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EC East Subcatchment Management Plan Volume 2 - Flood Study

Submitted to:
Marrickville Council
PO Box 14
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REPORT

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1.0 INTRODUCTION

Marrickville Council has commissioned Golder Associates Pty Ltd to prepare a Subcatchment Management Plan for sustainable water management in the East Channel East (ECE) Subcatchment. This planning process is part of Marrickville Council's sustainable urban water management approach, which is driven by Council's internal Integrated Urban Water Management Group. This report was prepared in general accordance with our proposal P87626067 dated 20 October 2008, and Council's letter of commissioning dated 6 January 2009.

The key differentiator of this approach from the traditional approaches to water management is the concept of collaborative planning and a holistic overview of water management at a subcatchment scale. The collaborative planning involves not only consultation with a wide variety of Council professionals involved in water planning but also extensive consultation with the community and external stakeholders.

As part of a holistic overview of water management in ECE Subcatchment, a stormwater drainage study has been undertaken to identify the issues related to stormwater flooding in the subcatchment. Identification of these issues together with understanding of the water balance within the subcatchment would be used to explore water management options that achieve the objectives of Water Sensitive Urban Design in the ECE Subcatchment.

2.0 PHYSICAL PROFILING

The urban water cycle involves various processes that need to be understood in detail for effective planning of the subcatchment. To achieve this objective, a water balance, water quality and hydrologic/hydraulic modelling program was undertaken for the ECE Subcatchment. This modelling quantifies various elements of the water cycle and helps in understanding the role each element plays in the water cycle.

The hydrologic and hydraulic modelling was undertaken to assess the performance of the existing stormwater drainage in the subcatchment and to determine the flood risk due to overland flows and excessive stormwater ponding on the streets.

Two separate models were developed for this purpose; one for hydrologic modelling based on the DRAINS modelling system and the other for hydraulic modelling based on the TUFLOW modelling system.

This report presents the details of hydrologic and hydraulic modelling undertaken for the ECE Subcatchment Management Plan. It includes details for model set-up, calibration and modelling of design flood events. The report concludes with an analysis of existing stormwater drainage performance.

3.0 HYDROLOGIC MODELLING

Hydrologic modelling establishes the runoff behaviour in a catchment by modelling the rainfall-runoff processes while taking into account the important catchment features such as street drainage. Rainfall is used as an input to a hydrologic model, which calculates discharge hydrographs at various locations in the catchment. These hydrographs are used as an input to a hydraulic model, which establishes the flood level and velocity data for the catchment.

The hydrologic modelling system DRAINS was used in this study. DRAINS is an established street drainage modelling system that provides appropriate estimates of stormwater behaviour in a catchment. Marrickville Council owns a copy of DRAINS and has in-house capability to undertake modelling using this system.

Although DRAINS has some capacity to provide flood level information, it is not well suited for this purpose in a complex urban setting. A detailed hydraulic model is required for flood level estimation. As such a separate hydraulic model was developed for this study. Details of hydraulic modelling are provided in Section 4.0.

3.1 Catchment Description

The ECE Subcatchment is approximately 131 ha and consists of commercial, industrial and residential land use. Of the 131 ha, approximately 95 ha (75%) of the catchment is impervious. The majority of the catchment is residential, with approximately 3031 land parcels being residential.

The subcatchment can broadly be divided into three major subcatchments; one to the north, one to the east and one to the south (Figure 1). The Illawarra Railway line separates the north and east subcatchment from the southern subcatchment. The ECE catchment discharges in a westerly direction to Eastern Channel which then discharges to the Cooks River. Figure 1 illustrates the boundary of ECE catchment and the location of the major subcatchments within ECE.

The ECE Subcatchment, in general, is quite steep and is completely urbanised. Development in the catchment consists of high-density residential terrace-housing, with very few free-standing homes. There are several villa-style developments, also of high-density, as well as a TAFE complex along Edgeware Road. There are several small to medium size open spaces/parks in the northern and southern Subcatchments. High density commercial precincts exist within each Subcatchment and are located along major roads such as Victoria Road, Edgeware Road, Enmore Road and Princes Highway.

Various Subcatchments within ECE catchment are described below:

- The northern Subcatchment is approximately 73.5 ha and is serviced by a pit and pipe network that extends into the upper north-east and drains in a south-westerly direction toward Eastern Channel.

- The southern Subcatchment is 38.9 ha and does not have a pit and pipe network in it's upper reaches, however, there is a cluster of pit and pipes, at a natural low-point, that act to collect and pipe runoff northward via a culvert under the Illawarra Railway line adjacent to the Bedwin Road railway bridge.

  In the southern Subcatchment, runoff that is in excess of the capacity of that pit and pipe drainage, pools at the corner of Campbell St and May St until such point it is transmitted via overland flow to a detention basin known as Camdenville Oval (Figure 1). There are two stormwater pumps in Camdenville Oval that act to dewater that basin into the culvert that runs under the Illawarra Railway line.

- The eastern Subcatchment is 18.9 ha and is located north of the Illawarra Railway line. Runoff from this catchment drains in a south-westerly direction toward the Bedwin Road bridge. A pit and pipe network exists from the middle reaches of this catchment; however, runoff from the majority of the catchment is transmitted via overland flow down various streets, predominantly Darley St and Lord St to the low point at the corner of Railway Parade and Edgeware Road underneath the Bedwin Road railway bridge.

The layout of the pit and pipe networks for the study area is presented in Figure 2.

3.2 Historical Flooding

The precipitation records over the past 60 years were obtained from the Bureau of Meteorology (Station 066037 - Sydney Airport) and the data corresponding to the specified dates was extracted for entry into the DRAINS model. Notable events in the Sydney Airport rainfall record (Station 066037) included:

- 23 March 1966 (~100 yr ARI (Average Recurrence Interval))
- 20 November 1988 (~2 yr ARI)
- 17 February 1993 (~2 yr ARI)
- 31 January 2001 (~1 yr ARI)
- 13 February 2009* (< 1 yr ARI)
- 14 March 2009* (~1 yr ARI)

* Recent events that were recalled by residents in responses to flood questionnaire.

Of note is that there has not been a significant rainfall event (> 2 yr ARI) in the catchment in more than 15 years. Data from Sydney Water Corporation (SWC) pluviograph stations were also reviewed with respect to the 13 February 2009 and 14 March 2009 events. These were found to have rainfall totals and interpreted ARIs equivalent to the BOM Sydney Airport Station. Accordingly, areal distribution of rainfall was not considered necessary considering the size of the EC East Subcatchment.

Table 1 presents the historic peak rainfall events provided by the Bureau of Meteorology (BOM) for Station 066037 - Sydney Airport.

Table 1: Significant Historical Rainfall Events

	18 min		30 min		1 hr		2 hr		6 hr	
Date	**Rainfall (mm)**	**ARI (yr)**	**Rainfall (mm)**	**ARI (yr)**	**Rainfall (mm)**	**ARI (yr)**	**Rainfall (mm)**	**ARI (yr)**	**Rainfall (mm)**	**ARI (yr)**
23/03/1966	49.1	< 100	69.8	>100	77.8	>20	78.9	10	78.9	>2
13/12/1963	30.4	>5	44.8	>10	64.9	>10	103.3	<50	165.5	<100
10/03/1975	24.5	>2	38.1	5	69.4	<20	96.2	>20	174.7	>100

3.3 Design Rainfall

Rainfall IFD Data

Intensity Frequency Duration (IFD) data for the catchment was established based on data and methodology presented in Volume 2 of Australian Rainfall & Runoff (Institute of Engineers Australia, 1987). Table 2 provides the coefficients used in the IFD determination and Table 3 presents the calculated intensities.

Table 2: Intensity, Frequency and Duration (IFD) Coefficients – Marrickville NSW

Duration	2 Year	50 Year
1 hr Rainfall Intensity (mm/hr)	37.5	82.5
12 hr Rainfall Intensity (mm/hr)	8.0	16.0
72 hr Rainfall Intensity (mm/hr)	2.5	5.0
G (skewness) = 0.0		
F2 = 4.29		
F50 = 15.8		

Table 3: Intensity, Frequency and Duration (IFD) Table – Marrickville NSW

Duration (min)	1 yr ARI (mm/hr)	2 yr ARI (mm/hr)	5 yr ARI (mm/hr)	10 yr ARI (mm/hr)	20 yr ARI (mm/hr)	50yr ARI (mm/hr)	100 yr ARI (mm/hr)
5	99	127	161	181	207	241	267
10	76	98	125	142	163	191	212
15	63	82	106	120	138	162	181
20	55	72	93	106	122	144	160
30	45	58	76	87	101	120	134
45	36	47	62	71	83	98	110
60	31	38	53	61	71	83	95
90	24	31	41	47	55	65	73
120	20	26	34	39	46	54	61
180	15	20	26	30	35	41	46
240	13	17	22	25	29	34	38
360	10	13	17	19	22	26	29
480	8	11	14	16	18	21	24
720	6.3	3	11	12	14	16	18
1440	4.1	5.3	7	8	9	11	12
4320	2.0	3	3.2	3.7	4.25	3	5.6

3.4 Probable Maximum Precipitation (PMP) Estimation

The PMP was estimated using the General Short Duration Method (GSDM) (BOM, 2003). The GSDM is appropriate for durations up to 6 hours and is appropriate to small catchments such as ECE.

The catchment area is 1.31 km^2 and lies within the 6 hour GSDM zone. The catchment was found to be topographically smooth and the initial PMP depths were obtained from Depth Duration Area curves presented in BOM (2003). The Elevation Adjustment Factor (EAF) was 1.0 and the Moisture Adjustment Factor (MAF) was 0.70. Table 4 presents the estimated PMP depths rounded to the nearest 10 mm.

Table 4: Estimated Probable Maximum Precipitation Depths

Duration (min)	PMP Depths (mm)
15	170
30	240
45	310
60	350
90	400
120	450
150	480
180	500
240	550
300	600
360	630

3.5 Data Gathering

3.5.1 Information Provided by Marrickville Council

The information provided by Marrickville Council related to the ECE Subcatchment included:

- AutoCAD drawings of nine intersections within the study area;
- 0.5 m topographic contours and original Aerial Laser Survey (ALS) data (captured in 2007);
- Aerial photography covering the study area;
- GIS data showing the approximate location of the existing pit and pipe network;
- Pit data sheets which contained the pit, lintel and grate dimensions, pipe diameters, depth to pipe inverts from the surface level of the pit. Some data sheets containing the pit and pipe material;
- A pit database which included: pit number, location, pit material, and the measurements of the pit, lintel and grate. Some of the pit, lintel and grate dimensions were missing for various pits;
- A pipe database which included: pipe number, location, upstream and downstream node, pipe diameter and pipe material. Some of the pipe diameters and pipe material were missing.

3.5.2 Information Provided by Sydney Water Corporation

Sydney Water performed Stormwater Inspections within Stormwater Channel (SWC) 66 Marrickville Valley from 1997 to 2006. Six CCTV tapes, each approximately 3 hours long were received, from Sydney Water which covers the Marrickville area.

The following Sydney Water reports were also provided by Marrickville Council:

- *Marrickville Valley SWC 66 Capacity Assessment*, Sydney Water Corporation Limited, September 1995;
- *Stormwater Planning, Asset Management: Marrickville Valley SWC No.66 – Open Conduit Inspection Report*, Patterson Britton and Partners, May 2007.

Sydney Water was also contacted to obtain construction plans for their culverts. The following plans were obtained:

- Metropolitan Water Sewerage and Drainage Board, 1964. *Drawings: Marrickville Valley Eastern S.W.C. No. 66 Amplification Stage 1, 2 and 3*. Reference No. WO 99922.
- *Drawings: Newtown-Marrickville Stormwater Drainage – Edgeware Road Stormwater Channel.* Reference No. GC1015.

3.5.3 Information provided by Railcorp

Railcorp was contacted to obtain available plans for the area.

The following relevant plans included:

- Department of Railways NSW, August 1947. *St Peters to Edgeware Road – Arrangement for 6 Tracks*. Reference No. EDMSCV0093059.

3.5.4 Community Questionnaire

A resident survey was conducted in February 2009 (Golder Ref: 097626003-011-R-Rev0) as part of the floodplain risk management process for the ECE catchment. The survey was mailed out to all property owners in the ECE catchment (3,274). There were 214 responses received over a period of six weeks which equated to a response rate of 6.5%. The majority of respondents had lived in the catchment for more than 5 years.

3.6 Modelling Methodology

The following sections outline the modelling approach and system that were used in developing the hydrologic model.

3.6.1 Model Catchment

The existing catchment boundary for the ECE Subcatchment was provided by Marrickville Council. Based on the topography of the area the subcatchment boundary has been revised and does not include some of the pits along King St. which actually drain away from the study area and into the adjacent catchment, as shown in Figure 1.

3.6.2 Modelling System

The hydrological modelling system chosen was DRAINS. This model was used because Council has an in-house license for DRAINS and can use this model for future requirements.

DRAINS is an urban drainage model which can model small to large scale catchments; it has several hydrological modelling methods available including ILSAX and Extended Rational Method (ERM). The ERM was utilised for this study. The model converts rainfall to stormwater runoff hydrographs based on differential treatment of pervious and impervious fractions as well as losses represented by a runoff coefficient. The runoff coefficient for pervious areas was 0.58 and the runoff for impervious areas was 0.90. The hydrographs are then routed through networks of pipes, channels and streams. Design features within the model include closed and open channel conduits, headwalls, culverts and stormwater detention systems.

3.6.3 DRAINS Modelling Details

The DRAINS model was compiled using the information listed in Sections 3.5.1 and 3.5.2, which was provided by Council and Sydney Water. In addition, a site visit was undertaken to verify some of the details of the street drainage in various parts of the catchment.

The existing database or pit data sheets did not have pit elevations recorded. After discussion with Council, a methodology was developed to acquire this data for the DRAINS modelling. The methodology involved using the ALS data to estimate the pit elevations by using the closest and lowest point to the pit or manhole within 1-2 m of the pit. If an ALS ground elevation point was not within 1-2 m of the pit then either the contours along the street or the two closest points were used to interpolate an estimated elevation.

While reviewing the provided pit data sheets, GIS data and aerial photo, it was noted that several pits and pipes were either not in the database or were missing data. The missing pit data was obtained during the site visit conducted on 11 August 2009. If a particular pit was inaccessible, the adjacent pit was assumed to be similar to the missing pit and data interpolated.

Several pipes were missing from the pipe database and have been added based on the GIS information and the pit data sheets. When the pipe material was unknown it was assumed that the pipe is made of concrete.

There are several pipes which are connected to the main pipes of the drainage system. These pipes have no downstream invert elevation information since they have not been connected via a pit or manhole. The downstream inverts of these pipes were estimated based on either the road slope (assuming that the pipe slope is similar to the road slope) using the slope of the upstream or downstream pipe where available or review of the SWC CCT video tapes.

The Council database for the pits and pipes was updated based on observations during the site visit and various assumptions as discussed above. The updated database is presented in APPENDIX A.

Figure 2 presents the pit locations and existing pipelines. Figure 3 presents the subcatchment boundaries. Further details on the development of the DRAINS model is provided in APPENDIX A including schematics of the pit/pipe network.

3.7 Model Calibration and Design Runs

3.7.1 Model Calibration

Since there are no flow gauge or flood levels available, calibration of the DRAINS model was achieved indirectly through calibration of the hydraulic model (TUFLOW). The logic being that calibration of hydraulic model would not be achievable if the approach taken to the hydrologic modelling was unrepresentative. Calibration of the hydraulic model is discussed in detail in Section 4.4.

There was an opportunity to verify the performance of the DRAINS model by comparison to the results of capacity assessment conducted by SWC (1995). The SWC study was undertaken based on the Rational Method. The DRAINS model was able to be compared to the SWC study because the Extended Rational Method was used within DRAINS. The DRAINS model was executed for a variety of durations and the critical duration determined. The model was executed with and without pit blockages applied to quantify the impact on predicted peak flow. The SWC66 capacity results were obtained from the *Marrickville Valley SWC66 Capacity Assessment (SWC, September 1995)*. The comparison between the Sydney Water study and the DRAINS model results for the 5 year event is presented in Table 5 with respect to the main trunk drainage lines.

Table 5: Comparison between DRAINS and the SWC66 Capacity Assessment

Channel Section*	Catchment (ha)	Sydney Water Estimate (m^3/s)	DRAINS With Pit Blockages (m^3/s)	DRAINS Without Pit Blockages (m^3/s)
BB1 – BB	114.4	23.49	21.6	21.9
C3 – C	13.8	3.05	2.95	2.96

*As per *Marrickville Valley SWC66 Capacity Assessment (Sydney Water, September 1995)*

From Table 5, the modelled hydrologic response from DRAINS is appropriately comparable to the Rational Method based assessment from SWC (1995).

3.7.2 Design Simulations

Design simulations were executed for the 1, 2, 5, 10, 20, 50 and 100 year ARI events as well as the PMP event for the durations of 15, 30, 60, 120 and 180 min. The design rainfall used in DRAINS was distributed using standard temporal patterns based on AR&R Vol 2 (Institute of Engineers, 1987). The temporal pattern for the PMP event was based on BOM (2003). The hydrographs generated from each DRAINS catchment were extracted from DRAINS and later used in the hydraulic model simulations (TUFLOW).

It is noted that inlet characteristics of modelled pits are accounted for within TUFLOW. See Section 4.2.5 for discussion of blockage factors applied to design hydraulic simulations.

4.0 HYDRAULIC MODELLING

A combined one dimensional-two dimensional (1D/2D) hydraulic modelling approach was adopted because it can readily combine a 1D pit and pipe network, detention storage (in 2D) and complex 2D overland flow behaviour that can be encountered in a urbanised catchment. Hydraulic modelling system TUFLOW was utilised to undertake an analysis of flooding behaviour in this catchment

Hydrological input to the TUFLOW model was obtained from the DRAINS model. The discharge hydrographs from the DRAINS model were applied as sources to the TUFLOW model at appropriate locations.

The pit and pipe network in TUFLOW was generated from the DRAINS model. The pit inlet hydraulic characteristic curves used in DRAINS were also adopted in TUFLOW.

Outflow from the catchment was set in TUFLOW using a normal depth assumption (discharge versus height) applied at an appropriate distance downstream from the catchment boundary across available flowpaths including Eastern Channel itself.

Details of the hydraulic modelling including model setup, calibration and modelling of design flood events is discussed in the following sections.

4.1 Survey Data

The basis of a 2D model is the Digital Terrain Model (DTM), which is a continuous elevation surface representing the topography of the catchment. Aerial Laser Survey (ALS) data was provided by Council consisting of topographic contours (0.5 m) as well as ground points between derived contours. In addition, the raw ALS data (Ground and Buildings; and Ground and All-Non Ground) was also provided.

The DTM used in the TUFLOW model was established via a series of elevation layers. The primary layer was developed from the topographic contours and ground points between the derived contours supplied by Council. The appropriateness of that DTM was confirmed by comparison between the modelled topographic contours and supplied topographic contours.

Adjustments to the ground surface were implemented where required as additional elevation layers that super-imposed over the original DTM. As an example of this adjustment, the upper-part of Lord St, at the intersection with Marian Lane, required smoothing of the data for better representation of the embankment at that location.

4.2 Model Setup

4.2.1 General

TUFLOW is a depth-averaged 1D/2D free-surface hydraulic model. It solves the 2D, depth-averaged, momentum and continuity equations for free-surface flow (applicable to sub-critical flow) using a finite difference grid. TUFLOW automatically switches to an upstream controlled flow regime (Manning's equation or Broad-Crested Weir equation) when the topography is steep and the Froude number exceeds 1. i.e. super-critical and weir flow, as required.

4.2.2 Model Domain

The TUFLOW model domain is presented in Figure 1. It is noted that model domain extends beyond the edge of the ECE catchment so as to allow overland flow reaching the south-westerly corner of model to be unimpeded and consequently unaffected by the model boundary. It is noted that model simulation results are not presented outside of the ECE boundary since subcatchment hydrology from DRAINS was not computed.

4.2.3 Model Grid

The model grid extended 1680 m in a NW-SE alignment and 1550 m in a NE-SW direction. The adopted model cell size was 2.0 m square. The model grid was therefore 840 by 775 cells. The computational timestep adopted in the model was 0.1 seconds in the 2D domain and 0.1 seconds in the 1D domain.

The grid alignment was chosen so that it was perpendicular and parallel to the branches of the main Eastern Channel. Cells that lay outside of the ECE catchment were declared null (no computation) as necessary.

4.2.4 Approach to Open Channels/Flow Paths

A 2D approach was adopted when representing open channels/flow paths within the TUFLOW model, rather than an embedded 1D approach. This approach was adopted to prevent model instabilities due to super-critical flow. Fine resolution of the model grid (2m) afforded appropriate representation of the channels (6 m to 12 m wide)

The open channels/flow paths that were modelled using the 2D approach include:

- The grass-lined drains either side of the Illawarra Railway line;
- The open channel between Llewellyn Street through Empire Lane to Victoria Road (referred to herein as the Empire Lane Channel); and

- The concrete-lined, Eastern Channel consisting of a NW-SE branch and the main NE-SW branch.

Channel Geometry

For the railway grass-lined drains, a gully breakline was adopted that snapped the elevations in the TUFLOW model to the appropriate level such that the lowest point, in cross-section, corresponded with the correct location of the thalweg of the drain. Similarly, a ridge breakline was applied along the centreline of the railway line to ensure the highest point, in cross-section, corresponded with the correct location of the centreline of the railway line.

For Empire Lane and Eastern Channel, the topographic contours supplied from Council required smoothing. The approach adopted was to review the raw ALS data and manually adjust the elevations in the TUFLOW model. A sharp channel side was obtained by separately developing a channel floor, based on filtered ALS data, and then applying a smoothed elevation at the edge of each channel. Accordingly, it was assumed that each of these channels had a rectangular shape.

Bridges and Culverts

There is a single culvert that exists within the Empire Lane channel. This culvert was modelled in 1D and was connected to the 2D domain using internal exchange boundary conditions as per model requirements (BMT-WBM, 2008).

Default TUFLOW values were used for entrance and exit losses, and height and width contraction coefficients for culverts.

Depth-varying 2D flow constrictions (refer BMT-WBM, 2008) were used to account for bridge structures within Eastern Channel rather than using 1D culverts. Details of the height of bridge decks and railings above channel inverts were obtained from SWC (1995) and Patterson Britton and Partners (2007). The location of each of these structures is presented in Figure 2.

4.2.5 Pit and Pipe Network

The 1D pit and pipe network was established from the pit and pipe level information developed in DRAINS, which in turn, was prepared based on the pit and pipe database provided by Council. Additional information was obtained from site visits to fill gaps in that database as required. Where information was not available, appropriate assumptions were made. The complete pit and pipe database is presented in APPENDIX A.

Pits were implemented in TUFLOW using the Pit/Q Channel approach. This approach automatically assigns an internal exchange boundary condition between the 2D domain and the 1D pipe network. The rate of exchange of flow between the two domains is controlled by a depth versus discharge relationship. TUFLOW uses the depth versus discharge relationship from DRAINS to model the entry of water through the 1D pits into the 1D pipe network. If the Hydraulic Grade Line (HGL) within the 1D pipe network is above ground surface, then the same depth versus discharge relationship is applied in reverse, controlling the rate of outflow from the 1D network into the 2D domain.

The depth versus discharge relationships used in TUFLOW were obtained from the DRAINS pit/pipe database for NSW (NSW Pits June 2008.db1). This approach was consistent with the recommendations in the TUFLOW model documentation (BMT-WBM, 2008). The depth versus discharge relationship obtained from DRAINS initially behaves in accordance with weir flow and then transitions to orifice flow as depth above the kerb inlet/grate increases. The depth versus discharge relationships obtained from the DRAINS default database, however, extends only up to a depth of 0.6 m. If the depth of water above a particular pit exceeds a defined range then the model documentation notes that TUFLOW extrapolates the relationship in accordance with orifice flow, based on a nominated lintel length (BMT-WBM, 2008)

Rather than allowing TUFLOW to extrapolate this relationship, a manual extrapolation to 3.0 m depth was carried out. The adopted depth versus inlet capacity relationship from DRAINS, including the extrapolated values is provided in APPENDIX B. For context, during the 100 yr ARI design flood event, only 16% of pits had a modelled maximum depth of more than 0.6 m; with only 5% of pits having a modelled maximum depth of more than 1.0 m. The maximum modelled depth above any pit in the 100 yr ARI design flood event, however, was only 1.55 m.

Pipe Outlets and Headwalls

There are several locations within the catchment where a particular stormwater pipe/culvert daylights at ground surface, discharging runoff into the street or into a stormwater channel or basin. These locations include:

- Reiby Street;
- Corner Edgeware Road and Sarah Street;
- Llewellyn Street (Empire Lane Channel);
- Easement from Shelleys Lane (Empire Lane Channel);
- Goodsell Street;
- May St (Camdenville Oval);
- Sydney Steel Road (Eastern Channel); and
- Murray Street (Eastern Channel).

There are also several locations within the catchment where surface overland flow enters the pit/pipe network via a headwall. These locations include:

- Victoria Road (Empire Lane Channel);
- Southern Drain (Illawarra Railway Line);

Both of these circumstances were accounted for by connecting the relevant 1D element directly to the 2D domain. As such, at these locations inflow or outflow was not controlled by a pit hydraulic characteristic curve.

Pit Loss Coefficients and Culvert Losses and Contraction Coefficients

Default pit loss coefficients from DRAINS were applied to 1D elements in TUFLOW as required. Table 6 presents the values adopted in TUFLOW. Default values from the TUFLOW manual for Entrance and Exit losses and Height and Width contraction coefficients were adopted. These adopted values are presented in Table 7.

Table 6: Adopted Pit Loss Coefficients, Ku

Type of Pit	Default Value	Adopted Value
Pit at the top of a line	5.0	5.0
Pit with a straight through flow, no sidelines	0.2	0.2
Pit with a right angle direction change, no sidelines	1.0	1.0
Pit with a straight through flow, one or more sidelines	1.5	1.5
Pit with a right angle direction change, one or more sidelines	2.0	2.0
Lintel inlet only	N/A	3.0

Table 7: Culvert Losses and Contraction Coefficients

Attribute	Default Value	Adopted Value
Height Contraction Coefficient	0.6	0.6
Width Contraction Coefficient	0.9	0.9
Entry Loss Coefficient	0.5	0.5
Exit Loss Coefficient	1.0	1.0

Pit Blockage Factors

Pit blockage factors were applied for design flood event simulations. This is a standard approach for design flood simulations to allow contingency for blockage of pits by debris. The typical value adopted in urban studies is 50% blockage for sag pits and 20% blockage for on-grade pits (O'Loughlin and Stack, 2008). These factors were applied to the pit characteristic curves described above. Blockages were not considered for calibration flood simulations because there was no information to confirm there was significantly debris associated with these events and their recurrence interval was 1 year or less.

4.2.6 Overland Flow Behaviour and Model Set-Up

Residential and commercial development within the ECE catchment is of high density, with very few free-standing homes or places of business. By far the predominant type of residence is terrace-housing. Given the nature of development in the catchment, the majority of the overland flow is likely along the streets, with only minor flow across high density developments. This flow behaviour is further corroborated from the resident survey where a large number of respondents have indicated that the “streets run like rivers” during rainfall events. Only residents in Goodsell St reported a potential active flowpath through residential property (refer Response No. 69 in Table 11). This report was investigated via a field inspection and was found not to be the case. There were no other reports of active flowpaths through property.

To model overland flow along the streets, a raised elevation approach was therefore adopted with respect to residential and commercial buildings. This approach is based on the assumption that there is no active flowpaths between residences or commercial premises. For example, flows within streets such as Pemell St and Fulham Road (trapped low points) of less than 1 m^3/s with respect to 100 yr ARI, are unlikely to create active flowpaths between properties down-gradient of trapped low points.

Land parcels were identified as residential or commercial based on zoning and aerial photographs in GIS. A relative increase in height of 5 m was applied to each residential or commercial land parcel. Free-standing homes were considered individually, with the raised area curtailed to the building footprint as required.

4.2.7 Model Roughness

Table 8 presents the adopted surface roughnesses for land-use types such as Parkland, Railway Corridor and Roads. The distribution of surface roughnesses within the catchment is presented in Figure 4.

Table 8: Adopted Surface Roughnesses

Material Type	Manning's n
Main Roads and Concrete-Lined Channels	0.016
Narrow Roads and Open Concreted Areas	0.018
Parkland and Grassed Channel	0.035
Railway Corridor	1.000[a]
Steep Streets and Roads (Upper Edgeware Road, Edgeware Lane, Metropolitan Road, Marian Lane, Marian Street, Simmons Street, Sarah St, Lynch Ave, part of Llewellyn St, Brown St, Florence St, part of Hutchinson St)	0.100[b]

[a] Representative of Railway Track Ballast; [b] An artificial surface roughness was applied to very steep streets within the catchment to stabilise the model. The relative impact of this approach was a change of less than 5 cm in water surface profile.

The roughness for areas that were raised above the floodplain (residential and commercial areas) was not relevant to flood behaviour assessment, therefore were not listed in Table 8.

4.3 Model Boundaries

There were two types of model boundaries implemented in the TUFLOW model. The first was the hydrologic input from the DRAINS model of the ECE catchment. The second was outlet boundaries based on a normal depth assumption (height versus discharge) developed from modelled topography within TUFLOW, assuming a bed-slope of 0.5%.

The ECE catchment was subdivided and analysed during development of the DRAINS model. The Extended Rational Method approach was adopted as the hydrological model within DRAINS. Figure 3 illustrates the developed subcatchment layout, plus the location of where the hydrographs from each of those subcatchments were applied as sources within the TUFLOW model.

The downstream height versus discharge curves were applied on Eastern Channel and at appropriate locations where there was a flow path available between commercial buildings or along streets. These curves were automatically generated by TUFLOW based on modelled topography.

4.4 Model Calibration

There are no flow gauging stations downstream of the ECE catchment nor were there specific maximum water level data associated with a particular flood event that could be sourced from the resident survey.

As noted in Section 3.2, there has not been a significant rainfall event in the catchment for more than 15 years. Although it is generally desirable to use a range of rainfall events, including large events, in model calibration, there are no observations available from the last major event in the catchment in 1966. Accordingly, two recent rainfall events identified by the community were used to confirm the performance of the hydraulic model. These events were:

- 13 February 2009
- 14 March 2009

Details of these events are presented in Table 9. The rainfall time series is shown in Figure A and Figure B.

Table 9: Calibration Rainfall Events (General Description)

Event	Start	End	Duration	Rainfall Total	Maximum Intensity (mm/hr)	Estimated ARI
13/2/09	21:56	23:07	71 min	15.4 mm	14.6 mm/hr (60 min)	<1 yr ARI[a]
14/3/09	16:00	16:23	23 min	17 mm	62.4 mm/hr (15 min)	1 yr ARI[b]

[a] IFD analysis on regionalised values from AR&R, 1987 Vol 2 indicated 1 yr 60 min intensity is 30.7 mm/hr; [b] IFD analysis indicates 1 yr 15 min intensity is 63 mm/hr.

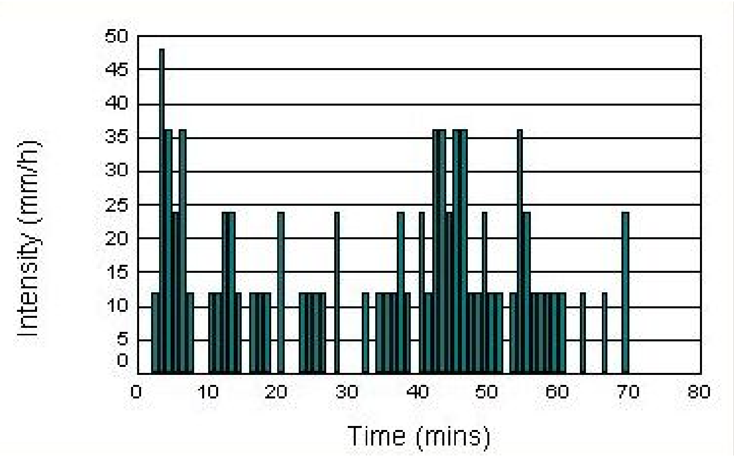

Figure A: Calibration Rainfall Event (13 February 2009)

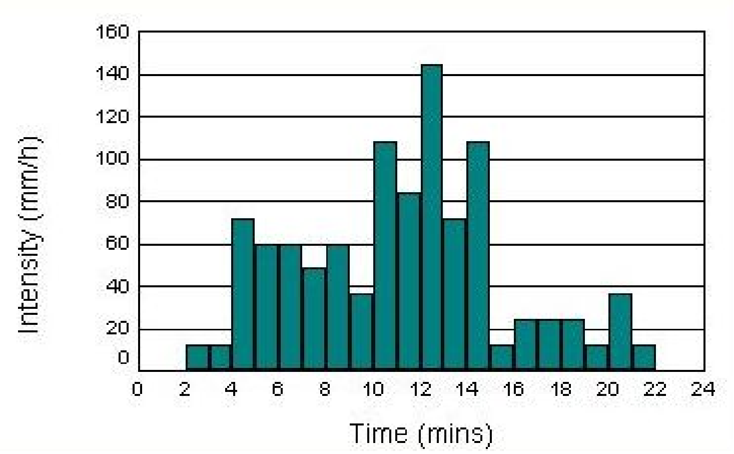

Figure B: Calibration Rainfall Event (14 March 2009)

Although surveyed levels of maximum flood height were not available, there was sufficient detail in flood questionnaire responses, with respect to these recent events, to test the model's performance against observations by the community. Table 10 presents extended responses from the flood questionnaire in regard to these events. The locations of these observations are annotated in Figure 5a and 5b. Model behaviour was assessed against these observations.

It is noted that the number of observations for the March 2009 event were limited, however, given the intensity (both less than the 1 yr event) of both calibration events, it can be inferred that flooding hotspots would be similar for both events.

