence of long term historical flood data. This approach involved setting up a DRAINS hydrologic and hydraulic computer model that simulated flow both in the pipe system and as overland through private property and along roads. The DRAINS model covered the entire catchment. A two-dimensional (2D) SOBEK computer model was established in the lower reaches to convert the upstream flows obtained from DRAINS into flood levels and velocities. The SOBEK model covered the open channel section from Hampden Street to Sydney Harbour at Rushcutters Bay.

Calibration to Historical Flood Levels: Due to the lack of data a rigorous calibration of the two computer models could not be undertaken. However, a limited calibration of the SOBEK model to historical flood height data was undertaken. This generally indicated that the SOBEK results were higher than the historical data. Reasons were provided for this difference.

Determination of Design Flood Flows and Levels: Design rainfall data from Council and design temporal patterns from Australian Rainfall and Runoff (1987) were obtained and input to the DRAINS model to determine design flood flows. The SOBEK model was used to determine design flood levels in the lower catchment. The creek downstream of New South Head Road is influenced by catchment flows and elevated water levels in Rushcutters Bay.

Sensitivity analyses were undertaken on the DRAINS and SOBEK model results. Due to the limited quality and quantity of the calibration data and in view of the sensitivity analyses, the order of accuracy was estimated at up to ±0.3 m for the reach downstream of New South Head Road and ±0.5 m for the reaches upstream. These orders of accuracy are typical of such studies and can only be improved upon with additional observed flood data to refine the model calibration.

Flood Problem Areas: The study indicated that floodwaters cross Trumper Park and the White City tennis complex in 5 year ARI and greater events. The yards of many private properties adjoining the open channel would also be inundated. In the upper parts of the catchment floodwaters would cross roads and enter private properties.

Outcomes: The main outcomes were as follows:

- full documentation of the methodology and results,
- preparation of flood contour, hazard and extent maps for the open channel section of the Rushcutters Bay catchment and upstream to Hampden Street,
- identification of peak overland flows and pipe capacities in the piped and overland flow section of the catchment,
- a modelling platform that will form the basis for a subsequent Floodplain Risk Management Study and Plan.

One outcome from the study was to highlight the importance of collecting and maintaining a database of historical rainfall and flood height data. Whilst both Woollahra Municipal Council and Sydney Water have some flooding records, it is vital that flood height data from any future events be recorded (photographed) within say 24 hours of the event. In the upper catchment the magnitude and direction of flow paths should also be accurately recorded.

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1. INTRODUCTION

1.1 General

The Rushcutters Bay catchment between Sydney Harbour and Oxford Street (Figure 1) is located primarily within the Woollahra Municipal Council Local Government Area (LGA). A small part is located within the City of Sydney LGA. The catchment drains the suburbs of Paddington, Rushcutters Bay and parts of Darlinghurst, Edgecliff and Woollahra.

Flooding problems have been experienced at a number of locations within the catchment during periods of heavy rainfall. Woollahra Municipal Council has undertaken to address this issue by preparing a comprehensive Flood Study covering both the upper and lower parts of the catchments. The upper section comprises a pipe and overland flow system whilst the lower section comprises an open channel section through the White City tennis complex.

The drainage systems within the upper catchment comprises a network of underground pipes that were largely installed by Woollahra Municipal Council in the 1930's. The open channel section and larger pipe systems were installed by Sydney Water.

The land usage within the study area is predominantly urban residential development, comprising a mixture of pre-1900 terrace buildings and new brick buildings including a number of medium density developments. The non-residential development in the catchment includes several schools, parks (including Trumper Park and the White City tennis complex), churches and community buildings. There are no significant industrial developments and few major commercial developments.

The area drains into Sydney Harbour at Rushcutters Bay via the Sydney Water open channel, which generally runs in a north-westerly direction. The channel floodplain is largely contained within a series of parks and open space areas. Upstream of Glenmore Road the main channel is covered through Trumper Park up to Jersey Road and beyond.

1.2 Objectives

Woollahra Municipal Council engaged Webb McKeown & Associates to undertake the Rushcutters Bay Catchment Flood Study utilising current technology and data. The information and results obtained from the study provide a firm basis for the development of targeted stormwater management strategies, and a subsequent Floodplain Risk Management Study and Plan.

The study was developed in order to meet the primary objective of defining the flood behaviour (5 year, 10 year, 20 year, 50 year, 100 year ARI design storms and the Probable Maximum Flood) in the Rushcutters Bay catchment and:

- to assess the adequacy and capacity of Council's existing pipe network and quantify overland flows,
- identify overland flow paths and determine design flood levels and velocities adjacent to the open channel.

This report details the results and findings of the Flood Study investigations. The key elements include:

- a summary of available historical flood related data,
- calibration of the hydrologic and hydraulic models,
- definition of the design flood behaviour for existing conditions through the analysis and interpretation of model results.

A glossary of flood related terms is provided in Appendix A.

2. BACKGROUND

2.1 Catchment Description

As noted previously, the entire catchment has been developed for mostly residential, commercial or light industrial purposes with the only areas of open space as parks. There is only one area of natural bushland remaining and this lies to the north of Trumper Park. In terms of local drainage, the roads have been formed with kerbs and gutters draining to an underground pipe system which discharges to the open channel system. The open channel system consists entirely of a lined channel with no natural channel remaining.

Much of the urbanisation occurred prior to the installation of drainage systems in the 1900s, and hence many buildings lie on overland flow paths. The large numbers of terraced houses with small gardens mean the proportion of impervious paved areas is large.

Significant catchment development occurred in the latter part of the 19th century. The 1861 census indicated a population of 2,700 which rose to 19,000 by 1890. In that time the number of houses increased from approximately 500 to 3,800. The current catchment population is of the order of 15,000 (Reference 1). Early references clearly identify parts of the lower catchment as low lying and swampy. There was also mention of surface and stormwater problems (flooding and water quality).

The effect of urbanisation on the quantity (and quality) of runoff from the catchment has not been assessed but would have been significant. As the catchment is already heavily urbanised any new developments are unlikely to produce further significant increases in peak flows, particularly as Council has an On-site Storage Detention Policy to ensure post development peak flows are not increased.

Reference 1 indicates the catchment land use as:

- low density residential - 55%,
- medium density residential - 13%,
- retail and commercial - 5%,
- industrial - 4%,
- open space - 10%,
- others - 13%.

The open channel runs from immediately downstream of Glenmore Road, under New South Head Road and out to Sydney Harbour at Rushcutters Bay. The open channel is tidal to upstream of Craigend Street. The only major structures over the channel are two culverts running under Craigend Street and New South Head Road. One culvert (approximately 7.9 m wide and constructed in 1986) flows directly into Rushcutters Bay. The other (approximately 4.5 m wide) flows into the open channel adjacent to Rushcutters Bay oval. There are also two footbridges within the White City tennis complex.

2.2 Drainage System

2.2.1 Open Channel

Table 1 and Photographs 1 to 10 provide a descriptive overview of the key characteristics of the open channel drainage system downstream of Glenmore Road.

Table 1: Open Channel Dimensions

Location	Width of Lined Channel (m)	Height to Coping (m)	Approx. Waterway Area to Coping (m^2)	Photograph
Glenmore Road	2.8	1.4	3.2	1
u/s White City footbridge #1	2.9	1.3	3.1	2
White City	3.9	1.3	4.0	3
White City footbridge #2	4.5	1.3	4.5	5
u/s of Culvert	4.6	1.3	4.6	6
d/s of Culvert	6.8	1.8	9.5	8
Channel outlet	13.0	2.5	30.2	10

Note: The above dimensions are approximate.
Coping is the top of bank of a lined channel.

The open channel system is owned and administered by Sydney Water. In December 1986 the box culvert under New South Head Road and Craigend Street was amplified with construction of a 7.9 m wide by 1.8 m high box culvert. This 7.9 m by 1.8 m box culvert exits to Rushcutters Bay approximately 10 m east of the open channel. A 4.5 m wide box culvert to the west exits into the open channel. However the roof of this box culvert narrows under New South Head Road having a curved roof of maximum height 1.1 m reducing to 0.5 m (waterway area of 4.6 m^2). A central partition wall was constructed immediately upstream of the culvert headwalls to funnel the flow into the larger 7.9 m wide box culvert (Photographs 6 and 7).

In the past parts of the drainage system acted as a combined stormwater and sewerage system. However Sydney Water has undertaken works to largely (if not entirely) separate both systems.

2.2.2 Piped Drainage

Upstream of Glenmore Road the Sydney Water channel system becomes an underground box or pipe culvert. Table 2 provides a summary of the piped network system within the catchment. Photographs 11-14 show some features of the drainage system immediately upstream of the open channel.

Table 2: Pit and Pipe Drainage Network

Pit Type	Number
Kerb inlet only	48
Grate inlet only	153
Kerb and grate inlet	474
Junction or bend or inspection - no inlet	620
Outlets	27
Total	**1322**

Pipe Diameter	Number
Less than 300 mm	248
300 mm	476
375 mm	211
450 mm	109
525 mm	20
600 mm	77
750 mm	11
900 mm	31
1050 mm	8
1200 mm	6
1500 mm	5
1800 mm	6
Box culverts	100
Total	**1308**

Photo 1: Open Channel d/s of Glenmore Road

Photo 2: Looking u/s footbridge within White City tennis complex

Photo 3: Looking d/s from footbridge within White City

Photo 4: White City tennis complex looking u/s

Photo 5: White City tennis complex looking u/s

Photo 6: u/s of New South Head Road culverts

Photo 7: Culverts u/s of New South Head Road

Photo 8: d/s of culvert under New South Head Road

Photo 9: Rushcutters Bay Park, looking d/s

Photo 10: Mouth of Rushcutters Bay channel with water quality boom

Photo 11: Grate inlet in front of underground carpark, Hampden Street

Photo 12: Kerb inlet in Cecil Street

Photo 13: Obstructed overland flow path in Cecil Street

Photo 14: Trumper Park looking d/s

2.3 Previous Studies

The following sections are a summary of previous investigations in the study area.

2.3.1 Rushcutters Bay SWC No. 84 Catchment Management Study

The Rushcutters Bay SWC No. 84 Catchment Management Study, 1991 (Reference 1) was undertaken as an overall investigation of stormwater drainage and water pollution issues in the catchment. The full length of the open channel and piped system controlled by Sydney Water, Woollahra and the City of Sydney Councils was examined.

A large part of the report covered water quality issues not relevant to this Flood Study. However, the study included a comprehensive questionnaire survey (8,900 sent out), the results of which have been reproduced in this study (Section 3.4.2) as they are still relevant.

An ILSAX hydrological model and a HEC-2 hydraulic model were developed and based on the results a cost-benefit analysis was undertaken to assess measures to reduce flooding. The main recommendations from the report (relating to stormwater drainage) were to provide new and duplicate pipe systems. The study found many of the pipes in the catchment had a 1 year ARI capacity.

The main limitation of the hydraulic modelling was the complexity of the culverts under New South Head Road. The study advised that model flood levels around the White City tennis centre should not be used to establish minimum floor levels and that a physical hydraulic model be developed for that purpose.

2.3.2 White City Stormwater Modelling Water Level and Velocity Measurements

Following from the main outcome of Reference 1, a physical hydraulic model was constructed to establish floor level controls for the redevelopment of the White City tennis centre (Reference 2) 2001. The physical model indicated that flood flows would not remain supercritical along the entire length of the open channel, as assumed in Reference 1, and hence higher flood levels (by up to 1 m) were defined.

The study concluded that the 20 year and 100 year ARI events would not submerge the New South Head Road culverts and therefore that the flood levels were controlled by the open channel and floodplain storage capacity upstream of the culverts. The study recommended that the significant temporary floodplain storage upstream of the culverts be taken into account through the use of a dynamic rather than a steady state hydraulic modelling system. The report also highlighted the lack of model calibration due to the limited amount of recorded flood height data.

2.3.3 Cecil and Hampden Streets, Paddington Drainage Investigation

The Cecil and Hampden Streets, Paddington Drainage Investigation 2004 (Reference 3), examined a small part of the catchment in the area of Cecil and Hampden Streets where localised flooding had occurred numerous times. The study used a DRAINS model and found that the small pipe drainage capacity and limited overflow routes allowed water to pond in these areas. The study then identified options to alleviate these problems. Stage 1 of the works (replacement of a blocked line with a new line via Hampden Street and Cecil Street to the Sydney Water system) was recently completed.

2.4 Causes of Flooding

Based on the available information it is clear that flooding within the Rushcutters Bay catchment may occur as a result of a combination of factors including:

- Elevated water levels in Rushcutters Bay due to a high tide and/or storm surge.
- Elevated water levels within the open channel section of the Rushcutters Bay catchment and along roads and through private property as a result of intense rain over the Rushcutters Bay catchment. The water levels in the channel and elsewhere may also be affected by constrictions (e.g. culverts, blockages, fences, buildings).
- Local runoff over a small area accumulating (ponding) in low spots. Generally this occurs in relatively flat areas with limited potential for drainage. This type of flooding may be exacerbated by inadequate or blocked local drainage provisions and restricted overland flow paths.

The factors causing flooding may occur in isolation or in combination with each other. The peak levels in the Parramatta River would typically result from ocean influences (tides, storm surge) which may or may not occur in conjunction with intense rainfall over the catchment causing flooding.

The rainfall event causing flooding within the Rushcutters Bay catchment may occur as part of a longer duration storm that also causes flooding of the Parramatta River. Alternatively, it may occur as a thunderstorm (as occurred in all previous events in the 1980's and 1990's) that does not produce flooding on the Parramatta River. Elevated water levels can also occur in Rushcutters Bay itself without significant flooding in the Rushcutters Bay catchment. Thus flooding in the Rushcutters Bay catchment and in Rushcutters Bay itself can be independent events which do not necessarily result from the same period of oceanic and meteorologic conditions.

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3. DATA

The first stage in the investigation of flooding matters is to establish the nature, size and frequency of the problem. On large river systems such as the Hawkesbury River there are generally stream height and historical records dating back to the early 1900's, or in some cases even further. However, in small urban catchments such as Rushcutters Bay there are no stream gauges or official historical records available. A picture of flooding must therefore be obtained from an examination of rainfall records and local knowledge. For this reason, a comprehensive data collection exercise was undertaken.

3.1 Historical Rainfall

3.1.1 Overview

Rainfall data is recorded either daily (24hr rainfall totals to 9:00am) or continuously (pluviometers measuring rainfall in 0.5 mm rainfall increments). Daily rainfall data have been recorded for over 100 years at many locations within the Sydney basin, including at Observatory Hill since 1858. In general, pluviometers have only been installed since the 1970's. Together these records provide a picture of when and how often large rainfall events have occurred in the past.

However, care must be taken when interpreting historical rainfall measurements. Rainfall records may not provide an accurate representation of past events due to a combination of factors including local site conditions, human error or limitations inherent to the type of recording instrument used. Examples of limitations that may impact the quality of data used for the present study are highlighted in the following:

- Rainfall gauges frequently fail to accurately record the total amount of rainfall. This can occur for a range of reasons including operator error, instrument failure, overtopping and vandalism. In particular, many gauges fail during periods of heavy rainfall and records of large events are often lost or misrepresented.

- Daily read information is usually obtained at 9:00am in the morning. Thus if the storm encompasses this period it becomes “split” between two days of record and a large single day total cannot be identified.

- In the past, rainfall over weekends was often erroneously accumulated and recorded as a combined Monday 9:00am reading.

- The duration of intense rainfall required to produce flooding in the Rushcutters Bay catchment is typically less than two hours. This is termed the “critical storm duration”. For a much larger catchment (such as the Parramatta River) the critical storm duration may be from 24 to 36 hours. For the Rushcutters Bay catchment a short intense period of rainfall can produce flooding but if the rain stops quickly (as would be typical of a

thunderstorm), the daily rainfall total may not necessarily reflect the magnitude of the intensity and subsequent flooding. Alternatively the rainfall may be relatively consistent throughout the day, producing a large total but only minor flooding.

- Rainfall records can frequently have "gaps" ranging from a few days to several weeks or even years.

- Pluviometer (continuous) records provide a much greater insight into the intensity (depth vs time) of rainfall events and have the advantage that the data can generally be analysed electronically. These data have much fewer limitations than daily read data. The main drawback is that many of the relevant gauges have only been installed since 1990 and hence have a very short period of record compared to the daily read data. The Sydney Observatory and Sydney Water Board Head Office gauges were installed in 1970 but unfortunately are located too far away to provide a representative indication of rainfalls occurring over the Rushcutters Bay catchment. Pluviometers can also fail during storm events due to the extreme weather conditions.

- Rainfall events which cause flooding in the Rushcutters Bay catchment are usually very localised and as such are only accurately "registered" by a nearby gauge. Gauges sited only a few kilometres away can show very different intensities and total rainfall depths.

3.1.2 Available Rainfall Data

Table 3 presents a summary of the official rainfall gauges (provided by the Bureau of Meteorology) located close to or within the catchment. These gauges are operated either by Sydney Water (SW) or the Bureau of Meteorology (BOM). There may also be other private gauges in the area (bowling clubs, schools) but data from these has not been collected as there is no public record of their existence. Of the 45 gauges listed in Table 3 over 58% (26) have now closed. The gauge with the longest record is Observatory Hill, operating from 1858 to the present.

Table 3: Rainfall Stations within a 6km Radius of Paddington

Station No	Owner	Station	Elevation (mAHD)	Distance from Paddington (km)	Date Opened	Date Closed	Type
66139	BOM	Paddington	5	0.0	Jan-68	Jan-76	Daily
566041	SW	Crown St Reservoir	40	0.8	Feb-1882	Dec-60	Daily
566032	SW	Paddington (Composite Site)	45	1.0	Apr-61		Continuous
566032	SW	Paddington (Composite Site)	45	1.0	Apr-61		Daily
566009	SW	Rushcutters Bay Tennis Club	0	1.3	May-98		Continuous
566042	SW	Sydney H.O. Pitt St	15	1.5	Aug-49	Feb-65	Continuous
66015	BOM	Crown St Reservoir		1.5	Feb-1882	Dec-60	Daily
66006	BOM	Sydney Botanic Gardens	15	1.9	Jan-1885		Daily
66160	BOM	Centennial Park	38	2.1	Jun-00		Daily
566011	SW	Victoria Park @ Camperdown	0	2.4	May-98		Continuous
66097	BOM	Randwick Bunnerong Rd		2.4	Jan-04	Jan-24	Daily
66062	BOM	Sydney (Observatory Hill)	39	2.7	??		Continuous
66062	BOM	Sydney (Observatory Hill)	39	2.7	Jul-1858	Aug-90	Daily
66033	BOM	Alexandria (Henderson Rd)	15	2.8	May-62	Dec-63	Daily
66033	BOM	Alexandria (Henderson Rd)	15	2.8	Apr-99	Mar-02	Daily
66073	BOM	Randwick Racecourse	25	2.9	Jan-37		Daily
566110	SW	Erskineville Bowling Club	10	3.4	Jun-93	Feb-01	Continuous
566010	SW	Cranbrook School @ Bellevue Hill	0	3.4	May-98		Continuous
566015	SW	Alexandria	5	3.5	May-04	Aug-89	Daily
66066	BOM	Waverley Shire Council		3.6	Sep-32	Dec-64	Daily
66149	BOM	Glebe Point Syd. Water Supply	15	3.6	Jun-07	Dec-14	Daily
566099	SW	Randwick Racecourse	30	3.7	Nov-91		Continuous
66052	BOM	Randwick Bowling Club	75	3.7	Jan-1888		Daily
566141	SW	SP0057 Cremorne Point	0	4.0			Continuous
66021	BOM	Erskineville	6	4.0	May-04	Dec-73	Daily
	SW	Gladstone Park Bowling Club	0	4.1	Jan-01		Continuous
566114	SW	Waverley Bowling Club	0	4.1	Jan-95		Continuous
566043	SW	Randwick (Army)	30	4.3	Dec-56	Sep-70	Continuous
566077	SW	Bondi (Dickson Park)	60	4.4	Dec-89	Feb-01	Continuous
566065	SW	Annandale	20	4.5	Dec-88		Continuous
66098	BOM	Royal Sydney Golf Club	8	4.5	Mar-28		Daily
66005	BOM	Bondi Bowling Club	15	4.6	Jul-39	Dec-82	Daily
66178	BOM	Birchgrove School	10	4.8	May-04	Dec-10	Daily
66075	BOM	Waverton Bowling Club	21	5.1	Dec-55	Jan-01	Daily
66187	BOM	Tamarama (Carlisle St)	30	5.1	Jul-91	Mar-99	Daily
66179	BOM	Bronte Surf Club	15	5.2	Jan-18	Jan-22	Daily
566130	SW	Mosman (Reid Park)	0	5.3	Jan-98	Jun-98	Continuous
566030	SW	North Sydney Bowling Club	80	5.5	Apr-50	Sep-95	Daily
66007	BOM	Botany No.1 Dam	6	5.5	Jan-1870	Jan-78	Daily
66067	BOM	Wollstonecraft	53	5.8	Jan-15	Jan-75	Daily
66061	BOM	Sydney North Bowling Club	75	5.8	Apr-50	Dec-74	Daily
566027	SW	Mosman (Bradleys Head)	85	5.8	Jun-04		Continuous
566027	SW	Mosman (Bradleys Head)	85	5.8	Jun-04		Daily
566006	BOM	Bondi (Sydney Water)	10	5.9	Jun-97		Operational
66175	BOM	Schnapper Island	5	5.9	Mar-32	Dec-39	Daily

BOM = Bureau of Meteorology
SW = Sydney Water

3.1.3 Analysis of Daily Read Data

For the purposes of this investigation, an analysis of daily rainfall data was undertaken to identify and place past storm events in some context. All daily rainfall depths greater than 150 mm recorded at Centennial Park (105 years of record), Sydney Observatory Hill (147 years of record) and Sydney Botanic Gardens (119 years of record) have been ranked and shown in Table 4.

Table 4: Daily Rainfalls Greater than 150 mm

Centennial Park (1900 -)		
Rank	**Date**	**Rainfall (mm)**
1	28-Mar-42	302
2	06-Aug-86	236
3	03-Feb-90	222
4	12-Aug-75	221
5	13-Oct-75	205
6	31-Jan-38	201
7	30-Apr-88	193
8	10-Feb-56	192
9	23-Jan-33	189
10	09-Feb-58	185
11	11-Mar-75	184
12	07-Jul-31	177
13	09-Apr-45	177
14	07-Aug-98	162
15	17-May-43	159
16	04-Feb-90	156
17	10-Jul-57	155
18	14-Nov-69	155
19	01-May-55	154
20	09-Feb-92	151
21	28-Jul-08	150
22	13-Jan-11	150

Botanic Gardens (1885 -)		
Rank	**Date**	**Rainfall (mm)**
1	06-Aug-86	340
2	28-Mar-42	277
3	09-Feb-92	264
4	09-Nov-84	248
5	03-Feb-90	238
6	01-May-88	230
7	02-May-53	226
8	11-Mar-75	217
9	01-May-55	193
10	11-Feb-56	191
11	13-Jan-11	186
12	07-Jul-31	181
13	08-Jan-73	174
14	28-May-89	171
15	19-May-98	159
16	05-Feb-02	158
17	31-Jan-38	158
18	09-Feb-58	155
19	10-Feb-92	155
20	10-Jan-49	150
21	22-Aug-71	150

Observatory Hill (1858 -)		
Rank	**Date**	**Rainfall (mm)**
1	06-Aug-86	328
2	28-Mar-42	281
3	03-Feb-90	244
4	09-Nov-84	235
5	25-Feb-73	226
6	28-May-89	212
7	11-Mar-75	198
8	07-Jul-31	198
9	10-Feb-56	192
10	06-Feb-78	191
11	29-Apr-60	191
12	17-Jan-88	191
13	09-Feb-92	190
14	01-May-55	188
15	13-Jan-11	180
16	08-Jan-73	169
17	03-Apr-61	168
18	12-Jan-18	166
19	09-Mar-13	166
20	11-Apr-98	165
21	06-Apr-82	165
22	06-Apr-84	164
23	24-Mar-84	164
24	13-Oct-02	162
25	17-Feb-68	157
26	06-May-98	154
27	23-Jan-55	152
28	11-Jun-91	151

The main points regarding these data are:

- March 1942 and August 1986 were the largest daily events recorded at all gauges. Both events recorded similar rainfalls at all three gauges. February 1990 was in the top 5 rank for all gauges, again showing very similar rainfalls at each gauge.
- February 1992 showed a significant difference between the three gauges (151 mm, 264 mm and 190 mm).
- Apart from March 1942 the top 4 ranked daily events occurred from 1975 onwards.
- March 1975 showed similar depths at the three gauges (184 mm, 217 mm and 198 mm).

3.1.4 Analysis of Pluviometer Data

As noted previously, pluviometer records provide a more detailed description of temporal variations in rainfall. Table 5 lists the maximum storm intensities for the four largest recent rainfall events from both the pluviometers and daily read gauges.

Table 5: November 1984, January 1989, March 1989 and January 1994 Maximum Recorded Storm Depths (in mm)

Station Location	9 Nov 1984		6 Jan 1989		9 March 1989		26 Jan 1991	
	20 min	30 min	20 min	30 min	20 min	30 min	20 min	30 min
Paddington	38	54	52	54	38	43	46	52
Observatory Hill*	57	80	42	29	24	30	44	58
Vaucluse	43	50	39	29	19	24	23	24

Station Location	24 hour Totals to 0900 hrs				
	8 Nov 1984 (3)	9 Nov 1984 (3)	6 Jan 1989	9 Mar 1989	26 Jan 1991
Royal Botanic Gardens	37	248	49	39	59
Rose Bay	-	(1)	85	40	53
Observatory Hill	44	234	47	35 (2)	65
Paddington	71	208	63	50	54

Notes:

* approximate intensities
Data taken from Reference 1

(1) Gauge washed away in flood.
(2) Accumulated total over a four day period.
(3) The November 1984 event consisted of two separate rainfall bursts (between 6:00am and 10:00am and 9:00pm and midnight). Both produced flooding but the second burst was the most intense. One possible reason why there are so few recorded flood levels is that the second burst occurred at night and thus few people would have been outside to view the flood extent or record levels.

The above data indicate that for January 1989, March 1989 and January 1991 the peak 30 minute rainfall comprised the majority of the daily rainfall. However, for November 1984 the 30 minute peak was part of a much larger rainfall event.

Comparison with design rainfall intensities (Table 8) indicate that the January 1989, March 1989 and January 1991 events were less than a 20 year ARI design intensity for the 20 minute and 30 minute intensities, except at Observatory Hill in January 1991 which approached a 40 year ARI.

The November 1984 event was the most severe event with the Observatory Hill gauge registering a 30 minute intensity greater than a 100 year ARI, although the 30 minute rainfall was only approximately a 20 year to 30 year ARI at Paddington and Vaucluse. At Paddington it exceeded a 100 year ARI for the 2 hour duration.

Storm intensities and durations recorded at the Paddington gauging station for all the major storm events are given in Table 6.

Table 6: Paddington Pluviometer Storm Intensities (mm/h)

Duration	6 min	10 min	20 min	30 min	60 min	120 min
12 Aug 1983	175	156	106	84	48	28
(approx. ARI)	*(10)*	*(20)*	*(10)*	*(10)*	*(5)*	*(2)*
5 Nov 1984	120	108	84	72	52	39
(approx. ARI)	*(2)*	*(2)*	*(5)*	*(5)*	*(5)*	*(10)*
8 Nov 1984	125	123	114	108	91	74
(approx. ARI)	*(2)*	*(5)*	*(10)*	*(25)*	*(75)*	*(>100)*
6 Jan 1989	215	195	155	108	56	30
(approx. ARI)	*(50)*	*(50)*	*(50)*	*(25)*	*(5)*	*(5)*
9 Mar 1989	140	138	114	85	54	28
(approx. ARI)	*(5)*	*(10)*	*(15)*	*(10)*	*(5)*	*(2)*
21 Apr 1989	140	120	78	54	29	14
(approx. ARI)	*(5)*	*(5)*	*(2)*	*(2)*	*(1)*	*(1)*
26 Jan 1991	190	162	138	103	53	27
(approx. ARI)	*(20)*	*(20)*	*(40)*	*(20)*	*(5)*	*(2)*

Data taken from Reference 1.

From the above it can be concluded that for the small catchments with a critical duration of up to 30 minutes the January 1989 storm was the most severe. However for the larger catchments the 8th November 1984 storm was the most severe.

Figure 2 shows the cumulative mass curves for the 8th November 1984 (both events), January 1989 and January 1991 events together with the design mass curves. This figure illustrates the intensities of the historical events.

3.1.5 November 1984 Storm

The 8th-9th November 1984 storm was a significant rainfall event across the Sydney and Wollongong region and is documented in Reference 4. Table 7 shows that this storm had an approximate ARI of 100 years across several locations in Sydney. The storm was separated into two distinct bursts (6:00am to 10:00am and 9:00pm to midnight). The latter was the most intense period and flooding was reported throughout the catchment although the actual timing of the flooding is unknown.

Table 7: ARI Estimates of the 8th November 1984 Rainfall (Reference 4)

Station	Rainfall Duration				
	0.5 hour	1 hour	2 hour	3 hour	6 hour
Sydney - Observatory Hill	100y	100y	100y	100y	100y
Mosman	20y	50y	100y	20y	10y
Vaucluse	100y	100y	50y	20y	10y

At the Paddington gauge the 8th November 1984 storm had similar intensity for the 30 minute duration as the January 1989 and January 1991 storms. However, anecdotal information indicates that the 8th November 1984 event produced greater flooding than other recent events. Possibly the 8th November 1984 storm produced greater flooding in the open channel section because this event was part of an extended period of rainfall that partially "filled" the channel and floodplain prior to the peak storm burst. Also the ARI was much greater for the longer 60 minute and 120 minute durations and hence more likely to produce flooding in the open channel section.

It should be noted that the culvert configuration under Craigend Street and New South Head Road was changed in December 1986.

3.2 Design Rainfall

Table 8 shows the design rainfall depths which were used for the hydrologic analysis. The design and PMP rainfall depths were supplied by Woollahra Municipal Council. Design temporal patterns were obtained from Australian Rainfall and Runoff (AR&R - Reference 5).

Table 8: Design Rainfall Data

Duration		Average Recurrence Interval					PMF
		5y	10y	20y	50y	100y	
30 minutes	intensity in mm/h	80	91	105	124	138	492
	depth in mm	40	46	53	62	69	246
1 hour	intensity in mm/h	55	63	73	86	96	346
	depth in mm	55	63	73	86	96	346
1.5 hours	intensity in mm/h	43	49	57	67	75	297
	depth in mm	65	74	86	101	113	446
2 hours	intensity in mm/h	36	41	47	56	63	263
	depth in mm	72	82	94	112	126	526
3 hours	intensity in mm/h	27	31	36	43	48	212
	depth in mm	81	93	108	129	144	636

3.3 Rushcutters Bay Water Level Data

Water level variations in Rushcutters Bay will impact on flood levels in the lower parts of the open channel system. The variations are largely as a function of astronomic tides but may also be influenced by:

- wind set up and the increased barometric effect,
- wave set up,
- wave runup,
- runoff in the Parramatta River catchment. This is a very small component and can largely be ignored,
- the Greenhouse Effect.

The adopted design water levels in Sydney Harbour at Fort Denison are given in Table 9.

Table 9: Adopted Design Water Levels at Fort Denison

ARI (years)	Water Level (mAHD)
20	1.38
50	1.42
100	1.45
Events >100 year ARI	Not known but assumed as 1.50

Elevated water levels are associated with major storm events (low pressures, strong onshore winds and large waves) but the peak level is determined by the height and timing of the high tide. As a result, peak levels are unlikely to occur in conjunction with a flood over the Rushcutters Bay catchment which is generated by a short duration (less than 2 hours) rainfall event. The coincidence of rainfall and ocean level events has been assessed in many similar studies, including Reference 1. A somewhat conservative approach of using a static water level of 1.0 mAHD in conjunction with flooding in the local catchment was adopted for this present study. This level approximates to a tide that is only exceeded a few times in a year.

3.4 Historical Flood Information

3.4.1 Overview

A data search was carried out to identify the dates and magnitudes of historical floods. The search concentrated on the period since approximately 1970 as data prior to this date would generally be of insufficient quality and quantity for model calibration. Unfortunately there were no stream height gauges in the catchment or any other means of reliably determining the level of past flood events so the following sources were used:

- Woollahra Municipal Council records,
- Sydney Water database,
- previous reports,
- questionnaire issued in August 2006,
- local residents.

A detailed review of rainfall records (Section 3.1) was also undertaken to establish the likely dates of floods.

3.4.2 Information from References

Reference 1 reviewed all available flood information. A limited questionnaire survey was carried out for the present Flood Study but Reference 1 provides a more comprehensive and complete survey with more contacts taken closer to the dates of flooding. Presumably any questionnaire survey today would provide less information as many residents will have moved or forgotten about past floods.

For Reference 1 some 8900 questionnaires were distributed, this included 1300 which had a more detailed questionnaire provided to known flood problem areas. Approximately 680 were returned (7.7%) including 147 (11.3%) of the detailed questionnaire. A summary of the key responses are provided in Table 10.

Table 10: Questionnaire Results (Reference 1)

Item	Response	Comment
Ever experienced flooding?	44%	This is a very high response but probably reflects the fact that those who have been flooded in the past have a greater desire to return the questionnaire.
Nature of flooding?		
• Above house floor	81 out of 303	This is a very high response for above floor inundation.
• Under house	34 out of 303	
• In yard	91 out of 303	
• In street	214 out of 303	This result is not unusual as flooding in the street is expected.
• Other	11 out of 303	

The list of dates of flooding in Reference 1 included no events prior to the 1980's. However it is unrealistic to assume that there were no prior flood events. For example, 10th/11th March 1975 produced significant flooding throughout the Sydney and Wollongong region and produced a significant daily total (Table 4). Reference 6 reported rainfall depths at Sydney Observatory Hill for the 1, 2 and 3 hour durations equal to or in excess of the 100 year ARI design rainfall. Unfortunately there were no reports of flooding in the Rushcutters Bay catchment for this event.

Reference 1 also provided a summary of the flood problems within seven separate areas. This information is summarised in Appendix B and indicates that the majority of the flooding issues were recorded in the Jersey Road, Trumper Park and White City areas. These are the areas along the natural drainage lines. This information is summarised on Figures 3 and 4.

Some of the depths of inundation in the upper catchment were significant with estimates of up to 1 m. In Cecil and Royalston Streets recorded depths were up to 1 m for January 1989 (Royalston Street) and 0.6 m for January 1991 (Cecil Street). Trumper Park was inundated by up to 0.15 m depth in January 1991.

The White City tennis complex grounds were inundated by approximately 1 m in November 1984 (indicative RL of 3.1 mAHD), 0.6 m in January 1989 (indicative RL of 2.7 mAHD) and 0.3 m in January 1991 (indicative RL of 2.5 mAHD). The November 1984 level (it was presumed to be for 8th November but whether for the first or second period is unknown) is reasonably reliable as the floor of the tennis office (RL 3.06 mAHD) was inundated by 0.07 m. However the January 1989 and January 1991 levels are much less reliable. It should be noted that subsequent to the November 1984 event an additional culvert was installed under New South Head Road. Thus one would expect lower flood levels for a similar rainfall event today.

3.4.3 Questionnaire Results - 2006

A questionnaire survey was undertaken in August 2006 as part of this study and the results summarised on Figure 5. The main outcomes of the survey were the relatively low level of response (only 17%) and the absence of detailed flood height data. To be successful this type of survey needs to be completed immediately following the flood event.

Local residents did report flooding near Cecil Street and Cecil Lane in March 2003, February 2001, August 1998 and April 1998.

3.4.4 Sydney Water Database

A listing of the Sydney Water database is provided in Appendix B. This lists the dates of flooding as:

June 1949	November 1979
September 1951	February 1980
August 1952	February 1981
February 1958	August 1983
February 1959	August 1986
November 1961	January 1989
December 1970	March 1989
March 1975	April 1989
March 1977	April 1998

Unfortunately no levels to AHD are provided although it was possible to approximate levels based on the estimated depths of flooding. However this method can be quite inaccurate. Also the database misses out key dates of flooding, such as November 1984 and may give a misleading picture because the dates mentioned the most (such as April 1998) do not necessarily reflect the most severe event.

The database does show clearly that extensive flooding has occurred numerous times in the past with depths of up to 0.9 m over the tennis courts (suggesting a level of at least 3.2 mAHD). At Cecil Street and Royalston Street depths of up to 0.7 m have been recorded (in April 1998) and at Hargrave Street over floor depths of up to 1.3 m have been recorded (March 1989).

3.5 Pit and Pipe Details

Details of the pit and pipe dimensions were obtained from Council's stormwater assets inventory program. The physical details including pit numbers, type, size, depth, lintel size and pipe diameter were provided in a spreadsheet file. This data was collected several years ago by Council and uses a pit numbering system supplied by Council. MGA co-ordinates for each pit were obtained from Council's GIS.

The pit invert and assumed pipe invert (where not provided) were taken as the pipe diameter plus 300 mm of cover below the surface.

Maps showing cadastral property boundaries were provided in electronic format. Reference to Woollahra Council's 1:2000 maps was made to define sections of the drainage system such as pipe bends and converters which were not provided in electronic form. Additional pit and pipe information from local studies was also incorporated where such data was available.

A listing of the pit and pipe details (from DRAINS) is provided in Appendix C.

3.6 Survey

A detailed cross-sectional survey of the open channel was undertaken as part of this study by Peter Bolan & Associates, Consulting Surveyors. The data included:

- cross-sections along the open channel,
- crossing details under Craigend Street and New South Head Road.

Ground level survey (to identify pit surface levels and for use in the hydraulic model) were obtained from Airborne Laser Scanning (ALS) spot levels provided by Council. This survey was flown in December 2005 and comprised ground levels at approximately 1 m to 2 m intervals. The data has a vertical order of accuracy of the order of ±0.1 m.

As part of the present study the approximate location and pit details (grate, lintel size, etc.) were verified by field inspection. At some locations additional pits were found. The original data provided by Council was subsequently modified to reflect the outcomes of this work and used in preference to the original data.

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4. APPROACH ADOPTED

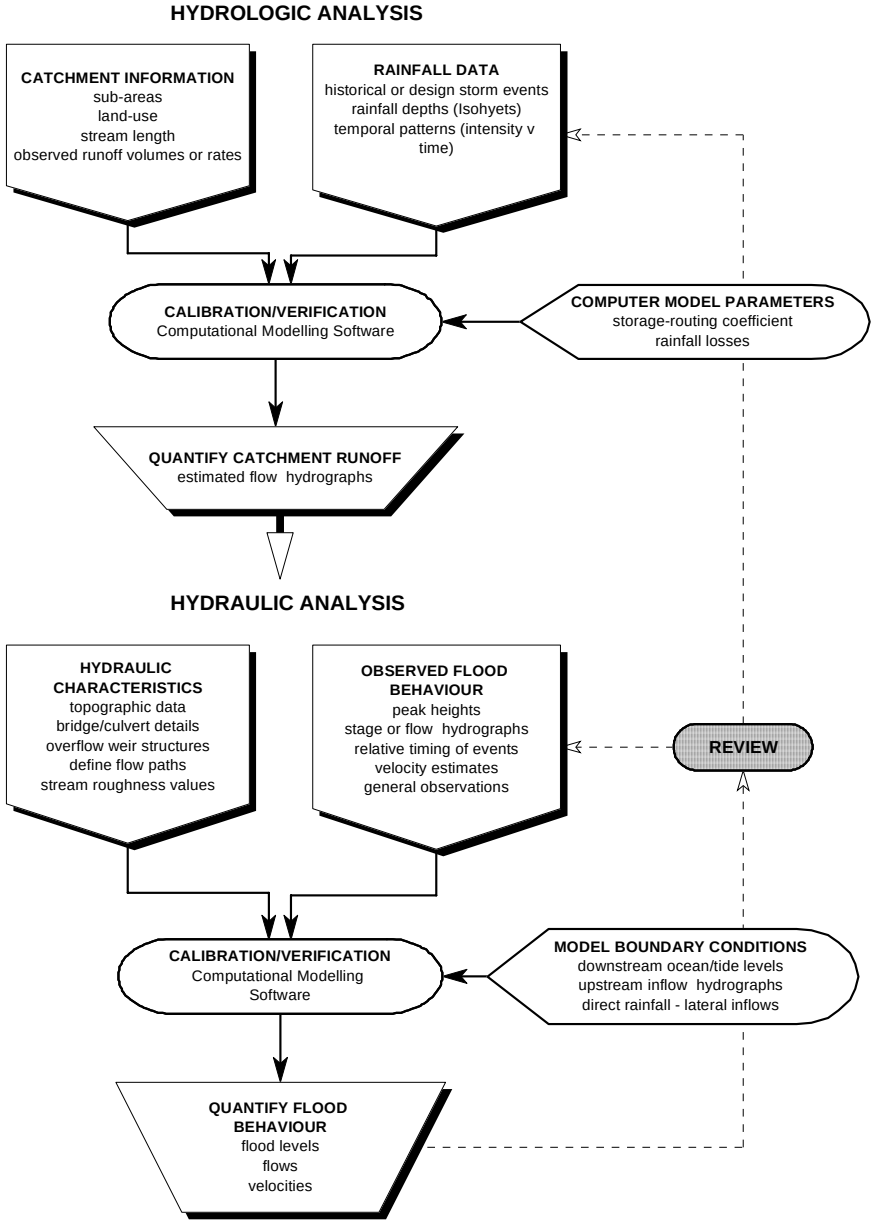
4.1 General

A diagrammatic representation of the Flood Study process is shown in Diagram 1. The urbanised nature of the study area with its mix of pervious and impervious surfaces, and existing piped and overland flow drainage systems has created a complex hydrologic and hydraulic flow regime. A hydrologic and hydraulic model (DRAINS - Reference 7) was established for the entire catchment and used to create flow boundary conditions for input to a two-dimensional unsteady flow hydraulic (SOBEK - Reference 8) model extending from Rushcutters Bay to Hampden Street. The SOBEK hydraulic model assessed the runoff passing through the stormwater channel and floodplain by using the channel survey details, ALS ground height data and flows determined from the DRAINS model.

To ensure confidence in the results, both models require calibration and verification against observed historical events. In an urban drainage situation such as the Rushcutters Bay catchment there is rarely sufficient historical flood data available to permit either a flood frequency approach or a rigorous calibration of hydrologic and hydraulic models using a rainfall and runoff approach. With the limited amount of flood height data available and given the lack of any stream gaugings, the model calibration process focussed on reproducing recorded peak flood levels in the White City tennis complex. The calibrated SOBEK model was then used to quantify the design flood behaviour for a range of design storm events up to and including the Probable Maximum Flood (PMF).

For the catchment upstream of Hampden Street (upper extent of the SOBEK model) the hydrologic and hydraulic regime was modelled using DRAINS. It was not possible to calibrate or verify the DRAINS model results due to lack of suitable data. However the peak flow results were compared to those from previous studies (Section 7.6).

Diagram 1: Flood Study Process



4.2 DRAINS

4.2.1 Data Collation

An extensive amount of data was required to establish the DRAINS model. Data collation was undertaken using a spreadsheet database of physical parameters such as pipe size, length, slope, Ku loss factor, pit type and location (refer Appendix C for selected output). The information was sourced from asset data provided by Council and the recent ALS survey. The database also included relevant DRAINS input parameters such as reference names and pipe connectivity information, as well as a description of catchment characteristics (catchment area,

% imperviousness, time of concentration, etc.) based on available data and field inspection. Sub-catchment areas and the connections between pipe and overland flows were derived from GIS.

The spreadsheet was then imported into DRAINS to establish the spatial drainage network.

4.2.2 Description of Data

The following provides a summary of the source of the data and any qualifications regarding its accuracy.

Pit Location: Co-ordinates were obtained from Council's GIS. A field inspection was undertaken to locate all pits (except buried pits). Only where there was a significant difference between the field and GIS locations were adjustments made. Every known pit is included in DRAINS.

Grate and Inlet Details: All inlet types were verified in the field but the size of the grates and kerb inlet were taken from Council's database.

Pipe Size, Depth to Invert: These were obtained from Council's database and not checked by field inspection.

Catchment areas: These were derived in GIS for all inlet pits using the 2 m contours (undertaken prior to provision of the ALS). It is noted that there are several pits at the upstream end of branches which have no inlet (i.e. no flow can enter). For an inlet pit immediately downstream of another inlet pit a nominal catchment area was included.

Pipe Slope: These were based on the assumed pipe inverts and the pipe distance (calculated from the GIS co-ordinates of the pits).

Pit Surface Levels: Taken as the lowest data point from the ALS within a 2 m radius of the pit. Adjustments were then made to ensure no negative pipe or overland grades.

Overland Flow Path: Determined in GIS using 2 m contours (undertaken prior to provision of the ALS). The route of the path is not given, only the link between the upstream and downstream inlet pits.

Overland Flow Travel Time: Based on a velocity calculated from 0.2 m^3/s travelling down a standard half road path for the given catchment slope.

Time of Concentration: DRAINS calculates the time of concentration based on a flow length for paved and grassed areas (assumed to be 35 m) and a lag time for overland flow in the gutter (calculated in the same way as the overland flow travel time).

Ku Loss Factor: Initially set at 1.5 and then DRAINS updates the values based on flows. This iteration was carried out twice.

Pit Connectivity: Taken from Council's database (not checked).

Pit Naming Convention: Provided by Council and amended (slightly) to include any additional pits found during the course of the study or ones not named previously.

4.2.3 Hydrologic and Hydraulic Modelling - DRAINS

DRAINS is a model that can simulate the full storm hydrograph and is capable of describing the flow behaviour of a catchment and pipe system for real storm events, as well as statistically-based design storms. It is designed for analysing urban or partly-urban catchments where artificial drainage elements have been installed.

The DRAINS model is characterised by features including:

- the hydrological component is based on the theory applied in the ILSAX model which has seen wide usage and acceptance in Australia,
- its application of the hydraulic grade line method for hydraulic analysis throughout the drainage system,
- the graphical display of network connections and results.

DRAINS generates a full hydrograph of surface flows arriving at each pit, and routes these through the pipe network or overland, combining them where appropriate. Consequently, it avoids the "partial area" problems of the Rational Method, and additionally it can model detention basins.

Runoff hydrographs for each sub-catchment area are calculated using the time-area method and the conveyance of flow through the drainage system is then modelled using the Hydraulic Grade Line method. Application of the Hydraulic Grade Line method is recommended for the design of pipe systems in AR&R (Reference 5). The method allows pipes to operate under pressure or to "surcharge", meaning that water rises within pits, but does not necessarily overflow out onto streets. This provides improved prediction of hydraulic behaviour, consistency in design, and greater freedom in selecting pipe slopes. It requires more complicated design procedures, since pipe capacity is influenced by upstream and downstream conditions.

However, DRAINS cannot adequately account for an elevated downstream tailwater level which would drown out the lower reaches of a drainage system (it can if the upstream pit is above the tailwater level but not if it is below). There is also the issue of what to assume for an appropriate tailwater level, as the peak from the local catchment and the main creek may not occur at the same time. For the purposes of this analysis, a free outflow has been assumed at the outlet of the drainage systems into the open channel system. Varying this assumption only changes the ratio of overland to pipe flow and as both flows are included in SOBEK it will produce no significant difference in design flood levels. A more detailed analysis may be required where the interaction of the tailwater level with the local catchment flow is likely to be of concern.

It also should be noted that DRAINS is not a true unsteady flow model and therefore does not account for the attenuation effects of routing through temporary floodplain storage.

4.3 SOBEK

The SOBEK modelling package includes a finite difference numerical model for the solution of the depth averaged shallow water flow equations in two dimensions. The SOBEK software is produced by Delft Hydraulics (Reference 8) and has been widely used for a range of similar projects both internationally and within Australia. The model is capable of dynamically simulating complex overland flow regimes. It is especially applicable to the hydraulic analysis of flooding in urban areas which is typically characterised by short-duration events and a combination of supercritical and sub-critical flow behaviour.

For the hydraulic analysis of overland flow paths (such as those identified in the present study downstream of Hampden Street), a two-dimensional (2D) model such as SOBEK provides several key advantages when compared to a traditional one-dimensional (1D) model. For example, in comparison to a 1D approach, a 2D model can:

- provide localised detail of any topographic and/or structural features that may influence flood behaviour,
- better facilitate the identification of the potential overland flow paths and flood problem areas,
- inherently represent the available floodplain storage within the 2D model geometry.

Importantly, a 2D hydraulic model can better define the spatial variations in flood behaviour across the study area. Information such as flow velocity, flood levels and hydraulic hazard can be readily mapped in detail across the model extent. This information can then be easily integrated into a GIS based environment enabling the outcomes to be incorporated into Council's planning activities. Furthermore, the SOBEK software provides a more flexible modelling platform to properly assess the impacts of any overland flow management strategies in the proposed floodplain risk management study.

The main disadvantage of the 2D approach is that model run times increase significantly from a few minutes for a 1D simulation to several hours for a 2D simulation. For a 2D model the grid size definition largely determines the run time. A 2 m^2 grid may take 6 hours whilst a 5 m^2 grid may take less than 30 minutes. A 2 m^2 grid is preferable as it allows accurate definition of streets. For this project a 2 m^2 and 5 m^2 grid models were established. For all the initial model testing the 5 m^2 grid was used with only the final runs undertaken using the 2 m^2 grid.

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5. HYDROLOGIC AND HYDRAULIC ANALYSIS - DRAINS

5.1 General

A DRAINS model comprising drainage systems in the Rushcutters Bay catchment was established as shown on Figure 6. 676 sub-catchments were determined, corresponding to all surface inlet pits. The reaches which do not have an associated sub-catchment correspond to junction pits or pipe bends. Allowances were made in the model for overland (bypass) flow paths between inlet pits.

5.2 Drainage Network and Catchment Definition

5.2.1 Pipe Network

The drainage system defined by the model is made up of:

- runoff entry points representing surface inlet pits,
- bends, junctions or inspections which are termed pits with no inlet (i.e. the lid is sealed),
- underground conduits (circular pipe or box) or open channel lengths between pits, called reaches.

A number of consecutive reaches is called a branch. The pipe system "tree" structure is defined by nominating the pits where two or more branches join. The length, slope, shape and dimension of each reach are specified, as well as representative inflow characteristics (surface inlet capacity) for each inlet pit. The inlet pits and non-inlet pits were labelled using Council's numbering system. New pits which were added (either not named previously or found as part of this study) were named using the same numbering system (as far as possible).

If a pit is buried (such as representing a junction between two or more pipes), no surface inflow was included in the model. Council's inventory survey of drainage assets did not include all pit details through private property or pipe bends. Consequently, pipe grades through private property were estimated from pit data immediately upstream and downstream, or interpolated based on topographic maps. Pipe bends were modelled as separate pits and treated similarly to junction pits. This was done to ensure the correct alignment of the pipe, however it is not known if the true alignment was formed due to curved pipes or straight lengths of pipes connected together.

Converters, which comprise short lengths of pipe across intersections, are generally found in the upper catchment areas. These converters were included during the definition of catchment areas with the exit modelled as an overland flow path.

5.2.2 Pit Types

Figure 6 shows all 1322 pits (inlet pits, bends, junctions, outlets) located in the catchment. All of these were modelled in DRAINS as follows:

- surface inlet pits - 675 of which 610 are ongrade pits and 65 sag pits,
- junctions - 620,
- outlets - 27.

Approximately 90% of all surface inlet pits were assumed to be an *ongrade surface inlet* with the overflow diverted to a downstream reach. Inlet capacities were specified at each pit based on the Hornsby pit capacity data set.

Surface inlets located at road low points are termed *sag inlets*. Approximately 10% of the total surface inlet pits were modelled as sag inlets. The sag inlet capacities were specified based on data in Reference 7 and assigned a 50% blockage factor. The volume of storage available at each sag inlet (as required by DRAINS) was assumed to be 5 m^3. Overflows were diverted to a downstream inlet pit once the storage volume was exceeded.

Approximately 50% of all the pits in DRAINS were modelled as *junction pits*. A junction pit is modelled where two upstream branches combine, where two different sized pipes join or where there is a significant bend in the pipe and there is no inlet to allow surface or bypass inflow. Junction pits were modelled as sealed pits without the ability to surcharge, by allowing the downstream pipe to pressurise. A limitation of this method is that the pit is unable to represent surcharging should a pit cover blow off under a highly pressurised pipe system.

There are 26 convertors in the catchment with outflow leading to an overland flow path.

5.2.3 Catchment Sub-areas

A sub-area is specified within DRAINS for each inlet pit and labelled with the prefix "a" followed by the pit name. For each sub-area the proportion of pervious (grassed), impervious (paved), supplementary area (paved area not directly connected to pipe system - these were estimated in this study as 5% of the total catchment), and overland travel time are required. The pervious and impervious areas were determined from field and aerial photographic inspection for the park areas, and elsewhere applying an average value of 85% impervious area. The catchment slopes were assumed from inspection of the contours and assigned values of either 1%, 9% and 30%. The 30% value was assigned to several catchments located on the steep gully and escarpment above Trumper Oval.

A breakdown of the catchment surface characteristics included in the model is shown in Table 11.

Table 11: DRAINS Catchment Details

Area	Area (ha)	%
Paved Area	188.1	78.6
Grassed Area	39.1	16.4
Supplementary	12.0	5.0
TOTAL	**239.2**	**100**

5.2.4 Overland Flow Paths

Any runoff that was unable to enter the downstream pipe reach due to insufficient inlet or pipe capacity was modelled as overland flow. These overland flow paths were determined from field inspection and topographic maps. At each inlet pit where overland flow was possible, a downstream inlet pit was specified as the receiving destination, together with an estimated travel time. The overland flow route from each pit is identified by the prefix "o" followed by the pit name.

Surface levels for inlet pits in sag areas were occasionally adjusted in the model to ensure that upstream inlet pits have a higher surface level than the receiving downstream inlet pits.

Where local flow paths were identified to pass through yards, garages and fences, measures were made to reflect the effects of these in the model. In the context of this catchment wide assessment it is not feasible to accurately determine individual local flow paths as in many instances these may vary from storm to storm. This will depend on blockages at the pits, parked vehicles, debris build up or other such obstructions (fences) which may divert runoff along different paths.

Overland flow travel times can have a significant bearing upon the accumulated peak flows achieved further downstream. DRAINS does not route flows along overflow routes, but takes flows from one pit and places it at the downstream pit after a specified travel time. This was estimated by assuming a velocity based on a standard half road cross-section with a flow of 0.2 m^3/s. If the travel times were less than 0.1 minute they were rounded to 0.1 minute.

5.3 Adopted Model Parameters

5.3.1 Rainfall Losses and Soil Type

Losses from a paved or impervious area are considered to comprise only of an initial loss (an amount sufficient to wet the pavement and fill minor surface depressions). Losses from grassed areas are comprised of an initial loss and a continuing loss. The continuing loss was calculated from an infiltration equation curve incorporated into the model and is based on the estimated representative soil type and antecedent moisture condition. It was assumed that the soil in the catchment has a slow infiltration rate potential and the antecedent moisture condition was considered to be saturated. The latter was justified by the fact that the peak rainfall burst can

typically occur within a longer event that possibly has a duration of a few days. The adopted parameters are summarised in Table 12.

Table 12: Adopted Hydrologic Model Parameters

RAINFALL LOSSES	
Paved Area Depression Storage (Initial Loss)	1.0 mm
Grassed Area Depression Storage (Initial Loss)	1.0 mm
SOIL TYPE	3
Moderate infiltration rates and moderately well drained. This parameter, in conjunction with the Antecedent Moisture Condition, determines the continuing loss (defined by Horton's infiltration equation).	
ANTECEDENT MOISTURE CONDITIONS (AMC)	3
Description	Saturated
Total Rainfall in 5 Days Preceding the Storm	50 mm

5.3.2 Time of Concentration

The surface runoff from each sub-area contributing to a pit has a particular *time of concentration*. This is defined as the time it takes for runoff from the upper part of a sub-area to start contributing as inflow to the pit. It is mainly related to the flow path distance, slope and surface type over which the runoff has to travel.

The time of concentration was defined as the sum of:

a) constant property flow times plus gutter flow times, and

b) overland flow time based on the Kinematic wave equation.

The gutter flow times were based on a standard half road section with a flow of 0.2 m^3/s and the average slope of the catchment at that location.

An additional delay lag of 5 minutes was applied to the pervious areas. The relationship was developed based on a catchment of similar characteristics within the Sydney region and is generally suitable for application in the present investigation. A minimum time of 5 minutes and a maximum of 15 minutes was applied.

5.3.3 Outlet Conditions

The pipe system outlet was modelled with a Sydney Harbour (Rushcutters Bay) tailwater level of 1 mAHD. The DRAINS model can only take this into account at the downstream pit. It cannot simulate the "drowning" of several downstream pits and overland flow routes by an elevated tailwater where the upstream pits are below the tailwater level. The reason why DRAINS can do the former but not the latter is because it does not take account of the water level (produced by an elevated tailwater or the bypassing flow) above the surface level of the upstream pits. It only does this for the downstream pit.

6. HYDRAULIC MODELLING - OPEN CHANNEL SYSTEM - SOBEK

6.1 General

Given the objectives of the study, the availability of ALS data and the nature of the flat terrain at the downstream limit of the catchment, a 2D overland flow hydraulic model was required to effectively assess flood behaviour. The 2D overland model was established using the SOBEK software package (Reference 8), which is widely used in Australia and internationally.

The SOBEK 2D hydraulic model of Rushcutters Bay extends from the mouth of the open channel in Rushcutters Bay to Hampden Street and surrounding floodplain (Figure 7).

6.2 Methodology of SOBEK Model

A 5 m^2 and a 2 m^2 2D grid were generated from the ALS data. This allowed initial runs to be undertaken quickly using the 5 m^2 grid with the final runs on the 2 m^2 grid. The ALS ground surface within the SOBEK model area is shown on Figure 8. The model boundary conditions (Figure 9) were:

- Overland flows entering the 2D model extent from the DRAINS model were defined as line boundaries.
- Surface pit sub-catchments located within the 2D model were defined as point sources. This assumed that the inlet pits contained within the 2D model were not capable of any more inflow, but were also not surcharging (i.e. the sub-surface drainage system was at capacity). This assumption was necessary for the interaction between the two models.
- Pipe flows from DRAINS were included as nodes with lateral flows.

SOBEK allows the channel to be modelled as a 1D component and this was coupled with a 2D overland receiving component (Figure 9). At a specified distance along the channel, a calculation point solves the momentum and continuity equations for both the 1D channel and overland flows.

The major box culvert structures over the channel at Craigend Street and New South Head Road were modelled as an orifice and a culvert to simulate both entry losses and losses along the culvert.

The Manning's "n" values for each grid cell were estimated from engineering experience and applied to the 2D overland area based on the terrain shown in Table 13.

Table 13: Manning's "n" values within SOBEK

Category	Manning's "n"	Description
1	0.10	Natural bushland, trees.
2	0.02	Streets, paved areas.
3	0.60 (1)	Private property obstructed by fences.
4	0.03	Grassed areas.
5	0.05	Grassed area with obstacles.
6	0.015	Open lined channel.

Note:
(1) The high Manning's "n" value of 0.6 was chosen where fences lay perpendicular to the flow in order to simulate that water would pond rather than flow in these locations.

6.3 Model Calibration and Verification

6.3.1 Overview

Ideally the SOBEK model should be calibrated to one historical event and verified using another historical event. There should also be sufficient historical flood height data (preferably for both historical events) to define the flood gradient within the modelling extent. However as indicated in References 1 and 2 there is very little flood height data available (refer Section 3.4.2). Whilst flooding has occurred several times in Cecil Street and Cecil Lane the maximum depths have never been accurately recorded but are of the order of 1 m.

Thus the only calibration information available was:

- White City tennis complex - 3.1 mAHD in November 1984,
- White City tennis complex - 2.7 mAHD in January 1989,
- White City tennis complex - 2.5 mAHD in January 1991.

It should be noted that the culverts under Craigend Street and New South Head Road were upgraded in 1986 and thus the present conditions do not reflect those at the time of the November 1984 event.

6.3.2 Historical Calibration and Verification Results

The results of the calibration and verification for SOBEK using the Paddington rainfall data are provided in Table 14.

Table 14: Calibration/Verification and Design Flood Results

Event	Level (mAHD) within White City tennis complex	
	Recorded Peak	SOBEK Peak
November 1984	3.1	3.50
January 1989	2.7	3.45
January 1991	2.5	3.27
PMF	n/a	
100 year ARI	n/a	3.97 *
50 year ARI	n/a	3.75 *
20 year ARI	n/a	3.31 *
10 year ARI	n/a	3.23 *
5 year ARI	n/a	3.16 *

* assumes 100% blockage of small culvert under New South Head Road

n/a - not applicable

The SOBEK results for the historical events clearly indicate higher levels than those recorded. There are a number of possible explanations as described below.

- The accuracy of the January 1989 and January 1991 levels is poor with possible errors of ±0.5 m. For November 1984 the accuracy should be better as the data source was inundation of the White City tennis building.
- The exact timing of the November 1984 event is unknown. The recorded level could be for the 1st or 2nd event on 8th November 1984 or for the significant rainfall on 5th November 1984.
- If the November 1984 level was a peak level mark inside a building there could be up to a 0.3 m height differential inside to outside.
- The nature of the flood levels (tide mark, debris in fence) is unknown?
- Blockage of the culverts under New South Head Road may have been a factor.

In summary, there is significant doubt as to the accuracy of all the recorded flood levels. This further emphasises the need for Council (or other authorities) to collect accurate flood data (rainfall and height) immediately following flood events. Ideally, maximum flood height recorders should be installed as the land use (recreation) mean that few people will actually be in or near to the floodplain when flooding occurs.

Possible reasons for the SOBEK results being “higher” than the recorded levels are:

- the rainfall recorded at Paddington was not the average falling over the catchment,
- the capacity of the culverts under New South Head Road was underestimated by SOBEK. This issue was investigated and the flow and height relationship compared to other “models”,
- DRAINS over-estimated the peak flow and/or the runoff volume. DRAINS has been tested on numerous catchments in NSW and elsewhere. However, each urban catchment is different, thus a satisfactory “test” on one catchment may not be valid for another catchment. Minor changes to the overland flow or time of concentration can produce significant differences in the peaks downstream. Unfortunately there is no way to “check” that DRAINS is producing the correct peak flows or runoff volumes. However the peak

flow results obtained from DRAINS are comparable with those included in Reference 1 (refer Section 7.6). It is possible to use other hydrologic models to obtain peak flow estimates and compare the results. Our experience with using this approach is that it is highly dependant upon the assumptions used to represent the effects of catchment urbanisation. Thus no definitive outcome is achieved.

The effect of sensitivity to assumptions on the performance of the culverts is discussed in Section 7.5.

In the absence of any sound information to the contrary the SOBEK and DRAINS modelling system is assumed to be calibrated and suitable for design flood estimation. However the calibration should be verified using data from the next flood event.

7. DESIGN FLOOD RESULTS

7.1 Overview

There are two basic approaches to determining design flood levels, namely:

- *flood frequency analysis* - based upon a statistical analysis of the flood events, and
- *rainfall and runoff routing* - design rainfalls are processed by hydrologic and hydraulic computer models to produce estimates of design flood behaviour.

The *flood frequency* approach requires a reasonably complete homogeneous record of flood levels and flows over a number of decades to give satisfactory results. No such records were available within the catchment. For this reason a *rainfall and runoff routing* approach using the DRAINS model results was adopted for this study to derive design inflow hydrographs for input to the SOBEK hydraulic model, which determines design flood levels, flows and velocities. This approach reflects current engineering practice and is consistent with the quality and quantity of available data.

7.2 Hydrologic Modelling

Design temporal patterns were derived from AR&R (Reference 5) and used as input for the DRAINS model. Uniform depths of rainfall with zero areal-reduction factor were applied across the entire catchment.

The determination of the critical storm duration for an urban catchment is more complex than for a rural catchment. Consideration must be taken of:

- the peak flow from the sub-catchment,
- the peak flow arriving at a surface inlet pit from upstream (conduit and overland flows),
- the peak flow in the pit,
- the volume temporarily collected in ponding areas,
- the location within the catchment.

Standard AR&R storm durations ranging from 30 minutes to 3 hours were run for the 100 year ARI event and the critical duration was found to vary across the catchment depending upon the size of the upstream catchment. However, a detailed review of the results showed that the relative differences between several storm durations were only minor. **It is recommended that the full range of storm durations are considered if undertaking detailed investigations for drainage upgrade works within the catchment.**

Design results from DRAINS are provided in Appendix D and on the following figures:

- Figure 10: Existing Pipe Capacity - this shows that for the majority of the catchment the pipe capacity is less than 5 year ARI. However, it should be noted that pipes showing greater capacities could be doing so because upstream overland flow is diverted elsewhere.

- Figure 11: 100 year ARI Pipe Flows - this indicates the pipe flows in m^3/s. It should be noted that the pipe flow does not vary significantly once the pipe is at full capacity.
- Figures 12 to 17 - shows the 5 year ARI to PMF overland flows.

7.3 Hydraulic Modelling

7.3.1 Tailwater Conditions - Rushcutters Bay

In addition to runoff from the catchment, the reach of the open channel downstream of Glenmore Road can also be influenced by backwater effects from high water levels in Rushcutters Bay (Section 3.3). As noted previously, these two distinct mechanisms produce flooding in Rushcutters Bay as well as in the open channel but may not result from the same storm. It is acknowledged however that this may not necessarily be the case and that tidal influences may occur in conjunction with rainfall events. Consideration must therefore be given to accounting for the joint probability of coincident flooding from both catchment runoff and backwater effects from Rushcutters Bay.

A full joint probability analysis is beyond the scope of the present study. It is accepted practice to estimate design flood levels in these situations using a 'peak envelope' approach that adopts the highest of the predicted levels from the two mechanisms. As the 100year ARI peak level in Rushcutters Bay due to a high tide/storm surge is largely contained within the stormwater canal downstream of New South Head Road, a single design scenario was adopted. For each design event, the relevant design flows are used in conjunction with a very high solstice tide static tailwater level of 1.0 mAHD in Rushcutters Bay. This approach is identical to that adopted in similar such studies elsewhere in Sydney.

This simplified approach is considered appropriate given that:

- there is a relatively short transitional zone between the peak levels for the two mechanisms,
- the transitional zone is confined to downstream of New South Head Road.

A sensitivity analysis of the relative impacts of assuming different tailwater conditions is presented in Section 7.5.

7.3.2 Blockage Assessment

The role of blockages in exacerbating flood impacts during the August 1998 storm in North Wollongong highlights the importance of considering the implications for blockages in design flood assessment. Whilst most blockages are due to plant debris, in an urban environment there is the risk that fences or vehicles may be swept into the channel and cause the same effect.

Based on site inspections and discussions with Council officers and local residents, the issue of culvert blockages is relevant for the Rushcutters Bay open channel system.

Evidence from the August 1998 North Wollongong storm indicates that there is the potential for culvert openings less than 6 m width to be blocked during a runoff event. For the Rushcutters Bay open channel this observation would imply that the smaller of the two culverts under New South Head Road could be either partially or fully blocked.

The 7.9 m wide by 1.8 m high box culvert is assumed to be of sufficient size that the likelihood of blockage during a typical storm is very small. For this reason no blockage was assumed. Whilst the 4.5 m wide box culvert leading to the open channel is relatively high (1.8 m) at the entrance, beneath New South Wales Road it narrows to a maximum height of 1.1 m with a curved roof reducing to a height of 0.5 m.

Blockage of this smaller box culvert could easily occur if fences, netting or such like entered the channel during the storm. However the entrance to the culvert is restricted (refer Photographs 6 and 7) which may reduce the likelihood of debris entering this culvert.

To quantify the impacts of potential blockages on design flood behaviour, an unblocked, 50% blocked and 100% blockage of the small culvert were simulated for the 100y ARI event using the SOBEK model (90 minute duration event). The results are indicated in Table 15.

Table 15: 100year ARI Flood Levels (mAHD) at tennis complex

4.5 m wide culvert under Craigend Street/New South Head Road		
Unblocked	**50% blockage**	**100% blockage**
3.70	3.80	3.97

As expected, the results indicate that the inclusion of 100% blockage of the small 4.5 m wide culvert under Craigend Street/New South Head Road has a significant impact on the peak flood level upstream. As a result 100% blockage of the small culvert was adopted for the design flood analysis.

7.4 Design Events

The critical storm duration (produces the highest peak level) was determined to be the 90 minute duration for the 100 year event. This event was used for all other design events apart from the PMF which was determined to be the 120 minute duration.

Peak height profiles for the 5, 10, 20, 50 and 100 year ARI events and the PMF are provided on Figure 18. Figures 19 to 24 summarise the results in graphical form. Design flood contours for the 20 year ARI, 100 year ARI and PMF events are provided on Figures 21, 23 and 24.

For the purposes of floodplain risk management in NSW the floodplain is divided into one of three Hydraulic categories (floodway, flood storage or flood fringe) and two Hazard categories (Low or High). These terms are defined in Appendix A. Further details of this process are provided in the

NSW Government's Floodplain Development Manual (Reference 9). Maps of the categorisation for the 100 year ARI and PMF events are provided on Figures 25 and 26.

The Hydraulic categorisation was determined qualitatively based upon the available hydraulic and survey information together with our knowledge of the Rushcutters Bay catchment and experience in other catchments. The Hazard categorisation was determined quantitatively based upon the available hydraulic and survey information in accordance with the provisional hydraulic hazard categorisation figures provided in Reference 9. As indicated in the NSW Government's Floodplain Development Manual this process of Hazard categorisation is **Provisional** and should be refined at a later date to reflect other factors that influence hazard (such as warning time, flood readiness, rate of rise, duration of flooding, evacuation problems, effective flood access and the type of development).

7.5 Sensitivity Analyses

Given the lack of reliable historical flood level and streamflow data, only a limited calibration of the SOBEK model was possible. In view of this, sensitivity analyses were undertaken to determine the impacts of key model parameters on the simulated flood behaviour.

The following sensitivity analyses were carried out for the 100 year ARI event (assuming 100% blockage):

- ±25% variation in Manning's 'n' value. This parameter reflects the surface friction (a higher "n" the greater the friction and the higher the flood level),
- ±10% change in rainfall,
- ±0.5 m change in tailwater level in Rushcutters Bay.

The results demonstrate that for a significant flood event, the impacts of assumed tailwater conditions are confined to the very lower reaches of the Rushcutters Bay open channel. Model results indicate that even with a relatively high tailwater, the backwater effects do not extend beyond upstream of Craigend Street. For low tailwater conditions, the results indicate the same. This validates the original tailwater assumptions made when undertaking the modelling of the calibration and verification events (as noted earlier in Section 7.3.1).

In general, variations in Manning's 'n' roughness values of +/-25% did not result in significant variations in predicted peak flood levels.

Changes to the design rainfall produced minor changes in the predicted flood peaks throughout the model as expected.

The "Greenhouse" effect has become one of the major environmental concerns over the last 20 years both in respect to increased ocean levels and storm intensities.

A change in the sea level has the potential to alter flood levels in Rushcutters Bay and thus the lower reaches of the Rushcutters Bay open channel. The full effects have not been quantified but the sensitivity analysis indicates that any increase in tailwater level will not significantly affect areas upstream of Craigend Street. The sensitivity analysis also indicates the effect of a 10% increase in design rainfall intensities will be minor.

7.6 Comparison of Results with Previous Studies

The peak flood levels within the White City tennis complex were compared (Table 16) with the two previous studies, the Rushcutters Bay Catchment Management Study and White City Stormwater Modelling Water Level and Velocity Measurements (References 1 and 2). Since the hydraulic modelling approach and methodology between all three studies is significantly different, differences in flood levels are expected.

Table 16: Comparison of Flood Levels (mAHD) between Previous Studies

Event (ARI)	Study					
	Rushcutters Bay Catchment Management Study (Reference 1)		White City Stormwater Modelling, (Reference 2) (1)		Present Study (assumes 100% blockage of small culvert under New South Head Road)	
Location upstream of Craigend Street culverts	80 m u/s	280 m u/s	80 m u/s	280 m u/s	80 m u/s	280 m u/s
5 y	2.15	2.60	3.0	3.1	2.88	3.16
10 y	2.30	2.64	3.2	3.2	3.00	3.23
20 y	2.49	2.94	3.7 (3.1)	3.8 (3.2)	3.21	3.31
100 y	2.71	3.42	4.6 (3.5)	4.6 (3.5)	3.97	3.98

Note:
(1) The White City study used a physical model and considered both Steady State and Unsteady Flow. The values in brackets are for the Unsteady Flow State.

References 1 and 2 used identical peak inflows from the ILSAX model (a precursor to DRAINS). A comparison of the peak flows (Table 17) indicates similar results. The only major differences are:

- there are some differences in the peak flows in the 5 year and 10 year ARI events as well as the PMF,
- the present study indicates a slightly higher peak flow for November 1984 but a slightly lower peak flow for January 1989.

Table 17: Comparison of Peak Flows (m^3/s) at Craigend Street

Event	Rushcutters Bay Catchment Management Study (Reference 1)	Present Study
5 y ARI	40	55
10 y ARI	46	63
20 y ARI	67	74
50 y ARI	not provided	83
100 y ARI	99	94
PMF	251	450
November 1984	50	63
January 1989	82	69
January 1991	62	58

It should be noted that neither Reference 1 or 2 undertook any form of model calibration. This point was made in Reference 2.

8. ACKNOWLEDGMENTS

This study was carried out by Webb, McKeown & Associates Pty Ltd and funded by Woollahra Council and the NSW State Government. The assistance of the following in providing data and guidance to the study is gratefully acknowledged:

- Woollahra Council,
- Department of Natural Resources,
- Floodplain Management Committee,
- NSW State Government,
- Residents of the Rushcutters Bay catchment.

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FIGURES

APPENDIX A: GLOSSARY OF FLOOD TERMS

APPENDIX A: GLOSSARY OF FLOOD TERMS

Taken from the Floodplain Development Manual (April 2005 edition)

acid sulfate soils	Are sediments which contain sulfidic mineral pyrite which may become extremely acid following disturbance or drainage as sulfur compounds react when exposed to oxygen to form sulfuric acid. More detailed explanation and definition can be found in the NSW Government Acid Sulfate Soil Manual published by Acid Sulfate Soil Management Advisory Committee.
Annual Exceedance Probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood discharge of 500 m^3/s has an AEP of 5%, it means that there is a 5% chance (that is one-in-20 chance) of a 500 m^3/s or larger event occurring in any one year (see ARI).
Australian Height Datum (AHD)	A common national surface level datum approximately corresponding to mean sea level.
Average Annual Damage (AAD)	Depending on its size (or severity), each flood will cause a different amount of flood damage to a flood prone area. AAD is the average damage per year that would occur in a nominated development situation from flooding over a very long period of time.
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.
caravan and moveable home parks	Caravans and moveable dwellings are being increasingly used for long-term and permanent accommodation purposes. Standards relating to their siting, design, construction and management can be found in the Regulations under the LG Act.
catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.
consent authority	The Council, government agency or person having the function to determine a development application for land use under the EP&A Act. The consent authority is most often the Council, however legislation or an EPI may specify a Minister or public authority (other than a Council), or the Director General of DIPNR, as having the function to determine an application.
development	Is defined in Part 4 of the Environmental Planning and Assessment Act (EP&A Act). **infill development:** refers to the development of vacant blocks of land that are generally surrounded by developed properties and is permissible under the current zoning of the land. Conditions such as minimum floor levels may be imposed on infill development. **new development:** refers to development of a completely different nature to that associated with the former land use. For example, the urban subdivision of an area previously used for rural purposes. New developments involve rezoning and typically require major extensions of existing urban services, such as roads, water supply, sewerage and electric power. **redevelopment:** refers to rebuilding in an area. For example, as urban areas age, it may become necessary to demolish and reconstruct buildings on a relatively large scale. Redevelopment generally does not require either rezoning or major extensions to urban services.
disaster plan (DISPLAN)	A step by step sequence of previously agreed roles, responsibilities, functions, actions and management arrangements for the conduct of a single or series of connected emergency operations, with the object of ensuring the coordinated response by all agencies having responsibilities and functions in emergencies.

discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m^3/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving for example, metres per second (m/s).
ecologically sustainable development (ESD)	Using, conserving and enhancing natural resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be maintained or increased. A more detailed definition is included in the Local Government Act 1993. The use of sustainability and sustainable in this manual relate to ESD.
effective warning time	The time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to move farm equipment, move stock, raise furniture, evacuate people and transport their possessions.
emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
flash flooding	Flooding which is sudden and unexpected. It is often caused by sudden local or nearby heavy rainfall. Often defined as flooding which peaks within six hours of the causative rain.
flood	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 before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
flood awareness	Flood awareness is an appreciation of the likely effects of flooding and a knowledge of the relevant flood warning, response and evacuation procedures.
flood education	Flood education seeks to provide information to raise awareness of the flood problem so as to enable individuals to understand how to manage themselves an their property in response to flood warnings and in a flood event. It invokes a state of flood readiness.
flood fringe areas	The remaining area of flood prone land after floodway and flood storage areas have been defined.
flood liable land	Is synonymous with flood prone land (i.e. land susceptible to flooding by the probable maximum flood (PMF) event). Note that the term flood liable land covers the whole of the floodplain, not just that part below the flood planning level (see flood planning area).
flood mitigation standard	The average recurrence interval of the flood, selected as part of the floodplain risk management process that forms the basis for physical works to modify the impacts of flooding.
floodplain	Area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land.
floodplain risk management options	The measures that might be feasible for the management of a particular area of the floodplain. Preparation of a floodplain risk management plan requires a detailed evaluation of floodplain risk management options.
floodplain risk management plan	A management plan developed in accordance with the principles and guidelines in this manual. Usually includes both written and diagrammetic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.
flood plan (local)	A sub-plan of a disaster plan that deals specifically with flooding. They can exist at State, Division and local levels. Local flood plans are prepared under the leadership of the State Emergency Service.
flood planning area	The area of land below the flood planning level and thus subject to flood related development controls. The concept of flood planning area generally supersedes the “flood liable land” concept in the 1986 Manual.

Flood Planning Levels (FPLs)	FPL's are the combinations of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans. FPLs supersede the "standard flood event" in the 1986 manual.
flood proofing	A combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate flood damages.
flood prone land	Is land susceptible to flooding by the Probable Maximum Flood (PMF) event. Flood prone land is synonymous with flood liable land.
flood readiness	Flood readiness is an ability to react within the effective warning time.
flood risk	Potential danger to personal safety and potential damage to property resulting from flooding. The degree of risk varies with circumstances across the full range of floods. Flood risk in this manual is divided into 3 types, existing, future and continuing risks. They are described below. **existing flood risk:** the risk a community is exposed to as a result of its location on the floodplain. **future flood risk:** the risk a community may be exposed to as a result of new development on the floodplain. **continuing flood risk:** the risk a community is exposed to after floodplain risk management measures have been implemented. For a town protected by levees, the continuing flood risk is the consequences of the levees being overtopped. For an area without any floodplain risk management measures, the continuing flood risk is simply the existence of its flood exposure.
flood storage areas	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. Hence, it is necessary to investigate a range of flood sizes before defining flood storage areas.
floodway areas	Those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flows, or a significant increase in flood levels.
freeboard	Freeboard provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the FPL is actually provided. It is a factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. Freeboard is included in the flood planning level.
habitable room	**in a residential situation:** a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom. **in an industrial or commercial situation:** an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.
hazard	A source of potential harm or a situation with a potential to cause loss. In relation to this manual the hazard is flooding which has the potential to cause damage to the community. Definitions of high and low hazard categories are provided in the Manual.
hydraulics	Term given to the study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity.
hydrograph	A graph which shows how the discharge or stage/flood level at any particular location varies with time during a flood.
hydrology	Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.
local overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.

local drainage Are smaller scale problems in urban areas. They are outside the definition of major drainage in this glossary.

mainstream flooding Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.

major drainage Councils have discretion in determining whether urban drainage problems are associated with major or local drainage. For the purpose of this manual major drainage involves:

- the floodplains of original watercourses (which may now be piped, channelised or diverted), or sloping areas where overland flows develop along alternative paths once system capacity is exceeded; and/or
- water depths generally in excess of 0.3 m (in the major system design storm as defined in the current version of Australian Rainfall and Runoff). These conditions may result in danger to personal safety and property damage to both premises and vehicles; and/or
- major overland flow paths through developed areas outside of defined drainage reserves; and/or
- the potential to affect a number of buildings along the major flow path.

mathematical/computer models The mathematical representation of the physical processes involved in runoff generation and stream flow. These models are often run on computers due to the complexity of the mathematical relationships between runoff, stream flow and the distribution of flows across the floodplain.

merit approach The merit approach weighs social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well being of the State's rivers and floodplains.

The merit approach operates at two levels. At the strategic level it allows for the consideration of social, economic, ecological, cultural and flooding issues to determine strategies for the management of future flood risk which are formulated into Council plans, policy and EPIs. At a site specific level, it involves consideration of the best way of conditioning development allowable under the floodplain risk management plan, local floodplain risk management policy and EPIs.

minor, moderate and major flooding Both the State Emergency Service and the Bureau of Meteorology use the following definitions in flood warnings to give a general indication of the types of problems expected with a flood:

minor flooding: causes inconvenience such as closing of minor roads and the submergence of low level bridges. The lower limit of this class of flooding on the reference gauge is the initial flood level at which landholders and townspeople begin to be flooded.

moderate flooding: low-lying areas are inundated requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered.

major flooding: appreciable urban areas are flooded and/or extensive rural areas are flooded. Properties, villages and towns can be isolated.

modification measures Measures that modify either the flood, the property or the response to flooding. Examples are indicated in Table 2.1 of the Manual together with further discussion.

peak discharge The maximum discharge occurring during a flood event.

Probable Maximum Flood (PMF)	The PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain. The extent, nature and potential consequences of flooding associated with a range of events rarer than the flood used for designing mitigation works and controlling development, up to and including the PMF event should be addressed in a floodplain risk management study.
Probable Maximum Precipitation (PMP)	The PMP is 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 PMF estimation.
probability	A statistical measure of the expected chance of flooding (see AEP).
risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of the manual it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
runoff	The amount of rainfall which actually ends up as streamflow, also known as rainfall excess.
stage	Equivalent to “water level”. Both are measured with reference to a specified datum.
stage hydrograph	A graph that shows how the water level at a particular location changes with time during a flood. It must be referenced to a particular datum.
survey plan	A plan prepared by a registered surveyor.
water surface profile	A graph showing the flood stage at any given location along a watercourse at a particular time.
wind fetch	The horizontal distance in the direction of wind over which wind waves are generated.

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APPENDIX B: HISTORICAL FLOOD DATA

APPENDIX B: HISTORICAL FLOOD DATA

The information provided in this appendix and summarised in the main body of the text is taken from the publicly available **"Rushcutters Bay SWC No 84 Catchment Management Study – December 1991 prepared by Bewsher Consulting Pty Ltd for Water Board (now known as Sydney Water)"**. All addresses and information were obtained from this report.

It should also be noted that any flood or drainage problem identified in the 1991 Sydney Water report does not necessarily reflect an ongoing problem. For example, it may have occurred due to a blocked kerb inlet, a diversion of runoff due to building works or for many other reasons. It is also possible that the identified problem was subsequently resolved by Council or the owner.

Any existing flood and drainage problems will be addressed in the next stage of the of the floodplain management process that is the preparation of a Floodplain Risk Management Study.

Area in Ref. 1	Event	Location	Description
Jersey Road		Low point in Queen Street, between Spicer and Moncur Streets .	Ponding of water.
Jersey Road	Jan 89	Outside No. 126 Queen Street.	Water at a depth of 0.5 m, floor inundation of less then 0.1 m.
Jersey Road		John Street near Ocean Street.	Localised drainage problems
Jersey Road		Moncur Street, until Britannia Lane.	Substantial flow which overtops the kerb at Britannia Lane.
Jersey Road	Jan 91	Morrell Street, north-west through the park and adjacent to the Holdsworth Community Centre.	Overland flows, reached a depth of 0.5 m.
Jersey Road	1984, Jan 87, Jan 89, Apr 89, and Jan 91	No 113 Jersey Road	Major overland flows, and severe flooding during stated events. (blamed on regrading of park in 1987, barricades now exist diverting flow and have prevented above floor flooding).
Jersey Road	Jan 89, Jan 91	Spicer Lane	0.5 m depths in the cul-de-sac, 0.3 m routing down spicer lane.
Jersey Road		No. 86 Holdsworth Street	Above floor flooding due to flows overtopping kerb in Holdsworth street en route to Jersey Road.
Jersey Road		Ocean Street between Trelawny Street and Wellington Street.	Property inundation.
Jersey Road		No. 76 Ocean Street	Above floor flooding.
Jersey Road	Jan 89	No. 9 Tara Street	Inundation to 0.15 m above floor level (garage and fence now exist to divert flow).
Jersey Road	Jan 91	No. 9 Tara Street	Garage floor inundated to a depth of 0.05 m, significant flows directed along adjacent pathway and through the rear of properties into Jersey Road.
Jersey Road	Jan 89	No. 204 Jersey Road	Depths of up to 1.0 m were observed in the units car park area.
Jersey Road	Jan 89	No. 47 Harris Street	Flooding above the house floor level.
Jersey Road	Jan 91	No. 47 Harris Street	Floor level inundation averted due to temporary barricade erection. Levels of 0.5 m in depth observed near barricade.
Jersey Road		No. 173 Windsor Street, No 223 Sutherland Street	Above floor level inundation.
Jersey Road		No. 189 Paddington Street	Below floor level inundation due to drainage problems.

Area in Ref. 1	Event	Location	Description
Jersey Road		No. 205 Hargrave Avenue	Above floor level inundation due to local drainage problems.
Jersey Road		No. 159 Paddington Street	Ground seepage enters residence during storms.
Jersey Road		No. 133 Windsor Street	Above floor flooding due to local drainage problem.
Jersey Road		No's 43 & 45 Harris Street	Above floor level inundation.
Jersey Road		No's 1,3,5.7,19,21 (and potentially 17, 15, 13,11, & 9) Harris Street	Floor level inundation through the rear of properties (and could through others during major storm events).
Jersey Road	Jan 89	No's 9, 11 and 13 Sutherland Avenue	Above floor level inundation to a depth of 0.1 m at No. 9.
Jersey Road	Jan 91, Jan 89	No. 1 Harris Street	A depth of 0.85 m in the street low point adjacent to the rear of No. 1 Harris Street. Inundation above the floor level.
Jersey Road	Jan 91, Jan 89	No. 3 Harris Street	Inundation was 0.03 m above the floor level.
Jersey Road	Jan 91, Jan 89	No, 5 and No. 7 Harris Street	Flow to a depth of 0.85 m passed through to Harris Street lapping at the rear step to No. 5.
Jersey Road	Jan 89	No. 2 Harris Street	Floor level inundation to 0.3 m, with water built up to 2.5 m.
Jersey Road	Jan 91	No. 2 Harris Street and neighbouring residences	Floor level inundation to 0.3 m, with water built up to 2.5 m.
Trumper Park	Jan 89, Mar 89, Apr 89, and Jan 91	No. 380 Oxford Street	Above floor level inundation.
Trumper Park	Jan 91	No. 380 Oxford Street	A depth of 1.0 m above the footpath was observed.
Trumper Park	Jan 89	No. 48 Victoria Street	Overland flows with a depth to 0.4 m were observed and lapped at the floor level of No. 48 Victoria.
Trumper Park		Victoria Street sag point	Floodwaters temporarily pond and cause flooding of adjacent property cellars.
Trumper Park		No. 121 Underwood Street	Rising groundwater causes inundation of the basement during major storm events.
Trumper Park	Jan 89, Jan 91	No. 1 Tivoli Street	Water up to 0.08 m at front of house (89), inundation up to 0.02 m above floor level (91).
Trumper Park	Jan 89, Jan 91	No. 18 George Street and neighbouring properties	Water to a depth of 0.6 m in the street and up to 0.05 m above floor level.
Trumper Park		Rear of No. 18 George Street	Ponding of floodwaters in laneway.
Trumper Park	1984, Jan 89, Jan 91	No. 11 Elizabeth Place	Depths up to 0.08 m above house floor level in 84 and 89 events, shallower in 91.
Trumper Park	Jan 89, Jan 91	No. 25 Elizabeth Street	Floor level inundation (89), water to 0.05 m below floor level (91).
Trumper Park	Jan 89, Jan 91	No. 130 Underwood Street	Property inundation to 0.3 m, and above floor flooding to 0.05 m (89), property inundation to 0.2 m (91).
Trumper Park		No. 184 Underwood Street	Above floor flooding due to a drainage problem.
Trumper Park		Northern end of Hopetoun Street	Severe property inundation during major storm events.
Trumper Park	Jan 89	No. 18 Norfolk Street	Above house floor level inundation to 0.08 m (has seen been averted due to construction of a dwarf wall).
Trumper Park	Jan 89,	No. 21 Paddington Street	Water to 0.15 m below floor level.

Area in Ref. 1	Event	Location	Description
	Jan 91		
Trumper Park		No's 14 28 and 30 Windsor Street	Inundation of below ground cellars.
Trumper Park	Jan 89, Mar 89	No's 8 10 and 12 Hargrave Street	Lower floors flooded, depths up to 1.5 m at 8 and 10 in both events. Depths up to 1.8 m at no 12 during Jan 89 event.
Trumper Park	Jan 89, Mar 89	No. 14 Hargrave Street	Above house floor level inundation to 0.7 m.
Trumper Park	Jan 89	No. 88 Hargrave Street	Inundated with depths of up to 1.5 m in the lower below street level.
Trumper Park	Jan 89	Low point in Hargrave Lane	Flooding to a depth of 0.6 m.
Trumper Park	Jan 89	No. 39 Sutherland Street	Inundated above house floor level.
Trumper Park	Jan 89, Mar 89	No. 66 Elizabeth Street	Above house floor inundation to unspecified depth.
Trumper Park		No. 4 Hampden Street	Flooding of below ground car park to a depth of 0.5 m.
Trumper Park	Jan 89, Jan 91	No's 6 and 8 Hampden Street	Above ground floor level inundation to 0.3 m in both blocks (89), No. 8 was up to 0.15 m above ground floor level (91).
Trumper Park	Jan 89, Jan 91	No's 14/17-23 Cecil Street	0.15 m above floor level inundation (89). Below floor level inundation (91).
Trumper Park	Jan 89	No's 26 – 52 Cecil Street	Property inundation.
Trumper Park	Jan 89, Jan 91	No. 48 Cecil Street	Depths to 0.95 m in the garage and 0.15 m in the house (89), 0.6 m in the garage and 0.05 m in the house (91).
Trumper Park	Jan 89	No's 1 – 13 Royalston Street	Property inundation to depths of 1.0 m.
Trumper Park	Jan 91	Trumper Park Oval	Water depth estimated at 0.15 m.
White City	Jan 91	No. 10 Duxford Street	Water lapped at floor level.
White City		No. 1 Gurner Street, No. 280 and 311 Glenmore Road,	Groundwater seepage due to storm events.
White City	Jan 89	No. 357 Glenmore Road	Rear of property inundated to depths of 0.3 m.
White City		Goodhope Street	Flows to a depth of 0.15 m above footpath.
White City		No. 29 Lawson Street	Above floor level inundation.
White City	Jan 90	Glenmore Road and adjacent streets lowpoint	Water to a depth of approximately 0.8 m.
White City	Jan 89, Jan 91	No. 422 Glenmore Road	Depth of up to 0.2 m above floor level (89), water diverted to prevent house inundation (91).
White City		No's 440 and 450 Glenmore Road	Above floor level inundation.
White City	1984, Jan 89, Jan 91	White City Tennis Courts	Above top of bank depths 1.0 m (84), 0.6 m (Jan 89), 0.3 m (Jan 91). Court offices inundated above floor level to 0.07 m (84).
White City	Aug 83	Neild Avenue / Craigend Street intersection	Flooding to depths of 0.45 m.
White City	Aug 83	Just upstream of Craigend Street culvert	Flooding to a maximum level of 1.3 m above the main channel.
Brown Street		No's 55 and 57 Underwood Street	Above house floor level inundation.
Brown Street		No. 10 Olive Street	Suffers from seepage during storm events.
Brown Street		No. 72 Brown Street	Rising ground water, up to 0.2 m, after storm events.

Area in Ref. 1	Event	Location	Description
Upper Boundary Street	1984, Jan 91, Jan 89	Properties adjacent to low points of Taylor Street and Sturt Street	Depths in the streets were up to 1.3 m (84), and 1.6 m (Jan 91), marginally less in the 89 event.
Upper Boundary Street	Jan 91	No. 66 Taylor Street	Water overtopped 0.5 m front fence and lapped at floor level.
Upper Boundary Street	Jan 91	No's 84 86 & 88 Oxford Street	Property inundation, water up to 0.45 m above footpath level adjacent to No. 84.
Upper Boundary Street	Jan 91	No. 39 Oxford Street	Depths of 0.15 m above footpath level adjacent to 39.
Upper Boundary Street	Jan 89	St Vincents Hospital	Major flooding of hospital basement areas.
Upper Boundary Street	Jan 89	No. 55 Boundary Street	Flows along adjacent path up to 0.15 m depth.
Neild Avenue	Jan 89, Jan 91	Boundary Street	Flows on western side of the street foot path depths of up to 0.5 m were observed (89).
Neild Avenue		Properties adjacent to lowpoint of McLachlan Street	Above floor level inundation.
Neild Avenue	Aug 83, Jan 91	Properties adjacent to lowpoint of McLachlan Street	Above showroom floor level inundation up to 0.2 m (83), up to 0.15 m in 91.
Neild Avenue	Jan 89	Nield Avenue properties	Storm flows up to 0.5 m deep.
Neild Avenue	Aug 83	Nield Street intersection	Flooding up to 0.45 m deep.
New South Head Road	Jan 89	Low point in Waratah Street	Ponding of up to 0.5 m above top of kerb.
New South Head Road		61/65 Bayswater Road	Above floor level inundation resulting from car park runoff entering below ground level shop car park.

HISTORICAL FLOODING INFORMATION - SYDNEY WATER DATABASE

DATA RATING: **1** - Well Defined Level and Location **2A** - Level Well Defined, Location Unsure **2B** - Level Unsure, Location Well Defined **3** - Approximate Only

SOURCE OF DATA: **A -** File No. 224152F9 **B** - File No. 225419F1 **C** - Rushcutters Bay SWC No. 84 General Flooding Folder **D** - Flooding Reports & Intensities for Storm 4.3.1977 **E** - Flooding Event 9-10 April 1998

No.	Branch No.	Location	Loc. On Map	Date Flooded From	Date Flooded to	Depth (m)	Level Above Floor (m)	Level Above Coping (m)	Flood Level (mAHD)	Floor Level (mAHD	Gutter Level (mAHD)	Remarks	Data Rating	Source of Data
2	84A	White City, Lot 3 New South Head Rd, Edgecliff		15/06/1949	15/06/1949	0.56						Stadium & White City Courts both flooded.	1	A
3	84A	White City, Lot 3 New South Head Rd, Edgecliff		25/09/1951	25/09/1951	0.64						Water covered many of the tennis courts at White City & reached a height of 0.64 m inside stadium.	1	A
4	84A	White City, Lot 3 New South Head Rd, Edgecliff		12/08/1952	13/08/1952			0.41				Most tennis courts flooded. No flooding under stadium	1	A
5	84A	White City, Lot 3 New South Head Rd, Edgecliff, Weigal Sportsground, Lot 2 Neild Ave, Paddington.		07/02/1958	09/02/1958		0.41	0.86				Flood water just below floor level of cottage adjoining channel at Glenmore Rd. Extensive flooding of tennis courts & Weigal Sports Ground. Dressing rooms in sports ground flooded 0.41 m.	1	A
6	84	Weigal Sportsground, Lot 2 Neild Ave, Paddington.		18/02/1959	18/02/1959			0.05				No flooding of stadium occurred.	1	B
7	84	153 Bayswater Rd, Darlinghurst		19/11/1961	24/11/1961							Water ponded in roadway & flowed into the basement garage of property fronting Bayswater Rd.	2B	B
7	84A	White City, Lot 3 New South Head Rd, Edgecliff		19/11/1961	24/11/1961			0.71				Flooding above coping of open channel at downstream footbridge & from 0.41 m to 0.56 m above adjacent tennis courts.	1	B
7	84A	White City, Lot 3 New South Head Rd, Edgecliff		19/11/1961	24/11/1961	0.41						Low level areas flooded due to surcharge from adjacent Board's channel thru connections & opening in retaining wall.	1	B
7	84C	28-54 Sutherland St, Paddington		19/11/1961	24/11/1961							A deep subsidence occurred, about 9 m in diameter. Filling washed into Board's SW System. Board's sewer & relief sewer damaged, also other	2B	B

No.	Branch No.	Location	Loc. On Map	Date Flooded From	Date Flooded to	Depth (m)	Level Above Floor (m)	Level Above Coping (m)	Flood Level (mAHD)	Floor Level (mAHD	Gutter Level (mAHD)	Remarks	Data Rating	Source of Data
												services & adjacent house foundations.		
8	84	St Vincents Hospital, Lot 2 Victoria Rd, Darlinghurst		01/12/1970	01/12/1970							Building flooded.	2B	C
9	84H	106 Oxford St, Paddington		01/03/1975	01/03/1975							Greater than 1 in 100 year storm.	2B	C
10	84	84-86 Oxford St & Kidman Lane, Paddington		04/03/1977	04/03/1977							Flooding 0.15 m above footpath. Water entered 84-86 Oxford St. Water flowed thru basement in fruit shop, cnr Oxford St & Kidman Lane - subsoil drainage blowing off cement rendering.	2B	C & D
10	84A	420 Glenmore Rd, Paddington		04/03/1977	04/03/1977	0.3						Water across road up to 3 bricks high on B/L at Stacks Building. Flow into yard of house No. 420. Water also coming from overland flow opposite thru Trumper Pk.	1	C & D
10	84A	19-21 Hampden St, Paddington		04/03/1977	04/03/1977							Water in basement car park of flats "Denman Court", appears to be subsoil & groundwater from ground floor car park.	2B	C & D
10	84A	202 Jersey St, Paddington (S/E corner of Sutherland St & Jersey Lane, Paddington)		04/03/1977	04/03/1977							Large subsidence upstream of point D.31 on Jersey Rd Bch under building. Caused by lid blowing off underground box chamber.	2B	C & D
11	84	64 Taylor St, Darlinghurst		01/11/1979	01/11/1979							Considerable gutter flow by-passes a gully in Sth Dowling St & drains into the sag in front of house. Problem caused by street cleaners sweeping rubbish into gullies.	2B	C
12	84	64 Taylor St, Darlinghurst		01/02/1980	01/02/1980							Considerable gutter flow by-passes a gully in Sth Dowling St & drains into the sag in front of house. Problem caused by street cleaners sweeping rubbish into gullies.	2B	C
13	84	64 Taylor St, Darlinghurst		01/02/1981	01/02/1981							Considerable gutter flow by-passes a gully in Sth Dowling St & drains into the sag in front of house. Problem	2B	C

No.	Branch No.	Location	Loc. On Map	Date Flooded From	Date Flooded to	Depth (m)	Level Above Floor (m)	Level Above Coping (m)	Flood Level (mAHD)	Floor Level (mAHD	Gutter Level (mAHD)	Remarks	Data Rating	Source of Data
												caused by street cleaners sweeping rubbish into gullies.		
14	84A	16 McLachlan Ave, Kings Cross		12/08/1983	12/08/1983	0.2		0.6				Overland flow entered channel at junction of Jersey Rd Bch & Main Channel at Craigend St. 200 mm deep thru showrooms of Monaco Motors.	1	C
14	84A	Lot 2 Nield Ave, Kings Cross - Weigal Sportsground		12/08/1983	12/08/1983	0.45		1.3				Flowed into Weigall Sports Ground. Contributed to Jersey Rd Bch overtopping its banks by 1300 mm	1	C
16	84A	White City, Lot 3 New South Head Rd, Edgecliff		05/08/1986	05/08/1986			0.8				Flood debris 800 mm above coping.	1	C
17	84	14 Hargrave St, Paddington		06/01/1989	06/01/1989		0.5					Houses & garages flooded. Enormous damage to property etc. Storms exceeded capacity of Board's channels.	1	C
17	84	3 & 7 Roylston St & 48 Cecit St, Paddington		06/01/1989	06/01/1989		0.9					Houses & garages flooded. Enormous damage to property etc. Storms exceeded capacity of Board's channels.	1	C
17	84	8 Hargrave St, Paddington		06/01/1989	06/01/1989		1.5					Houses & garages flooded. Enormous damage to property etc. Huge wall of water tore doors off hinges. Storms exceeded capacity of Board's channels.	1	C
18	84	14 Hargrave St, Paddington		09/03/1989	09/03/1989		0.62					Houses & garages flooded. Enormous damage to property etc. Storms exceeded capacity of Board's channels.	1	C
18	84	3 & 7 Roylston St & 48 Cecit St, Paddington		09/03/1989	09/03/1989		0.9					Houses & garages flooded. Enormous damage to property etc. Storms exceeded capacity of Board's channels.	1	C
18	84	8 Hargrave St, Paddington		09/03/1989	09/03/1989		1.3					Houses & garages flooded. Enormous damage to property etc. Huge wall of water tore doors off hinges. Storms exceeded capacity of Board's	1	C

No.	Branch No.	Location	Loc. On Map	Date Flooded From	Date Flooded to	Depth (m)	Level Above Floor (m)	Level Above Coping (m)	Flood Level (mAHD)	Floor Level (mAHD	Gutter Level (mAHD)	Remarks	Data Rating	Source of Data
												channels.		
19	84	14 Hargrave St, Paddington		21/04/1989	21/04/1989							Houses & garages flooded. Enormous damage to property etc. Storms exceeded capacity of Board's channels.	2B	C
19	84	3 & 7 Roylston St & 48 Cecit St, Paddington		21/04/1989	21/04/1989		0.45					Houses & garages flooded. Enormous damage to property etc. Storms exceeded capacity of Board's channels.	1	C
19	84	8 Hargrave St, Paddington		21/04/1989	21/04/1989							Neighbour removed grating from drain to dissipate flood water more quickly.	2B	C
	84A	188 Barcom Av, Darlinghurst		09/04/1998	10/04/1998	0.5						Depth at back gate (outside off Boundary Rd) - lower floor flooded.	1	E
	84A	190 Barcom Av, Darlinghurst		09/04/1998	10/04/1998							Back yard flood - lower floor flooded.	3	E
	84A	192 Barcom Av, Darlinghurst		09/04/1998	10/04/1998							Back yard flood - lower floor flooded.	3	E
	84A	34 Cecil St, Paddington		09/04/1998	10/04/1998							Garage flooded (off Cecil La).	2B	E
	84A	36 Cecil St, Paddington		09/04/1998	10/04/1998							Garage flooded (off Cecil La) - water to front door of Cecil St.	2B	E
	84A	38 Cecil St, Paddington		09/04/1998	10/04/1998							Garage flooded (off Cecil La).	2B	E
	84A	40 Cecil St, Paddington		09/04/1998	10/04/1998							Garage flooded (off Cecil La).	2B	E
	84A	42 Cecil St, Paddington		09/04/1998	10/04/1998							Garage flooded (off Cecil La).	2B	E
	84A	44 Cecil St, Paddington		09/04/1998	10/04/1998							Garage flooded (off Cecil La).	2B	E
	84A	46 Cecil St, Paddington		09/04/1998	10/04/1998	0.53						Garage flooded (off Cecil La) - some into house majority held back by sandbags.	1	E
	84A	48 Cecil St, Paddington		09/04/1998	10/04/1998	0.65	0.25					Garage flooded (off Cecil La) - into house to depth of 25 mm.	1	E
	84A	50 Cecil St, Paddington		09/04/1998	10/04/1998							Garage flooded (off Cecil La).	2B	E
	84A	52 Cecil St, Paddington		09/04/1998	10/04/1998	0.25						250 mm in storage area fronting Cecil La.	1	E
		11 Roylston St, Paddington		09/04/1998	10/04/1998	0.55						In garage off Cecil La.	1	E
	84A	13 Roylston St, Paddington		09/04/1998	10/04/1998	0.35						In yard off Cecil La. Internal sewerage surcharge.	1	E
	84A	1 Roylston St, Paddington		09/04/1998	10/04/1998	0.7						In garage off Cecil La - new development no floor.	2B	E