Table 10: Calibration Observations from Flood Questionnaire (Golder, 2009[c])

Date of Flooding	ID	Location of Flooding	Observation by Respondent[a]	Model Behaviour (Location Number)
13 February 2009 Event				
Weekend 20-22 Feb 09	0011	1. Camden St cnr Edgeware alongside TAFE car park. 2. Cnr Alice and Edgeware SE corner	1. Has been water on road almost every day since I moved here (has been raining lots). 2. Water formed large pool on road on corner - both Alice and Edgeware Roads - after heavy rain during week	1. Confirmed (C1) 2. Confirmed (C2)

Date of Flooding	ID	Location of Flooding	Observation by Respondent[a]	Model Behaviour (Location Number)
Morning, Mid Feb 2009	0044	1. Corner of Alice St. and Edgeware Rd., 2. Enmore park, Matt Hogan Park, 3.Car park of Marrickville Memorial Anzac Club, 4. Near Newtown Station.	I was on my way to go to Marrickville Metro, when I had to cross the road I found it was flooded with the heavy rain. I saw people try to cross they had to lift their clothes and remove their shoes. Further down Edgeware Rd., where the school is was flooded too. I often witness children have to go into the puddles of water	1. Confirmed (C2) 2. Out of Catchment 3. Confirmed (C3) 4. Out of Catchment
Feb 2009 and every time there is heavy rain	0049	Sarah St. between Simmons St. and Marian St.	Drains can't cope	1. Confirmed (C4)
1. pm February 2009. 2 and 3. a year ago	0052	1.Cnr of Llewellyn St. and Edgeware Rd, Enmore. 2. Cnr Edinburgh and Murray St. 3. Cnr Unwins Bridge Rd, Edgeware Rd, May St.	Flooded our road	1. Confirmed (C2) 2. Confirmed (C5) 3. Confirmed (C6)
15/02/09 am	0063	Cnr of Alice St., and Edgeware Rd	Drove to Marrickville Metro and the footpath, gutter and road were flooded	1. Confirmed (C2)
14/02/09 and every time it rains hard.	0089	From Simpson Park across Hutchison St., along Campbell St., past Brown St.	The water floods the road. Cars get flooded and stuck in the water. Pedestrians can't walk past. I can't leave my property	1. Confirmed (C6)
Sunday to Wednesday Feb 2009	0111	Cnr of Sarah and Simmons St., Enmore	Water banks up from Margaret, Marian, Sarah and Simmons St and becomes a water pond overflow	1. Confirmed (C4)
9am February 2009 (The week is bucketed down)	0140	Cnr Darley St and John St. & Cnr of Lord St and John St.	Whenever large amounts of rain falls, runoff from Wells, Holmwood, Dickson and Pearl Sts finds its way to John St. The intersections of John and Darley and John and Lord always flood. Sometimes the stormwater covers on the road are lifted. Very dangerous for drivers as they can't see this. Also footpaths are flooded and pedestrians need gumboots.	1. Confirmed (C7) 2. Confirmed (C8)
2pm Thursday 12th Feb 09	0141	Hutchinson St. Camdenville oval at the end of May St	Overland Flow on Downhill Slope of footpath and overfull street gutters carrying fair volume of water down Hutchinson St (E-W) Immediately after heavy rain. NB: Roof areas on factories very large	1. Confirmed (C6)

Date of Flooding	ID	Location of Flooding	Observation by Respondent[a]	Model Behaviour (Location Number)
			and most discharge water directly into stormwater and street.	
Feb 2009	0193	From Edgeware Rd to Cnr Alice St.	There is major flooding on the road during heavy rain. Also, flooding at Edgeware Rd. When walking home, I have been splashed by passing traffic to flooding from the gutter to the middle of the road (on Edgeware Rd.)	1. Confirmed (C2)
5:30pm, Saturday 14th March 2009. Whenever there is heavy rain	0146	Cnr Alice and Edgeware Rd	I've lived here 26 years and every time there is heavy rain the flooding occurs at the intersection. Also, it is over knee deep to try to cross, I had to carry my dog across on Saturday as the force of the water was so great. Also Council are not moving leaves very often, they clog up the road gutters and thus clog the drains	1. Confirmed (C2)
18:00 13/02/09. 14:00 14/09/08. 19:00 12/12/08 At least 1 other event.	0169	Llewellyn St. Also Edgeware Rd and Alice St	Ponding over Edgeware Rd. Could not cross Edgeware Rd on South Side. Had to cross Alice, Edgeware and Llewellyn to get to SW corner	1. Confirmed (C9) 2. Confirmed (C2)
14 March 2009				
5.15pm, Sat 14th March 2009 and many other events	0184	Campbell St from Church St to Unwins Bridge Rd and lower end of Brown St and lower end of Hutchinson St.	Electrical storm with heavy rain caused flooding of Campbell St from Brown St to Unwins Bridge Rd., resulting in road closure. One motor vehicle (BMW) stranded in flood waters with at least one occupant, Newtown police attended.	1. Confrmed (C6)
8pm, Saturday 15th March 2009	0188	Wells St	heavy downpour was over high gutters and could have leaked into parked cars.	1. Confirmed (C10)
4:15pm 14/03/09 and every time we have heavy rain	0208	Margaret St., Newtown	We had a heavy short shower and the whole street was like a river. The drains are constantly blocked on the cnr of Margaret and Ferndale and as we are at the bottom of the dip.hill from King St and Enmore Rd, the water rushes into Margaret St. The drains cannot cope and the parked cars mean that the water	1. Confirmed (C11)

Date of Flooding	ID	Location of Flooding	Observation by Respondent[a]	Model Behaviour (Location Number)
			floods onto the pavement. we have digital photos if you would like to see them. Luckily we have a front step, otherwise the water would flood the inside of our house	

[a]It is noted that community responses were not edited. Comments on locations referred to sequential order from 1 to 4, where appropriate. In some cases, reported issues lies outside of ECE catchment. These are noted as "Out of Catchment"; [b] The location of observations are annotated as calibration observations in Figure 5a and 5b; [c]Golder, 2009. *Results of Community Flood Survey.* Reference No. 097626003-011-R-Rev1.

From Table 10, notable flooding hotspots include:

Northern Catchment

- Corner of Edgeware Road and Camden St (alongside TAFE carpark)
- Sarah St between Marian St and Simmons St
- Margaret St
- Corner of Edgeware Road and Alice St
- Llewellyn St (stormwater channel)
- From Edgeware Road to corner of Alice St
- Corner of Edinburgh and Murray St

Eastern Catchment

- Well St, Darley St and Lord St
- Corner of John St and Lord St
- Wells St

Southern Catchment

- Campbell St from Church St to Bedwin Road and lower end of Brown St, Florence St and Hutchinson St
- Camdenville Oval at end of May St

TUFLOW simulation results shown in Figure 5a and 5b are consistent with responses reported in Table 10.

In addition to these event-specific observations, there are other areas within the catchment that were noted by respondents as flood affected. Table 11 presents these general observations together with review of TUFLOW model performance at those locations. The location of these general observations are also noted in Figure 5a and 5b.

Table 11: General Observations from Flood Questionnaire (Golder, 2009[c])

ID	Location of Flooding	Observation by Respondent[a]	Model Behaviour (Location Number)
Goodsell St and May Lane			
0164	Goodsell St., St. Peters 2044	Extensive rain short time - water pumping up through the road adding to storm drain flows. Leaf litter blocking runoff. Water ankle deep across whole footpath (North side of Street)	1. Confirmed (G1)

ID	Location of Flooding	Observation by Respondent[a]	Model Behaviour (Location Number)
0069	Goodsell St., St. Peters	Gutters overflow footpath. May lane completely overflows. Backyard submerged. Water from back lane could not get away quick enough. Water in front street was too much for the gutters. A row of 4 of 5 houses flooded through. The water drained away fairly quickly.	1. Confirmed (G1)
0061	Goodsell St., St. Peters, NSW 2044	Goodsell St. experiences extreme water flow down gutter when heavy rain	1. Confirmed (G1)
0072	Goodsell St., St. Peters, NSW 2044	Next door neighbours property had ground floor flooded due to water entering via back gate. Our garden was saved by garage door which didn't let water in.	1. Confirmed (G1)
John St and Lord St			
N/A	John Street, Newtown	I want to take this opportunity to point out if it hasn't been already, that John Street Newtown floods everytime there is rain even if its duration is short. This is because the catchment for John Street includes upper Wells St, half of Pearl St, half of Pearl Lane, all of Dickson St and all of Dickson Lane and John Street itself. The apparent reason for this is that there are no subterranean drains from the gutters of those streets mentioned above, and the first subterranean stormwater drain in the water's path is on John St near the corner with Darley St. By the time even modest falls travel from the geographic high point on Dickson Street, the water is a raging torrent. The streets mentioned are all well cambered and yet the stormwater typically rises over the footpaths on John St and not infrequently covers the entire width of the road rendering it virtually impassible to foot traffic, and threatening to inundate my property.	1. Confirmed (G2)
Overland Flow Lord St, Darley St and Well St			
0076	Lord St., Newtown, NSW 2042	Lord St (South end) floods during torrential rain storms. Street resembles a river. Stormwater drainage has been improved by Council (Circa 1998) - has stopped stormwater drain in John St from overflowing. Low water table in Lord St. Area under property was prone to flooding until agricultural pipes drain put along side of house. However, flooding can reach front door from road and footpath.	1. Confirmed (G3)
0042	Lord St., Newtown	I opened my front door and saw water lapping against our front steps	1. Confirmed (G3)
0174	Lord St., Newtown	For example yesterday road floods onto footpaths. Huge amount of water especially at John St/Lord St Corner	1. Confirmed (G3)
0094	Darley St., Newtown NSW 2042	Roads and Paths	1. Confirmed (G3)
0212	Wells St.,	At blocked section of Wells St.	1. Confirmed (G3)

ID	Location of Flooding	Observation by Respondent[a]	Model Behaviour (Location Number)
	Newtown NSW 2042		
Corner Railway Parade and Edgeware Road			
0172	Edgeware Rd., Newtown NSW 2042	Flash flooding I guess. Heavy rain flooded the street extending under the bridge not even buses could get through. Bin floated around. Cars would have had wet floors. Came up to the top step of the house	1. Confirmed (G4)
0134	Edgeware Rd.	Drain has been planned for 15 years but council has still not put it in. This is the lowest part of Newtown but council won't fix it. Floods every heavy rain. Flooding up to garages several time. I did a flood study at great expense for "Newtown" in the middle of the city Does this tell you that something needs fixing? Please spend less time workshopping this and do something.	1. Confirmed (G4)
Overland flow Brown St and Florence St			
0013	Brown St., St. Peters	Whenever it rains Front yard	1. Confirmed (G5)
0086	Brown St., St. Peters 2044	The road and footpath floods	1. Confirmed (G5)
Bailey St, Holt St and Station St			
0019		Road flooded on Margaret St. and Holt St.	1. Confirmed (G6)
0133	Station St., Newtown 2042	Every time there is a heavy downpour, the stormwater drain at Holt/Station Sts cannot handle the volumes of water so the roads are covered. There also seams to be an aquifer between Bailey St and Station St. Our house always has water under it and we have put in a sump pump to handle it.	1. Confirmed (G6)
Pemell St			
0181	Pemell St, Newtown	Stormwater ponds in gutter and sometimes flows on to nature strip. This occurs when fallen leaves are not cleared from grid over drain which runs between the two above premises	1. Confirmed (G7)
0196	Pemell St., Newtown NSW 2042	Drains can get blocked by street tree debris so it may not be a strict capacity issue. There is a stormwater drain between No's 20&22. Water pools onto the footpath at the lowest point on the street. (Can I stress that tree debris is a significant factor. The crepe myrtle (?) is not a drain friendly species)	1. Confirmed (G7)
Fulham St			
0078	Fulham St., Newtown	1. Storm water caused backflow from sewers to flood backyard up to kitchen door and up drain in bathroom - lots of damage. 2&3. Road near St. Peters Station on King St. - bad flooding and huge pools of water on road. Drains unable to cope.	1. Confirmed (G8) 2. Out of Catchment 3. Out of Catchment

[a]It is noted that community responses were not edited; [b] The location of observations are annotated as general observations in Figure 5a and 5b; [c]Golder, 2009. *Results of Community Flood Survey.* Reference No. 097626003-011-R-Rev0.

From areas that are generally noted as problematic include:

Northern Catchment

- In the vicinity of Bailey, Holt and Station St
- Pemell St
- Fulham St
- Margaret St and Ferndale St
- Simmons and James St

Eastern Catchment

- Corner Railway Pde and Edgeware Road

Southern Catchment

- Goodsell St and May Lane
- Overland flow in Brown St and Florence St

From Table 11, flood affected areas were consistent with TUFLOW simulations presented with respect to February and March 2009 events in Figure 5a and 5b.

The calibrated model had parameters which are typical of urban conditions. As such, the hydraulic model can be used confidently to model larger design flood events such as the 100 yr ARI event.

4.5 Design Flood Modelling

Design flood simulations are presented for 2, 5, 10 and 100 year ARI (Average Recurrence Interval) events for durations 15 min, 30 min, 60 min, 1.5 hours and 2 hours. These durations were selected based on the results of preliminary modelling of the 100 yr design flood event that identified critical duration at various locations within the catchment. The 45 min and 3 hour duration events were critical in less than 1% of locations, therefore were omitted.

The maximum modelled water level from within any of these duration events was used to develop the maximum modelled flood depth. Figure 6 presents the modelled flood depth for each design event. The estimated flood extent is also presented in Figure 6.

The maximum modelled flood velocity for each design event is presented in Figure 7. The maximum flood velocity was determined from within any of the simulated durations for each particular design event. The maximum velocity recorded is the maximum velocity during the simulation where depth of flow is more than 10 cm. Where the maximum flow depth was less than 10 cm at a particular location during the simulation, recorded maximum velocity is the velocity at peak flood level. The TUFLOW documentation notes that this is to avoid reporting very high velocities that can occur when model cells are initially becoming wet.

The results from design flood simulations are also tabulated at various key locations as presented in Table 13. The locations of tabulated results are annotated on Figure 6 and 7.

4.5.1 Interpreted Flood Extent

The flood extent was developed by intersecting the modelled maximum water level (extrapolated perpendicular to the flow direction) with the DTM, considering a cut-off threshold of 10 cm depth. The modelling approach adopted is reasonable in this case because of the relatively low storage within this catchment. Where the flood surface did not intersect the ground surface, such as on the down-slope side of some steep streets, the results were interpreted. Properties identified as being flood affected, based on this approach, are highlighted in Figure 6, 7 and 8.

Table 12 presents the calculated number of land parcels inundated with respect to each of the design flood simulations (considering maximum modelled water level of any duration event).

Table 12: Number of Land Parcels Inundated - Design Flood Simulations

	2 YR	5 YR	10 YR	100 YR
Number of Land Parcels Inundated	321	418	603	925

Table 13: Modelled Water Level, Velocity and Discharge - Design Flood Simulations

#	Description	2 YR			5 YR			10 YR			100 YR		
		H[a]	V[a]	Q[b]	H	V	Q	H	V	Q	H	V	Q
1	Camdenville Oval	4.98	0.58	3.01	5.68	0.76	4.90	6.03	0.78	6.06	6.67	0.75	10.52
2	Corner Campbell St and May St	6.19	0.42	2.33	6.23	0.46	3.59	6.26	0.48	4.37	6.67	0.49	7.36
3	Corner Campbell St and Brown St	6.29	1.06	2.01	6.37	1.20	3.07	6.41	1.28	3.69	6.66	1.53	6.28
4	Corner Railway Parade and Edgeware Road	5.79	0.28	1.29	5.88	0.30	2.26	5.93	0.33	2.77	6.07	0.36	4.81
5	Corner of John St and Lord St	8.81	0.95	1.04	8.86	0.98	1.53	8.89	1.10	1.73	8.97	1.00	2.73
6	John St	13.29	0.54	0.50	13.34	0.57	0.72	13.36	0.60	0.87	13.44	0.75	1.44
7	Cnr of Edinburgh and Murray St	4.61	0.11	1.07	4.87	0.18	2.65	4.98	0.21	3.47	5.24	0.30	5.96
8	Cnr Edgeware Road and Alice St	8.42	0.45	1.11	8.49	0.69	2.57	8.55	0.85	3.84	8.69	1.50	8.69
9	Cnr of Edgeware Road and Camden St	11.27	1.63	1.49	11.29	2.29	1.86	11.32	2.47	2.06	11.37	2.75	3.18
10	Camden St	10.85	0.25	0.00	10.96	0.25	0.07	11.00	0.25	0.22	11.26	0.25	1.96
11	Corner of Marian St and Sarah St	17.151	0.38	0.17	17.17	0.45	0.27	17.18	0.49	0.34	17.21	1.52	0.55
12	Pemell St	22.80	0.14	0.18	22.96	0.12	0.26	23.08	0.14	0.32	23.48	0.17	0.62

[a]H is modelled maximum water level (mAHD); V is modelled maximum flood velocity (m/s); Q is modelled maximum discharge (appropriate cross-section) (m^3/s); [b]Q are line objects whereas H and V are point objects. Reported Q is flow through section adjacent point object. The direction of any particular section is illustrated.

4.6 Hazard Categorisation

Provisional hazard categorisation with respect to each design event was determined using TUFLOW's Z1 hazard type output. The Z1 hazard categorisation is based on the NSW Floodplain Development Manual, Figure L-2. Output from TUFLOW is standardised into Low, Intermediate and High Hazard. Figure 8 presents the modelled maximum provisional hazard categorisation with respect to each of the design flood events. Properties identified as being flood-affected are also highlighted in Figure 8.

It is noted that the Velocity X Depth product for each model cell is calculated at each time step, therefore the maximum hazard presented is the maximum dynamic hazard derived from all the duration events of a particular design recurrence interval. The estimated hazard at the various locations identified in Table 13 is provided in Table 14.

Table 14: Modelled Flood Hazard Category - Design Flood Simulations

#	Description	Provisional Flood Hazard, Z1[a]			
		2 YR	5 YR	10 YR	100 YR
1	Camdenville Oval	H	H	H	H
2	Corner Campbell St and May St	L	L	L	I
3	Corner Campbell St and Brown St	L	L	L	I
4	Corner Railway Parade and Edgeware Road	L	L	L	I
5	Corner of John St and Lord St	L	L	L	L
6	John St	L	L	I	H
7	Corner of Edinburgh and Murray St	L	L	I	H
8	Corner Edgeware Road and Alice St	L	L	L	I
9	Corner of Edgeware Road and Camden St	I	I	I	H
10	Camden St	L	L	L	I
11	Corner of Marian St and Sarah St	L	L	L	L
12	Pemell St	L	L	L	H

[a]Z1 is provisional hydraulic hazard categorisation in that vicinity {L - Low, I - Intermediate and H - High}.

4.7 Model Sensitivity Analysis and Climate Change Impact Assessment

A sensitivity analysis was undertaken to establish the impact of basic model parameters of roughness and catchment runoff on design flood events. The catchment runoff sensitivity was combined with the climate change impact assessment as the two analyses are similar in nature. Model runs were carried out for the 5 yr 30 minute and 100 yr 30 minute events.

Model sensitivity was assessed by comparing predicted maximum flood depth for the above design flood events. Modelled scenarios included:

- Increase in surface roughnesses by 20% (Sensitivity Analysis)
- Decrease in surface roughnesses by 20% (Sensitivity Analysis)
- Increase in rainfall intensity by 30% (Sensitivity Analysis and Climate Change Impact Assessment)

The modelled change in maximum flood depth are presented in APPENDIX G.

From APPENDIX G, the modelled change in flood depth, in the 5 yr 30 minute event, because of a 20% increase in surface roughness was a minor decrease of between 1 and 3 cm. The modelled change in flood depth because of a 20% decrease in surface roughness was a minor increase of between 1 and 3 cm.

These changes indicate the model is relatively insensitive to changes in surface roughness, which is to be expected given the steepness of the catchment. Minor changes in modelled flood depth observed in Figure G1 and Figure G2 reflect changes in timing of flood behaviour between the respective sensitivity runs.

From APPENDIX G, the modelled change in flood depth due to a 30% increase in rainfall intensity was generally an increase of 5 cm at the identified drainage hot-spots (Murray St, intersection of Alice St and Edgeware Road, corner of Railway Parade and Edgeware Road, intersection of John St and Lord St) in the 5 yr 30 minute event. There was an increase of up to 15 cm at trapped low-points in Fulham St and Pemmel St, Murray St and in Camdenville Oval detention basin. For the 100 yr 30 minute event, the general increase in flood depth was 5 to 15 cm, with an increase of more than 15 cm along Camden St and along Victoria Road in front of the Marrickville Metro and in Murray St as well as Camdenville Oval detention basin due to the change in timing.

Sensitivity analysis indicates that model predictions are sensitive to an increase in rainfall intensity, the climate change scenario, however are essentially insensitive to adopted value for surface roughness.

4.8 Flood Damages Assessment

4.8.1 Overview

The economic impact of stormwater flooding is due to:

- Tangible Impacts – which includes direct impacts such as damage to building contents (internal and external) and structural damage to building. It also includes indirect impact such as loss of revenue, clean-up cost and loss of public services (water supply, sewerage etc.)
- Intangible Impacts – which include inconvenience during flooding and post flooding periods, loss of amenity, insecurity and stress.

The analysis is based on the spreadsheet model developed by Department of Climate Change and Water (DECCW). The model is based on the 'damage curves', which relate the depth of flooding on the property with potential damage to the property. Damage curves for residential properties were determined based on the DECCW spreadsheet model. Damage curves for commercial/industrial properties were adopted from the details presented in ANUFLOOD (Smith and Greenaway, 1992).

The cost of intangible impacts were included in the analysis by increasing the damage curves for residential by 15% and by increasing the damage curves for commercial properties by 55% as per the recommendation in the ANUFLOOD (Smith and Greenaway, 1992).

4.8.2 Property Survey

Property survey for the flood affected properties was undertaken to determine the habitable floor levels and other relevant property details for flood damage estimation. A total of 1,953 properties were surveyed that were identified as being potentially subject to flooding under existing conditions during the Probable maximum Flood (PMF) design flood event. After discussions with DECCW, it was agreed that the floor level elevations could be estimated from Council's recently acquired Aerial Laser Scanning (ALS) topographic dataset, using an appropriate field based approach.

Accordingly, the following information was collected on-site and documented in a standard form:

- street name and number;
- property type;
- property size;
- number of storeys;
- type of construction;

- if people live on the ground floor; and
- the habitable floor height from the point of measurement.

Photographs were taken at each property for reference. Details of the field survey work and methodology are presented in APPENDIX D. The complete property survey is provided separately.

4.8.3 Flood Damage Estimation Methodology

The flood damage estimation is based on the damage curves, which are derived from a methodology developed by DECCW. These damage curves relate the depth of flooding on the property with the likely damage cost.

The DECCW damage curves are based on the state-wide damage data that has been collected following various flooding events. Consequently, the damage curves are approximate in nature and economic impact analysis based on these curves are indicative only. However, a number of parameters have been included in estimation of these curves that can be varied to suit local conditions.

As noted, damage curves for commercial and residential properties

Details of the damage curves estimation for the EC East Subcatchment are discussed below. Detailed calculations are provided in APPENDIX E.

4.8.4 Damage Curves

The spreadsheet model prepared by DECCW as part of Floodplain Management (FM) Guideline series was used to develop the damage curves for the EC East Subcatchment. The damage curves for residential properties were based on DECCW data. Damage curves for commercial and industrial properties were based on ANUFLOOD (Smith and Greenaway, 1992).

There are six types of properties for which damage curves were estimated using the DECCW guidelines. They are:

- Single storey slab/ low set
- Single storey/high set; and
- Two storey
- Small Commercial Properties (<186 m^2)
- Medium Commercial Properties (186 – 650 m^2)
- Large Commercial Properties (>650 m^2)

Residential properties in the EC East Subcatchment are either single storey slab/low set or two storey buildings. In general, the single storey building incurs higher damages as compared to two storey building as the later provides an opportunity to have home contents spread out over two stories. Two storey properties also provide an opportunity to move valuables to the upper storey in case of a flood warning. However, this is not relevant to the EC East Subcatchment, as there is no flood warning time available due to short duration of flooding.

All commercial/industrial properties within EC East Subcatchment were assigned Medium Commercial Property category (Low Damage Class [2] – Offices, Hardware, Clubs, Service Stations, Schools) except for properties within the Marrickville Metro. Commercial properties on the ground floor of the Marrickville Metro were assigned Small Commercial Property category (High Damage Class [4] – Printing, Men's and Women's Clothing, Cameras, Pharmaceuticals, Electronics) except for the Kmart and Woolworths whose damages were based on Large Commercial Property (High Damage Class [4] – as above) and calculated on a $/$m^2$ basis. It is noted that flood depth within the Marrickville Metro was determined from peak cumulative inflow at the entrance to the Metro on Victoria Road and dividing this flow by Metro's ground floor area.

Garden/Yard damage

The damage curves assume that the damage to property starts when the garden or the front/back yard of the property is inundated, even though the flood waters have not risen to enter the habitable floor level. An approximate value for damages has been assumed in the DECCW model with associated clean-up cost and this has been retained for damage assessment for this study. A minor amendment to the DECCW spreadsheet was implemented for this study. If the modelled flood level was below ground level at a particular property, the damage value was set to $0, rather than damages commencing at -0.5 m or -1.0 m below floor level, as per the default in the DECCW spreadsheet. This was implemented to account for the large number of properties with a habitable floor level at only 0 to 0.5 m. The average difference between ground level and floor level of the 1,953 properties surveyed was 0.34 m.

Average Weekly Earnings

The cost base for the DECCW damage curves was established in 2001. The NSW Floodplain Management guideline recommends use of Average Weekly Earnings (AWE) to update this cost base. AWE has been adopted instead of inflation rate based on Consumer Price Index in the damage curve estimation as it is assumed to be a better estimate of the societal wealth that can directly be linked to the damages that would be incurred on a flood affected property.

Based on the Australian Bureau of Statistics (ABS) data the AWE in Aug 2009 (latest figures available with ABS) is $934.70 as compared to $676.40 in November 2001. Thus the increase in AWE is 38%, which has been applied to the cost base in the residential damage curves. The commercial damage curves from ANUFLOOD were reviewed and a 38% increase was also applied to these curves.

Damage curve parameters

A number of other parameters are included in the assessment of damage curves for residential. These parameters and the assumed values are listed below:

- The average value of home contents is assumed to be $100,000. This is one of the important parameters and can have major impact on estimated damages. This assumption is based on preliminary home content insurance cover quote obtained online from a recognised insurer.
- A typical property has a floor area of 120 m^2.
- Level of flood awareness is minimal i.e. the community is not well prepared to respond to a flood emergency (typical of most urban communities)
- Effective warning time for flooding is assumed to be zero since catchment response time is short
- There are no post flood inflation costs (This parameter is more relevant to regional towns)
- The residents of the flood affected properties will move out of the property for 3 weeks for clean-up purposes

Assumptions included in damage curve estimations for residential properties are presented in APPENDIX E. The damage curves are shown in Figure 1 below including the curves developed for the commercial properties based on ANUFLOOD (Smith and Greenaway, 1992). It is noted that the residential and commercial curves presented in Figure 1 include allowance for intangible damages of 15% and 55% respectively.

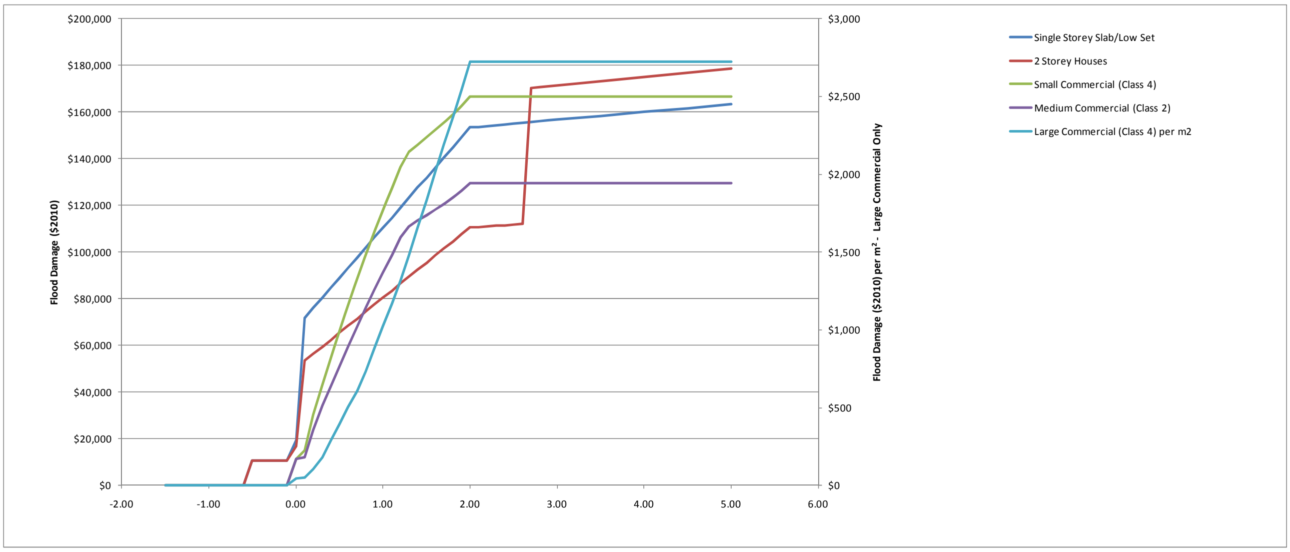

Figure 1: Damage Curves for EC East Subcatchment (Based on DECCW model and ANUFLOOD)

4.9 Flood Damage Estimation

The stormwater flooding damages were estimated for the existing catchment conditions of EC East Subcatchment. Table 15 provides damage estimates for various design flood events.

Table 15: Damage estimates for various design flood events

Event	Damages
PMF	$62,176,926
100 Year ARI	$15,905,403
20 Year ARI	$10,505,878
5 Year ARI	$5,348,807
2 Year ARI	$3,019,858

4.9.1 Annual Average Damage

The Annual Average Damage (AAD) provides a measure of the average cost of stormwater flooding to the community on annual basis. Damage cost for each design event is plotted against the probability of the design event to establish a damage-probability relationship, as shown in Figure 2.

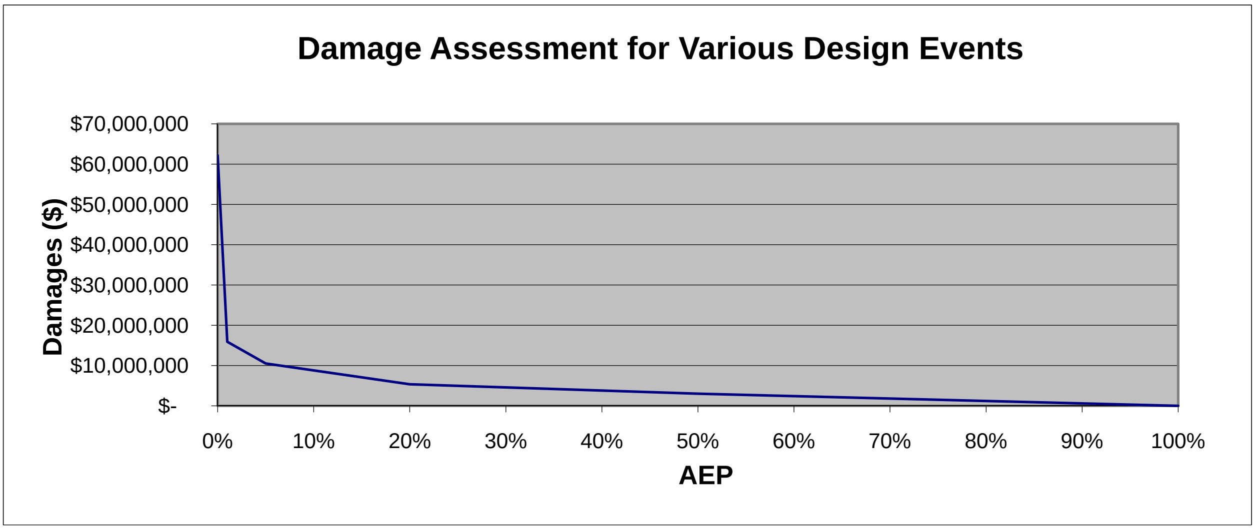

Figure 2: Damage-Probability relationship for various design flood events

The AAD is assessed by estimating the area under the damage-probability curve. For the EC East Subcatchment, the AAD is estimated to be $4,117,613. Table 16 provides contribution of each design flood event to the AAD.

Table 16: Average Annual Damage (AAD) for various design flood events

Design Flood Event	AAD
up to 2 Year ARI	$754,965
2 Year to 5 Year ARI	$1,255,300
5 Year to 20 Year ARI	$1,189,101
20 Year to 100 Year	$528,226
100 Year to PMF	$390,021
Total Average Annual Damage	**$4,117,613**

Approximately half (49%) of the contribution to the AAD is from the flood events ranging up to 5 yr ARI. Events above the 5 yr ARI contribute the remaining 51% to the AAD for the EC East Subcatchment.

4.10 Results and Discussion

A 1D/2D TUFLOW hydraulic model has been developed for the ECE catchment. The developed model utilises output from DRAINS nodes as internal boundary conditions, providing hydrologic response consistent with a highly urbanised environment associated with street drainage and overland flow along the streets. A summary table of key modelling assumptions is provided in Table 17.

Table 17: Summary of Key Modelling Assumptions

Assumption	Description
No active flowpaths between residences	Due to the density of development, the majority of the catchment was modelled assuming no active flowpaths between buildings. Where there were standalone buildings, these were treated individually by trimming to the building footprint.
Pit blockages	Pit blockages of 20% for on-gradient pits and 50% for sag pits was assumed for design flood events.
Pit hydraulic characteristics	Pit entry/exit hydraulic characteristics were derived from DRAINS model database, extrapolated to 1.5 m

The 1D/2D TUFLOW model was calibrated against recent observations recorded in the resident survey and general reports of flood affected areas.

In general, many of the drainage issues reported by respondents relate to overland flow either from runoff in excess of inlet capacity of the stormwater system, or at trapped low points, or where stormwater infrastructure is absent and stormwater is conveyed along streets. It is noted, however, that there has not been a significant storm event reported at the BOM's Sydney Airport rainfall gauge during the last 15 years.

In some areas, however, hydraulic performance of the stormwater system is not being governed by the inlet capacity of the system; rather the capacity of infrastructure downstream controls the conveyance of the upstream network. This implies that additional pits in flooding hotspot locations will not necessarily assist in flood mitigation because performance is not inlet controlled.

The modelled performance of the pipe/culvert system is presented in Figure 9 with respect to calibration events and Figure 10 with respect to design flood simulations. These figures thematically map the % of flow area utilised within any particular pipe/culvert during a simulation. Results presented with respect to design flood events are for the 30 minute duration simulation. It is noted that the maximum flow area, expressed as a %, that is mapped in Figure 10 is the maximum flow area at any point during the flood simulation. i.e. if a particular culvert flows full for only 5 minutes at the peak of a storm event, or flows full throughout a modelled storm event, it is still mapped as flowing 100% full in Figure 10.

An analysis of modelling results with respect to each of the areas of interest within the catchment is presented below, with particular reference to modelled pipe/culvert performance.

Goodsell St and May Lane

There is no formal stormwater drainage infrastructure in this part of the catchment. The contributing catchment to these streets is not extensive, although runoff from the Princes Highway is captured and conveyed to the top of Goodsell St, where the pipe network daylights and stormwater is conveyed down Goodsell St to Council St. Modelled flow along Goodsell St is up to 20 cm in the 2 yr event and up to 30 cm in the 100 yr event. Modelled flow velocity in Goodsell St ranges from about 1.2 m/s in the 2 yr event up to about 1.5 m/s in the 100 yr event. Flood hazard in Goodsell St is generally low for 2, 5 and 10 yr event, however, there are pockets of intermediate and high hazard for the 100 yr event.

Runoff from properties along May St discharge in a northerly direction towards May Lane. Overland flow from May Lane reaches Council St and then flows into the Illawara Railway corridor. Responses from residents suggest overland flow within May Lane may be contributing to inundation of rear yards of some Goodsell St properties.

There is also no pit and pipe network at the corner of May St and Council St. The resident at that location also reports stormwater issues.

John St and Lord St

The catchment for John St and Lord St extends to Commodore St in the north. Runoff from Dickson St, Dickson Lane and Holmwood Lane runs into Pearl Lane, which in turn flows into Wells St, together with input from Pearl St. These combined flows then enter John St travelling within the street cross-section until the intersection with Darley St, where there is a cluster of pits. A 300 mm pipe connects these pits to a cluster of pits at the intersection of Lord St and John St, which then drain via a 375 mm pipe to a culvert (1850 x 1100 mm) running along the north side of the Illawarra Railway line toward the corner of Edgeware Road and Railway Parade (discussed below).

Drainage issues reported in this part of the eastern subcatchment pertain to overland flow along Wells St to the corner of John St and within John St to the intersection with Lord St. Modelled depth of flow entering John St from Wells St ranges between 20 cm in the 2 yr event up to 35 cm in the 100 yr event, however, it is fast flowing with a modelled flow velocity of up to 1 m/s in both 2 yr and 100 yr ARI events. Provisional flood hazard, however, is low due to shallow depth, even up to the 100 yr event. Modelled depth of flow at the intersection of John St and Lord St ranges between 20 cm in the 2 yr event up to 40 cm in the 100 yr event. The provisional flood hazard category at this intersection is low up to the 100 yr event.

Modelled pipe/culvert performance indicates that the 375 mm pipe running from the intersection of John St and Lord St to the culvert running along the north side of the Illawarra Railway line is flowing full in all design events (refer Figure 10). The culvert (1850 x 1100 mm) running along the north side of the Illawarra Railway line is not flowing at full capacity in the 2 yr event and even up to the 100 yr event, however, it may be operating under downstream control. Figure 9a, from the calibration simulation events (<1 yr ARI) indicates, however, that it is a capacity constraint of that 375 mm pipe which is likely to be affecting the cluster of pits and feeder pipes at that intersection.

There were also drainage issues reported along Lord St, upstream of the intersection with John St, although there is a pit/pipe network covering that area. There is a response in the flood questionnaire along Lord St of above floor flooding. It appears that the floor level, however, is at or below street level at that location.

Lower Lord St, Darley St and Wells St

Lord St, Darley St and Wells St down-gradient of John St drain to the corner of Railway Parade and Edgeware Road, the natural low-point. Stormwater infrastructure exists along Lord St (300 mm pipe) from halfway between John St and Edgeware Road. Similarly, stormwater infrastructure exists along Darley St (225 mm pipe) from halfway between John St and Edgeware Road. There is no equivalent system along Wells St, however, there are two pits at the intersection of Wells St and Edgeware Road that drains it southward via a 225 mm pipe and then a 450 mm pipe to the corner of Railway Parade and Edgeware Road. Darley St and Lord St pipes are also connected to this pipe.

Drainage issues reported from Lord St suggest regular exceedance of the capacity of stormwater system within Lord St. Issues with lower Lord St are exacerbated by overflow from the intersection of John St and Lord St. It is noted that spacing of pit inlets along Lord St is more than 60 m implying limited potential for entrainment of overland flows.

Modelled flood depth along the lower end of Lord St ranges from 25 cm to 40 cm. Modelled velocity at that location ranges between 1 and 1.5 m/s in the 2, 5 and 10 yr event and up to 2 m/s in the 100 yr event. Flood hazard category is low for the 2 and 5 yr event; however, some high hazard areas appear in the 10 and 100 yr event.

Modelled flood depth along Darley St ranges from 5 to 10 cm in the 2 yr event to 15 to 20 cm in the 100 yr event. Modelled flood depth along Wells St ranges from 10 to 20 cm in the 2 yr event to 20 to 30 cm in the 100 yr event.

Modelled hydraulic performance indicates that the capacity of the 300 mm pipe in Lord St and the 450 mm pipe in Edgeware Road from Lord St to Railway Parade is exceeded in less than the 1 yr ARI event (refer Figure 9a). Modelled performance of the 225 mm pipe in Edgeware Road between Wells St and Lord St indicates it's capacity is exceeded in the 1 yr event (refer Figure 9b). The modelled performance of the 225 mm pipe within Darley St indicates it is flowing at more than 80% of it's capacity in the 1 yr event (refer Figure 9b).

Model results for the 13 February 2009 calibration event (<1 yr ARI) suggest capacity constraint of pipes within Lord St, Darley St and along Edgeware Road between Wells St and Railway Parade may be responsible for drainage issues reported at this location. Design simulations (Figure 10) and the 14 March 2009 calibration simulation (Figure 9b), however, indicate downstream control in the culverts between Railway Parade and Eastern Channel. This implies that improvements to inlet capacity or conveyance capacity at this location will have limited effect if downstream control is not rectified. This is discussed further in the following section.

Corner of Railway Parade and Edgeware Road

The corner of Railway Parade and Edgeware Road where Railway Parade passes underneath Bedwin Road is reported as an area experiencing regular issues with respect to flooding. An additional constraint at this location is that drainage from the railway corridor also arrives at this low point as overland flow. There is an informal grass-lined drain within the railway corridor, however, it terminates at this location. This appears to be compounding the issue at this location.

Modelled flood depth underneath Bedwin Road bridge ranges from 60 cm in the 2 yr event up to 85 cm in the 100 yr event. Modelled flood velocity is 0.5 m/s or less in all design rainfall events implying that stormwater is ponding at this location. Modelled flood hazard category is low for 2, 5 and 10 yr event and is intermediate for the 100 yr event.

Modelled simulation results suggest that inlet capacity is not governing performance of stormwater infrastructure at this location, rather, the downstream culvert (1550 X 870 mm) parallel to the railway line that discharges to Eastern Channel is flowing full in the 1 yr calibration event (refer Figure 9b) and all design flood events (refer Figure 10). This conclusion is consistent with the analysis of Boyden and Partners (1999), who suspected outlet control was governing system behaviour with respect to this low point. This implies that adding additional pits at this location will have limited effect if capacity of downstream infrastructure is not increased.

Intersection of Campbell St, Hutchinson St, Brown St and May St

There is no drainage infrastructure in the southern subcatchment upstream of this natural low point. Overland flow from Hutchinson St, Campbell St, Brown St, Florence St and further upstream is captured by this local depression and is transmitted by a cluster of pits and small pipes to the 1200 mm pipe underlying Bedwin Road railway bridge, which in turn drains under the railway line to the culvert (1550 X 870 mm) that discharges to Eastern Channel. Runoff in excess of the capacity of this system pools at this location before being transmitted by overland flow into Camdenville Oval.

Modelled flood depth at the low point outside of the Town and Country Hotel ranges between 40 cm in the 2 yr event to 90 cm in the 100 yr event at the low point. The modelled flood velocity in Campbell St, as it approaches the low point, reaches up to 1.5 m/s in the 2 yr event and up to 2.5 m/s in the 100 yr event. Modelled flood hazard is low for the 2, 5 and 10 yr events, however, becomes intermediate to high in the 100 yr event.

Analysis indicates the 1200 mm stormwater pipe underlying Bedwin Road is being governed by outlet control rather than inlet capacity of the pit cluster in events with a recurrence interval of more than 1 yr (refer Figure 9b and Figure 10). Figure 9a suggests that hydraulic capacity of the pipes under this intersection may be a constraint in less than 1 yr events and increasing the capacity of interconnecting pipes between these pits may help to alleviate this issue during events less than the 1 yr recurrence interval. However, this will not resolve hydraulic performance in events greater than the 1 yr event since the 1200 mm pipe below Bedwin Road is downstream controlled.

This conclusion is generally consistent with conclusions of Lucas et al (1998), although it was not realised that the inlet controlled capacity of the main 1200 mm pipe (hydraulic grade of 0.25%) could not be fully utilised because the system is downstream controlled. The capacity of the culvert running underneath the railway line and the culvert running parallel to the railway line along Murray St (1550 X 870 mm) is not enough.

Simulated behaviour of Camdenville Oval implies it is underutilised early in a design flood event. Only surface overland flow down May St enters the detention basin prior to over-topping outside of the Town and Country Hotel. By that stage, resident survey responses indicate ponding from upstream of the intersection to the end of Brown St and Hutchinson Road. This is consistent with modelled flood behaviour.

Overland Flow Upper Brown St and Florence St

Respondents to the flood questionnaire indicated runoff is conveyed by streets and footpaths in these streets. There is no drainage infrastructure in Brown St or Florence St.

Modelled flood depth along Brown St ranges from 5 to 10 cm in the 2 yr event to 10 to 15 cm in the 100 yr event. Modelled flood depth along Florence St ranges from about 10 cm in the 2 yr event to about 20 cm in the 100 yr event. Modelled flood hazard in both upper Brown St and upper Florence St is low for all design flood events.

Edgeware Road (alongside TAFE carpark)

Surface overland flow along Edgeware Road, adjacent the TAFE carpark, is reported as a regular drainage issue. There is a significant contributing catchment to the pit and pipe network that exists at the corner of Sarah St and Edgeware Road. There is no drainage network in the upper reach of this part of the catchment. At present, captured runoff is discharged at the corner of Sarah St and Edgeware Road as surface overland flow along Edgeware Road, past the TAFE carpark, to a cluster of pits at the corner of Edgeware Road and Camden St.

Modelled flood depth along Edgeware Road at this location ranges from about 5 cm in the 2 yr event up to about 15 cm in 100 yr event. Modelled flow velocity, however, is quite high, ranging from about 1.5 m/s in the 2 yr event to about 4 m/s in the 100 yr event. Modelled flood hazard category is low to intermediate in the 2 yr event, however, is intermediate to high in the 5 yr event and above, due to the high velocity.

Hydraulic analysis suggests the SWC 1800 mm pipe that enters Edgeware Road from Camden St is fully utilised in events above the 5 yr event (refer Figure 10b). The second SWC pipe (1050 mm) that enters Edgeware Road from Camden St is fully utilised in the 1 yr event and above (refer Figure 9b).

Camden St (adjacent TAFE carpark)

There is a natural low point along Camden St, approximately halfway between Simmons St and Edgeware Road. There are two SWC trunk drains running along Camden St. On the north side of the street there is a 1050 mm pipe and on the south side there is a box culvert (1350 X 900 mm). These main drainage lines carry stormwater from the whole northeast corner of ECE. There are three pits at this location that services this depression. There is one pit on the north side (P-EE128C) which is connected to the 1050 mm pipe. There are two pits on the south side of Camden St. One pit (P-EE128D) is connected to the SWC box culvert. The other pit (P-EE128E) was modelled as being connected to the SWC culvert at a high invert level, as per Council's drawings, and is then connected to a 900 mm pipe that drains southwards toward Alice St through a relatively new townhouse development.

Modelled flood depth at this location ranges from 35 cm in the 2 yr event to 0.8 m in the 100 yr event. There is an overland flow path from Camden St through Prince Avenue to Alice Avenue. It is noted that private drainage has not been incorporated in the model, in general, however, in this case the system has been implemented as per Council's drawings. Site inspection at this location noted raised fences to allow surface overland flow. This was incorporated in the model as variable height flow constrictions.

Review of modelled hydraulic performance implies the 1050 mm pipe on the north side of Camden St is flowing at full capacity in the 1 yr event and above (refer Figure 9b and Figure 10). On the south side of Camden St, the 450 mm pipe connecting the pit (P-EE128D) to the SWC culvert (1350 X 900 mm) is at full capacity in the 1 yr event and above, however, the SWC culvert itself does not reach full capacity even in the 100 yr event. This implies that the inlet capacity of this pit (P-EE128D) could plausibly be increased, although it is noted that the culvert is at full capacity from the corner of Camden St and Edgeware Road onward.

It is noted that the pipe running from P-EE121G underneath Alice Avenue to the corner of Alice St and Edgeware Road was connected to the drainage network of this redeveloped area via a high invert level, as per Council's drawings.

Corner of Edgeware Road and Alice St

The corner of Edgeware Road and Alice St is a reported hotspot with respect to ponded runoff. The intersection is a natural low point. The intersection is a confluence of all surface overland flow not entrained into the pit and pipe network. The contributing catchment to this point is 53 hectares.

Modelled flood depth at this intersection ranges from 30 cm in the 2 yr event to 60 cm in the 100 yr event. Modelled flood velocity at this intersection ranges from less than 0.50 m/s in the 2 yr event to only 1.2 m/s in the 100 yr event. Accordingly, the modelled flood hazard category is low for the 2, 5 and 10 yr event and intermediate for the 100 yr event.

Analysis suggests limited pit capacity may be a control with respect to pits at the corner of Alice St and Edgeware Road (P-EE219, P-EE220 and P-EE221) since the main culvert is not flowing full in the calibration simulations (refer Figure 9a (<1 yr event) and Figure 9b (1 yr event)). Results presented in Figure 10 suggest the main SWC culvert (2240 X 1300 mm), at this intersection, is fully utilised in the 5 yr event and above, therefore increasing the capacity of the pit inlets at this intersection may be of assistance for more frequent events. It is noted, however, that the main SWC culvert is fully utilised in the 1 yr event from downstream of the corner of Victoria Rd and Murray St (refer Figure 9a), therefore there is a limit to the benefit of improving inlet capacity at this intersection without resolving capacity constraints further downstream.

On south side of the intersection, surface overland flow that escapes the intersection cannot re-enter the stormwater drainage network because there are no pits until the intersection with Victoria Road. Modelled flood depth on the south side of the intersection ranges from 10 cm in the 2 yr event to 40 cm in the 100 yr event. Additional pits from either side of Edgeware Road between Alice St and Victoria Road may be able to be connected to the SWC main culvert (2240 X 1300 mm) to be of assistance for more frequent events.

Corner of Pearl St and Alice Lane

There is a trapped low point adjacent a commercial premises at the corner of Pearl St and Alice Lane. That depression appears to be serviced by a couple of sag pits. Although in general private drainage was not incorporated in the TUFLOW model, pits were added to that location. Other than noting that this land parcel is susceptible to ponding of surface overland flow if grated inlets at that location become inoperable, no further comment is made with respect to this location.

Alice St

There is a villa/townhouse development on Alice St between Alice Avenue and Hawkens St that has a subterranean carpark. There is potential for surface overland flow from behind that complex to enter the carpark. Modelling results along Alice St suggest that during the 100 yr event, flood depth may just be sufficient to enter the carpark from the Alice St driveway.

Marrickville Metro

Model results along Victoria Road at the entrance to delivery dock range between 10 cm in the 2 yr event up to 40 cm in the 100 yr event implying the dock area, which is below street level, may become inundated. Although outside the reporting area for ECE, the pedestrian entrance to Marrickville Metro on Victoria Road, opportunity the Empire Lane Channel, is below street level. The culvert under the Marrickville Metro (1900 mm X 1000 mm) is the natural drainage line. Model results suggest flood depth of about 5 cm in the 2, 5 and 10 yr events; however, is 20 cm in the 100 yr event due to overtopping of the Empire Lane Channel.

Edinburgh and Murray St

The area between Edinburgh and Murray St is a low lying area. The main SWC channel runs down Murray St, discharging into Eastern Channel.

Modelled flood depth within Murray St ranges from 40 cm in the 2 yr event to 1.1 m in the 100 yr event. Modelled flood velocity is less than 0.6 m/s in the 2 yr event and is less than 1.0 m/s in the 100 yr event. Modelled flood hazard is low for the 2 and 5 yr events, intermediate for the 10 yr event and high for the 100 yr event due to flood depth. From Figure 9 and Figure 10, pits within Murray St are all downstream controlled since the main SWC culvert (2240 X 1300 mm) is flowing full in the 1 yr event and above and is at more than 40% of it's capacity in the 13 February 2009 calibration simulation (< 1 yr ARI event).

Marian St, Simmons St and Sarah St

There is no stormwater infrastructure in Marian St or Simmons St. Surface overland flow from Marian St is currently collected by a single pit at the intersection of Marian St and Sarah St and transmitted via a pipe underlying the park adjacent the TAFE, to James St. Runoff from Simmons St is not entrained into a pipe, rather it is conveyed across the road divider between upper and lower Simmons St by a cluster of pits. Runoff is then conveyed down Simmons St to Camden St via road cross-section.

Model results suggest the 300 mm pipe under the TAFE park is underutilised in 2, 5 and 10 yr event. It is 60 to 80% utilised during the 100 yr event. Model results indicate, however, the 300 mm pipe from James St to Camden St is fully utilised in the 1 yr event and above (refer Figure 9b and Figure 10).

Respondents indicate surface overland flow down Simmons St to Camden St is a regular issue with respect to drainage. Modelled flood depth ranges from about 5 cm in the 2 yr event to 15 to 20 cm in the 100 yr event.

Some respondents at Simmons St report water ponding at the bottom of Simmons Street, at a local low point. Modelled flood depth ranges from 5 cm in the 2 yr event at this location to 15 cm in the 100 yr event. Model results indicate that the cluster of pits at the corner of Simmons St and Camden St are at full capacity in the 1 yr event (refer Figure 9b) and above.

Margaret St and Ferndale St

There is a cluster of pits at the corner of Margaret St and Ferndale St which act to capture surface overland flow from the northeast corner of the ECE catchment. There are no pits down Ferndale St from Margaret St to Kent St.

Respondents suggest surface overland flow from Margaret St that is not captured at the corner with Ferndale St runs down Ferndale St to Camden St in an uncontrolled manner.

Modelled flood depth at the corner of Margaret St and Ferndale St ranges from 2 to 5 cm in the 2 yr event and up to 10 cm in the 100 yr event. Modelled flood hazard is low for all design events.

Model results indicate that the 600 mm pipe entering Ferndale St from Fulham St reaches full capacity in the 1 yr event and above (refer Figure 9b and Figure 10). The 900 mm pipe entering Ferndale St from Margaret St reaches 85% of capacity in the 1 yr event and above. Analysis indicates that the 1050 mm pipe that these pipes are connected to, in Camden St, reaches 90% of its capacity in the 1 yr event (refer Figure 9b). This implies that there is a limit to the effectiveness of increasing inlet capacity of pits at the corner of Margaret St and Ferndale St without resolving downstream capacity constraint.

Bailey St, Holt St and Station St

There is no drainage infrastructure along Bailey St, or the upper part of Holt St or Station St. Respondents indicate that the cluster of pits at the junction of Station St and Holt St is regularly overwhelmed, with excess runoff running along Margaret St and into Ferndale St.

Analysis indicates the 225 mm pipe in Holt St reaches full capacity in less than the 1 yr event (refer Figure 9a). The 450 mm pipe in College St has a level of service of about the 1 yr ARI. The 450 mm pipe in Margaret St, between Reiby St and College St, is flowing at 90% of capacity in the 1 yr event and above, however, does not reach full capacity because the pipe in Margaret St is already full, downstream, before it enters a larger pipe in Ferndale St.

The capacity of pit inlets at the corner of Holt St and Station St is small, however, residential complaints probably relate to the need for a grate inlet to be installed at the traffic diversion/pathway that is stopping thoroughfare along Station St. Review of the ground surface at that location implies water would tend to pond against that pathway.

Pemell St

Respondents to flood questionnaire indicate that stormwater regularly pools in Pemell St. This is a trapped low point. There is no overland flowpath away from this location.

Modelled flood depth ranges from 45 cm in the 2 yr event to 1.1 m in the 100 yr event. Accordingly, modelled flood hazard is low for 2, 5 and 10 yr event and is high for 100 yr event due to depth.

Analysis indicates that the 600 mm pipe that runs from Pemell St down to Margaret St flows at 90% of capacity in the 1 yr event (refer Figure 9b) and reaches full capacity in the 5 yr event and above.

Respondents note that the single pit in Pemell St (P-EE147) becomes regularly blocked with leaves.

Fulham St

There is a cluster of pits at this location to drain a trapped low point. There is no overland flowpath away from this location.

Modelled flood depth ranges from 25 cm in the 2 yr event to 1.5 m in the 100 yr event. Accordingly, modelled flood hazard is low in the 2, 5 and 10 yr and is high in the 100 yr event.

Hydraulic analysis indicates the 900 mm pipe from Fulham St to Margaret St reaches full capacity in the 1 yr event and above (refer Figure 9b), however, this is likely because the pipe network from Margaret St that enters Ferndale St is already close to full capacity.

There is a single response from the flood questionnaire referring to surcharge of sewer inside the respondents' house. It is assumed this relates to incorrect connection of sewer to stormwater.

5.0 ASSUMPTIONS AND QUALIFICATIONS

This modelling study has been undertaken to estimate the hydraulic behaviour within the ECE catchment. The following assumptions and qualifications are made with respect to this analysis:

- The 1D pit and pipe network has been constructed based on data provided by Council, which was supplemented by field inspection where required. Where information was not available, appropriate assumptions were made.
- The 2D ground surface used in the TUFLOW model was based upon Digital Terrain Data supplied by Council as 0.5 m topographic contours. Historical survey (in AutoCAD format) was provided by Council to verify ALS data at key locations. Topographic contours were reviewed against raw Aerial Laser Survey (ALS) information, where required, however, were not confirmed separately by independent survey.
- A raised elevation approach was adopted in this study when representing residential and commercial premises. Free-standing homes and businesses were considered individually. The approach adopted is dependent on the assumption that there are no active flowpaths between residences and storage within these areas is acceptably small due to the very high density of development within the catchment.
- The accuracy of predicted flood extent and modelled depths is dependent on the accuracy of the Digital Elevation Model (DEM) upon which the model is based. The likely accuracy of the DEM is +/- 10 cm on hard surfaces. This translates to an interpreted accuracy of flood extent and modelled flood height of at least +/- 10 cm.

6.0 REFERENCES

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Report Signature Page

GOLDER ASSOCIATES PTY LTD

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Dr Justin Bell
Senior Environmental Engineer

MAK,JRB/HR,LBJ/mak,jrb

A.B.N. 64 006 107 857

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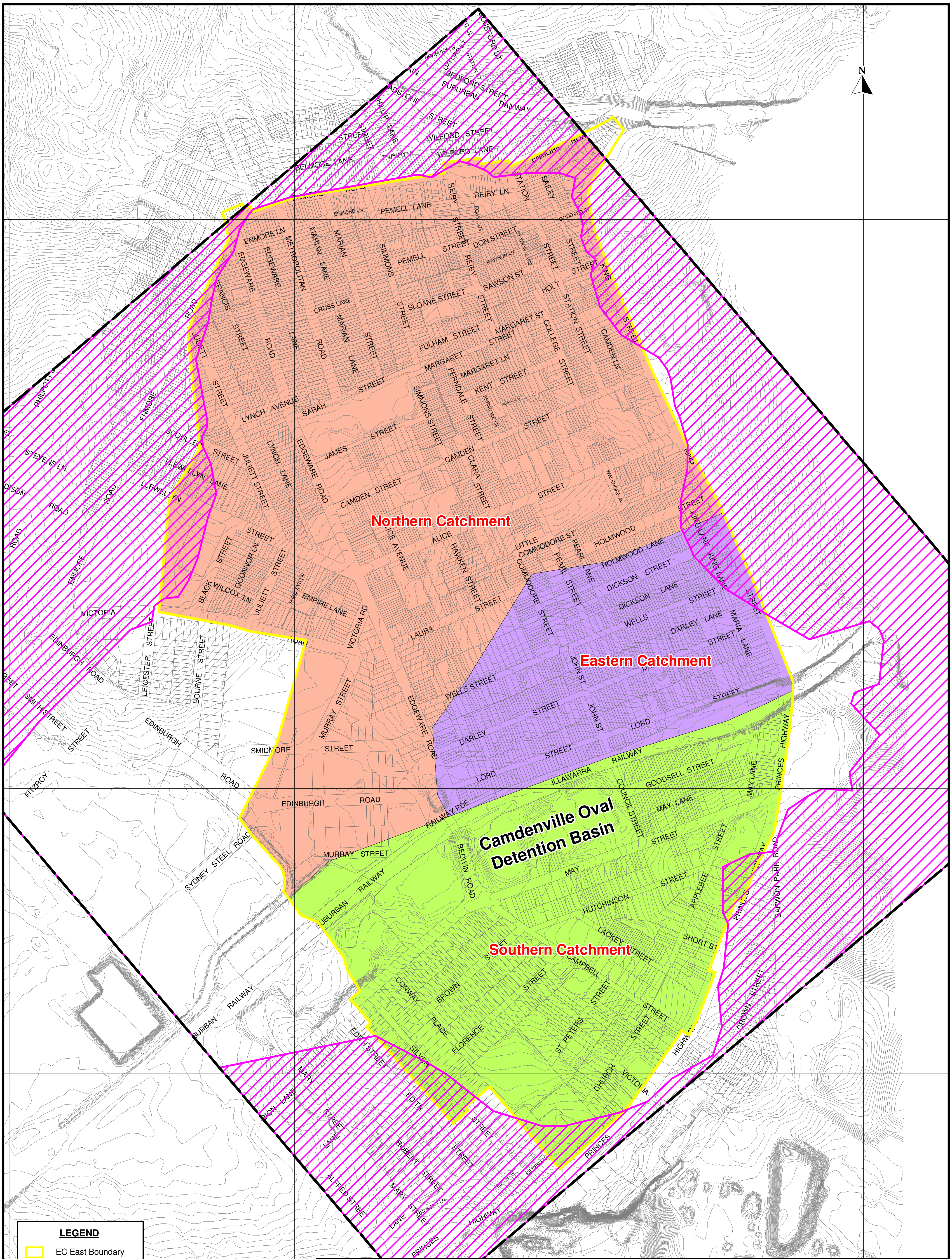

Golder Associates

CLIENT: Marrickville Council		PROJECT: Eastern Channel East Flood Study	
DRAWN: JRB	DATE: 24-12-09	TITLE: STUDY CATCHMENT and MODEL EXTENT	
CHECKED: HR	DATE: 24-12-09		
SCALE: 1:6,000		PROJECT No: 097626003	FIGURE No: 1 REV No: 1 A3

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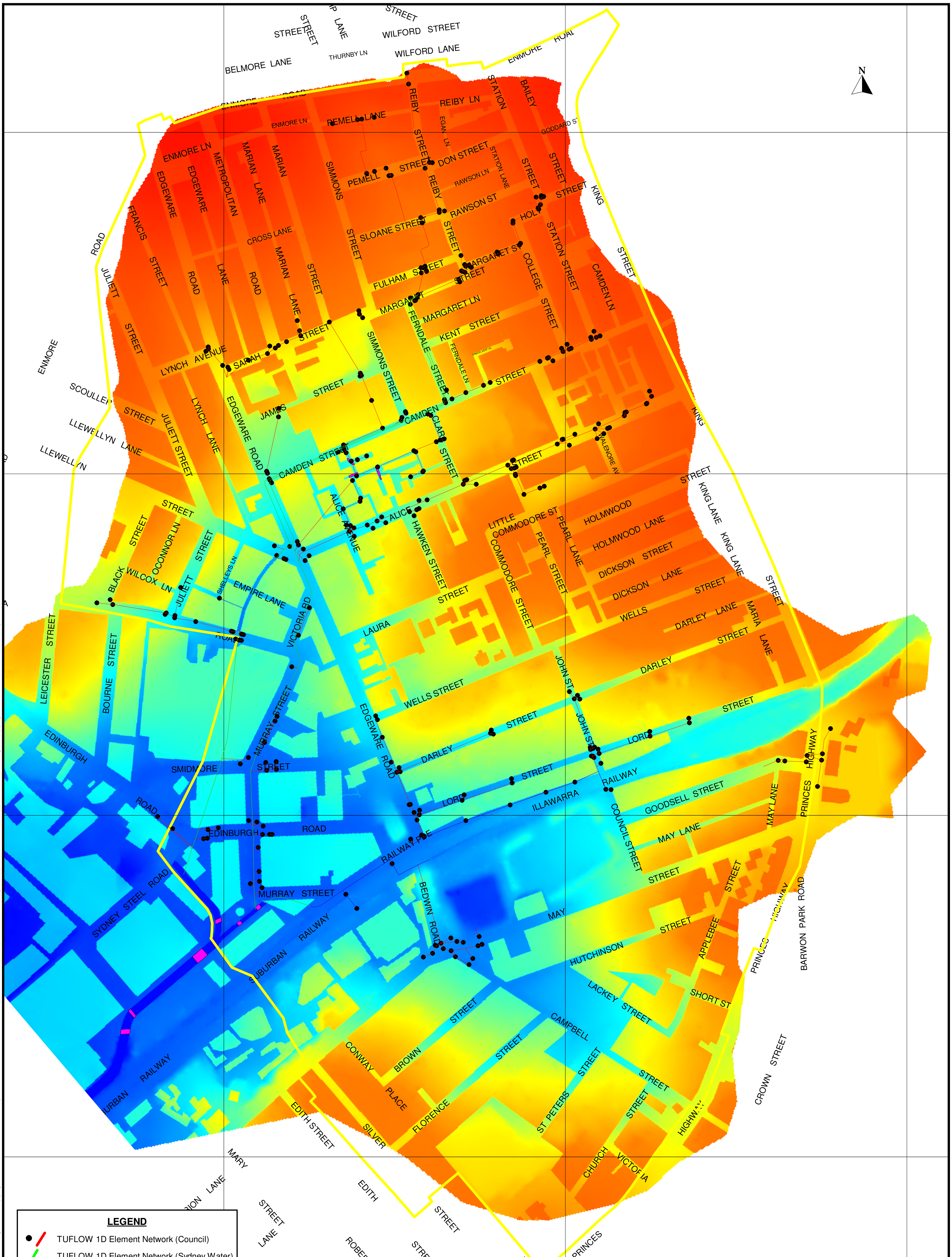

LEGEND

- TUFLOW 1D Element Network (Council)
- TUFLOW 1D Element Network (Sydney Water)
- TUFLOW 1D Element Network (Railcorp)
- TUFLOW 2D Layered Flow Constriction
- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN	JRB	DATE	24-12-09
CHECKED	HR	DATE	24-12-09
TITLE	MODELLED TERRAIN and PIT/PIPE NETWORK		
SCALE	1:5,000	PROJECT No	097626003
FIGURE No	2	REV No	1
A3			

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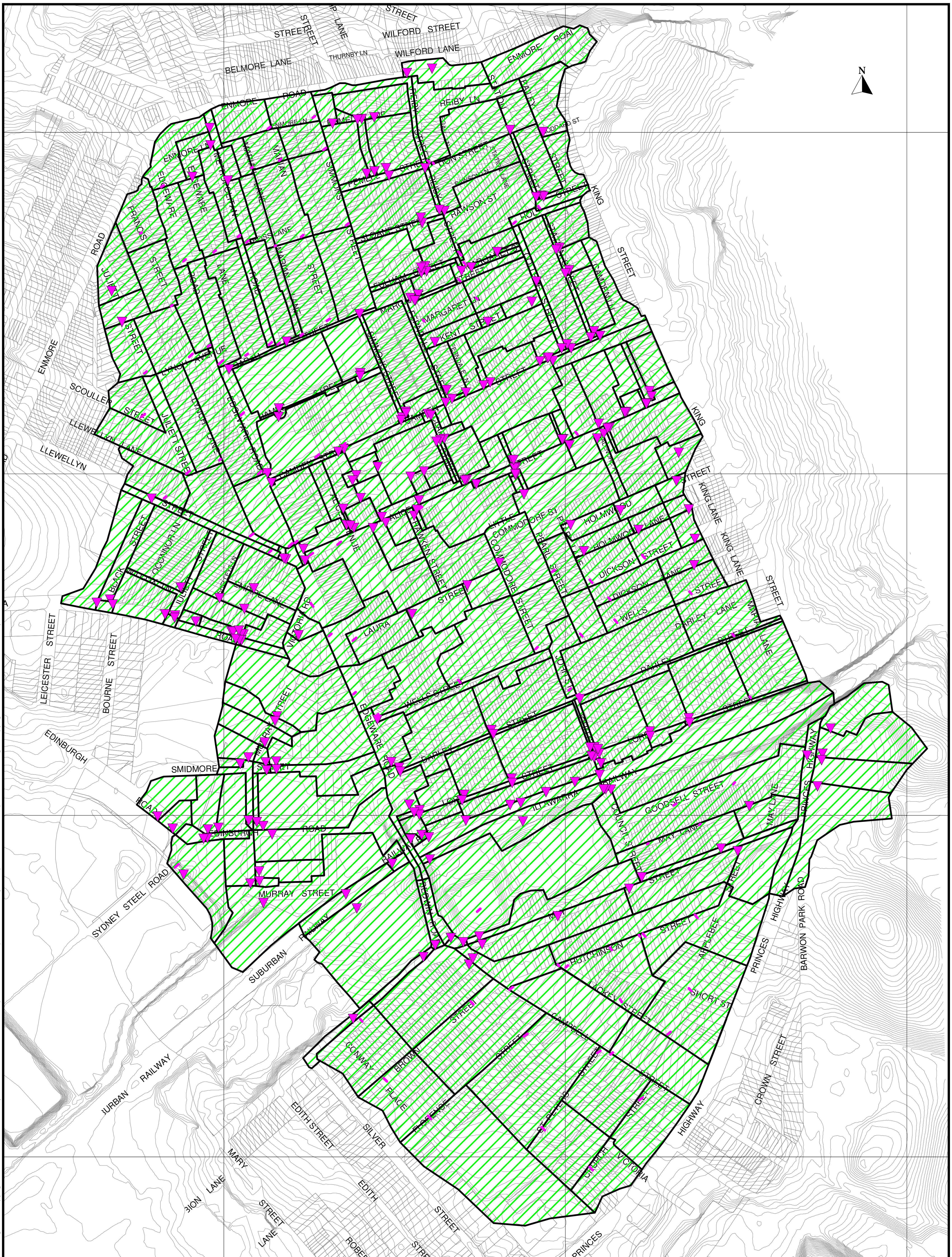

LEGEND

- TUFLOW Internal Boundary
- DRAINS Sub-Catchment

Note: Datum GDA94, Projection MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN	JRB	DATE	24-12-09
CHECKED	HR	DATE	24-12-09
SCALE	1:5,000		

TITLE: **SUB-CATCHMENT LAYOUT**

PROJECT No	FIGURE No	REV No	
097626003	3	1	A3

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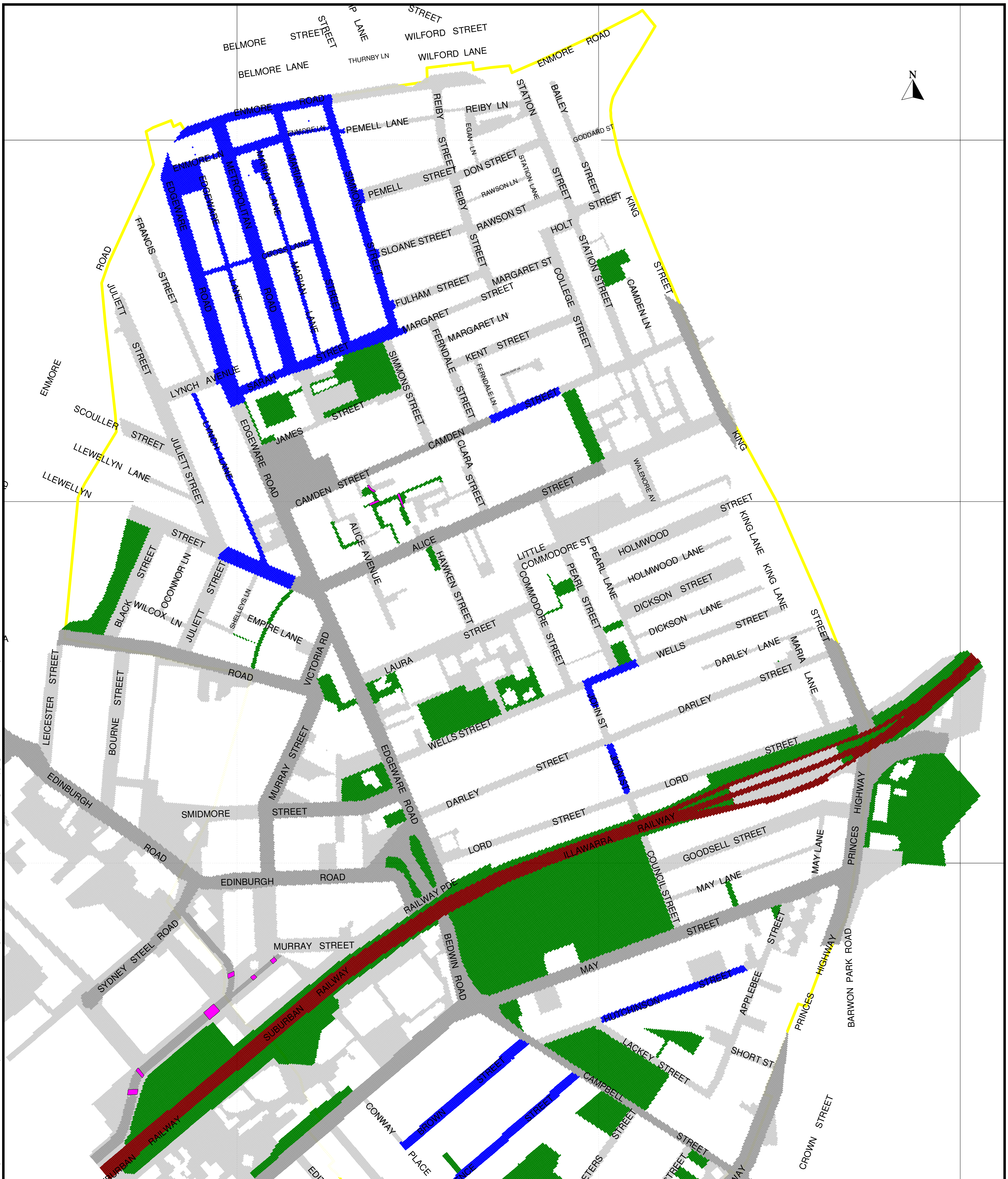

LEGEND

Material Type:

- Inactive Model Area
- Narrow Roads and Open Concreted Areas
- Parkland and Grassed Channels
- Railway Line
- Main Roads and Concrete-Lined Channels
- Steep Streets*

*A higher roughness was applied to these streets as part of model stabilisation. For further details refer to main report.