APPENDIX C: PIPE, PIT AND SUB-CATCHMENT DATA FROM DRAINS

APPENDIX C: PIPE, PIT AND SUB-CATCHMENT DATA FROM DRAINS

Pipe	Start	End	Diameter	Capacity	100Y_Q
pDP18G2	DP18G2	DP18G1	375	<5Y ARI	0.03
pDP18G1	DP18G1	DP18A7	300	<5Y ARI	0.06
pDP18A7	DP18A7	DP18A6	450	<5Y ARI	0.37
pDP18A6	DP18A6	DP18A5	375	<5Y ARI	0.40
pDP18A5	DP18A5	DP18A5_1	450	<5Y ARI	0.47
pDP18A5_1	DP18A5_1	DP18A4	450	<5Y ARI	0.47
pDP18A4	DP18A4	DP18A3A	750	<5Y ARI	0.64
pDP18A3A	DP18A3A	DP18A3_1	750	<5Y ARI	0.90
pDP18A3_1	DP18A3_1	DP18A3	750	<5Y ARI	0.89
pDP18A3	DP18A3	DP18A2	600	<5Y ARI	0.96
pDP18A2	DP18A2	Outlet	600	<5Y ARI	0.97
pDP18I4	DP18I4	DP18I3	300	<5Y ARI	0.07
pDP18I3	DP18I3	DP18I2	300	<5Y ARI	0.14
pDP18I2	DP18I2	DP18I1	Box Culvert < 1 m wide	<5Y ARI	0.10
pDP18I1	DP18I1	DP18A8	225	<5Y ARI	0.14
pDP18A8	DP18A8	DP18A8_1	450	<5Y ARI	0.35
pDP18A8_1	DP18A8_1	DP18A7A	450	<5Y ARI	0.35
pDP18A7A	DP18A7A	DP18A7	450	<5Y ARI	0.36
pDP18A13	DP18A13	DP18A12	375	<5Y ARI	0.12
pDP18A12	DP18A12	DP18A11	375	<5Y ARI	0.24
pDP18A11	DP18A11	DP18A10	375	<5Y ARI	0.27
pDP18A10	DP18A10	DP18A9	375	<5Y ARI	0.27
pDP18A9	DP18A9	DP18A8	450	<5Y ARI	0.27
pW5E11	W5E11	W5E10	300	<5Y ARI	0.09
pW5E10	W5E10	W5E9	450	<5Y ARI	0.21
pW5E9	W5E9	W5E8	375	<5Y ARI	0.17
pW5E8	W5E8	W5E7	450	<5Y ARI	0.26
pW5E7	W5E7	W5E6	450	<5Y ARI	0.45
pW5E6	W5E6	W5E5	450	<5Y ARI	0.56
pW5E5	W5E5	W5E4	450	<5Y ARI	0.62
pW5E4	W5E4	W5E3B	Box Culvert < 1 m wide	<5Y ARI	0.77
pW5E3B	W5E3B	W5E3A	Box Culvert < 1 m wide	<5Y ARI	0.87
pW5E3A	W5E3A	W5E3	Box Culvert < 1 m wide	<5Y ARI	0.88
pW5E3	W5E3	W5E2	600	<5Y ARI	0.88
pW5E2	W5E2	W5E1	600	<5Y ARI	0.88
pW5E1	W5E1	W5E0C	600	<5Y ARI	0.88
pW5E0C	W5E0C	W5E0B	600	<5Y ARI	0.98
pW5E0B	W5E0B	W5E0A	600	<5Y ARI	1.05
pW5E0A	W5E0A	W5A0A	600	<5Y ARI	1.05
pW5A0A	W5A0A	W5AJ	Box Culvert > 1m wide	<5Y ARI	2.99
pW5AJ	W5AJ	P18A0	525	<5Y ARI	3.29
pP18A0	P18A0	P18A0_1	900	<5Y ARI	4.04
pP18A0_1	P18A0_1	P13E4	900	<5Y ARI	4.04
pP13E4	P13E4	P13E4_1	900	<5Y ARI	4.26
pP13E4_1	P13E4_1	P17A1	525	<5Y ARI	3.85
pP17A1	P17A1	P16A0	525	<5Y ARI	4.00
pP16A0	P16A0	P15A0	900	<5Y ARI	4.05
pP15A0	P15A0	P15A0_1	1200	<5Y ARI	4.18
pP15A0_1	P15A0_1	P15A0_2	1200	<5Y ARI	4.18
pP15A0_2	P15A0_2	P14A0	1200	<5Y ARI	4.18
pP14A0	P14A0	P14A0_1	375	<5Y ARI	4.32
pP14A0_1	P14A0_1	P13BA1	1200	<5Y ARI	4.32
pP13BA1	P13BA1	P12A0	Box Culvert > 1m wide	<5Y ARI	4.39
pP12A0	P12A0	P11A0	Box Culvert > 1m wide	<5Y ARI	4.52
pP11A0	P11A0	P10A0	1500	<5Y ARI	4.52
pP10A0	P10A0	P9A0	1500	<5Y ARI	4.60
pP9A0	P9A0	P7AF1	1500	<5Y ARI	4.95
pP7AF1	P7AF1	P7AF1_1	1500	<5Y ARI	4.21
pP7AF1_1	P7AF1_1	P7A0J1	1500	<5Y ARI	4.21
pP7A0J1	P7A0J1	P7A0J1_1	1200	<5Y ARI	3.82
pP7A0J1_1	P7A0J1_1	P6A0	1200	<5Y ARI	3.82
pP6A0	P6A0	P4A0F	Box Culvert > 1m wide	<5Y ARI	5.30
pP4A0F	P4A0F	P3A0	Box Culvert > 1m wide	<5Y ARI	3.95
pP3A0	P3A0	P2AO	Box Culvert > 1m wide	<5Y ARI	2.90

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP2AO	P2AO	P1AA0	225	<5Y ARI	2.04
pW5K1	W5K1	W5E7	450	<5Y ARI	0.11
pW5K3	W5K3	W5K2	225	<5Y ARI	0.07
pW5K2	W5K2	W5E7	225	<5Y ARI	0.07
pW5H1	W5H1	W5E6	Box Culvert < 1 m wide	<5Y ARI	0.11
pW5H4	W5H4	W5H3	225	<5Y ARI	0.08
pW5H3	W5H3	W5H2	225	<5Y ARI	0.08
pW5F1	W5F1	W5E3A	300	<5Y ARI	0.07
pW5G1	W5G1	W5E3B	Box Culvert < 1 m wide	<5Y ARI	0.11
pW5I11	W5I11	W5I10	375	<5Y ARI	0.07
pW5I9	W5I9	W5I7	300	<5Y ARI	0.12
pW5I7	W5I7	W5I6	375	<5Y ARI	0.20
pW5I6	W5I6	W5I5	375	<5Y ARI	0.26
pW5I5	W5I5	W5I3	Box Culvert < 1 m wide	<5Y ARI	0.28
pW5I3	W5I3	W5I0B	375	<5Y ARI	0.38
pW5I0B	W5I0B	W5I0A	375	<5Y ARI	0.34
pW5I0A	W5I0A	W5I0A_1	375	<5Y ARI	0.37
pW5I0A_1	W5I0A_1	W5I0A_2	375	<5Y ARI	0.37
pW5I0A_2	W5I0A_2	W5I0A_3	375	<5Y ARI	0.37
pW5I0A_3	W5I0A_3	W5I0A_4	375	<5Y ARI	0.37
pW5I0A_4	W5I0A_4	W5E4	375	<5Y ARI	0.37
pW5I8	W5I8	W5I7	300	<5Y ARI	0.09
pW5I4	W5I4	W5I3	375	5-10Y ARI	0.03
pW5I2	W5I2	W5I0B	375	<5Y ARI	0.06
pW5I1	W5I1	W5I0A	375	<5Y ARI	0.06
pW5D1	W5D1	W5E0C	300	<5Y ARI	0.10
pW5C1	W5C1	W5E0B	450	<5Y ARI	0.07
pW5B1	W5B1	W5E0A	375	<5Y ARI	0.05
pW5W3	W5W3	W5W2	Box Culvert < 1 m wide	<5Y ARI	0.10
pW5W2	W5W2	W5W2_1	300	<5Y ARI	0.11
pW5W2_1	W5W2_1	W5W1	300	<5Y ARI	0.11
pW5W1	W5W1	W5W0	450	<5Y ARI	0.23
pW5W0	W5W0	W5A1	450	<5Y ARI	0.98
pW5A1	W5A1	W5A0A	Box Culvert > 1m wide	<5Y ARI	2.16
pW5X2	W5X2	W5X0	Box Culvert < 1 m wide	<5Y ARI	0.11
pW5X0	W5X0	W5W0	Box Culvert < 1 m wide	<5Y ARI	0.14
pW5X1	W5X1	W5X1A	Box Culvert < 1 m wide	<5Y ARI	0.03
pW5X1A	W5X1A	W5X0	Box Culvert < 1 m wide	<5Y ARI	0.03
pW5AD5	W5AD5	W5AD4	300	<5Y ARI	0.00
pW5AD4	W5AD4	W5AD3	300	<5Y ARI	0.07
pW5AD3	W5AD3	W5AD2	300	<5Y ARI	0.07
pW5AD1	W5AD1	W5AA3	300	<5Y ARI	0.07
pW5AA3	W5AA3	W5AA2	Box Culvert < 1 m wide	<5Y ARI	0.42
pW5AA2	W5AA2	W5AA1	600	<5Y ARI	0.53
pW5AA1	W5AA1	W5AA1_1	750	<5Y ARI	0.70
pW5AA1_1	W5AA1_1	W5W0	750	<5Y ARI	0.70
pW5AE1	W5AE1	W5AA3A	300	<5Y ARI	0.09
pW5AA3A	W5AA3A	W5AA3	525	<5Y ARI	0.35
pW5AF6	W5AF6	W5AF3	375	<5Y ARI	0.11
pW5AF3	W5AF3	W5AF3_1	Box Culvert < 1 m wide	<5Y ARI	0.26
pW5AF3_1	W5AF3_1	W5AF3_2	450	<5Y ARI	0.26
pW5AF3_2	W5AF3_2	W5AF3_3	450	<5Y ARI	0.26
pW5AF3_3	W5AF3_3	W5AF3_4	450	<5Y ARI	0.24
pW5AF3_4	W5AF3_4	W5AF3_5	450	<5Y ARI	0.24
pW5AF3_5	W5AF3_5	W5AF3_6	450	<5Y ARI	0.24
pW5AF3_6	W5AF3_6	W5AF3_7	450	<5Y ARI	0.24
pW5AF3_7	W5AF3_7	W5AF2A	450	<5Y ARI	0.24
pW5AF2A	W5AF2A	W5AF2A_1	Box Culvert < 1 m wide	<5Y ARI	0.26
pW5AF2A_1	W5AF2A_1	W5AF2A_2	Box Culvert < 1 m wide	<5Y ARI	0.26
pW5AF2A_2	W5AF2A_2	W5AF2A_3	375	<5Y ARI	0.26
pW5AF2A_3	W5AF2A_3	W5AF2A_4	375	<5Y ARI	0.26
pW5AF2A_4	W5AF2A_4	W5AF2A_5	300	<5Y ARI	0.26
pW5AF2A_5	W5AF2A_5	W5AF2A_6	300	<5Y ARI	0.26
pW5AF2A_6	W5AF2A_6	W5AF2A_7	300	<5Y ARI	0.26
pW5AF2A_7	W5AF2A_7	W5AF2A_8	300	<5Y ARI	0.21
pW5AF2A_8	W5AF2A_8	W5AF2A_9	300	<5Y ARI	0.21
pW5AF2A_9	W5AF2A_9	W5AF2A_10	300	<5Y ARI	0.21

Pipe	Start	End	Diameter	Capacity	100Y_Q
pW5AF2A_10	W5AF2A_10	W5AF2A_11	300	<5Y ARI	0.21
pW5AF2A_11	W5AF2A_11	W5AF2A_12	300	<5Y ARI	0.21
pW5AF2A_12	W5AF2A_12	W5AF2A_13	300	<5Y ARI	0.21
pW5AF2A_13	W5AF2A_13	W5AF2A_14	300	<5Y ARI	0.21
pW5AF2A_14	W5AF2A_14	W5AF2A_15	300	<5Y ARI	0.21
pW5AF2A_15	W5AF2A_15	W5AF2A_16	300	<5Y ARI	0.21
pW5AF2A_16	W5AF2A_16	W5AF2	300	<5Y ARI	0.21
pW5AF2	W5AF2	W5AF1	525	<5Y ARI	0.21
pW5AF1	W5AF1	W5AA4	525	<5Y ARI	0.21
pW5AA4	W5AA4	W5AA3A	525	<5Y ARI	0.27
pW5AF5	W5AF5	W5AF4	300	5-10Y ARI	0.07
pW5AF4	W5AF4	W5AF3	Box Culvert < 1 m wide	<5Y ARI	0.15
pW5AG4	W5AG4	W5AG3	375	<5Y ARI	0.11
pW5AG3	W5AG3	W5AG2	375	>20Y ARI	0.11
pW5AG2	W5AG2	W5AG1	375	>20Y ARI	0.13
pW5AG1	W5AG1	W5AF2A	375	<5Y ARI	0.07
pW5AH1	W5AH1	W5AA7	375	<5Y ARI	0.00
pW5AA7	W5AA7	W5AA6	300	<5Y ARI	0.18
pW5AA6_1	W5AA6	W5AA5	300	<5Y ARI	0.09
pW5AA6_2	W5AA6	W5AC3	300	<5Y ARI	0.09
pW5AA5	W5AA5	W5AA4	525	<5Y ARI	0.09
pW5AI1	W5AI1	W5AA7	225	<5Y ARI	0.06
pW5AA8	W5AA8	W5AA7	300	<5Y ARI	0.12
pW5AB2	W5AB2	W5AB1	225	<5Y ARI	0.00
pW5AB1	W5AB1	W5AA1	225	<5Y ARI	0.06
pW5Z3	W5Z3	W5Z2	225	<5Y ARI	0.04
pW5Z2	W5Z2	W5Z1	375	<5Y ARI	0.07
pW5Z1	W5Z1	W5Z0	225	<5Y ARI	0.08
pW5Z0	W5Z0	W5W1	750	<5Y ARI	0.08
pW5N2	W5N2	W5N1	300	<5Y ARI	0.09
pW5N1	W5N1	W5M0	300	<5Y ARI	0.10
pW5M0	W5M0	W5A2	300	<5Y ARI	0.28
pW5A2	W5A2	W5A1	Box Culvert > 1m wide	<5Y ARI	1.27
pW5M5	W5M5	W5M4	300	<5Y ARI	0.02
pW5M3	W5M3	W5M2	225	<5Y ARI	0.03
pW5M2	W5M2	W5M1	375	<5Y ARI	0.12
pW5M1	W5M1	W5M0	Box Culvert < 1 m wide	<5Y ARI	0.20
pW5R1	W5R1	W5A5	450	<5Y ARI	0.14
pW5A5	W5A5	W5A4A	600	<5Y ARI	0.56
pW5A4A	W5A4A	W5A4	600	<5Y ARI	0.65
pW5A4	W5A4	W5A3	600	<5Y ARI	0.83
pW5A3	W5A3	W5A2	750	<5Y ARI	0.94
pW5P2	W5P2	W5P1	300	<5Y ARI	0.07
pW5P1	W5P1	W5A4	375	<5Y ARI	0.07
pW5O4	W5O4	W5O3	450	>20Y ARI	0.02
pW5O3	W5O3	W5O2	450	>20Y ARI	0.02
pW5O2	W5O2	W5O1	450	<5Y ARI	0.11
pW5O1	W5O1	W5A4	450	<5Y ARI	0.11
pW5Q4	W5Q4	W5Q3	Box Culvert < 1 m wide	<5Y ARI	0.07
pW5Q3	W5Q3	W5Q2	Box Culvert < 1 m wide	<5Y ARI	0.14
pW5Q1	W5Q1	W5Q1_1	300	<5Y ARI	0.09
pW5Q1_1	W5Q1_1	W5A4A	300	<5Y ARI	0.09
pW5S4	W5S4	W5S3A	Box Culvert < 1 m wide	<5Y ARI	0.07
pW5S3A	W5S3A	W5S1	Box Culvert < 1 m wide	<5Y ARI	0.12
pW5S1	W5S1	W5A6	450	<5Y ARI	0.26
pW5A6	W5A6	W5A6_1	600	<5Y ARI	0.48
pW5A6_1	W5A6_1	W5A5	600	<5Y ARI	0.48
pW5S3	W5S3	W5S3A	225	<5Y ARI	0.05
pW5S2	W5S2	W5S1	300	<5Y ARI	0.07
pW5A7	W5A7	W5A6A	450	<5Y ARI	0.09
pW5A6A	W5A6A	W5A6A_1	450	<5Y ARI	0.15
pW5A6A_1	W5A6A_1	W5A6	450	<5Y ARI	0.15
pW5U9	W5U9	W5U6	225	<5Y ARI	0.00
pW5U6	W5U6	W5U5	225	<5Y ARI	0.04
pW5U5	W5U5	W5U4	225	<5Y ARI	0.04
pW5U8	W5U8	W5U5	225	<5Y ARI	0.00
pW5U7	W5U7	W5U6	225	<5Y ARI	0.00

Pipe	Start	End	Diameter	Capacity	100Y_Q
pW5U3	W5U3	W5U2	375	<5Y ARI	0.00
pW5U1	W5U1	W5A6A	300	<5Y ARI	0.06
pW5T2	W5T2	W5T1	300	>20Y ARI	0.04
pW5T1	W5T1	W5A9	300	>20Y ARI	0.04
pW5A9	W5A9	W5A8	450	>20Y ARI	0.11
pW5A10	W5A10	W5A10_1	300	<5Y ARI	0.07
pW5A10_1	W5A10_1	W5A10_2	300	<5Y ARI	0.07
pW5A10_2	W5A10_2	W5A9	300	<5Y ARI	0.07
pP24C3	P24C3	P24C2	Box Culvert > 1m wide	<5Y ARI	0.00
pP24C2_1	P24C2_1	P24C2_2	375	<5Y ARI	0.00
pP24C2_2	P24C2_2	P24C1	375	<5Y ARI	0.00
pP24C1	P24C1	P24A1A	375	<5Y ARI	0.17
pP24A1A	P24A1A	P24A1	1050	<5Y ARI	1.85
pP24A1	P24A1	P24A0A	Box Culvert > 1m wide	<5Y ARI	1.85
pP24A0A	P24A0A	P24A0A_1	Box Culvert > 1m wide	<5Y ARI	1.92
pP24A0A_1	P24A0A_1	P21A0	Box Culvert > 1m wide	<5Y ARI	1.92
pP21A0	P21A0	P26A1	1800	<5Y ARI	4.72
pP26A1	P26A1	P25A0	375	<5Y ARI	0.40
pP25A0	P25A0	Outlet	1800	<5Y ARI	0.63
pP24D4	P24D4	P24D1	300	<5Y ARI	0.12
pP24D1	P24D1	P24A1B	225	<5Y ARI	0.17
pP24A1B	P24A1B	P24A1B_1	1050	<5Y ARI	1.61
pP24A1B_1	P24A1B_1	P24A1B_2	1050	<5Y ARI	1.61
pP24A1B_2	P24A1B_2	P24A1A	1050	<5Y ARI	1.68
pP24D3	P24D3	P24D2	225	<5Y ARI	0.04
pP24D2	P24D2	P24D1	225	<5Y ARI	0.08
pP24G17	P24G17	P24G15A	300	<5Y ARI	0.07
pP24G15A	P24G15A	P24G15	300	<5Y ARI	0.12
pP24G15	P24G15	P24G14	225	<5Y ARI	0.12
pP24G14	P24G14	P24G14_1	225	<5Y ARI	0.12
pP24G14_1	P24G14_1	P24G13	225	<5Y ARI	0.12
pP24G16	P24G16	P24G15A	225	<5Y ARI	0.06
pP24G13_1	P24G13_1	P24G12	375	<5Y ARI	0.00
pP24G12	P24G12	P24G11	225	<5Y ARI	0.08
pP24G11	P24G11	P24G10	300	<5Y ARI	0.13
pP24G10	P24G10	P24G10_1	300	<5Y ARI	0.18
pP24G10_1	P24G10_1	P24G9	300	<5Y ARI	0.18
pP24G9	P24G9	P24G8	300	<5Y ARI	0.13
pP24G8	P24G8	P24G7	300	<5Y ARI	0.16
pP24G7	P24G7	P24G6	300	<5Y ARI	0.18
pP24G5	P24G5	P24G4	225	<5Y ARI	0.07
pP24G4	P24G4	P24G3	300	<5Y ARI	0.14
pP24G1	P24G1	P24A2	150	<5Y ARI	0.05
pP24A2	P24A2	P24A2_1	Box Culvert > 1m wide	<5Y ARI	1.45
pP24A2_1	P24A2_1	P24A2_2	1050	<5Y ARI	1.45
pP24A2_2	P24A2_2	P24A1B	1050	<5Y ARI	1.45
pP24AA	P24AA	P24G11	225	<5Y ARI	0.04
pP24H1	P24H1	P24H0A	375	<5Y ARI	0.08
pP24H0A	P24H0A	P24G3	375	<5Y ARI	0.22
pP24K1	P24K1	P24I2	300	<5Y ARI	0.00
pP24L1	P24L1	P24I2A	300	<5Y ARI	0.09
pP24I2A	P24I2A	P24I2	225	<5Y ARI	0.14
pP24I4	P24I4	P24I3	225	<5Y ARI	0.06
pP24I3	P24I3	P24I2A	225	<5Y ARI	0.10
pP24I1	P24I1	P24H0A	300	<5Y ARI	0.11
pP24E1	P24E1	P24A2	Box Culvert < 1 m wide	<5Y ARI	0.06
pP24F1	P24F1	P24A2	300	<5Y ARI	0.07
pP24O2	P24O2	P24O1	225	<5Y ARI	0.07
pP24O1	P24O1	P24O1A	225	<5Y ARI	0.12
pP24O1A	P24O1A	P24A4	225	<5Y ARI	0.13
pP24A4	P24A4	P24A3	Box Culvert > 1m wide	<5Y ARI	1.10
pP24A3	P24A3	P24A3_1	Box Culvert > 1m wide	<5Y ARI	1.10
pP24A3_1	P24A3_1	P24A3_2	1050	<5Y ARI	1.10
pP24A3_2	P24A3_2	P24A2	1050	<5Y ARI	1.10
pP24N2	P24N2	P24N1	300	<5Y ARI	0.07
pP24N1	P24N1	P24O1A	300	<5Y ARI	0.07
pP24M1	P24M1	P24A4	225	<5Y ARI	0.07

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP24O6	P24O6	P24O5	300	<5Y ARI	0.04
pP24O5	P24O5	P24O4	225	<5Y ARI	0.04
pP24O4	P24O4	P24O3A	450	<5Y ARI	0.09
pP24O3A	P24O3A	P24O3A_1	450	<5Y ARI	0.18
pP24O3A_1	P24O3A_1	P24O3	450	<5Y ARI	0.18
pP24P1	P24P1	P24O3A	300	<5Y ARI	0.09
pP24Z1A	P24Z1A	P24A7A	375	<5Y ARI	0.07
pP24A7A	P24A7A	P24A7A_1	375	<5Y ARI	0.07
pP24A7A_1	P24A7A_1	P24A7A_2	375	<5Y ARI	0.07
pP24A7A_2	P24A7A_2	P24A7	375	<5Y ARI	0.07
pP24A7	P24A7	P24A7_1	Box Culvert < 1 m wide	<5Y ARI	0.24
pP24A7_1	P24A7_1	P24A7_2	900	<5Y ARI	0.24
pP24A7_2	P24A7_2	P24A7_3	900	<5Y ARI	0.24
pP24A7_3	P24A7_3	P24A6	900	<5Y ARI	0.24
pP24A6	P24A6	P24A5	Box Culvert < 1 m wide	<5Y ARI	0.39
pP24A5	P24A5	P24A5_1	Box Culvert > 1m wide	<5Y ARI	0.87
pP24A5_1	P24A5_1	P24A5_2	900	<5Y ARI	0.93
pP24A5_2	P24A5_2	P24A4	900	<5Y ARI	0.93
pP24Z1	P24Z1	P24Y1A	225	<5Y ARI	0.00
pP24Y1A	P24Y1A	P24A7	225	<5Y ARI	0.17
pP24Y1	P24Y1	P24Y1A	225	<5Y ARI	0.07
pP24X2	P24X2	P24X1	225	<5Y ARI	0.04
pP24X1	P24X1	P24Y1A	225	<5Y ARI	0.10
pP24R1	P24R1	P24T0A	225	<5Y ARI	0.08
pP24T0A	P24T0A	P24T0A_1	600	<5Y ARI	0.48
pP24T0A_1	P24T0A_1	P24A5	600	<5Y ARI	0.48
pP24Q1	P24Q1	P24T0A	300	<5Y ARI	0.07
pP24S1	P24S1	P24T0B	300	<5Y ARI	0.17
pP24T0B	P24T0B	P24T0B_1	600	<5Y ARI	0.36
pP24T0B_1	P24T0B_1	P24T0B_2	600	<5Y ARI	0.36
pP24T0B_2	P24T0B_2	P24T0A	600	<5Y ARI	0.36
pP24J1	P24J1	P24T2A	Box Culvert > 1m wide	<5Y ARI	0.00
pP24T2A	P24T2A	P24T2	600	<5Y ARI	0.16
pP24T2	P24T2	P24T1	600	<5Y ARI	0.16
pP24T1	P24T1	P24T0B	600	<5Y ARI	0.22
pP24V2	P24V2	P24V1	225	<5Y ARI	0.03
pP24V1	P24V1	P24T2A	375	<5Y ARI	0.09
pP24AL	P24AL	P24AEB	300	<5Y ARI	0.07
pP24AEB	P24AEB	P24AC	Box Culvert < 1 m wide	<5Y ARI	0.34
pP24AC	P24AC	P24AC_2	225	<5Y ARI	0.15
pP24AC_2	P24AC_2	P24AC_1	225	<5Y ARI	0.15
pP24AC_1	P24AC_1	P24A6	225	<5Y ARI	0.15
pP24AK	P24AK	P24AH	225	>20Y ARI	0.01
pP24AH	P24AH	P24AGA	375	<5Y ARI	0.15
pP24AGA	P24AGA	P24AFA	375	<5Y ARI	0.15
pP24AFA	P24AFA	P24AE	375	<5Y ARI	0.27
pP24AE	P24AE	P24AEB	Box Culvert < 1 m wide	<5Y ARI	0.27
pP24AJ	P24AJ	P24AI	375	>20Y ARI	0.01
pP24AI	P24AI	P24AH	Box Culvert > 1m wide	>20Y ARI	0.02
pP24AG	P24AG	P24AGA	Box Culvert < 1 m wide	<5Y ARI	0.00
pP24AF	P24AF	P24AFA	450	<5Y ARI	0.12
pP24AP	P24AP	P24AO	375	<5Y ARI	0.11
pP24AO	P24AO	P24ACE	450	<5Y ARI	0.17
pP24ACE	P24ACE	P24ACD	1800	<5Y ARI	0.39
pP24ACD	P24ACD	P24ACD_1	1800	<5Y ARI	0.53
pP24ACD_1	P24ACD_1	P24AC	1800	<5Y ARI	0.53
pP24AN	P24AN	P24AM	Box Culvert < 1 m wide	>20Y ARI	0.03
pP24AM	P24AM	P24ACD	600	<5Y ARI	0.14
pP24AS	P24AS	P24AR	150	<5Y ARI	0.03
pP24AR	P24AR	P24AQ1	300	<5Y ARI	0.22
pP24AQ1	P24AQ1	P24AQ1_1	Box Culvert > 1m wide	<5Y ARI	0.22
pP24AQ1_1	P24AQ1_1	P24ACE	1800	<5Y ARI	0.22
pP24AV1	P24AV1	P24AQ5A	225	<5Y ARI	0.06
pP24AQ5A	P24AQ5A	P24AQ5A_1	300	<5Y ARI	0.24
pP24AQ5A_1	P24AQ5A_1	P24AQ5	300	<5Y ARI	0.24
pP24AQ5	P24AQ5	P24AQ4	450	<5Y ARI	0.31
pP24AQ4	P24AQ4	P24AQ4_1	Box Culvert < 1 m wide	<5Y ARI	0.38

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP24AQ4_1	P24AQ4_1	P24AQ3	525	<5Y ARI	0.38
pP24AQ3	P24AQ3	P24AQ2	450	<5Y ARI	0.29
pP24AQ2	P24AQ2	P24AQ2_1	Box Culvert < 1 m wide	<5Y ARI	0.36
pP24AQ2_1	P24AQ2_1	P24AQ2_2	450	<5Y ARI	0.36
pP24AQ2_2	P24AQ2_2	P24ATA	450	<5Y ARI	0.36
pP24ATA	P24ATA	P24AR	Box Culvert > 1m wide	<5Y ARI	0.55
pP24AW1	P24AW1	P24AQ6A	225	>20Y ARI	0.02
pP24AQ6A	P24AQ6A	P24AQ6A_1	Box Culvert > 1m wide	>20Y ARI	0.24
pP24AQ6A_1	P24AQ6A_1	P24AQ6	300	>20Y ARI	0.20
pP24AQ6	P24AQ6	P24AQ5B	375	<5Y ARI	0.19
pP24AQ5B	P24AQ5B	P24AQ5A	300	<5Y ARI	0.19
pP24AX1	P24AX1	P24AQ7A	Box Culvert < 1 m wide	<5Y ARI	0.04
pP24AQ7A	P24AQ7A	P24AQ7A_1	300	<5Y ARI	0.17
pP24AQ7A_1	P24AQ7A_1	P24AQ7	300	<5Y ARI	0.17
pP24AQ7	P24AQ7	P24AQ6A	300	<5Y ARI	0.23
pP24AQ10	P24AQ10	P24AQ9	Box Culvert < 1 m wide	<5Y ARI	0.06
pP24AQ9	P24AQ9	P24AQ8	Box Culvert < 1 m wide	<5Y ARI	0.05
pP24AQ8	P24AQ8	P24AQ7A	300	<5Y ARI	0.15
pP24AT3	P24AT3	P24AT3_1	300	<5Y ARI	0.07
pP24AT3_1	P24AT3_1	P24AT2A	300	<5Y ARI	0.07
pP24AT2A	P24AT2A	P24AT2A_1	300	<5Y ARI	0.07
pP24AT2A_1	P24AT2A_1	P24AT2A_2	300	<5Y ARI	0.07
pP24AT2A_2	P24AT2A_2	P24AT1	300	<5Y ARI	0.07
pP24AT1	P24AT1	P24AT	450	<5Y ARI	0.14
pP24AT	P24AT	P24AT_1	450	<5Y ARI	0.20
pP24AT_1	P24AT_1	P24ATA	450	<5Y ARI	0.20
pP23C1	P23C1	P23A0B	225	<5Y ARI	0.08
pP23A0B	P23A0B	P23A0A	600	<5Y ARI	0.85
pP23A0A	P23A0A	P23A0A_1	600	<5Y ARI	0.84
pP23A0A_1	P23A0A_1	P23A0A_2	600	<5Y ARI	0.84
pP23A0A_2	P23A0A_2	P21A0	600	<5Y ARI	0.84
pP23B3	P23B3	P23B1	300	<5Y ARI	0.06
pP23B1	P23B1	P23A0A	225	<5Y ARI	0.08
pP23B2	P23B2	P23B1	225	<5Y ARI	0.04
pP23D1	P23D1	P23A0C	375	<5Y ARI	0.04
pP23A0C	P23A0C	P23A0C_1	600	<5Y ARI	0.88
pP23A0C_1	P23A0C_1	P23A0B	600	<5Y ARI	0.88
pP23J1	P23J1	P23A1	600	<5Y ARI	0.00
pP23A1	P23A1	P23A0F	600	<5Y ARI	1.20
pP23A0F	P23A0F	P23A0E	600	<5Y ARI	1.28
pP23A0E	P23A0E	P23A0D	600	<5Y ARI	1.36
pP23A0D	P23A0D	P23A0C	600	<5Y ARI	1.10
pP23H1	P23H1	P23A1	600	<5Y ARI	0.14
pP23F3	P23F3	P23F4A	225	<5Y ARI	0.03
pP23F4A	P23F4A	P23F1	225	<5Y ARI	0.07
pP23F1	P23F1	P23A0E	300	<5Y ARI	0.15
pP23F2	P23F2	P23F4A	225	<5Y ARI	0.05
pP23E2	P23E2	P23E10	225	<5Y ARI	0.03
pP23E10	P23E10	P23A0D	225	<5Y ARI	0.08
pP23E1	P23E1	P23E10	300	<5Y ARI	0.05
pP23L2	P23L2	P23L1	Box Culvert < 1 m wide	<5Y ARI	0.14
pP23L1	P23L1	P23K3	300	<5Y ARI	0.20
pP23K3	P23K3	P23K2	375	<5Y ARI	0.36
pP23K2	P23K2	P23K1	375	<5Y ARI	0.47
pP23K1	P23K1	P23K1_1	375	<5Y ARI	0.47
pP23K1_1	P23K1_1	P23A1A	375	<5Y ARI	0.47
pP23A1A	P23A1A	P23A1	600	<5Y ARI	1.07
pP23M1	P23M1	P23K3A	300	<5Y ARI	0.09
pP23K3A	P23K3A	P23K3	375	<5Y ARI	0.15
pP23O1	P23O1	P23N1A	225	<5Y ARI	0.07
pP23N1A	P23N1A	P23N1	300	<5Y ARI	0.13
pP23N1	P23N1	P23A2A	300	<5Y ARI	0.20
pP23A2A	P23A2A	P23A2	375	<5Y ARI	0.62
pP23A2	P23A2	P23A1A	600	<5Y ARI	0.62
pP23P1	P23P1	P23N1	225	<5Y ARI	0.07
pP23Q1	P23Q1	P23N1B	225	<5Y ARI	0.07
pP23N1B	P23N1B	P23N1B_1	225	<5Y ARI	0.07

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP23N1B_1	P23N1B_1	P23N1B_2	225	<5Y ARI	0.07
pP23N1B_2	P23N1B_2	P23N1B_3	225	<5Y ARI	0.07
pP23N1B_3	P23N1B_3	P23N1B_4	225	<5Y ARI	0.07
pP23N1B_4	P23N1B_4	P23N1B_5	300	<5Y ARI	0.07
pP23N1B_5	P23N1B_5	P23N1B_6	300	<5Y ARI	0.07
pP23N1B_6	P23N1B_6	P23N1B_7	300	<5Y ARI	0.07
pP23N1B_7	P23N1B_7	P23N1A	300	<5Y ARI	0.07
pP23N3	P23N3	P23N2	300	<5Y ARI	0.00
pP23N2	P23N2	P23N1B	300	<5Y ARI	0.00
pP23R2	P23R2	P23R1	225	<5Y ARI	0.05
pP23R1	P23R1	P23A2B	225	<5Y ARI	0.05
pP23A2B	P23A2B	P23A2A	375	<5Y ARI	0.45
pP23U2	P23U2	P23U1	375	<5Y ARI	0.00
pP23U1	P23U1	P23A4	375	<5Y ARI	0.00
pP23A4	P23A4	P23A3A	375	<5Y ARI	0.41
pP23A3A	P23A3A	P23A3	300	<5Y ARI	0.43
pP23A3	P23A3	P23A2B	375	<5Y ARI	0.43
pP23T2	P23T2	P23T1	300	<5Y ARI	0.07
pP23T1	P23T1	P23A3A	300	<5Y ARI	0.07
pP23X1	P23X1	P23A6	375	>20Y ARI	0.11
pP23A6	P23A6	P23A5	375	>20Y ARI	0.33
pP23A5	P23A5	P23A4	375	>20Y ARI	0.38
pP23V4	P23V4	P23V1	225	<5Y ARI	0.00
pP23V1	P23V1	P23W1A	375	<5Y ARI	0.07
pP23W1A	P23W1A	P23A5	Box Culvert < 1 m wide	<5Y ARI	0.14
pP23V3	P23V3	P23V2	225	<5Y ARI	0.07
pP23V2	P23V2	P23V1	300	<5Y ARI	0.07
pP23W2	P23W2	P23W1	225	<5Y ARI	0.06
pP23W1	P23W1	P23W1A	Box Culvert < 1 m wide	<5Y ARI	0.06
pP23A9	P23A9	P23A7	225	<5Y ARI	0.07
pP23A7	P23A7	P23A7_1	300	<5Y ARI	0.13
pP23A7_1	P23A7_1	P23A6_1	300	<5Y ARI	0.13
pP23A6_1	P23A6_1	P23A6	300	5-10Y ARI	0.17
pP23A8	P23A8	P23A7	225	>20Y ARI	0.05
pP22C2	P22C2	P22C1	300	<5Y ARI	0.04
pP22C1	P22C1	P22C1A	300	<5Y ARI	0.12
pP22C1A	P22C1A	P22B1A	900	<5Y ARI	1.05
pP22B1A	P22B1A	P22B1A_1	900	<5Y ARI	1.11
pP22B1A_1	P22B1A_1	P22B1A_2	900	<5Y ARI	1.11
pP22B1A_2	P22B1A_2	P22B1A_3	900	<5Y ARI	1.11
pP22B1A_3	P22B1A_3	P21A0	900	<5Y ARI	1.11
pP22B1	P22B1	P22B1A	225	<5Y ARI	0.07
pP22D2	P22D2	P22D1	300	<5Y ARI	0.09
pP22D1	P22D1	P22A1	375	<5Y ARI	0.16
pP22A1	P22A1	P22A1_1	900	<5Y ARI	0.94
pP22A1_1	P22A1_1	P22A1_2	900	<5Y ARI	0.94
pP22A1_2	P22A1_2	P22A1_3	900	<5Y ARI	0.94
pP22A1_3	P22A1_3	P22C1A	900	<5Y ARI	0.94
pP22E1	P22E1	P22D1	300	<5Y ARI	0.07
pP22F1	P22F1	P22A1	300	<5Y ARI	0.11
pP22G1	P22G1	P22A1	300	<5Y ARI	0.11
pP22H2	P22H2	P22H1	300	<5Y ARI	0.04
pP22H1	P22H1	P22H1A	300	<5Y ARI	0.05
pP22H1A	P22H1A	P22H1A_1	600	<5Y ARI	0.57
pP22H1A_1	P22H1A_1	P22H1A_2	600	<5Y ARI	0.57
pP22H1A_2	P22H1A_2	P22H1A_3	600	<5Y ARI	0.57
pP22H1A_3	P22H1A_3	P22A1A	600	<5Y ARI	0.57
pP22A1A	P22A1A	P22A1	600	<5Y ARI	0.57
pP22L3	P22L3	P22L0A	300	<5Y ARI	0.09
pP22L0A	P22L0A	P22K2A	300	<5Y ARI	0.19
pP22K2A	P22K2A	P22K2A_1	375	<5Y ARI	0.30
pP22K2A_1	P22K2A_1	P22K2	375	<5Y ARI	0.30
pP22K2	P22K2	P22K1	375	<5Y ARI	0.32
pP22K1	P22K1	P22RCAD	450	<5Y ARI	0.32
pP22RCAD	P22RCAD	P22A2	450	<5Y ARI	0.54
pP22A2	P22A2	P22A2_1	Box Culvert < 1 m wide	<5Y ARI	0.66
pP22A2_1	P22A2_1	P22A2_2	600	<5Y ARI	0.66

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP22A2_2	P22A2_2	P22A2_3	600	<5Y ARI	0.66
pP22A2_3	P22A2_3	P22A2_4	600	<5Y ARI	0.66
pP22A2_4	P22A2_4	P22H1A	600	<5Y ARI	0.66
pP22L2	P22L2	P22L1	225	<5Y ARI	0.07
pP22L1	P22L1	P22L0A	300	<5Y ARI	0.13
pP22K3B	P22K3B	P22KB	300	<5Y ARI	0.07
pP22KB	P22KB	P22K	300	<5Y ARI	0.07
pP22K	P22K	P22K_1	300	<5Y ARI	0.14
pP22K_1	P22K_1	P22K2A	300	<5Y ARI	0.14
pP22A13	P22A13	P22A13_1	150	<5Y ARI	0.04
pP22A13_1	P22A13_1	P22A12	150	<5Y ARI	0.04
pP22A12	P22A12	P22A11	300	<5Y ARI	0.04
pP22A11	P22A11	P22A10	150	<5Y ARI	0.05
pP22A10	P22A10	P22A9	375	<5Y ARI	0.05
pP22A9	P22A9	P22A8	375	<5Y ARI	0.13
pP22A8	P22A8	P22A7	375	<5Y ARI	0.19
pP22A7	P22A7	P22A6	375	<5Y ARI	0.24
pP22A6	P22A6	P22Z1	450	>20Y ARI	0.28
pP22Z1	P22Z1	P22A5	450	>20Y ARI	0.35
pP22A5	P22A5	P22A4	450	>20Y ARI	0.35
pP22A4	P22A4	P22A4_1	450	>20Y ARI	0.35
pP22A4_1	P22A4_1	P22A3	450	>20Y ARI	0.35
pP22A3	P22A3	P22RCAD	Box Culvert < 1 m wide	<5Y ARI	0.26
pP22N3	P22N3	P22N2	375	<5Y ARI	0.08
pP22N2	P22N2	P22N1	375	>20Y ARI	0.11
pP22N1	P22N1	P22T0B	300	>20Y ARI	0.11
pP22T0B	P22T0B	P22T0B_1	225	>20Y ARI	0.13
pP22T0B_1	P22T0B_1	P22T0A	375	>20Y ARI	0.13
pP22T0A	P22T0A	P22T0A_1	375	>20Y ARI	0.20
pP22T0A_1	P22T0A_1	P22RCAD	375	>20Y ARI	0.20
pP22M2	P22M2	P22M1	225	<5Y ARI	0.07
pP22M1	P22M1	P22T0A	375	<5Y ARI	0.07
pP22Q2	P22Q2	P22Q1	375	<5Y ARI	0.12
pP22Q1	P22Q1	P22Q0	375	<5Y ARI	0.03
pP22Q0	P22Q0	P22T0C	375	<5Y ARI	0.03
pP22T0C	P22T0C	P22T0B	225	<5Y ARI	0.11
pP22P2	P22P2	P22P1	225	5-10Y ARI	0.01
pP22P1	P22P1	P22T0C	225	<5Y ARI	0.00
pP22R1	P22R1	P22T0D	300	<5Y ARI	0.05
pP22T0D	P22T0D	P22T0C	300	<5Y ARI	0.21
pP22U1	P22U1	P22T2	375	<5Y ARI	0.00
pP22T2	P22T2	P22T1	150	<5Y ARI	0.06
pP22T1	P22T1	P22T0D	300	<5Y ARI	0.19
pP22V2	P22V2	P22V1	225	<5Y ARI	0.04
pP22V1	P22V1	P22T2	300	<5Y ARI	0.02
pP22T9	P22T9	P22T8	225	<5Y ARI	0.05
pP22T8	P22T8	P22T7	300	<5Y ARI	0.05
pP22T6	P22T6	P22T6_1	225	<5Y ARI	0.05
pP22T6_1	P22T6_1	P22T6_2	225	<5Y ARI	0.05
pP22T6_2	P22T6_2	P22T5	225	<5Y ARI	0.05
pP22T5	P22T5	P22T4	300	<5Y ARI	0.10
pP22T4	P22T4	P22T3	300	<5Y ARI	0.13
pP22T3	P22T3	P22T2	300	<5Y ARI	0.13
pP22W3	P22W3	P22W2	225	<5Y ARI	0.07
pP22W2_1	P22W2_1	P22W1	375	<5Y ARI	0.17
pP22W1	P22W1	P22T1	300	<5Y ARI	0.13
pP21C1	P21C1	P21A2	300	<5Y ARI	0.06
pP21A2	P21A2	P21A1	900	<5Y ARI	0.86
pP21A1	P21A1	P21A0	900	<5Y ARI	0.86
pP21K1	P21K1	P21A2B	300	5-10Y ARI	0.13
pP21A2B	P21A2B	P21A2	300	5-10Y ARI	0.19
pP21A3	P21A3	P21A3_1	300	<5Y ARI	0.07
pP21A3_1	P21A3_1	P21A2B	300	<5Y ARI	0.07
pP21G1	P21G1	P21F4	300	>20Y ARI	0.11
pP21F4	P21F4	P21F3	300	<5Y ARI	0.10
pP21F3	P21F3	P21F2	300	<5Y ARI	0.14
pP21F2	P21F2	P21F1	300	<5Y ARI	0.19

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP21F1	P21F1	P21B1	300	<5Y ARI	0.19
pP21B1	P21B1	P21A2	600	<5Y ARI	0.60
pP21H1	P21H1	P21H1_1	225	<5Y ARI	0.06
pP21H1_1	P21H1_1	P21F5A	225	<5Y ARI	0.06
pP21F5A	P21F5A	P21F5	225	<5Y ARI	0.07
pP21F5	P21F5	P21F4	300	<5Y ARI	0.07
pP21F6	P21F6	P21F5A	225	<5Y ARI	0.02
pP21E1	P21E1	P21D0A	300	<5Y ARI	0.04
pP21D0A	P21D0A	P21B1	375	<5Y ARI	0.15
pP21D1	P21D1	P21D1_1	375	<5Y ARI	0.11
pP21D1_1	P21D1_1	P21D0A	375	<5Y ARI	0.11
pP21B3B	P21B3B	P21B2B	225	<5Y ARI	0.06
pP21B2B	P21B2B	P21B2A	375	<5Y ARI	0.21
pP21B2A	P21B2A	P21B2	375	<5Y ARI	0.26
pP21B2	P21B2	P21B1	375	<5Y ARI	0.26
pP21B3A	P21B3A	P21B2A	225	<5Y ARI	0.05
pP21B6A	P21B6A	P21B6B	225	<5Y ARI	0.06
pP21B6B	P21B6B	P21B6B_1	225	<5Y ARI	0.08
pP21B6B_1	P21B6B_1	P21B3C	225	<5Y ARI	0.08
pP21B3C	P21B3C	P21B3	225	<5Y ARI	0.10
pP21B3	P21B3	P21B2B	375	<5Y ARI	0.16
pP21B6	P21B6	P21B5	225	<5Y ARI	0.06
pP21B5	P21B5	P21B3C	375	<5Y ARI	0.06
pP21B4	P21B4	P21B3C	375	<5Y ARI	0.07
pP26A2	P26A2	P26A2_1	375	<5Y ARI	0.07
pP26A2_1	P26A2_1	P26A2_2	375	<5Y ARI	0.07
pP26A2_2	P26A2_2	P26A1	1800	<5Y ARI	0.07
pP27A1	P27A1	P27outlet	375	<5Y ARI	0.05
pP27outlet	P27outlet	Outlet	375	<5Y ARI	0.05
pP25E1	P25E1	P25A0C	300	<5Y ARI	0.01
pP25A0C	P25A0C	P25A0B	300	<5Y ARI	0.15
pP25A0B	P25A0B	P25A0A	300	<5Y ARI	0.16
pP25A0A	P25A0A	P25A0	300	<5Y ARI	0.23
pP25D1	P25D1	P25A0B	300	<5Y ARI	0.02
pP25C1	P25C1	P25A0A	300	<5Y ARI	0.07
pP25G5	P25G5	P25G4	225	<5Y ARI	0.05
pP25G4	P25G4	P25G2	225	<5Y ARI	0.06
pP25G2	P25G2	P25F2	300	<5Y ARI	0.08
pP25F2	P25F2	P25G1	300	<5Y ARI	0.08
pP25G1	P25G1	P25A0D	300	<5Y ARI	0.09
pP25A0D	P25A0D	P25A0C	300	<5Y ARI	0.18
pP25F1	P25F1	P25G1	300	<5Y ARI	0.04
pP25H2	P25H2	P25H1	225	>20Y ARI	0.02
pP25H1	P25H1	P25H1_1	300	5-10Y ARI	0.05
pP25H1_1	P25H1_1	P25H1_2	300	5-10Y ARI	0.05
pP25H1_2	P25H1_2	P25H1_3	300	5-10Y ARI	0.05
pP25H1_3	P25H1_3	P25H1_4	300	5-10Y ARI	0.05
pP25H1_4	P25H1_4	P25H1_5	300	5-10Y ARI	0.05
pP25H1_5	P25H1_5	P25H1_6	300	5-10Y ARI	0.05
pP25H1_6	P25H1_6	P25H1_7	300	5-10Y ARI	0.05
pP25H1_7	P25H1_7	P25H1_8	300	5-10Y ARI	0.05
pP25H1_8	P25H1_8	P25H1_9	300	5-10Y ARI	0.05
pP25H1_9	P25H1_9	P25H1_10	300	5-10Y ARI	0.05
pP25H1_10	P25H1_10	P25H1_11	300	5-10Y ARI	0.05
pP25H1_11	P25H1_11	P25H1_12	300	5-10Y ARI	0.05
pP25H1_12	P25H1_12	P25H1_13	300	5-10Y ARI	0.05
pP25H1_13	P25H1_13	P25H1_14	300	5-10Y ARI	0.05
pP25H1_14	P25H1_14	P25H1_15	300	5-10Y ARI	0.05
pP25H1_15	P25H1_15	P25H1_16	300	5-10Y ARI	0.05
pP25H1_16	P25H1_16	P25H1_17	300	5-10Y ARI	0.05
pP25H1_17	P25H1_17	P25H1_18	300	5-10Y ARI	0.05
pP25H1_18	P25H1_18	P25H1_19	300	5-10Y ARI	0.05
pP25H1_19	P25H1_19	P25H1_20	300	5-10Y ARI	0.05
pP25H1_20	P25H1_20	P25H1_21	300	5-10Y ARI	0.05
pP25H1_21	P25H1_21	P25H1_22	300	5-10Y ARI	0.05
pP25H1_22	P25H1_22	P25H1_23	300	5-10Y ARI	0.05
pP25H1_23	P25H1_23	P25H1_24	300	5-10Y ARI	0.05

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP25H1_24	P25H1_24	P25H1_25	300	5-10Y ARI	0.05
pP25H1_25	P25H1_25	P25H1_26	300	5-10Y ARI	0.05
pP25H1_26	P25H1_26	P25H1_27	300	5-10Y ARI	0.05
pP25H1_27	P25H1_27	P25H1_28	300	5-10Y ARI	0.05
pP25H1_28	P25H1_28	P25H1_29	300	5-10Y ARI	0.05
pP25H1_29	P25H1_29	P25A2	300	5-10Y ARI	0.05
pP25A2	P25A2	P25A2_1	300	<5Y ARI	0.11
pP25A2_1	P25A2_1	P25A1	300	<5Y ARI	0.11
pP25A1	P25A1	P25A0D	300	<5Y ARI	0.11
pP25A6	P25A6	P25A5	225	<5Y ARI	0.09
pP25A5	P25A5	P25A4	225	<5Y ARI	0.11
pP25A4	P25A4	P25A3	225	<5Y ARI	0.12
pP25A3	P25A3	P25A3_1	300	<5Y ARI	0.19
pP25A3_1	P25A3_1	P25A2	300	<5Y ARI	0.19
pP1AA1	P1AA1	P1AA0	375	<5Y ARI	0.07
pP2A1	P2A1	P2A0	225	<5Y ARI	0.10
pP2A0	P2A0	P2AO	225	<5Y ARI	0.10
pP1F1	P1F1	P1A5	375	<5Y ARI	0.00
pP1A5	P1A5	P1A4	375	<5Y ARI	0.14
pP1A4	P1A4	P1A3	375	<5Y ARI	0.29
pP1A3	P1A3	P1A2	450	<5Y ARI	0.36
pP1A2	P1A2	P1A1	450	<5Y ARI	0.41
pP1A1	P1A1	P1AA0	375	<5Y ARI	0.50
pP1C6	P1C6	P1C5	Box Culvert < 1 m wide	5-10Y ARI	0.06
pP1C5	P1C5	P1C2A	375	5-10Y ARI	0.22
pP1C2A	P1C2A	P1C2	Box Culvert < 1 m wide	5-10Y ARI	0.27
pP1C2	P1C2	P1C1	300	5-10Y ARI	0.28
pP1C1	P1C1	P1A4	300	<5Y ARI	0.14
pP1C4	P1C4	P1C5	Box Culvert < 1 m wide	<5Y ARI	0.11
pP1C3	P1C3	P1C2A	Box Culvert < 1 m wide	<5Y ARI	0.06
pP1D1	P1D1	P1C1	300	5-10Y ARI	0.10
pP1G1	P1G1	P1A4	375	<5Y ARI	0.11
pP1B1	P1B1	P1A4	375	<5Y ARI	0.11
pP3A1	P3A1	P3A0	Box Culvert < 1 m wide	<5Y ARI	0.11
pP6A15	P6A15	P6A14	375	<5Y ARI	0.12
pP6A14	P6A14	P6A13	375	<5Y ARI	0.24
pP6A13	P6A13	P6A12	375	<5Y ARI	0.24
pP6A12	P6A12	P6A11	375	<5Y ARI	0.41
pP6A11	P6A11	P6A10	375	<5Y ARI	0.45
pP6A10	P6A10	P6A9	450	<5Y ARI	0.70
pP6A9	P6A9	P6A8	450	>20Y ARI	0.71
pP6A8	P6A8	P6A7	450	>20Y ARI	0.71
pP6A7	P6A7	P6A7_1	600	<5Y ARI	0.56
pP6A7_1	P6A7_1	P6A7_2	600	<5Y ARI	0.56
pP6A7_2	P6A7_2	P6A6	600	<5Y ARI	0.56
pP6A6	P6A6	P6A6_1	600	<5Y ARI	0.72
pP6A6_1	P6A6_1	P6A6_2	600	<5Y ARI	0.72
pP6A6_2	P6A6_2	P6A4	600	<5Y ARI	0.72
pP6A4	P6A4	P6A4_1	750	<5Y ARI	0.95
pP6A4_1	P6A4_1	P6A4_2	750	<5Y ARI	0.95
pP6A4_2	P6A4_2	P6A3	750	<5Y ARI	0.95
pP6A3	P6A3	P6A3_1	600	<5Y ARI	0.95
pP6A3_1	P6A3_1	P6A3_2	600	<5Y ARI	0.95
pP6A3_2	P6A3_2	P6A3_3	600	<5Y ARI	0.95
pP6A3_3	P6A3_3	P6A3_4	600	<5Y ARI	0.95
pP6A3_4	P6A3_4	P6A3_5	600	<5Y ARI	0.95
pP6A3_5	P6A3_5	P6A3_6	600	<5Y ARI	0.95
pP6A3_6	P6A3_6	P6A3_7	600	<5Y ARI	0.95
pP6A3_7	P6A3_7	P6A3_8	600	<5Y ARI	0.95
pP6A3_8	P6A3_8	P6A3_9	600	<5Y ARI	0.95
pP6A3_9	P6A3_9	P6A2	600	<5Y ARI	1.08
pP6A2	P6A2	P6A2_1	600	<5Y ARI	1.08
pP6A2_1	P6A2_1	P6A1	600	<5Y ARI	1.08
pP6A1	P6A1	P6A0	600	<5Y ARI	1.61
pW5X1B_1	W5X1B	W5X1B_3	300	<5Y ARI	0.00
pW5X1B_3	W5X1B_3	W5X1A	300	<5Y ARI	0.00
pW5X1B_1	W5X1B	W5X1B_3	300	<5Y ARI	0.00