General Items:

- TUFLOW 1D Element Network
- TUFLOW 2D Layered Flow Constriction
- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN JRB	DATE 24-12-09	TITLE	MODELLED SURFACE ROUGHNESS DISTRIBUTION
CHECKED HR	DATE 24-12-09		
SCALE	1:5,000	PROJECT No 097626003	FIGURE No 4 · REV No 1 · A3

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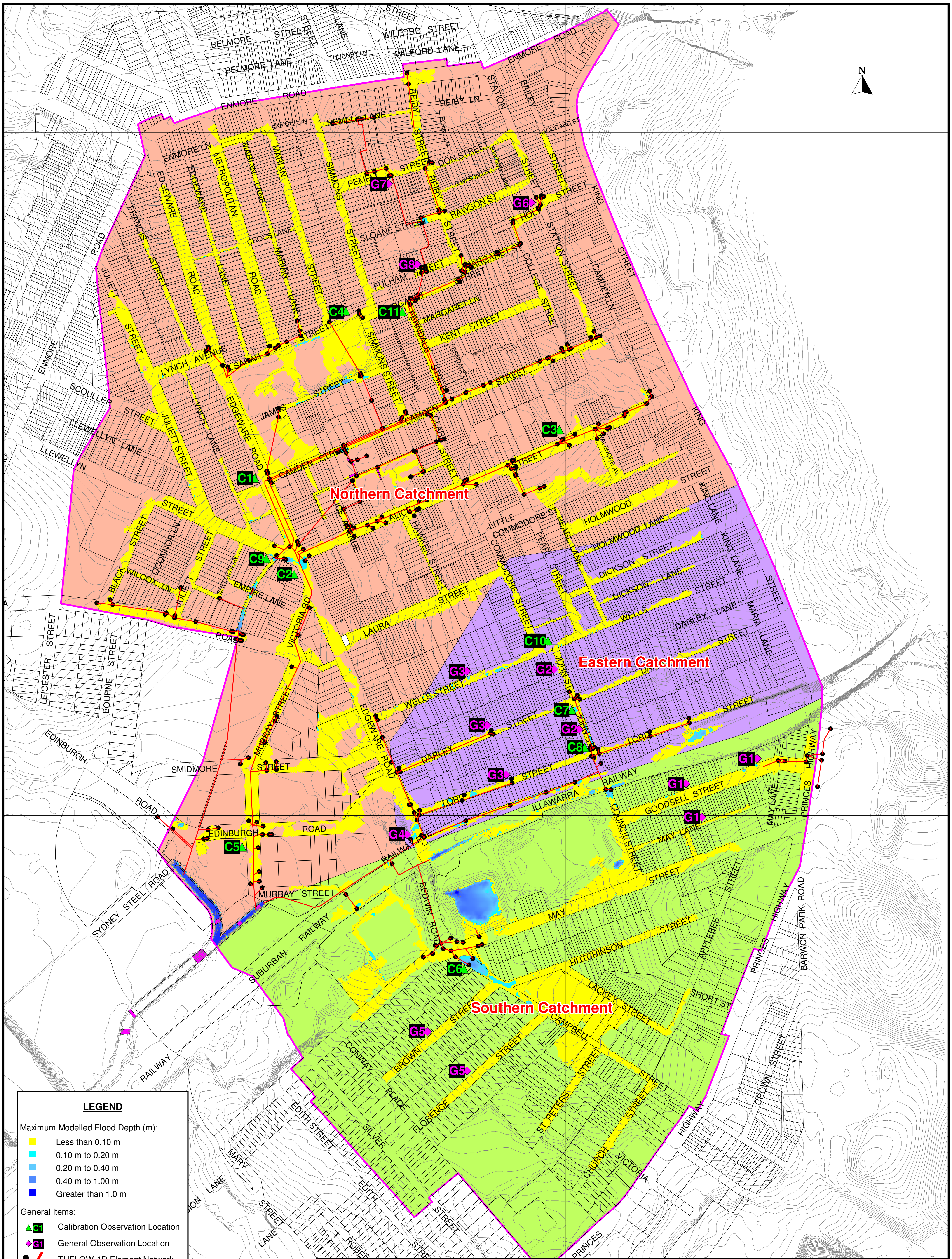

CLIENT	Marrickville Council			PROJECT	Eastern Channel East Flood Study		
DRAWN	JRB	DATE	24-12-09	TITLE	MODELLED FLOOD DEPTH (m) 13 FEBRUARY 2009		
CHECKED	HR	DATE	24-12-09				
SCALE	1:5,000			PROJECT No	097626003	FIGURE No 5a	REV No 1 A3

Golder Associates

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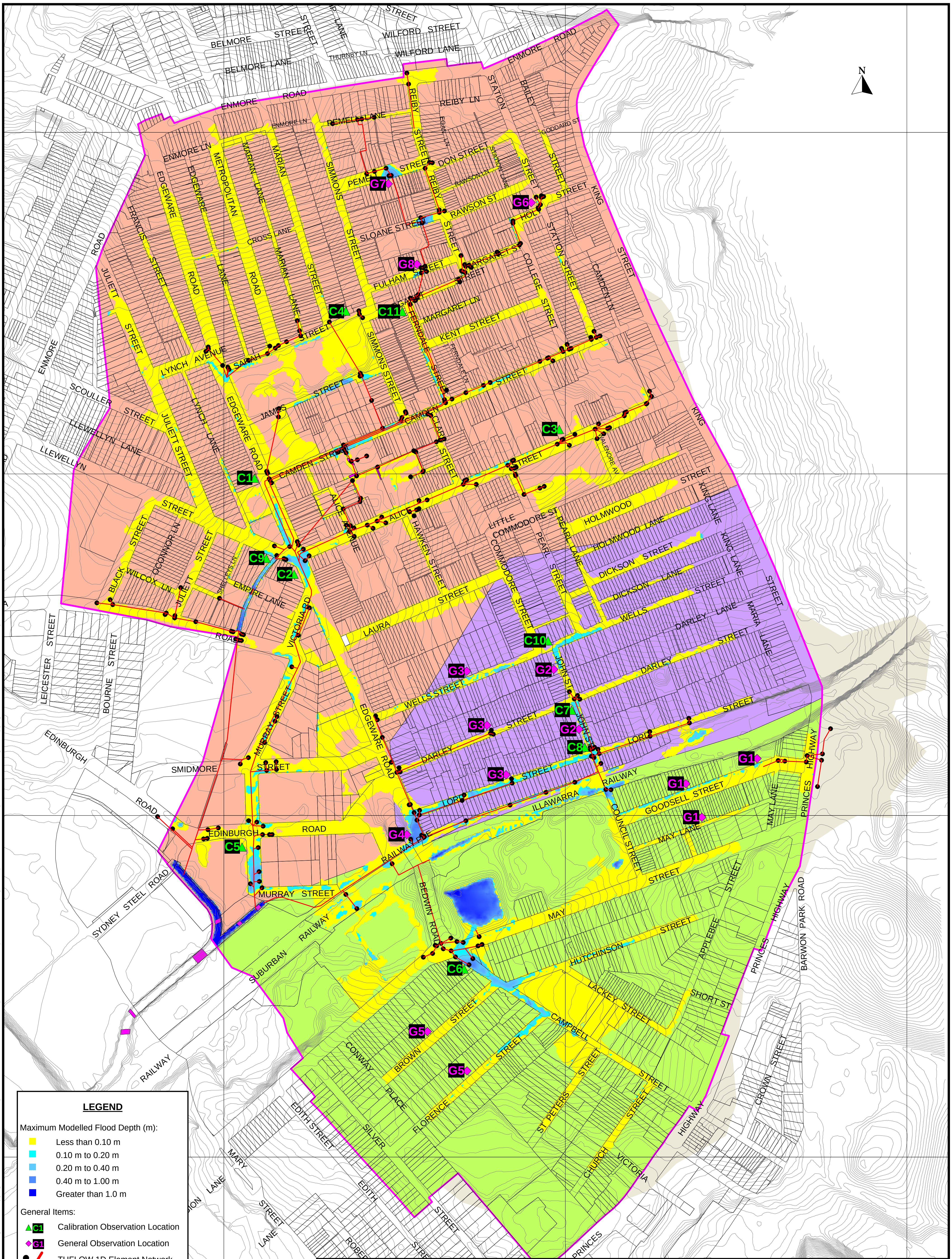

LEGEND

Maximum Modelled Flood Depth (m):

- Less than 0.10 m
- 0.10 m to 0.20 m
- 0.20 m to 0.40 m
- 0.40 m to 1.00 m
- Greater than 1.0 m

General Items:

- C1 Calibration Observation Location
- G1 General Observation Location
- TUFLOW 1D Element Network
- TUFLOW 2D Bridge Element
- Main Sub-Catchments
- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

Golder Associates	CLIENT: Marrickville Council		PROJECT: Eastern Channel East Flood Study		
	DRAWN: JRB	DATE: 24-12-09	TITLE: MODELLED FLOOD DEPTH (m) 14 MARCH 2009		
	CHECKED: HR	DATE: 24-12-09			
	SCALE: 1:5,000		PROJECT No: 097626003	FIGURE No: 5b	REV No: 2 A3

File Location: J:\hyd\2009\097626003 Marrickville Council EC1 Study\Technical Doc\GIS\Project\

LEGEND

Modelled Maximum Flood Depth (m):

- Less than 0.10 m
- 0.10 m to 0.20 m
- 0.20 m to 0.40 m
- 0.40 m to 1.00 m
- Greater than 1.0 m

General Items:

- Flood Affected Property
- TUFLOW Output Locations
- TUFLOW 1D Element Network
- TUFLOW 2D Bridge Element
- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

Golder Associates	CLIENT: Marrickville Council		PROJECT: Eastern Channel East Flood Study
	DRAWN: JRB	DATE: 24-12-09	TITLE: MODELLED FLOOD DEPTH (m) 2YR DESIGN EVENT
	CHECKED: HR	DATE: 24-12-09	
	SCALE: 1:5,000		PROJECT No: 097626003 · FIGURE No: 6a · REV No: 2 · A3

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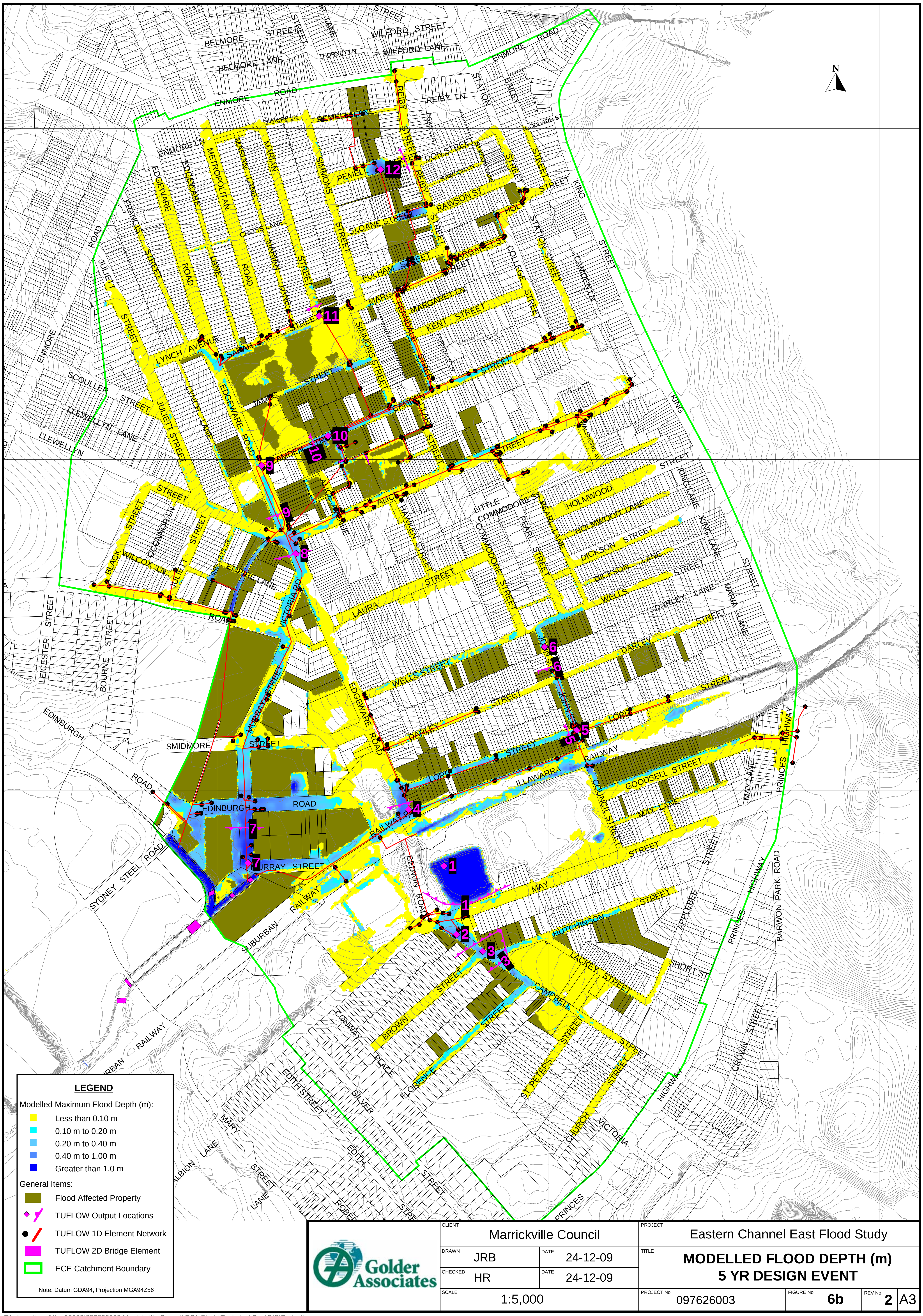

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	DRAWN: JRB	DATE: 24-12-09	TITLE: MODELLED FLOOD DEPTH (m) 10YR DESIGN EVENT	
	CHECKED: HR	DATE: 24-12-09		
	SCALE: 1:5,000		PROJECT No: 097626003	FIGURE No: 6c · REV No: 2 · A3

Golder Associates

CLIENT: Marrickville Council		PROJECT: Eastern Channel East Flood Study	
DRAWN: JRB	DATE: 24-12-09	TITLE: MODELLED FLOOD DEPTH (m) 100YR DESIGN EVENT	
CHECKED: HR	DATE: 24-12-09		
SCALE: 1:5,000		PROJECT No: 097626003	FIGURE No: 6d, REV No: 2, A3

LEGEND

Modelled Maximum Flood Velocity (m/s):

- Less than 0.4 m/s
- 0.4 m/s to 0.8 m/s
- 0.8 m/s to 1.2 m/s
- 1.2 m/s to 2.0 m/s
- Greater than 2.0 m/s

General Items:

- Flood Affected Property
- TUFLOW Output Locations
- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

Golder Associates

CLIENT: Marrickville Council		PROJECT: Eastern Channel East Flood Study	
DRAWN: JRB	DATE: 24-12-09	TITLE: MODELLED FLOOD VELOCITY (m/s) 2YR DESIGN EVENT	
CHECKED: HR	DATE: 24-12-09		
SCALE: 1:5,000		PROJECT No: 097626003	FIGURE No: 7a / REV No: 2 / A3

File Location: J:\hyd\2009\097626003 Marrickville Council EC1 Study\Technical Doc\GIS\Project\

LEGEND

Modelled Maximum Flood Velocity (m/s):

- Less than 0.4 m/s
- 0.4 m/s to 0.8 m/s
- 0.8 m/s to 1.2 m/s
- 1.2 m/s to 2.0 m/s
- Greater than 2.0 m/s

General Items:

- Flood Affected Property
- TUFLOW Output Locations
- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

Golder Associates

CLIENT: Marrickville Council		PROJECT: Eastern Channel East Flood Study		
DRAWN: JRB	DATE: 24-12-09	TITLE: MODELLED FLOOD VELOCITY (m/s) 5YR DESIGN EVENT		
CHECKED: HR	DATE: 24-12-09			
SCALE: 1:5,000		PROJECT No: 097626003	FIGURE No: 7b	REV No: 2 A3

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Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN JRB	DATE 24-12-09	TITLE	MODELLED FLOOD VELOCITY (m/s) 10YR DESIGN EVENT
CHECKED HR	DATE 24-12-09		
SCALE	1:5,000	PROJECT No 097626003	FIGURE No 7c · REV No 2 · A3

File Location: J:\hyd\2009\097626003 Marrickville Council EC1 Study\Technical Doc\GIS\Project\

CLIENT	Marrickville Council
DRAWN	JRB
DATE	24-12-09
CHECKED	HR
DATE	24-12-09
SCALE	1:5,000
PROJECT	Eastern Channel East Flood Study
TITLE	MODELLED FLOOD VELOCITY (m/s) 100YR DESIGN EVENT
PROJECT No	097626003
FIGURE No	7d
REV No	2
	A3

Golder Associates

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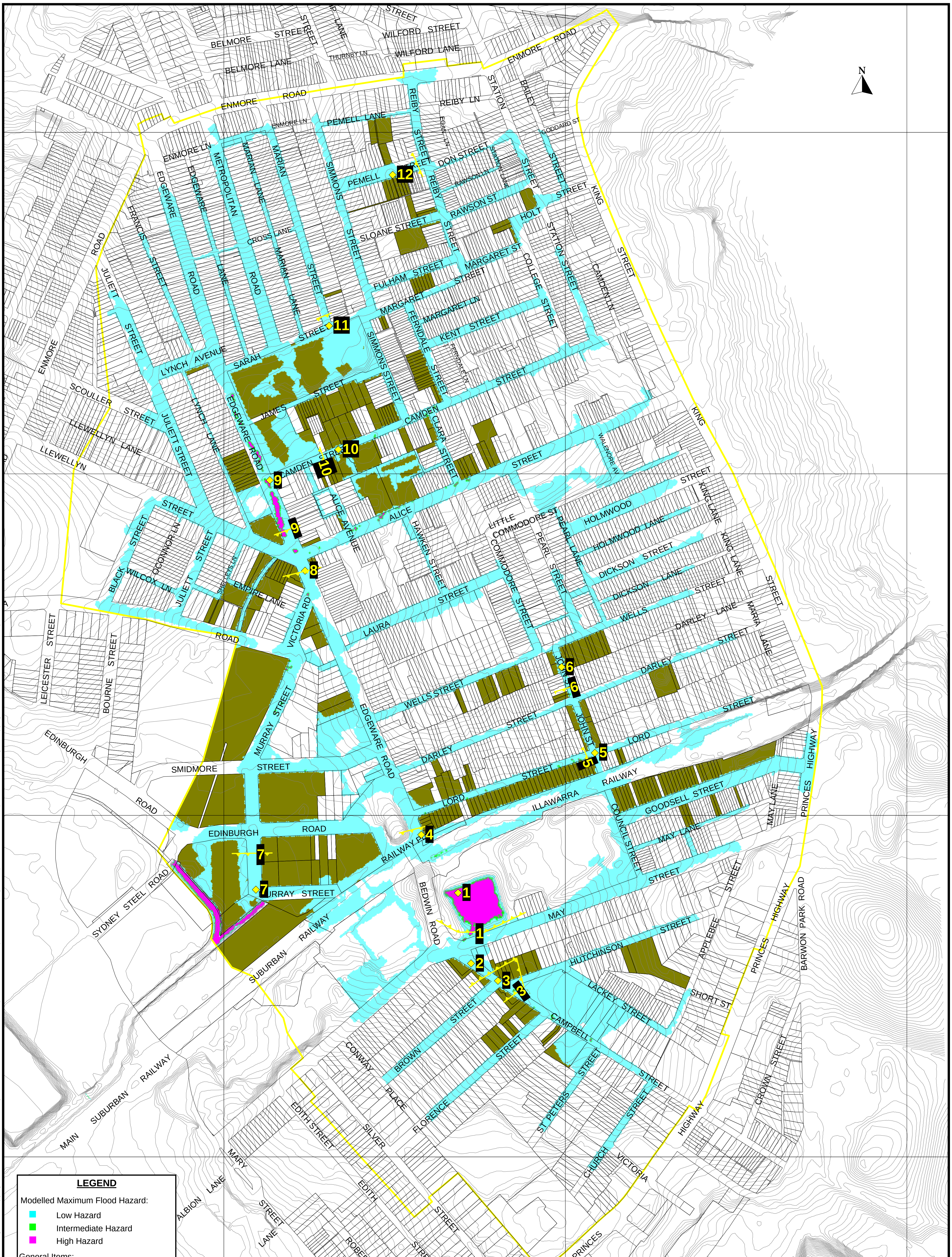

LEGEND

Modelled Maximum Flood Hazard:

- Low Hazard
- Intermediate Hazard
- High Hazard

General Items:

- Flood Affected Property
- TUFLOW Output Locations
- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN: JRB	DATE: 24-12-09	TITLE	MODELLED FLOOD HAZARD 2YR DESIGN EVENT
CHECKED: HR	DATE: 24-12-09		
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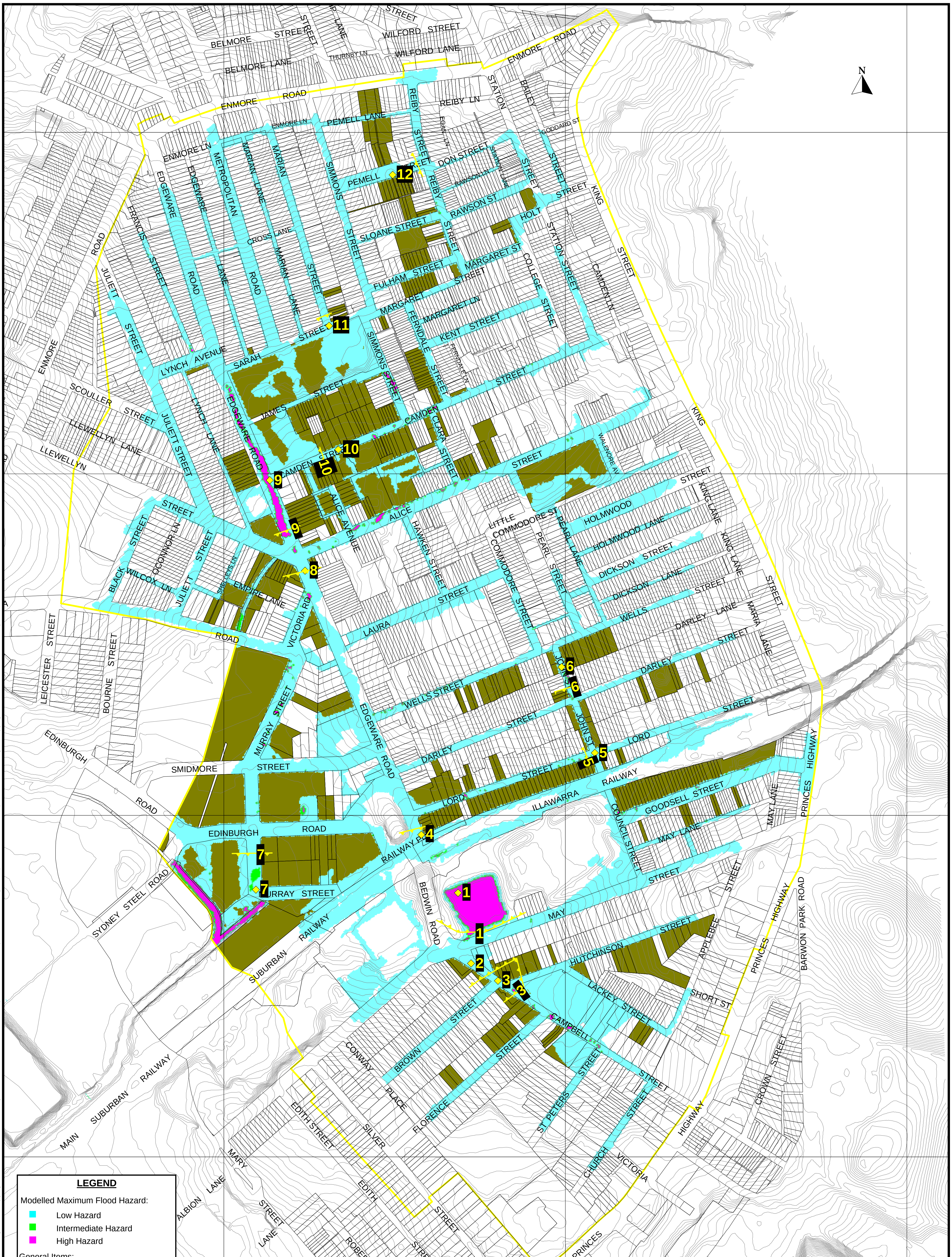

Golder Associates

CLIENT: Marrickville Council		PROJECT: Eastern Channel East Flood Study	
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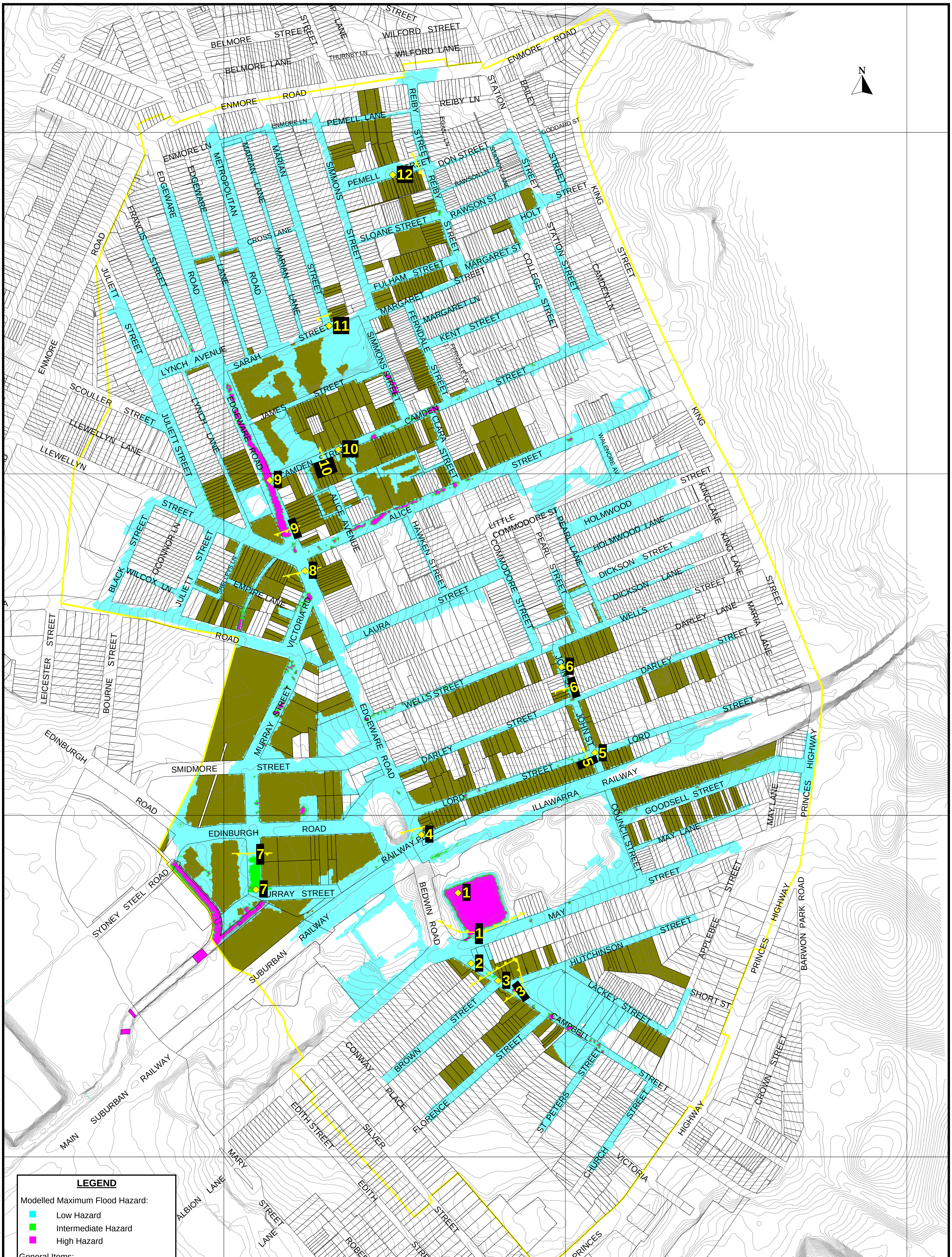


LEGEND

Modelled Maximum Flood Hazard:

- Low Hazard
- Intermediate Hazard
- High Hazard

General Items:

- Flood Affected Property
- TUFLOW Output Locations
- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN JRB	DATE 24-12-09	TITLE	MODELLED FLOOD HAZARD 10YR DESIGN EVENT
CHECKED HR	DATE 24-12-09		
SCALE	1:5,000	PROJECT No 097626003	FIGURE No 8c · REV No 2 · A3

File Location: J:\hyd\2009\097626003 Marrickville Council EC1 Study\Technical Doc\GIS\Project\

LEGEND

Modelled Maximum Flood Hazard:

- Low Hazard
- Intermediate Hazard
- High Hazard

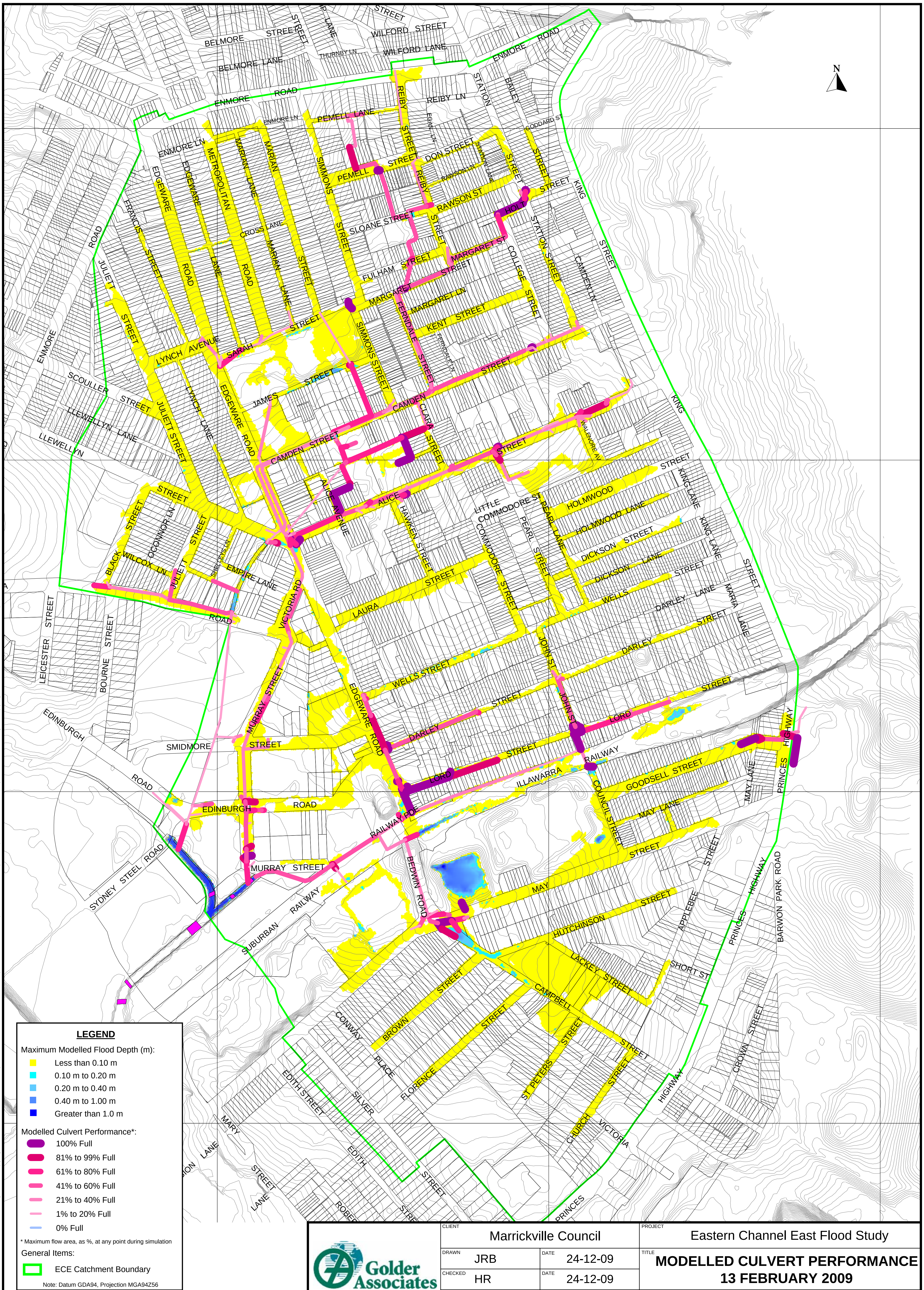
General Items:

- Flood Affected Property
- TUFLOW Output Locations
- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN	JRB	DATE	24-12-09
CHECKED	HR	DATE	24-12-09
TITLE	MODELLED FLOOD HAZARD 100YR DESIGN EVENT		
SCALE	1:5,000	PROJECT No	097626003
FIGURE No	8d	REV No	2
	A3		

Golder Associates



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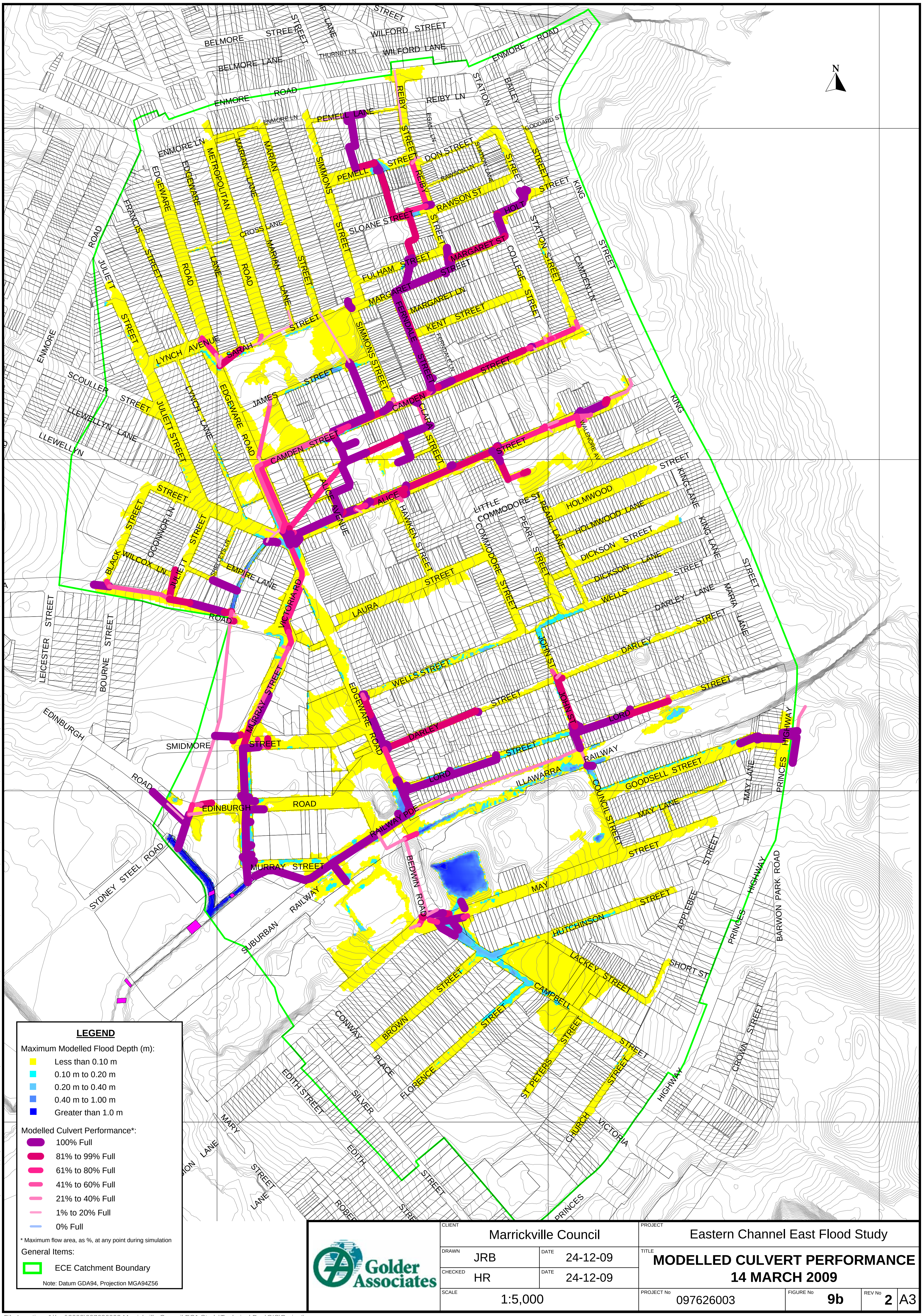
DRAWN: JRB	DATE: 24-12-09	TITLE: MODELLED CULVERT PERFORMANCE 13 FEBRUARY 2009	
CHECKED: HR	DATE: 24-12-09		
SCALE: 1:5,000		PROJECT No: 097626003	FIGURE No: 9a / REV No: 2 / A3

Golder Associates



CLIENT	Marrickville Council		PROJECT	Eastern Channel East Flood Study
DRAWN	JRB	DATE 24-12-09	TITLE	**MODELLED CULVERT PERFORMANCE 14 MARCH 2009**
CHECKED	HR	DATE 24-12-09		
SCALE	1:5,000		PROJECT No 097626003	FIGURE No 9b / REV No 2 / A3

Golder Associates

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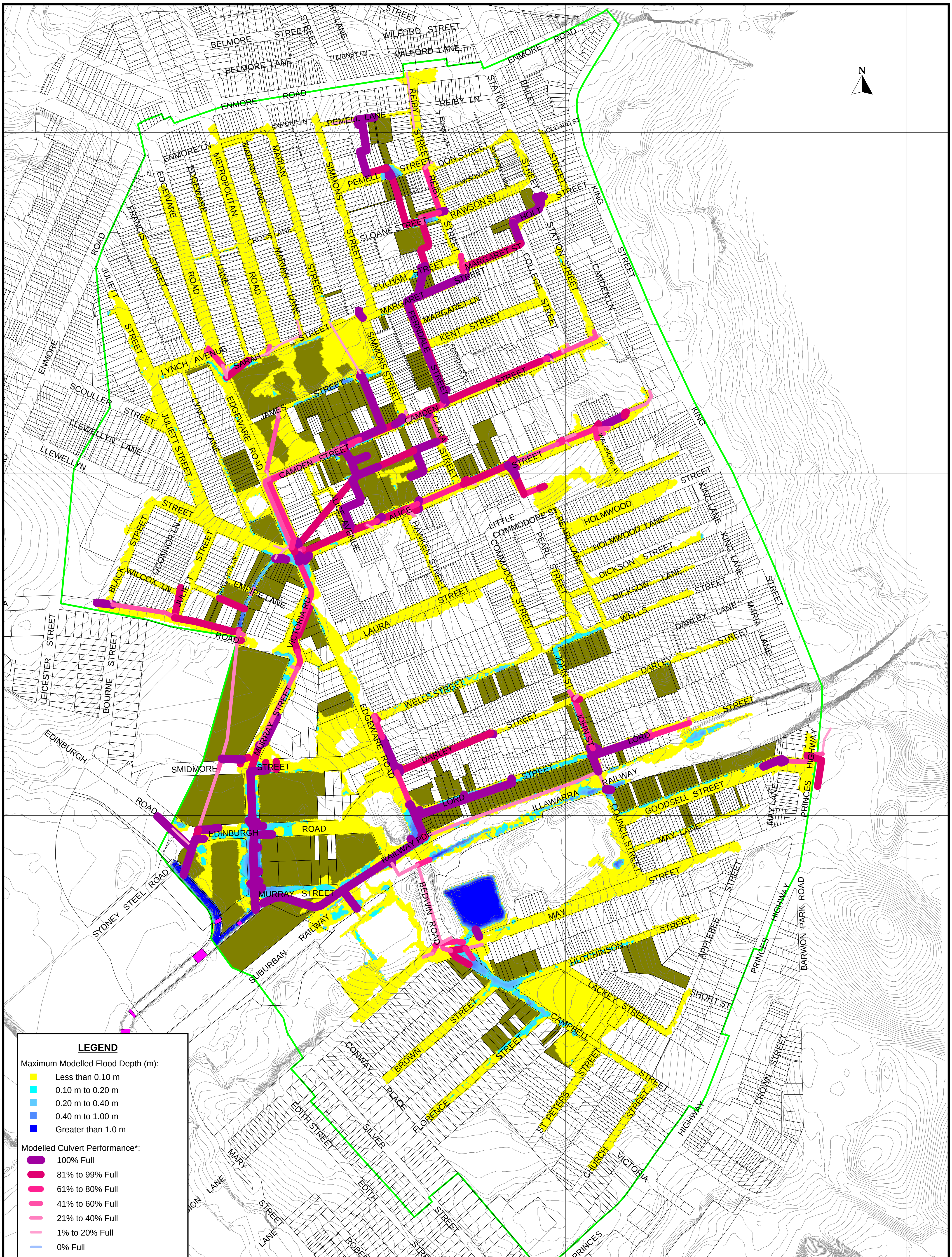


LEGEND

Maximum Modelled Flood Depth (m):

- Less than 0.10 m
- 0.10 m to 0.20 m
- 0.20 m to 0.40 m
- 0.40 m to 1.00 m
- Greater than 1.0 m

Modelled Culvert Performance*:

- 100% Full
- 81% to 99% Full
- 61% to 80% Full
- 41% to 60% Full
- 21% to 40% Full
- 1% to 20% Full
- 0% Full

* Maximum flow area, as %, at any point during 30 min storm

General Items:

- Flood Affected Property
- ECE Catchment Boundary

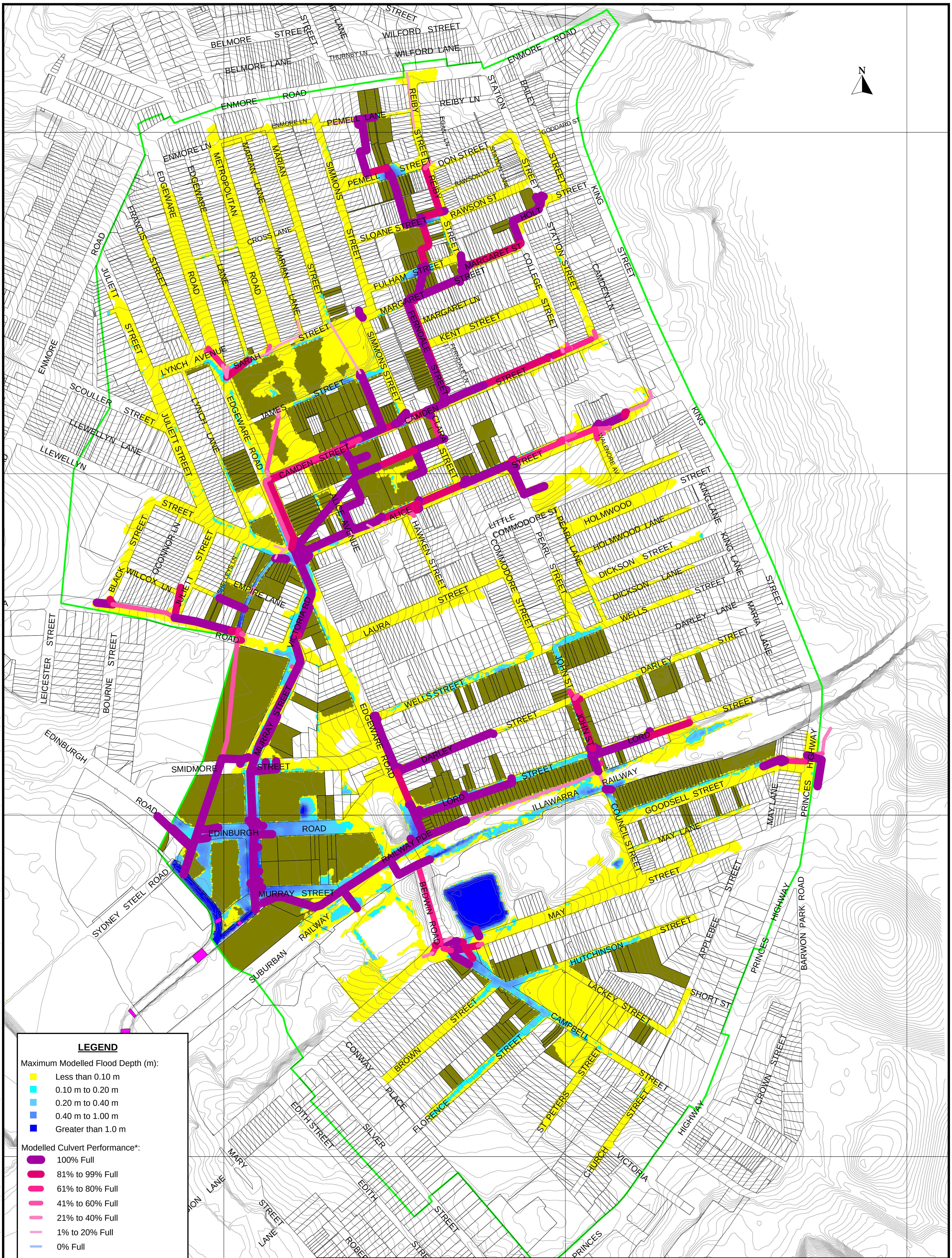
Note: Datum GDA94, Projection MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN	JRB	DATE	24-12-09
CHECKED	HR	DATE	24-12-09
SCALE	1:5,000	PROJECT No	097626003

TITLE: **MODELLED CULVERT PERFORMANCE 2YR DESIGN EVENT**

FIGURE No **10a** REV No **2** A3



LEGEND

Maximum Modelled Flood Depth (m):

- Less than 0.10 m
- 0.10 m to 0.20 m
- 0.20 m to 0.40 m
- 0.40 m to 1.00 m
- Greater than 1.0 m

Modelled Culvert Performance*:

- 100% Full
- 81% to 99% Full
- 61% to 80% Full
- 41% to 60% Full
- 21% to 40% Full
- 1% to 20% Full
- 0% Full

* Maximum flow area, as %, at any point during 30 min storm

General Items:

- Flood Affected Property
- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

Golder Associates	CLIENT: Marrickville Council		PROJECT: Eastern Channel East Flood Study
	DRAWN: JRB	DATE: 24-12-09	TITLE: MODELLED CULVERT PERFORMANCE 5 YR DESIGN EVENT
	CHECKED: HR	DATE: 24-12-09	
	SCALE: 1:5,000		PROJECT No: 097626003 · FIGURE No: 10b · REV No: 2 · A3

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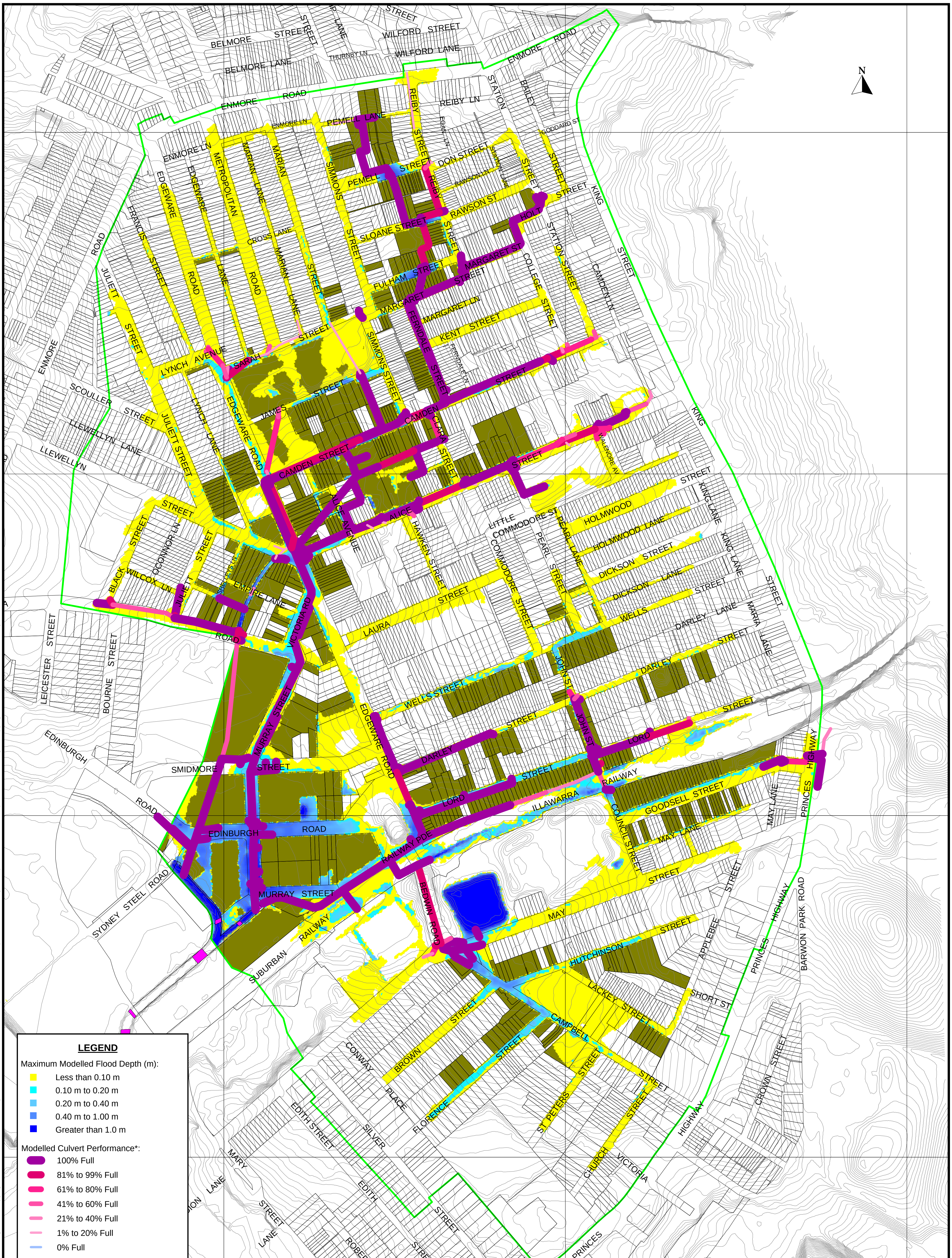

LEGEND

Maximum Modelled Flood Depth (m):
- Less than 0.10 m
- 0.10 m to 0.20 m
- 0.20 m to 0.40 m
- 0.40 m to 1.00 m
- Greater than 1.0 m

Modelled Culvert Performance*:
- 100% Full
- 81% to 99% Full
- 61% to 80% Full
- 41% to 60% Full
- 21% to 40% Full
- 1% to 20% Full
- 0% Full

* Maximum flow area, as %, at any point during 30 min storm

General Items:
- Flood Affected Property
- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN	JRB	DATE	24-12-09
CHECKED	HR	DATE	24-12-09
TITLE	MODELLED CULVERT PERFORMANCE 10YR DESIGN EVENT		
SCALE	1:5,000	PROJECT No	097626003
FIGURE No	10c	REV No	2
A3			

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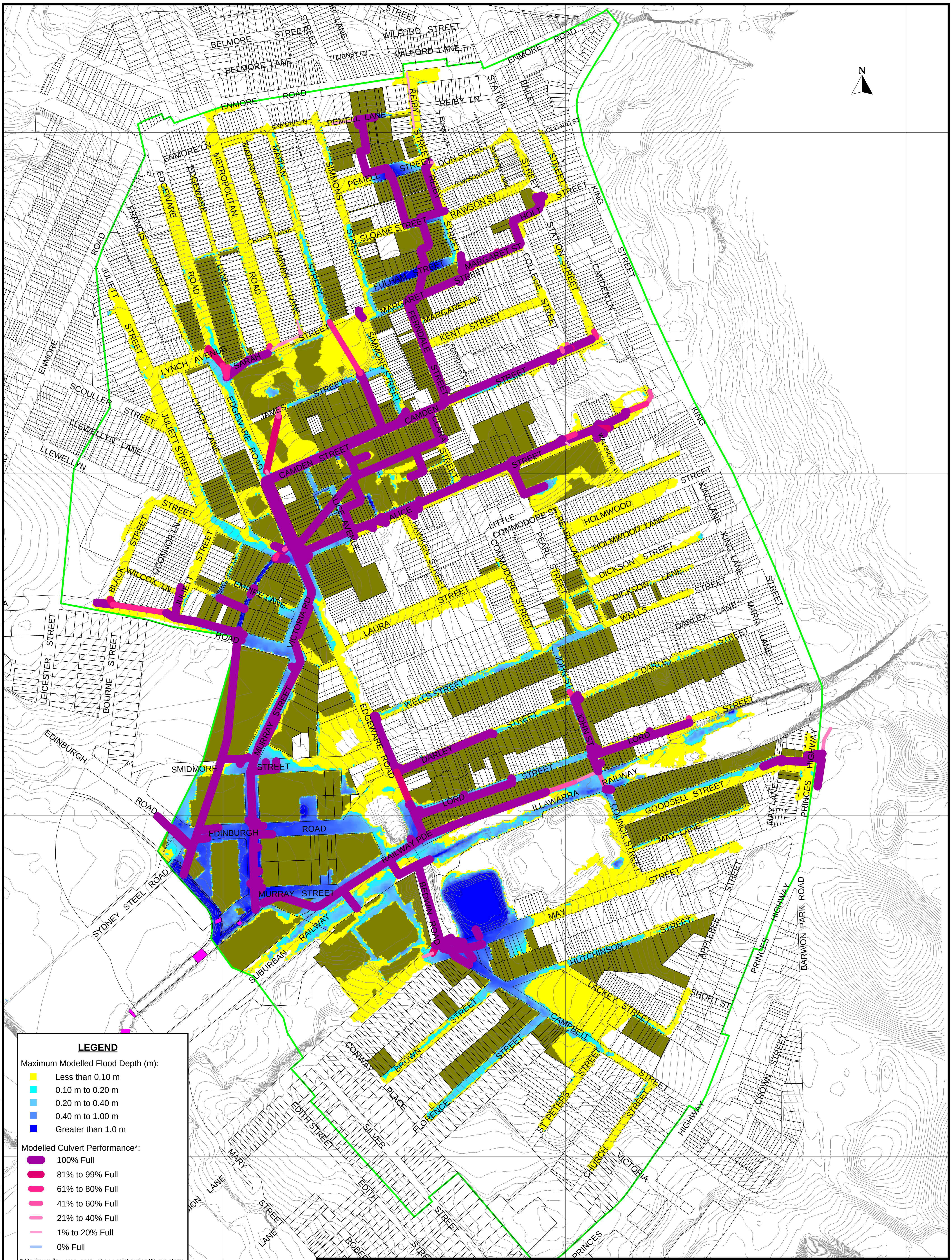

Golder Associates	CLIENT: Marrickville Council		PROJECT: Eastern Channel East Flood Study
	DRAWN: JRB	DATE: 24-12-09	TITLE: MODELLED CULVERT PERFORMANCE 100YR DESIGN EVENT
	CHECKED: HR	DATE: 24-12-09	
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APPENDIX A

DRAINS Modelling Details

MODEL DETAILS

Hydrological model DRAINS was setup using the data provided by Marrickville Council.

Various steps were taken to confirm the accuracy of the data and to produce a database that contained all of the required information for the DRAINS model.

Model Attribute Naming Convention

The components within the DRAINS model were labelled based on the Marrickville Council pit numbers. The attributes were labelled with an EE to represent the Eastern Channel East Subcatchment. The pits south of the railway are labelled ES based on the pit data sheet and GIS information provided by Council. It is assumed that these pits and pipes were originally included in the Eastern South Channel Subcatchment based on the historic labelling.

For the various attribute types the corresponding naming conventions were used:

- Pits – e.g. P-EE55;
- Manholes (bolted down lid) – e.g. MH-EE207;
- Pipes – e.g. EE55.207 – this represents the pipe connecting Pit EE55 with Manhole EE207;
- Catchments – e.g. C-EE55; and
- Overflow Pathways – e.g. OF-EE55.

Pit Locations and Elevations

The first step in setting up the model included the review of the provided aerial photo to confirm the locations of the pits and manholes. Site investigation and appropriate assumptions were used when a pit or manhole could not be located on the aerial photo due to tree cover.

Since the pit elevation data was missing from the database, a desktop approach using the ALS data was adopted for estimation of pit levels. To determine whether or not the provided ALS data was suitable for use in estimating the pit elevations, AutoCAD drawings of nine intersections within the subcatchment, provided by Marrickville Council, were compared to the ALS data. There was an average margin of error of approximately +/-10 cm which is within the expected accuracy of the ALS data on hard surfaces. Since the TUFLOW model is based on the provided ALS data, Golder approached the Department of the Environment, Climate Change and Water (DECCW) to obtain approval that using the ALS data to estimate the pit elevations would meet the requirements for a DECCW standard flood study. DECCW responded that using the ALS would be a reasonable method in estimating the pit elevations.

The pit elevations were estimated by using the closest and lowest point to the pit or manhole within 1-2 m. If an ALS ground elevation point was not within 1-2 m of the pit then either the contours along the street or the two closest points were used to interpolate an estimated elevation.

Stormwater Inspections – Sydney Water

Sydney Water performed Stormwater Inspections within Stormwater Channel (SWC) 66 Marrickville Valley from 1997 – 2006. Six CCTV tapes, each approximately 3 hours long were received from Sydney Water which covers the Marrickville area. Three of the six tapes were relevant to the ECE Subcatchment. Golder reviewed the three tapes to obtain information about missing pipe inverts, pipe conditions and possible blockages.

The tapes covered three of the main pipes. The first pipe starts at the intersection of Margaret St. and Ferndale St. and travels down Edgeware Rd to Murray St and into the main Sydney Water Channel. The second pipe also starts at Margaret St and Ferndale St and travels down Edgeware Rd and connects to the first pipe at Edgeware Rd and Alice St. The third main pipe starts at Edgeware Rd and Llewellyn St before becoming an open channel from Llewellyn St to Victoria Rd. The pipe then continues underground through the industrial area between Juliett Rd and Victoria Rd to the main Sydney Water Channel.

There are many pipes which are connected to the two main pipes which have not been connected via a pit or manhole. Many of these pipes entering the main pipe system entered at an elevated level above the main pipe invert. This information was useful in estimating the unknown pipe invert elevations.

Within the main pipes there were a few blockages. The first pipe, along Murray St, had several small piles of debris in it and also roots coming through the top of the pipe. The third pipe at the upstream end on Edgeware Rd contained large piles of debris.

The 900 mm diameter pipe down Ferndale St which connects EE23 with EE21 was clean; however, there was one location where roots were coming up through the bottom of the pipe and debris was caught on the roots.

The second pipe along Camden St (1350 mm diameter) had water in it during the video. Continuing downstream, the pipe along Edgeware Rd (1050 mm diameter) had debris in it for about 3-4 m located approximately 73 m downstream from EE216 (near 192 Edgeware Rd). At the intersection of Edgeware Rd and Alice St the pipe bends and has a sudden drop in elevation before entering the first larger pipe.

The debris observed in various pipes was loose and included leaves, plastic bottles and bags and would wash away down the pipe system in a large flood event.

Drainage Area Delineation

Drainage areas were delineated for each of the 198 pits using the provided DTM data. The drainage areas were divided into percent impervious and percent pervious. There are 70 manholes (MH) within the ECE Subcatchment which do not receive runoff and therefore dos not have a drainage area associated with them. According to the provided Pit Data Sheets four of the pits/MH have been removed: EE19, EE216, EE24, and EE21. These pits/manholes are represented in the model as a MH since these pits still have pipes connected to them based on the pit data sheets. The catchment areas for each pit are shown in Table A1.

For appropriate representation of overland flow along the streets, where the street drainage did not exist, a surface node was placed at the upstream and downstream ends as well as the mid-section of a few streets in the subcatchment. These pit catchments are labelled as C-street name and a number corresponding with the surface node.

Table A1: Subcatchment Areas

Catchment	Area (ha)	Impervious (%)	Pervious (%)
C-111.u/sD	0.800	71	29
C-116.u/sD	1.072	55	45
C-149u/sD	0.222	78	22
C-161A.u/sD	0.469	78	22
C-161B.u/sD	0.100	97	3
C-2.u/sD	0.283	64	36
C-204.u/sD	0.827	62	38
C-230u/sD	0.746	94	6
C-4.u/sD	0.029	100	0
C-46.u/sD	0.464	69	31
C-58.u/sD	0.235	82	18
C-76A.u/sD	0.914	71	29
C-80.u/sD	0.146	84	16
C-9.u/sD	0.079	99	1
C-BrownD1	0.909	57	43
C-BrownD2	1.519	66	34

Catchment	Area (ha)	Impervious (%)	Pervious (%)
C-Campbell1	0.896	90	10
C-ChurchD1	0.517	76	24
C-ChurchD2	0.758	67	33
C-CommodD1	0.707	69	31
C-CommodD2	0.484	69	31
C-CrossD	0.189	73	27
C-CVO	2.817	0	100
C-DicksonD1	0.159	67	33
C-DicksonD2	0.309	81	19
C-DicksonD3	0.395	84	16
C-DicksonLD1	0.243	76	24
C-DicksonLD2	0.332	82	18
C-EdgeLaneD1	0.211	85	15
C-EdgeLaneD2	0.511	63	37
C-EdgeRd4	0.431	73	27
C-EdgeRdD1	0.466	97	3
C-EdgeRdD2	0.490	80	20
C-EdgeRdD3	0.915	66	34
C-EE1	0.381	89	11
C-EE100	0.020	66	34
C-EE102	0.411	66	34
C-EE103	0.053	100	0
C-EE104	0.849	58	42
C-EE106	0.147	77	23
C-EE107	0.870	50	50
C-EE109	0.843	88	12
C-EE109D	0.438	79	21
C-EE11	0.017	99	1
C-EE110	0.235	89	11
C-EE111	1.323	69	31
C-EE112	0.277	82	8
C-EE115	0.360	78	22
C-EE116	0.820	39	61
C-EE117	0.077	33	67
C-EE118	0.071	63	37
C-EE119	0.305	66	34
C-EE12	0.281	77	23
C-EE120	0.035	98	2
C-EE121	0.035	99	1
C-EE121A	0.063	41	59
C-EE121C	0.103	64	36
C-EE121F	0.715	62	38
C-EE121G	0.118	68	32
C-EE121H	0.034	35	65

Catchment	Area (ha)	Impervious (%)	Pervious (%)
C-EE121I	0.165	75	25
C-EE122	0.868	60	40
C-EE123	0.004	100	0
C-EE124	0.096	89	11
C-EE125	0.144	87	13
C-EE126	0.036	100	0
C-EE127	0.473	0	100
C-EE128C	1.670	69	31
C-EE128D	0.062	100	0
C-EE128E	0.213	90	10
C-EE129	0.069	89	11
C-EE13	0.001	100	0
C-EE130	1.138	68	32
C-EE131	0.717	66	34
C-EE132	0.055	100	0
C-EE135	0.149	46	54
C-EE136	0.008	100	0
C-EE137	0.477	82	18
C-EE138	0.183	83	17
C-EE139	0.422	89	11
C-EE14	0.119	98	2
C-EE140	0.003	100	0
C-EE141	0.042	100	0
C-EE142	0.125	100	0
C-EE143	0.416	47	53
C-EE144	0.097	68	32
C-EE145	0.536	65	35
C-EE147	0.129	100	0
C-EE148	0.721	96	4
C-EE149	0.563	70	30
C-EE15	0.323	72	28
C-EE150	0.238	100	0
C-EE151	0.041	99	1
C-EE152	0.628	69	31
C-EE154	0.908	66	34
C-EE155	0.189	61	39
C-EE157	0.536	63	37
C-EE158	0.239	96	4
C-EE159	0.050	100	0
C-EE16	0.541	67	33
C-EE160	0.031	100	0
C-EE161	0.019	100	0
C-EE161A*	0.660	64	36
C-EE161B*	0.160	96	4

Catchment	Area (ha)	Impervious (%)	Pervious (%)
C-EE162	0.055	100	0
C-EE163	0.505	33	67
C-EE164	0.318	70	30
C-EE165	0.040	100	0
C-EE166	0.898	70	30
C-EE167	0.225	99	1
C-EE168	0.380	67	33
C-EE169	0.049	75	25
C-EE17	0.216	66	34
C-EE170	0.065	90	10
C-EE171	0.009	100	0
C-EE172	0.006	100	0
C-EE173	0.192	61	39
C-EE174	0.084	65	35
C-EE175	0.007	100	0
C-EE176	0.106	87	13
C-EE177	0.428	95	5
C-EE178	0.844	50	50
C-EE179	0.046	70	30
C-EE18	0.011	98	2
C-EE180	0.037	90	10
C-EE181	0.045	86	14
C-EE182	0.225	97	3
C-EE183	0.312	96	4
C-EE184	0.261	99	1
C-EE185	1.246	87	13
C-EE186	1.084	73	27
C-EE187	0.330	97	3
C-EE188	0.315	97	3
C-EE189	0.071	63	37
C-EE190	0.081	88	12
C-EE191	0.313	96	4
C-EE193	0.041	100	0
C-EE194	0.279	100	0
C-EE195	0.932	88	12
C-EE196	0.143	89	11
C-EE196A	0.057	75	25
C-EE196B	1.145	95	5
C-EE197	0.355	96	4
C-EE198	0.148	94	6
C-EE2	0.339	72	28
C-EE20	1.300	55	45
C-EE200	0.512	92	8
C-EE201	0.045	0	100

Catchment	Area (ha)	Impervious (%)	Pervious (%)
C-EE201A	0.313	0	100
C-EE201B*	2.109	85	15
C-EE202	0.469	68	32
C-EE203	0.090	81	9
C-EE204	0.824	60	40
C-EE205	0.090	100	0
C-EE208	0.474	76	24
C-EE211	1.526	75	25
C-EE213	0.303	83	17
C-EE214	0.002	100	0
C-EE215	0.004	100	0
C-EE218	0.572	62	38
C-EE219	0.164	85	15
C-EE22	0.263	84	16
C-EE220	1.087	66	34
C-EE221	0.300	100	0
C-EE225	0.097	71	29
C-EE226	0.027	82	18
C-EE227	0.014	100	0
C-EE230	0.406	100	0
C-EE232	0.450	81	19
C-EE234	0.028	87	13
C-EE242	0.779	73	27
C-EE243	0.351	77	23
C-EE244	0.976	69	31
C-EE245A	0.507	86	14
C-EE246	0.134	63	37
C-EE247	0.368	41	59
C-EE25	0.032	100	0
C-EE26	0.001	100	0
C-EE27	0.049	74	26
C-EE28	0.169	79	21
C-EE30	0.149	72	28
C-EE34	0.013	100	0
C-EE35	1.010	67	33
C-EE36	0.235	82	18
C-EE38	0.052	100	0
C-EE39	0.019	100	0
C-EE4	0.066	88	12
C-EE43	0.114	83	17
C-EE45	0.109	79	21
C-EE46	0.280	99	1
C-EE47	0.377	75	25
C-EE48	0.061	98	2

Catchment	Area (ha)	Impervious (%)	Pervious (%)
C-EE50	0.327	92	8
C-EE51	0.005	100	0
C-EE52	0.158	93	7
C-EE53	0.012	85	15
C-EE54	0.084	81	19
C-EE55	0.219	93	7
C-EE56	0.644	58	42
C-EE57	0.019	82	18
C-EE58	0.464	77	23
C-EE59	0.119	88	12
C-EE6	0.021	100	0
C-EE60	0.391	65	35
C-EE61	0.190	96	4
C-EE62	0.070	13	87
C-EE63	0.020	12	88
C-EE64	0.329	96	4
C-EE65	0.025	100	0
C-EE66	0.364	51	49
C-EE67	0.032	54	46
C-EE68	0.027	100	0
C-EE69	0.006	100	0
C-EE7	0.721	73	27
C-EE71	0.064	84	16
C-EE72	0.184	43	57
C-EE73	0.009	50	50
C-EE74	0.095	78	22
C-EE75	0.914	58	42
C-EE76	0.026	74	26
C-EE77	0.693	93	7
C-EE78	0.146	46	54
C-EE79	0.087	70	30
C-EE80	0.257	63	37
C-EE81	0.157	67	33
C-EE82	0.186	60	40
C-EE82A	0.009	100	0
C-EE83	0.235	36	64
C-EE84	0.191	97	3
C-EE85	0.602	73	27
C-EE86	0.046	100	0
C-EE89	0.027	100	0
C-EE9	0.172	91	9
C-EE90	0.009	100	0
C-EE92	0.005	100	0
C-EE93	0.961	63	37

Catchment	Area (ha)	Impervious (%)	Pervious (%)
C-EE94	0.075	68	32
C-EE95	0.509	71	29
C-EE96	0.052	69	31
C-EE97	0.258	73	27
C-EE98	0.115	99	1
C-ES110	2.171	96	4
C-ES111	0.515	85	15
C-ES56	1.323	72	28
C-ES57	0.005	0	100
C-ES71	0.127	89	11
C-ES72A	0.036	90	10
C-ES75	0.710	38	62
C-ES76A	2.219	71	29
C-ES79	0.109	70	30
C-ES80	0.258	84	16
C-ES83	0.445	100	0
C-ES83A	0.471	84	16
C-ES83B	0.788	22	78
C-ES83C	0.532	24	76
C-ES83D	0.896	62	38
C-FlorenceD1	2.654	16	84
C-FlorenceD2	1.880	46	54
C-FrancisD1	0.491	66	34
C-FrancisD2	0.510	54	46
C-HolmLaneD1	0.084	81	19
C-HolmLaneD2	0.138	77	23
C-HolmLaneD3	0.238	79	21
C-HolmStD1	0.115	74	26
C-HolmStD2	0.193	82	18
C-HolmStD3	0.224	82	18
C-HutchinD1	1.117	100	0
C-HutchinD3	0.948	83	17
C-HutchinD4	0.807	95	5
C-JuliettD1	0.440	74	26
C-JuliettD2	0.255	82	18
C-JuliettD3	0.409	84	16
C-JuliettD4	0.823	79	21
C-KentD1	0.129	88	12
C-KentD2	0.087	92	8
C-KentD3	0.198	44	56
C-Lackey1	1.580	87	13
C-LauraD1	0.245	59	41
C-LauraD2	0.408	82	18
C-LauraD3	0.449	67	33

Catchment	Area (ha)	Impervious (%)	Pervious (%)
C-L-EE224A	0.753	69	31
C-L-EE224B	0.042	100	0
C-LordSt	0.510	95	5
C-LynchD	0.642	83	17
C-MargLaneD1	0.497	61	39
C-MargLaneD2	0.442	69	31
C-MarianD2	0.268	85	15
C-MarianD3	0.642	77	23
C-MarianStD1	0.394	100	0
C-MayLaneD1	0.375	92	8
C-MayLaneD2	0.741	80	20
C-MayStD1	0.582	79	21
C-MayStD2	0.205	100	0
C-MayStD3	0.683	91	9
C-MetroD1	0.072	89	11
C-MetroD2	0.122	81	19
C-MetroD3	0.326	83	17
C-MLaneD1	0.113	60	40
C-MLaneD2	0.250	79	21
C-Openc1	1.921	95	5
C-Openc2	0.751	97	3
C-PearlD	0.367	78	22
C-ScoulStD	0.352	85	15
C-SimmonsD1	0.308	97	3
C-SimmonsD2	0.282	53	47
C-SimmonsD3	0.697	65	35
C-SimpsonPark	0.990	0	100
C-St.PetersD1	0.817	57	43
C-St.PetersD2	2.991	79	21
C-Station2-2u/s	0.137	11	89
C-Station2-4u/s	0.023	98	2
C-WellsD1	0.339	73	27
C-WellsD2	0.446	83	17
C-WellsD3	0.302	61	39
Open168-1	0.611	63	37
Open168-2	0.297	83	17
Open168-3	0.337	45	55
RailNorth1	2.188	58	42
RailNorth2	0.546	5	95
RailSouth1	1.535	32	68
RailSouth2	0.716	0	100
Total Area (ha)	***132.3 ha***		

* Catchment area to lintel

From Table A1, the reported total subcatchment area compares favourably to the catchment area of 131 ha.

Hydrological Model

Extended Rational Method (ERM) was used to estimate the catchment flows. The DRAINS version of the ERM is a variation of the US Modified Rational Method. The ERM works the same way as the ILSAX model by using a time-area routing procedure rather than assuming hydrograph shapes. However, the loss model is different from the ILSAX model by assuming a continuing loss proportional to the rainfall intensities.

The input into the model is the same as the Rational Method, however the ERM runs using rainfall patterns or hyetographs instead of intensities derived from an IFD relationship. Additional information can be found in the DRAINS manual (O'Loughlin, April 2008).

Given the nature of catchment development and small size of catchments contributing to the pits, ERM was deemed to be an appropriate hydrologic model for use in the DRAINS model.