Pipe	Start	End	Diameter	Capacity	100Y_Q
pW5X1B_2	W5X1B_2	W5W1	300	<5Y ARI	0.00
pW5AK1	W5AK1	W5AC2A	Box Culvert < 1 m wide	<5Y ARI	0.00
pW5AC2A	W5AC2A	W5AC2	Box Culvert < 1 m wide	<5Y ARI	0.16
pP24B1	P24B1	P24A0A	225	<5Y ARI	0.09
pP24EY	P24EY	P24AE	300	<5Y ARI	0.00
pP24AY1	P24AY1	P24AQ5B	300	<5Y ARI	0.00
pP24AT4	P24AT4	P24AT2A	300	<5Y ARI	0.00
pP23S1A	P23S1A	P23A3	300	<5Y ARI	0.00
pP22X	P22X	P22A1A	300	<5Y ARI	0.00
pP22KB1	P22KB1	P22KB	300	<5Y ARI	0.00
pP21G	P21G	P21JP	300	<5Y ARI	0.00
pP21JP	P21JP	P21F3	300	<5Y ARI	0.00
pP25A0A1	P25A0A1	P25A0A	300	<5Y ARI	0.00
pP1A8A	P1A8A	P1A8A_1	300	<5Y ARI	0.00
pP1A8A_1	P1A8A_1	P1A8	300	<5Y ARI	0.00
pP1A8	P1A8	P1A7	300	<5Y ARI	0.07
pP1A7	P1A7	P1A6	300	<5Y ARI	0.13
pP1A6	P1A6	P1A5	375	<5Y ARI	0.20
pP1E4	P1E4	P1E3	300	<5Y ARI	0.00
pP1E3	P1E3	P1E2	300	<5Y ARI	0.00
pP1E2	P1E2	P1E1	300	<5Y ARI	0.00
pP1E1	P1E1	P1A7	375	<5Y ARI	0.00
pP4A1A	P4A1A	P4A1A_1	300	<5Y ARI	0.00
pP4A1A_1	P4A1A_1	P4A0F	300	<5Y ARI	0.00
pP6E1	P6E1	P6A12	300	<5Y ARI	0.17
pP6G4	P6G4	P6G3	375	<5Y ARI	0.07
pP6G3	P6G3	P6G2	375	<5Y ARI	0.21
pP6G2	P6G2	P6G1	375	<5Y ARI	0.35
pP6G1	P6G1	P6A10	450	<5Y ARI	0.35
pP6I1	P6I1	P6H1	375	<5Y ARI	0.11
pP6H1	P6H1	P6A5	375	>20Y ARI	0.22
pP6A5	P6A5	P6A4	750	>20Y ARI	0.22
pP6H3	P6H3	P6H2	375	<5Y ARI	0.11
pP6H2	P6H2	P6H1	375	<5Y ARI	0.11
pP6K6	P6K6	P6K4	375	<5Y ARI	0.06
pP6K4	P6K4	P6K3	375	<5Y ARI	0.07
pP6K3	P6K3	P6K2	375	<5Y ARI	0.20
pP6K2	P6K2	P6K1	375	<5Y ARI	0.24
pP6K1	P6K1	P6A6	375	<5Y ARI	0.26
pP6K5	P6K5	P6K4	375	>20Y ARI	0.01
pP6D1	P6D1	P6D0A	375	<5Y ARI	0.09
pP6D0A	P6D0A	P6C0	300	<5Y ARI	0.20
pP6C0	P6C0	P6B1A	375	<5Y ARI	0.33
pP6B1A	P6B1A	P6B1A_1	375	<5Y ARI	0.53
pP6B1A_1	P6B1A_1	P6A1	375	<5Y ARI	0.53
pP6C3	P6C3	P6D0A	300	<5Y ARI	0.11
pP6C2	P6C2	P6C0	375	<5Y ARI	0.11
pP6C1	P6C1	P6C0	375	<5Y ARI	0.07
pP5E2	P5E2	P5E1	225	<5Y ARI	0.04
pP5E1	P5E1	P5E1_1	225	<5Y ARI	0.11
pP5E1_1	P5E1_1	P5D1	225	<5Y ARI	0.11
pP5D1	P5D1	P5A2	375	<5Y ARI	0.11
pP5A2	P5A2	P5A1	600	<5Y ARI	0.82
pP5A1	P5A1	P4A0F	600	<5Y ARI	0.93
pP5B1	P5B1	P5A1	300	<5Y ARI	0.11
pP5C2	P5C2	P5C1	225	<5Y ARI	0.07
pP5C1	P5C1	P5C1_1	300	<5Y ARI	0.13
pP5C1_1	P5C1_1	P5A2	300	<5Y ARI	0.13
pP5F2	P5F2	P5F1	Box Culvert < 1 m wide	<5Y ARI	0.12
pP5F1	P5F1	P5O1A	300	<5Y ARI	0.14
pP5O1A	P5O1A	P5A2	450	<5Y ARI	0.46
pP5O9A	P5O9A	P5O9B	300	<5Y ARI	0.03
pP5O9B	P5O9B	P5O8B	300	<5Y ARI	0.22
pP5O8B	P5O8B	P5O8B_1	300	<5Y ARI	0.24
pP5O8B_1	P5O8B_1	P5O8A	300	<5Y ARI	0.24
pP5O8A	P5O8A	P5O8	300	<5Y ARI	0.30
pP5O8	P5O8	P5O8_1	450	<5Y ARI	0.30

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP5O8_1	P5O8_1	P5O7	450	<5Y ARI	0.30
pP5O7	P5O7	P5O6	450	<5Y ARI	0.16
pP5O6	P5O6	P5O5B	450	<5Y ARI	0.16
pP5O5B	P5O5B	P5O5A	300	<5Y ARI	0.16
pP5O5A	P5O5A	P5O5	300	<5Y ARI	0.23
pP5O5	P5O5	P5O4A	450	<5Y ARI	0.22
pP5O4A	P5O4A	P5O4	450	<5Y ARI	0.22
pP5O4	P5O4	P5O3	450	<5Y ARI	0.47
pP5O3	P5O3	P5O2B	450	<5Y ARI	0.47
pP5O2B	P5O2B	P5O2A	450	<5Y ARI	0.54
pP5O2A	P5O2A	P502	450	<5Y ARI	0.54
pP502	P502	P5O1A	450	<5Y ARI	0.41
pP5O9	P5O9	P5O8A	225	<5Y ARI	0.06
pP5O1	P5O1	P5O1_1	300	<5Y ARI	0.06
pP5O1_1	P5O1_1	P502	300	<5Y ARI	0.06
pP5Q1	P5Q1	P5P1	300	<5Y ARI	0.11
pP5P1	P5P1	P5O4	300	5-10Y ARI	0.25
pP5R1	P5R1	P5P1	225	<5Y ARI	0.06
pP5P2	P5P2	P5P1	225	<5Y ARI	0.02
pP5T1	P5T1	P5O5B	300	<5Y ARI	0.11
pP5S1	P5S1	P5O5A	300	<5Y ARI	0.11
pP5W1	P5W1	P5O9C	225	<5Y ARI	0.02
pP5O9C	P5O9C	P5O9B	450	<5Y ARI	0.34
pP5V1	P5V1	P5O9B	225	<5Y ARI	0.04
pP5U1	P5U1	P5O8B	225	<5Y ARI	0.07
pP5O11A	P5O11A	P5O11C	300	<5Y ARI	0.07
pP5O11C	P5O11C	P5O10C	450	<5Y ARI	0.36
pP5O10C	P5O10C	P5O10A	450	<5Y ARI	0.36
pP5O10A	P5O10A	P5O10	450	<5Y ARI	0.36
pP5O10	P5O10	P5O9C	450	<5Y ARI	0.36
pP5O13	P5O13	P5O13B	225	<5Y ARI	0.07
pP5O13B	P5O13B	P5O11C	450	<5Y ARI	0.29
pP5X4	P5X4	P5X3	225	<5Y ARI	0.04
pP5X3	P5X3	P5X1	225	<5Y ARI	0.09
pP5X1	P5X1	P5X1_1	450	<5Y ARI	0.23
pP5X1_1	P5X1_1	P5O13B	450	<5Y ARI	0.23
pP5O14	P5O14	P5O14A	225	<5Y ARI	0.07
pP5O14A	P5O14A	P5X2	375	<5Y ARI	0.31
pP5X2	P5X2	P5X1	225	<5Y ARI	0.08
pP5Y1	P5Y1	P5O15	225	>20Y ARI	0.02
pP5O15	P5O15	P5O14C	225	<5Y ARI	0.10
pP5O14C	P5O14C	P5O14A	300	<5Y ARI	0.25
pP5Z1	P5Z1	P5O15B	225	<5Y ARI	0.07
pP5O15B	P5O15B	P5O15	300	<5Y ARI	0.21
pP5AC	P5AC	P5AB	300	<5Y ARI	0.07
pP5AB	P5AB	P5AB_1	300	>20Y ARI	0.09
pP5AB_1	P5AB_1	P5O14D	300	>20Y ARI	0.09
pP5O14D	P5O14D	P5O14C	300	<5Y ARI	0.15
pP5AA	P5AA	P5O14D	225	<5Y ARI	0.07
pP5A8	P5A8	P5A7	225	>20Y ARI	0.03
pP5G6	P5G6	P5G4A	300	<5Y ARI	0.07
pP5G4A	P5G4A	P5G4	300	<5Y ARI	0.14
pP5G4	P5G4	P5G2A	300	<5Y ARI	0.24
pP5G2A	P5G2A	P5G2	300	<5Y ARI	0.27
pP5G5	P5G5	P5G4A	225	<5Y ARI	0.07
pP5G1	P5G1	P5A6	450	<5Y ARI	0.12
pP5A6	P5A6	P5A5	225	<5Y ARI	0.08
pP5A5	P5A5	P5A4	375	<5Y ARI	0.17
pP5A4	P5A4	P5A3	450	<5Y ARI	0.28
pP5A3	P5A3	P5A2	450	<5Y ARI	0.30
pP5G3	P5G3	P5G2A	225	<5Y ARI	0.06
pP5L1	P5L1	P5H2A	225	<5Y ARI	0.07
pP5H2A	P5H2A	P5H2	300	<5Y ARI	0.28
pP5H2	P5H2	P5H1B	300	<5Y ARI	0.12
pP5H1B	P5H1B	P5H1A	300	<5Y ARI	0.17
pP5H1A	P5H1A	P5H1	300	<5Y ARI	0.20
pP5H1	P5H1	P5G4	300	<5Y ARI	0.20

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP5K1	P5K1	P5H1B	225	<5Y ARI	0.06
pP5I1	P5I1	P5H1A	225	5-10Y ARI	0.05
pP5H3	P5H3	P5H2B	225	<5Y ARI	0.03
pP5H2B	P5H2B	P5H2A	300	<5Y ARI	0.22
pP5N4	P5N4	P5N2A	225	<5Y ARI	0.05
pP5N2A	P5N2A	P5N2	225	<5Y ARI	0.10
pP5N3	P5N3	P5N2A	225	<5Y ARI	0.05
pP5N2_1	P5N2_1	P5N2_2	225	<5Y ARI	0.05
pP5N2_2	P5N2_2	P5N2_3	225	<5Y ARI	0.06
pP5N2_3	P5N2_3	P5N1	225	<5Y ARI	0.06
pP5N1	P5N1	P5M3	300	<5Y ARI	0.13
pP5M3	P5M3	P5M3_1	300	<5Y ARI	0.21
pP5M3_1	P5M3_1	P5M2	300	<5Y ARI	0.21
pP5M2	P5M2	P5M2_1	300	<5Y ARI	0.15
pP5M2_1	P5M2_1	P5M1	300	<5Y ARI	0.15
pP5M1	P5M1	P5H2B	300	<5Y ARI	0.20
pP5M4	P5M4	P5M4_1	300	<5Y ARI	0.09
pP5M4_1	P5M4_1	P5M4_2	300	<5Y ARI	0.09
pP5M4_2	P5M4_2	P5M3	300	<5Y ARI	0.09
pP7C1	P7C1	P7A1	300	<5Y ARI	0.01
pP7A1	P7A1	P7A1_1	300	<5Y ARI	0.27
pP7A1_1	P7A1_1	P7A0J1	300	<5Y ARI	0.27
pP7B1	P7B1	P7A1	225	<5Y ARI	0.07
pP7D5	P7D5	P7D3	225	<5Y ARI	0.06
pP7D3	P7D3	P7D2	300	<5Y ARI	0.13
pP7D2	P7D2	P7D1	450	<5Y ARI	0.26
pP7D1	P7D1	P7A2	375	<5Y ARI	0.26
pP7A2	P7A2	P7A1	1200	<5Y ARI	2.39
pP7D4	P7D4	P7D3	300	<5Y ARI	0.09
pP7F9	P7F9	P7F8	225	<5Y ARI	0.07
pP7F8	P7F8	P7F7	300	<5Y ARI	0.16
pP7F7	P7F7	P7D2	300	<5Y ARI	0.22
pP7E3	P7E3	P7E2	150	>20Y ARI	0.02
pP7E2	P7E2	P7E1	Box Culvert < 1 m wide	<5Y ARI	0.04
pP7E1	P7E1	P7E1_1	300	<5Y ARI	0.06
pP7E1_1	P7E1_1	P7D1	300	<5Y ARI	0.06
pP7E5	P7E5	P7E4	Box Culvert < 1 m wide	<5Y ARI	0.03
pP7E4	P7E4	P7E1	Box Culvert < 1 m wide	<5Y ARI	0.03
pP7K3	P7K3	P7K1	300	<5Y ARI	0.12
pP7K1	P7K1	P7A4B	Box Culvert < 1 m wide	<5Y ARI	0.32
pP7A4B	P7A4B	P7A4A	900	<5Y ARI	1.65
pP7A4A	P7A4A	P7A4	900	<5Y ARI	1.78
pP7A4	P7A4	P7A4_1	1200	<5Y ARI	2.00
pP7A4_1	P7A4_1	P7A3	1200	<5Y ARI	2.07
pP7A3	P7A3	P7A2	1200	<5Y ARI	2.14
pP7K2	P7K2	P7K1	Box Culvert < 1 m wide	<5Y ARI	0.20
pP7I2	P7I2	P7I1A	300	<5Y ARI	0.09
pP7I1A	P7I1A	P7A4	300	5-10Y ARI	0.16
pP7I1	P7I1	P7I1A	300	<5Y ARI	0.10
pP7H2	P7H2	P7H1	375	>20Y ARI	0.05
pP7H1	P7H1	P7A4	300	>20Y ARI	0.06
pP7ZC3	P7ZC3	P7ZC2	225	<5Y ARI	0.06
pP7ZC2	P7ZC2	P7ZC1	Box Culvert < 1 m wide	<5Y ARI	0.04
pP7ZC1	P7ZC1	P7ZA1	375	<5Y ARI	0.09
pP7ZA1	P7ZA1	P7A4A	450	<5Y ARI	0.13
pP7ZJ1	P7ZJ1	P7ZJ2	225	<5Y ARI	0.05
pP7ZJ2	P7ZJ2	P7ZA1	Box Culvert < 1 m wide	<5Y ARI	0.05
pP7ZJ3	P7ZJ3	P7ZJ2	225	<5Y ARI	0.07
pP7S1	P7S1	P7N1	375	>20Y ARI	0.02
pP7N1	P7N1	P7A4C	Box Culvert < 1 m wide	>20Y ARI	0.33
pP7A4C	P7A4C	P7A4B	900	>20Y ARI	1.84
pP7S2	P7S2	P7N2	375	<5Y ARI	0.06
pP7N2	P7N2	P7N1	Box Culvert < 1 m wide	<5Y ARI	0.31
pP7N6	P7N6	P7N5	375	>20Y ARI	0.00
pP7N5	P7N5	P7N4	600	<5Y ARI	0.14
pP7N4	P7N4	P7N2A	600	<5Y ARI	0.14
pP7N2A	P7N2A	P7N2	375	<5Y ARI	0.24

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP7N3	P7N3	P7N2A	375	<5Y ARI	0.11
pP7P1	P7P1	P7N10A	225	<5Y ARI	0.07
pP7N10A	P7N10A	P7N9	600	<5Y ARI	0.46
pP7N9	P7N9	P7N8	600	<5Y ARI	0.47
pP7N8	P7N8	P7N7	225	<5Y ARI	0.07
pP7N7	P7N7	P7N5	600	<5Y ARI	0.07
pP7N11	P7N11	P7N10B	300	>20Y ARI	0.04
pP7N10B	P7N10B	P7N10A	600	>20Y ARI	0.39
pP7N10	P7N10	P7N9	375	>20Y ARI	0.01
pP7R5	P7R5	P7R4	300	<5Y ARI	0.11
pP7R4	P7R4	P7R1A	300	<5Y ARI	0.15
pP7R1A	P7R1A	P7R1	300	<5Y ARI	0.23
pP7R1	P7R1	P7N12	600	<5Y ARI	0.32
pP7N12	P7N12	P7N10B	600	<5Y ARI	0.35
pP7R3	P7R3	P7R2	300	>20Y ARI	0.03
pP7R2	P7R2	P7R1A	300	<5Y ARI	0.11
pP7N16	P7N16	P7N15	150	<5Y ARI	0.02
pP7N15	P7N15	P7N14	150	<5Y ARI	0.04
pP7N14	P7N14	P7N13	300	5-10Y ARI	0.11
pP7N13	P7N13	P7N12	300	5-10Y ARI	0.11
pP7Q2	P7Q2	P7Q1	300	<5Y ARI	0.09
pP7Q1	P7Q1	P7R1	300	<5Y ARI	0.09
pP7V5	P7V5	P7V4	225	<5Y ARI	0.06
pP7V4	P7V4	P7V3	Box Culvert < 1 m wide	<5Y ARI	0.13
pP7V2	P7V2	P7V1	300	<5Y ARI	0.11
pP7V1	P7V1	P7V1_1	300	<5Y ARI	0.13
pP7V1_1	P7V1_1	P7V1_2	300	<5Y ARI	0.13
pP7V1_2	P7V1_2	P7V1_3	300	<5Y ARI	0.13
pP7V1_3	P7V1_3	P7V1_4	300	<5Y ARI	0.13
pP7V1_4	P7V1_4	P7V1_5	300	<5Y ARI	0.13
pP7V1_5	P7V1_5	P7V1_6	300	<5Y ARI	0.13
pP7V1_6	P7V1_6	P7V1_7	300	<5Y ARI	0.13
pP7V1_7	P7V1_7	P7V1_8	300	<5Y ARI	0.13
pP7V1_8	P7V1_8	P7V1_9	300	<5Y ARI	0.13
pP7V1_9	P7V1_9	P7V1_10	300	<5Y ARI	0.13
pP7V1_10	P7V1_10	P7V1_11	300	<5Y ARI	0.13
pP7V1_11	P7V1_11	P7V1_12	300	<5Y ARI	0.13
pP7V1_12	P7V1_12	P7V1_13	300	<5Y ARI	0.13
pP7V1_13	P7V1_13	P7V1_14	300	<5Y ARI	0.13
pP7V1_14	P7V1_14	P7V1_15	300	<5Y ARI	0.13
pP7V1_15	P7V1_15	P7V1_16	300	<5Y ARI	0.13
pP7V1_16	P7V1_16	P7V1_17	300	<5Y ARI	0.13
pP7V1_17	P7V1_17	P7V1_18	300	<5Y ARI	0.13
pP7V1_18	P7V1_18	P7V1_19	300	<5Y ARI	0.13
pP7V1_19	P7V1_19	P7V1_20	300	<5Y ARI	0.12
pP7V1_20	P7V1_20	P7A5	300	<5Y ARI	0.12
pP7A5	P7A5	P7A4C	900	<5Y ARI	1.51
pP7T4	P7T4	P7T3	225	<5Y ARI	0.06
pP7T3	P7T3	P7T2	225	<5Y ARI	0.05
pP7T2	P7T2	P7T1	225	<5Y ARI	0.05
pP7T1	P7T1	P7A6	225	<5Y ARI	0.08
pP7A6	P7A6	P7A5	900	<5Y ARI	1.39
pP7U2	P7U2	P7U1	300	<5Y ARI	0.10
pP7U1	P7U1	P7A6	300	<5Y ARI	0.16
pP7X12	P7X12	P7X10	375	<5Y ARI	0.05
pP7X10	P7X10	P7X8	300	<5Y ARI	0.10
pP7X8	P7X8	P7X7	300	<5Y ARI	0.12
pP7X7	P7X7	P7X6	300	<5Y ARI	0.12
pP7X6	P7X6	P7X5	300	<5Y ARI	0.12
pP7X5	P7X5	P7X4	300	<5Y ARI	0.12
pP7X11	P7X11	P7X10	375	<5Y ARI	0.06
pP7X9	P7X9	P7X8	Box Culvert < 1 m wide	5-10Y ARI	0.05
pP7W2	P7W2	P7W1	300	<5Y ARI	0.11
pP7W1	P7W1	P7A6A	300	<5Y ARI	0.11
pP7A6A	P7A6A	P7A6A_1	900	<5Y ARI	1.15
pP7A6A_1	P7A6A_1	P7A6	900	<5Y ARI	1.15
pP7X3	P7X3	P7X1	375	<5Y ARI	0.11

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP7X1	P7X1	P7A6C	450	<5Y ARI	0.14
pP7A6C	P7A6C	P7A6B	900	<5Y ARI	0.90
pP7A6B	P7A6B	P7A6A	900	<5Y ARI	1.05
pP7X2	P7X2	P7X1	300	<5Y ARI	0.03
pP7Y8	P7Y8	P7Y6	225	<5Y ARI	0.05
pP7Y6	P7Y6	P7Y6_1	375	>20Y ARI	0.14
pP7Y6_1	P7Y6_1	P7Y6_2	375	>20Y ARI	0.14
pP7Y6_2	P7Y6_2	P7Y4	375	>20Y ARI	0.14
pP7Y4	P7Y4	P7Y3	225	<5Y ARI	0.08
pP7Y3	P7Y3	P7Y2	525	<5Y ARI	0.21
pP7Y2	P7Y2	P7Y1	525	<5Y ARI	0.27
pP7Y1	P7Y1	P7A6B	375	<5Y ARI	0.21
pP7Y7	P7Y7	P7Y6	225	<5Y ARI	0.02
pP7Y5	P7Y5	P7Y4	225	<5Y ARI	0.04
pP7AA3	P7AA3	P7AA2	300	<5Y ARI	0.06
pP7AA2	P7AA2	P7A9A	300	<5Y ARI	0.07
pP7A9A	P7A9A	P7A9	900	<5Y ARI	0.63
pP7A9	P7A9	P7A8	900	<5Y ARI	0.63
pP7A8	P7A8	P7A7B	900	<5Y ARI	0.63
pP7A7B	P7A7B	P7A7A	450	<5Y ARI	0.66
pP7A7A	P7A7A	P7A7	450	<5Y ARI	0.77
pP7A7	P7A7	P7A6C	900	<5Y ARI	0.77
pP7AA1	P7AA1	P7A9A	300	<5Y ARI	0.00
pP7AE1	P7AE1	P7AE1A	225	5-10Y ARI	0.04
pP7AE1A	P7AE1A	P7AD1_1	225	5-10Y ARI	0.09
pP7AD1_1	P7AD1_1	P7AD1	225	<5Y ARI	0.08
pP7AD1	P7AD1	P7A7B	450	<5Y ARI	0.18
pP7AD2	P7AD2	P7AD2_1	225	<5Y ARI	0.06
pP7AD2_1	P7AD2_1	P7AE1B	225	<5Y ARI	0.06
pP7AE1B	P7AE1B	P7AE1B_1	225	<5Y ARI	0.07
pP7AE1B_1	P7AE1B_1	P7AE1A	225	<5Y ARI	0.07
pP7AJ3	P7AJ3	P7AJ2	300	>20Y ARI	0.02
pP7AJ2	P7AJ2	P7AJ1	300	>20Y ARI	0.03
pP7AJ1	P7AJ1	P7AFA0	375	>20Y ARI	0.03
pP7AFA0	P7AFA0	P7AE1B	300	>20Y ARI	0.12
pP7AFA2	P7AFA2	P7AFA1	225	<5Y ARI	0.09
pP7AFA1	P7AFA1	P7AFA0	300	<5Y ARI	0.09
pP7Z11	P7Z11	P7Z5D	Box Culvert < 1 m wide	<5Y ARI	0.03
pP7Z5D	P7Z5D	P7Z5C	Box Culvert < 1 m wide	<5Y ARI	0.06
pP7Z5C	P7Z5C	P7Z5C_1	Box Culvert < 1 m wide	<5Y ARI	0.15
pP7Z5C_1	P7Z5C_1	P7Z5B	Box Culvert < 1 m wide	<5Y ARI	0.15
pP7Z5B	P7Z5B	P7Z5B_1	Box Culvert < 1 m wide	<5Y ARI	0.17
pP7Z5B_1	P7Z5B_1	P7Z5A	Box Culvert < 1 m wide	<5Y ARI	0.17
pP7Z5A	P7Z5A	P7Z5	Box Culvert < 1 m wide	<5Y ARI	0.23
pP7Z5	P7Z5	P7Z4	375	<5Y ARI	0.31
pP7Z4	P7Z4	P7Z4_1	375	<5Y ARI	0.31
pP7Z4_1	P7Z4_1	P7ZA2	375	<5Y ARI	0.31
pP7ZA2	P7ZA2	P7Z1	Box Culvert < 1 m wide	<5Y ARI	0.05
pP7Z1	P7Z1	P7A7A	450	<5Y ARI	0.12
pP7Z10	P7Z10	P7Z5D	Box Culvert < 1 m wide	<5Y ARI	0.07
pP7Z9	P7Z9	P7Z5C	Box Culvert < 1 m wide	<5Y ARI	0.10
pP7Z8	P7Z8	P7Z5B	Box Culvert < 1 m wide	<5Y ARI	0.05
pP7Z7	P7Z7	P7Z5A	225	<5Y ARI	0.06
pP7Z6	P7Z6	P7Z5	225	<5Y ARI	0.07
pP7Z3	P7Z3	P7ZA2	Box Culvert < 1 m wide	<5Y ARI	0.02
pP7Z2	P7Z2	P7Z1	225	<5Y ARI	0.08
pP7AB1	P7AB1	P7A10A	225	<5Y ARI	0.08
pP7A10A	P7A10A	P7A10A_1	900	<5Y ARI	0.57
pP7A10A_1	P7A10A_1	P7A10	900	<5Y ARI	0.57
pP7A10	P7A10	P7A9A	900	<5Y ARI	0.57
pP7AC6	P7AC6	P7AC5	150	<5Y ARI	0.04
pP7AC5	P7AC5	P7AC4	225	<5Y ARI	0.04
pP7AC4	P7AC4	P7AC3	225	<5Y ARI	0.04
pP7AC3	P7AC3	P7AC2	225	<5Y ARI	0.05
pP7AC2	P7AC2	P7AC1	225	<5Y ARI	0.05
pP7AC1	P7AC1	P7A10A	900	<5Y ARI	0.05
pP7AI2	P7AI2	P7AI1	Box Culvert < 1 m wide	<5Y ARI	0.01

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP7AI1	P7AI1	P7AH1	300	<5Y ARI	0.02
pP7AH1	P7AH1	P7A11A	450	<5Y ARI	0.22
pP7A11A	P7A11A	P7A11	300	<5Y ARI	0.27
pP7A11	P7A11	P7A10A	900	<5Y ARI	0.44
pP7AK4	P7AK4	P7AK3	300	<5Y ARI	0.02
pP7AK3	P7AK3	P7AK3_1	300	<5Y ARI	0.12
pP7AK3_1	P7AK3_1	P7AK0A	300	<5Y ARI	0.12
pP7AK0A	P7AK0A	P7AH3A	300	<5Y ARI	0.13
pP7AH3A	P7AH3A	P7AH3	450	<5Y ARI	0.29
pP7AH3	P7AH3	P7AH2	450	<5Y ARI	0.30
pP7AH2	P7AH2	P7AH1	450	<5Y ARI	0.34
pP7AK2	P7AK2	P7AK0A	225	<5Y ARI	0.05
pP7AK1	P7AK1	P7AK0A	150	<5Y ARI	0.02
pP7AO2	P7AO2	P7AN3	225	<5Y ARI	0.00
pP7AN3	P7AN3	P7AN2	225	<5Y ARI	0.07
pP7AN2	P7AN2	P7AN1	225	<5Y ARI	0.07
pP7AN1	P7AN1	P7AN0A	225	<5Y ARI	0.07
pP7AN0A	P7AN0A	P7AK3	225	<5Y ARI	0.08
pP7AO1	P7AO1	P7AN2	225	<5Y ARI	0.00
pP7AN5	P7AN5	P7AN4	225	<5Y ARI	0.04
pP7AN4	P7AN4	P7AN3	225	<5Y ARI	0.05
pP7AM1	P7AM1	P7AM1_1	150	<5Y ARI	0.02
pP7AM1_1	P7AM1_1	P7AN0A	150	<5Y ARI	0.02
pP7AL2	P7AL2	P7AL0A	225	<5Y ARI	0.02
pP7AL0A	P7AL0A	P7AK3	225	<5Y ARI	0.05
pP7AL1	P7AL1	P7AL0A	225	<5Y ARI	0.02
pP7AP1	P7AP1	P7AH3B	300	<5Y ARI	0.06
pP7AH3B	P7AH3B	P7AH3A	450	<5Y ARI	0.29
pP7AH9	P7AH9	P7AH5	375	<5Y ARI	0.05
pP7AH5	P7AH5	P7AH4	375	<5Y ARI	0.27
pP7AH4	P7AH4	P7AH4_1	450	5-10Y ARI	0.35
pP7AH4_1	P7AH4_1	P7AH3B	450	5-10Y ARI	0.35
pP7AH8	P7AH8	P7AH6	225	<5Y ARI	0.05
pP7AH6	P7AH6	P7AH5	375	<5Y ARI	0.16
pP7AH7	P7AH7	P7AH6	375	>20Y ARI	0.03
pP7A14	P7A14	P7A13	450	<5Y ARI	0.12
pP7A13	P7A13	P7A12	Box Culvert < 1 m wide	<5Y ARI	0.24
pP7A12	P7A12	P7A11C	900	<5Y ARI	0.32
pP7A11C	P7A11C	P7A11B	900	<5Y ARI	0.31
pP7A11B	P7A11B	P7A11A	900	<5Y ARI	0.23
pP7AQ3	P7AQ3	P7A12	300	<5Y ARI	0.12
pP7AQ2	P7AQ2	P7A11C	300	<5Y ARI	0.11
pP7AQ1	P7AQ1	P7A11B	300	<5Y ARI	0.06
pP11A3	P11A3	P11A2	225	<5Y ARI	0.02
pP11A2	P11A2	P11ZA1	300	<5Y ARI	0.04
pP11ZA1	P11ZA1	P10A3	300	<5Y ARI	0.14
pP10A3	P10A3	P10A3_1	300	<5Y ARI	0.14
pP10A3_1	P10A3_1	P10A2	300	<5Y ARI	0.14
pP10A2	P10A2	P10A1	300	<5Y ARI	0.14
pP10A1	P10A1	P10A0	225	<5Y ARI	0.14
pP12A4	P12A4	P12A2	300	>20Y ARI	0.02
pP12A2	P12A2	P12A1	300	<5Y ARI	0.13
pP12A1	P12A1	P12A1_1	300	<5Y ARI	0.13
pP12A1_1	P12A1_1	P12A1_2	300	<5Y ARI	0.13
pP12A1_2	P12A1_2	P12A0	300	<5Y ARI	0.13
pP12A3	P12A3	P12A2	225	<5Y ARI	0.05
pP8B1	P8B1	P8A1	225	<5Y ARI	0.05
pP8A1	P8A1	P8A0	225	<5Y ARI	0.13
pP8A0	P8A0	P8outlet	225	<5Y ARI	0.13
pP8outlet	P8outlet	P6A3_9	225	<5Y ARI	0.13
pP8A3	P8A3	P8A2	300	<5Y ARI	0.09
pP8A2	P8A2	P8A1	375	<5Y ARI	0.09
pP15A4	P15A4	P15A3	300	<5Y ARI	0.11
pP15A3	P15A3	P15A2	375	<5Y ARI	0.11
pP15A2	P15A2	P15A1	375	<5Y ARI	0.11
pP15A1	P15A1	P15A0	375	<5Y ARI	0.14
pP14A4	P14A4	P14A3	300	>20Y ARI	0.00

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP14A3	P14A3	P14A2	300	<5Y ARI	0.11
pP14A2	P14A2	P14A1	300	<5Y ARI	0.17
pP14A1	P14A1	P14A1_1	375	<5Y ARI	0.17
pP14A1_1	P14A1_1	P14A0	375	<5Y ARI	0.17
pP16A1	P16A1	P16A0	300	<5Y ARI	0.06
pP13F2	P13F2	P13F1	225	5-10Y ARI	0.03
pP13F1	P13F1	P13E1	300	<5Y ARI	0.03
pP13E1	P13E1	P13E2	300	<5Y ARI	0.15
pP13E2	P13E2	P13E3	300	<5Y ARI	0.37
pP13E3	P13E3	P13E4	300	<5Y ARI	0.37
pP13G2	P13G2	P13G1	225	<5Y ARI	0.07
pP13G1	P13G1	P13E2	225	<5Y ARI	0.25
pP13A17	P13A17	P13A16	300	<5Y ARI	0.11
pP13A16_2	P13A16	P13BA15	225	>20Y ARI	0.02
pP13A16_1	P13A16	P13E1	300	>20Y ARI	0.11
pP13BA15	P13BA15	P13BA14	225	<5Y ARI	0.04
pP13BA14	P13BA14	P13BA13	225	<5Y ARI	0.08
pP13BA13	P13BA13	P13BA12	225	<5Y ARI	0.09
pP13BA12	P13BA12	P13BA11	300	<5Y ARI	0.10
pP13BA11	P13BA11	P13BA10	300	<5Y ARI	0.12
pP13BA10	P13BA10	P13BA9	300	<5Y ARI	0.18
pP13BA9	P13BA9	P13BA8	300	<5Y ARI	0.18
pP13A19	P13A19	P13A18	300	<5Y ARI	0.07
pP13D1	P13D1	P13A16	225	>20Y ARI	0.03
pP17B2	P17B2	P17B1	300	<5Y ARI	0.11
pP17B1	P17B1	P17A10	Box Culvert < 1 m wide	<5Y ARI	0.22
pP17A10	P17A10	P17A9	450	<5Y ARI	0.22
pP17A9	P17A9	P17A8	300	>20Y ARI	0.22
pP17A8	P17A8	P17A7	Box Culvert < 1 m wide	>20Y ARI	0.22
pP17C2	P17C2	P17C1	375	<5Y ARI	0.11
pP17C1	P17C1	P17A11	375	<5Y ARI	0.13
pP17A11	P17A11	P17A10	375	<5Y ARI	0.21
pP17A7_1	P17A7_1	P17A15A	450	<5Y ARI	0.00
pP17A15A	P17A15A	P17A5	450	<5Y ARI	0.06
pP17A5	P17A5	P17A4	225	<5Y ARI	0.12
pP17A4	P17A4	P17A3A	300	<5Y ARI	0.19
pP17A3A	P17A3A	P17A2A	300	<5Y ARI	0.49
pP17A2A	P17A2A	P17A1A	300	<5Y ARI	0.49
pP17A1A	P17A1A	P17A1	300	<5Y ARI	0.49
pP17A6	P17A6	P17A15A	300	<5Y ARI	0.06
pP17E1	P17E1	P17A17	200	<5Y ARI	0.04
pP17A17	P17A17	P17A16	300	>20Y ARI	0.16
pP17A16	P17A16	P17A15	300	<5Y ARI	0.22
pP17A15	P17A15	P17A14	300	<5Y ARI	0.17
pP17A14	P17A14	P17A13	375	<5Y ARI	0.17
pP17A13	P17A13	P17A12	375	<5Y ARI	0.17
pP17A12	P17A12	P17A11	375	<5Y ARI	0.23
pP17A18	P17A18	P17A17	300	<5Y ARI	0.12
pP13BA7	P13BA7	P13BA6	300	<5Y ARI	0.07
pP13BA6	P13BA6	P13BA5	300	<5Y ARI	0.07
pP13BA5	P13BA5	P13BA4	300	<5Y ARI	0.07
pP13BA4	P13BA4	P13BA3	300	<5Y ARI	0.07
pP13BA3	P13BA3	P13BA2	200	<5Y ARI	0.07
pP13BA2	P13BA2	P13BA1	225	<5Y ARI	0.07
pP13BC2	P13BC2	P13BC1	300	<5Y ARI	0.06
pP13BC1	P13BC1	P13BA10	300	<5Y ARI	0.06
pP13BB2	P13BB2	P13BB1	300	5-10Y ARI	0.12
pP13BB1	P13BB1	P13BA8	300	>20Y ARI	0.23
pP19A2	P19A2	W5AJ	225	<5Y ARI	0.08
pP19C1	P19C1	W5AJ	225	<5Y ARI	0.08
pP19B1	P19B1	P19A1	300	<5Y ARI	0.07
pP19A1	P19A1	W5AJ	525	<5Y ARI	0.21
pP19D2	P19D2	P19D1	300	<5Y ARI	0.07
pP19D1	P19D1	P19D1_1	300	<5Y ARI	0.14
pP19D1_1	P19D1_1	P19A1	150	<5Y ARI	0.14
pP18B1	P18B1	P18A2	300	<5Y ARI	0.07
pP18A2	P18A2	P18A1	525	<5Y ARI	0.78

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP18A1	P18A1	P18A1_1	450	<5Y ARI	0.75
pP18A1_1	P18A1_1	P18A0	450	<5Y ARI	0.75
pP18C1	P18C1	P18A2	300	<5Y ARI	0.02
pP18D1	P18D1	P18A2	300	<5Y ARI	0.07
pP18E2	P18E2	P18E1	300	>20Y ARI	0.03
pP18E1	P18E1	P18A4	300	>20Y ARI	0.03
pP18A4	P18A4	P18A3	525	>20Y ARI	0.65
pP18A3	P18A3	P18A2	525	>20Y ARI	0.65
pP18F2	P18F2	P18F1	300	<5Y ARI	0.09
pP18F1	P18F1	P18A4A	150	<5Y ARI	0.09
pP18A4A	P18A4A	P18A4	525	<5Y ARI	0.56
pP18H1	P18H1	P18A4B	225	<5Y ARI	0.04
pP18A4B	P18A4B	P18A4A	525	<5Y ARI	0.53
pP18G1	P18G1	P18A4B	225	<5Y ARI	0.02
pP18I1	P18I1	P18A5	300	<5Y ARI	0.07
pP18A5	P18A5	P18A4B	525	<5Y ARI	0.48
pP18L1	P18L1	P18A5	300	<5Y ARI	0.05
pP18K1	P18K1	P18A5	300	>20Y ARI	0.01
pP18M1	P18M1	P18A6	300	5-10Y ARI	0.05
pP18A6	P18A6	P18A5	450	<5Y ARI	0.36
pP18N1	P18N1	P18A7	300	<5Y ARI	0.07
pP18A7	P18A7	P18A6	450	<5Y ARI	0.47
pP18O1	P18O1	P18A8	150	<5Y ARI	0.03
pP18A8	P18A8	P18A7	450	<5Y ARI	0.41
pP18Q2	P18Q2	P18Q1	150	<5Y ARI	0.02
pP18Q1	P18Q1	P18A10	225	<5Y ARI	0.06
pP18A10	P18A10	P18A9	450	<5Y ARI	0.44
pP18A9	P18A9	P18A8	450	<5Y ARI	0.44
pP18P3	P18P3	P18P1	150	>20Y ARI	0.01
pP18P1	P18P1	P18A10	150	<5Y ARI	0.01
pP18P2	P18P2	P18P1	150	<5Y ARI	0.00
pP18S2	P18S2	P18S1	150	<5Y ARI	0.03
pP18S1	P18S1	P18A12	300	<5Y ARI	0.12
pP18A12	P18A12	P18A11	525	5-10Y ARI	0.38
pP18A11	P18A11	P18A11_1	525	5-10Y ARI	0.44
pP18A11_1	P18A11_1	P18A10	525	5-10Y ARI	0.44
pP18V1	P18V1	P18A13	225	<5Y ARI	0.07
pP18A13	P18A13	P18A12	300	<5Y ARI	0.17
pP18A14	P18A14	P18A13	225	<5Y ARI	0.05
pP18Q3	P18Q3	P18Q1	300	<5Y ARI	0.06
pP18R1	P18R1	P18A11	225	<5Y ARI	0.05
pP22Z2	P22Z2	P22Z1	Box Culvert < 1 m wide	<5Y ARI	0.07
pP6B4A	P6B4A	P6B3	375	<5Y ARI	0.00
pP6B3	P6B3	P6B2	375	<5Y ARI	0.17
pP6B2	P6B2	P6B1	375	<5Y ARI	0.24
pP6B1	P6B1	P6B1A	375	<5Y ARI	0.24
pP5011	P5011	P5O10A	375	<5Y ARI	0.00
pP5012	P5012	P5O10C	300	<5Y ARI	0.00
pP7AF6	P7AF6	P7AF6_1	300	<5Y ARI	0.06
pP7AF6_1	P7AF6_1	P7AF4	300	<5Y ARI	0.06
pP7AF4	P7AF4	P7AF2C	300	<5Y ARI	0.13
pP7AF2C	P7AF2C	P7AF2B	300	>20Y ARI	0.13
pP7AF2B	P7AF2B	P7AF2A	300	>20Y ARI	0.19
pP7AF2A	P7AF2A	P7AF2	300	>20Y ARI	0.19
pP7AF2	P7AF2	P7AF1	300	<5Y ARI	0.26
pP7AG6	P7AG6	P7AG5	300	<5Y ARI	0.05
pP7AG5	P7AG5	P7AG3	300	<5Y ARI	0.11
pP7AG3	P7AG3	P7AG1	Box Culvert < 1 m wide	<5Y ARI	0.11
pP7AG1	P7AG1	P7AF2	300	<5Y ARI	0.12
pP7AG4	P7AG4	P7AG3	300	<5Y ARI	0.03
pP7AF5	P7AF5	P7AF2B	300	<5Y ARI	0.07
pP11JZ3	P11JZ3	P11JZ4	225	<5Y ARI	0.00
pP11JZ4	P11JZ4	P7A4_1	225	<5Y ARI	0.08
pP11JZ2	P11JZ2	P11ZA4A	225	<5Y ARI	0.00
pP11ZA4A	P11ZA4A	P11JZ1	225	<5Y ARI	0.00
pP11JZ1	P11JZ1	P11JZ0A	225	<5Y ARI	0.00
pP11JZ0A	P11JZ0A	P11JZ4	225	<5Y ARI	0.06

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP7ZD2A	P7ZD2A	P7ZD1	300	<5Y ARI	0.00
pP7ZD1	P7ZD1	P7ZC1	300	>20Y ARI	0.05
pP11ZD1	P11ZD1	P11A2	300	<5Y ARI	0.01
pP11ZC1	P11ZC1	P11A2	300	<5Y ARI	0.02
pP11ZB4	P11ZB4	P11ZB3	300	<5Y ARI	0.07
pP11ZB3	P11ZB3	P11ZB1	300	<5Y ARI	0.14
pP11ZB1	P11ZB1	P11ZA1	300	<5Y ARI	0.14
pP11ZB2	P11ZB2	P11ZB1	300	>20Y ARI	0.00
pP18UA1	P18UA1	P18U1	150	<5Y ARI	0.03
pP18U1	P18U1	P18A12	150	<5Y ARI	0.03
pP24END	P24END	P24T3	300	<5Y ARI	0.00
pP24T3	P24T3	P24T2A	600	<5Y ARI	0.07
pDP18H1	DP18H1	DP18A7A	375	>20Y ARI	0.02
pP24Z1B	P24Z1B	P24A7A	375	<5Y ARI	0.00
pW5A1A	W5A1A	W5A1	Box Culvert > 1m wide	<5Y ARI	0.00
pW5AE2	W5AE2	W5AA3A	300	<5Y ARI	0.00
pP1F2	P1F2	P1A5	300	<5Y ARI	0.07
pP5R1A	P5R1A	P5P1	300	<5Y ARI	0.02
pP7AG11	P7AG11	P7AG10	300	<5Y ARI	0.07
pP7AG10	P7AG10	P7AG8	300	>20Y ARI	0.07
pP7AG8	P7AG8	P7AG5	300	<5Y ARI	0.10
pP7AG9	P7AG9	P7AG8	300	<5Y ARI	0.03
pP11ZE1	P11ZE1	P11ZB1	300	>20Y ARI	0.00
pP23G2	P23G2	P23G1	300	<5Y ARI	0.05
pP23G1	P23G1	P23A0F	225	<5Y ARI	0.08
pP24A1C	P24A1C	P24A1B_2	300	<5Y ARI	0.07
pP24AA2	P24AA2	P24AA1	300	<5Y ARI	0.08
pP24AA1	P24AA1	P24A2	300	<5Y ARI	0.17
pP22K19	P22K19	P22K18	300	<5Y ARI	0.01
pP22K18	P22K18	P22AC2	300	<5Y ARI	0.02
pP22AC2	P22AC2	P22AC1	300	>20Y ARI	0.03
pP22AC1	P22AC1	P22K12	300	<5Y ARI	0.04
pP22K12	P22K12	P22K11	300	<5Y ARI	0.14
pP22K11	P22K11	P22K10	300	<5Y ARI	0.17
pP22K10	P22K10	P22K9	300	<5Y ARI	0.19
pP22K9	P22K9	P22K8	300	<5Y ARI	0.19
pP22K8	P22K8	P22K7	300	<5Y ARI	0.17
pP22K7	P22K7	P22K6	300	<5Y ARI	0.17
pP22K6	P22K6	P22K5_1	300	<5Y ARI	0.20
pP22K5_1	P22K5_1	P22K4	300	<5Y ARI	0.12
pP22K4	P22K4	P22K3	375	<5Y ARI	0.07
pP22K3	P22K3	P22K	375	<5Y ARI	0.11
pP23Y2	P23Y2	P23Y1_1	300	<5Y ARI	0.05
pP23Y1_1	P23Y1_1	P23Y1	300	<5Y ARI	0.05
pP23Y1	P23Y1	P23A6	225	5-10Y ARI	0.07
pP23U3	P23U3	P23A4	300	<5Y ARI	0.03
pP23K6	P23K6	P23K5	300	<5Y ARI	0.03
pP23K5	P23K5	P23K4	300	<5Y ARI	0.06
pP23K4	P23K4	P23K3A	375	<5Y ARI	0.06
pP22AC3	P22AC3	P22AC2	300	>20Y ARI	0.00
pP24U1	P24U1	P24A5_1	300	<5Y ARI	0.07
pP24W1	P24W1	P24A7A_2	300	>20Y ARI	0.00
pP24AC2	P24AC2	P24AC	300	>20Y ARI	0.01
pP24AC3	P24AC3	P24AC	300	<5Y ARI	0.03
pP22K17	P22K17	P22K16	300	<5Y ARI	0.05
pP22K16	P22K16	P22K15	300	<5Y ARI	0.06
pP22K15	P22K15	P22K14	300	<5Y ARI	0.07
pP22K14	P22K14	P22K13	300	<5Y ARI	0.08
pP22K13	P22K13	P22K12	300	<5Y ARI	0.10
pP22AB3	P22AB3	P22AB2	300	<5Y ARI	0.02
pP22AB2	P22AB2	P22AB1	300	<5Y ARI	0.03
pP22AB1	P22AB1	P22K9	300	<5Y ARI	0.05
pP22AA1	P22AA1	P22K5	300	<5Y ARI	0.05
pP22K5	P22K5	P22K3	375	<5Y ARI	0.05
pP7N8A	P7N8A	P7N8	300	<5Y ARI	0.10
pP7AA4	P7AA4	P7AA2	300	<5Y ARI	0.02
pP22R2	P22R2	P22T0D	300	5-10Y ARI	0.01

Pipe	Start	End	Diameter	Capacity	100Y_Q
pP5017	P5017	P5O16	300	<5Y ARI	0.04
pP5O16	P5O16	P5O15B	300	<5Y ARI	0.14
pDP18B9	DP18B9	DP18B8	300	>20Y ARI	0.02
pDP18B8	DP18B8	DP18B7	300	5-10Y ARI	0.05
pDP18B7	DP18B7	DP18B6	375	<5Y ARI	0.22
pDP18B6	DP18B6	DP18B5	375	<5Y ARI	0.26
pDP18B5	DP18B5	DP18B4	375	<5Y ARI	0.26
pDP18B4	DP18B4	DP18B3	375	<5Y ARI	0.26
pDP18B3	DP18B3	DP18B2	375	>20Y ARI	0.27
pDP18B2	DP18B2	DP18B1	375	>20Y ARI	0.28
pDP18B1	DP18B1	DP18A3A	375	<5Y ARI	0.26
pDP18D1	DP18D1	DP18B7	300	<5Y ARI	0.07
pDP18C1	DP18C1	DP18B4	375	<5Y ARI	0.07
pDP18E3	DP18E3	DP18E2	150	<5Y ARI	0.04
pDP18E2	DP18E2	DP18E2_1	150	<5Y ARI	0.05
pDP18E2_1	DP18E2_1	DP18E1	150	<5Y ARI	0.05
pDP18E1	DP18E1	DP18E1A	450	<5Y ARI	0.17
pDP18E1A	DP18E1A	DP18A4	450	<5Y ARI	0.17
pDP18F1	DP18F1	DP18A4	450	<5Y ARI	0.06
pP7AG2	P7AG2	P7AG1	300	>20Y ARI	0.00
pP7AF3	P7AF3	P7AF2C	300	>20Y ARI	0.00
pP7AG7	P7AG7	P7AF2A	300	>20Y ARI	0.00
pP9A1	P9A1	P9A0	Box Culvert < 1 m wide	<5Y ARI	0.54
pW5AC3	W5AC3	W5AC2A	Box Culvert < 1 m wide	<5Y ARI	0.16