Site Visit

A site visit to gather missing information was conducted on 11 August 2009. A number of observations were made during the site visit. A brief description is presented below. (See Figure A-1, A-2 and A-3 for pit numbers referred to in the following description).

- Four locations were observed where water exits the pipe network and flows along the street towards the next most downstream pit. The locations at which this occurs are:
  - Reiby St – water from EE231 surfaces and flows down Reiby St. to the next pit (EE150);
  - Simmons St – water from EE132 surfaces and flows down Simmons St. to the next pit (EE124);
  - Sarah St and Edgeware Rd – The flow from the gutters and upstream pipe network surfaces and flows down Edgeware Rd to pit EE213; and
  - Goodsell St – Water from ES86 surfaces and flows west down Goodsell St to Council St and then North to pit ES56.
- There are two pipe networks which were checked on site. These networks were located within developments and were therefore not readily accessible. Pipe network EE128 joins James St with Camden St via a pipe connecting EE126 to EE128B. The pits along Camden St (EE128B to EE128E) were measured and the pit database was updated. It was confirmed that EE128E acts as an overflow for the 900 mm diameter pipe along Camden St through a development to EE83. The second pipe network to traverse through development is the EE121 network which occurs between Camden St. and Alice St. Pits EE121G and EE121H were measured and pipe diameters were confirmed. The pit information for all EE121 pits was available in the pit database but pit data sheets were not provided.
- The GIS data provided by Council showed that there is a pipe connecting the EE121 network to EE218A located at the corner of Edgeware Rd and Alice St. The pit lid for EE218A could not be lifted during the site visit and the upstream end of the pipe could not be located. Therefore, it was assumed that the pipe acts as an overflow and connects the EE121 network to EE218A starting upstream at the right angle bend of the main pipe between EE121G to EE121H. Discussion with Council staff confirmed the existence of the pipe connection.
- The pit data sheet of EE34 and pit dimensions in the database were missing; therefore the pit was measured during the site visit.
- There are four pits along the east side Princes Highway across from ES83. During the site visit it was confirmed that these pits are connected to ES83 and therefore the area of Sydney Park contributes flow to the ECE Subcatchment.

Pits and Pipes

For modelling purposes the pipe systems were divided into eight branches within the catchment and the available pit and pipe data was organised in this fashion. The updated pit and pipe databases are presented in Table A2 and A3.

The database provided by Council was updated to capture the relevant information as discussed above.

The pit and pipe identifiers for the ECE Subcatchment are EE at the beginning of each asset. However, the south portion of the subcatchment has the identifier ES which have been previously labelled as part of the Eastern Channel South.

A pit database was provided by Marrickville Council which included: pit number, location, pit material, and the measurements of the pit, lintel and grate. Some of the pit, lintel and grate dimensions were missing for various pits and were therefore assumed based on the dimensions of adjacent pits. The surface elevation of each pit was added to the database using the technique described under the Pit Location and Elevation section.

The provided pit database was not complete since thirteen pits/lintels were missing along various streets which capture runoff. These pits and lintels were shown on the GIS pit layer provided by Council and were confirmed using site Investigation and appropriate assumptions. The missing information has been added into the database and have been labelled according to the method described above. When no information was available the pit/lintel was given an assumed number.

Pit data sheets were also provided which contained the pit, lintel and grate dimensions, pipe diameters, depth to pipe inverts from the surface level of the pit and some data sheets contained the pit and pipe material. The information provided in the pit data sheets were compared to the provided pit and pipe databases. When there was a discrepancy in the data the pit data sheet information was used.

A pipe database was also provided by Marrickville Council which included: pipe number, location, upstream and downstream node, pipe diameter and pipe material. Some of the pipe diameters and pipe material were missing. Where information was available the missing information was obtained from the pit data sheets and the pipe diameter layer provided in GIS by Council. When the pipe material was unknown it was assumed that the pipe is made of concrete. Several pipes were missing from the pipe database and have been added based on the GIS information and pit data sheets.

The pipe invert elevations were estimated based on the surface elevation of each pit and subtracting the depth to pipe invert as outlined on the pit data sheets. For example, the surface elevation of pit EE53 on Alice St. was estimated to be approximately 23.09 m AHD. According to the pit data sheets the depth to invert of the outlet pipe is 1.6 m; therefore the invert elevation of the outlet pipe is approximately 21.49 m.

There are several pipes, as mentioned in the Stormwater Inspections – Sydney Water section, which are connected to the main pipes of the drainage system. These pipes have no downstream invert elevation information since they have not been connected via a pit or manhole. The downstream inverts of these pipes were estimated based on either the road slope (assuming that the pipe slope is similar to the road slope) or using the slope of the upstream or downstream pipe where available.

Pit Number	Locat	Pit Material	Pit Base Material		Pit Length		Pit Width	Pit Depth	Surface Level	Lintel	Lintel Type	Lintel Length	Lintel Height	Grate Type	Grate Length	Grate Width	Pit Size - DRAINS	Sag/on-grade	Comments	Original Pit Locat
Camden Street - Pipe Network 1																				
EE139		Brick		0.63	0.9		0.7	0.85	26.49	Yes	Concrete	1.8	0.1	SDG - Single Double Grate	0.98	0.51	SA2	Sag		PEMELL LNE-
EE140		Brick		0.45	0.9		0.5	1.65	26.87	No	None			SDG - Single Double Grate	0.98	0.51	RM7	Ongrade		PEMELL LNE-
EE142		Concrete		0.405	0.9		0.45	1.25	29.72	No	None			SWG - Swing/Pivot Grate	1.02	0.45	RM7	Ongrade		PEMELL LNE-
EE141		Brick		0.63	0.9		0.7	2.05	26.91	Yes	Concrete	1.8	0.08	SWG - Swing/Pivot Grate	1.02	0.45	SA2	Ongrade	LINTEL SETTLED	PEMELL LNE-
EE143		Brick		0.585	0.9		0.65	1.3	23.98	Yes	Concrete	1.8	0.05	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		PEMELL ST-
EE144		Brick		0.45	0.9		0.5	1	23.29	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade		PEMELL ST-
EE145		Brick		0.63	0.9		0.7	1	22.63	Yes	Concrete	0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		PEMELL ST-
EE147		Brick		0.63	0.9		0.7	1.5	22.36	***Yes***	Other	0.9	0.08	***SDG - Single Double Grate***	0.98	0.58	SA2	Sag		PEMELL ST-
EE146		Brick		#N/A	1		0.5	0.9	22.36	No	None			None			SF1	Ongrade		PEMELL ST-
EE149		Brick		0.405	0.9		0.45	0.45	23.84	Yes	Other	0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		DON ST-CNR REIBY ST
EE148		Brick		0.54	0.9		0.6	1.1	23.79	Yes	Other	0.9	0.1	SDG - Single Double Grate	0.98	0.51	SA1	Ongrade		REIBY ST-CNR DON ST
EE150		Brick		0.63	0.9		0.7	1.45	23.21	Yes	Other	0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		REIBY ST-CNR PEMELL ST
EE151		Brick		0.6	0.9		0.6	1	19.76	Yes	Other	0.9	0.07	SDG - Single Double Grate	0.98	0.51	SA1	Ongrade		REIBY ST-CNR SLOANE ST
EE152		Brick		0.575	0.9		0.5	1.15	19.79	Yes		0.8	0.14	SDG - Single Double Grate	0.98	0.51	SA1	Ongrade		REIBY ST-CNR RAWSON ST
EE153		Brick		#N/A	0.8		0.8	1.2	19.50	No	None			None			SF1	Ongrade		SLOANE ST-CNR REIBY ST
EE154		Brick		1.6	2		0.8	2.05	19.10	Yes	Other	2	0.14	***SDG - Single Double Grate***	0.98	0.58	SA2	Ongrade		SLOANE-SIDE OF REIBY ST
EE155		Brick		1.4	2		0.7	2.4	18.85	Yes		2	0.11	***SDG - Single Double Grate***	0.98	0.58	SA2	Sag		SLOANE ST-
EE156		Brick		#N/A	0.9		0.9	1.7	16.81	No	None			None			SF1	Ongrade	BRICK PIPE NO GOOD CONDITION SEND COMPANY CCTV	FULHAM ST-
EE157		Brick		0.59	0.9		0.65	1.35	16.88	***Yes***	Other	0.9	0.3	***SDG - Single Double Grate***	0.98	0.58	SA2	Ongrade		FULHAM ST-
EE158		Brick		0.63	0.9		0.7	1.3	16.83	Yes	Other	0.9	0.16	***SDG - Single Double Grate***	0.98	0.58	SA1	Ongrade		FULHAM ST-
EE159		Brick		0.63	0.9		0.7	1.5	16.66	***Yes***	Other	0.9	0.12	***SDG - Single Double Grate***	0.98	0.58	SA2	Sag		FULHAM ST-
EE160		Brick		0.63	0.9		0.7	1.3	16.76	***Yes***	Other	0.9	0.15	***SDG - Single Double Grate***	0.98	0.58	SA2	Sag		FULHAM ST-
EE28		Brick		1.8	3.6		0.5	1.1	15.59	No	None			SDG - Single Double Grate	3.6	0.4	RM7	Ongrade		MARGARET ST-OPP
EE27		Concrete		0.59	0.9		0.65	1.7	15.51	Yes	Other	0.8	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		MARGARET ST-
EE21		Concrete		#N/A	1		1	2	12.87	No	None			None			SF1	Ongrade		FERNDALE ST-CNR CAMDEN ST
EE46		Brick		0.63	0.9		0.7	1	28.16	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		HOLT ST-CNR STATION ST
EE47		Brick		0.63	0.9		0.7	1.4	27.98	Yes	Other	0.8	0.05	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		STATION ST-CNR HOLT ST
EE49		Brick		#N/A	0.7		0.7	0.75	28.02	No	None			None			SF1	Ongrade		HOLT ST-CNR STATION ST
EE48		Brick		0.51	0.85		0.6	0.6	27.79	Yes	Concrete	2	0.09	SWG - Swing/Pivot Grate	0.87	0.45	SA2	Ongrade	Opp 80 Station - GT	-
EE229		Concrete		#N/A	0.4		0.5	0.85	27.74	No	None			None			SF1	Ongrade		HOLT ST-
EE45		Other		0.54	0.9		0.6	0.8	27.34	Yes	Other	0.8	0.7	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		HOLT ST-OPP
EE228		Concrete		#N/A	1		0.6	0.85	27.38	No	None			SWG - Swing/Pivot Grate	1.05	0.45	SF1	Ongrade		HOLT ST-OPP
EE44		Brick		#N/A	0.6		0.6	1	25.24	No	None			None			SF1	Ongrade		COLLEGE ST-CNR HOLT ST
EE43		Brick		1	1		1	1	25.02	Yes	Concrete	1.4	0.115	SWG - Swing/Pivot Grate	1.02	0.45	SA2	Ongrade		COLLEGE ST-CNR HOLT ST
EE42		Brick		#N/A	0.6		0.6	1.2	25.15	No	None			None			SF1	Ongrade		COLLEGE ST-CNR MARGARET ST
EE41		Brick		#N/A	0.7		0.7	1.3	24.72	No	None			None			SF1	Ongrade		MARGARET ST-CNR COLLEGE ST
EE39		Concrete		0.9	1		0.9	1	22.31	No	None			SWG - Swing/Pivot Grate	1.02	0.45	RM7	Ongrade		MARGARET ST-
EE40		Concrete		#N/A	0.7		0.7	1.3	22.31	No	None			None			SF1	Ongrade		MARGARET ST-
EE38		Concrete		0.7	1		0.7	0.5	19.50	Yes	Concrete	2.6	0.11	SWG - Swing/Pivot Grate	1.02	0.45	SA3	Ongrade		MARGARET ST-
EE37		Concrete		#N/A	0.7		0.7	2	19.34	No	None			None			SF1	Ongrade		MARGARET ST-
EE36		Concrete		0.7	1		0.7	1.3	18.95	Yes	Concrete	3.2	0.11	SWG - Swing/Pivot Grate	1.02	0.45	SA3	Ongrade		MARGARET ST-
EE32		Concrete		#N/A	1.1		1.1	1.8	19.00	No	None			None			SF1	Ongrade		MARGARET ST-CNR REIBY ST
EE35		Brick		0.54	0.9		0.6	0.6	18.67	Yes	Concrete	2.8	0.11	SWG - Swing/Pivot Grate	0.87	0.45	SA3	Ongrade	SILTED WITH DEBRIS	REIBY ST-CNR FULHAM ST
EE34		Concrete		0.45	0.75		0.6	0.5	18.51	No	None			SWG - Swing/Pivot Grate	0.75	0.45	SA2	Ongrade		
EE33		Concrete		#N/A	1		0.6	1.2	18.61	No	None			None			SF1	Ongrade		REIBY ST-CNR MARGARET ST
EE31		Concrete		#N/A	1.3		1.3	1.8	18.62	No	None			None			SF1	Ongrade		MARGARET ST-
EE29		Concrete		#N/A	0.9		0.9	1.3	17.90	No	None			None			SF1	Ongrade		MARGARET ST-
EE30		Concrete		0.8	1		0.8	0.5	17.78	Yes	Concrete	3.2	0.12	SWG - Swing/Pivot Grate	1.02	0.45	SA3	Ongrade		MARGARET ST-
EE24		Concrete		#N/A	0.75		0.75	1.05	15.56	No	None			None			SF1	Ongrade		MARGARET ST-
EE25		Concrete		0.54	0.9		0.6	0.7	15.53	Yes	Other	0.8	0.07	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		MARGARET ST-
EE26		Concrete		0.54	0.9		0.6	1.6	15.49	Yes	Other	0.7	0.07	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		MARGARET ST-
EE23		Concrete		#N/A	0.7		0.7	1.75	15.34	No	None			None			SF1	Ongrade		FERNDALE ST-CNR MARGARET ST
EE22		Brick		0.63	0.9		0.7	0.9	13.17	Yes	Concrete	3.2	0.075	SDG - Single Double Grate	0.98	0.58	SA3	Ongrade		FERNDALE ST-
EE122		Brick		0.63	0.9		0.7	1.65	11.75	Yes	Concrete	2	0.08	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		SIMMONS ST-CAMDEN ST
EE123		Brick		0.59	0.9		0.65	1.65	11.65	No		1.8	0.1	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		SIMMONS ST-CNR CAMDEN ST
EE124		Brick		0.63	0.9		0.7	1.8	11.54	Yes	Concrete	2.5	0.12	SDG - Single Double Grate	0.98	0.58	SA3	Ongrade		SIMMONS ST-CNR CAMDEN ST
EE125		Brick		0.63	0.9		0.7	2	11.45	Yes	Concrete	0.9	0.07	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		CAMDEN ST-CNR SIMMONS ST
EE242		Brick		0.54	0.9		0.6	0.6	17.32	Yes	Concrete	0.9	0.09	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	Blocked pit due to leaves.	MARIAN ST-CNR SARAH ST
EE127		Brick		0.63	0.9		0.7	0.6	13.16	Yes	Concrete	1.4	0.15	SDG - Single Double Grate	0.98	0.51	SA2	Ongrade		JAMES ST-OPP
EE126		Brick		0.63	0.9		0.7	1.3	13.15	Yes	Other	0.8	0.11	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	500MM WATER	JAMES ST-
EE128		Brick		#N/A	0.6		0.5	0.7	13.11	No	None			Steel Cover	0.5	0.55	RM7	Ongrade		JAMES ST-
EE128A		Concrete		#N/A	0.9		0.7	0.6	12.33	No	None			None			SF1	Ongrade	Buried junction pit	REAR OF NO 33, JAMES STREET
EE128B		Concrete		#N/A	0.63		0.63	0.36	11.11	No	None			Steel Cover			SF1	Ongrade	Pit is not formed.	
EE128C		Concrete		0.5	0.9		0.7	0.6	10.63	No	None			SWG - Swing/Pivot Grate	0.98	0.58	SA2	Ongrade		
EE130		Concrete		0.77	0.85		0.9	1.25	13.87	Yes	Concrete	1.1	0.15	SWG - Swing/Pivot Grate	0.88	0.45	SA1	Ongrade		JAMES ST-TAFE (SYDNEY INSTITUTE OF TECHNOLOGY)
EE129		Brick		0.6	0.85		0.7	1.75	13.70	Yes	Concrete	1.4	0.1	SWG - Swing/Pivot Grate	0.88	0.45	SA1	Ongrade		JAMES ST-TAFE (SYDNEY INSTITUTE OF TECHNOLOGY)
EE213		Brick		1.2	1		1.2	1.5	11.64	Yes	Concrete	2	0.11	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		EDGEWARE RD-CNR CAMDEN ST
EE214		Brick		1.2	1		1.2	1.6	11.52	Yes	Concrete	2	0.12	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		EDGEWARE RD-CNR CAMDEN ST
EE217		Concrete		#N/A	1.5		1.5	4.9	11.39	No	None			None			SF1	Ongrade		EDGEWARE RD-CNR CAMDEN ST

LEGEND

Pit "Deleted" according to Pit data sheet
Added into database
On original Map but not on the most current layer of pits from MC
Missing Data - data has been assumed based on adjacent MH/Pits

Alice Street

Pit Number	t Locati	Pit Material	Pit Base Material		Pit Length		Pit Width	Pit Depth	Surface Level	Lintel	Lintel Type	Lintel Length	Lintel Height	Grate Type	Grate Length	Grate Width	Pit Size - DRAINS	Sag/on-grade	Comments	Original Pit Locat
EE50	Rear o	Concrete			1		0.6	1.15	23.84	No	None			SWG - Swing/Pivot Grate	1.02	0.45	RM7	Ongrade	AT THE FAR CNR OF NO 503 FROM ALICE ST- SH	FLAT LANE-
EE51	Rear o	Concrete			1		0.9	1.75	23.72	Yes	Concrete	2	0.1	SWG - Swing/Pivot Grate	1.02	0.45	SA2	Ongrade		FLAT LANE-CNR ALICE ST
EE52		Concrete			1		0.6	1.75	23.33	No	None			SWG - Swing/Pivot Grate	1.02	0.45	RM7	Ongrade		ALICE ST-CNR FLAT LANE
EE53		Concrete			0.9		0.7	1.6	23.09	Yes	Concrete	2	0.09	SWG - Swing/Pivot Grate	1.02	0.45	SA2	Ongrade		ALICE ST-
EE54		Brick			0.9		0.7	0.7	21.42	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade		ALICE ST-OPP 01 ALICE ST
EE55		Brick			0.9		0.7	1.6	21.29	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade	1000MM WATER	ALICE ST-OPP NO 16
EE207		Concrete			1		1	1.4	21.12	No	None			None			SF1	Ongrade		ALICE ST-
EE208		Brick			0.9		0.65	1.4	19.12	Yes	Concrete	0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-
EE56		Brick			0.9		0.65	0.85	19.65	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-
EE57		Brick			0.9		0.65	1.6	19.50	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-CNR WALENORE AVE
EE58		Brick			0.9		0.65	0.8	19.11	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	IN WALENORE AVE AT CNR NO 30- SH	WALENORE AVE-CNR ALICE ST
EE59		Brick			0.9		0.65	1.5	18.65	Yes	Other	0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	800 WATER	WALENORE AVE-WEST-TRAM CNR ALICE ST
EE206		Concrete			1		1	1.7	18.69	No	None			None			SF1	Ongrade		ALICE ST-INT WALE
EE61		Brick			0.9		0.7	0.5	17.50	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-CLOUSTON & HALL BROK SELLERS
EE60		Brick			0.7		0.5	0.7	17.73	No	None			SWG - Swing/Pivot Grate	0.85	0.45	RM7	Ongrade		ALICE ST-MATT HOGAN RESERVE
EE62		Brick			0.9		0.6	0.55	17.27	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-MATT HOGAN RESERVE
EE63		Brick			0.9		0.6	1.4	17.24	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	800MM WATER	ALICE ST-MATT HOGAN RESERVE
EE209		Concrete			0.9		0.9	1.6	17.08	No	None			None			SF1	Ongrade		ALICE ST-
EE64		Concrete			0.9		0.7	0.5	16.27	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-CNR PEARL ST DYEMOND PTY LTD
EE65		Concrete			0.9		0.7	0.6	16.27	Yes	Other	0.9	0.07	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-CNR PEARL ST DYEMOND PTY LTD
EE66		Concrete			0.9		0.7	0.65	16.13	Yes	Concrete	0.9	0.09	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-
EE67		Concrete			0.9		0.5	1.55	16.08	Yes	Other	0.9	0.075	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-
EE211		Brick			0.9		0.6	2.2	18.30	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade	ON THE SIDE OF PEARL STREET- SH	PEARL ST-
EE68		Brick			0.9		0.9	1.6	17.00	Yes	Other	1	0.12	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		PEARL ST-CNR ALICE ST
EE69		Concrete			0.9		0.75	1.4	16.74	Yes	Other	1	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		PEARL ST-CNR ALICE ST
EE70		Concrete			0.7		0.7	0.8	16.19	No	None			None			SF1	Ongrade		ALICE ST-DYEMOND PTY (LTD)
EE210		Concrete			0.9		0.9	1.5	16.04	No	None			None			SF1	Ongrade		ALICE ST-CNR PEART ST
EE71		Concrete			0.9		0.65	0.65	15.40	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade	100MM WATER	ALICE ST-
EE72		Concrete			0.9		0.6	0.8	14.86	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-CNR CLARA ST
EE73		Concrete			0.9		0.6	1.4	14.78	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-CNR CLARA ST
EE248		Concrete			0.7		0.7	1.7	14.77	No	None			None			SF1	Ongrade		MIDDLE OF THE ROAD
EE249		Concrete			0.7		0.7	1.7	13.25	No	None			None			SF1	Ongrade		MIDDLE OF THE ROAD
EE74		Brick			0.9		0.65	1.3	12.75	Yes	Other	0.9	0.07	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	600MM WATER	ALICE ST-
EE75		Brick			0.9		0.65	0.4	12.80	Yes	Other	0.9	0.09	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	NEEDS CLEANING	ALICE ST-CNR HAWKEN ST
EE76		Brick			0.9		0.7	0.7	12.62	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-CNR HAWKEN ST
EE77					0.9		0.7	1.4	12.54	Yes	Concrete	0.9	0.09	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		HAWKEN ST-CNR ALICE ST
EE212		Brick			1		1	1.45	12.32	No	None			None			SF1	Ongrade		ALICE ST-CNR HAWKEN ST
EE78		Brick			0.9		0.7	0.5	11.09	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-
EE79		Brick			0.9		0.7	1.4	10.58	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade	600MM WATER	ALICE ST-
EE79A		Concrete			0.7		0.7	1.8	10.36	No	None			None			SF1	Ongrade		ALICE ST
EE80		Brick			0.9		0.7	0.4	10.29	Yes	Concrete	1.5	0.07	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		ALICE ST-
EE80A		Concrete			0.7		0.7	1.8	10.00	No	None			None			SF1	Ongrade		ALICE ST
EE81		Brick			0.9		0.7	1.3	9.43	Yes		0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-CNR ALICE AVE
EE82		Brick			0.9		0.7	1.2	9.22	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE AVE-CNR ALICE ST
EE83		Concrete			4		1	1.4	9.51	No	None			SWG - Swing/Pivot Grate	4.05	1	RM7	Ongrade		ALICE AVE-
EE82A		Concrete			1		0.7	1.45	9.34	Yes		1	0.075	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	IN ALICE AVE AT SIDE OF 173 ALICE ST- SH	IN ALICE AVE
EE81A		Concrete			0.4		0.9	2	9.27	No	None			None			SF1	Ongrade	IN MIDDLE OF ROAD AT CNR OF NO 175- SH	MIDDLE OF THE ROAD
EE219		Brick			0.9		0.6	1.4	8.25	***Yes***	Concrete	0.9	0.09	***SDG - Single Double Grate***	0.98	0.58	SA2	Ongrade		ALICE ST-CNR EDGEWARE RD
EE220		Brick			0.9		0.6	0.6	8.18	Yes	Concrete	0.9	0.075	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		ALICE ST-CNR EDGEWARE RD
EE221		Brick			1.8		0.6	1.5	8.13	Yes	Other	0.9	0.1	***SDG - Single Double Grate***	0.98	0.58	SA1	Sag		EDGEWARE RD-CNR ALICE ST
EE218		Concrete			0.9		0.9	0.7	8.44	Yes	Concrete	2.8	0.13	SDG - Single Double Grate	0.98	0.51	SA3	Ongrade		EDGEWARE RD-CNR ALICE ST
EE218A		Concrete			0.4		0.9	2	8.36	No	None			None			SA1	Ongrade	204 Edgeware Rd	

Murray Street

Pit Number	t Locati	Pit Material	Pit Base Material		Pit Length		Pit Width	Pit Depth	Surface Level	Lintel	Lintel Type	Lintel Length	Lintel Height	Grate Type	Grate Length	Grate Width	Pit Size - DRAINS	Sag/on-grade	Comments	Original Pit Locat
EE186		Concrete			0.9		0.8	0.9	7.73	Yes	Concrete	2.5	0.14	SDG - Single Double Grate	0.9	0.55	SA3	Ongrade		VICTORIA RD-CNR EDGEWARE RD
EE246		Concrete			0.9		0.8	0.9	7.37	Yes	Concrete	1.2	0.12	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		VICTORIA RD-INFRONT OF
EE247		Concrete			0.9		0.8	0.9	6.70	Yes	Concrete	1.2	0.12	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		MURRAY ST-CNR VICTORIA RD
EE185		Concrete			0.9		0.7	0.7	5.62	Yes	Concrete	3.2	0.15	SDG - Single Double Grate	0.9	0.45	SA3	Ongrade		MURRAY ST-TRADE LINK PLUMBING SUPPLIES CENTRE
EE184		Concrete			0.9		0.75	0.85	5.52	No	None			SDG - Single Double Grate	0.9	0.45	RM7	Ongrade		MURRAY ST-TRADE LINK PLUMBING SUPPLIES CENTRE
EE183		Concrete			0.9		0.9	1.8	5.23	Yes	Concrete	1.8	0.11	SDG - Single Double Grate	0.9	0.45	SA2	Ongrade	WET PIT (900 WATER)	MURRAY ST-OPP MARRICKVILLE SHOPPING CENTRE
EE178		Concrete			0.9		0.7	0.45	5.09	Yes	Concrete	2	0.13	SDG - Single Double Grate	0.9	0.45	SA2	Ongrade		SMIDMORE ST-CNR MURRAY ST
EE177		Concrete			1		0.75	0.8	5.02	Yes	Concrete	2.4	0.12	SDG - Single Double Grate	0.9	0.55	SA3	Ongrade		SMIDMORE ST-CNR MURRAY ST
EE179		Concrete			0.9		0.7	0.5	5.00	Yes	Concrete	2	0.14	SDG - Single Double Grate	0.9	0.45	SA2	Ongrade		SMIDMORE ST-CNR MURRAY ST
EE180		Concrete			1.4		0.75	1.75	4.97	Yes	Concrete	2	0.14	SDG - Single Double Grate	0.9	0.55	SA2	Ongrade	750 WATER WET PIT	SMIDMORE ST-CNR MURRAY ST
EE196		Concrete			0.9		0.7	1.05	4.44	Yes	Concrete	2	0.14	SWG - Swing/Pivot Grate	1.02	0.45	SA2	Ongrade		MURRAY ST-CNR EDINBURGH ST KASS SMASH REPAIRS
EE195		Brick			0.85		0.55	0.7	4.23	Yes		1.8	0.08	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade	CRACK ON PIT WALL	MURRAY ST-CNR EDINBURGH ST
EE194		Concrete			1		0.65	0.95	4.06	Yes	Concrete	2	0.13	SDG - Single Double Grate	1.02	0.45	SA2	Sag		MURRAY ST-PAINT & PANEL SHOP
EE193		Brick			1		0.65	1.05	4.10	Yes	Other	1	0.125	SDG - Single Double Grate	1.02	0.45	SA1	Ongrade		MURRAY ST-PAINT & PANEL SHOP
EE191		Brick			0.9		0.8	0.9	4.00	Yes	Concrete	2	0.2	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		MURRAY ST-CANNON SOUND
EE192		Brick			0.7		0.5	0.5	4.27	Yes	Other	0.4	0.25	None			SF1	Ongrade		MURRAY ST-
EE196A									4.46								RM7	Ongrade		
EE196B									4.39								RM7	Ongrade		

LEGEND

Pit "Deleted" according to Pit data sheet

Added into database

On original Map but not on the most current layer of pits from MC

Missing Data - data has been assumed based on adjacent MH/Pits

Pit Number	Locat	Pit Material	Pit Base Material		Pit Length		Pit Width	Pit Depth	Surface Level	Lintel	Lintel Type	Lintel Length	Lintel Height	Grate Type	Grate Length	Grate Width	Pit Size - DRAINS	Sag/on-grade	Comments	Original Pit Locat
John St and Lord Street																				
EE110		Brick			0.9		0.65	1.5	11.50	Yes	Other	0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	800MM WATER	DARLEY ST-CNR JOHN ST
EE111		Brick			0.9		0.65	1.5	11.66	Yes		0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	WATER 900MM	DARLEY ST-CNR JOHN ST
EE112		Brick			0.9		0.75	0.5	11.85	Yes	Concrete	1.9	0.08	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		JOHN ST-
EE113		Brick			1		0.9	1.5	11.40	No	None			None			SF1	Ongrade		DARLEY ST-CNR JOHN ST
EE87		Concrete			0.5		0.5	0.5	8.70	No	None			None			SF1	Ongrade		JOHN ST-CNR LORD ST
EE86		Concrete			0.9		0.55	0.9	8.81	Yes	Other	0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	WET PIT - 300MM	JOHN ST-CNR LORD ST
EE88		Concrete			0.9		0.5	0.75	8.67	No	None			None			SF1	Ongrade		LORD ST-CNR JOHN ST
EE89		Concrete			0.9		0.65	1.25	8.86	***Yes***	Concrete	0.9	0.12	***SDG - Single Double Grate***	0.98	0.58	SA2	Ongrade	WET PIT - 750MM WATER	JOHN ST-
EE85		Concrete			0.55		0.9	0.75	8.73	Yes	Other	0.9	0.11	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	WET PIT	LORD ST-CNR JOHN ST
EE204		Concrete			0.9		0.5	0.6	12.00	Yes	Other	0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		LORD ST-
EE205		Concrete			0.9		0.5	0.75	11.81	Yes	Other	0.9	0.1	SDG - Single Double Grate			SA1	Ongrade		LORD ST-OPP BOUNDARY
EE202		Concrete			0.9		0.7	0.7	10.35	Yes	Other	0.9	0.07	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	WET PIT 200MM WATER	LORD ST-
EE203		Concrete			0.9		0.5	1.1	10.29	Yes		0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	300MM WATER WET PIT	LORD ST-
EE84		Concrete			0.9		0.55	0.75	8.69	Yes	Other	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		LORD ST-CNR JOHN ST
EE90		Concrete			0.9		0.55	0.75	8.52	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade		LORD ST-CNR JOHN ST
EE91		Concrete			0.5		0.5	0.7	8.56	No	None			None			SF1	Ongrade		LORD ST-CNR JOHN ST
EE92					0.9		0.6	0.9	8.59	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade		JOHN ST-CNR LORD ST
EE227		Brick			0.9		0.65	0.7	8.80	Yes	Concrete	0.9	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		JOHN ST-CNR LORD ST
ES56		Concrete			1.8		0.7	1.25	8.58	Yes	Concrete	1.8	0.135	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		GOODHSELL ST-END
ES57		Concrete			0.5		0.5	1.5	8.64	No	None			SWG - Swing/Pivot Grate	0.5	0.5	RM7	Ongrade		GOODSHELL ST-END (RAILWAY PROPERTY)
ES83		Brick			0.9		0.6	0.82	16.60	Yes	Concrete	1.4	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		
ES84		Brick			1		1	1.55	16.31	No	None			None			SF1	Ongrade	CNR OF NO 645-657- SH	
ES85		Brick			1		0.1	1.1	15.24	No	None			None			SF1	Ongrade		
ES86		Brick			0.6		0.6	0.6	14.90	No	None			Concrete Cover			SF1	Ongrade	ON GOODSELL ST, CLOSE TO CNR OF NO 645-657- SH	
ES83A		Concrete			0.93		0.79	0.92	17.50	Yes	Concrete	0.8	0.1	SDG - Single Double Grate	0.93	0.79	SA1	Ongrade		
ES83C		Concrete			0.50		0.50	0.97	16.83	Yes	Concrete	0.5	0.1	SDG - Single Double Grate	0.5	0.5	SA1	Ongrade		
ES83D		Concrete			0.93		0.79	0.92	16.85	Yes	Concrete	0.8	0.1	SDG - Single Double Grate	0.93	0.79	SA1	Ongrade		
Edgeware Rd																				
EE116		Brick			0.9		0.65	1.3	9.53	Yes	Other	0.9	0.04	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	500MM WATER	WELLS ST-CNR EDGEWARE RD
EE115		Brick			0.9		0.65	1.3	9.53	Yes	Other	0.8	0.5	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		WELLS ST-CNR EDGEWARE RD
EE114		Brick			0.5		0.4	0.8	8.45	No	None			None			SF1	Ongrade	IN FRONT OF 310 EDGEWARE RD-SH	EDGEWARE RD-
EE109		Brick			0.9		0.65	1.3	7.57	Yes	Other	0.9	0.11	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	900 WATER	EDGEWARE RD-CNR DARLEY ST
EE103		Brick			0.9		0.7	1.4	9.88	Yes	Other	0.8	0.07	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		DARLEY ST-
EE104		Brick			0.9		0.7	1.4	13.15	Yes	Concrete	0.8	0.07	Other	0.98	0.58	SA1	Ongrade		DARLEY ST-
EE105		Brick			0.6		0.6	0.9	9.87	No	None			None			SF1	Ongrade		DARLEY ST-
EE108		Concrete			0.6		0.6	0.8	7.35	No	None			None			SF1	Ongrade		EDGEWARE RD-CNR DARLEY ST
EE107		Brick			0.9		0.65	1.6	7.56	Yes	Other	0.8	0.06	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		DARLEY ST-CNR EDGEWARE RD
EE106		Brick			0.9		0.7	1.45	7.53	Yes	Other	0.8	0.05	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		DARLEY ST-CNR EDGEWARE RD
EE102		Concrete			0.9		0.55	0.6	5.74	Yes	Other	0.9	0.11	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		EDGEWARE RD-EHDEN COURT CNR LORD ST
EE101		Concrete			0.6		0.6	1.05	5.74	No	None			None			SF1	Ongrade		EDGEWARE RD-EHDEN COURT CNR LORD ST
EE100		Concrete			0.9		0.65	0.7	5.48	Yes	Other	0.8	0.07	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		LORD ST-CNR EDGEWARE RD
EE97		Brick			0.9		0.6	0.4	5.55	Yes	Other	0.9	0.12	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		LORD ST-CNR EDGEWARE RD
EE93		Concrete			0.9		0.5	0.7	7.22	Yes	Other	0.9	0.06	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		LORD ST-
EE94		Concrete			0.9		0.5	0.9	7.06	Yes	Other	0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		LORD ST-
EE95		Concrete			0.9		0.45	0.45	6.44	Yes	Other	0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		LORD ST-
EE96		Brick			0.9		0.5	0.9	6.19	Yes	Other	0.9	0.1	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		LORD ST-
EE98		Concrete			0.9		0.6	0.5	5.47	Yes	Other	0.9	0.12	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		LORD ST-CNR EDGEWARE RD
EE99		Brick			1		0.6	0.85	5.43	No	None			None			SF1	Ongrade		LORD ST-CNR EDGEWARE RD
EE99A		Concrete			1		1.85	1.1	5.48	No	None			None			SF1	Ongrade		Edgeware Rd
EE225		Concrete			0.3		0.3	0.5	5.39	No	None			SSG - Single Single Grate	0.35	0.35	RM7	Sag		EDGEWARE RD-END
EE226		Concrete			1		0.9	0.85	5.21	Yes		2	0.25	SDG - Single Double Grate	1.02	0.51	SA2	Ongrade		EDGEWARE RD-CURVE (UNDER THE BRIDGE)
EE201					0.9		0.5	1.2	5.73	No	None			SDG - Single Double Grate	0.925	0.51	RM7	Ongrade		RAILWAY-(UNDER THE RAILWAY BRIDGE)
ES75		Brick			0.5		0.45	2.2	5.80	Yes	Concrete	2	0.11	SDG - Single Double Grate	0.98	0.58	SA2	Sag	NOT FUNCTIONING PROPERLY, CNR EDGEWARE RD	MAY ST-CNR EDGEWARE RD
ES72A									5.86	Yes	Concrete			None			SA1	Ongrade		
ES72		Brick			0.55		0.55	0.85	6.10	No	None			None			SF1	Ongrade	cnr may st	EDGEWARE RD-CNR MAY ST
ES71		Brick			0.9		0.6	1.1	6.49	Yes	Concrete	1.8	0.12	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade	corner of May st	EDGEWARE RD-CNR MAY ST
ES73		Brick			0.6		0.6	1.75	6.74	No	None			None			SF1	Ongrade	cnr may st	EDGEWARE RD-CNR MAY ST
ES74		Brick			0.6		0.6	1.4	6.42	No	None			None			SF1	Ongrade	cnr may st	EDGEWARE RD-INTER MAY ST
ES77		Concrete			0.6		0.6	0.8	6.46	No	None			None			SF1	Ongrade	cnr cambell st	UNWINS BRIDGE RD-CNR CAMPBELL ST
ES79		Brick			0.9		0.5	0.75	6.64	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade	cnr bedwinrd	UNWINS BRIDGE RD-CNR BEDWIN RD
ES78		Brick			0.6		0.6	0.8	6.63	No	None			None			SF1	Ongrade	cnr edgeware rd	UNWINS BRIDGE RD-CNR EDGEWARE RD
ES76A									5.76	Yes	Concrete			None			SA1	Sag		
ES76		Brick			0.7		0.7	1	6.05	No	None			None			SF1	Ongrade	cnr cambell st	UNWINS BRIDGE RD-CNR CAMPBELL ST
ES95		Brick			0.6		0.6	1.3	6.12	No	None			None			SF1	Ongrade	cnr campbell st	UNWINS BRIDGE RD-CNR CAMPBELL ST
ES80		Brick			0.9		0.8	0.4	6.55	Yes	Concrete	2.2	0.115	SDG - Single Double Grate	0.98	0.5	SA2	Ongrade	opp 16 unwins rd	UNWINS BRIDGE RD-OPP
ES110									5.90	Yes	Concrete			None			SA1	Ongrade		
ES111									5.90	Yes	Concrete			None			SA1	Ongrade		

LEGEND

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Added into database

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Missing Data - data has been assumed based on adjacent MH/Pits

Pit Number	Locat	Pit Material	Pit Base Material		Pit Length		Pit Width	Pit Depth	Surface Level	Lintel	Lintel Type	Lintel Length	Lintel Height	Grate Type	Grate Length	Grate Width	Pit Size - DRAINS	Sag/on-grade	Comments	Original Pit Locat
Camden Street - Pipe Network 2																				
EE1		Concrete			0.9		0.7	1.2	24.84	Yes	Concrete	2.6	0.14	SWG - Swing/Pivot Grate	0.87	0.45	SA3	Ongrade		CAMDEN ST-CNR STATION ST
EE2		Concrete			0.9		0.65	1	24.77	Yes	Concrete	2.6	0.13	SWG - Swing/Pivot Grate	0.87	0.45	SA3	Ongrade		STATION ST-CNR CAMDEN ST
EE3		Concrete			0.7		0.7	1.25	24.52	No	None			None			SF1	Ongrade		CAMDEN ST-CNR STATION ST
EE4		Concrete			0.9		0.7	0.8	24.32	Yes	Concrete	2.5	0.14	SWG - Swing/Pivot Grate	0.87	0.45	SA3	Ongrade		STATION ST-CNR CAMDEN ST
EE5		Concrete			0.7		0.7	1.35	24.17	No	None			None			SF1	Ongrade		CAMDEN ST-CNR STATION ST
EE6		Concrete			0.9		0.75	1.35	22.43	Yes	Concrete	1	0.125	SWG - Swing/Pivot Grate	0.87	0.45	SA1	Ongrade		CAMDEN ST-CNR COLLEGE ST REAR SIDE STATION ST
EE7		Concrete			0.9		0.9	0.85	22.48	Yes	Concrete	2.6	0.13	SWG - Swing/Pivot Grate	0.87	0.45	SA3	Ongrade		COLLEGE ST-CNR CAMDEN ST REAR SIDE STATION ST
EE8		Concrete			0.6		0.6	1.65	22.31	No	None			None			SF1	Ongrade		CAMDEN ST-CNR COLLEGE ST
EE9		Concrete			0.9		0.6	0.85	22.00	Yes	Concrete	2.6	0.08	SWG - Swing/Pivot Grate	0.87	0.45	SA3	Ongrade		COLLEGE ST-CNR GRAEME COOPER CAMDEN ST
EE10		Concrete			0.6		0.6	2.1	21.90	No	None			None			SF1	Ongrade		CAMDEN ST-GRAEME COOPER CNR COLLEGE ST
EE12		Brick			0.9		0.5	1.4	20.76	Yes	Concrete	1.8	0.1	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		CAMDEN ST-
EE11		Brick			0.9		0.5	2.2	20.53	Yes	Concrete	2	0.12	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		CAMDEN ST-OPP GRAEME COOPER
EE13		Brick			0.9		0.7	2.2	20.42	Yes	Concrete	1.8	0.1	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade	IN CAMDEN ST CLOSE TO CNR OF 43 COLLEGE ST- SH	BOUNDARY-CAMPDEN ST
EE14		Brick			0.9		0.7	1.2	19.75	Yes	Concrete	1.8	0.12	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		CAMDEN ST-
EE15		Brick			0.9		0.65	1.55	15.42	Yes	Concrete	1.8	0.1	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		CAMDEN ST-CNR KENT LNE
EE16		Brick			0.9		0.8	1.5	14.90	Yes	Concrete	1.8	0.12	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		CAMDEN ST-CNR KENT LANE
EE17		Brick			0.9		0.75	1.45	13.85	Yes	Concrete	2	0.11	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		CAMDEN ST-CNR FERNDALE LNE FERNDALE ST
EE18		Brick			0.9		0.7	1.2	13.06	Yes	Concrete	2	0.11	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		CAMDEN ST-CNR FERNDALE ST
EE19		Concrete			0.8		0.8	1.65	12.79	No	None			None			SF1	Ongrade		CAMDEN ST-CNR FERNDALE ST
EE20		Brick			0.9		0.7	1.25	12.79	Yes	Concrete	2	0.14	SWG - Swing/Pivot Grate	0.87	0.45	SA2	Ongrade		CAMDEN ST-CNR FERNDALE ST
EE119		Brick			1		0.65	1.3	12.77	Yes	Other	0.9	0.075	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	WET PIT 500MM WATER	CLARA ST-
EE120		Brick			0.9		0.7	1.05	12.70	Yes	Concrete	1.9	0.09	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		CLARA ST-
EE117		Brick			0.9		0.75	1.25	12.22	Yes	Concrete	2	0.075	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		CLARA ST-CNR CAMDEN ST
EE118		Brick			0.9		0.75	1.5	12.02	Yes	Concrete	2	0.08	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		CAMDEN ST-CNR CLARA ST
EE216		Concrete			1.1		1.1	4.8	11.19	No	None			None			SF1	Ongrade		EDGEWARE RD-CNR CAMDEN ST
EE215		Brick			1		0.7	1.1	11.12	Yes	Concrete	1.1	0.15	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		EDGEWARE RD-CNR CAMDEN ST
EE128D		Concrete			0.89		0.5	0.6	10.51	Yes	Concrete	2	0.08	SDG - Single Double Grate	0.89	0.5	SA2	Sag		
EE128E		Concrete			0.89		0.5	0.6	10.44	No	None			SDG - Single Double Grate	0.89	0.5	RM7	Sag		
EE121		Brick			0.9		0.5	0.9	12.66	No				SDG - Single Double Grate	0.98	0.58	RM7	Ongrade	SILTED	CLARA ST-ON FOOTPATH
EE121A	Other	Concrete			0.5		0.5	0.7	11.85	No				SSG - Single Single Grate	0.45	0.45	RM7	Ongrade		
EE121B		Concrete			0.9		0.9	1.5	12.31	No				None			SF1	Ongrade	behind house no. 123	
EE121C		Concrete			0.9		0.9	1.35	12.34	No				SDG - Single Double Grate	0.9	0.9	RM7	Ongrade		
EE121D		Concrete			0.6		0.6	1.1	11.92	No				None			SF1	Ongrade		
EE121E		Concrete			0.6		0.6	0.82	11.65	No				None			SF1	Ongrade		
EE121F		Concrete			0.9		0.9	1.36	10.63	No				SDG - Single Double Grate	0.65	0.65	RM7	Ongrade		
EE121G		Concrete			1.2		1.2	1.47	10.37	No				SDG - Single Double Grate	0.65	0.65	RM7	Ongrade		
EE121H		Concrete			1.7		1.4	1.53	10.21	No				SDG - Single Double Grate	0.6	0.6	RM7	Ongrade	THE ORIGINAL OF PIT EE121H WAS EE218B.- SH	
EE121I		Concrete			3.7		1.3	1.53	10.1	No				None			SF1	Ongrade		
Victoria Road																				
EE200		Concrete			0.9		1.1	0.9	8.51	Yes	Concrete	2	0.16	SDG - Single Double Grate	1.1	0.6	SA2	Ongrade		EDGEWARE RD-CNR LLEWELLYN ST THE GOLDEN BAILEY H
EE161A*									8.74					None			RM7	Ongrade		
EE161B*									8.60					None			RM7	Ongrade		
EE162		Brick			0.9		0.85	0.7	8.04	Yes	Concrete	1.8	0.15	SDG - Single Double Grate	0.98	0.51	SA2	Sag		LLEWELLYN ST-EDGEWARE RD
EE161		Concrete			0.9		0.8	0.7	8.01	Yes	Concrete	2.1	0.14	SDG - Single Double Grate	0.98	0.51	SA2	Sag		LLEWELLYN ST-CNR EDGEWARE RD
EE168	Rear o	Concrete			0.9		0.9	0.9	8.09	Yes	Concrete	1.2	0.175	SDG - Single Double Grate	0.98	0.51	SA1	Ongrade		LNE-NEXT TO JULLIET ST
EE163		Brick			0.8		0.6	0.6	13.72	Yes	Concrete	2	0.11	SWG - Swing/Pivot Grate	0.87	0.45	SA2	Ongrade		VICTORIA RD-PARK CNR BLACK ST
EE164		Concrete			0.9		0.7	1.4	13.36	Yes		3	0.11	SDG - Single Double Grate	0.9	0.45	SA3	Ongrade		BLACK ST-CNR VICTORIA RD
EE165		Concrete			0.9		0.7	1.2	13.00	Yes	Concrete	1.8	0.115	SDG - Single Double Grate	0.9	0.45	SA2	Ongrade		VICTORIA RD-CNR BLACK ST
EE232		Concrete			0.9		0.4	0.3	10.10	Yes		2	0.1	SSG - Single Single Grate	0.98	0.45	SA2	Ongrade		VICTORIA RD-
EE233		Concrete			0.8		0.7	2.15	10.05	No	None			None			SF1	Ongrade		VICTORIA RD-
EE166		Concrete			0.9		0.6	1.8	10.56	Yes	Concrete	1.8	0.11	SDG - Single Double Grate	0.9	0.45	SA2	Ongrade	IN FRONT OF NO 89 (LEAVES INSIDE THE PIT)	JULIET ST-
EE167		Concrete			0.9		0.7	2	9.40	Yes	Concrete	1.8	0.125	SDG - Single Double Grate	0.9	0.55	SA2	Ongrade	CNR VICTORIA RD AND JULIETT ST- SH	JULLIET ST-DEAD END
EE234		Concrete			0.8		0.8	2.3	9.24	Yes		1	0.1	SWG - Swing/Pivot Grate	1	1	SA2	Ongrade		VICTORIA RD-LETTER BOX
EE169		Concrete			0.9		0.75	1.6	8.09	Yes	Concrete	1.8	0.12	SSG - Single Single Grate	0.98	0.45	SA2	Ongrade		VICTORIA RD-
EE170		Concrete			0.9		0.8	0.9	7.12	Yes	Concrete	2.4	0.12	SDG - Single Double Grate	0.9	0.45	SA3	Ongrade		VICTORIA RD-
EE171		Concrete			1.6		0.6	1.7	7.07	No	None			SDG - Single Double Grate	0.9	0.45	RM7	Ongrade	WET PIT 700 WATER DEBRIS TO BE REMOVED	VICTORIA RD-CANAL BOUNDARY
EE173		Concrete			0.9		0.8	0.8	7.05	Yes	Concrete	2.4	0.11	SDG - Single Double Grate	0.9	0.45	SA3	Ongrade		VICTORIA RD-
EE172		Concrete			0.1		0.8	1.7	7.01	No	None			SDG - Single Double Grate	0.9	0.45	RM7	Ongrade	WET PIT 700MM WATER	VICTORIA RD-CANAL BOUNDARY
EE176		Concrete			0.9		0.8	1.55	7.00	Yes	Concrete	2.4	0.11	SDG - Single Double Grate	0.9	0.45	SA3	Ongrade		VICTORIA RD OPPOSITE NO 37
EE174		Concrete			0.9		0.7	0.8	6.96	Yes	Concrete	2.5	0.09	SDG - Single Double Grate	0.9	0.45	SA3	Sag		VICTORIA RD-OPP
EE175		Concrete			0.9		0.8	1.55	6.96	No	None			SDG - Single Double Grate	0.9	0.45	RM7	Sag		VICTORIA RD-OPP CHANNEL
EE182		Concrete			0.9		0.8	1.55	5.10	Yes		1.8	0.1	SDG - Single Double Grate	0.9	0.42	SA2	Ongrade	GARBAGE IN THE PIT	MURRAY ST-CNR SMIDMORE ST
EE181		Concrete			0.9		0.75	0.7	5.00	Yes		1.8	0.14	SDG - Single Double Grate	0.9	0.42	SA2	Ongrade		SMIDMORE ST-CNR MURRAY ST
EE187		Brick			0.9		0.75	0.65	4.52	Yes	Concrete	1.8	0.08	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		EDINBURGH ST-OPP MARRICKVILLE BUSINESS PARK
EE188		Brick			0.6		0.6	0.8	4.63	Yes		1.8	0.08	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		EDINBURGH ST-OPP MARRICKVILLE BUSINESS PARK
EE189		Brick			0.85		0.45	0.45	4.51	No	None			SWG - Swing/Pivot Grate	0.85	0.45	RM7	Ongrade	SILTED TO BE CLEANED	EDINBURGH ST-THE AUSTRALIAN SALES MARKET
EE190		Brick			1		0.6	0.7	4.53	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade		EDINBURGH ST-THE AUSTRALIAN SALES MARKET
EE198		Brick			0.9		0.65	0.6	4.75	Yes	Concrete	2	0.19	SDG - Single Double Grate	0.98	0.58	SA2	Ongrade		EDINBURGH ST-
EE197		Concrete			0.9		0.65	1	4.61	Yes	Other	1	0.12	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade		EDINBURGH ST-

LEGEND

Pit "Deleted" according to Pit data sheet

Added into database

On original Map but not on the most current layer of pits from MC

Missing Data - data has been assumed based on adjacent MH/Pits

Pit Number	t Locati	Pit Material	Pit Base Material		Pit Length		Pit Width	Pit Depth	Surface Level	Lintel	Lintel Type	Lintel Length	Lintel Height	Grate Type	Grate Length	Grate Width	Pit Size - DRAINS	Sag/on-grade	Comments	Original Pit Locat
Sarah Street																				
EE133	Rear o	Concrete			0.7		0.7	0.8	18.52	No	None			None			SF1	Ongrade		ARA LANE-REAR SIDE
EE134	Rear o	Concrete			0.7		0.7	0.85	17.88	No	None			None			SF1	Ongrade		ARA LANE-JP
EE135		Brick			0.8		0.7	0.45	17.61	Yes	Concrete	1.8	0.15	SWG - Swing/Pivot Grate	0.85	0.45	SA2	Ongrade	IN SARAH ST BACK CNR OF 100 METROPOLITAN RD- SH	ARA LANE-CNR SARAH ST
EE136		Brick			0.9		0.4	0.45	17.60	No	None			SDG - Single Double Grate	0.9	0.45	RM7	Ongrade		SARAH ST-SIDE OF METROPOLITAN
EE137		Brick			0.9		0.8	0.4	17.53	Yes	Concrete	1.8	0.16	SWG - Swing/Pivot Grate	0.85	0.45	SA2	Ongrade		METROPOLITAN RD-CNR SARAH RD
EE138		Brick			0.9		0.7	1	17.55	Yes	Other	0.8	0.08	SDG - Single Double Grate	0.98	0.58	SA1	Ongrade	INFRONT OF 101 METROPOLITAN RD	METROLITAN RD-CNR SARAH ST
EE222		Concrete			0.9		0.9	0.6	17.32	No	None			None			SF1	Ongrade		SARAH ST-CNR METROPOLITAN
EE223		Concrete			1.5		0.9	0.8	17.10	No	None			None			SF1	Ongrade		SARAH ST-CNR METROPOLITAN RD
EE224		Concrete			0.9		0.9	0.8	16.70	No	None			None			SF1	Ongrade		SARAH ST-OPP SIDE EDGEWARE RD
EE244		Brick			0.9		0.6	0.73	18.42	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade		LYNCH AVE-CNR EDGEWARE RD
EE243		Concrete			0.9		0.6	0.84	18.38	No	None			SDG - Single Double Grate	0.98	0.58	RM7	Ongrade		EDGEWARE RD-CNR LYNCH AVE
EE245		Brick			0.66		0.55	1.53	18.35	No	None			None			SF1	Ongrade		EDGEWARE RD-CNR LYNCH AVE
EE224A									16.61					None			RM7	Ongrade		
EE224B									16.52					None			RM7	Ongrade		
EE245A									16.90					None			RM7	Ongrade		
EE131		Brick			0.9		0.7	0.4	16.83	Yes	Concrete	1.8	0.15	SWG - Swing/Pivot Grate	0.85	0.45	SA2	Ongrade		SARAH ST-CNR SIMMONS ST
EE132		Brick			0.8		0.7	0.3	16.61	Yes	Concrete	2	0.4	SWG - Swing/Pivot Grate	0.85	0.45	SA2	Ongrade		SARAH ST-OPP CNR SIMMONS ST
Reiby Street																				
EE230		Concrete			2		0.45	0.65	30.88	No	None			***SDG - Single Double Grate***	0.98	0.51	RM7	Ongrade		ENMORE RD-
EE231		Concrete			1.1		0.8	1.3	29.85	No	None			None			SF1	Ongrade		ENMORE RD-CNR REIBY ST

LEGEND

Pit "Deleted" according to Pit data sheet

Added into database

On original Map but not on the most current layer of pits from MC

Missing Data - data has been assumed based on adjacent MH/Pits

Asset Number	Pipe Number	Upstream Asset No	Upstream Node	wnstream Ass	nstream N	Upstream Node Type	Upstrm Invert Lvl	Downstrm Node Type	Downstr Invert Lvl	Pipe Type		Pipe Diameter	Pipe Length
Camden Street - Pipe Network 1													
DPI115	ee.139.140	DRP2151	EE139	DRP2152	EE140	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	25.640	DGGP - Double Graded Gully Pit	25.220	BR - Brick	0.375	375	20.25
DPI1194	ee.140.141	DRP2152	EE140	DRP2228	EE141	DGGP - Double Graded Gully Pit	25.220	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	24.860	RCP - Reinforced Concrete Pipe	0.375	375	1.95
DPI1195	ee.141p.143	DRP2228	EE141	DRP2153	EE143	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	24.170	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	23.080	RCP - Reinforced Concrete Pipe	0.3	525	33
DPI116	ee.141.141p	DRP2228	EE141		EE141A	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	24.860		24.170	RCP - Reinforced Concrete Pipe	0.525	525	54.1
BREAKDOWN	ee.141p.143		EE141A	DRP2153	EE143		24.170		23.080	RCP - Reinforced Concrete Pipe	0.3	300	33
DPI1196	ee.142.141	DRP2229	EE142	DRP2228	EE141	DGGP - Double Graded Gully Pit	28.470	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	25.710	RCP - Reinforced Concrete Pipe	0.3	375	39.58
DPI117	ee.143.144	DRP2153	EE143	DRP1697	EE144	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	22.680	DGGP - Double Graded Gully Pit	22.590	RCP - Reinforced Concrete Pipe	0.45	450	9.65
DPI2447	ee.144.145	DRP1697	EE144	DRP2138	EE145	DGGP - Double Graded Gully Pit	22.290	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.930	RCP - Reinforced Concrete Pipe	0.45	450	15.63
DPI118	ee.145.146	DRP2138	EE145	DRP844	EE146	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.930	JPS - Junction Pit Sealed	21.460	VC - Clay	0.45	450	11.79
DPI120	ee.147.146.1	DRP1670	EE147	DRP844	EE146	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.610	JPS - Junction Pit Sealed	21.510	VC - Clay	0.225	225	2.14
DPI121	ee.147.146.2	DRP1670	EE147	DRP844	EE146	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.910	JPS - Junction Pit Sealed	21.910	RCP - Reinforced Concrete Pipe	0.225	225	2.14
MISSING	ee.146.155	DRP844	EE146	DRP847	EE155	JPS - Junction Pit Sealed	21.460		16.850	VC - Clay	0.6	600	86.43
DPI2600	ee.149.148	DRP2140	EE149	DRP2139	EE148	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	23.390	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	23.240	VC - Clay	0.3	300	4.97
DPI122	ee.148.150	DRP2139	EE148	DRP2141	EE150	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	22.690	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	22.460	VC - Clay	0.3	300	9.78
DPI1197	ee.150.151	DRP2141	EE150	DRP2142	EE151	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	22.460	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.860	VC - Clay	0.3	300	61.43
DPI2316	ee.151.153	DRP2142	EE151	DRP846	EE153	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.760	JPS - Junction Pit Sealed	18.400	VC - Clay	0.375	375	3.48
DPI1198	ee.152.153	DRP845	EE152	DRP846	EE153	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.640	JPS - Junction Pit Sealed	18.400	VC - Clay	0.3	300	7.02
DPI2705	ee.153.154	DRP846	EE153	DRP1671	EE154	JPS - Junction Pit Sealed	18.400	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.250	RCP - Reinforced Concrete Pipe	0.45	450	28.01
DPI124	ee.154.155	DRP1671	EE154	DRP847	EE155	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.250	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.850	BR - Brick	0.9	900	5.53
DPI1199	ee.155.156	DRP847	EE155	DRP617	EE156	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.850	JPS - Junction Pit Sealed	15.110	BR - Brick	0.9	900	74.21
DPI1200	ee.157.156	DRP1672	EE157	DRP617	EE156	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.080	JPS - Junction Pit Sealed	16.010	VC - Clay	0.3	300	1.72
DPI1201	ee.158.156	DRP1673	EE158	DRP617	EE156	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.030	JPS - Junction Pit Sealed	16.010	VC - Clay	0.3	300	1.51
DPI126	ee.159.159p	DRP1674	EE159	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.060	BP - Buried Pit	15.030	VC - Clay	0.3	300	1.53
DPI127	ee.160.160p	DRP1675	EE160	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.160	BP - Buried Pit	15.030	VC - Clay	0.3	300	3.62
BREAKDOWN	ee.156.159p	DRP617	EE156		N-EE159		15.110		15.030	BR - Brick	0.9	900	5.32
BREAKDOWN	ee.159p.28	N-EE159		DRP2415	EE28		15.030		14.350	BR - Brick	0.9144	900	36.68
MISSING	ee.27.27p	DRP1751	EE27		N-EE27		14.710		14.340	VC - Clay	0.2286	300	1
DPI1241	ee.28.27p	DRP2415	EE28	DRP1751	EE27	DGGP - Double Graded Gully Pit	14.490	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	13.882	BR - Brick	0.6096	600	13.35
DPI154	ee.27p.21	DRP1751	EE27	DRP868	EE21	DGGP - Double Graded Gully Pit	13.88	JPS - Junction Pit Sealed	11.427	BR - Brick	0.6096	600	159.7
DPI1250	ee.46.49	DRP1753	EE46	DRP619	EE49	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	27.460	JPS - Junction Pit Sealed	27.270	RCP - Reinforced Concrete Pipe	0.225	225	1.63
DPI163	ee.47.49	DRP1754	EE47	DRP619	EE49	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	27.380	JPS - Junction Pit Sealed	27.270	BR - Brick	0.225	225	1.58
DPI1252	ee.49.229	DRP619	EE49	DRP360	EE229	JPS - Junction Pit Sealed	27.270	JPS - Junction Pit Sealed	26.890	RCP - Reinforced Concrete Pipe	0.3	300	10.35
DPI1251	ee.48.229	DRP2295	EE48	DRP360	EE229	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	27.190	JPS - Junction Pit Sealed	26.890	PVC - Plastic	0.3	300	10.32
DPI150	ee.229.45	DRP360	EE229	DRP1752	EE45	JPS - Junction Pit Sealed	26.890	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	26.740	RCP - Reinforced Concrete Pipe	0.3	300	4.94
DPI162	ee.45.228	DRP1752	EE45	DRP2217	EE228	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	26.640	DGGP - Double Graded Gully Pit	26.530	RCP - Reinforced Concrete Pipe	0.225	225	1.45
DPI1231	ee.228.44	DRP2217	EE228	DRP880	EE44	DGGP - Double Graded Gully Pit	26.530	JPS - Junction Pit Sealed	24.240	VC - Clay	0.225	225	37.26
DPI1249	ee.44.43	DRP880	EE44	DRP2632	EE43	JPS - Junction Pit Sealed	24.340	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	24.320	RCP - Reinforced Concrete Pipe	0.45	450	4.8
DPI1248	ee.43.42	DRP2632	EE43	DRP879	EE42	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	24.020	JPS - Junction Pit Sealed	23.950	RCP - Reinforced Concrete Pipe	0.45	450	27.39
DPI161	ee.42.41	DRP879	EE42	DRP878	EE41	JPS - Junction Pit Sealed	24.000	JPS - Junction Pit Sealed	23.470	RCP - Reinforced Concrete Pipe	0.45	450	2.58
DPI2710	ee.41.40	DRP878	EE41	DRP621	EE40	JPS - Junction Pit Sealed	23.420	JPS - Junction Pit Sealed	21.010	RCP - Reinforced Concrete Pipe	0.45	450	39.8
DPI1246	ee.39.40	DRP2631	EE39	DRP621	EE40	DGGP - Double Graded Gully Pit	21.310	JPS - Junction Pit Sealed	21.310	RCP - Reinforced Concrete Pipe	0.375	375	1.17
DPI1247	ee.40.37	DRP621	EE40	DRP877	EE37	JPS - Junction Pit Sealed	21.010	JPS - Junction Pit Sealed	18.040	RCP - Reinforced Concrete Pipe	0.45	450	38.2
DPI159	ee.38.37	DRP2630	EE38	DRP877	EE37	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	19.000	JPS - Junction Pit Sealed	18.540	RCP - Reinforced Concrete Pipe	0.375	375	3.25
DPI1245	ee.37.32	DRP877	EE37	DRP873	EE32	JPS - Junction Pit Sealed	18.040	JPS - Junction Pit Sealed	17.800	RCP - Reinforced Concrete Pipe	0.45	450	3.77
DPI158	ee.36.32	DRP2629	EE36	DRP873	EE32	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.650	JPS - Junction Pit Sealed	17.350	RCP - Reinforced Concrete Pipe	0.375	375	2.15
DPI1244	ee.35.33	DRP2628	EE35	DRP620	EE33	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.070	JPS - Junction Pit Sealed	17.910	RCP - Reinforced Concrete Pipe	0.375	375	23.77
DPI1243	ee.34.33	DRP533	EE34	DRP620	EE33	SGGP - Single Graded Gully Pit	18.010	JPS - Junction Pit Sealed	17.910	RCP - Reinforced Concrete Pipe	0.3	300	2.44
DPI157	ee.33.31	DRP620	EE33	DRP872	EE31	JPS - Junction Pit Sealed	17.410	JPS - Junction Pit Sealed	17.320	RCP - Reinforced Concrete Pipe	0.45	450	2.81
DPI1242	ee.32.31	DRP873	EE32	DRP872	EE31	JPS - Junction Pit Sealed	17.200	JPS - Junction Pit Sealed	16.820	RCP - Reinforced Concrete Pipe	0.525	525	8.31
DPI2388	ee.31.29	DRP872	EE31	DRP871	EE29	JPS - Junction Pit Sealed	16.820	JPS - Junction Pit Sealed	16.600	RCP - Reinforced Concrete Pipe	0.525	525	12.98
DPI156	ee.30.29	DRP2627	EE30	DRP871	EE29	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.280	JPS - Junction Pit Sealed	17.100	RCP - Reinforced Concrete Pipe	0.375	375	0.44
DPI155	ee.29.24	DRP871	EE29	DRP870	EE24	JPS - Junction Pit Sealed	16.600	JPS - Junction Pit Sealed	14.510	RCP - Reinforced Concrete Pipe	0.525	525	64.19
DPI1235	ee.24.p	DRP870	EE24	DRP666	EEP	JPS - Junction Pit Sealed	14.510	BP - Buried Pit	14.310	VC - Clay	0.3048	300	3.22
DPI2603	ee.25.26	DRP1749	EE25	DRP1750	EE26	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	14.830	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	14.790	BOX - Reinforced Concrete Box Culvert	#VALUE!	225x225	0.57
DPI1239	ee.26.26p	DRP1750	EE26	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	14.490	BP - Buried Pit	14.340	VC - Clay	0.457	300	4.63
											0		
											0		
											0		
											0		

LEGEND

Pipe information changed - please see note in spreadsheet

MISSING/BREAKDOWN - pipe missing or split into two pipes for modelling purposes

Asset Number	Pipe Number	Upstream Asset No	Upstream Node	nstream Ass	nstream N	Upstream Node Type	Upstrm Invert Lvl	Downstrm Node Type	Downstr Invert Lvl	Pipe Type		Pipe Diameter	Pipe Length
BREAKDOWN	ee.28.24p	DRP2415	EE28		N-EE24		13.87		13.709	BR - Brick	0.9144	900	6.53
BREAKDOWN	ee.24p.26p		N-EE24		N-EE26		13.71		13.540	BR - Brick	0.9144	900	7.95
BREAKDOWN	ee.26p.23		N-EE26	DRP869	EE23		13.54		13.380	BR - Brick	0.9144	900	5.24
DPI1232	ee.23.22p	DRP869	EE23	DRP868	EE21	JPS - Junction Pit Sealed	13.38	JPS - Junction Pit Sealed	11.426	BR - Brick	0.9	900	147.8
DPI2404	ee.22.22p	DRP1565	EE22	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.270	BP - Buried Pit	11.630	RCP - Reinforced Concrete Pipe	0.6	600	3.05
MISSING	ee.22p.21		N-EE22	DRP886	EE19		11.43		11.122	RCP - Reinforced Concrete Pipe	0.9	900	15
MISSING	ee.122.123		EE122	DRP852	EE123		10.100		10.000	RCP - Reinforced Concrete Pipe	0.675	675	1.87
DPI2703	ee.123.124	DRP852	EE123	DRP1700	EE124	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	10.000	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.740	RCP - Reinforced Concrete Pipe	0.675	675	6.36
DPI111	ee.124.125	DRP1700	EE124	DRP1701	EE125	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.740	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.450	RCP - Reinforced Concrete Pipe	0.675	675	3.35
DPI2857	ee.125.125p	DRP1701	EE125	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.450	BP - Buried Pit	9.250	RCP - Reinforced Concrete Pipe	0.675	675	9.4
DPI2954	ee.242.127	DRP1558	EE242	DRP2148	EE127	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.720	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.560	RCP - Reinforced Concrete Pipe	0.3	300	87.03
DPI3144	ee.127.128	DRP2148	EE127	DRP849	EE128	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.560	JPS - Junction Pit Sealed	12.410	VC - Clay	0.3	300	7.75
DPI112	ee.126.128	DRP2147	EE126	DRP849	EE128	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.450	JPS - Junction Pit Sealed	12.410	VC - Clay	0.225	225	2.58
DPI1185	ee.128.128A	DRP849	EE128	DRP383	EE128A	JPS - Junction Pit Sealed	12.410	JPS - Junction Pit Sealed	11.630	VC - Clay	0.3	300	38
DPI3145	ee.128A.128B	DRP383	EE128A	DRP376	EE128B	JPS - Junction Pit Sealed	11.630	JPS - Junction Pit Sealed	10.410	VC - Clay	0.3	300	48
DPI3147	ee.128B.128C	DRP376	EE128B	DRP377	EE128C	JPS - Junction Pit Sealed	10.410	JPS - Junction Pit Sealed	9.930	VC - Clay	0.3	300	22
BREAKDOWN	ee.128Cp.217		N-EE128C	DRP355	EE217		7.06		6.339	RCP - Reinforced Concrete Pipe	1.524	1500	118.4
DPI2949	ee.130.129.1	DRP2224	EE130	DRP2223	EE129	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.720	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.950	RCP - Reinforced Concrete Pipe	0.375	375	8.55
DPI2949	ee.130.129.2	DRP2224	EE130	DRP2223	EE129	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.720		12.100	PVC - Plastic	0.375	375	9.26
DPI3143	ee.129.213	DRP2223	EE129	DRP2106	EE213	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.950	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	10.140	RCP - Reinforced Concrete Pipe	0.375	375	89.76
MISSING	ee.213.214		EE213	DRP2107	EE214		10.140		9.920	RCP - Reinforced Concrete Pipe	0.9	900	3.33
DPI146	ee.214.217	DRP2107	EE214	DRP355	EE217	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.920	JPS - Junction Pit Sealed	6.490	RCP - Reinforced Concrete Pipe	0.9	900	6.08
MISSING	eeHAMH06218b		HA-MH06		N-EE218b		5.455		5.400	BOX - Reinforced Concrete Box Culvert	#VALUE!	2240x1300	7.00
											0		
											0		
											0		
											0		