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
DP18G2	OnGrade	Kerb Inlet		4.00	27.81		0	336764	6249941	No	0.72
DP18G1	OnGrade	Kerb Inlet		3.50	27.33		0	336760	6249938	No	0.00
DP18A7	OnGrade	Hornsby Council		1.60	27.15		0	336757	6249935	No	0.05
DP18A6	OnGrade	Grated Inlet Pit		1.10	23.18		0	336724	6249973	No	0.15
DP18A5	OnGrade	Hornsby Council		0.60	22.67		0	336718	6249981	No	0.05
DP18A5_1	OnGrade	Junction Pit		0.50	19.35		0	336681	6250022	Yes	No Inlet
DP18A4	OnGrade	Hornsby Council		1.40	17.84		0	336652	6250046	No	0.27
DP18A3A	OnGrade	Junction Pit		1.10	17.05		0	336635	6250059	Yes	No Inlet
DP18A3_1	OnGrade	Kerb Inlet		1.70	16.01		0	336605	6250075	No	0.56
DP18A3	OnGrade	Hornsby Council		0.50	11.16		0	336511	6250098	No	0.16
DP18A2	OnGrade	Hornsby Council		0.50	6.43		0	336397	6250121	No	0.09
Outlet	Node				0.58			336244	6250158		No Inlet
DP18I4	OnGrade	Hornsby Council		4.00	33.07		0	336778	6249962	No	2.12
DP18I3	OnGrade	Hornsby Council		2.50	32.10		0	336782	6249943	No	0.42
DP18I2	OnGrade	Hornsby Council		2.20	30.96		0	336790	6249921	No	0.04
DP18I1	Sag	Hornsby Council	5	0.50	30.67	0.2	0.5	336794	6249910	No	0.15
DP18A8	OnGrade	Junction Pit		2.50	30.63		0	336794	6249904	Yes	No Inlet
DP18A8_1	OnGrade	Junction Pit		0.50	29.64		0	336777	6249913	Yes	No Inlet
DP18A7A	OnGrade	Junction Pit		0.60	28.80		0	336770	6249920	Yes	No Inlet
DP18A13	OnGrade	Hornsby Council		4.00	37.10		0	336940	6249880	No	0.23
DP18A12	OnGrade	Hornsby Council		2.50	35.43		0	336898	6249888	No	0.43
DP18A11	OnGrade	Hornsby Council		1.80	33.56		0	336862	6249896	No	0.27
DP18A10	OnGrade	Hornsby Council		1.70	32.59		0	336837	6249902	No	0.35
DP18A9	OnGrade	Junction Pit		0.00	31.13		0	336805	6249908	Yes	No Inlet
W5E11	Sag	Hornsby Council	5	0.50	60.61	0.2	0.5	337123	6249382	No	1.17
W5E10	Sag	Hornsby Council	5	0.50	60.57	0.2	0.5	337110	6249379	No	0.13
W5E9	OnGrade	Hornsby Council		4.50	58.25		0	337068	6249338	No	0.38
W5E8	OnGrade	Hornsby Council		1.80	57.15		0	337062	6249308	No	0.09
W5E7	OnGrade	Grated Inlet Pit		1.40	57.13		0	337058	6249301	No	0.01
W5E6	OnGrade	Junction Pit		0.90	55.50		0	337052	6249289	Yes	No Inlet
W5E5	OnGrade	Grated Inlet Pit		0.90	54.54		0	337051	6249286	No	0.02
W5E4	OnGrade	Hornsby Council		1.10	51.92		0	337024	6249233	No	0.26
W5E3B	OnGrade	Junction Pit		0.80	51.88		0	337022	6249229	Yes	No Inlet
W5E3A	OnGrade	Junction Pit		1.70	51.75		0	337018	6249222	Yes	No Inlet
W5E3	OnGrade	Junction Pit		0.00	51.43		0	337013	6249211	Yes	No Inlet
W5E2	OnGrade	Kerb Inlet		0.60	51.05		0	337007	6249200	No	0.21
W5E1	OnGrade	Junction Pit		4.40	51.05		0	336985	6249157	Yes	No Inlet
W5E0C	OnGrade	Junction Pit		0.70	51.01		0	336982	6249157	Yes	No Inlet
W5E0B	OnGrade	Junction Pit		0.60	50.88		0	336974	6249155	Yes	No Inlet
W5E0A	OnGrade	Junction Pit		0.60	50.19		0	336964	6249152	Yes	No Inlet
W5A0A	OnGrade	Junction Pit		1.20	48.50		0	336947	6249148	Yes	No Inlet
W5AJ	OnGrade	Junction Pit		3.40	47.71		0	336941	6249165	Yes	No Inlet
P18A0	OnGrade	Junction Pit		1.40	39.46		0	336926	6249222	Yes	No Inlet
P18A0_1	OnGrade	Junction Pit		0.50	38.39		0	336918	6249250	Yes	No Inlet
P13E4	OnGrade	Junction Pit		0.50	29.09		0	336902	6249311	Yes	No Inlet
P13E4_1	OnGrade	Junction Pit		2.50	27.59		0	336900	6249317	Yes	No Inlet
P17A1	OnGrade	Junction Pit		1.70	26.69		0	336899	6249326	Yes	No Inlet
P16A0	OnGrade	Junction Pit		0.00	26.39		0	336899	6249330	Yes	No Inlet
P15A0	OnGrade	Junction Pit		3.00	21.72		0	336887	6249431	Yes	No Inlet
P15A0_1	OnGrade	Junction Pit		0.50	19.76		0	336880	6249434	Yes	No Inlet
P15A0_2	OnGrade	Junction Pit		0.50	17.74		0	336861	6249443	Yes	No Inlet
P14A0	OnGrade	Junction Pit		3.50	16.02		0	336852	6249448	Yes	No Inlet
P14A0_1	OnGrade	Junction Pit		0.00	11.82		0	336839	6249454	Yes	No Inlet
P13BA1	OnGrade	Junction Pit		0.10	10.35		0	336833	6249461	Yes	No Inlet
P12A0	OnGrade	Junction Pit		1.60	8.38		0	336785	6249524	Yes	No Inlet
P11A0	OnGrade	Junction Pit		0.50	8.84		0	336763	6249552	Yes	No Inlet
P10A0	OnGrade	Junction Pit		1.60	7.31		0	336736	6249589	Yes	No Inlet
P9A0	OnGrade	Junction Pit		1.80	6.95		0	336727	6249600	Yes	No Inlet
P7AF1	OnGrade	Junction Pit		1.60	6.86		0	336703	6249631	Yes	No Inlet
P7AF1_1	OnGrade	Junction Pit		0.50	6.85		0	336700	6249634	Yes	No Inlet
P7A0J1	OnGrade	Junction Pit		3.50	6.26		0	336664	6249673	Yes	No Inlet
P7A0J1_1	OnGrade	Junction Pit		0.50	6.23		0	336661	6249675	Yes	No Inlet
P6A0	OnGrade	Junction Pit		0.00	5.54		0	336581	6249759	Yes	No Inlet
P4A0F	OnGrade	Junction Pit		1.90	4.55		0	336579	6249762	Yes	No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P3A0	OnGrade	Junction Pit		0.60	4.48		0	336578	6249763	Yes	No Inlet
P2AO	OnGrade	Junction Pit		2.50	4.42		0	336572	6249769	Yes	No Inlet
P1AA0	Node				4.06			336568	6249773		No Inlet
W5K1	OnGrade	Hornsby Council		4.00	57.46		0	337070	6249308	No	0.09
W5K3	OnGrade	Hornsby Council		4.00	62.79		0	337150	6249323	No	0.14
W5K2	OnGrade	Junction Pit		0.50	60.30		0	337118	6249315	Yes	No Inlet
W5H1	OnGrade	Hornsby Council		4.00	56.48		0	337064	6249292	No	0.44
W5H4	OnGrade	Hornsby Council		4.00	63.03		0	337152	6249312	No	0.60
W5H3	OnGrade	Junction Pit		0.50	60.58		0	337124	6249305	Yes	No Inlet
W5H2	Node				60.41			337119	6249304		No Inlet
W5F1	OnGrade	Hornsby Council		4.00	51.79		0	337020	6249210	No	0.13
W5G1	OnGrade	Hornsby Council		4.00	51.92		0	337027	6249229	No	0.81
W5I11	OnGrade	Hornsby Council		4.00	59.13		0	337103	6249169	No	0.41
W5I10	Node				58.69			337107	6249177		0.03
W5I9	Sag	Hornsby Council	5	4.00	65.87	0.2	0.5	337196	6249117	No	0.74
W5I7	OnGrade	Junction Pit		1.10	65.74		0	337188	6249118	Yes	No Inlet
W5I6	OnGrade	Hornsby Council		1.90	64.76		0	337184	6249133	No	0.20
W5I5	Sag	Hornsby Council	5	3.30	61.65	0.2	0.5	337157	6249244	No	1.79
W5I3	OnGrade	Hornsby Council		1.40	61.61		0	337141	6249243	No	0.06
W5I0B	OnGrade	Junction Pit		0.80	56.78		0	337095	6249238	Yes	No Inlet
W5I0A	OnGrade	Junction Pit		0.80	56.62		0	337087	6249237	Yes	No Inlet
W5I0A_1	OnGrade	Junction Pit		0.50	56.25		0	337082	6249235	Yes	No Inlet
W5I0A_2	OnGrade	Junction Pit		0.50	54.79		0	337069	6249238	Yes	No Inlet
W5I0A_3	OnGrade	Junction Pit		0.50	53.81		0	337060	6249240	Yes	No Inlet
W5I0A_4	OnGrade	Junction Pit		0.50	51.96		0	337028	6249233	Yes	No Inlet
W5I8	OnGrade	Hornsby Council		4.00	65.78		0	337190	6249110	No	1.43
W5I4	OnGrade	Hornsby Council		4.00	61.65		0	337142	6249239	No	0.06
W5I2	Sag	Hornsby Council	5	4.00	56.82	0.2	0.5	337095	6249235	No	0.27
W5I1	Sag	Hornsby Council	5	4.00	56.66	0.15	0.5	337089	6249231	No	0.04
W5D1	OnGrade	Hornsby Council		4.00	51.61		0	336988	6249150	No	1.06
W5C1	OnGrade	Hornsby Council		4.00	50.92		0	336979	6249164	No	0.07
W5B1	OnGrade	Hornsby Council		4.00	51.17		0	336967	6249140	No	0.07
W5W3	OnGrade	Hornsby Council		4.00	62.97		0	337030	6248815	No	0.44
W5W2	Sag	Grated Inlet Pit	5	4.10	62.75	0.2	0.5	337033	6248820	No	0.39
W5W2_1	OnGrade	Junction Pit		2.50	62.54		0	337046	6248843	Yes	No Inlet
W5W1	OnGrade	Grated Inlet Pit		3.10	55.37		0	337012	6249002	No	0.84
W5W0	OnGrade	Junction Pit		3.10	54.93		0	337011	6249006	Yes	No Inlet
W5A1	OnGrade	Junction Pit		2.40	51.68		0	336964	6249110	Yes	No Inlet
W5X2	OnGrade	Hornsby Council		4.00	55.47		0	337010	6248999	No	0.78
W5X0	OnGrade	Junction Pit		3.00	55.17		0	337008	6249005	Yes	No Inlet
W5X1	Sag	Hornsby Council	5	4.00	55.25	0.08	0.5	337001	6249007	No	0.03
W5X1A	OnGrade	Junction Pit		0.50	55.21		0	337005	6249005	Yes	No Inlet
W5AD5	OnGrade	Junction Pit		4.00	64.12		0	337094	6248833	Yes	No Inlet
W5AD4	OnGrade	Hornsby Council		3.90	64.16		0	337119	6248839	No	1.29
W5AD3	OnGrade	Junction Pit		0.50	63.17		0	337115	6248854	Yes	No Inlet
W5AD2	Node				62.83			337112	6248858		0.27
W5AD1	OnGrade	Hornsby Council		4.00	61.57		0	337105	6248886	No	0.17
W5AA3	OnGrade	Junction Pit		2.80	60.81		0	337108	6248891	Yes	No Inlet
W5AA2	OnGrade	Hornsby Council		1.10	60.52		0	337092	6248900	No	0.05
W5AA1	OnGrade	Hornsby Council		0.60	55.49		0	337029	6249006	No	0.15
W5AA1_1	OnGrade	Junction Pit		2.50	55.17		0	337028	6249007	Yes	No Inlet
W5AE1	Sag	Grated Inlet Pit	5	4.00	61.27	0.2	0.5	337111	6248891	No	0.02
W5AA3A	OnGrade	Junction Pit		1.60	61.16		0	337111	6248892	Yes	No Inlet
W5AF6	OnGrade	Hornsby Council		4.00	69.66		0	337250	6248856	No	1.84
W5AF3	OnGrade	Junction Pit		1.50	69.13		0	337248	6248862	Yes	No Inlet
W5AF3_1	OnGrade	Junction Pit		0.00	69.09		0	337246	6248863	Yes	No Inlet
W5AF3_2	OnGrade	Junction Pit		0.50	69.07		0	337244	6248864	Yes	No Inlet
W5AF3_3	OnGrade	Junction Pit		0.50	69.01		0	337243	6248864	Yes	No Inlet
W5AF3_4	OnGrade	Junction Pit		0.50	68.94		0	337241	6248865	Yes	No Inlet
W5AF3_5	OnGrade	Junction Pit		0.50	68.91		0	337239	6248865	Yes	No Inlet
W5AF3_6	OnGrade	Junction Pit		0.50	68.87		0	337238	6248865	Yes	No Inlet
W5AF3_7	OnGrade	Junction Pit		0.50	68.83		0	337237	6248866	Yes	No Inlet
W5AF2A	OnGrade	Junction Pit		0.90	68.79		0	337236	6248866	Yes	No Inlet
W5AF2A_1	OnGrade	Junction Pit		0.50	68.75		0	337234	6248866	Yes	No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
W5AF2A_2	OnGrade	Junction Pit		0.50	68.71		0	337233	6248866	Yes	No Inlet
W5AF2A_3	OnGrade	Junction Pit		0.50	68.67		0	337232	6248866	Yes	No Inlet
W5AF2A_4	OnGrade	Junction Pit		0.50	68.63		0	337230	6248866	Yes	No Inlet
W5AF2A_5	OnGrade	Junction Pit		0.50	68.59		0	337229	6248866	Yes	No Inlet
W5AF2A_6	OnGrade	Junction Pit		0.50	68.55		0	337227	6248866	Yes	No Inlet
W5AF2A_7	OnGrade	Junction Pit		0.50	68.51		0	337226	6248866	Yes	No Inlet
W5AF2A_8	OnGrade	Junction Pit		0.50	67.97		0	337224	6248866	Yes	No Inlet
W5AF2A_9	OnGrade	Junction Pit		0.50	67.79		0	337221	6248865	Yes	No Inlet
W5AF2A_10	OnGrade	Junction Pit		0.50	67.60		0	337219	6248865	Yes	No Inlet
W5AF2A_11	OnGrade	Junction Pit		0.50	67.52		0	337217	6248865	Yes	No Inlet
W5AF2A_12	OnGrade	Junction Pit		0.50	67.44		0	337214	6248864	Yes	No Inlet
W5AF2A_13	OnGrade	Junction Pit		0.50	66.95		0	337206	6248863	Yes	No Inlet
W5AF2A_14	OnGrade	Junction Pit		0.50	66.23		0	337198	6248862	Yes	No Inlet
W5AF2A_15	OnGrade	Junction Pit		0.50	65.76		0	337190	6248861	Yes	No Inlet
W5AF2A_16	OnGrade	Junction Pit		0.50	65.74		0	337182	6248860	Yes	No Inlet
W5AF2	OnGrade	Junction Pit		2.00	65.06		0	337174	6248859	Yes	No Inlet
W5AF1	OnGrade	Junction Pit		3.40	64.23		0	337163	6248900	Yes	No Inlet
W5AA4	OnGrade	Junction Pit		0.50	63.98		0	337159	6248902	Yes	No Inlet
W5AF5	Sag	Hornsby Council	5	4.00	69.61	0.2	0.5	337252	6248868	No	0.17
W5AF4	Sag	Hornsby Council	5	1.50	69.40	0.2	0.5	337249	6248864	No	0.01
W5AG4	OnGrade	Hornsby Council		4.00	71.96		0	337260	6248755	No	0.28
W5AG3	OnGrade	Hornsby Council		0.70	71.62		0	337255	6248776	No	0.01
W5AG2	OnGrade	Hornsby Council		1.00	69.96		0	337246	6248818	No	0.03
W5AG1	OnGrade	Hornsby Council		1.90	68.83		0	337237	6248858	No	0.03
W5AH1	OnGrade	Junction Pit		0.50	68.49		0	337221	6248913	Yes	No Inlet
W5AA7	OnGrade	Junction Pit		0.50	68.19		0	337220	6248919	Yes	No Inlet
W5AA6	OnGrade	Junction Pit		0.50	65.93		0	337198	6248912	Yes	No Inlet
W5AC3	OnGrade	Hornsby Council		1.80	64.44		0	337169	6248907	No	0.24
W5AC2A	OnGrade	Junction Pit		0.50	64.31		0	337163	6248905	Yes	No Inlet
W5AC2	Node				63.56			337154	6248904		No Inlet
W5AI1	OnGrade	Grated Inlet Pit		4.00	68.45		0	337226	6248920	No	0.10
W5AA8	OnGrade	Hornsby Council		4.00	68.71		0	337235	6248930	No	0.27
W5AB2	OnGrade	Junction Pit		0.50	57.63		0	337067	6249012	Yes	No Inlet
W5AB1	OnGrade	Kerb Inlet		4.50	57.38		0	337062	6249015	No	1.60
W5Z3	OnGrade	Kerb Inlet		4.00	57.50		0	337065	6249025	No	1.01
W5Z2	OnGrade	Kerb Inlet		2.00	57.42		0	337061	6249021	No	0.08
W5Z1	OnGrade	Hornsby Council		3.70	55.43		0	337020	6249011	No	0.02
W5Z0	OnGrade	Junction Pit		2.00	55.41		0	337016	6249003	Yes	No Inlet
W5N2	OnGrade	Hornsby Council		4.00	59.19		0	336902	6249011	No	0.25
W5N1	OnGrade	Hornsby Council		3.60	58.12		0	336917	6249016	No	0.20
W5M0	OnGrade	Junction Pit		2.80	57.49		0	336925	6249031	Yes	No Inlet
W5A2	OnGrade	Hornsby Council		2.40	56.20		0	336935	6249052	No	0.14
W5M5	OnGrade	Kerb Inlet		4.00	60.86		0	336951	6248905	No	0.17
W5M4	Node				60.34			336955	6248909		1.72
W5M3	OnGrade	Kerb Inlet		4.00	58.96		0	336937	6248970	No	0.61
W5M2	OnGrade	Hornsby Council		3.50	58.56		0	336939	6248973	No	0.06
W5M1	OnGrade	Hornsby Council		1.90	57.53		0	336929	6249016	No	0.21
W5R1	OnGrade	Hornsby Council		4.00	64.00		0	336982	6248789	No	1.33
W5A5	OnGrade	Hornsby Council		2.50	63.96		0	336997	6248793	No	0.19
W5A4A	OnGrade	Junction Pit		1.80	63.15		0	336993	6248809	Yes	No Inlet
W5A4	OnGrade	Junction Pit		5.10	62.29		0	336987	6248834	Yes	No Inlet
W5A3	OnGrade	Hornsby Council		0.80	58.05		0	336951	6248985	No	0.36
W5P2	OnGrade	Hornsby Council		4.00	63.57		0	336970	6248817	No	0.76
W5P1	OnGrade	Junction Pit		0.00	63.19		0	336974	6248824	Yes	No Inlet
W5O4	OnGrade	Grated Inlet Pit		4.00	62.99		0	337016	6248829	No	0.03
W5O3	Sag	Hornsby Council	5	0.80	62.79	0.2	0.5	337011	6248827	No	0.00
W5O2	OnGrade	Hornsby Council		0.90	62.75		0	337006	6248826	No	0.00
W5O1	OnGrade	Junction Pit		2.50	62.74		0	336993	6248823	Yes	No Inlet
W5Q4	OnGrade	Hornsby Council		4.00	71.29		0	336816	6248749	No	0.68
W5Q3	OnGrade	Grated Inlet Pit		2.40	70.84		0	336826	6248762	No	0.03
W5Q2	Node				70.49			336831	6248769		No Inlet
W5Q1	OnGrade	Hornsby Council		4.00	63.85		0	336971	6248804	No	0.39
W5Q1_1	OnGrade	Junction Pit		0.50	63.46		0	336978	6248806	Yes	No Inlet
W5S4	OnGrade	Hornsby Council		4.00	67.50		0	337007	6248693	No	0.19

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
W5S3A	OnGrade	Junction Pit		2.40	67.05		0	337005	6248700	Yes	No Inlet
W5S1	OnGrade	Hornsby Council		3.70	66.03		0	337001	6248718	No	0.02
W5A6	OnGrade	Hornsby Council		2.80	65.65		0	337014	6248722	No	0.25
W5A6_1	OnGrade	Junction Pit		0.50	64.00		0	336997	6248792	Yes	No Inlet
W5S3	OnGrade	Hornsby Council		4.00	67.48		0	336998	6248698	No	4.23
W5S2	OnGrade	Hornsby Council		4.00	66.73		0	336996	6248709	No	0.11
W5A7	OnGrade	Hornsby Council		4.00	67.09		0	337021	6248693	No	0.51
W5A6A	OnGrade	Junction Pit		1.30	66.68		0	337019	6248701	Yes	No Inlet
W5A6A_1	OnGrade	Junction Pit		0.50	66.60		0	337018	6248704	Yes	No Inlet
W5U9	OnGrade	Junction Pit		0.50	73.11		0	337171	6248690	Yes	No Inlet
W5U6	OnGrade	Grated Inlet Pit		4.50	72.95		0	337169	6248695	No	0.40
W5U5	OnGrade	Grated Inlet Pit		3.10	72.78		0	337164	6248694	No	0.02
W5U4	Node				72.74			337158	6248693		0.01
W5U8	OnGrade	Junction Pit		0.50	73.19		0	337167	6248689	Yes	No Inlet
W5U7	OnGrade	Junction Pit		0.50	73.14		0	337176	6248697	Yes	No Inlet
W5U3	OnGrade	Junction Pit		0.50	69.80		0	337066	6248671	Yes	No Inlet
W5U2	Node				67.41			337056	6248711		1.27
W5U1	OnGrade	Hornsby Council		4.00	66.90		0	337029	6248704	No	0.04
W5T2	OnGrade	Grated Inlet Pit		4.00	72.71		0	337019	6248600	No	0.07
W5T1	OnGrade	Junction Pit		0.50	72.45		0	337023	6248607	Yes	No Inlet
W5A9	OnGrade	Junction Pit		1.70	71.16		0	337036	6248631	Yes	No Inlet
W5A8	Node				71.12			337035	6248635		No Inlet
W5A10	OnGrade	Hornsby Council		4.00	72.54		0	337047	6248607	No	2.41
W5A10_1	OnGrade	Junction Pit		2.50	72.50		0	337041	6248610	Yes	No Inlet
W5A10_2	OnGrade	Junction Pit		0.50	71.36		0	337037	6248626	Yes	No Inlet
P24C3	OnGrade	Junction Pit		0.50	14.52		0	335829	6249820	Yes	No Inlet
P24C2	Node				14.23			335827	6249825		No Inlet
P24C2_1	OnGrade	Junction Pit		0.50	13.38		0	335826	6249831	Yes	No Inlet
P24C2_2	OnGrade	Junction Pit		0.50	13.04		0	335832	6249833	Yes	No Inlet
P24C1	Sag	Hornsby Council	5	4.50	10.41	0.2	0.5	335921	6249853	No	0.89
P24A1A	OnGrade	Junction Pit		0.70	10.37		0	335925	6249862	Yes	No Inlet
P24A1	OnGrade	Junction Pit		0.00	10.14		0	335934	6249862	Yes	No Inlet
P24A0A	OnGrade	Junction Pit		1.60	9.76		0	335946	6249863	Yes	No Inlet
P24A0A_1	OnGrade	Junction Pit		0.50	8.53		0	335996	6249866	Yes	No Inlet
P21A0	OnGrade	Junction Pit		3.00	6.20		0	336107	6249867	Yes	No Inlet
P26A1	OnGrade	Hornsby Council		3.50	2.50		0	336277	6250088	No	19.49
P25A0	OnGrade	Junction Pit		0.70	0.59		0	336258	6250128	Yes	No Inlet
P24D4	OnGrade	Hornsby Council		4.00	15.17		0	335814	6249814	No	0.27
P24D1	OnGrade	Junction Pit		2.70	14.27		0	335811	6249826	Yes	No Inlet
P24A1B	OnGrade	Junction Pit		0.50	13.95		0	335814	6249834	Yes	No Inlet
P24A1B_1	OnGrade	Junction Pit		0.50	13.43		0	335822	6249839	Yes	No Inlet
P24A1B_2	OnGrade	Junction Pit		0.50	10.40		0	335919	6249861	Yes	No Inlet
P24D3	OnGrade	Hornsby Council		4.00	14.71		0	335807	6249820	No	0.79
P24D2	OnGrade	Hornsby Council		3.00	14.49		0	335809	6249822	No	0.00
P24G17	OnGrade	Grated Inlet Pit		4.00	50.50		0	335718	6249432	No	0.26
P24G15A	OnGrade	Junction Pit		1.40	49.50		0	335720	6249438	Yes	No Inlet
P24G15	OnGrade	Junction Pit		2.50	48.98		0	335722	6249443	Yes	No Inlet
P24G14	OnGrade	Junction Pit		2.50	47.28		0	335712	6249462	Yes	No Inlet
P24G14_1	OnGrade	Junction Pit		0.50	46.85		0	335712	6249470	Yes	No Inlet
P24G13	Node				46.07			335719	6249476		No Inlet
P24G16	OnGrade	Hornsby Council		4.00	50.45		0	335712	6249433	No	0.11
P24G13_1	OnGrade	Junction Pit		0.50	44.69		0	335730	6249489	Yes	No Inlet
P24G12	OnGrade	Hornsby Council		4.50	42.17		0	335725	6249517	No	0.46
P24G11	OnGrade	Grated Inlet Pit		2.90	41.18		0	335722	6249527	No	0.02
P24G10	OnGrade	Grated Inlet Pit		1.80	40.82		0	335720	6249535	No	0.10
P24G10_1	OnGrade	Junction Pit		2.50	32.91		0	335705	6249617	Yes	No Inlet
P24G9	OnGrade	Hornsby Council		1.60	31.66		0	335712	6249631	No	0.42
P24G8	OnGrade	Hornsby Council		1.90	31.48		0	335713	6249635	No	0.01
P24G7	OnGrade	Kerb Inlet		1.50	30.87		0	335717	6249643	No	0.03
P24G6	Node				30.27			335722	6249653		0.03
P24G5	OnGrade	Hornsby Council		4.00	27.13		0	335750	6249716	No	0.18
P24G4	OnGrade	Hornsby Council		2.00	26.70		0	335752	6249720	No	0.01
P24G3	Node				26.31			335754	6249725		No Inlet
P24G2	Node				24.58			335741	6249740		No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P24G1	OnGrade	Hornsby Council		4.00	21.71		0	335720	6249766	No	0.09
P24A2	OnGrade	Junction Pit		1.50	21.30		0	335713	6249781	Yes	No Inlet
P24A2_1	OnGrade	Junction Pit		0.50	15.95		0	335788	6249819	Yes	No Inlet
P24A2_2	OnGrade	Junction Pit		0.50	14.54		0	335805	6249829	Yes	No Inlet
P24AA	OnGrade	Hornsby Council		4.00	41.49		0	335715	6249521	No	0.13
P24H1	OnGrade	Hornsby Council		4.00	26.89		0	335775	6249713	No	0.15
P24H0A	OnGrade	Grated Inlet Pit		3.40	26.72		0	335770	6249716	No	0.01
P24K1	OnGrade	Junction Pit		0.50	31.43		0	335743	6249634	Yes	No Inlet
P24I2	Node				30.81			335737	6249641		0.03
P24L1	OnGrade	Hornsby Council		4.00	32.07		0	335738	6249623	No	0.51
P24I2A	OnGrade	Junction Pit		2.40	31.65		0	335730	6249629	Yes	No Inlet
P24I4	OnGrade	Grated Inlet Pit		4.00	32.84		0	335724	6249619	No	0.18
P24I3	OnGrade	Hornsby Council		2.20	32.15		0	335727	6249624	No	0.01
P24I1	OnGrade	Hornsby Council		4.00	27.45		0	335767	6249710	No	0.58
P24E1	OnGrade	Hornsby Council		4.00	21.54		0	335709	6249769	No	0.81
P24F1	OnGrade	Hornsby Council		4.00	21.52		0	335725	6249774	No	0.33
P24O2	OnGrade	Hornsby Council		4.00	27.55		0	335616	6249627	No	1.10
P24O1	Sag	Hornsby Council	5	2.50	27.08	0.2	0.5	335615	6249631	No	0.01
P24O1A	OnGrade	Junction Pit		1.60	26.53		0	335614	6249636	Yes	No Inlet
P24A4	OnGrade	Junction Pit		1.40	26.49		0	335611	6249649	Yes	No Inlet
P24A3	OnGrade	Junction Pit		0.50	25.20		0	335644	6249678	Yes	No Inlet
P24A3_1	OnGrade	Junction Pit		0.50	25.00		0	335648	6249684	Yes	No Inlet
P24A3_2	OnGrade	Junction Pit		0.50	21.47		0	335706	6249777	Yes	No Inlet
P24N2	OnGrade	Hornsby Council		4.00	26.61		0	335628	6249641	No	0.62
P24N1	OnGrade	Junction Pit		4.50	26.55		0	335627	6249647	Yes	No Inlet
P24M1	OnGrade	Hornsby Council		4.00	26.80		0	335611	6249637	No	0.14
P24O6	OnGrade	Hornsby Council		4.00	43.97		0	335666	6249470	No	0.10
P24O5	OnGrade	Junction Pit		2.50	41.74		0	335660	6249485	Yes	No Inlet
P24O4	OnGrade	Hornsby Council		2.30	38.55		0	335649	6249504	No	0.13
P24O3A	OnGrade	Junction Pit		2.50	37.90		0	335644	6249513	Yes	No Inlet
P24O3A_1	OnGrade	Junction Pit		0.50	35.50		0	335634	6249535	Yes	No Inlet
P24O3	Node				33.53			335629	6249560		No Inlet
P24P1	OnGrade	Hornsby Council		4.00	38.10		0	335637	6249508	No	0.35
P24Z1A	OnGrade	Hornsby Council		4.00	46.68		0	335329	6249535	No	7.68
P24A7A	OnGrade	Junction Pit		3.50	45.88		0	335322	6249550	Yes	No Inlet
P24A7A_1	OnGrade	Junction Pit		0.50	39.95		0	335392	6249582	Yes	No Inlet
P24A7A_2	OnGrade	Junction Pit		0.60	39.30		0	335419	6249573	Yes	No Inlet
P24A7	OnGrade	Junction Pit		1.40	38.06		0	335457	6249574	Yes	No Inlet
P24A7_1	OnGrade	Junction Pit		0.00	37.64		0	335464	6249574	Yes	No Inlet
P24A7_2	OnGrade	Junction Pit		0.50	32.90		0	335510	6249574	Yes	No Inlet
P24A7_3	OnGrade	Junction Pit		0.50	32.19		0	335515	6249577	Yes	No Inlet
P24A6	OnGrade	Junction Pit		0.50	31.05		0	335524	6249583	Yes	No Inlet
P24A5	OnGrade	Junction Pit		2.10	29.62		0	335540	6249594	Yes	No Inlet
P24A5_1	OnGrade	Junction Pit		1.70	29.19		0	335548	6249598	Yes	No Inlet
P24A5_2	OnGrade	Junction Pit		0.50	26.61		0	335605	6249644	Yes	No Inlet
P24Z1	OnGrade	Junction Pit		0.50	39.06		0	335449	6249565	Yes	No Inlet
P24Y1A	OnGrade	Junction Pit		0.50	38.35		0	335456	6249569	Yes	No Inlet
P24Y1	OnGrade	Hornsby Council		4.00	39.23		0	335450	6249560	No	0.87
P24X2	OnGrade	Hornsby Council		4.00	39.36		0	335454	6249558	No	0.11
P24X1	OnGrade	Hornsby Council		3.00	38.70		0	335455	6249562	No	0.01
P24R1	OnGrade	Hornsby Council		4.00	31.59		0	335551	6249568	No	0.23
P24T0A	OnGrade	Junction Pit		2.00	31.46		0	335548	6249570	Yes	No Inlet
P24T0A_1	OnGrade	Junction Pit		2.50	30.96		0	335550	6249574	Yes	No Inlet
P24Q1	OnGrade	Hornsby Council		4.00	31.50		0	335546	6249571	No	0.62
P24S1	Sag	Hornsby Council	5	4.00	35.52	0.2	0.5	335521	6249468	No	0.12
P24T0B	OnGrade	Junction Pit		2.40	35.48		0	335520	6249472	Yes	No Inlet
P24T0B_1	OnGrade	Junction Pit		2.50	35.47		0	335523	6249473	Yes	No Inlet
P24T0B_2	OnGrade	Junction Pit		0.50	35.24		0	335527	6249514	Yes	No Inlet
P24J1	OnGrade	Junction Pit		0.50	38.96		0	335489	6249451	Yes	No Inlet
P24T2A	OnGrade	Junction Pit		1.70	38.17		0	335496	6249452	Yes	No Inlet
P24T2	OnGrade	Junction Pit		0.50	37.55		0	335499	6249455	Yes	No Inlet
P24T1	OnGrade	Grated Inlet Pit		1.70	35.54		0	335516	6249470	No	0.06
P24V2	OnGrade	Hornsby Council		4.00	38.87		0	335491	6249440	No	0.07
P24V1	Sag	Hornsby Council	5	2.70	38.59	0.2	0.5	335496	6249445	No	0.30

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P24AL	OnGrade	Hornsby Council		4.00	41.92		0	335508	6249390	No	0.29
P24AEB	OnGrade	Junction Pit		1.90	41.35		0	335496	6249405	Yes	No Inlet
P24AC	Sag	Grated Inlet Pit	5	3.80	36.19	0.17	0.5	335535	6249441	No	0.01
P24AC_2	OnGrade	Junction Pit		0.50	35.54		0	335524	6249471	Yes	No Inlet
P24AC_1	OnGrade	Junction Pit		2.50	35.57		0	335508	6249531	Yes	No Inlet
P24AK	OnGrade	Grated Inlet Pit		4.00	46.39		0	335486	6249358	No	0.01
P24AH	OnGrade	Hornsby Council		5.10	46.35		0	335482	6249363	No	1.52
P24AGA	OnGrade	Junction Pit		0.50	46.31		0	335477	6249370	Yes	No Inlet
P24AFA	OnGrade	Junction Pit		2.40	46.27		0	335473	6249374	Yes	No Inlet
P24AE	OnGrade	Junction Pit		3.00	46.05		0	335469	6249379	Yes	No Inlet
P24AJ	OnGrade	Hornsby Council		4.00	46.39		0	335487	6249354	No	0.01
P24AI	OnGrade	Hornsby Council		2.90	46.35		0	335482	6249359	No	0.01
P24AG	OnGrade	Junction Pit		0.50	46.35		0	335477	6249363	Yes	No Inlet
P24AF	OnGrade	Hornsby Council		4.00	46.31		0	335472	6249372	No	3.27
P24AP	OnGrade	Hornsby Council		4.00	42.13		0	335573	6249395	No	0.12
P24AO	OnGrade	Grated Inlet Pit		2.80	42.09		0	335573	6249398	No	0.01
P24ACE	OnGrade	Junction Pit		0.50	42.05		0	335567	6249399	Yes	No Inlet
P24ACD	OnGrade	Junction Pit		2.00	41.64		0	335562	6249405	Yes	No Inlet
P24ACD_1	OnGrade	Junction Pit		0.50	36.57		0	335538	6249433	Yes	No Inlet
P24AN	Sag	Hornsby Council	5	4.00	42.15	0.2	0.5	335558	6249399	No	0.05
P24AM	OnGrade	Hornsby Council		3.00	41.68		0	335559	6249403	No	0.22
P24AS	Sag	Grated Inlet Pit	5	4.00	43.76	0.2	0.5	335567	6249364	No	0.05
P24AR	OnGrade	Hornsby Council		2.80	43.72		0	335565	6249367	No	0.01
P24AQ1	OnGrade	Junction Pit		2.00	43.72		0	335562	6249366	Yes	No Inlet
P24AQ1_1	OnGrade	Junction Pit		2.00	42.07		0	335572	6249393	Yes	No Inlet
P24AV1	OnGrade	Hornsby Council		4.00	54.15		0	335714	6249270	No	0.30
P24AQ5A	OnGrade	Junction Pit		1.00	53.43		0	335710	6249263	Yes	No Inlet
P24AQ5A_1	OnGrade	Junction Pit		0.50	52.11		0	335685	6249275	Yes	No Inlet
P24AQ5	OnGrade	Hornsby Council		0.90	51.80		0	335681	6249277	No	0.11
P24AQ4	OnGrade	Hornsby Council		0.70	48.66		0	335620	6249305	No	0.18
P24AQ4_1	OnGrade	Junction Pit		2.50	47.81		0	335608	6249312	Yes	No Inlet
P24AQ3	OnGrade	Hornsby Council		2.90	47.36		0	335625	6249325	No	0.01
P24AQ2	OnGrade	Grated Inlet Pit		2.40	47.36		0	335623	6249327	No	0.54
P24AQ2_1	OnGrade	Junction Pit		0.50	46.77		0	335625	6249345	Yes	No Inlet
P24AQ2_2	OnGrade	Junction Pit		2.50	46.73		0	335625	6249348	Yes	No Inlet
P24ATA	OnGrade	Junction Pit		0.00	43.76		0	335574	6249363	Yes	No Inlet
P24AW1	OnGrade	Hornsby Council		4.00	57.69		0	335787	6249237	No	0.04
P24AQ6A	OnGrade	Junction Pit		0.10	57.31		0	335784	6249230	Yes	No Inlet
P24AQ6A_1	OnGrade	Junction Pit		2.50	57.14		0	335780	6249231	Yes	No Inlet
P24AQ6	OnGrade	Hornsby Council		1.00	54.67		0	335728	6249255	No	0.26
P24AQ5B	OnGrade	Junction Pit		2.50	53.68		0	335716	6249261	Yes	No Inlet
P24AX1	OnGrade	Hornsby Council		4.00	57.98		0	335793	6249234	No	0.26
P24AQ7A	OnGrade	Junction Pit		0.90	57.76		0	335791	6249228	Yes	No Inlet
P24AQ7A_1	OnGrade	Junction Pit		0.50	57.53		0	335788	6249229	Yes	No Inlet
P24AQ7	OnGrade	Grated Inlet Pit		1.60	57.47		0	335788	6249229	No	0.06
P24AQ10	OnGrade	Hornsby Council		4.00	60.49		0	335843	6249212	No	0.29
P24AQ9	OnGrade	Hornsby Council		3.70	60.35		0	335839	6249216	No	0.21
P24AQ8	OnGrade	Hornsby Council		2.70	60.07		0	335833	6249214	No	0.07
P24AT3	OnGrade	Hornsby Council		4.00	50.74		0	335686	6249359	No	0.46
P24AT3_1	OnGrade	Junction Pit		0.50	50.70		0	335683	6249354	Yes	No Inlet
P24AT2A	OnGrade	Junction Pit		0.50	50.68		0	335680	6249353	Yes	No Inlet
P24AT2A_1	OnGrade	Junction Pit		0.50	47.98		0	335644	6249341	Yes	No Inlet
P24AT2A_2	OnGrade	Junction Pit		0.50	46.62		0	335623	6249347	Yes	No Inlet
P24AT1	OnGrade	Grated Inlet Pit		1.90	45.24		0	335610	6249350	No	0.80
P24AT	OnGrade	Grated Inlet Pit		1.80	44.25		0	335594	6249355	No	0.09
P24AT_1	OnGrade	Junction Pit		2.50	43.80		0	335575	6249361	Yes	No Inlet
P23C1	OnGrade	Hornsby Council		4.00	7.60		0	336094	6249814	No	0.20
P23A0B	OnGrade	Junction Pit		1.60	6.67		0	336081	6249829	Yes	No Inlet
P23A0A	OnGrade	Junction Pit		0.70	6.67		0	336084	6249831	Yes	No Inlet
P23A0A_1	OnGrade	Junction Pit		2.50	6.28		0	336108	6249852	Yes	No Inlet
P23A0A_2	OnGrade	Junction Pit		0.50	6.24		0	336107	6249863	Yes	No Inlet
P23B3	OnGrade	Hornsby Council		4.00	6.94		0	336075	6249824	No	0.31
P23B1	Sag	Grated Inlet Pit	5	3.90	6.72	0.2	0.5	336079	6249832	No	0.01
P23B2	OnGrade	Hornsby Council		4.00	6.93		0	336075	6249833	No	0.20

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P23D1	OnGrade	Grated Inlet Pit		4.00	8.06		0	336047	6249803	No	0.13
P23A0C	OnGrade	Junction Pit		0.50	8.02		0	336049	6249801	Yes	No Inlet
P23A0C_1	OnGrade	Junction Pit		0.50	6.99		0	336073	6249822	Yes	No Inlet
P23J1	OnGrade	Junction Pit		4.00	17.09		0	335953	6249721	No	No Inlet
P23A1	OnGrade	Junction Pit		0.50	14.58		0	335973	6249734	Yes	No Inlet
P23A0F	OnGrade	Junction Pit		0.50	12.52		0	335987	6249747	Yes	No Inlet
P23A0E	OnGrade	Junction Pit		0.60	10.81		0	336001	6249759	Yes	No Inlet
P23A0D	OnGrade	Junction Pit		0.60	8.89		0	336024	6249779	Yes	No Inlet
P23H1	OnGrade	Hornsby Council		4.00	15.29		0	335964	6249735	No	0.15
P23F3	OnGrade	Grated Inlet Pit		4.00	11.53		0	335993	6249755	No	0.03
P23F4A	OnGrade	Junction Pit		1.70	11.23		0	335994	6249759	Yes	No Inlet
P23F1	OnGrade	Grated Inlet Pit		3.00	11.10		0	335994	6249762	No	0.16
P23F2	OnGrade	Grated Inlet Pit		4.00	11.66		0	335989	6249760	No	0.17
P23E2	OnGrade	Hornsby Council		4.00	9.27		0	336015	6249783	No	0.11
P23E10	OnGrade	Junction Pit		1.70	8.93		0	336022	6249780	Yes	No Inlet
P23E1	OnGrade	Grated Inlet Pit		4.00	9.21		0	336016	6249775	No	0.04
P23L2	OnGrade	Hornsby Council		4.00	24.89		0	335904	6249667	No	0.13
P23L1	OnGrade	Hornsby Council		3.00	24.37		0	335907	6249671	No	0.01
P23K3	OnGrade	Grated Inlet Pit		2.00	23.77		0	335911	6249669	No	0.09
P23K2	OnGrade	Hornsby Council		1.10	22.04		0	335920	6249687	No	0.01
P23K1	OnGrade	Junction Pit		0.50	20.74		0	335931	6249698	Yes	No Inlet
P23K1_1	OnGrade	Junction Pit		0.50	20.54		0	335933	6249699	Yes	No Inlet
P23A1A	OnGrade	Junction Pit		0.50	19.35		0	335940	6249705	Yes	No Inlet
P23M1	OnGrade	Hornsby Council		4.00	25.71		0	335897	6249657	No	0.57
P23K3A	OnGrade	Junction Pit		1.60	25.04		0	335903	6249655	Yes	No Inlet
P23O1	OnGrade	Hornsby Council		4.00	29.02		0	335908	6249599	No	0.88
P23N1A	OnGrade	Junction Pit		0.50	29.01		0	335906	6249605	Yes	No Inlet
P23N1	OnGrade	Junction Pit		0.50	28.84		0	335900	6249609	Yes	No Inlet
P23A2A	OnGrade	Junction Pit		2.10	28.80		0	335889	6249615	Yes	No Inlet
P23A2	OnGrade	Junction Pit		0.00	21.48		0	335930	6249689	Yes	No Inlet
P23P1	OnGrade	Hornsby Council		4.00	28.97		0	335907	6249609	No	0.10
P23Q1	OnGrade	Hornsby Council		4.00	31.28		0	335993	6249536	No	0.25
P23N1B	OnGrade	Junction Pit		2.20	30.90		0	335992	6249543	Yes	No Inlet
P23N1B_1	OnGrade	Junction Pit		0.50	30.86		0	335987	6249552	Yes	No Inlet
P23N1B_2	OnGrade	Junction Pit		0.50	30.82		0	335981	6249560	Yes	No Inlet
P23N1B_3	OnGrade	Junction Pit		0.50	30.78		0	335979	6249563	Yes	No Inlet
P23N1B_4	OnGrade	Junction Pit		0.00	30.74		0	335977	6249566	Yes	No Inlet
P23N1B_5	OnGrade	Junction Pit		0.50	30.70		0	335974	6249568	Yes	No Inlet
P23N1B_6	OnGrade	Junction Pit		0.50	30.63		0	335971	6249569	Yes	No Inlet
P23N1B_7	OnGrade	Junction Pit		0.50	29.40		0	335930	6249591	Yes	No Inlet
P23N3	OnGrade	Junction Pit		0.50	38.40		0	336032	6249485	Yes	No Inlet
P23N2	OnGrade	Junction Pit		4.50	31.27		0	336007	6249522	Yes	No Inlet
P23R2	OnGrade	Hornsby Council		4.00	29.55		0	335887	6249607	No	0.08
P23R1	OnGrade	Hornsby Council		3.60	29.14		0	335888	6249610	No	0.01
P23A2B	OnGrade	Junction Pit		1.70	29.04		0	335888	6249612	Yes	No Inlet
P23U2	OnGrade	Junction Pit		0.50	37.07		0	335845	6249558	Yes	No Inlet
P23U1	OnGrade	Junction Pit		0.50	36.08		0	335850	6249565	Yes	No Inlet
P23A4	OnGrade	Junction Pit		1.60	34.97		0	335863	6249567	Yes	No Inlet
P23A3A	OnGrade	Junction Pit		2.50	33.10		0	335871	6249582	Yes	No Inlet
P23A3	OnGrade	Junction Pit		0.00	32.03		0	335877	6249591	Yes	No Inlet
P23T2	OnGrade	Grated Inlet Pit		4.00	36.01		0	335848	6249568	No	0.04
P23T1	OnGrade	Junction Pit		4.00	34.85		0	335855	6249578	Yes	No Inlet
P23X1	Sag	Hornsby Council	5	4.00	41.11	0.2	0.5	335845	6249503	No	0.11
P23A6	OnGrade	Junction Pit		2.60	41.07		0	335838	6249509	Yes	No Inlet
P23A5	OnGrade	Junction Pit		1.10	39.38		0	335840	6249534	Yes	No Inlet
P23V4	OnGrade	Junction Pit		0.50	41.37		0	335833	6249510	Yes	No Inlet
P23V1	OnGrade	Junction Pit		2.00	40.18		0	335834	6249524	Yes	No Inlet
P23W1A	OnGrade	Junction Pit		1.60	39.44		0	335834	6249534	Yes	No Inlet
P23V3	Sag	Hornsby Council	5	4.00	40.22	0.2	0.5	335820	6249529	No	0.60
P23V2	OnGrade	Junction Pit		0.00	40.18		0	335825	6249525	Yes	No Inlet
P23W2	OnGrade	Hornsby Council		4.00	39.81		0	335819	6249538	No	0.14
P23W1	OnGrade	Junction Pit		0.00	39.69		0	335826	6249535	Yes	No Inlet
P23A9	OnGrade	Hornsby Council		4.00	54.64		0	335818	6249376	No	0.21
P23A7	OnGrade	Junction Pit		0.90	54.31		0	335821	6249380	Yes	No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P23A7_1	OnGrade	Junction Pit		0.50	53.47		0	335828	6249389	Yes	No Inlet
P23A6_1	OnGrade	Hornsby Council		1.30	43.16		0	335836	6249490	No	0.03
P23A8	Sag	Hornsby Council	5	4.00	54.35	0.2	0.5	335811	6249380	No	0.08
P22C2	OnGrade	Grated Inlet Pit		4.00	8.21		0	336074	6249804	No	0.41
P22C1	OnGrade	Hornsby Council		4.00	8.18		0	336080	6249808	No	0.02
P22C1A	OnGrade	Junction Pit		0.70	8.14		0	336086	6249802	Yes	No Inlet
P22B1A	OnGrade	Junction Pit		0.60	8.10		0	336088	6249804	Yes	No Inlet
P22B1A_1	OnGrade	Junction Pit		0.50	7.72		0	336098	6249812	Yes	No Inlet
P22B1A_2	OnGrade	Junction Pit		0.50	7.62		0	336103	6249817	Yes	No Inlet
P22B1A_3	OnGrade	Junction Pit		2.50	6.24		0	336116	6249845	Yes	No Inlet
P22B1	OnGrade	Hornsby Council		4.00	8.19		0	336087	6249805	No	2.99
P22D2	OnGrade	Hornsby Council		4.00	16.16		0	336062	6249641	No	0.19
P22D1	OnGrade	Junction Pit		0.90	15.07		0	336044	6249642	Yes	No Inlet
P22A1	OnGrade	Junction Pit		1.60	15.07		0	336039	6249640	Yes	No Inlet
P22A1_1	OnGrade	Junction Pit		2.50	14.25		0	336043	6249661	Yes	No Inlet
P22A1_2	OnGrade	Junction Pit		2.50	10.63		0	336031	6249721	Yes	No Inlet
P22A1_3	OnGrade	Junction Pit		0.50	8.44		0	336050	6249772	Yes	No Inlet
P22E1	OnGrade	Hornsby Council		4.00	15.11		0	336046	6249638	No	0.95
P22F1	OnGrade	Hornsby Council		4.00	15.11		0	336042	6249636	No	0.53
P22G1	OnGrade	Hornsby Council		4.00	15.64		0	336035	6249636	No	0.16
P22H2	OnGrade	Hornsby Council		4.00	32.79		0	336058	6249528	No	0.22
P22H1	OnGrade	Hornsby Council		2.90	32.80		0	336059	6249530	No	0.06
P22H1A	OnGrade	Junction Pit		1.60	32.74		0	336060	6249532	Yes	No Inlet
P22H1A_1	OnGrade	Junction Pit		2.50	32.44		0	336053	6249534	Yes	No Inlet
P22H1A_2	OnGrade	Junction Pit		0.50	18.77		0	336042	6249585	Yes	No Inlet
P22H1A_3	OnGrade	Junction Pit		2.50	17.52		0	336031	6249608	Yes	No Inlet
P22A1A	OnGrade	Junction Pit		0.50	15.74		0	336037	6249632	Yes	No Inlet
P22L3	OnGrade	Hornsby Council		4.00	39.93		0	335997	6249451	No	0.05
P22L0A	OnGrade	Junction Pit		2.70	39.88		0	336005	6249452	Yes	No Inlet
P22K2A	OnGrade	Junction Pit		0.00	38.90		0	336018	6249467	Yes	No Inlet
P22K2A_1	OnGrade	Junction Pit		0.50	38.04		0	336049	6249493	Yes	No Inlet
P22K2	OnGrade	Hornsby Council		3.00	37.81		0	336060	6249493	No	0.40
P22K1	OnGrade	Junction Pit		2.00	37.81		0	336064	6249497	Yes	No Inlet
P22RCAD	OnGrade	Junction Pit		3.50	37.32		0	336080	6249493	Yes	No Inlet
P22A2	OnGrade	Hornsby Council		2.40	37.28		0	336081	6249497	No	0.11
P22A2_1	OnGrade	Junction Pit		0.50	37.00		0	336081	6249501	Yes	No Inlet
P22A2_2	OnGrade	Junction Pit		0.50	36.40		0	336080	6249504	Yes	No Inlet
P22A2_3	OnGrade	Junction Pit		2.50	33.22		0	336076	6249525	Yes	No Inlet
P22A2_4	OnGrade	Junction Pit		0.50	32.74		0	336061	6249531	Yes	No Inlet
P22L2	OnGrade	Hornsby Council		4.00	41.37		0	336006	6249438	No	0.54
P22L1	OnGrade	Hornsby Council		2.10	40.37		0	336006	6249445	No	0.01
P22K3B	OnGrade	Grated Inlet Pit		4.00	53.67		0	335971	6249321	No	0.86
P22KB	OnGrade	Junction Pit		2.50	53.43		0	335978	6249325	Yes	No Inlet
P22K	OnGrade	Junction Pit		3.50	40.33		0	335969	6249463	Yes	No Inlet
P22K_1	OnGrade	Junction Pit		0.50	40.11		0	335981	6249458	Yes	No Inlet
P22A13	OnGrade	Grated Inlet Pit		4.00	51.85		0	336053	6249334	No	0.50
P22A13_1	OnGrade	Junction Pit		0.50	50.88		0	336054	6249343	Yes	No Inlet
P22A12	OnGrade	Hornsby Council		3.50	48.09		0	336055	6249380	No	0.18
P22A11	OnGrade	Grated Inlet Pit		3.70	48.05		0	336033	6249381	No	0.01
P22A10	OnGrade	Junction Pit		2.00	47.93		0	336022	6249381	Yes	No Inlet
P22A9	OnGrade	Hornsby Council		3.20	47.57		0	336019	6249384	No	0.42
P22A8	OnGrade	Hornsby Council		2.30	44.82		0	336018	6249407	No	0.03
P22A7	OnGrade	Grated Inlet Pit		3.00	44.69		0	336018	6249411	No	0.01
P22A6	OnGrade	Hornsby Council		0.60	44.69		0	336022	6249414	No	0.01
P22Z1	OnGrade	Junction Pit		0.90	43.90		0	336059	6249415	Yes	No Inlet
P22A5	OnGrade	Junction Pit		2.50	43.86		0	336079	6249423	Yes	No Inlet
P22A4	OnGrade	Junction Pit		2.50	37.77		0	336075	6249482	Yes	No Inlet
P22A4_1	OnGrade	Junction Pit		0.50	37.67		0	336078	6249483	Yes	No Inlet
P22A3	OnGrade	Hornsby Council		2.50	37.46		0	336079	6249484	No	0.43
P22N3	OnGrade	Hornsby Council		4.00	41.52		0	336134	6249437	No	0.15
P22N2	OnGrade	Hornsby Council		1.60	41.14		0	336137	6249441	No	0.01
P22N1	OnGrade	Junction Pit		4.40	39.04		0	336150	6249462	Yes	No Inlet
P22T0B	OnGrade	Junction Pit		2.00	38.64		0	336153	6249466	Yes	No Inlet
P22T0B_1	OnGrade	Junction Pit		0.00	38.60		0	336152	6249467	Yes	No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P22T0A	OnGrade	Junction Pit		2.30	38.24		0	336145	6249472	Yes	No Inlet
P22T0A_1	OnGrade	Junction Pit		0.50	37.43		0	336132	6249481	Yes	No Inlet
P22M2	OnGrade	Hornsby Council		4.00	39.03		0	336140	6249464	No	0.68
P22M1	OnGrade	Junction Pit		0.00	38.55		0	336141	6249466	Yes	No Inlet
P22Q2	OnGrade	Hornsby Council		4.00	39.75		0	336167	6249454	No	0.03
P22Q1	OnGrade	Hornsby Council		2.50	39.49		0	336164	6249456	No	0.00
P22Q0	OnGrade	Junction Pit		0.50	38.97		0	336154	6249463	Yes	No Inlet
P22T0C	OnGrade	Junction Pit		2.50	38.74		0	336154	6249466	Yes	No Inlet
P22P2	OnGrade	Hornsby Council		4.00	38.84		0	336161	6249466	No	0.03
P22P1	OnGrade	Hornsby Council		4.30	38.80		0	336158	6249468	No	0.00
P22R1	OnGrade	Hornsby Council		4.00	40.79		0	336179	6249440	No	0.40
P22T0D	OnGrade	Junction Pit		0.80	40.41		0	336179	6249448	Yes	No Inlet
P22U1	OnGrade	Junction Pit		0.50	44.47		0	336226	6249407	Yes	No Inlet
P22T2	OnGrade	Junction Pit		3.50	44.47		0	336221	6249412	Yes	No Inlet
P22T1	OnGrade	Junction Pit		2.90	43.39		0	336214	6249422	Yes	No Inlet
P22V2	OnGrade	Hornsby Council		4.00	45.95		0	336220	6249403	No	0.13
P22V1	OnGrade	Hornsby Council		3.30	45.38		0	336222	6249406	No	0.16
P22T9	OnGrade	Hornsby Council		4.00	51.11		0	336257	6249300	No	0.84
P22T8	OnGrade	Junction Pit		0.00	50.58		0	336259	6249316	Yes	No Inlet
P22T7	Node				50.33			336259	6249321		No Inlet
P22T6	OnGrade	Hornsby Council		4.00	49.03		0	336261	6249343	No	0.09
P22T6_1	OnGrade	Junction Pit		0.50	48.99		0	336261	6249346	Yes	No Inlet
P22T6_2	OnGrade	Junction Pit		0.50	48.93		0	336261	6249347	Yes	No Inlet
P22T5	OnGrade	Hornsby Council		2.30	48.89		0	336260	6249348	No	0.02
P22T4	OnGrade	Grated Inlet Pit		2.10	48.21		0	336196	6249359	No	0.31
P22T3	OnGrade	Grated Inlet Pit		3.20	47.79		0	336193	6249363	No	0.02
P22W3	Sag	Hornsby Council	5	4.00	51.15	0.2	0.5	336173	6249315	No	1.24
P22W2	Node				50.25			336174	6249331		No Inlet
P22W2_1	OnGrade	Junction Pit		4.00	47.30		0	336179	6249368	No	No Inlet
P22W1	OnGrade	Hornsby Council		3.30	43.81		0	336210	6249415	No	0.50
P21C1	Sag	Hornsby Council	5	4.00	6.36	0.2	0.5	336233	6249835	No	0.33
P21A2	OnGrade	Junction Pit		4.60	6.30		0	336223	6249844	Yes	No Inlet
P21A1	OnGrade	Junction Pit		0.50	6.26		0	336128	6249863	Yes	No Inlet
P21K1	Sag	Hornsby Council	5	4.00	8.10	0.2	0.5	336319	6249815	No	0.23
P21A2B	OnGrade	Junction Pit		1.70	6.34		0	336314	6249825	Yes	No Inlet
P21A3	OnGrade	Hornsby Council		4.00	8.31		0	336340	6249813	No	0.13
P21A3_1	OnGrade	Junction Pit		0.50	6.37		0	336328	6249822	Yes	No Inlet
P21G1	Sag	Hornsby Council	5	4.00	11.75	0.2	0.5	336271	6249731	No	0.16
P21F4	OnGrade	Hornsby Council		2.00	10.30		0	336265	6249758	No	0.02
P21F3	OnGrade	Hornsby Council		2.20	10.20		0	336242	6249761	No	0.05
P21F2	OnGrade	Hornsby Council		3.40	10.17		0	336225	6249763	No	0.04
P21F1	OnGrade	Junction Pit		2.50	10.13		0	336222	6249767	Yes	No Inlet
P21B1	OnGrade	Junction Pit		3.00	10.09		0	336218	6249767	Yes	No Inlet
P21H1	OnGrade	Grated Inlet Pit		4.00	12.12		0	336295	6249733	No	0.15
P21H1_1	OnGrade	Junction Pit		0.50	11.75		0	336289	6249738	Yes	No Inlet
P21F5A	OnGrade	Junction Pit		2.00	10.38		0	336280	6249756	Yes	No Inlet
P21F5	OnGrade	Junction Pit		0.00	10.34		0	336277	6249757	Yes	No Inlet
P21F6	OnGrade	Grated Inlet Pit		4.00	10.66		0	336294	6249754	No	0.03
P21E1	OnGrade	Hornsby Council		4.00	13.04		0	336197	6249744	No	0.11
P21D0A	OnGrade	Junction Pit		1.10	11.53		0	336200	6249762	Yes	No Inlet
P21D1	OnGrade	Hornsby Council		4.00	12.59		0	336183	6249758	No	0.32
P21D1_1	OnGrade	Junction Pit		0.50	11.85		0	336195	6249761	Yes	No Inlet
P21B3B	OnGrade	Grated Inlet Pit		4.00	12.62		0	336229	6249710	No	0.15
P21B2B	OnGrade	Junction Pit		1.00	12.59		0	336225	6249711	Yes	No Inlet
P21B2A	OnGrade	Junction Pit		0.90	12.05		0	336225	6249716	Yes	No Inlet
P21B2	Sag	Grated Inlet Pit	5	2.20	10.79	0.2	0.5	336224	6249745	No	0.33
P21B3A	OnGrade	Grated Inlet Pit		4.00	12.42		0	336229	6249713	No	0.22
P21B6A	OnGrade	Hornsby Council		4.00	20.30		0	336185	6249663	No	0.30
P21B6B	OnGrade	Hornsby Council		2.70	19.79		0	336185	6249667	No	0.01
P21B6B_1	OnGrade	Junction Pit		2.50	19.14		0	336186	6249671	Yes	No Inlet
P21B3C	OnGrade	Junction Pit		3.50	16.17		0	336230	6249669	Yes	No Inlet
P21B3	OnGrade	Grated Inlet Pit		1.60	16.02		0	336227	6249671	No	0.08
P21B6	OnGrade	Hornsby Council		4.00	16.40		0	336231	6249663	No	0.65
P21B5	OnGrade	Junction Pit		2.00	16.35		0	336232	6249667	Yes	No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P21B4	OnGrade	Hornsby Council		4.00	16.38		0	336229	6249666	No	0.38
P26A2	OnGrade	Hornsby Council		4.00	5.31		0	336338	6250093	No	0.14
P26A2_1	OnGrade	Junction Pit		0.50	4.93		0	336317	6250091	Yes	No Inlet
P26A2_2	OnGrade	Junction Pit		0.00	4.75		0	336295	6250088	Yes	No Inlet
P27A1	OnGrade	Kerb Inlet		4.00	5.30		0	336294	6250142	No	0.56
P27outlet	OnGrade	Junction Pit		2.50	3.69		0	336270	6250172	Yes	No Inlet
P25E1	OnGrade	Hornsby Council		4.00	6.64		0	336366	6250108	No	0.10
P25A0C	OnGrade	Junction Pit		1.60	6.60		0	336366	6250112	Yes	No Inlet
P25A0B	OnGrade	Junction Pit		0.80	5.77		0	336331	6250119	Yes	No Inlet
P25A0A	OnGrade	Junction Pit		2.10	5.26		0	336282	6250128	Yes	No Inlet
P25D1	OnGrade	Hornsby Council		4.00	5.81		0	336332	6250122	No	0.09
P25C1	OnGrade	Hornsby Council		4.00	5.30		0	336276	6250111	No	1.38
P25G5	OnGrade	Hornsby Council		4.00	11.08		0	336479	6250050	No	0.45
P25G4	OnGrade	Hornsby Council		3.80	10.43		0	336476	6250055	No	0.06
P25G2	OnGrade	Hornsby Council		3.10	10.20		0	336471	6250055	No	0.01
P25F2	OnGrade	Junction Pit		0.50	9.85		0	336473	6250076	Yes	No Inlet
P25G1	OnGrade	Grated Inlet Pit		2.40	9.89		0	336473	6250081	No	0.02
P25A0D	OnGrade	Junction Pit		2.30	9.77		0	336474	6250093	Yes	No Inlet
P25F1	OnGrade	Grated Inlet Pit		4.00	9.85		0	336464	6250081	No	0.16
P25H2	Sag	Hornsby Council	5	4.00	16.17	0.2	0.5	336515	6249985	No	0.03
P25H1	Sag	Hornsby Council	5	3.10	16.07	0.09	0.5	336507	6249985	No	0.06
P25H1_1	OnGrade	Junction Pit		0.50	16.06		0	336507	6249987	Yes	No Inlet
P25H1_2	OnGrade	Junction Pit		0.50	16.05		0	336507	6249989	Yes	No Inlet
P25H1_3	OnGrade	Junction Pit		0.50	16.04		0	336507	6249991	Yes	No Inlet
P25H1_4	OnGrade	Junction Pit		0.50	16.03		0	336506	6249993	Yes	No Inlet
P25H1_5	OnGrade	Junction Pit		0.50	16.02		0	336506	6249995	Yes	No Inlet
P25H1_6	OnGrade	Junction Pit		0.50	16.01		0	336506	6249996	Yes	No Inlet
P25H1_7	OnGrade	Junction Pit		0.50	16.00		0	336506	6249997	Yes	No Inlet
P25H1_8	OnGrade	Junction Pit		0.50	15.99		0	336506	6249999	Yes	No Inlet
P25H1_9	OnGrade	Junction Pit		0.50	15.98		0	336506	6250000	Yes	No Inlet
P25H1_10	OnGrade	Junction Pit		0.50	15.97		0	336506	6250001	Yes	No Inlet
P25H1_11	OnGrade	Junction Pit		0.50	15.96		0	336506	6250002	Yes	No Inlet
P25H1_12	OnGrade	Junction Pit		0.50	15.95		0	336506	6250003	Yes	No Inlet
P25H1_13	OnGrade	Junction Pit		2.50	15.94		0	336506	6250004	Yes	No Inlet
P25H1_14	OnGrade	Junction Pit		2.50	15.93		0	336506	6250005	Yes	No Inlet
P25H1_15	OnGrade	Junction Pit		0.50	15.92		0	336506	6250006	Yes	No Inlet
P25H1_16	OnGrade	Junction Pit		0.50	15.91		0	336506	6250007	Yes	No Inlet
P25H1_17	OnGrade	Junction Pit		0.50	15.90		0	336507	6250008	Yes	No Inlet
P25H1_18	OnGrade	Junction Pit		0.50	15.89		0	336507	6250009	Yes	No Inlet
P25H1_19	OnGrade	Junction Pit		0.50	15.88		0	336507	6250010	Yes	No Inlet
P25H1_20	OnGrade	Junction Pit		0.50	15.87		0	336507	6250011	Yes	No Inlet
P25H1_21	OnGrade	Junction Pit		0.50	15.86		0	336509	6250018	Yes	No Inlet
P25H1_22	OnGrade	Junction Pit		0.50	15.85		0	336511	6250025	Yes	No Inlet
P25H1_23	OnGrade	Junction Pit		0.50	15.62		0	336513	6250033	Yes	No Inlet
P25H1_24	OnGrade	Junction Pit		0.50	15.60		0	336515	6250040	Yes	No Inlet
P25H1_25	OnGrade	Junction Pit		0.50	15.50		0	336517	6250047	Yes	No Inlet
P25H1_26	OnGrade	Junction Pit		0.50	15.40		0	336519	6250053	Yes	No Inlet
P25H1_27	OnGrade	Junction Pit		0.50	15.27		0	336520	6250059	Yes	No Inlet
P25H1_28	OnGrade	Junction Pit		0.50	14.38		0	336522	6250065	Yes	No Inlet
P25H1_29	OnGrade	Junction Pit		0.50	13.69		0	336523	6250070	Yes	No Inlet
P25A2	OnGrade	Hornsby Council		2.70	12.10		0	336525	6250076	No	0.25
P25A2_1	OnGrade	Junction Pit		2.50	12.10		0	336522	6250077	Yes	No Inlet
P25A1	OnGrade	Junction Pit		2.50	12.06		0	336521	6250083	Yes	No Inlet
P25A6	OnGrade	Hornsby Council		4.00	30.28		0	336765	6249892	No	0.04
P25A5	OnGrade	Hornsby Council		2.90	25.72		0	336728	6249938	No	0.23
P25A4	OnGrade	Hornsby Council		2.00	19.90		0	336675	6249999	No	0.31
P25A3	OnGrade	Hornsby Council		1.50	16.68		0	336626	6250038	No	0.15
P25A3_1	OnGrade	Junction Pit		0.50	15.40		0	336594	6250060	Yes	No Inlet
P1AA1	OnGrade	Grated Inlet Pit		4.00	4.48		0	336567	6249767	No	0.40
P2A1	OnGrade	Hornsby Council		4.00	4.56		0	336588	6249784	No	1.88
P2A0	OnGrade	Junction Pit		0.50	4.45		0	336575	6249772	Yes	No Inlet
P1F1	OnGrade	Junction Pit		0.50	13.30		0	336648	6249919	Yes	No Inlet
P1A5	OnGrade	Grated Inlet Pit		3.90	10.55		0	336636	6249919	No	0.08
P1A4	OnGrade	Hornsby Council		3.40	10.29		0	336625	6249911	No	0.01

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P1A3	OnGrade	Grated Inlet Pit		0.70	9.02		0	336625	6249889	No	0.05
P1A2	OnGrade	Hornsby Council		1.40	5.79		0	336599	6249834	No	0.68
P1A1	OnGrade	Hornsby Council		1.40	4.44		0	336573	6249774	No	0.20
P1C6	OnGrade	Hornsby Council		4.00	14.99		0	336592	6249926	No	0.12
P1C5	Sag	Grated Inlet Pit	5	2.50	15.01	0.2	0.5	336589	6249920	No	0.01
P1C2A	OnGrade	Junction Pit		2.10	14.30		0	336590	6249915	Yes	No Inlet
P1C2	OnGrade	Grated Inlet Pit		1.10	13.60		0	336599	6249916	No	0.02
P1C1	OnGrade	Hornsby Council		1.50	10.66		0	336621	6249914	No	0.03
P1C4	OnGrade	Hornsby Council		4.00	15.23		0	336582	6249920	No	0.28
P1C3	OnGrade	Hornsby Council		4.00	14.66		0	336587	6249915	No	0.15
P1D1	OnGrade	Hornsby Council		4.00	11.17		0	336620	6249923	No	0.09
P1G1	OnGrade	Hornsby Council		4.00	11.08		0	336625	6249927	No	0.45
P1B1	OnGrade	Hornsby Council		4.00	10.37		0	336636	6249910	No	0.07
P3A1	OnGrade	Hornsby Council		4.00	4.55		0	336579	6249766	No	2.74
P6A15	OnGrade	Hornsby Council		4.00	44.83		0	336964	6249669	No	1.76
P6A14	OnGrade	Hornsby Council		2.50	43.83		0	336959	6249681	No	0.11
P6A13	OnGrade	Junction Pit		0.50	41.60		0	336953	6249699	Yes	No Inlet
P6A12	OnGrade	Junction Pit		2.30	40.66		0	336949	6249712	Yes	No Inlet
P6A11	OnGrade	Hornsby Council		1.30	40.19		0	336946	6249719	No	0.20
P6A10	OnGrade	Hornsby Council		1.00	37.64		0	336923	6249743	No	0.21
P6A9	OnGrade	Hornsby Council		0.60	36.46		0	336912	6249747	No	0.04
P6A8	OnGrade	Junction Pit		0.50	34.62		0	336908	6249751	Yes	No Inlet
P6A7	OnGrade	Hornsby Council		0.40	32.39		0	336846	6249755	No	0.18
P6A7_1	OnGrade	Junction Pit		0.50	32.39		0	336843	6249754	Yes	No Inlet
P6A7_2	OnGrade	Junction Pit		0.50	32.35		0	336836	6249751	Yes	No Inlet
P6A6	OnGrade	Hornsby Council		1.50	32.31		0	336832	6249748	No	0.12
P6A6_1	OnGrade	Junction Pit		0.50	32.27		0	336830	6249747	Yes	No Inlet
P6A6_2	OnGrade	Junction Pit		0.50	32.23		0	336829	6249746	Yes	No Inlet
P6A4	OnGrade	Junction Pit		1.00	32.19		0	336825	6249743	Yes	No Inlet
P6A4_1	OnGrade	Junction Pit		0.50	31.85		0	336811	6249732	Yes	No Inlet
P6A4_2	OnGrade	Junction Pit		0.50	29.30		0	336792	6249718	Yes	No Inlet
P6A3	OnGrade	Junction Pit		0.50	28.48		0	336787	6249715	Yes	No Inlet
P6A3_1	OnGrade	Junction Pit		0.50	25.99		0	336773	6249706	Yes	No Inlet
P6A3_2	OnGrade	Junction Pit		0.50	25.78		0	336769	6249704	Yes	No Inlet
P6A3_3	OnGrade	Junction Pit		0.50	25.74		0	336765	6249702	Yes	No Inlet
P6A3_4	OnGrade	Junction Pit		0.50	25.70		0	336761	6249702	Yes	No Inlet
P6A3_5	OnGrade	Junction Pit		0.50	24.72		0	336757	6249703	Yes	No Inlet
P6A3_6	OnGrade	Junction Pit		0.50	23.26		0	336753	6249704	Yes	No Inlet
P6A3_7	OnGrade	Junction Pit		0.50	23.00		0	336753	6249705	Yes	No Inlet
P6A3_8	OnGrade	Junction Pit		0.50	16.37		0	336734	6249714	Yes	No Inlet
P6A3_9	OnGrade	Junction Pit		0.50	11.67		0	336714	6249722	Yes	No Inlet
P6A2	OnGrade	Junction Pit		0.50	6.68		0	336695	6249729	Yes	No Inlet
P6A2_1	OnGrade	Junction Pit		0.50	6.57		0	336694	6249729	Yes	No Inlet
P6A1	OnGrade	Junction Pit		0.50	5.60		0	336618	6249754	Yes	No Inlet
W5X1B	OnGrade	Junction Pit		0.50	55.39		0	336998	6249000	Yes	No Inlet
W5X1B_3	OnGrade	Junction Pit		0.50	55.36		0	336998	6249004	Yes	No Inlet
W5X1B_1	OnGrade	Junction Pit		0.50	55.42		0	337006	6249002	Yes	No Inlet
W5X1B_2	OnGrade	Junction Pit		0.50	55.41		0	337009	6249002	Yes	No Inlet
W5AK1	OnGrade	Junction Pit		0.50	64.35		0	337158	6248926	Yes	No Inlet
P24B1	OnGrade	Hornsby Council		4.00	9.88		0	335949	6249855	No	0.12
P24EY	OnGrade	Junction Pit		0.50	46.19		0	335464	6249385	Yes	No Inlet
P24AY1	OnGrade	Junction Pit		0.50	54.10		0	335719	6249267	Yes	No Inlet
P24AT4	OnGrade	Junction Pit		0.50	50.72		0	335683	6249360	Yes	No Inlet
P23S1A	OnGrade	Junction Pit		0.50	34.62		0	335867	6249571	Yes	No Inlet
P22X	OnGrade	Junction Pit		0.50	29.83		0	336000	6249547	Yes	No Inlet
P22KB1	OnGrade	Junction Pit		0.50	53.85		0	335974	6249317	Yes	No Inlet
P21G	OnGrade	Junction Pit		0.50	10.94		0	336242	6249745	Yes	No Inlet
P21JP	OnGrade	Junction Pit		0.50	10.84		0	336242	6249750	Yes	No Inlet
P25A0A1	OnGrade	Junction Pit		0.50	5.30		0	336284	6250134	Yes	No Inlet
P1A8A	OnGrade	Junction Pit		0.50	12.44		0	336630	6249985	Yes	No Inlet
P1A8A_1	OnGrade	Junction Pit		0.50	12.40		0	336625	6249982	Yes	No Inlet
P1A8	OnGrade	Grated Inlet Pit		4.50	12.39		0	336626	6249977	No	0.21
P1A7	OnGrade	Hornsby Council		2.80	11.60		0	336626	6249948	No	0.18
P1A6	OnGrade	Grated Inlet Pit		1.30	10.96		0	336627	6249927	No	0.00

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P1E4	OnGrade	Junction Pit		0.50	17.51		0	336692	6249917	Yes	No Inlet
P1E3	OnGrade	Junction Pit		0.50	15.10		0	336679	6249951	Yes	No Inlet
P1E2	OnGrade	Junction Pit		0.50	15.00		0	336674	6249946	Yes	No Inlet
P1E1	OnGrade	Junction Pit		0.50	11.64		0	336634	6249948	Yes	No Inlet
P4A1A	OnGrade	Junction Pit		0.50	4.63		0	336581	6249773	Yes	No Inlet
P4A1A_1	OnGrade	Junction Pit		0.50	4.59		0	336583	6249770	Yes	No Inlet
P6E1	Sag	Grated Inlet Pit	5	4.00	41.26	0.2	0.5	336929	6249690	No	0.12
P6G4	OnGrade	Hornsby Council		4.00	57.27		0	337040	6249627	No	2.85
P6G3	OnGrade	Hornsby Council		3.20	56.20		0	337037	6249644	No	0.01
P6G2	OnGrade	Hornsby Council		3.30	47.70		0	337007	6249738	No	0.94
P6G1	OnGrade	Junction Pit		0.00	46.51		0	336989	6249742	Yes	No Inlet
P6I1	OnGrade	Hornsby Council		4.00	34.05		0	336832	6249724	No	0.05
P6H1	Sag	Hornsby Council	5	2.70	33.48	0.2	0.5	336837	6249733	No	0.02
P6A5	OnGrade	Junction Pit		0.00	32.63		0	336832	6249741	Yes	No Inlet
P6H3	OnGrade	Hornsby Council		4.00	35.06		0	336836	6249719	No	0.43
P6H2	OnGrade	Junction Pit		2.50	34.63		0	336839	6249728	Yes	No Inlet
P6K6	OnGrade	Hornsby Council		4.00	41.48		0	336922	6249681	No	0.17
P6K4	OnGrade	Junction Pit		1.70	41.28		0	336919	6249685	Yes	No Inlet
P6K3	Sag	Hornsby Council	5	3.10	40.36	0.2	0.5	336914	6249691	No	0.01
P6K2	OnGrade	Grated Inlet Pit		1.50	36.44		0	336890	6249720	No	0.25
P6K1	OnGrade	Hornsby Council		1.70	35.98		0	336881	6249724	No	0.03
P6K5	OnGrade	Hornsby Council		4.00	41.60		0	336914	6249682	No	0.01
P6D1	OnGrade	Hornsby Council		4.00	29.75		0	336810	6249771	No	0.10
P6D0A	OnGrade	Junction Pit		1.40	29.26		0	336809	6249784	Yes	No Inlet
P6C0	OnGrade	Grated Inlet Pit		2.90	29.18		0	336781	6249795	No	0.10
P6B1A	OnGrade	Junction Pit		1.60	27.43		0	336743	6249811	Yes	No Inlet
P6B1A_1	OnGrade	Junction Pit		0.50	5.65		0	336625	6249758	Yes	No Inlet
P6C3	OnGrade	Hornsby Council		4.00	30.42		0	336845	6249770	No	0.52
P6C2	OnGrade	Hornsby Council		4.00	29.17		0	336771	6249793	No	0.05
P6C1	OnGrade	Hornsby Council		4.00	29.19		0	336778	6249806	No	0.32
P5E2	OnGrade	Hornsby Council		4.00	8.15		0	336471	6249704	No	0.09
P5E1	OnGrade	Hornsby Council		3.60	6.13		0	336515	6249695	No	0.11
P5E1_1	OnGrade	Junction Pit		0.50	6.09		0	336521	6249693	Yes	No Inlet
P5D1	OnGrade	Junction Pit		0.00	5.84		0	336540	6249700	Yes	No Inlet
P5A2	OnGrade	Junction Pit		4.70	5.47		0	336544	6249698	Yes	No Inlet
P5A1	OnGrade	Junction Pit		0.70	5.34		0	336548	6249707	Yes	No Inlet
P5B1	OnGrade	Hornsby Council		4.00	5.48		0	336541	6249710	No	0.07
P5C2	OnGrade	Hornsby Council		4.00	7.11		0	336574	6249642	No	0.09
P5C1	OnGrade	Hornsby Council		3.10	7.02		0	336571	6249646	No	0.35
P5C1_1	OnGrade	Junction Pit		2.50	6.81		0	336573	6249656	Yes	No Inlet
P5F2	OnGrade	Hornsby Council		4.00	6.81		0	336521	6249672	No	0.91
P5F1	OnGrade	Hornsby Council		3.50	6.73		0	336523	6249677	No	0.00
P5O1A	OnGrade	Junction Pit		2.00	6.46		0	336523	6249683	Yes	No Inlet
P5O9A	OnGrade	Grated Inlet Pit		4.00	18.82		0	336312	6249670	No	0.00
P5O9B	OnGrade	Junction Pit		3.30	18.78		0	336310	6249670	Yes	No Inlet
P5O8B	OnGrade	Junction Pit		2.00	18.16		0	336316	6249677	Yes	No Inlet
P5O8B_1	OnGrade	Junction Pit		0.50	17.21		0	336325	6249685	Yes	No Inlet
P5O8A	OnGrade	Junction Pit		1.90	16.91		0	336326	6249687	Yes	No Inlet
P5O8	OnGrade	Junction Pit		0.00	15.58		0	336341	6249704	Yes	No Inlet
P5O8_1	OnGrade	Junction Pit		0.50	15.58		0	336349	6249711	Yes	No Inlet
P5O7	OnGrade	Hornsby Council		1.30	14.83		0	336353	6249715	No	0.07
P5O6	OnGrade	Junction Pit		0.50	14.77		0	336355	6249717	Yes	No Inlet
P5O5B	OnGrade	Junction Pit		3.50	14.70		0	336357	6249718	Yes	No Inlet
P5O5A	OnGrade	Junction Pit		2.30	13.57		0	336369	6249730	Yes	No Inlet
P5O5	OnGrade	Kerb Inlet		2.50	12.59		0	336378	6249735	No	0.05
P5O4A	OnGrade	Junction Pit		0.50	11.42		0	336398	6249727	Yes	No Inlet
P5O4	OnGrade	Junction Pit		2.60	10.52		0	336415	6249719	Yes	No Inlet
P5O3	OnGrade	Junction Pit		0.50	9.75		0	336433	6249712	Yes	No Inlet
P5O2B	OnGrade	Hornsby Council		1.00	8.28		0	336470	6249695	No	0.25
P5O2A	OnGrade	Hornsby Council		1.00	7.94		0	336479	6249692	No	0.06
P502	OnGrade	Hornsby Council		1.10	6.46		0	336517	6249684	No	0.04
P5O9	OnGrade	Hornsby Council		4.00	17.39		0	336327	6249683	No	0.05
P5O1	OnGrade	Hornsby Council		4.00	6.50		0	336520	6249682	No	0.01
P5O1_1	OnGrade	Junction Pit		2.50	6.46		0	336517	6249682	Yes	No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P5Q1	OnGrade	Hornsby Council		4.00	19.02		0	336416	6249689	No	0.47
P5P1	Sag	Hornsby Council	5	3.60	18.85	0.16	0.5	336419	6249695	No	0.02
P5R1	OnGrade	Hornsby Council		4.00	18.89		0	336423	6249691	No	0.12
P5P2	OnGrade	Grated Inlet Pit		4.00	34.86		0	336450	6249527	No	0.12
P5T1	OnGrade	Hornsby Council		4.00	16.07		0	336359	6249709	No	0.58
P5S1	OnGrade	Hornsby Council		4.00	15.21		0	336372	6249718	No	0.44
P5W1	OnGrade	Grated Inlet Pit		4.00	19.63		0	336292	6249665	No	0.05
P5O9C	OnGrade	Junction Pit		0.70	19.37		0	336304	6249664	Yes	No Inlet
P5V1	OnGrade	Grated Inlet Pit		4.00	19.09		0	336310	6249667	No	0.01
P5U1	OnGrade	Grated Inlet Pit		4.00	18.86		0	336318	6249670	No	0.39
P5O11A	OnGrade	Grated Inlet Pit		4.00	26.55		0	336284	6249591	No	0.31
P5O11C	OnGrade	Junction Pit		1.90	25.78		0	336283	6249595	Yes	No Inlet
P5O10C	OnGrade	Junction Pit		0.50	23.14		0	336290	6249625	Yes	No Inlet
P5O10A	OnGrade	Junction Pit		1.50	22.13		0	336292	6249636	Yes	No Inlet
P5O10	OnGrade	Junction Pit		3.60	19.72		0	336302	6249662	Yes	No Inlet
P5O13	OnGrade	Hornsby Council		4.00	27.70		0	336264	6249576	No	0.12
P5O13B	OnGrade	Junction Pit		1.00	27.39		0	336274	6249576	Yes	No Inlet
P5X4	OnGrade	Hornsby Council		4.00	29.61		0	336266	6249553	No	0.42
P5X3	OnGrade	Hornsby Council		3.80	29.41		0	336268	6249555	No	0.10
P5X1	OnGrade	Grated Inlet Pit		2.90	28.93		0	336264	6249557	No	0.01
P5X1_1	OnGrade	Junction Pit		0.50	28.80		0	336265	6249558	Yes	No Inlet
P5O14	OnGrade	Grated Inlet Pit		4.00	32.83		0	336213	6249524	No	0.11
P5O14A	OnGrade	Junction Pit		0.00	32.49		0	336233	6249524	Yes	No Inlet
P5X2	OnGrade	Grated Inlet Pit		2.90	29.69		0	336257	6249548	No	0.10
P5Y1	OnGrade	Hornsby Council		4.00	34.19		0	336247	6249518	No	0.04
P5O15	OnGrade	Grated Inlet Pit		2.50	33.44		0	336240	6249517	No	0.01
P5O14C	OnGrade	Junction Pit		2.30	33.01		0	336230	6249520	Yes	No Inlet
P5Z1	OnGrade	Hornsby Council		4.00	37.85		0	336271	6249496	No	0.02
P5O15B	OnGrade	Junction Pit		2.20	36.50		0	336272	6249500	Yes	No Inlet
P5AC	OnGrade	Hornsby Council		4.00	36.28		0	336230	6249488	No	0.33
P5AB	OnGrade	Hornsby Council		3.10	36.31		0	336235	6249489	No	0.04
P5AB_1	OnGrade	Junction Pit		2.50	34.44		0	336240	6249505	Yes	No Inlet
P5O14D	OnGrade	Grated Inlet Pit		4.10	33.53		0	336222	6249508	No	0.22
P5AA	OnGrade	Hornsby Council		4.00	33.67		0	336211	6249508	No	0.32
P5A8	OnGrade	Grated Inlet Pit		4.00	30.19		0	336495	6249465	No	0.05
P5A7	Node				28.23			336499	6249484		No Inlet
P5G6	OnGrade	Hornsby Council		4.00	32.88		0	336474	6249446	No	0.41
P5G4A	OnGrade	Junction Pit		1.40	32.72		0	336474	6249449	Yes	No Inlet
P5G4	OnGrade	Junction Pit		4.40	30.69		0	336481	6249476	Yes	No Inlet
P5G2A	OnGrade	Junction Pit		1.00	29.69		0	336483	6249485	Yes	No Inlet
P5G2	Node				27.70			336487	6249500		No Inlet
P5G5	OnGrade	Grated Inlet Pit		4.00	32.87		0	336471	6249450	No	0.09
P5G1	OnGrade	Hornsby Council		4.00	15.17		0	336511	6249608	No	0.33
P5A6	OnGrade	Grated Inlet Pit		3.20	9.81		0	336536	6249652	No	0.22
P5A5	OnGrade	Hornsby Council		2.20	9.31		0	336537	6249658	No	0.01
P5A4	OnGrade	Hornsby Council		1.70	7.25		0	336539	6249673	No	0.01
P5A3	OnGrade	Hornsby Council		1.00	6.25		0	336542	6249685	No	0.08
P5G3	OnGrade	Grated Inlet Pit		4.00	29.93		0	336480	6249486	No	0.12
P5L1	OnGrade	Hornsby Council		4.00	38.70		0	336412	6249470	No	0.18
P5H2A	OnGrade	Junction Pit		1.00	37.24		0	336414	6249481	Yes	No Inlet
P5H2	OnGrade	Hornsby Council		1.30	34.85		0	336432	6249478	No	0.05
P5H1B	OnGrade	Junction Pit		1.10	34.26		0	336443	6249478	Yes	No Inlet
P5H1A	OnGrade	Junction Pit		0.90	34.09		0	336445	6249478	Yes	No Inlet
P5H1	OnGrade	Junction Pit		0.50	32.96		0	336459	6249478	Yes	No Inlet
P5K1	OnGrade	Grated Inlet Pit		4.00	35.17		0	336441	6249468	No	0.14
P5I1	OnGrade	Grated Inlet Pit		4.00	34.79		0	336443	6249467	No	0.04
P5H3	OnGrade	Hornsby Council		4.00	38.80		0	336389	6249484	No	0.07
P5H2B	OnGrade	Junction Pit		2.20	38.37		0	336400	6249482	Yes	No Inlet
P5N4	OnGrade	Grated Inlet Pit		4.00	48.86		0	336317	6249351	No	0.25
P5N2A	OnGrade	Junction Pit		0.50	48.73		0	336306	6249349	Yes	No Inlet
P5N2	Node				48.12			336298	6249355		0.14
P5N3	OnGrade	Grated Inlet Pit		4.00	48.82		0	336310	6249346	No	0.39
P5N2_1	OnGrade	Junction Pit		4.00	47.82		0	336292	6249362	No	No Inlet
P5N2_2	OnGrade	Junction Pit		4.20	47.78		0	336295	6249365	No	No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P5N2_3	OnGrade	Junction Pit		4.30	43.31		0	336362	6249435	No	No Inlet
P5N1	OnGrade	Hornsby Council		2.50	42.87		0	336377	6249432	No	0.47
P5M3	OnGrade	Junction Pit		4.30	42.41		0	336387	6249430	Yes	No Inlet
P5M3_1	OnGrade	Junction Pit		0.50	41.57		0	336390	6249443	Yes	No Inlet
P5M2	OnGrade	Hornsby Council		2.40	41.17		0	336391	6249448	No	0.05
P5M2_1	OnGrade	Junction Pit		0.50	39.51		0	336396	6249468	Yes	No Inlet
P5M1	OnGrade	Grated Inlet Pit		1.70	38.79		0	336398	6249476	No	0.07
P5M4	OnGrade	Hornsby Council		4.00	43.06		0	336385	6249418	No	0.19
P5M4_1	OnGrade	Junction Pit		0.50	42.41		0	336387	6249429	Yes	No Inlet
P5M4_2	OnGrade	Junction Pit		0.50	42.41		0	336387	6249429	Yes	No Inlet
P7C1	OnGrade	Hornsby Council		4.00	6.38		0	336659	6249633	No	0.15
P7A1	OnGrade	Hornsby Council		3.50	6.38		0	336649	6249635	No	0.18
P7A1_1	OnGrade	Junction Pit		0.50	6.27		0	336652	6249643	Yes	No Inlet
P7B1	OnGrade	Hornsby Council		4.00	6.37		0	336643	6249630	No	0.46
P7D5	OnGrade	Hornsby Council		4.00	8.43		0	336673	6249509	No	0.64
P7D3	OnGrade	Junction Pit		2.70	8.03		0	336669	6249525	Yes	No Inlet
P7D2	OnGrade	Junction Pit		2.20	7.97		0	336639	6249548	Yes	No Inlet
P7D1	OnGrade	Junction Pit		1.90	7.93		0	336624	6249560	Yes	No Inlet
P7A2	OnGrade	Junction Pit		1.70	7.89		0	336620	6249566	Yes	No Inlet
P7D4	OnGrade	Hornsby Council		4.00	8.41		0	336665	6249516	No	0.28
P7F9	OnGrade	Hornsby Council		4.00	8.32		0	336633	6249539	No	0.09
P7F8	OnGrade	Hornsby Council		3.20	8.30		0	336632	6249542	No	0.06
P7F7	OnGrade	Grated Inlet Pit		1.90	8.26		0	336635	6249545	No	0.01
P7E3	OnGrade	Grated Inlet Pit		4.00	9.07		0	336582	6249534	No	0.03
P7E2	Sag	Hornsby Council	5	1.90	8.16	0.08	0.5	336605	6249563	No	0.05
P7E1	OnGrade	Junction Pit		1.20	8.01		0	336609	6249567	Yes	No Inlet
P7E1_1	OnGrade	Junction Pit		0.50	7.97		0	336619	6249562	Yes	No Inlet
P7E5	OnGrade	Hornsby Council		4.00	7.93		0	336593	6249580	No	0.12
P7E4	OnGrade	Hornsby Council		4.00	7.96		0	336594	6249574	No	0.21
P7K3	OnGrade	Hornsby Council		4.00	22.26		0	336589	6249445	No	1.30
P7K1	OnGrade	Junction Pit		0.50	21.92		0	336575	6249456	Yes	No Inlet
P7A4B	OnGrade	Junction Pit		1.70	21.88		0	336572	6249459	Yes	No Inlet
P7A4A	OnGrade	Junction Pit		1.70	21.84		0	336576	6249464	Yes	No Inlet
P7A4	OnGrade	Junction Pit		1.20	21.74		0	336581	6249469	Yes	No Inlet
P7A4_1	OnGrade	Junction Pit		0.60	9.23		0	336594	6249506	Yes	No Inlet
P7A3	OnGrade	Hornsby Council		0.60	8.25		0	336617	6249557	No	0.15
P7K2	Sag	Grated Inlet Pit	5	4.00	21.96	0.2	0.5	336580	6249452	No	0.64
P7I2	OnGrade	Hornsby Council		4.00	21.86		0	336606	6249450	No	0.16
P7I1A	OnGrade	Hornsby Council		1.80	21.85		0	336588	6249466	No	0.02
P7I1	OnGrade	Hornsby Council		4.00	21.82		0	336594	6249460	No	0.01
P7H2	OnGrade	Hornsby Council		4.00	21.88		0	336574	6249475	No	0.08
P7H1	OnGrade	Hornsby Council		3.00	21.86		0	336578	6249472	No	0.01
P7ZC3	OnGrade	Hornsby Council		4.00	34.20		0	336713	6249332	No	0.85
P7ZC2	OnGrade	Hornsby Council		3.60	33.65		0	336717	6249336	No	0.01
P7ZC1	OnGrade	Junction Pit		3.00	32.98		0	336709	6249343	Yes	No Inlet
P7ZA1	OnGrade	Junction Pit		2.30	32.12		0	336716	6249360	Yes	No Inlet
P7ZJ1	OnGrade	Hornsby Council		4.00	33.64		0	336730	6249334	No	1.00
P7ZJ2	OnGrade	Hornsby Council		4.30	33.18		0	336733	6249348	No	0.01
P7ZJ3	OnGrade	Hornsby Council		4.00	33.46		0	336738	6249345	No	0.29
P7S1	OnGrade	Hornsby Council		4.00	31.44		0	336523	6249401	No	0.04
P7N1	OnGrade	Junction Pit		0.60	31.05		0	336521	6249399	Yes	No Inlet
P7A4C	OnGrade	Junction Pit		1.90	31.01		0	336519	6249401	Yes	No Inlet
P7S2	Sag	Hornsby Council	5	4.00	31.42	0.2	0.5	336527	6249399	No	0.40
P7N2	OnGrade	Junction Pit		0.40	31.38		0	336524	6249397	Yes	No Inlet
P7N6	OnGrade	Hornsby Council		4.00	32.62		0	336549	6249381	No	0.00
P7N5	OnGrade	Grated Inlet Pit		2.40	32.27		0	336544	6249381	No	0.03
P7N4	OnGrade	Junction Pit		0.50	32.14		0	336537	6249387	Yes	No Inlet
P7N2A	OnGrade	Junction Pit		2.50	31.60		0	336531	6249391	Yes	No Inlet
P7N3	OnGrade	Hornsby Council		4.00	31.60		0	336533	6249394	No	0.02
P7P1	OnGrade	Hornsby Council		4.00	38.13		0	336600	6249319	No	0.30
P7N10A	OnGrade	Junction Pit		1.80	38.09		0	336609	6249329	Yes	No Inlet
P7N9	OnGrade	Junction Pit		0.80	35.82		0	336590	6249344	Yes	No Inlet
P7N8	OnGrade	Hornsby Council		3.70	34.60		0	336569	6249361	No	0.03
P7N7	OnGrade	Junction Pit		0.00	32.70		0	336549	6249377	Yes	No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P7N11	OnGrade	Hornsby Council		4.00	38.32		0	336618	6249326	No	0.07
P7N10B	OnGrade	Junction Pit		0.70	38.12		0	336616	6249323	Yes	No Inlet
P7N10	OnGrade	Hornsby Council		0.50	35.86		0	336592	6249346	No	0.00
P7R5	OnGrade	Hornsby Council		4.00	46.18		0	336658	6249259	No	1.05
P7R4	OnGrade	Hornsby Council		3.60	45.47		0	336661	6249264	No	0.04
P7R1A	OnGrade	Junction Pit		3.50	44.27		0	336655	6249270	Yes	No Inlet
P7R1	OnGrade	Junction Pit		1.70	44.27		0	336656	6249273	Yes	No Inlet
P7N12	OnGrade	Junction Pit		2.90	43.54		0	336663	6249286	Yes	No Inlet
P7R3	OnGrade	Hornsby Council		4.00	46.18		0	336642	6249265	No	0.05
P7R2	OnGrade	Hornsby Council		4.00	44.27		0	336647	6249273	No	0.01
P7N16	OnGrade	Hornsby Council		4.00	48.66		0	336734	6249213	No	0.47
P7N15	OnGrade	Hornsby Council		3.80	48.51		0	336741	6249227	No	0.11
P7N14	OnGrade	Hornsby Council		2.70	45.81		0	336690	6249267	No	0.07
P7N13	OnGrade	Junction Pit		0.50	44.99		0	336679	6249275	Yes	No Inlet
P7Q2	OnGrade	Hornsby Council		4.00	46.53		0	336678	6249256	No	0.29
P7Q1	OnGrade	Junction Pit		0.50	45.34		0	336667	6249265	Yes	No Inlet
P7V5	OnGrade	Hornsby Council		4.00	41.20		0	336455	6249357	No	0.13
P7V4	OnGrade	Grated Inlet Pit		2.10	40.10		0	336467	6249363	No	0.01
P7V3	Node				38.48			336474	6249377		No Inlet
P7V2	OnGrade	Hornsby Council		4.00	36.25		0	336478	6249399	No	0.04
P7V1	OnGrade	Hornsby Council		2.60	35.26		0	336479	6249406	No	0.01
P7V1_1	OnGrade	Junction Pit		0.50	35.11		0	336479	6249407	Yes	No Inlet
P7V1_2	OnGrade	Junction Pit		0.50	35.11		0	336479	6249407	Yes	No Inlet
P7V1_3	OnGrade	Junction Pit		0.50	35.10		0	336479	6249408	Yes	No Inlet
P7V1_4	OnGrade	Junction Pit		0.50	35.10		0	336480	6249408	Yes	No Inlet
P7V1_5	OnGrade	Junction Pit		0.50	34.88		0	336480	6249409	Yes	No Inlet
P7V1_6	OnGrade	Junction Pit		0.50	34.88		0	336480	6249409	Yes	No Inlet
P7V1_7	OnGrade	Junction Pit		0.50	34.72		0	336481	6249410	Yes	No Inlet
P7V1_8	OnGrade	Junction Pit		0.50	34.72		0	336481	6249410	Yes	No Inlet
P7V1_9	OnGrade	Junction Pit		0.50	34.54		0	336481	6249411	Yes	No Inlet
P7V1_10	OnGrade	Junction Pit		0.50	34.53		0	336482	6249411	Yes	No Inlet
P7V1_11	OnGrade	Junction Pit		0.50	34.50		0	336482	6249411	Yes	No Inlet
P7V1_12	OnGrade	Junction Pit		0.50	34.46		0	336483	6249411	Yes	No Inlet
P7V1_13	OnGrade	Junction Pit		0.50	34.34		0	336483	6249411	Yes	No Inlet
P7V1_14	OnGrade	Junction Pit		0.50	34.18		0	336484	6249411	Yes	No Inlet
P7V1_15	OnGrade	Junction Pit		0.50	34.18		0	336484	6249411	Yes	No Inlet
P7V1_16	OnGrade	Junction Pit		0.50	34.17		0	336484	6249410	Yes	No Inlet
P7V1_17	OnGrade	Junction Pit		0.50	34.17		0	336485	6249410	Yes	No Inlet
P7V1_18	OnGrade	Junction Pit		0.50	33.68		0	336485	6249410	Yes	No Inlet
P7V1_19	OnGrade	Junction Pit		0.50	33.60		0	336486	6249410	Yes	No Inlet
P7V1_20	OnGrade	Junction Pit		0.50	33.60		0	336486	6249410	Yes	No Inlet
P7A5	OnGrade	Junction Pit		0.70	31.98		0	336509	6249390	Yes	No Inlet
P7T4	OnGrade	Hornsby Council		4.00	42.80		0	336526	6249326	No	0.45
P7T3	OnGrade	Grated Inlet Pit		2.50	39.58		0	336482	6249363	No	0.20
P7T2	OnGrade	Hornsby Council		2.90	39.54		0	336480	6249364	No	0.00
P7T1	OnGrade	Grated Inlet Pit		2.80	39.50		0	336477	6249366	No	0.00
P7A6	OnGrade	Junction Pit		1.80	39.46		0	336473	6249368	Yes	No Inlet
P7U2	OnGrade	Hornsby Council		4.00	41.89		0	336468	6249348	No	0.05
P7U1	OnGrade	Hornsby Council		2.60	41.39		0	336470	6249352	No	0.01
P7X12	OnGrade	Hornsby Council		4.00	52.19		0	336618	6249193	No	0.80
P7X10	OnGrade	Grated Inlet Pit		3.30	52.17		0	336606	6249201	No	0.02
P7X8	OnGrade	Hornsby Council		3.30	52.01		0	336598	6249207	No	0.01
P7X7	OnGrade	Junction Pit		0.50	51.97		0	336594	6249211	Yes	No Inlet
P7X6	OnGrade	Junction Pit		0.50	51.34		0	336587	6249216	Yes	No Inlet
P7X5	OnGrade	Junction Pit		0.50	50.36		0	336571	6249228	Yes	No Inlet
P7X4	Node				49.76			336566	6249231		No Inlet
P7X11	Sag	Hornsby Council	5	4.00	52.32	0.2	0.5	336606	6249193	No	1.02
P7X9	OnGrade	Hornsby Council		4.00	52.29		0	336592	6249201	No	0.09
P7W2	OnGrade	Hornsby Council		4.00	45.50		0	336479	6249317	No	0.18
P7W1	OnGrade	Junction Pit		0.50	44.96		0	336469	6249324	Yes	No Inlet
P7A6A	OnGrade	Junction Pit		3.50	43.91		0	336453	6249334	Yes	No Inlet
P7A6A_1	OnGrade	Junction Pit		2.50	42.63		0	336453	6249344	Yes	No Inlet
P7X3	OnGrade	Hornsby Council		4.00	46.02		0	336472	6249305	No	0.61
P7X1	OnGrade	Junction Pit		0.40	45.98		0	336463	6249312	Yes	No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P7A6C	OnGrade	Junction Pit		1.80	45.35		0	336452	6249320	Yes	No Inlet
P7A6B	OnGrade	Junction Pit		0.80	44.93		0	336452	6249324	Yes	No Inlet
P7X2	OnGrade	Kerb Inlet		4.00	46.59		0	336464	6249302	No	0.71
P7Y8	Sag	Hornsby Council	5	4.00	49.06	0.2	0.5	336369	6249350	No	0.38
P7Y6	Sag	Hornsby Council	5	2.00	49.12	0.2	0.5	336387	6249352	No	0.11
P7Y6_1	OnGrade	Junction Pit		2.50	48.47		0	336415	6249350	Yes	No Inlet
P7Y6_2	OnGrade	Junction Pit		0.50	48.31		0	336417	6249347	Yes	No Inlet
P7Y4	Sag	Hornsby Council	5	4.10	47.98	0.2	0.5	336417	6249327	No	0.11
P7Y3	Sag	Hornsby Council	5	2.50	47.82	0.2	0.5	336420	6249327	No	0.03
P7Y2	OnGrade	Grated Inlet Pit		1.50	47.17		0	336435	6249325	No	0.02
P7Y1	OnGrade	Hornsby Council		3.00	45.13		0	336450	6249324	No	0.36
P7Y7	OnGrade	Hornsby Council		4.00	49.06		0	336382	6249357	No	0.03
P7Y5	OnGrade	Hornsby Council		4.00	48.30		0	336417	6249320	No	0.29
P7AA3	OnGrade	Hornsby Council		4.00	53.39		0	336408	6249196	No	0.04
P7AA2	OnGrade	Hornsby Council		4.50	53.43		0	336405	6249193	No	0.05
P7A9A	OnGrade	Grated Inlet Pit		2.00	53.43		0	336411	6249189	No	0.15
P7A9	OnGrade	Junction Pit		0.50	52.42		0	336434	6249222	Yes	No Inlet
P7A8	OnGrade	Junction Pit		0.50	52.34		0	336443	6249227	Yes	No Inlet
P7A7B	OnGrade	Junction Pit		2.00	51.87		0	336447	6249233	Yes	No Inlet
P7A7A	OnGrade	Junction Pit		0.80	51.85		0	336447	6249234	Yes	No Inlet
P7A7	OnGrade	Junction Pit		0.00	51.80		0	336447	6249239	Yes	No Inlet
P7AA1	OnGrade	Junction Pit		0.50	53.71		0	336423	6249181	Yes	No Inlet
P7AE1	OnGrade	Hornsby Council		4.00	56.83		0	336539	6249126	No	0.08
P7AE1A	OnGrade	Junction Pit		2.20	56.56		0	336546	6249134	Yes	No Inlet
P7AD1_1	OnGrade	Kerb Inlet		2.20	55.40		0	336516	6249157	No	0.56
P7AD1	Sag	Hornsby Council	5	3.20	52.69	0.2	0.5	336445	6249213	No	0.63
P7AD2	OnGrade	Hornsby Council		4.00	57.90		0	336574	6249110	No	0.54
P7AD2_1	OnGrade	Junction Pit		0.50	56.92		0	336554	6249127	Yes	No Inlet
P7AE1B	OnGrade	Hornsby Council		3.80	56.88		0	336551	6249129	No	0.45
P7AE1B_1	OnGrade	Junction Pit		0.50	56.87		0	336550	6249130	Yes	No Inlet
P7AJ3	OnGrade	Hornsby Council		4.00	64.00		0	336566	6249037	No	0.03
P7AJ2	OnGrade	Hornsby Council		3.10	62.68		0	336543	6249055	No	0.01
P7AJ1	OnGrade	Junction Pit		2.00	60.09		0	336562	6249080	Yes	No Inlet
P7AFA0	OnGrade	Junction Pit		2.00	58.12		0	336531	6249104	Yes	No Inlet
P7AFA2	Sag	Hornsby Council	5	4.00	60.08	0.2	0.5	336506	6249073	No	1.08
P7AFA1	OnGrade	Junction Pit		0.00	58.53		0	336527	6249099	Yes	No Inlet
P7Z11	OnGrade	Hornsby Council		4.00	59.58		0	336194	6249221	No	0.18
P7Z5D	OnGrade	Junction Pit		2.00	59.51		0	336202	6249219	Yes	No Inlet
P7Z5C	OnGrade	Junction Pit		1.80	59.47		0	336206	6249219	Yes	No Inlet
P7Z5C_1	OnGrade	Junction Pit		0.50	59.22		0	336228	6249215	Yes	No Inlet
P7Z5B	OnGrade	Junction Pit		1.00	59.20		0	336253	6249197	Yes	No Inlet
P7Z5B_1	OnGrade	Junction Pit		0.50	59.16		0	336258	6249196	Yes	No Inlet
P7Z5A	OnGrade	Junction Pit		1.00	59.12		0	336267	6249188	Yes	No Inlet
P7Z5	OnGrade	Grated Inlet Pit		2.50	58.51		0	336298	6249165	No	0.02
P7Z4	OnGrade	Junction Pit		0.50	55.72		0	336326	6249201	Yes	No Inlet
P7Z4_1	OnGrade	Junction Pit		2.50	53.16		0	336361	6249247	Yes	No Inlet
P7ZA2	OnGrade	Junction Pit		2.50	53.12		0	336366	6249246	Yes	No Inlet
P7Z1	OnGrade	Junction Pit		1.20	52.27		0	336415	6249238	Yes	No Inlet
P7Z10	OnGrade	Hornsby Council		4.00	59.95		0	336197	6249211	No	0.33
P7Z9	OnGrade	Hornsby Council		4.00	59.84		0	336202	6249212	No	0.70
P7Z8	Sag	Hornsby Council	5	4.00	59.70	0.13	0.5	336252	6249194	No	0.09
P7Z7	OnGrade	Grated Inlet Pit		4.00	59.65		0	336259	6249180	No	0.37
P7Z6	OnGrade	Hornsby Council		4.00	58.83		0	336292	6249161	No	1.21
P7Z3	OnGrade	Hornsby Council		4.00	53.16		0	336362	6249240	No	0.30
P7Z2	Sag	Hornsby Council	5	4.00	52.31	0.2	0.5	336414	6249230	No	0.24
P7AB1	OnGrade	Hornsby Council		4.00	54.52		0	336399	6249163	No	0.54
P7A10A	OnGrade	Junction Pit		2.00	54.44		0	336397	6249164	Yes	No Inlet
P7A10A_1	OnGrade	Junction Pit		0.50	54.44		0	336397	6249165	Yes	No Inlet
P7A10	OnGrade	Junction Pit		0.50	53.75		0	336404	6249178	Yes	No Inlet
P7AC6	OnGrade	Hornsby Council		4.00	58.57		0	336314	6249142	No	1.16
P7AC5	OnGrade	Junction Pit		0.00	57.77		0	336325	6249151	Yes	No Inlet
P7AC4	OnGrade	Junction Pit		0.50	57.10		0	336328	6249155	Yes	No Inlet
P7AC3	OnGrade	Hornsby Council		3.90	54.58		0	336356	6249193	No	0.46
P7AC2	OnGrade	Junction Pit		0.50	54.50		0	336379	6249176	Yes	No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P7AC1	OnGrade	Junction Pit		0.00	54.48		0	336394	6249167	Yes	No Inlet
P7AI2	OnGrade	Hornsby Council		4.00	60.85		0	336417	6249029	No	0.09
P7AI1	OnGrade	Hornsby Council		3.60	61.00		0	336414	6249025	No	0.02
P7AH1	OnGrade	Grated Inlet Pit		1.20	61.00		0	336411	6249021	No	0.13
P7A11A	OnGrade	Junction Pit		3.50	58.48		0	336358	6249066	Yes	No Inlet
P7A11	Sag	Hornsby Council	5	1.60	57.92	0.2	0.5	336373	6249104	No	0.06
P7AK4	Sag	Hornsby Council	5	4.00	66.11	0.1	0.5	336507	6248891	No	0.16
P7AK3	OnGrade	Hornsby Council		4.00	66.08		0	336503	6248895	No	0.03
P7AK3_1	OnGrade	Junction Pit		0.50	66.04		0	336493	6248902	Yes	No Inlet
P7AK0A	OnGrade	Junction Pit		2.20	63.38		0	336461	6248951	Yes	No Inlet
P7AH3A	OnGrade	Hornsby Council		2.60	62.51		0	336427	6248982	No	0.01
P7AH3	OnGrade	Grated Inlet Pit		1.20	62.47		0	336430	6248986	No	0.01
P7AH2	OnGrade	Grated Inlet Pit		2.90	62.47		0	336439	6248998	No	0.02
P7AK2	OnGrade	Hornsby Council		4.00	63.43		0	336460	6248949	No	0.46
P7AK1	OnGrade	Grated Inlet Pit		4.00	63.46		0	336464	6248954	No	0.36
P7AO2	OnGrade	Junction Pit		0.50	67.53		0	336543	6248893	Yes	No Inlet
P7AN3	OnGrade	Grated Inlet Pit		2.70	67.49		0	336541	6248890	No	0.10
P7AN2	OnGrade	Junction Pit		0.50	67.30		0	336537	6248893	Yes	No Inlet
P7AN1	OnGrade	Hornsby Council		3.50	66.53		0	336520	6248907	No	0.05
P7AN0A	OnGrade	Junction Pit		0.50	66.12		0	336516	6248904	Yes	No Inlet
P7AO1	OnGrade	Junction Pit		0.50	67.35		0	336540	6248896	Yes	No Inlet
P7AN5	OnGrade	Hornsby Council		4.00	68.48		0	336560	6248875	No	0.54
P7AN4	OnGrade	Grated Inlet Pit		3.10	67.66		0	336543	6248888	No	0.03
P7AM1	OnGrade	Hornsby Council		4.00	66.59		0	336522	6248911	No	0.10
P7AM1_1	OnGrade	Junction Pit		2.50	66.18		0	336518	6248910	Yes	No Inlet
P7AL2	OnGrade	Hornsby Council		4.00	66.26		0	336497	6248878	No	0.13
P7AL0A	OnGrade	Junction Pit		2.50	66.12		0	336499	6248883	Yes	No Inlet
P7AL1	OnGrade	Hornsby Council		4.00	66.26		0	336501	6248881	No	0.14
P7AP1	Sag	Hornsby Council	5	4.00	62.52	0.2	0.5	336427	6248974	No	1.17
P7AH3B	OnGrade	Junction Pit		1.80	62.40		0	336423	6248976	Yes	No Inlet
P7AH9	OnGrade	Hornsby Council		4.00	68.85		0	336511	6248811	No	0.14
P7AH5	OnGrade	Hornsby Council		2.00	68.49		0	336500	6248812	No	0.02
P7AH4	OnGrade	Hornsby Council		2.40	64.47		0	336392	6248925	No	0.14
P7AH4_1	OnGrade	Junction Pit		0.50	64.22		0	336393	6248935	Yes	No Inlet
P7AH8	OnGrade	Hornsby Council		4.00	69.15		0	336518	6248802	No	1.21
P7AH6	OnGrade	Hornsby Council		3.40	69.06		0	336515	6248796	No	0.11
P7AH7	OnGrade	Hornsby Council		4.00	71.51		0	336581	6248729	No	0.04
P7A14	OnGrade	Hornsby Council		4.00	63.04		0	336320	6248987	No	2.26
P7A13	OnGrade	Hornsby Council		3.00	63.05		0	336323	6248983	No	2.78
P7A12	OnGrade	Junction Pit		0.70	60.45		0	336338	6249018	Yes	No Inlet
P7A11C	OnGrade	Junction Pit		0.50	60.40		0	336340	6249023	Yes	No Inlet
P7A11B	OnGrade	Junction Pit		0.90	59.24		0	336348	6249041	Yes	No Inlet
P7AQ3	Sag	Hornsby Council	5	4.00	60.82	0.2	0.5	336334	6249022	No	0.79
P7AQ2	Sag	Hornsby Council	5	4.00	60.60	0.2	0.5	336337	6249026	No	0.09
P7AQ1	Sag	Hornsby Council	5	4.00	59.27	0.2	0.5	336345	6249044	No	0.31
P11A3	OnGrade	Grated Inlet Pit		4.00	8.74		0	336678	6249458	No	0.09
P11A2	OnGrade	Junction Pit		0.80	8.57		0	336703	6249488	Yes	No Inlet
P11ZA1	OnGrade	Junction Pit		3.10	8.19		0	336704	6249505	Yes	No Inlet
P10A3	OnGrade	Hornsby Council		2.50	8.50		0	336713	6249537	Yes	No Inlet
P10A3_1	OnGrade	Junction Pit		2.50	7.68		0	336702	6249546	Yes	No Inlet
P10A2	OnGrade	Junction Pit		0.50	7.64		0	336715	6249563	Yes	No Inlet
P10A1	OnGrade	Junction Pit		2.50	7.60		0	336729	6249580	Yes	No Inlet
P12A4	OnGrade	Grated Inlet Pit		4.00	24.53		0	336758	6249415	No	0.03
P12A2	OnGrade	Grated Inlet Pit		3.80	22.58		0	336763	6249418	No	0.01
P12A1	OnGrade	Junction Pit		2.50	19.66		0	336738	6249442	Yes	No Inlet
P12A1_1	OnGrade	Junction Pit		0.50	10.14		0	336741	6249451	Yes	No Inlet
P12A1_2	OnGrade	Junction Pit		0.50	8.55		0	336759	6249490	Yes	No Inlet
P12A3	OnGrade	Hornsby Council		4.00	26.36		0	336764	6249410	No	0.01
P8B1	OnGrade	Grated Inlet Pit		4.00	29.87		0	336782	6249660	No	0.17
P8A1	OnGrade	Junction Pit		2.50	29.83		0	336779	6249672	Yes	No Inlet
P8A0	OnGrade	Junction Pit		0.50	29.22		0	336777	6249671	Yes	No Inlet
P8outlet	OnGrade	Junction Pit		2.50	27.02		0	336773	6249667	Yes	No Inlet
P8A3	Sag	Hornsby Council	5	4.00	32.64	0.2	0.5	336794	6249678	No	0.46
P8A2	OnGrade	Junction Pit		0.00	32.60		0	336790	6249675	Yes	No Inlet

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P15A4	OnGrade	Hornsby Council		4.00	23.63		0	336877	6249345	No	0.24
P15A3	OnGrade	Junction Pit		0.00	23.61		0	336879	6249356	Yes	No Inlet
P15A2	OnGrade	Junction Pit		2.50	22.96		0	336890	6249374	Yes	No Inlet
P15A1	OnGrade	Grated Inlet Pit		3.20	21.76		0	336886	6249380	No	0.06
P14A4	OnGrade	Grated Inlet Pit		4.00	20.69		0	336819	6249388	No	0.00
P14A3	OnGrade	Hornsby Council		4.40	19.11		0	336825	6249388	No	0.08
P14A2	OnGrade	Grated Inlet Pit		3.30	19.07		0	336817	6249395	No	0.02
P14A1	OnGrade	Junction Pit		0.00	16.10		0	336834	6249421	Yes	No Inlet
P14A1_1	OnGrade	Junction Pit		0.50	16.06		0	336851	6249447	Yes	No Inlet
P16A1	OnGrade	Grated Inlet Pit		4.00	27.50		0	336905	6249323	No	0.20
P13F2	OnGrade	Grated Inlet Pit		4.00	39.63		0	336946	6249269	No	0.04
P13F1	OnGrade	Grated Inlet Pit		3.00	39.59		0	336940	6249274	No	0.00
P13E1	OnGrade	Grated Inlet Pit		2.60	39.57		0	336940	6249276	No	0.01
P13E2	OnGrade	Junction Pit		0.50	37.73		0	336923	6249289	Yes	No Inlet
P13E3	OnGrade	Junction Pit		0.50	36.62		0	336914	6249296	Yes	No Inlet
P13G2	OnGrade	Grated Inlet Pit		4.00	38.33		0	336927	6249285	No	0.03
P13G1	Sag	Grated Inlet Pit	5	3.60	38.06	0.2	0.5	336924	6249286	No	0.00
P13A17	OnGrade	Hornsby Council		4.00	48.11		0	336980	6249261	No	0.08
P13A16	OnGrade	Grated Inlet Pit		2.60	46.97		0	336970	6249266	No	0.01
P13BA15	Sag	Hornsby Council	5	3.40	44.98	0.2	0.5	336945	6249361	No	0.83
P13BA14	Sag	Grated Inlet Pit	5	1.40	44.77	0.2	0.5	336939	6249390	No	0.35
P13BA13	Sag	Grated Inlet Pit	5	1.20	44.56	0.2	0.5	336933	6249414	No	0.20
P13BA12	OnGrade	Grated Inlet Pit		2.00	44.33		0	336930	6249431	No	0.28
P13BA11	Sag	Grated Inlet Pit	5	3.30	43.90	0.2	0.5	336926	6249449	No	0.47
P13BA10	OnGrade	Hornsby Council		2.10	43.89		0	336908	6249493	No	0.36
P13BA9	OnGrade	Junction Pit		2.50	43.79		0	336903	6249515	Yes	No Inlet
P13BA8	Node				33.99			336886	6249508		No Inlet
P13A19	OnGrade	Hornsby Council		4.00	51.74		0	337016	6249234	No	0.39
P13A18	Node				51.41			337011	6249232		No Inlet
P13D1	OnGrade	Grated Inlet Pit		4.00	46.98		0	336975	6249279	No	0.04
P17B2	OnGrade	Hornsby Council		4.00	29.48		0	336795	6249342	No	0.04
P17B1	Sag	Hornsby Council	5	2.20	29.14	0.2	0.5	336788	6249348	No	0.14
P17A10	OnGrade	Hornsby Council		1.30	28.92		0	336785	6249355	No	0.00
P17A9	OnGrade	Grated Inlet Pit		2.60	28.96		0	336781	6249358	No	0.01
P17A8	OnGrade	Junction Pit		0.00	28.70		0	336783	6249361	Yes	No Inlet
P17A7	Node				28.14			336785	6249366		No Inlet
P17C2	OnGrade	Hornsby Council		4.00	29.71		0	336805	6249335	No	0.56
P17C1	OnGrade	Grated Inlet Pit		3.30	29.48		0	336802	6249337	No	0.00
P17A11	OnGrade	Hornsby Council		2.50	29.44		0	336803	6249340	No	0.01
P17A7_1	OnGrade	Junction Pit		0.50	27.56		0	336789	6249370	Yes	No Inlet
P17A15A	OnGrade	Junction Pit		0.50	25.68		0	336804	6249386	Yes	No Inlet
P17A5	OnGrade	Grated Inlet Pit		3.70	25.70		0	336808	6249383	No	0.07
P17A4	OnGrade	Hornsby Council		1.60	25.68		0	336825	6249369	No	0.11
P17A3A	OnGrade	Hornsby Council		2.00	24.89		0	336860	6249340	No	0.43
P17A2A	OnGrade	Junction Pit		0.50	26.78		0	336887	6249319	Yes	No Inlet
P17A1A	OnGrade	Junction Pit		2.50	26.74		0	336892	6249314	Yes	No Inlet
P17A6	OnGrade	Hornsby Council		4.00	25.77		0	336801	6249389	No	0.21
P17E1	OnGrade	Hornsby Council		4.00	45.63		0	336947	6249223	No	0.05
P17A17	OnGrade	Hornsby Council		2.50	45.55		0	336949	6249225	No	0.05
P17A16	OnGrade	Grated Inlet Pit		1.70	40.65		0	336946	6249229	No	0.00
P17A15	OnGrade	Grated Inlet Pit		1.40	39.53		0	336937	6249235	No	0.06
P17A14	OnGrade	Junction Pit		0.00	38.39		0	336918	6249249	Yes	No Inlet
P17A13	OnGrade	Junction Pit		0.50	37.73		0	336907	6249258	Yes	No Inlet
P17A12	OnGrade	Grated Inlet Pit		1.50	30.51		0	336816	6249329	No	0.17
P17A18	Sag	Hornsby Council	5	4.00	46.51	0.2	0.5	336957	6249212	No	0.40
P13BA7	OnGrade	Junction Pit		4.00	21.16		0	336877	6249484	No	No Inlet
P13BA6	OnGrade	Junction Pit		0.50	21.00		0	336884	6249473	Yes	No Inlet
P13BA5	OnGrade	Junction Pit		2.50	20.99		0	336887	6249440	Yes	No Inlet
P13BA4	OnGrade	Junction Pit		0.50	19.61		0	336872	6249440	Yes	No Inlet
P13BA3	OnGrade	Junction Pit		2.50	19.60		0	336860	6249448	Yes	No Inlet
P13BA2	OnGrade	Junction Pit		0.00	15.00		0	336844	6249461	Yes	No Inlet
P13BC2	OnGrade	Grated Inlet Pit		4.00	44.23		0	336932	6249494	No	0.14
P13BC1	OnGrade	Junction Pit		2.50	44.02		0	336928	6249488	Yes	No Inlet
P13BB2	Sag	Grated Inlet Pit	5	4.00	43.72	0.2	0.5	336864	6249552	No	0.18

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P13BB1	Sag	Grated Inlet Pit	5	3.50	43.68	0.2	0.5	336891	6249519	No	0.18
P19A2	OnGrade	Hornsby Council		4.00	47.76		0	336939	6249161	No	0.20
P19C1	OnGrade	Hornsby Council		4.00	48.00		0	336944	6249162	No	0.10
P19B1	OnGrade	Hornsby Council		4.00	47.75		0	336935	6249168	No	0.31
P19A1	OnGrade	Junction Pit		1.30	47.75		0	336939	6249166	Yes	No Inlet
P19D2	OnGrade	Grated Inlet Pit		4.00	54.65		0	336904	6249078	No	0.33
P19D1	OnGrade	Hornsby Council		3.50	54.49		0	336900	6249081	No	0.04
P19D1_1	OnGrade	Junction Pit		2.50	47.79		0	336939	6249166	Yes	No Inlet
P18B1	OnGrade	Hornsby Council		4.00	48.95		0	336858	6249183	No	0.20
P18A2	OnGrade	Junction Pit		1.70	48.91		0	336853	6249185	Yes	No Inlet
P18A1	OnGrade	Junction Pit		2.50	46.40		0	336875	6249213	Yes	No Inlet
P18A1_1	OnGrade	Junction Pit		2.50	46.38		0	336914	6249207	Yes	No Inlet
P18C1	OnGrade	Hornsby Council		4.00	49.01		0	336854	6249181	No	0.03
P18D1	OnGrade	Hornsby Council		4.00	49.00		0	336849	6249184	No	0.03
P18E2	OnGrade	Hornsby Council		4.00	52.16		0	336841	6249147	No	0.05
P18E1	OnGrade	Junction Pit		0.50	51.83		0	336835	6249151	Yes	No Inlet
P18A4	OnGrade	Grated Inlet Pit		1.70	51.35		0	336831	6249157	No	0.01
P18A3	OnGrade	Junction Pit		0.50	50.98		0	336835	6249161	Yes	No Inlet
P18F2	OnGrade	Hornsby Council		4.00	52.31		0	336833	6249136	No	0.36
P18F1	OnGrade	Junction Pit		2.50	51.78		0	336823	6249144	Yes	No Inlet
P18A4A	OnGrade	Junction Pit		0.50	51.76		0	336823	6249147	Yes	No Inlet
P18H1	OnGrade	Hornsby Council		4.00	52.02		0	336820	6249139	No	0.08
P18A4B	OnGrade	Junction Pit		1.60	51.86		0	336820	6249142	Yes	No Inlet
P18G1	OnGrade	Hornsby Council		4.00	51.90		0	336816	6249141	No	0.01
P18I1	OnGrade	Grated Inlet Pit		4.00	53.34		0	336802	6249109	No	0.35
P18A5	OnGrade	Junction Pit		1.30	53.16		0	336799	6249115	Yes	No Inlet
P18L1	OnGrade	Grated Inlet Pit		4.00	53.20		0	336799	6249110	No	0.01
P18K1	OnGrade	Grated Inlet Pit		4.00	53.26		0	336795	6249114	No	0.01
P18M1	OnGrade	Hornsby Council		4.00	55.90		0	336780	6249082	No	0.10
P18A6	OnGrade	Grated Inlet Pit		1.90	55.33		0	336776	6249085	No	0.00
P18N1	OnGrade	Hornsby Council		4.00	56.48		0	336772	6249067	No	1.01
P18A7	OnGrade	Junction Pit		1.80	56.16		0	336767	6249074	Yes	No Inlet
P18O1	OnGrade	Hornsby Council		4.00	56.39		0	336765	6249068	No	0.06
P18A8	OnGrade	Junction Pit		1.60	56.35		0	336764	6249070	Yes	No Inlet
P18Q2	OnGrade	Grated Inlet Pit		4.00	58.97		0	336746	6249038	No	0.34
P18Q1	OnGrade	Grated Inlet Pit		4.40	58.93		0	336742	6249038	No	0.00
P18A10	OnGrade	Junction Pit		1.70	58.83		0	336742	6249042	Yes	No Inlet
P18A9	OnGrade	Junction Pit		0.50	57.67		0	336753	6249055	Yes	No Inlet
P18P3	OnGrade	Grated Inlet Pit		4.00	59.11		0	336736	6249040	No	0.01
P18P1	OnGrade	Grated Inlet Pit		1.00	58.95		0	336740	6249042	No	0.00
P18P2	OnGrade	Grated Inlet Pit		4.00	58.91		0	336739	6249046	No	0.00
P18S2	OnGrade	Grated Inlet Pit		4.00	62.94		0	336701	6249012	No	0.35
P18S1	OnGrade	Hornsby Council		3.10	62.90		0	336710	6249005	No	0.06
P18A12	Sag	Hornsby Council	5	2.50	62.70	0.2	0.5	336713	6249003	No	0.02
P18A11	OnGrade	Junction Pit		1.70	62.06		0	336720	6249013	Yes	No Inlet
P18A11_1	OnGrade	Junction Pit		0.50	60.58		0	336728	6249023	Yes	No Inlet
P18V1	OnGrade	Hornsby Council		4.00	66.57		0	336679	6248949	No	0.03
P18A13	OnGrade	Grated Inlet Pit		3.10	66.39		0	336674	6248953	No	0.03
P18A14	OnGrade	Grated Inlet Pit		4.00	66.39		0	336672	6248951	No	0.34
P18Q3	OnGrade	Grated Inlet Pit		4.00	59.10		0	336740	6249036	No	0.04
P18R1	OnGrade	Hornsby Council		4.00	62.70		0	336728	6249006	No	0.10
P22Z2	OnGrade	Hornsby Council		4.00	44.71		0	336058	6249412	No	0.15
P6B4A	OnGrade	Junction Pit		0.50	33.67		0	336857	6249867	Yes	No Inlet
P6B3	OnGrade	Kerb Inlet		4.50	31.11		0	336787	6249886	No	1.51
P6B2	OnGrade	Hornsby Council		1.70	30.93		0	336779	6249879	No	0.27
P6B1	OnGrade	Junction Pit		2.50	29.45		0	336773	6249824	Yes	No Inlet
P5011	OnGrade	Junction Pit		0.50	22.69		0	336293	6249631	Yes	No Inlet
P5012	OnGrade	Junction Pit		0.50	23.62		0	336280	6249625	Yes	No Inlet
P7AF6	OnGrade	Grated Inlet Pit		4.00	6.73		0	336676	6249593	No	0.21
P7AF6_1	OnGrade	Junction Pit		2.50	6.72		0	336675	6249595	Yes	No Inlet
P7AF4	OnGrade	Hornsby Council		3.10	6.59		0	336676	6249597	No	0.02
P7AF2C	OnGrade	Hornsby Council		0.50	6.94		0	336679	6249601	No	0.00
P7AF2B	OnGrade	Hornsby Council		0.50	6.92		0	336681	6249603	No	0.00
P7AF2A	OnGrade	Hornsby Council		0.50	6.90		0	336694	6249620	No	0.00

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P7AF2	OnGrade	Hornsby Council		1.30	6.81		0	336698	6249625	No	0.23
P7AG6	OnGrade	Grated Inlet Pit		4.00	6.50		0	336693	6249612	No	0.01
P7AG5	OnGrade	Hornsby Council		0.50	6.78		0	336694	6249617	No	0.00
P7AG3	OnGrade	Hornsby Council		0.00	6.79		0	336696	6249620	No	0.00
P7AG1	OnGrade	Hornsby Council		3.50	6.80		0	336697	6249622	No	0.00
P7AG4	OnGrade	Grated Inlet Pit		4.00	6.51		0	336694	6249615	No	0.03
P7AF5	OnGrade	Grated Inlet Pit		4.00	6.55		0	336680	6249599	No	0.04
P11JZ3	OnGrade	Junction Pit		0.50	9.54		0	336572	6249523	Yes	No Inlet
P11JZ4	OnGrade	Grated Inlet Pit		4.70	9.27		0	336591	6249508	No	0.30
P11JZ2	OnGrade	Junction Pit		0.50	19.77		0	336678	6249439	Yes	No Inlet
P11ZA4A	OnGrade	Junction Pit		0.50	18.57		0	336669	6249446	Yes	No Inlet
P11JZ1	OnGrade	Junction Pit		0.50	15.15		0	336645	6249465	Yes	No Inlet
P11JZ0A	OnGrade	Grated Inlet Pit		4.50	9.31		0	336606	6249496	No	0.07
P7ZD2A	OnGrade	Junction Pit		0.50	33.30		0	336702	6249342	Yes	No Inlet
P7ZD1	OnGrade	Hornsby Council		4.50	33.02		0	336704	6249345	No	0.07
P11ZD1	OnGrade	Hornsby Council		4.00	8.64		0	336698	6249486	No	0.05
P11ZC1	OnGrade	Hornsby Council		4.00	8.66		0	336701	6249483	No	0.04
P11ZB4	OnGrade	Hornsby Council		4.00	8.87		0	336710	6249484	No	0.73
P11ZB3	OnGrade	Grated Inlet Pit		2.40	8.86		0	336715	6249491	No	1.18
P11ZB1	OnGrade	Grated Inlet Pit		4.20	9.20		0	336721	6249497	No	1.45
P11ZB2	OnGrade	Grated Inlet Pit		0.50	9.35		0	336721	6249500	No	0.00
P18UA1	OnGrade	Hornsby Council		4.00	66.60		0	336683	6248943	No	0.69
P18U1	OnGrade	Grated Inlet Pit		3.80	63.11		0	336713	6248998	No	0.70
P24END	OnGrade	Junction Pit		0.50	45.95		0	335444	6249406	Yes	No Inlet
P24T3	OnGrade	Grated Inlet Pit		4.00	41.52		0	335469	6249428	No	0.50
DP18H1	OnGrade	Hornsby Council		4.00	30.64		0	336776	6249926	No	0.02
P24Z1B	OnGrade	Junction Pit		0.50	46.60		0	335312	6249538	Yes	No Inlet
W5A1A	OnGrade	Junction Pit		0.50	51.72		0	336965	6249113	Yes	No Inlet
W5AE2	OnGrade	Junction Pit		0.50	61.16		0	337110	6248893	Yes	No Inlet
P1F2	OnGrade	Hornsby Council		4.00	10.97		0	336634	6249928	No	0.14
P5R1A	OnGrade	Kerb Inlet		4.00	18.62		0	336422	6249695	No	0.00
P7AG11	OnGrade	Hornsby Council		4.00	6.39		0	336689	6249608	No	0.02
P7AG10	OnGrade	Hornsby Council		2.50	6.43		0	336689	6249610	No	0.00
P7AG8	OnGrade	Hornsby Council		1.50	6.46		0	336691	6249612	No	0.00
P7AG9	OnGrade	Hornsby Council		4.00	6.41		0	336691	6249611	No	0.00
P11ZE1	OnGrade	Hornsby Council		0.50	9.36		0	336720	6249502	No	0.00
P23G2	OnGrade	Kerb Inlet		4.00	15.59		0	335969	6249725	No	0.13
P23G1	OnGrade	Hornsby Council		3.80	14.05		0	335984	6249735	No	0.01
P24A1C	OnGrade	Hornsby Council		4.00	10.61		0	335895	6249862	No	0.94
P24AA2	OnGrade	Kerb Inlet		4.00	21.32		0	335699	6249790	No	14.69
P24AA1	OnGrade	Kerb Inlet		4.50	21.14		0	335707	6249793	No	5.67
P22K19	OnGrade	Kerb Inlet		4.00	60.52		0	335889	6249275	No	0.04
P22K18	OnGrade	Kerb Inlet		3.80	57.65		0	335875	6249296	No	0.08
P22AC2	OnGrade	Kerb Inlet		3.60	57.52		0	335879	6249308	No	0.01
P22AC1	OnGrade	Kerb Inlet		1.30	54.17		0	335873	6249340	No	0.04
P22K12	OnGrade	Kerb Inlet		2.30	51.64		0	335871	6249374	No	0.04
P22K11	OnGrade	Kerb Inlet		1.10	49.25		0	335891	6249394	No	0.29
P22K10	OnGrade	Kerb Inlet		1.00	48.58		0	335910	6249396	No	0.02
P22K9	OnGrade	Kerb Inlet		3.70	47.27		0	335926	6249397	No	0.02
P22K8	OnGrade	Kerb Inlet		2.70	45.36		0	335935	6249416	No	0.03
P22K7	OnGrade	Kerb Inlet		2.80	43.99		0	335934	6249432	No	0.02
P22K6	OnGrade	Kerb Inlet		1.10	41.84		0	335936	6249452	No	0.03
P22K5_1	OnGrade	Kerb Inlet		1.00	40.66		0	335945	6249463	No	0.01
P22K4	OnGrade	Hornsby Council		3.00	40.38		0	335959	6249468	No	0.78
P22K3	OnGrade	Grated Inlet Pit		2.50	40.36		0	335963	6249463	No	0.47
P23Y2	OnGrade	Hornsby Council		4.00	47.97		0	335835	6249443	No	0.04
P23Y1_1	OnGrade	Junction Pit		0.50	43.25		0	335838	6249490	Yes	No Inlet
P23Y1	OnGrade	Hornsby Council		3.10	41.74		0	335839	6249501	No	0.01
P23U3	OnGrade	Kerb Inlet		4.00	49.65		0	335867	6249558	No	0.90
P23K6	OnGrade	Kerb Inlet		4.00	30.31		0	335877	6249607	No	0.05
P23K5	OnGrade	Kerb Inlet		2.50	29.30		0	335880	6249613	No	0.01
P23K4	OnGrade	Junction Pit		0.00	25.62		0	335900	6249648	Yes	No Inlet
P22AC3	OnGrade	Kerb Inlet		4.00	58.28		0	335886	6249297	No	0.02
P24U1	OnGrade	Hornsby Council		4.00	28.97		0	335550	6249592	No	0.23

Pit Name	Type	Family	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Blocking Factor	x	y	Bolt-down lid	Catchment Area (ha)
P24W1	OnGrade	Kerb Inlet		4.00	39.07		0	335414	6249580	No	0.01
P24AC2	OnGrade	Hornsby Council		4.00	36.37		0	335536	6249442	No	0.02
P24AC3	OnGrade	Hornsby Council		4.00	36.40		0	335536	6249440	No	0.23
P22K17	OnGrade	Hornsby Council		4.00	56.99		0	335866	6249310	No	0.03
P22K16	OnGrade	Kerb Inlet		1.20	55.78		0	335864	6249317	No	0.03
P22K15	OnGrade	Kerb Inlet		1.20	54.26		0	335863	6249339	No	0.05
P22K14	OnGrade	Kerb Inlet		1.10	52.95		0	335862	6249360	No	0.05
P22K13	OnGrade	Kerb Inlet		2.80	51.83		0	335861	6249373	No	0.03
P22AB3	OnGrade	Kerb Inlet		4.00	49.12		0	335892	6249384	No	0.14
P22AB2	OnGrade	Kerb Inlet		2.60	48.51		0	335911	6249385	No	0.06
P22AB1	OnGrade	Kerb Inlet		3.20	47.57		0	335927	6249386	No	0.05
P22AA1	OnGrade	Kerb Inlet		4.00	42.78		0	335944	6249441	No	0.63
P22K5	OnGrade	Junction Pit		0.00	40.76		0	335960	6249458	Yes	No Inlet
P7N8A	OnGrade	Kerb Inlet		4.00	34.73		0	336564	6249352	No	0.24
P7AA4	OnGrade	Kerb Inlet		4.00	53.46		0	336404	6249190	No	0.03
P22R2	OnGrade	Kerb Inlet		4.00	41.36		0	336193	6249440	No	0.02
P5017	OnGrade	Kerb Inlet		4.00	38.05		0	336300	6249492	No	1.08
P5O16	OnGrade	Hornsby Council		3.40	37.94		0	336279	6249496	No	0.04
DP18B9	OnGrade	Hornsby Council		0.50	28.95		0	336647	6250205	No	0.04
DP18B8	OnGrade	Hornsby Council		0.50	28.08		0	336638	6250194	No	0.06
DP18B7	OnGrade	Hornsby Council		4.00	27.17		0	336633	6250177	No	0.28
DP18B6	OnGrade	Hornsby Council		2.30	22.76		0	336646	6250122	No	0.28
DP18B5	OnGrade	Grated Inlet Pit		1.50	21.07		0	336654	6250102	No	0.13
DP18B4	OnGrade	Hornsby Council		1.70	20.36		0	336655	6250094	No	0.01
DP18B3	OnGrade	Hornsby Council		0.50	18.32		0	336644	6250070	No	0.01
DP18B2	OnGrade	Hornsby Council		0.50	18.09		0	336642	6250066	No	0.03
DP18B1	OnGrade	Hornsby Council		0.50	17.33		0	336639	6250061	No	0.03
DP18D1	OnGrade	Hornsby Council		0.50	28.34		0	336651	6250185	No	0.62
DP18C1	OnGrade	Hornsby Council		0.50	20.97		0	336672	6250096	No	0.05
DP18E3	OnGrade	Hornsby Council		0.50	20.51		0	336670	6250085	No	0.11
DP18E2	OnGrade	Hornsby Council		0.50	19.93		0	336665	6250076	No	0.11
DP18E2_1	OnGrade	Junction Pit		0.50	18.47		0	336657	6250059	Yes	No Inlet
DP18E1	OnGrade	Hornsby Council		4.00	18.36		0	336655	6250056	No	1.16
DP18E1A	OnGrade	Junction Pit		0.50	17.88		0	336652	6250051	Yes	No Inlet
DP18F1	OnGrade	Hornsby Council		0.50	18.36		0	336653	6250041	No	0.15
P7AG2	OnGrade	Hornsby Council		0.50	6.79		0	336699	6249619	No	0.00
P7AF3	OnGrade	Hornsby Council		0.50	6.95		0	336677	6249600	No	0.00
P7AG7	OnGrade	Hornsby Council		0.50	6.91		0	336692	6249620	No	0.00
N14514	Node							336353	6250181		1.52
P9A1	OnGrade	Hornsby Council		2.50	7.01		0	336713	6249582	Yes	No Inlet
N85312	Node							336408	6250188		0.23
P1AA0_1	Node				3.25			336548	6249789		No Inlet
P1AA0_2	Node				2.95			336303	6250055		No Inlet
P1AA0_3	Node				2.54			336283	6250077		No Inlet
W5AA5	OnGrade	Junction Pit		0.00	64.51		0	337169	6248905	Yes	No Inlet

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APPENDIX D: DRAINS RESULTS SUMMARY

APPENDIX D: DRAINS RESULTS SUMMARY

Overland	Start	End	Type	PMF_Q	100Y_Q	50Y_Q	20Y_Q	10Y_Q	5Y_Q
oDP18G2	DP18G2	DP18G1	Half Road	1.6	0.5	0.4	0.4	0.3	0.3
oDP18G1	DP18G1	DP18A7	Half Road	1.6	0.5	0.4	0.4	0.3	0.3
oDP18A7	DP18A7	DP18A6	Half Road	10.6	3.0	2.6	2.4	2.0	1.7
oDP18A6	DP18A6	DP18A5	Half Road	11.0	3.1	2.7	2.4	2.0	1.7
oDP18A5	DP18A5	DP18A4	Half Road	11.0	3.0	2.6	2.4	2.0	1.7
oDP18A4	DP18A4	DP18B1	Flow over road at sag	18.1	4.8	4.2	3.8	3.1	2.6
oDP18A3_1	DP18A3_1	DP18A3	Half Road	19.5	5.2	4.6	4.1	3.4	2.9
oDP18A3	DP18A3	DP18A2	Half Road	19.8	5.2	4.5	4.1	3.3	2.8
oDP18A2	DP18A2	Outlet	Half Road	19.9	5.2	4.5	4.1	3.3	2.8
oDP18I4	DP18I4	DP18I3	Half Road	4.8	1.4	1.3	1.1	1.0	0.8
oDP18I3	DP18I3	DP18I2	Half Road	5.7	1.6	1.5	1.3	1.1	0.9
oDP18I2	DP18I2	DP18I1	Half Road	5.9	1.8	1.5	1.4	1.2	1.1
oDP18I1	DP18I1	DP18A7	Half Road	8.9	2.5	2.2	1.9	1.6	1.4
oDP18A13	DP18A13	DP18A12	Half Road	0.4	0.0	0.0	0.0	0.0	0.0
oDP18A12	DP18A12	DP18A11	Half Road	1.3	0.2	0.2	0.2	0.1	0.1
oDP18A11	DP18A11	DP18A10	Half Road	1.9	0.4	0.3	0.3	0.2	0.1
oDP18A10	DP18A10	DP18I1	Half Road	2.7	0.6	0.5	0.5	0.4	0.3
oW5E11	W5E11	W5E10	Flow over road at sag	2.6	0.7	0.7	0.6	0.5	0.4
oW5E10	W5E10	W5K1	Half Road	2.8	0.7	0.8	0.5	0.4	0.3
oW5E9	W5E9	W5E8	Full Road	0.9	0.3	0.1	0.3	0.2	0.2
oW5E8	W5E8	W5E7	Half Road	1.1	0.4	0.1	0.3	0.2	0.2
oW5E7	W5E7	W5E5	Half Road	4.2	1.0	0.8	0.7	0.6	0.4
oW5E5	W5E5	W5E4	Full Road	6.4	1.6	1.3	1.2	0.9	0.7
oW5E4	W5E4	P13A19	Flow over road at sag	20.5	5.8	5.1	4.6	3.9	3.3
oW5E2	W5E2	W5C1	Full Road	1.8	1.6	1.6	1.5	1.6	1.4
oP1AA0	P1AA0	P1AA0_1	Channel	244.7	54.7	49.0	42.8	37.8	32.7
oW5K1	W5K1	W5E7	Half Road	3.1	0.7	0.8	0.5	0.4	0.3
oW5K3	W5K3	W5K1	Half Road	0.2	0.0	0.0	0.0	0.0	0.0
oW5H1	W5H1	W5E5	Half Road	2.3	0.6	0.5	0.5	0.4	0.3
oW5H4	W5H4	W5H2	Flow over road at sag	1.3	0.4	0.3	0.3	0.2	0.2
oW5H2	W5H2	W5H1	Half Road	1.4	0.4	0.4	0.3	0.3	0.3
oW5F1	W5F1	W5E2	Full Road	0.2	0.1	0.1	0.1	0.0	0.0
oW5G1	W5G1	W5E4	Full Road	12.9	3.6	3.1	2.8	2.3	2.0
oW5I11	W5I11	W5I1	Half Road	0.9	0.2	0.2	0.2	0.1	0.1
oW5I10	W5I10	W5I2	Half Road	0.1	0.1	0.1	0.1	0.1	0.1
oW5I9	W5I9	W5I6	Flow over road at sag	1.6	0.4	0.4	0.3	0.3	0.2
oW5I6	W5I6	W5I5	Half Road	5.2	1.4	1.2	1.1	0.9	0.8
oW5I5	W5I5	W5I3	Flow over road at sag	9.3	2.6	2.3	2.1	1.7	1.5
oW5I3	W5I3	W5I2	Through private property	9.4	2.6	2.3	2.0	1.7	1.4
oW5I8	W5I8	W5I6	Flow over road at sag	3.2	0.9	0.8	0.7	0.6	0.5
oW5I4	W5I4	W5I3	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oW5I2	W5I2	W5I1	Flow over road at sag	10.3	2.9	2.6	2.3	2.0	1.7
oW5I1	W5I1	W5G1	Through private property	11.2	3.1	2.7	2.5	2.1	1.8
oW5D1	W5D1	W5C1	Flow over road at sag	38.4	11.0	10.0	9.1	8.0	6.9
oW5C1	W5C1	P7ZJ3	Half Road	39.3	12.2	10.4	10.2	8.5	7.4
oW5B1	W5B1	P19C1	Half Road	0.4	0.5	0.4	0.4	0.4	0.5
oW5W3	W5W3	W5W2	Half Road	1.0	0.3	0.2	0.2	0.2	0.1
oW5W2	W5W2	W5O2	Half Road	9.4	2.6	2.3	2.1	1.7	1.5
oW5W1	W5W1	W5X1	Flow over road at sag	10.0	4.1	3.8	3.6	3.3	3.0
oW5X2	W5X2	W5X1	Flow over road at sag	24.1	6.6	5.9	5.3	4.7	4.1
oW5X1	W5X1	W5D1	Full Road	36.2	10.8	9.8	8.9	7.9	6.8
oW5AD4	W5AD4	W5W2	Full Road	7.6	2.2	2.0	1.8	1.5	1.3
oW5AD2	W5AD2	W5AD1	Full Road	0.7	0.3	0.2	0.2	0.2	0.2
oW5AD1	W5AD1	W5AE1	Half Road	1.0	0.3	0.3	0.3	0.2	0.2
oW5AA2	W5AA2	W5AB1	Full Road	2.3	0.5	0.4	0.4	0.3	0.2
oW5AA1	W5AA1	W5W1	Half Road	7.6	3.0	2.8	2.7	2.5	2.3
oW5AE1	W5AE1	W5AA2	Half Road	2.3	0.6	0.5	0.4	0.4	0.3
oW5AF6	W5AF6	W5AF4	Half Road	4.1	1.2	1.1	1.0	0.9	0.8
oW5AF5	W5AF5	W5AF4	Half Road	0.3	0.1	0.0	0.0	0.0	0.0
oW5AF4	W5AF4	W5AG1	Flow over road at sag	4.4	1.2	1.1	0.9	0.8	0.6
oW5AG4	W5AG4	W5U2	Full Road	0.5	0.1	0.1	0.1	0.0	0.0
oW5AG3	W5AG3	W5AG2	Full Road	0.0	0.0	0.0	0.0	0.0	0.0

Overland	Start	End	Type	PMF Q	100Y Q	50Y Q	20Y Q	10Y Q	5Y Q
oW5AG2	W5AG2	W5AG1	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oW5AG1	W5AG1	W5AD4	Full Road	4.7	1.4	1.2	1.1	0.9	0.8
oW5AI1	W5AI1	W5AC3	Full Road	0.7	0.1	0.1	0.0	0.0	0.0
oW5AA8	W5AA8	W5AI1	Flow over road at sag	0.5	0.1	0.1	0.0	0.0	0.0
oW5AB1	W5AB1	W5AA1	Half Road	5.9	1.6	1.4	1.2	1.0	0.9
oW5Z3	W5Z3	W5Z2	Half Road	2.3	0.7	0.6	0.5	0.5	0.4
oW5Z2	W5Z2	W5Z1	Half Road	2.4	0.7	0.6	0.6	0.5	0.4
oW5Z1	W5Z1	W5X1	Half Road	2.5	0.8	0.7	0.6	0.5	0.5
oW5N2	W5N2	P19D1	Half Road	0.5	0.1	0.1	0.1	0.0	0.0
oW5N1	W5N1	W5M1	Half Road	0.4	0.1	0.1	0.1	0.1	0.1
oW5A2	W5A2	W5D1	Full Road	0.2	3.7	4.0	3.1	2.6	4.1
oW5M5	W5M5	W5M4	Half Road	0.4	0.1	0.1	0.1	0.1	0.1
oW5M4	W5M4	W5M2	Half Road	22.0	6.3	5.6	5.1	4.4	3.8
oW5M3	W5M3	W5M2	Half Road	1.3	0.4	0.4	0.3	0.3	0.2
oW5M2	W5M2	W5M1	Full Road	23.3	6.6	5.8	5.3	4.5	3.9
oW5M1	W5M1	P19D2	Flow over road at sag	24.2	6.6	5.9	5.3	4.6	3.9
oW5R1	W5R1	W5Q1	Half Road	13.3	3.7	3.3	3.0	2.5	2.2
oW5A5	W5A5	W5O2	Half Road	12.8	4.0	3.6	3.3	2.9	2.5
oW5A3	W5A3	W5X2	Full Road	22.7	6.5	5.8	5.2	4.5	3.9
oW5P2	W5P2	W5M4	Half Road	17.7	5.1	4.5	4.1	3.5	3.1
oW5O4	W5O4	W5O3	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oW5O3	W5O3	W5O2	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oW5O2	W5O2	W5A3	Flow over road at sag	22.1	6.5	5.8	5.3	4.5	3.9
oW5Q4	W5Q4	W5Q3	Flow over road at sag	1.5	0.4	0.4	0.3	0.3	0.2
oW5Q3	W5Q3	W5Q2	Full Road	1.5	0.4	0.3	0.3	0.2	0.2
oW5Q2	W5Q2	W5Q1	Full Road	1.6	0.5	0.4	0.4	0.3	0.3
oW5Q1	W5Q1	W5P2	Flow over road at sag	15.8	4.5	4.0	3.6	3.1	2.7
oW5S4	W5S4	W5S3	Half Road	0.5	0.1	0.1	0.1	0.0	0.0
oW5S1	W5S1	W5R1	Half Road	10.3	2.9	2.6	2.3	2.0	1.7
oW5A6	W5A6	W5A5	Half Road	11.6	3.3	2.9	2.6	2.2	1.9
oW5S3	W5S3	W5S2	Flow over road at sag	10.1	2.9	2.6	2.4	2.0	1.8
oW5S2	W5S2	W5S1	Half Road	10.3	3.0	2.6	2.4	2.0	1.7
oW5A7	W5A7	W5U1	Half Road	6.7	2.0	1.8	1.6	1.4	1.2
oW5U6	W5U6	W5U5	Full Road	0.9	0.3	0.2	0.2	0.2	0.1
oW5U5	W5U5	W5U4	Half Road	0.9	0.3	0.2	0.2	0.2	0.1
oW5U4	W5U4	W5U2	Full Road	1.0	0.3	0.3	0.2	0.2	0.2
oW5U2	W5U2	W5U1	Full Road	4.4	1.3	1.1	1.0	0.9	0.8
oW5U1	W5U1	W5A6	Flow over road at sag	11.1	3.2	2.8	2.6	2.2	1.9
oW5T2	W5T2	W5S4	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oW5A8	W5A8	W5A7	Half Road	5.6	1.7	1.5	1.4	1.2	1.1
oW5A10	W5A10	W5A8	Half Road	5.4	1.6	1.4	1.3	1.1	1.0
oP24C2	P24C2	P24C1	Full Road	62.2	15.9	13.9	12.9	11.0	9.4
oP24C1	P24C1	P24B1	Flow over road at sag	63.8	15.9	13.9	12.8	10.9	9.4
oP26A1	P26A1	Outlet	Flow over road at sag	449.8	93.9	83.4	74.4	63.4	54.9
oP24D4	P24D4	P24D2	Half Road	0.5	0.2	0.2	0.2	0.2	0.0
oP24D3	P24D3	P24D2	Half Road	61.8	15.8	13.8	12.8	10.9	9.4
oP24D2	P24D2	P24C2	Flow over road at sag	62.2	15.9	13.9	12.9	11.0	9.4
oP24G17	P24G17	P24G16	Flow over road at sag	0.5	0.1	0.1	0.1	0.1	0.1
oP24G13	P24G13	P24G12	Full Road	0.9	0.3	0.2	0.2	0.2	0.2
oP24G16	P24G16	P24G13	Half Road	0.7	0.2	0.1	0.1	0.1	0.1
oP24G12	P24G12	P24G11	Full Road	1.8	0.5	0.5	0.4	0.3	0.3
oP24G11	P24G11	P24G10	Flow over road at sag	2.3	0.6	0.5	0.5	0.4	0.3
oP24G10	P24G10	P24G9	Full Road	2.5	0.6	0.5	0.5	0.4	0.3
oP24G9	P24G9	P24G8	Full Road	3.5	1.0	0.9	0.8	0.7	0.6
oP24G8	P24G8	P24G7	Flow over road at sag	5.0	1.4	1.2	1.1	0.9	0.8
oP24G7	P24G7	P24G6	Half Road	5.1	1.4	1.2	1.1	0.9	0.8
oP24G6	P24G6	P24G5	Half Road	5.3	1.6	1.4	1.3	1.1	0.9
oP24G5	P24G5	P24G4	Half Road	5.7	1.6	1.4	1.3	1.1	0.9
oP24G4	P24G4	P24G3	Half Road	7.3	2.0	1.7	1.6	1.3	1.1
oP24G3	P24G3	P24G2	Full Road	7.7	2.4	2.1	1.9	1.6	1.4
oP24G2	P24G2	P24G1	Full Road	7.7	2.4	2.1	1.9	1.6	1.4
oP24G1	P24G1	P24E1	Full Road	7.8	2.4	2.1	1.9	1.6	1.4
oP24AA	P24AA	P24G11	Full Road	0.4	0.1	0.1	0.1	0.0	0.0
oP24H1	P24H1	P24H0A	Full Road	0.3	0.0	0.0	0.0	0.0	0.0
oP24H0A	P24H0A	P24G4	Flow over road at sag	1.7	0.5	0.4	0.3	0.3	0.2

Overland	Start	End	Type	PMF Q	100Y Q	50Y Q	20Y Q	10Y Q	5Y Q
oP24I2	P24I2	P24I1	Half Road	0.2	0.1	0.2	0.2	0.2	0.2
oP24L1	P24L1	P24G8	Flow over road at sag	1.2	0.4	0.3	0.3	0.2	0.2
oP24I4	P24I4	P24I3	Half Road	0.4	0.1	0.1	0.1	0.0	0.0
oP24I3	P24I3	P24G8	Flow over road at sag	0.4	0.1	0.1	0.1	0.1	0.1
oP24I1	P24I1	P24H0A	Half Road	1.4	0.5	0.4	0.4	0.3	0.3
oP24E1	P24E1	P24F1	Flow over road at sag	59.7	15.6	13.7	12.7	10.8	9.3
oP24F1	P24F1	P24D3	Half Road	60.3	15.6	13.7	12.7	10.8	9.3
oP24O2	P24O2	P24O1	Full Road	12.0	3.0	2.6	2.4	2.0	1.7
oP24O1	P24O1	P24M1	Full Road	12.0	3.0	2.5	2.3	2.0	1.7
oP24N2	P24N2	P24E1	Half Road	50.5	13.6	12.0	11.1	9.5	8.2
oP24M1	P24M1	P24N2	Flow over road at sag	49.2	13.3	11.7	10.9	9.3	8.1
oP24O6	P24O6	P24AA	Full Road	0.2	0.0	0.0	0.0	0.0	0.0
oP24O4	P24O4	P24P1	Full Road	0.2	0.0	0.0	0.0	0.0	0.0
oP24O3	P24O3	P24O2	Full Road	9.6	2.5	2.1	1.9	1.6	1.4
oP24P1	P24P1	P24O3	Full Road	9.4	2.3	2.0	1.8	1.5	1.2
oP24Z1A	P24Z1A	P24Y1	Full Road	17.5	5.3	4.7	4.3	3.6	3.2
oP24Y1	P24Y1	P24X1	Flow over road at sag	19.4	5.7	5.1	4.6	4.0	3.4
oP24X2	P24X2	P24X1	Half Road	0.2	0.0	0.0	0.0	0.0	0.0
oP24X1	P24X1	P24U1	Full Road	19.6	5.7	5.1	4.6	3.9	3.4
oP24R1	P24R1	P24U1	Half Road	14.4	4.3	3.8	3.6	3.1	2.7
oP24Q1	P24Q1	P24U1	Half Road	2.5	0.7	0.6	0.5	0.4	0.3
oP24S1	P24S1	P24R1	Half Road	14.0	4.2	3.8	3.5	3.0	2.7
oP24T1	P24T1	P24Q1	Half Road	1.1	0.3	0.2	0.2	0.1	0.1
oP24V2	P24V2	P24V1	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP24V1	P24V1	P24S1	Half Road	0.7	0.2	0.1	0.1	0.1	0.1
oP24AL	P24AL	P24AC3	Full Road	0.6	0.1	0.1	0.1	0.1	0.1
oP24AC	P24AC	P24S1	Through private property	13.1	4.2	3.8	3.5	3.0	2.7
oP24AK	P24AK	P24AH	Full Road	0.0	0.0	0.0	0.0	0.0	0.0
oP24AH	P24AH	P24AF	Full Road	3.4	1.0	0.8	0.8	0.6	0.5
oP24AJ	P24AJ	P24AK	Full Road	0.0	0.0	0.0	0.0	0.0	0.0
oP24AI	P24AI	P24AH	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP24AF	P24AF	P24AC3	Full Road	10.8	3.1	2.7	2.5	2.1	1.8
oP24AP	P24AP	P24AO	Half Road	8.5	2.3	2.0	1.9	1.6	1.3
oP24AO	P24AO	P24P1	Half Road	8.4	2.3	2.0	1.8	1.5	1.3
oP24AN	P24AN	P24AM	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP24AM	P24AM	P24AC3	Through private property	0.4	0.1	0.0	0.0	0.0	0.0
oP24AS	P24AS	P24AR	Half Road	8.0	2.1	1.8	1.6	1.3	1.1
oP24AR	P24AR	P24AP	Half Road	8.3	2.4	2.1	1.9	1.6	1.4
oP24AV1	P24AV1	P24AQ5	Full Road	0.6	0.2	0.1	0.1	0.1	0.1
oP24AQ5	P24AQ5	P24AQ4	Full Road	3.3	0.8	0.7	0.6	0.5	0.4
oP24AQ4	P24AQ4	P24AQ3	Full Road	3.7	0.8	0.7	0.7	0.5	0.4
oP24AQ3	P24AQ3	P24AQ2	Flow over footpath at sag	3.8	1.0	0.9	0.8	0.7	0.5
oP24AQ2	P24AQ2	P24AS	Full Road	6.0	1.6	1.4	1.2	1.0	0.8
oP24AW1	P24AW1	P24AQ6	Full Road	0.0	0.0	0.0	0.0	0.0	0.0
oP24AQ6	P24AQ6	P24AQ5	Full Road	2.5	0.7	0.6	0.6	0.4	0.4
oP24AX1	P24AX1	P24AQ7	Full Road	0.6	0.2	0.2	0.1	0.1	0.1
oP24AQ7	P24AQ7	P24AQ6	Full Road	1.9	0.5	0.4	0.4	0.3	0.2
oP24AQ10	P24AQ10	P24AQ8	Half Road	0.6	0.1	0.1	0.1	0.1	0.1
oP24AQ9	P24AQ9	P24AQ8	Half Road	0.5	0.2	0.2	0.1	0.1	0.1
oP24AQ8	P24AQ8	P24AQ7	Full Road	1.2	0.3	0.2	0.2	0.1	0.1
oP24AT3	P24AT3	P24AQ2	Full Road	1.0	0.3	0.2	0.2	0.2	0.1
oP24AT1	P24AT1	P24AT	Full Road	1.8	0.5	0.4	0.4	0.3	0.3
oP24AT	P24AT	P24AS	Full Road	1.9	0.5	0.4	0.4	0.3	0.3
oP23C1	P23C1	P26A1	Half Road	34.6	8.4	7.1	6.7	5.6	4.8
oP23B3	P23B3	P23B1	Half Road	6.1	1.5	1.3	1.2	0.9	0.8
oP23B1	P23B1	P26A1	Half Road	69.6	16.5	14.5	13.0	11.0	9.4
oP23B2	P23B2	P23B1	Half Road	64.4	15.9	13.9	12.8	10.9	9.3
oP23D1	P23D1	P23B3	Half Road	5.4	1.4	1.2	1.0	0.8	0.7
oP23H1	P23H1	P23F3	Half Road	3.6	0.6	0.5	0.3	0.2	0.1
oP23F3	P23F3	P23F1	Half Road	4.0	0.7	0.5	0.4	0.2	0.1
oP23F1	P23F1	P23E1	Half Road	4.5	0.9	0.7	0.6	0.4	0.3
oP23F2	P23F2	P23F3	Half Road	0.3	0.1	0.1	0.1	0.0	0.0
oP23E2	P23E2	P23E1	Half Road	0.3	0.1	0.1	0.1	0.1	0.1
oP23E1	P23E1	P23D1	Half Road	4.9	1.1	0.9	0.8	0.6	0.4
oP23L2	P23L2	P23L1	Half Road	1.4	0.3	0.3	0.2	0.2	0.1

Overland	Start	End	Type	PMF Q	100Y Q	50Y Q	20Y Q	10Y Q	5Y Q
oP23L1	P23L1	P23K3	Half Road	1.4	0.3	0.2	0.2	0.1	0.1
oP23K3	P23K3	P23K2	Half Road	3.5	0.8	0.6	0.5	0.4	0.3
oP23K2	P23K2	P23H1	Half Road	3.4	0.7	0.5	0.4	0.2	0.1
oP23M1	P23M1	P23L2	Flow over road at sag	1.2	0.3	0.3	0.2	0.2	0.2
oP23O1	P23O1	P23P1	Half Road	4.2	1.3	1.2	1.1	1.0	0.9
oP23P1	P23P1	P23G2	Half Road	4.4	1.3	1.2	1.1	1.0	1.0
oP23Q1	P23Q1	P22G1	Through private property	0.5	0.1	0.1	0.1	0.1	0.1
oP23R2	P23R2	P23R1	Half Road	2.1	0.6	0.5	0.5	0.4	0.3
oP23R1	P23R1	P23O1	Half Road	2.3	0.7	0.7	0.6	0.6	0.5
oP23T2	P23T2	P23K6	Half Road	1.9	0.5	0.4	0.4	0.3	0.3
oP23X1	P23X1	P22K4	Full Road	0.7	0.0	0.0	0.0	0.0	0.0
oP23V3	P23V3	P23W2	Flow over road at sag	1.3	0.4	0.3	0.3	0.2	0.2
oP23W2	P23W2	P23T2	Half Road	1.7	0.5	0.4	0.4	0.3	0.2
oP23A9	P23A9	P23Y2	Half Road	0.4	0.1	0.1	0.0	0.0	0.0
oP23A6_1	P23A6_1	P23Y1	Full Road	0.5	0.0	0.0	0.0	0.0	0.0
oP23A8	P23A8	P23Y2	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP22C2	P22C2	P22C1	Half Road	5.6	1.6	1.4	1.2	1.2	1.1
oP22C1	P22C1	P23C1	Flow over road at sag	30.6	7.4	6.5	5.9	4.9	4.3
oP22B1	P22B1	P22C1	Half Road	25.1	6.1	5.4	4.7	4.1	3.5
oP22D2	P22D2	P22E1	Half Road	0.3	0.0	0.0	0.0	0.0	0.0
oP22E1	P22E1	P23C1	Half Road	3.6	0.9	0.8	0.7	0.6	0.5
oP22F1	P22F1	P22E1	Half Road	1.1	0.3	0.2	0.2	0.2	0.1
oP22G1	P22G1	P22B1	Half Road	18.5	4.9	4.3	3.9	3.2	2.8
oP22H2	P22H2	P22G1	Through private property	17.8	4.9	4.2	3.8	3.2	2.8
oP22H1	P22H1	P22H2	Half Road	0.2	0.1	0.1	0.1	0.1	0.1
oP22L3	P22L3	P22A3	Half Road	10.6	2.9	2.5	2.3	1.9	1.7
oP22K2	P22K2	P22A2	Half Road	1.0	0.3	0.2	0.2	0.2	0.2
oP22A2	P22A2	P22H2	Through private property	17.1	4.6	4.0	3.6	3.0	2.6
oP22L2	P22L2	P22L1	Half Road	1.2	0.3	0.3	0.2	0.2	0.2
oP22L1	P22L1	P22L3	Half Road	1.1	0.3	0.2	0.2	0.1	0.1
oP22K3B	P22K3B	P22AA1	Through private property	1.9	0.5	0.5	0.4	0.4	0.3
oP22A13	P22A13	P22A12	Through private property	1.1	0.3	0.3	0.3	0.2	0.2
oP22A12	P22A12	P22A11	Full Road	1.5	0.5	0.4	0.4	0.3	0.3
oP22A11	P22A11	P22A9	Full Road	1.5	0.4	0.4	0.4	0.3	0.3
oP22A9	P22A9	P22A8	Full Road	2.4	0.6	0.6	0.5	0.4	0.3
oP22A8	P22A8	P22A7	Full Road	2.5	0.7	0.6	0.5	0.4	0.3
oP22A7	P22A7	P22A3	Half Road	2.6	0.6	0.5	0.4	0.3	0.3
oP22A6	P22A6	P22A7	Full Road	0.2	0.0	0.0	0.0	0.0	0.0
oP22A3	P22A3	P22A2	Flow over road at sag	15.9	4.4	3.9	3.5	3.0	2.5
oP22N3	P22N3	P22N2	Full Road	0.2	0.0	0.0	0.0	0.0	0.0
oP22N2	P22N2	P22P1	Half Road	0.2	0.0	0.0	0.0	0.0	0.0
oP22M2	P22M2	P22A3	Half Road	1.5	0.4	0.4	0.3	0.3	0.2
oP22Q2	P22Q2	P22Q1	Half Road	8.7	2.5	2.2	2.0	1.6	1.4
oP22Q1	P22Q1	P22P1	Flow over road at sag	9.0	2.7	2.4	2.2	1.8	1.6
oP22P2	P22P2	P22P1	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP22P1	P22P1	P5AA	Full Road	9.4	2.8	2.5	2.3	1.9	1.7
oP22R1	P22R1	P22Q2	Half Road	8.8	2.6	2.3	2.1	1.7	1.5
oP22V2	P22V2	P22V1	Half Road	1.0	0.3	0.2	0.2	0.2	0.1
oP22V1	P22V1	P22W1	Flow over road at sag	3.5	1.1	0.9	0.8	0.7	0.6
oP22T9	P22T9	P22T7	Flow over road at sag	1.9	0.5	0.5	0.4	0.4	0.3
oP22T7	P22T7	P22T6	Full Road	1.9	0.6	0.5	0.5	0.4	0.4
oP22T6	P22T6	P22T5	Full Road	2.1	0.6	0.6	0.5	0.4	0.4
oP22T5	P22T5	P22V1	Half Road	2.1	0.6	0.5	0.4	0.4	0.3
oP22T4	P22T4	P22T3	Flow over road at sag	0.7	0.2	0.2	0.1	0.1	0.1
oP22T3	P22T3	P22V2	Half Road	0.7	0.2	0.2	0.2	0.1	0.1
oP22W3	P22W3	P22W2	Flow over road at sag	3.2	1.0	0.9	0.8	0.7	0.6
oP22W2	P22W2	P22W2_1	Full Road	3.3	1.1	0.9	0.9	0.7	0.7
oP22W2_1	P22W2_1	P22W1	Half Road	3.1	0.9	0.8	0.7	0.6	0.5
oP22W1	P22W1	P22R1	Half Road	7.8	2.3	2.0	1.9	1.6	1.4
oP21C1	P21C1	P26A1	Flow over grassed area	20.8	4.9	4.3	4.0	3.3	2.8
oP21K1	P21K1	P26A1	Footpath	1.0	0.1	0.1	0.1	0.0	0.0
oP21A3	P21A3	P21K1	Footpath	0.2	0.0	0.0	0.0	0.0	0.0
oP21G1	P21G1	P21B2	Half Road	0.3	0.0	0.0	0.0	0.0	0.0
oP21F4	P21F4	P21F3	Half Road	0.2	0.1	0.1	0.1	0.1	0.1
oP21F3	P21F3	P21F2	Half Road	0.3	0.2	0.2	0.2	0.1	0.1

Overland	Start	End	Type	PMF Q	100Y Q	50Y Q	20Y Q	10Y Q	5Y Q
oP21F2	P21F2	P21C1	Half Road	19.5	4.8	4.3	3.9	3.3	2.8
oP21H1	P21H1	P21F6	Full Road	0.3	0.1	0.0	0.0	0.0	0.0
oP21F6	P21F6	P21K1	Full Road	0.4	0.1	0.1	0.0	0.0	0.0
oP21E1	P21E1	P21B2	Half Road	0.2	0.0	0.0	0.0	0.0	0.0
oP21D1	P21D1	P21C1	Half Road	0.6	0.1	0.1	0.1	0.1	0.0
oP21B3B	P21B3B	P21B3A	Flow over road at sag	17.6	4.7	4.1	3.8	3.2	2.7
oP21B2	P21B2	P21F2	Flow over road at sag	19.3	4.9	4.2	3.9	3.3	2.8
oP21B3A	P21B3A	P21B2	Footpath	18.1	4.7	4.1	3.8	3.2	2.7
oP21B6A	P21B6A	P21B6B	Full Road	0.6	0.2	0.1	0.1	0.1	0.1
oP21B6B	P21B6B	P21B4	Full Road	0.6	0.1	0.1	0.1	0.1	0.1
oP21B3	P21B3	P21B3B	Footpath	17.2	4.6	4.1	3.7	3.1	2.7
oP21B6	P21B6	P21B4	Half Road	15.6	4.3	3.8	3.5	2.9	2.5
oP21B4	P21B4	P21B3	Flow over road at sag	17.1	4.7	4.1	3.7	3.2	2.7
oP26A2	P26A2	P26A1	Half Road	2.6	0.7	0.6	0.6	0.5	0.4
oP27A1	P27A1	Outlet	Full Road	4.6	1.2	1.0	1.0	0.8	0.6
oP25E1	P25E1	P25C1	Half Road	0.3	0.1	0.1	0.1	0.1	0.1
oP25D1	P25D1	P27A1	Half Road	0.2	0.1	0.1	0.1	0.1	0.1
oP25C1	P25C1	P27A1	Flow over road at sag	3.3	0.8	0.7	0.7	0.5	0.4
oP25G5	P25G5	P25G4	Full Road	1.0	0.3	0.2	0.2	0.2	0.1
oP25G4	P25G4	P25G2	Full Road	1.3	0.3	0.3	0.3	0.2	0.2
oP25G2	P25G2	P25G1	Full Road	1.3	0.3	0.3	0.2	0.2	0.1
oP25G1	P25G1	P25F1	Half Road	2.0	0.6	0.5	0.5	0.4	0.4
oP25F1	P25F1	P26A2	Half Road	2.4	0.7	0.7	0.6	0.5	0.5
oP25H2	P25H2	P25H1	Full Road	0.0	0.0	0.0	0.0	0.0	0.0
oP25H1	P25H1	P25G4	Full Road	0.1	0.0	0.0	0.0	0.0	0.0
oP25A2	P25A2	P25G1	Half Road	0.7	0.3	0.3	0.3	0.3	0.2
oP25A6	P25A6	P25A5	Half Road	12.1	3.1	2.8	2.5	2.1	1.8
oP25A5	P25A5	P25A4	Half Road	12.6	3.2	2.8	2.6	2.1	1.8
oP25A4	P25A4	P25A3	Half Road	13.2	3.3	2.9	2.6	2.2	1.8
oP25A3	P25A3	P1A8	Half Road	13.5	3.3	2.9	2.6	2.1	1.8
oP1AA1	P1AA1	P1A1	Half Road	66.8	16.4	14.7	13.1	11.5	9.8
oP2A1	P2A1	P3A1	Half Road	28.6	6.5	5.2	5.0	4.1	3.4
oP1A5	P1A5	P1B1	Half Road	14.3	3.5	3.0	2.7	2.2	1.9
oP1A4	P1A4	P1A3	Half Road	2.8	0.7	0.6	0.5	0.4	0.4
oP1A3	P1A3	P1A2	Half Road	2.9	0.7	0.6	0.5	0.4	0.3
oP1A2	P1A2	P26A1	Full Road	4.4	1.1	1.0	0.9	0.7	0.6
oP1A1	P1A1	P1AA0	Half Road	243.9	54.0	48.3	42.1	37.0	31.9
oP1C6	P1C6	P1D1	Half Road	0.7	0.1	0.1	0.0	0.0	0.0
oP1C5	P1C5	P1C6	Half Road	0.4	0.0	0.1	0.0	0.0	0.0
oP1C2	P1C2	P1C1	Half Road	0.3	0.1	0.0	0.0	0.0	0.0
oP1C1	P1C1	P1A4	Half Road	0.6	0.3	0.3	0.2	0.2	0.2
oP1C4	P1C4	P1C5	Half Road	0.5	0.1	0.1	0.1	0.0	0.0
oP1C3	P1C3	P1C2	Half Road	0.3	0.1	0.0	0.0	0.0	0.0
oP1D1	P1D1	P1G1	Half Road	0.8	0.0	0.0	0.0	0.0	0.0
oP1G1	P1G1	P1A6	Half Road	1.8	0.3	0.2	0.2	0.1	0.1
oP1B1	P1B1	P2A1	Half Road	14.4	3.4	3.0	2.6	2.2	1.8
oP3A1	P3A1	P1A1	Flow over road at sag	184.3	38.6	34.6	30.0	26.7	23.0
oP6A15	P6A15	P6A14	Full Road	3.9	1.1	1.0	0.9	0.7	0.6
oP6A14	P6A14	P6E1	Full Road	4.0	1.1	0.9	0.8	0.7	0.6
oP6A11	P6A11	P6A10	Full Road	0.4	0.0	0.0	0.0	0.0	0.0
oP6A10	P6A10	P6K2	Full Road	1.0	0.3	0.3	0.2	0.2	0.2
oP6A9	P6A9	P6A7	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP6A7	P6A7	P6C3	Half Road	0.9	0.6	0.6	0.6	0.5	0.5
oP6A6	P6A6	P6C2	Half Road	7.0	1.4	1.1	1.0	0.7	0.5
oW5AC2	W5AC2	W5AE1	Half Road	1.3	0.3	0.3	0.3	0.2	0.2
oP24B1	P24B1	P23B2	Half Road	64.0	15.9	13.9	12.8	10.9	9.3
oP1A8	P1A8	P1F2	Half Road	13.8	3.3	2.9	2.6	2.1	1.8
oP1A7	P1A7	P1A6	Half Road	0.4	0.1	0.1	0.0	0.0	0.0
oP1A6	P1A6	P1A4	Flow over road at sag	2.0	0.3	0.2	0.2	0.1	0.1
oP6E1	P6E1	P6K3	Flow over road at sag	4.6	1.1	1.0	0.9	0.7	0.5
oP6G4	P6G4	P6G3	Full Road	6.5	1.9	1.7	1.6	1.3	1.2
oP6G3	P6G3	P6G2	Full Road	6.3	1.8	1.6	1.4	1.2	1.0
oP6G2	P6G2	P6B3	Full Road	8.4	2.3	2.0	1.8	1.5	1.3
oP6I1	P6I1	P6A6	Half Road	0.9	0.1	0.1	0.1	0.0	0.0
oP6H1	P6H1	P6A6	Half Road	0.0	0.0	0.0	0.0	0.0	0.0

Overland	Start	End	Type	PMF Q	100Y Q	50Y Q	20Y Q	10Y Q	5Y Q
oP6H3	P6H3	P6I1	Half Road	0.9	0.2	0.2	0.1	0.1	0.1
oP6K6	P6K6	P6E1	Half Road	0.3	0.1	0.1	0.0	0.0	0.0
oP6K3	P6K3	P6K2	Full Road	4.5	1.0	0.8	0.7	0.6	0.4
oP6K2	P6K2	P6K1	Half Road	6.0	1.4	1.2	1.0	0.8	0.6
oP6K1	P6K1	P6A6	Half Road	6.0	1.4	1.2	1.0	0.8	0.6
oP6K5	P6K5	P6K3	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP6D1	P6D1	P6C0	Half Road	2.2	0.9	0.8	0.8	0.7	0.7
oP6C0	P6C0	P6C2	Flow over road at sag	3.0	1.1	1.0	0.9	0.8	0.7
oP6C3	P6C3	P6D1	Half Road	2.0	0.8	0.8	0.8	0.7	0.7
oP6C2	P6C2	P2A1	Flow over grassed area	10.1	2.4	2.1	1.8	1.4	1.2
oP6C1	P6C1	P6C0	Half Road	0.7	0.2	0.2	0.1	0.1	0.1
oP5E2	P5E2	P5E1	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP5E1	P5E1	P5B1	Half Road	65.8	16.2	14.5	12.8	11.3	9.6
oP5B1	P5B1	P1AA1	Half Road	66.0	16.4	14.6	13.1	11.5	9.8
oP5C2	P5C2	P5C1	Flow over road at sag	57.6	11.9	10.7	9.0	7.5	6.2
oP5C1	P5C1	P5A3	Half Road	58.2	12.0	10.7	9.0	7.6	6.2
oP5F2	P5F2	P5F1	Half Road	56.8	13.9	12.1	11.0	9.4	8.0
oP5F1	P5F1	P5O1	Half Road	56.9	13.9	12.1	11.1	9.4	8.1
oP5O9A	P5O9A	P5O9	Full Road	3.5	1.4	1.3	1.2	1.1	1.0
oP5O7	P5O7	P5O5	Full Road	5.2	2.0	1.8	1.7	1.5	1.4
oP5O5	P5O5	P5O2B	Full Road	6.2	2.2	2.0	1.9	1.7	1.5
oP5O2B	P5O2B	P5O2A	Half Road	8.3	2.8	2.3	2.1	1.9	1.7
oP5O2A	P5O2A	P502	Half Road	8.3	2.7	2.3	2.2	1.9	1.7
oP502	P502	P5E1	Flow over road at sag	65.3	16.1	14.3	12.8	11.2	9.6
oP5O9	P5O9	P5O7	Full Road	3.5	1.4	1.2	1.2	1.0	0.9
oP5O1	P5O1	P502	Half Road	56.8	13.9	12.1	11.1	9.4	8.0
oP5Q1	P5Q1	P5P1	Flow over road at sag	1.3	0.4	0.3	0.3	0.3	0.2
oP5P1	P5P1	P5R1A	Half Road	1.2	0.2	0.2	0.1	0.0	0.0
oP5R1	P5R1	P5R1A	Half Road	0.2	0.1	0.1	0.1	0.1	0.1
oP5P2	P5P2	P5Q1	Half Road	0.3	0.1	0.1	0.0	0.0	0.0
oP5T1	P5T1	P5O7	Half Road	1.2	0.3	0.3	0.2	0.2	0.2
oP5S1	P5S1	P5O5	Half Road	0.9	0.2	0.2	0.2	0.1	0.1
oP5W1	P5W1	P21B3B	Full Road	0.1	0.1	0.0	0.0	0.0	0.0
oP5V1	P5V1	P5O9A	Full Road	2.5	1.1	1.0	0.9	0.8	0.8
oP5U1	P5U1	P5O9A	Full Road	0.8	0.2	0.2	0.2	0.1	0.1
oP5O11A	P5O11A	P5V1	Half Road	2.4	1.0	0.9	0.9	0.8	0.7
oP5O13	P5O13	P21B6	Half Road	14.2	4.1	3.6	3.2	2.7	2.4
oP5X4	P5X4	P5X3	Half Road	0.9	0.3	0.2	0.2	0.2	0.1
oP5X3	P5X3	P5X1	Half Road	1.1	0.3	0.2	0.2	0.2	0.1
oP5X1	P5X1	P5O11A	Half Road	1.8	0.8	0.8	0.8	0.7	0.6
oP5O14	P5O14	P5O13	Half Road	13.9	4.1	3.6	3.3	2.8	2.4
oP5X2	P5X2	P5X1	Half Road	0.7	0.6	0.6	0.6	0.6	0.6
oP5Y1	P5Y1	P5O15	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP5O15	P5O15	P5X2	Half Road	0.4	0.3	0.3	0.3	0.3	0.3
oP5Z1	P5Z1	P5O14D	Full Road	2.4	0.6	0.5	0.4	0.4	0.3
oP5AC	P5AC	P5O14D	Full Road	0.8	0.2	0.1	0.1	0.1	0.1
oP5AB	P5AB	P5AC	Full Road	0.0	0.0	0.0	0.0	0.0	0.0
oP5O14D	P5O14D	P5O14	Flow over road at sag	13.8	4.1	3.6	3.3	2.8	2.4
oP5AA	P5AA	P5O14D	Full Road	10.1	3.0	2.6	2.4	2.0	1.8
oP5A8	P5A8	P5A7	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP5A7	P5A7	P5A6	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP5G6	P5G6	P5G5	Half Road	41.8	10.7	9.4	8.6	7.3	6.3
oP5G2	P5G2	P5G1	Half Road	54.6	13.8	12.0	11.1	9.4	8.1
oP5G5	P5G5	P5G3	Half Road	54.1	13.5	11.8	10.8	9.2	7.9
oP5G1	P5G1	P5F2	Half Road	55.1	13.8	12.0	11.0	9.3	8.0
oP5A6	P5A6	P5A5	Half Road	0.6	0.2	0.2	0.2	0.2	0.2
oP5A5	P5A5	P5A4	Half Road	0.6	0.2	0.1	0.1	0.1	0.1
oP5A4	P5A4	P5A3	Flow over road at sag	0.5	0.0	0.0	0.0	0.0	0.0
oP5A3	P5A3	P3A1	Half Road	59.4	12.4	11.1	9.4	8.0	6.8
oP5G3	P5G3	P5G2	Half Road	54.3	13.5	11.8	10.8	9.2	7.8
oP5L1	P5L1	P5H2	Half Road	11.7	2.9	2.5	2.3	2.0	1.7
oP5H2	P5H2	P5G5	Half Road	11.9	3.1	2.6	2.5	2.1	1.8
oP5K1	P5K1	P5I1	Flow over road at sag	0.3	0.0	0.0	0.0	0.0	0.0
oP5I1	P5I1	P5G5	Half Road	0.3	0.0	0.0	0.0	0.0	0.0
oP5H3	P5H3	P5M1	Half Road	0.1	0.0	0.0	0.0	0.0	0.0

Overland	Start	End	Type	PMF Q	100Y Q	50Y Q	20Y Q	10Y Q	5Y Q
oP5N4	P5N4	P5N3	Half Road	0.5	0.1	0.1	0.1	0.1	0.1
oP5N2	P5N2	P5N2_1	Full Road	1.8	0.6	0.5	0.5	0.4	0.3
oP5N3	P5N3	P5N2	Half Road	1.4	0.4	0.3	0.3	0.2	0.2
oP5N2_1	P5N2_1	P5N2_2	Full Road	1.8	0.5	0.5	0.4	0.4	0.3
oP5N2_2	P5N2_2	P5N2_3	Full Road	1.7	0.5	0.4	0.4	0.3	0.3
oP5N2_3	P5N2_3	P5N1	Full Road	1.7	0.5	0.4	0.4	0.3	0.3
oP5N1	P5N1	P5M2	Flow over road at sag	2.7	0.8	0.7	0.6	0.5	0.4
oP5M2	P5M2	P5M1	Full Road	11.0	2.8	2.4	2.3	1.9	1.7
oP5M1	P5M1	P5L1	Flow over road at sag	11.3	2.9	2.5	2.3	2.0	1.7
oP5M4	P5M4	P5M2	Half Road	8.1	2.0	1.8	1.6	1.4	1.2
oP7C1	P7C1	P7A1	Footpath	1.6	0.4	0.3	0.3	0.3	0.3
oP7A1	P7A1	P7B1	Footpath	4.8	3.0	2.9	3.0	2.9	2.8
oP7B1	P7B1	P3A1	Flow over grassed area	92.7	21.0	18.6	17.0	15.4	12.9
oP7D5	P7D5	P7D4	Flow over road at sag	1.9	0.6	0.5	0.5	0.4	0.3
oP7D4	P7D4	P7F7	Full Road	2.5	0.7	0.6	0.6	0.4	0.4
oP7F9	P7F9	P7F8	Half Road	53.9	11.5	10.1	8.7	7.4	6.2
oP7F8	P7F8	P7F7	Full Road	54.5	11.6	10.2	8.7	7.4	6.2
oP7F7	P7F7	P7A3	Full Road	56.5	11.9	10.6	9.0	7.5	6.2
oP7E3	P7E3	P7E2	Full Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7E2	P7E2	P7E4	Full Road	56.8	11.9	10.6	9.0	7.5	6.2
oP7E5	P7E5	P5C2	Full Road	57.5	11.9	10.7	9.0	7.5	6.2
oP7E4	P7E4	P7E5	Full Road	57.2	11.9	10.6	9.0	7.5	6.2
oP7K3	P7K3	P7K2	Half Road	3.1	1.0	0.9	0.8	0.7	0.6
oP7A3	P7A3	P7E2	Full Road	56.7	11.9	10.6	9.0	7.5	6.2
oP7K2	P7K2	P7I1	Flow over road at sag	53.3	11.5	10.2	8.8	7.5	6.3
oP7I2	P7I2	P7I1A	Half Road	0.4	0.1	0.1	0.1	0.0	0.0
oP7I1A	P7I1A	P7I1	Half Road	0.3	0.0	0.0	0.0	0.0	0.0
oP7I1	P7I1	P11JZ0A	Through private property	53.6	11.5	10.1	8.7	7.5	6.3
oP7H2	P7H2	P7H1	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP7H1	P7H1	P7I1	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP7ZC3	P7ZC3	P7ZC2	Half Road	2.4	0.7	0.7	0.6	0.5	0.5
oP7ZC2	P7ZC2	P7ZJ1	Half Road	2.5	0.8	0.7	0.7	0.5	0.5
oP7ZJ1	P7ZJ1	P7ZJ3	Flow over road at sag	7.3	2.7	2.5	2.3	2.1	2.0
oP7ZJ2	P7ZJ2	P12A3	Full Road	45.4	12.9	11.8	11.4	9.5	8.0
oP7ZJ3	P7ZJ3	P7ZJ2	Half Road	45.3	12.9	11.8	11.3	9.4	8.0
oP7S1	P7S1	P7S2	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7S2	P7S2	P7K2	Through private property	49.3	10.8	9.6	8.3	7.0	5.9
oP7N6	P7N6	P7N5	Flow over footpath at sag	0.0	0.0	0.0	0.0	0.0	0.0
oP7N5	P7N5	P7N3	Half Road	0.9	0.4	0.4	0.4	0.4	0.4
oP7N3	P7N3	P7S2	Half Road	0.9	0.5	0.5	0.5	0.5	0.4
oP7P1	P7P1	P7N8A	Half Road	31.1	7.3	6.5	5.6	4.8	4.0
oP7N8	P7N8	P7N5	Half Road	0.9	0.5	0.5	0.5	0.4	0.4
oP7N11	P7N11	P7N10	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP7N10	P7N10	P7N8	Half Road	0.2	0.0	0.0	0.0	0.0	0.0
oP7R5	P7R5	P7R4	Half Road	2.3	0.6	0.6	0.5	0.4	0.3
oP7R4	P7R4	P7R2	Flow over road at sag	30.5	7.2	6.5	5.6	4.8	4.0
oP7R3	P7R3	P7R2	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7R2	P7R2	P7P1	Full Road	30.6	7.3	6.5	5.6	4.8	4.0
oP7N16	P7N16	P7Q2	Half Road	28.0	7.0	6.3	5.5	4.8	4.0
oP7N15	P7N15	P7N14	Half Road	0.2	0.1	0.0	0.0	0.0	0.0
oP7N14	P7N14	P7ZC3	Half Road	0.3	0.0	0.0	0.0	0.0	0.0
oP7Q2	P7Q2	P7R4	Half Road	28.5	7.0	6.3	5.5	4.7	4.0
oP7V5	P7V5	P5G6	Half Road	41.0	10.6	9.3	8.6	7.3	6.3
oP7V4	P7V4	P7V3	Half Road	15.7	3.6	3.0	2.7	2.2	1.8
oP7V3	P7V3	P7V2	Half Road	17.2	4.0	3.3	3.1	2.6	2.1
oP7V2	P7V2	P7V1	Half Road	17.2	3.9	3.3	3.0	2.5	2.1
oP7V1	P7V1	P7S2	Flow over road at sag	17.2	3.9	3.3	3.0	2.5	2.0
oP7T4	P7T4	P7T3	Full Road	1.0	0.3	0.2	0.2	0.2	0.1
oP7T3	P7T3	P7T2	Full Road	1.5	0.4	0.4	0.3	0.3	0.3
oP7T2	P7T2	P7T1	Full Road	1.5	0.4	0.4	0.4	0.3	0.3
oP7T1	P7T1	P7V3	Half Road	1.4	0.4	0.3	0.3	0.2	0.2
oP7U2	P7U2	P7U1	Half Road	15.8	3.7	3.1	2.8	2.3	2.0
oP7U1	P7U1	P7V4	Half Road	15.8	3.6	3.1	2.8	2.3	1.9
oP7X12	P7X12	P7X10	Full Road	10.1	2.6	2.2	2.1	1.7	1.4
oP7X10	P7X10	P7X8	Flow over road at sag	12.5	3.3	2.8	2.6	2.2	1.9

Overland	Start	End	Type	PMF Q	100Y Q	50Y Q	20Y Q	10Y Q	5Y Q
oP7X8	P7X8	P7X4	Full Road	12.6	3.3	2.7	2.6	2.1	1.8
oP7X4	P7X4	P7X3	Full Road	12.8	3.4	2.9	2.7	2.3	2.0
oP7X11	P7X11	P7X10	Half Road	2.3	0.7	0.6	0.6	0.5	0.4
oP7X9	P7X9	P7X8	Half Road	0.2	0.0	0.0	0.0	0.0	0.0
oP7W2	P7W2	P7U2	Half Road	15.8	3.7	3.2	2.9	2.4	2.0
oP7X3	P7X3	P7W2	Flow over road at sag	15.5	3.7	3.2	2.9	2.4	2.1
oP7X2	P7X2	P7X3	Half Road	1.6	0.5	0.4	0.4	0.3	0.3
oP7Y8	P7Y8	P7Y7	Flow over road at sag	7.7	2.1	1.9	1.7	1.4	1.2
oP7Y6	P7Y6	P7Y7	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP7Y4	P7Y4	P7Y3	Flow over road at sag	1.0	0.3	0.3	0.3	0.2	0.2
oP7Y3	P7Y3	P7Y2	Through private property	40.0	10.5	9.1	8.5	7.2	6.2
oP7Y2	P7Y2	P7Y1	Through private property	40.0	10.4	9.0	8.4	7.2	6.2
oP7Y1	P7Y1	P7V5	Half Road	40.8	10.7	9.3	8.6	7.3	6.3
oP7Y7	P7Y7	P5M4	Through private property	7.8	2.1	1.8	1.7	1.4	1.2
oP7Y5	P7Y5	P7Y4	Half Road	0.6	0.2	0.2	0.1	0.1	0.1
oP7AA3	P7AA3	P7Z2	Through private property	31.1	8.3	7.3	6.6	5.7	4.9
oP7AA2	P7AA2	P7AA3	Flow over road at sag	1.1	0.3	0.2	0.2	0.2	0.1
oP7A9A	P7A9A	P7AA3	Flow over road at sag	29.8	8.2	7.2	6.5	5.5	4.8
oP7AE1	P7AE1	P7AD1_1	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP7AD1_1	P7AD1_1	P7AD1	Half Road	6.2	1.8	1.6	1.5	1.3	1.1
oP7AD1	P7AD1	P7Z2	Half Road	7.7	2.3	2.1	1.9	1.6	1.4
oP7AD2	P7AD2	P7AE1B	Half Road	1.2	0.3	0.3	0.3	0.2	0.2
oP7AE1B	P7AE1B	P7AD1_1	Flow over road at sag	4.8	1.4	1.3	1.2	1.0	0.9
oP7AJ3	P7AJ3	P7AJ2	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7AJ2	P7AJ2	P7AE1B	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7AFA2	P7AFA2	P7AE1B	Half Road	2.4	0.7	0.6	0.5	0.4	0.4
oP7Z11	P7Z11	P22W3	Full Road	0.5	0.2	0.2	0.2	0.1	0.1
oP7Z5	P7Z5	P7Z3	Full Road	5.9	1.5	1.3	1.2	1.0	0.8
oP7Z10	P7Z10	P7Z9	Half Road	0.7	0.2	0.1	0.1	0.1	0.1
oP7Z9	P7Z9	P7Z8	Full Road	2.2	0.6	0.5	0.4	0.3	0.3
oP7Z8	P7Z8	P7Z7	Full Road	2.3	0.6	0.5	0.4	0.3	0.3
oP7Z7	P7Z7	P7Z6	Full Road	3.1	0.8	0.7	0.6	0.4	0.4
oP7Z6	P7Z6	P7Z5	Flow over road at sag	5.8	1.6	1.4	1.2	1.0	0.8
oP7Z3	P7Z3	P7Y8	Full Road	6.8	2.0	1.8	1.6	1.4	1.2
oP7Z2	P7Z2	P7Y3	Full Road	39.2	10.5	9.1	8.5	7.2	6.3
oP7AB1	P7AB1	P7A9A	Half Road	29.5	8.2	7.2	6.5	5.5	4.8
oP7AC6	P7AC6	P7A11	Full Road	2.6	0.8	0.7	0.6	0.5	0.5
oP7AC3	P7AC3	P7AA4	Half Road	1.0	0.3	0.3	0.3	0.2	0.2
oP7AI2	P7AI2	P7A11	Through private property	11.7	3.4	3.0	2.7	2.3	2.0
oP7AI1	P7AI1	P7AI2	Full Road	11.5	3.3	2.9	2.6	2.2	1.9
oP7AH1	P7AH1	P7AI1	Full Road	11.5	3.3	2.9	2.7	2.3	2.0
oP7A11	P7A11	P7AB1	Through private property	28.4	8.1	7.2	6.5	5.5	4.8
oP7AK4	P7AK4	P7AK3	Flow over road at sag	6.0	1.6	1.3	1.2	1.0	0.8
oP7AK3	P7AK3	P7AK2	Flow over grassed area	6.0	1.6	1.4	1.2	1.0	0.8
oP7AH3A	P7AH3A	P7AH3	Full Road	11.1	3.2	2.8	2.6	2.2	1.9
oP7AH3	P7AH3	P7AH2	Full Road	11.0	3.1	2.8	2.5	2.1	1.8
oP7AH2	P7AH2	P7AH1	Full Road	11.0	3.1	2.7	2.4	2.0	1.7
oP7AK2	P7AK2	P7AP1	Footpath	7.9	2.1	1.8	1.6	1.3	1.1
oP7AK1	P7AK1	P7AK2	Full Road	0.8	0.2	0.2	0.2	0.2	0.1
oP7AN3	P7AN3	P7AN1	Footpath	1.5	0.4	0.4	0.3	0.3	0.2
oP7AN1	P7AN1	P7AK4	Half Road	1.8	0.5	0.5	0.4	0.4	0.3
oP7AN5	P7AN5	P7AN4	Through private property	1.2	0.3	0.3	0.3	0.2	0.2
oP7AN4	P7AN4	P7AN3	Full Road	1.3	0.4	0.3	0.3	0.2	0.2
oP7AM1	P7AM1	P7AN1	Full Road	0.2	0.1	0.0	0.0	0.0	0.0
oP7AL2	P7AL2	P7AL1	Full Road	3.5	0.9	0.7	0.6	0.5	0.4
oP7AL1	P7AL1	P7AK4	Flow over road at sag	3.8	0.9	0.8	0.7	0.6	0.5
oP7AP1	P7AP1	P7AH3A	Flow over road at sag	10.8	3.0	2.6	2.4	2.0	1.7
oP7AH9	P7AH9	P7AH5	Half Road	0.2	0.0	0.0	0.0	0.0	0.0
oP7AH5	P7AH5	P7AL2	Full Road	3.2	0.8	0.7	0.6	0.5	0.4
oP7AH4	P7AH4	P7AP1	Full Road	0.2	0.0	0.0	0.0	0.0	0.0
oP7AH8	P7AH8	P7AH6	Half Road	2.8	0.8	0.7	0.7	0.6	0.5
oP7AH6	P7AH6	P7AH5	Full Road	2.9	0.8	0.7	0.6	0.5	0.4
oP7AH7	P7AH7	P7AH6	Full Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7A14	P7A14	P7AQ3	Through private property	11.3	3.3	2.9	2.6	2.2	1.9
oP7A13	P7A13	P7A14	Half Road	6.2	1.8	1.6	1.5	1.2	1.1

Overland	Start	End	Type	PMF Q	100Y Q	50Y Q	20Y Q	10Y Q	5Y Q
oP7AQ3	P7AQ3	P7AQ2	Flow over road at sag	13.0	3.7	3.3	3.0	2.5	2.2
oP7AQ2	P7AQ2	P7AQ1	Through private property	13.3	3.8	3.4	3.1	2.6	2.2
oP7AQ1	P7AQ1	P7A11	Full Road	14.1	4.2	3.8	3.4	2.9	2.5
oP11A3	P11A3	P11ZC1	Full Road	0.2	0.1	0.0	0.0	0.0	0.0
oP12A4	P12A4	P12A2	Flow over grassed area	0.0	0.0	0.0	0.0	0.0	0.0
oP12A2	P12A2	P11ZB4	Half Road	45.3	12.8	11.7	11.3	9.3	7.9
oP12A3	P12A3	P12A2	Flow over grassed area	45.3	12.9	11.8	11.3	9.4	8.0
oP8B1	P8B1	P7C1	Through private property	0.3	0.1	0.1	0.1	0.1	0.1
oP8A3	P8A3	P7C1	Through private property	1.0	0.2	0.2	0.2	0.1	0.1
oP15A4	P15A4	P14A3	Half Road	26.8	6.9	6.4	5.5	5.0	4.3
oP15A1	P15A1	P14A3	Half Road	0.9	1.0	0.9	1.0	0.9	0.8
oP14A4	P14A4	P14A3	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP14A3	P14A3	P14A2	Half Road	27.3	7.0	6.6	5.9	5.5	4.8
oP14A2	P14A2	P11ZB4	Half Road	27.3	7.6	6.7	6.0	5.7	5.1
oP16A1	P16A1	P15A4	Half Road	0.4	0.2	0.2	0.2	0.2	0.2
oP13F2	P13F2	P13F1	Full Road	0.1	0.0	0.0	0.0	0.0	0.0
oP13F1	P13F1	P13E1	Full Road	0.1	0.0	0.0	0.0	0.0	0.0
oP13E1	P13E1	P13G2	Full Road	0.4	0.5	0.4	0.4	0.5	0.4
oP13G2	P13G2	P13G1	Full Road	0.4	0.5	0.4	0.4	0.5	0.4
oP13G1	P13G1	P17A3A	Half Road	0.6	0.4	0.4	0.5	0.6	0.4
oP13A17	P13A17	P17A18	Full Road	21.5	6.0	5.3	4.8	4.0	3.4
oP13A16	P13A16	P13F2	Full Road	0.0	0.0	0.0	0.0	0.0	0.0
oP13BA15	P13BA15	P13BA14	Full Road	1.9	0.6	0.5	0.5	0.4	0.3
oP13BA14	P13BA14	P13BA13	Full Road	2.7	0.8	0.7	0.7	0.6	0.5
oP13BA13	P13BA13	P13BA12	Full Road	3.2	0.9	0.8	0.7	0.6	0.5
oP13BA12	P13BA12	P13BA11	Full Road	3.8	1.1	1.0	0.9	0.8	0.7
oP13BA11	P13BA11	Basin2	Through private property	4.8	1.5	1.3	1.2	1.0	0.9
oP13BA10	P13BA10	P13BA7	Through private property	1.1	0.2	0.2	0.2	0.1	0.1
oP13BA8	P13BA8	P13BA7	Through private property	0.7	0.4	0.4	0.4	0.4	0.3
oP13A19	P13A19	P13A18	Full Road	21.3	6.0	5.3	4.8	4.0	3.4
oP13A18	P13A18	P13A17	Full Road	21.4	6.1	5.4	4.9	4.1	3.5
oP13D1	P13D1	P13BA15	Full Road	0.0	0.0	0.0	0.0	0.0	0.0
oP17B2	P17B2	P17B1	Half Road	23.6	6.0	5.3	4.7	3.9	3.3
oP17B1	P17B1	P17A10	Flow over road at sag	23.7	5.9	5.2	4.6	3.8	3.2
oP17A10	P17A10	P17A7	Full Road	24.4	6.2	5.5	4.9	4.1	3.5
oP17A9	P17A9	P17A10	Full Road	0.0	0.0	0.0	0.0	0.0	0.0
oP17A7	P17A7	P17A5	Full Road	24.6	6.4	5.7	5.1	4.3	3.7
oP17C2	P17C2	P17C1	Half Road	23.5	6.0	5.3	4.7	3.9	3.3
oP17C1	P17C1	P17B2	Half Road	23.6	6.1	5.3	4.8	4.0	3.4
oP17A11	P17A11	P17A10	Half Road	0.4	0.2	0.2	0.1	0.1	0.1
oP17A5	P17A5	P17A4	Half Road	25.1	6.5	5.7	5.1	4.3	3.7
oP17A4	P17A4	P17A3A	Half Road	25.3	6.5	5.7	5.1	4.3	3.7
oP17A3A	P17A3A	P15A4	Flow over road at sag	26.1	6.9	6.3	5.6	5.0	4.4
oP17A6	P17A6	P17A5	Half Road	0.5	0.1	0.1	0.1	0.1	0.1
oP17E1	P17E1	P17A16	Flow over footpath at sag	22.3	6.0	5.3	4.7	4.0	3.4
oP17A17	P17A17	P17A16	Flow over footpath at sag	0.1	0.0	0.0	0.0	0.0	0.0
oP17A16	P17A16	P17A15	Flow over footpath at sag	22.3	5.9	5.2	4.7	3.9	3.3
oP17A15	P17A15	P17C2	Full Road	22.5	6.0	5.3	4.7	3.9	3.4
oP17A12	P17A12	P17A11	Half Road	0.3	0.1	0.1	0.0	0.0	0.0
oP17A18	P17A18	P17E1	Flow over road at sag	22.2	6.0	5.3	4.8	4.0	3.4
oP13BA7	P13BA7	Basin2	Through private property	1.7	0.6	0.5	0.5	0.4	0.4
oP13BC2	P13BC2	P13BA10	Flow over grassed area	0.3	0.0	0.0	0.0	0.0	0.0
oP13BB2	P13BB2	Basin2	Through private property	0.4	0.1	0.1	0.0	0.0	0.0
oP13BB1	P13BB1	P13BA8	Through private property	0.2	0.0	0.0	0.0	0.0	0.0
oP19A2	P19A2	P19B1	Flow over road at sag	0.7	0.4	0.4	0.4	0.4	0.3
oP19C1	P19C1	P19B1	Flow over road at sag	0.5	0.5	0.5	0.5	0.5	0.5
oP19B1	P19B1	P7ZJ1	Half Road	2.1	1.1	1.0	1.0	0.9	1.0
oP19D2	P19D2	P19D1	Full Road	24.8	6.7	5.9	5.4	4.5	3.9
oP19D1	P19D1	P18F2	Full Road	25.4	6.6	5.8	5.3	4.5	3.9
oP18B1	P18B1	P7ZJ1	Half Road	0.5	0.2	0.2	0.2	0.2	0.2
oP18C1	P18C1	P18D1	Flow over road at sag	0.2	0.1	0.2	0.2	0.1	0.1
oP18D1	P18D1	P7ZC3	Half Road	0.3	0.2	0.2	0.3	0.2	0.2
oP18E2	P18E2	P18A4	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP18A4	P18A4	P18C1	Full Road	0.0	0.0	0.0	0.0	0.0	0.0
oP18F2	P18F2	P7N16	Half Road	26.0	6.7	5.9	5.3	4.5	3.9

Overland	Start	End	Type	PMF Q	100Y Q	50Y Q	20Y Q	10Y Q	5Y Q
oP18H1	P18H1	P18G1	Flow over road at sag	1.2	0.3	0.3	0.3	0.2	0.2
oP18G1	P18G1	P7N16	Half Road	1.2	0.4	0.3	0.3	0.3	0.2
oP18I1	P18I1	P18L1	Half Road	0.7	0.2	0.2	0.1	0.1	0.1
oP18L1	P18L1	P18H1	Half Road	1.0	0.3	0.3	0.2	0.2	0.2
oP18K1	P18K1	P7R5	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP18M1	P18M1	P18A6	Half Road	0.2	0.0	0.0	0.0	0.0	0.0
oP18A6	P18A6	P18L1	Half Road	0.3	0.1	0.2	0.1	0.1	0.1
oP18N1	P18N1	P18O1	Flow over footpath at sag	2.3	0.7	0.6	0.6	0.5	0.4
oP18O1	P18O1	P7X12	Full Road	8.3	2.3	2.0	1.8	1.5	1.2
oP18Q2	P18Q2	P18O1	Flow over road at sag	0.8	0.2	0.2	0.2	0.2	0.1
oP18Q1	P18Q1	P18O1	Flow over road at sag	5.1	1.3	1.1	1.0	0.8	0.7
oP18P3	P18P3	P18P1	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP18P1	P18P1	P18P2	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP18P2	P18P2	P7X11	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP18S2	P18S2	P18S1	Full Road	0.8	0.2	0.2	0.2	0.2	0.1
oP18S1	P18S1	P18A12	Full Road	0.8	0.2	0.1	0.1	0.1	0.1
oP18A12	P18A12	P18R1	Flow over road at sag	0.8	0.1	0.1	0.1	0.0	0.0
oP18V1	P18V1	P18A13	Half Road	1.6	0.4	0.4	0.3	0.3	0.2
oP18A13	P18A13	P18U1	Full Road	2.4	0.6	0.6	0.5	0.4	0.3
oP18A14	P18A14	P18A13	Flow over road at sag	0.8	0.2	0.2	0.2	0.2	0.1
oP18Q3	P18Q3	P18Q1	Half Road	5.0	1.2	1.0	0.9	0.7	0.6
oP18R1	P18R1	P18Q3	Half Road	4.9	1.3	1.1	1.0	0.8	0.6
oP22Z2	P22Z2	P22A6	Full Road	0.3	0.0	0.0	0.0	0.0	0.0
oP6B3	P6B3	P6B2	Half Road	11.5	3.1	2.8	2.5	2.1	1.8
oP6B2	P6B2	P25A6	Flow over road at sag	12.1	3.2	2.9	2.6	2.2	1.9
oP7AF6	P7AF6	P7AF4	Half Road	86.6	18.1	15.8	14.1	12.6	10.3
oP7AF4	P7AF4	P7AF5	Half Road	86.7	18.2	15.8	14.2	12.7	10.4
oP7AF2C	P7AF2C	P7AF2B	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7AF2B	P7AF2B	P7AG11	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7AF2A	P7AF2A	P7AG3	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7AF2	P7AF2	P7AG1	Flow over road at sag	1.0	0.7	0.6	0.7	0.6	0.6
oP7AG6	P7AG6	P7AG9	Half Road	1.0	0.4	0.4	0.4	0.3	0.4
oP7AG5	P7AG5	P7AG4	Half Road	0.8	0.4	0.4	0.5	0.4	0.4
oP7AG3	P7AG3	P7AG5	Half Road	0.8	0.5	0.5	0.5	0.5	0.5
oP7AG1	P7AG1	P7AG3	Half Road	0.9	0.6	0.6	0.6	0.5	0.5
oP7AG4	P7AG4	P7AG6	Half Road	0.9	0.4	0.4	0.4	0.4	0.4
oP7AF5	P7AF5	P7AG11	Half Road	86.8	18.2	15.9	14.3	12.8	10.4
oP11JZ4	P11JZ4	P7F8	Half Road	0.6	0.2	0.1	0.1	0.1	0.1
oP11JZ0A	P11JZ0A	P7F9	Half Road	53.8	11.5	10.1	8.7	7.4	6.2
oP7ZD1	P7ZD1	P7K3	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP11ZD1	P11ZD1	P7D5	Half Road	0.4	0.2	0.1	0.1	0.1	0.1
oP11ZC1	P11ZC1	P11ZD1	Flow over road at sag	0.3	0.1	0.1	0.1	0.1	0.1
oP11ZB4	P11ZB4	P11ZB3	Flow over road at sag	73.8	19.5	16.9	16.3	15.1	12.5
oP11ZB3	P11ZB3	Basin2	Half Road	78.7	20.0	17.3	16.6	15.3	12.6
oP11ZB1	P11ZB1	P11ZB3	Flow over road at sag	3.2	0.9	0.8	0.7	0.6	0.5
oP11ZB2	P11ZB2	P11ZB1	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP18UA1	P18UA1	P18V1	Half Road	1.5	0.5	0.4	0.4	0.3	0.3
oP18U1	P18U1	P18R1	Flow over road at sag	4.0	1.1	1.0	0.9	0.7	0.6
oP24T3	P24T3	P24T1	Half Road	1.1	0.3	0.3	0.2	0.2	0.2
oDP18H1	DP18H1	DP18A7	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP1F2	P1F2	P1A5	Half Road	14.1	3.3	2.8	2.5	2.1	1.7
oP5R1A	P5R1A	P5O2B	Through private property	1.5	0.3	0.3	0.2	0.1	0.1
oP7AG11	P7AG11	P7B1	Through private property	87.4	18.3	15.9	14.4	12.9	10.5
oP7AG10	P7AG10	P7AG11	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7AG8	P7AG8	P7AG9	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7AG9	P7AG9	P7AG11	Half Road	1.0	0.4	0.4	0.5	0.3	0.4
oP11ZE1	P11ZE1	P11ZB2	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP23G2	P23G2	P23G1	Half Road	4.6	1.3	1.2	1.1	1.0	1.0
oP23G1	P23G1	P22C2	Half Road	4.7	1.3	1.2	1.1	1.0	1.0
oP24A1C	P24A1C	P26A1	Full Road	48.4	14.1	12.5	11.4	9.8	8.6
oP24AA2	P24AA2	P24AA1	Flow over road at sag	33.6	10.0	8.9	8.1	7.0	6.1
oP24AA1	P24AA1	P24A1C	Half Road	46.5	13.8	12.3	11.2	9.6	8.4
oP22K19	P22K19	P22K18	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP22K18	P22K18	P22K17	Half Road	0.2	0.1	0.1	0.1	0.0	0.0
oP22AC2	P22AC2	P22AC1	Full Road	0.0	0.0	0.0	0.0	0.0	0.0

Overland	Start	End	Type	PMF Q	100Y Q	50Y Q	20Y Q	10Y Q	5Y Q
oP22AC1	P22AC1	P22K12	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oP22K12	P22K12	P22AB3	Through private property	0.2	0.0	0.0	0.0	0.0	0.0
oP22K11	P22K11	P22K10	Half Road	1.2	0.3	0.2	0.2	0.2	0.2
oP22K10	P22K10	P22K9	Half Road	1.2	0.3	0.2	0.2	0.2	0.1
oP22K9	P22K9	P22K8	Half Road	1.4	0.3	0.3	0.2	0.2	0.1
oP22K8	P22K8	P22K7	Half Road	1.5	0.4	0.3	0.3	0.2	0.2
oP22K7	P22K7	P22K6	Half Road	1.5	0.4	0.3	0.3	0.2	0.2
oP22K6	P22K6	P22K5_1	Half Road	1.6	0.4	0.3	0.3	0.2	0.2
oP22K5_1	P22K5_1	P22K4	Flow over road at sag	1.7	0.5	0.4	0.4	0.3	0.3
oP22K4	P22K4	P22K3	Full Road	8.1	2.2	1.9	1.8	1.5	1.3
oP22K3	P22K3	P22L3	Full Road	9.3	2.6	2.3	2.1	1.7	1.5
oP23Y2	P23Y2	P23A6_1	Full Road	0.5	0.1	0.0	0.0	0.0	0.0
oP23Y1	P23Y1	P23X1	Full Road	0.5	0.0	0.0	0.0	0.0	0.0
oP23U3	P23U3	P23R2	Half Road	2.0	0.6	0.5	0.5	0.4	0.4
oP23K6	P23K6	P23K5	Half Road	1.9	0.5	0.4	0.4	0.3	0.3
oP23K5	P23K5	P23K3	Half Road	1.9	0.5	0.4	0.4	0.3	0.2
oP22AC3	P22AC3	P22AC2	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP24U1	P24U1	P24M1	Full Road	37.0	10.6	9.5	8.7	7.4	6.4
oP24W1	P24W1	P24AA2	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP24AC2	P24AC2	P24AC	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP24AC3	P24AC3	P24AC	Flow over road at sag	12.2	3.4	3.0	2.7	2.3	1.9
oP22K17	P22K17	P22K16	Half Road	0.2	0.0	0.0	0.0	0.0	0.0
oP22K16	P22K16	P22K15	Half Road	0.3	0.1	0.0	0.0	0.0	0.0
oP22K15	P22K15	P22K14	Half Road	0.4	0.1	0.1	0.1	0.0	0.0
oP22K14	P22K14	P22K13	Half Road	0.4	0.1	0.1	0.1	0.1	0.0
oP22K13	P22K13	P22K11	Half Road	0.5	0.1	0.1	0.1	0.1	0.1
oP22AB3	P22AB3	P22AB2	Half Road	0.5	0.1	0.1	0.1	0.1	0.1
oP22AB2	P22AB2	P22AB1	Half Road	0.6	0.2	0.1	0.1	0.1	0.1
oP22AB1	P22AB1	P22AA1	Half Road	0.7	0.2	0.2	0.1	0.1	0.1
oP22AA1	P22AA1	P22K4	Half Road	3.8	1.1	1.0	0.9	0.7	0.6
oP7N8A	P7N8A	P7S2	Half Road	31.5	7.2	6.5	5.6	4.8	4.0
oP7AA4	P7AA4	P7AA2	Half Road	1.1	0.3	0.3	0.2	0.2	0.2
oP22R2	P22R2	P22P2	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP5017	P5017	P5O16	Flow over road at sag	2.4	0.7	0.6	0.6	0.5	0.4
oP5O16	P5O16	P5Z1	Full Road	2.4	0.6	0.6	0.5	0.4	0.3
oDP18B9	DP18B9	DP18B8	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oDP18B8	DP18B8	DP18B7	Half Road	0.1	0.0	0.0	0.0	0.0	0.0
oDP18B7	DP18B7	DP18B6	Full Road	0.7	0.1	0.1	0.1	0.1	0.0
oDP18B6	DP18B6	DP18B5	Full Road	1.3	0.3	0.2	0.2	0.1	0.1
oDP18B5	DP18B5	DP18B4	Full Road	1.6	0.4	0.3	0.3	0.2	0.2
oDP18B4	DP18B4	DP18E1	Full Road	1.7	0.5	0.4	0.3	0.3	0.2
oDP18B3	DP18B3	DP18B2	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oDP18B2	DP18B2	DP18B1	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oDP18B1	DP18B1	DP18A3_1	Half Road	18.2	4.9	4.3	3.8	3.1	2.6
oDP18D1	DP18D1	DP18C1	Half Road	1.4	0.4	0.3	0.3	0.2	0.2
oDP18C1	DP18C1	DP18E3	Half Road	1.4	0.3	0.3	0.2	0.2	0.1
oDP18E3	DP18E3	DP18E2	Half Road	1.6	0.4	0.3	0.3	0.2	0.2
oDP18E2	DP18E2	DP18E1	Half Road	1.9	0.4	0.4	0.3	0.2	0.2
oDP18E1	DP18E1	DP18A4	Half Road	6.1	1.6	1.4	1.2	1.0	0.8
oDP18F1	DP18F1	DP18A4	Half Road	0.3	0.1	0.0	0.0	0.0	0.0
oP7AG2	P7AG2	P7AG5	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7AF3	P7AF3	P7AF2C	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
oP7AG7	P7AG7	P7AF2A	Half Road	0.0	0.0	0.0	0.0	0.0	0.0
obasin2c	Basin2	P7AF6	Half Road	32.7	8.4	7.5	6.9	6.3	5.4
oP1AA0_1	P1AA0_1	P1AA0_2	Channel	244.7	54.7	49.0	42.8	37.8	32.7
oP1AA0_2	P1AA0_2	P1AA0_3	Channel	244.7	54.7	49.0	42.8	37.8	32.7
oP1AA0_3	P1AA0_3	P26A1	Channel	244.7	54.7	49.0	42.8	37.8	32.7
oW5AC3	W5AC3	W5AC2	Half Road	1.2	0.2	0.1	0.1	0.1	0.1