LEGEND

Pipe information changed - please see note in spreadsheet

MISSING/BREAKDOWN - pipe missing or split into two pipes for modelling purposes

Asset Number	Pipe Number	Upstream Asset No	Upstream Node	wnstream Ass	nstream N	Upstream Node Type	Upstrm Invert Lvl	Downstrm Node Type	Downstr Invert Lvl	Pipe Type		Pipe Diameter	Pipe Length
Alice St. Model											0		
DPI3022	ee.50.51	DRP2231	EE50	DRP2623	EE51	DGGP - Double Graded Gully Pit	22.690	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.970	RCP - Reinforced Concrete Pipe	0.375	375	6.35
DPI2448	ee.51.52	DRP2623	EE51	DRP2624	EE52	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.970	DGGP - Double Graded Gully Pit	21.580	RCP - Reinforced Concrete Pipe	0.375	375	7.97
DPI2479	ee.52.53	DRP2624	EE52	DRP2625	EE53	DGGP - Double Graded Gully Pit	21.580	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.490	RCP - Reinforced Concrete Pipe	0.375	375	1.97
DPI1253	ee.53.54	DRP2625	EE53	DRP1742	EE54	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.490	DGGP - Double Graded Gully Pit	20.720	RCP - Reinforced Concrete Pipe	0.375	375	31
DPI2535	ee.54.55	DRP1742	EE54	DRP1743	EE55	DGGP - Double Graded Gully Pit	20.720	DGGP - Double Graded Gully Pit	20.690	VC - Clay	0.225	225	2.82
DPI2604	ee.55.207.1	DRP1743	EE55	DRP615	EE207	DGGP - Double Graded Gully Pit	20.690	JPS - Junction Pit Sealed	20.320	VC - Clay	0.225	225	7.23
DPI2909	ee.55.207.2	DRP1743	EE55	DRP615	EE207	DGGP - Double Graded Gully Pit	20.690	JPS - Junction Pit Sealed	20.320	VC - Clay	0.225	225	5.88
DPI1226	ee.207.206	DRP615	EE207	DRP837	EE206	JPS - Junction Pit Sealed	19.720	JPS - Junction Pit Sealed	17.090	RCP - Reinforced Concrete Pipe	0.225	225	43.43
DPI2957	ee.56.57	DRP1744	EE56	DRP1745	EE57	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.950	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.700	RCP - Reinforced Concrete Pipe	0.3	300	1.65
DPI165	ee.57.206	DRP1745	EE57	DRP837	EE206	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.700	JPS - Junction Pit Sealed	17.440	RCP - Reinforced Concrete Pipe	0.3	300	12.22
DPI2711	ee.58.206	DRP1746	EE58	DRP837	EE206	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.510	JPS - Junction Pit Sealed	17.090	RCP - Reinforced Concrete Pipe	0.225	225	11.83
DPI1254	ee.59.206	DRP1747	EE59	DRP837	EE206	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.950	JPS - Junction Pit Sealed	17.090	BOX - Reinforced Concrete Box Culvert	#VALUE!	300x180	11.6
DPI2317	ee.208.206	DRP2122	EE208	DRP837	EE206	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.320	JPS - Junction Pit Sealed	17.090	RCP - Reinforced Concrete Pipe	0.225	225	7.6
DPI1256	ee.61.61p	DRP1748	EE61	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.100	BP - Buried Pit	16.630	RCP - Reinforced Concrete Pipe	0.225	225	7.69
DPI2708	ee.206.209	DRP837	EE206	DRP838	EE209	JPS - Junction Pit Sealed	16.990	JPS - Junction Pit Sealed	15.480	RCP - Reinforced Concrete Pipe	0.525	525	59.89
BREAKDOWN	ee.61p.209		N-EE61		EE209	BP - Buried Pit	16.63	JPS - Junction Pit Sealed	15.480	RCP - Reinforced Concrete Pipe	0.525	525	15.6
DPI1255	ee.60.62	DRP2626	EE60	DRP1564	EE62	DGGP - Double Graded Gully Pit	17.030	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.720	PVC - Plastic	0.225	225	17.52
DPI2819	ee.60.62	DRP2626	EE60	DRP1564	EE62	DGGP - Double Graded Gully Pit	17.030	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.720	PVC - Plastic	0.225	225	17.52
MISSING	ee.62.63	DRP1564	EE62	DRP1733	EE63	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.720	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.640	BOX - Reinforced Concrete Box Culvert	#VALUE!	300x300	1.62
DPI167	ee.63.209.1	DRP1733	EE63	DRP838	EE209	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.640	JPS - Junction Pit Sealed	16.280	RCP - Reinforced Concrete Pipe	0.225	225	10.84
DPI168	ee.63.209.2	DRP1733	EE63	DRP838	EE209	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.640	JPS - Junction Pit Sealed	16.280	RCP - Reinforced Concrete Pipe	0.225	225	11.57
DPI3141	ee.209.210	DRP838	EE209	DRP839	EE210	JPS - Junction Pit Sealed	15.480	BP - Buried Pit	14.540	RCP - Reinforced Concrete Pipe	0.6	600	34.7
DPI169	ee.64.65	DRP1734	EE64	DRP1735	EE65	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.770	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.670	RCP - Reinforced Concrete Pipe	0.3	300	1.84
DPI170	ee.65.70	DRP1735	EE65	DRP867	EE70	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.670	JPS - Junction Pit Sealed	15.390	RCP - Reinforced Concrete Pipe	0.3	300	3.41
DPI171	ee.66.67	DRP1736	EE66	DRP1737	EE67	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.480	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.330	VC - Clay	0.225	225	1.87
DPI2605	ee.67.210	DRP1737	EE67	DRP839	EE210	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.430	JPS - Junction Pit Sealed	14.840	VC - Clay	0.3	300	8.87
DPI144	ee.211.68	DRP2123	EE211	DRP1738	EE68	DGGP - Double Graded Gully Pit	16.100	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.600	RCP - Reinforced Concrete Pipe	0.45	450	28.25
DPI172	ee.68.69	DRP1738	EE68	DRP1739	EE69	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.600	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.490	RCP - Reinforced Concrete Pipe	0.45	450	1.7
DPI173	ee.69.70	DRP1739	EE69	DRP867	EE70	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.490	JPS - Junction Pit Sealed	15.390	RCP - Reinforced Concrete Pipe	0.3	300	5.98
DPI2536	ee.69.70	DRP1739	EE69	DRP867	EE70	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.490	JPS - Junction Pit Sealed	15.390	RCP - Reinforced Concrete Pipe	0.3	300	5.98
DPI1257	ee.70.210	DRP867	EE70	DRP839	EE210	JPS - Junction Pit Sealed	15.390	JPS - Junction Pit Sealed	14.840	RCP - Reinforced Concrete Pipe	0.45	450	6.82
DPI3148	ee.210.248	DRP839	EE210		EE248	JPS - Junction Pit Sealed	14.540	JPS - Junction Pit Sealed	13.070	RCP - Reinforced Concrete Pipe	0.675	675	74
DPI3154	ee.71.248	DRP1740	EE71		EE248	DGGP - Double Graded Gully Pit	14.897	JPS - Junction Pit Sealed	14.070	RCP - Reinforced Concrete Pipe	0.225	225	18.55
DPI1258	ee.72.73	DRP1741	EE72	DRP1716	EE73	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	14.360	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	14.130	VC - Clay	0.225	225	1.81
DPI175	ee.73.248	DRP1716	EE73		EE248	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	14.080	JPS - Junction Pit Sealed	13.970	RCP - Reinforced Concrete Pipe	0.3	300	3.72
DPI1259	ee.74.74p	DRP1717	EE74	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.050	BP - Buried Pit	11.740	RCP - Reinforced Concrete Pipe	0.225	225	6.56
DPI3149	ee248.249		EE248		EE249	JPS - Junction Pit Sealed	13.070	JPS - Junction Pit Sealed	12.050	RCP - Reinforced Concrete Pipe	0.75	750	54.7
BREAKDOWN	ee.249.74p		EE249		N-EE74	JPS - Junction Pit Sealed	12.050	BP - Buried Pit	11.740	RCP - Reinforced Concrete Pipe	0.75	750	16.6
BREAKDOWN	ee.74p.212p		N-EE74		N-EE212	BP - Buried Pit	11.74	BP - Buried Pit	9.830	RCP - Reinforced Concrete Pipe	0.75	750	17.1
DPI1260	ee.75.76	DRP1718	EE75	DRP1719	EE76	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.400	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.020	VC - Clay	0.15	150	2.88
DPI176	ee.76.212	DRP1719	EE76	DRP840	EE212	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.020	JPS - Junction Pit Sealed	11.420	RCP - Reinforced Concrete Pipe	0.225	225	6.38
DPI1261	ee.77.212	DRP1687	EE77	DRP840	EE212	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.840	JPS - Junction Pit Sealed	11.420	RCP - Reinforced Concrete Pipe	0.3	300	5.75
DPI145	ee.212.212p	DRP840	EE212		N-EE212	JPS - Junction Pit Sealed	10.870	BP - Buried Pit	9.830	RCP - Reinforced Concrete Pipe	0.375	375	5.63
DPI3150	ee.212p.79A		N-EE212	DRP384	EE79A	JPS - Junction Pit Sealed	9.83	JPS - Junction Pit Sealed	8.560	RCP - Reinforced Concrete Pipe	0.75	750	80.1
DPI1262	ee.78.79A	DRP1720	EE78	DRP384	EE79A	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	10.590	JPS - Junction Pit Sealed	9.660	VC - Clay	0.225	225	15.89
DPI1263	ee.79.79A	DRP1721	EE79	DRP384	EE79A	DGGP - Double Graded Gully Pit	9.780	JPS - Junction Pit Sealed	9.360	VC - Clay	0.225	225	7.82
DPI3152	ee.79A.80A	DRP384	EE79A	DRP669	EE80A	JPS - Junction Pit Sealed	8.560	JPS - Junction Pit Sealed	8.200	RCP - Reinforced Concrete Pipe	0.9	900	0
DPI2858	ee.80.80A	DRP1722	EE80	DRP669	EE80A	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.890	JPS - Junction Pit Sealed	9.400	RCP - Reinforced Concrete Pipe	0.225	225	7.63
DPI1264	ee.80.80A	DRP1722	EE80	DRP669	EE80A	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.890	JPS - Junction Pit Sealed	9.400	RCP - Reinforced Concrete Pipe	0.225	225	7.63
DPI2829	ee.80A.81A	DRP669	EE80A	DRP534	EE81A	JPS - Junction Pit Sealed	8.20	JPS - Junction Pit Sealed	7.520	RCP - Reinforced Concrete Pipe	0.75	750	27.8
DPI1265	ee.81.81A	DRP863	EE81	DRP534	EE81A	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.630	JPS - Junction Pit Sealed	8.370	VC - Clay	0.225	225	8.5
DPI2606	ee.82.81A	DRP1723	EE82	DRP534	EE81A	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.820	JPS - Junction Pit Sealed	8.570	RCP - Reinforced Concrete Pipe	0.225	225	10.7
DPI1266	ee.83.82A	DRP2230	EE83	DRP507	EE82A	DGGP - Double Graded Gully Pit	8.110	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.890	RCP - Reinforced Concrete Pipe	0.6	600	26.3
DPI3371	ee.82A.81A	DRP507	EE82A	DRP534	EE81A	SGGP - Single Graded Gully Pit	7.890	JPS - Junction Pit Sealed	7.520	BOX - Reinforced Concrete Box Culvert	#VALUE!	900x300	10
DPI148	ee.219.219a	DRP1668	EE219	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.650	BP - Buried Pit	7.000	RCP - Reinforced Concrete Pipe	0.381	225	4
DPI1227	ee.221.221p	DRP1559	EE221	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.63	BP - Buried Pit	6.380	RCP - Reinforced Concrete Pipe	0.6096	225	8
BREAKDOWN	ee.218a.218b		N-EE218a		N-EE218b	BP - Buried Pit	7.37	BP - Buried Pit	7.080	RCP - Reinforced Concrete Pipe	1.219	600	0
											0		
											0		
											0		
											0		

LEGEND

Pipe information changed - please see note in spreadsheet

MISSING/BREAKDOWN - pipe missing or split into two pipes for modelling purposes

Asset Number	Pipe Number	Upstream Asset No	Upstream Node	nstream Ass	nstream N	Upstream Node Type	Upstrm Invert Lvl	Downstrm Node Type	Downstr Invert Lvl	Pipe Type		Pipe Diameter	Pipe Length
Murray Street											0		
DPI2908	ee.186.246	DRP2137	EE186	DRP668	EE186A	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.830	BP - Buried Pit	6.470	RCP - Reinforced Concrete Pipe	0.375	375	38.3
DPI1216	ee.246.246p	DRP668	EE186A	DRP2103	EE246	BP - Buried Pit	6.470	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	5.840	RCP - Reinforced Concrete Pipe	0.45	450	5.57
MISSING	ee.246p247pA					BP - Buried Pit	4.234	BP - Buried Pit	4.070	BOX - Reinforced Concrete Box Culvert	#VALUE!	2240x1300	51.66
DPI2955	ee.247.247p	DRP2104	EE247	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	5.800	BP - Buried Pit	5.535	RCP - Reinforced Concrete Pipe	0.3	300	8.63
MISSING	ee.247p.183p					BP - Buried Pit	3.98	BP - Buried Pit	3.400	BOX - Reinforced Concrete Box Culvert	#VALUE!	2240x1300	125.6
DPI136	ee.185.184	DRP2136	EE185	DRP2135	EE184	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.920	DGGP - Double Graded Gully Pit	4.670	RCP - Reinforced Concrete Pipe	0.375	375	7.54
DPI1215	ee.184.183	DRP2135	EE184	DRP2134	EE183	DGGP - Double Graded Gully Pit	4.670	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.330	RCP - Reinforced Concrete Pipe	0.375	375	37.32
DPI1214	ee.183.183p	DRP2134	EE183	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.330	BP - Buried Pit	3.960	RCP - Reinforced Concrete Pipe	0.45	450	6.22
MISSING	ee.183p.180p					BP - Buried Pit	3.400	BP - Buried Pit	3.270	BOX - Reinforced Concrete Box Culvert	#VALUE!	2240x1300	41.64
DPI1211	ee.178.177	DRP2131	EE178	DRP2130	EE177	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.640	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.420	RCP - Reinforced Concrete Pipe	0.375	375	29.28
DPI1210	ee.177.180	DRP2130	EE177	DRP2133	EE180	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.42	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.070	RCP - Reinforced Concrete Pipe	0.6	600	8.55
DPI133	ee.179.180	DRP2132	EE179	DRP2133	EE180	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.500	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.370	RCP - Reinforced Concrete Pipe	0.375	375	13.78
DPI2706	ee.180.180p	DRP2133	EE180	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.070	BP - Buried Pit	3.285	RCP - Reinforced Concrete Pipe	0.6	600	19.82
MISSING	ee180p.196p					BP - Buried Pit	3.270	BP - Buried Pit	2.870	BOX - Reinforced Concrete Box Culvert	#VALUE!	2240x1300	81.24
DPI2534	ee.196.196p	DRP2220	EE196	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	3.390	BP - Buried Pit	2.910	RCP - Reinforced Concrete Pipe	0.375	375	7.6
MISSING	ee196A196p					Lintel	3.860	BP - Buried Pit	2.910	RCP - Reinforced Concrete Pipe	0.45	450	7.42
MISSING	ee196B196p					Lintel	3.790	BP - Buried Pit	2.910	RCP - Reinforced Concrete Pipe	0.45	450	13.47
DPI1220	ee.195.195p	DRP835	EE195	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	3.530	BP - Buried Pit	3.220	RCP - Reinforced Concrete Pipe	0.375	375	6.56
MISSING	ee.195p.194p					BP - Buried Pit	2.72	BP - Buried Pit	2.560	BOX - Reinforced Concrete Box Culvert	#VALUE!	2240x1300	37.35
DPI140	ee.194.194p	DRP2114	EE194	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	3.110	BP - Buried Pit	3.040	RCP - Reinforced Concrete Pipe	0.375	375	6.81
MISSING	ee.194p.193p					BP - Buried Pit	2.56	BP - Buried Pit	2.520	BOX - Reinforced Concrete Box Culvert	#VALUE!	2240x1300	10.4
DPI1219	ee.193.193p	DRP2113	EE193	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	3.050	BP - Buried Pit	2.542	RCP - Reinforced Concrete Pipe	0.3	300	7.34
MISSING	ee.193p.191p					BP - Buried Pit	2.52	BP - Buried Pit	2.480	BOX - Reinforced Concrete Box Culvert	#VALUE!	2240x1300	8.57
DPI2707	ee.191.191p	DRP2112	EE191	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	3.150	BP - Buried Pit	3.000	RCP - Reinforced Concrete Pipe	0.3	300	7.17
MISSING	ee.191p.192p					BP - Buried Pit	2.48	BP - Buried Pit	2.440	BOX - Reinforced Concrete Box Culvert	#VALUE!	2240x1300	12.51
DPI139	ee.192.192p	DRP366	EE192	DRP666	EEP	SGGP + EKI - Single Graded Gully Pit + Ext.Kerb Inlet	3.770	BP - Buried Pit	2.870	VC - Clay	0.45	450	12.3
MISSING	ee.192p.outf					BP - Buried Pit	2.444	BP - Buried Pit	2.350	BOX - Reinforced Concrete Box Culvert	#VALUE!	2240x1300	35.4
											0		
John St - Lord Street											0		
DPI2702	ee110.113	DRP1708	EE110	DRP860	EE113	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	10.800	JPS - Junction Pit Sealed	10.200	RCP - Reinforced Concrete Pipe	0.225	225	5.4
DPI1177	ee111.113	DRP618	EE111	DRP860	EE113	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.060	JPS - Junction Pit Sealed	10.000	RCP - Reinforced Concrete Pipe	0.225	225	7.58
DPI108	ee.112-113	DRP1709	EE112	DRP860	EE113	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.350	JPS - Junction Pit Sealed	10.400	RCP - Reinforced Concrete Pipe	0.3	300	12.77
DPI1178	ee.113.87	DRP860	EE113	DRP1726	EE86	JPS - Junction Pit Sealed	9.900	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.200	RCP - Reinforced Concrete Pipe	0.3	300	74.89
DPI1268	ee.86.87	DRP1726	EE86	DRP865	EE88	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.210	JPS - Junction Pit Sealed	8.200	RCP - Reinforced Concrete Pipe	0.225	225	1.89
DPI2958	ee.87.88	DRP864	EE87	DRP865	EE88	JPS - Junction Pit Sealed	8.200	JPS - Junction Pit Sealed	7.920	RCP - Reinforced Concrete Pipe	0.3	300	1.88
DPI1269	ee.89.88	DRP1676	EE89	DRP865	EE88	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.360	JPS - Junction Pit Sealed	7.920	RCP - Reinforced Concrete Pipe	0.225	225	1.33
DPI179	ee.88.91	DRP865	EE88	DRP866	EE90	JPS - Junction Pit Sealed	7.920	JPS - Junction Pit Sealed	7.860	RCP - Reinforced Concrete Pipe	0.3	300	7.67
DPI2378	ee.90.91	DRP1727	EE91	DRP866	EE90	JPS - Junction Pit Sealed	8.020	BP - Buried Pit	7.860	VC - Clay	0.15	150	1.26
DPI1225	ee.204.205	DRP2120	EE204	DRP2121	EE205	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.400	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.060	RCP - Reinforced Concrete Pipe	0.3	300	5.88
DPI143	ee.205.203	DRP2121	EE205	DRP836	EE203	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.060	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.490	RCP - Reinforced Concrete Pipe	0.3	300	60
DPI142	ee.202.203	DRP2119	EE202	DRP836	EE203	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.850	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.490	RCP - Reinforced Concrete Pipe	0.3	300	4.76
DPI1224	ee.203.84	DRP836	EE203	DRP1724	EE84	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.490	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.090	RCP - Reinforced Concrete Pipe	0.3	300	78.71
DPI178	ee.85.84	DRP1725	EE85	DRP1724	EE84	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.180	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.090	RCP - Reinforced Concrete Pipe	0.3	300	4.84
DPI1267	ee.84.91	DRP1724	EE84	DRP866	EE90	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.090	DGGP - Double Graded Gully Pit	7.860	RCP - Reinforced Concrete Pipe	0.3	300	8.88
MISSING	ee.91.92p	DRP866	EE90	DRP1728	EE92	DGGP - Double Graded Gully Pit	7.860	DGGP - Double Graded Gully Pit	7.740	VC - Clay	0.375	375	3.67
DPI2712	ee.92.92p	DRP1728	EE92	DRP666	EEP	DGGP - Double Graded Gully Pit	8.090	BP - Buried Pit	7.740	VC - Clay	0.15	150	1.23
DPI149	ee.227.227p	DRP2111	EE227	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.100	BP - Buried Pit	7.300	RCP - Reinforced Concrete Pipe	0.225	225	8.1
BREAKDOW	ee.92p.227p					BP - Buried Pit	7.740	BP - Buried Pit	7.300	RCP - Reinforced Concrete Pipe	0.375	375	13.40
BREAKDOW	ee.227p.57e					BP - Buried Pit	7.300	UKN - Unknown	6.500	RCP - Reinforced Concrete Pipe	0.375	375	9.20
DPI259	es.56.57	DRP1657	ES56	DRP2162	ES57	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.330	DGGP - Double Graded Gully Pit	7.140	RCP - Reinforced Concrete Pipe	0.45	450	11.66
DPI1366	es.57.57p	DRP2162	ES57	DRP546	ESE	DGGP - Double Graded Gully Pit	7.140	UKN - Unknown	6.500	BOX - Reinforced Concrete Box Culvert	#VALUE!	1200x500	24.90
DPI1373	es.83.84	DRP2442	ES83	DRP749	ES84	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	15.780	JPS - Junction Pit Sealed	14.960	RCP - Reinforced Concrete Pipe	0.45	450	6.01
DPI272	es.84.85	DRP749	ES84	DRP750	ES85	JPS - Junction Pit Sealed	14.810	JPS - Junction Pit Sealed	14.290	RCP - Reinforced Concrete Pipe	0.45	450	30.32
DPI1374	es.85.86.1	DRP750	ES85	DRP751	ES86	JPS - Junction Pit Sealed	14.290	SGGP + EKI - Single Graded Gully Pit + Ext.Kerb Inlet	14.270	RCP - Reinforced Concrete Pipe	0.225	225	3.07
DPI1375	es.85.86.2	DRP750	ES85	DRP751	ES86	JPS - Junction Pit Sealed	14.290	SGGP + EKI - Single Graded Gully Pit + Ext.Kerb Inlet	14.270	RCP - Reinforced Concrete Pipe	0.225	225	3.01
DPI273	es.86.e	DRP751	ES86	DRP546	ESE	SGGP + EKI - Single Graded Gully Pit + Ext.Kerb Inlet	14.270	UKN - Unknown	14.200	BOX - Reinforced Concrete Box Culvert	#VALUE!	600x150	12.5
	es83AES83B						16.580		15.980	RCP - Reinforced Concrete Pipe	0.3	300	39.7
	es83B.83						15.980		15.780	RCP - Reinforced Concrete Pipe	0.3	300	22.5
	es83D.83C						15.930		15.860	RCP - Reinforced Concrete Pipe	0.3	300	38.8
	es83C.83						15.860		15.780	RCP - Reinforced Concrete Pipe	0.3	300	22.3
											0		
											0		
											0		
											0		

LEGEND

Pipe information changed - please see note in spreadsheet

MISSING/BREAKDOWN - pipe missing or split into two pipes for modelling purposes

Asset Number	Pipe Number	Upstream Asset No	Upstream Node	nstream Ass	nstream N	Upstream Node Type	Upstrm Invert Lvl	Downstrm Node Type	Downstr Invert Lvl	Pipe Type		Pipe Diameter	Pipe Length
Edgeware Rd											0		
DPI2828	ee116116p	DRP1711	EE116		N-EE116	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.730	BP - Buried Pit	8.630	VC - Clay	0.225	225	3.54
MISSING	ee116p115p		EE114A		N-EE115		8.630	BP - Buried Pit	8.490	PVC - Plastic	0.3	225	3.62
DPI1180	ee.115.p	DRP1710	EE115	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.730	BP - Buried Pit	8.490	VC - Clay	0.225	225	1.5
DPI1179	ee.115p.114		N-EE115	DRP861	EE114	JPS - Junction Pit Sealed	8.490	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.650	VC - Clay	0.3	300	26.2
BREAKDOWN	ee.114.109p	DRP861	EE114	DRP666	EEP		7.650	BP - Buried Pit	6.843	PVC - Plastic	0.225	225	39.60
BREAKDOWN	ee.109p.108		N-EE109	DRP859	EE108	BP - Buried Pit	6.843		6.550	PVC - Plastic	0.225	225	15.90
DPI107	ee.109.109p	DRP1707	EE109	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.170	BP - Buried Pit	6.843	VC - Clay	0.225	225	2.8
DPI1176	ee.107.108	DRP1706	EE107	DRP859	EE108	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.560	JPS - Junction Pit Sealed	6.550	VC - Clay	0.225	225	5.52
DPI1175	ee.106.108	DRP1705	EE106	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.627	BP - Buried Pit	6.550	VC - Clay	0.225	225	3.14
DPI2315	ee.103.105	DRP1704	EE103	DRP855	EE105	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	9.180	JPS - Junction Pit Sealed	8.970	VC - Clay	0.225	225	4.553
DPI1174	ee.104.105	DRP2390	EE104	DRP855	EE105	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.450	JPS - Junction Pit Sealed	8.970	VC - Clay	0.225	225	5.137
DPI2436	ee.105.108	DRP855	EE105	DRP859	EE108	JPS - Junction Pit Sealed	8.970	JPS - Junction Pit Sealed	6.550	VC - Clay	0.225	225	144.93
DPI1173	ee.108.101	DRP859	EE108	DRP854	EE101	JPS - Junction Pit Sealed	6.550	JPS - Junction Pit Sealed	4.890	RCP - Reinforced Concrete Pipe	0.45	450	54.9
DPI3139	ee.102.101	DRP1703	EE102	DRP854	EE101	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	5.140	JPS - Junction Pit Sealed	4.890	RCP - Reinforced Concrete Pipe	0.3	300	1.80
DPI2947	ee.101.100	DRP854	EE101	DRP1563	EE100	JPS - Junction Pit Sealed	4.890	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.880	RCP - Reinforced Concrete Pipe	0.45	450	13.00
DPI3137	ee.100.99	DRP1563	EE100	DRP853	EE99	JPS - Junction Pit Sealed	4.880	JPS - Junction Pit Sealed	4.580	RCP - Reinforced Concrete Pipe	0.45	450	11.76
DPI2389	ee.97.98	DRP1715	EE97	DRP1702	EE98	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	5.150	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.970	VC - Clay	0.3	300	6.80
DPI180	ee.93.94	DRP1729	EE93	DRP1730	EE94	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.520	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.160	VC - Clay	0.3	300	6.60
DPI2537	ee.94.96	DRP1730	EE94	DRP1732	EE96	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.160	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	5.290	VC - Clay	0.3	300	75.8
DPI3138	ee.95.96	DRP1731	EE95	DRP1732	EE96	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	5.990	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	5.290	VC - Clay	0.3	300	8.939
DPI2830	ee.96.98	DRP1732	EE96	DRP1702	EE98	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	5.290	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.970	VC - Clay	0.3	300	66
DPI1271	ee.98.99	DRP1702	EE98	DRP853	EE99	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.970	JPS - Junction Pit Sealed	4.580	VC - Clay	0.3	300	7.28
DPI2480	ee.99.99A	DRP853	EE99	DRP666	EEP	JPS - Junction Pit Sealed	4.580	BP - Buried Pit	4.200	RCP - Reinforced Concrete Pipe	0.45	450	28.2
DPI1230	ee.225.225p	DRP2366	EE225	DRP666	EEP	SGGP - Single Graded Gully Pit	4.890	BP - Buried Pit	4.580	RCP - Reinforced Concrete Pipe	0.3	300	11.15
MISSING	ee.99A.225p	DRP666	EE99A	DRP666	N-EE225		3.900		3.882	BOX - Reinforced Concrete Box Culvert	#VALUE!	1850x1100	1.9
DPI2951	ee.226.226p	DRP359	EE226	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.360	BP - Buried Pit	3.723	BOX - Reinforced Concrete Box Culvert	#VALUE!	600x300	8.00
MISSING	ee.225p.226p	DRP666	EE99A	DRP666	N-EE226		3.882	BP - Buried Pit	3.723	BOX - Reinforced Concrete Box Culvert	#VALUE!	1850x1100	16.97
MISSING	ee.226p.201p		EE99A		N-outflow	BP - Buried Pit	3.723	BP - Buried Pit	3.315	BOX - Reinforced Concrete Box Culvert	#VALUE!	1850x1100	43.54
DPI269	es.75.75e	DRP2448	ES75	DRP546	ESE	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	3.600	UKN - Unknown	3.500	VC - Clay	0.3	300	12.05
DPI2405	es71.73	DRP2447	ES71	DRP756	ES73	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	5.990	JPS - Junction Pit Sealed	5.640	VC - Clay	0.3	300	16.20
MISSING	es.72A.72		ES72A	DRP755	ES72		5.260	JPS - Junction Pit Sealed	5.250	BOX - Reinforced Concrete Box Culvert	#VALUE!	600x500	9.20
DPI267	es72.73	DRP755	ES72	DRP756	ES73	JPS - Junction Pit Sealed	5.250	JPS - Junction Pit Sealed	4.990	RCP - Reinforced Concrete Pipe	0.45	450	23.38
MISSING	es.76A.76		ES76A		ES76		5.210	JPS - Junction Pit Sealed	5.060	BOX - Reinforced Concrete Box Culvert	#VALUE!	900x450	22.80
DPI1372	es.76.95		ES76	DRP741	ES95	JPS - Junction Pit Sealed	5.060	JPS - Junction Pit Sealed	5.020	BOX - Reinforced Concrete Box Culvert	#VALUE!	900x450	10.87
MISSING	es110.110A		ES110		N-ES110		5.360		5.360	BOX - Reinforced Concrete Box Culvert	#VALUE!	900x450	6
MISSING	es111.110p		ES111		N-ES110		5.350		5.181	BOX - Reinforced Concrete Box Culvert	#VALUE!	900x450	18.44
MISSING	es.110p.95		N-ES110	DRP741	ES95		5.181	JPS - Junction Pit Sealed	5.020	RCP - Reinforced Concrete Pipe	0.45	450	21.65
DPI1380	es95.74	DRP741	ES95	DRP757	ES74	JPS - Junction Pit Sealed	5.020	JPS - Junction Pit Sealed	5.020	BOX - Reinforced Concrete Box Culvert	#VALUE!	1200x750	11.94
DPI268	es74.73	DRP757	ES74	DRP756	ES73	JPS - Junction Pit Sealed	5.020	JPS - Junction Pit Sealed	4.990	BOX - Reinforced Concrete Box Culvert	#VALUE!	1200x1000	8.40
DPI271	es.80.77	DRP2450	ES80	DRP759	ES77	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.150	JPS - Junction Pit Sealed	5.960	BOX - Reinforced Concrete Box Culvert	#VALUE!	500x300	14.43
DPI2719	es.77.78	DRP759	ES77	DRP610	ES78	JPS - Junction Pit Sealed	5.960	JPS - Junction Pit Sealed	5.830	BOX - Reinforced Concrete Box Culvert	#VALUE!	500x300	12.55
MISSING	es.79.78		ES79	DRP610	ES78		5.890		5.830	RCP - Reinforced Concrete Pipe	0.225	225	2.47
DPI270	es.78.73	DRP610	ES78	DRP756	ES73	JPS - Junction Pit Sealed	5.830	JPS - Junction Pit Sealed	5.740	BOX - Reinforced Concrete Box Culvert	#VALUE!	500x300	7.51
BREAKDOWN	es.73.N73	DRP756	ES73		N-ES73		4.990		4.620	RCP - Reinforced Concrete Pipe	1.2	1200	115.00
BREAKDOWN	es.N73.ee201		N-ES73		EE201	BP - Buried Pit	4.623	BP - Buried Pit	4.200	BOX - Reinforced Concrete Box Culvert	#VALUE!	1550x870	29.30
BREAKDOWN	ee201.201p		EE201		N-EE201	BP - Buried Pit	4.200	BP - Buried Pit	3.315	BOX - Reinforced Concrete Box Culvert	#VALUE!	1550x870	11.93
											0		
											0		
											0		
											0		

LEGEND

Pipe information changed - please see note in spreadsheet

MISSING/BREAKDOWN - pipe missing or split into two pipes for modelling purposes

Asset Number	Pipe Number	Upstream Asset No	Upstream Node	nstream Ass	nstream N	Upstream Node Type	Upstrm Invert Lvl	Downstrm Node Type	Downstr Invert Lvl	Pipe Type		Pipe Diameter	Pipe Length
Camden Street - Pipe Network 2											0		
DPI1172	ee.1.3	DRP2633	EE1	DRP881	EE3	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	23.640	JPS - Junction Pit Sealed	23.270	RCP - Reinforced Concrete Pipe	0.375	375	4.09
DPI141	ee.2.3	DRP2634	EE2	DRP881	EE3	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	23.770	JPS - Junction Pit Sealed	23.270	RCP - Reinforced Concrete Pipe	0.375	375	8.12
DPI2709	ee.3.5	DRP881	EE3	DRP882	EE5	JPS - Junction Pit Sealed	23.270	JPS - Junction Pit Sealed	22.820	RCP - Reinforced Concrete Pipe	0.375	375	3.92
DPI160	ee.4.5	DRP2635	EE4	DRP882	EE5	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	23.520	JPS - Junction Pit Sealed	23.320	RCP - Reinforced Concrete Pipe	0.375	375	2.24
DPI164	ee.5.6	DRP882	EE5	DRP2636	EE6	JPS - Junction Pit Sealed	22.820	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.080	RCP - Reinforced Concrete Pipe	0.375	375	31.61
DPI166	ee.6.8	DRP2636	EE6	DRP622	EE8	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.080	JPS - Junction Pit Sealed	20.660	RCP - Reinforced Concrete Pipe	0.45	450	2.02
DPI174	ee.7.8	DRP2637	EE7	DRP622	EE8	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.630	JPS - Junction Pit Sealed	21.310	RCP - Reinforced Concrete Pipe	0.375	375	4.75
DPI177	ee.8.10	DRP622	EE8	DRP883	EE10	JPS - Junction Pit Sealed	20.660	JPS - Junction Pit Sealed	20.200	RCP - Reinforced Concrete Pipe	0.45	450	6.81
DPI1270	ee.9.10	DRP2638	EE9	DRP883	EE10	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	21.150	JPS - Junction Pit Sealed	20.950	RCP - Reinforced Concrete Pipe	0.375	375	2.52
DPI2421	ee.10.11	DRP883	EE10	DRP1755	EE11	JPS - Junction Pit Sealed	19.800	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.900	RCP - Reinforced Concrete Pipe	0.45	450	21.6
DPI1182	ee.12.11	DRP1756	EE12	DRP1755	EE11	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	19.360	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.930	RCP - Reinforced Concrete Pipe	0.45	450	5.72
MISSING	ee.11.13						18.33		18.220	RCP - Reinforced Concrete Pipe	0.45	450	2.13
DPI1188	ee.13.14	DRP884	EE13	DRP1757	EE14	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.92	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.550	RCP - Reinforced Concrete Pipe	0.45	450	6.53
DPI1193	ee.14.15	DRP1757	EE14	DRP885	EE15	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	18.550	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	13.870	RCP - Reinforced Concrete Pipe	0.45	450	77.22
DPI123	ee.15.16	DRP885	EE15	DRP1758	EE16	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	13.870	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	13.400	RCP - Reinforced Concrete Pipe	0.525	525	6.97
DPI1202	ee.16.17	DRP1758	EE16	DRP1759	EE17	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	13.400	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.400	RCP - Reinforced Concrete Pipe	0.525	525	26.85
DPI1208	ee.17.18	DRP1759	EE17	DRP1760	EE18	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.400	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.860	RCP - Reinforced Concrete Pipe	0.525	525	19.16
DPI1212	ee.18.19	DRP1760	EE18	DRP886	EE19	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.860	JPS - Junction Pit Sealed	11.390	RCP - Reinforced Concrete Pipe	0.6	600	8.15
MISSING	ee.19.20p	DRP886	EE19		N-EE20		11.140		10.980	RCP - Reinforced Concrete Pipe	0.9	900	3.23
DPI1222	ee.20.20p	DRP2639	EE20	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.540	BP - Buried Pit	11.470	RCP - Reinforced Concrete Pipe	0.375	375	2.7
MISSING	ee.20p.118p		N-EE20		N-EE118		10.980		10.448	RCP - Reinforced Concrete Pipe	0.914	900	31.33
DPI2948	ee.119.120	DRP1713	EE119	DRP1714	EE120	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.970	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.750	VC - Clay	0.225	225	2.7
DPI1183	ee.120.117	DRP1714	EE120	DRP1712	EE117	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.650	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.070	RCP - Reinforced Concrete Pipe	0.375	375	36.46
DPI1181	ee.117.118	DRP1712	EE117	DRP862	EE118	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	10.970	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	10.520	RCP - Reinforced Concrete Pipe	0.375	375	3.67
DPI110	ee.118.118p	DRP862	EE118	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	10.570	BP - Buried Pit	10.250	RCP - Reinforced Concrete Pipe	0.9	900	2.45
MISSING	ee.216.215p		EE216		N-EE215		8.32		8.220	BOX - Reinforced Concrete Box Culvert	#VALUE!	1350x900	6.76
DPI147	ee.215.215p	DRP2108	EE215	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	10.020	BP - Buried Pit	8.220	RCP - Reinforced Concrete Pipe	0.457	450	3.7
											0		
	ee128E2121G						9.150		8.900	RCP - Reinforced Concrete Pipe	0.75	900	23
DPI1184	ee121E121F	DRP1698	EE121	DRP535	EEE	DGGP - Double Graded Gully Pit	10.830	BP - Buried Pit	9.270	RCP - Reinforced Concrete Pipe	0.375	225	58
DPI3293	ee121A121B	DRP394	EE121A	DRP426	EE121B	JPG - Junction Pit Grated	11.15	JPS - Junction Pit Sealed	11.010	RCP - Reinforced Concrete Pipe	0.225	225	19.11
DPI3294	ee121B121C	DRP426	EE121B	DRP427	EE121C	JPS - Junction Pit Sealed	11.01	JPG - Junction Pit Grated	10.990	RCP - Reinforced Concrete Pipe	0.225	225	2
DPI3295	ee121C121D	DRP427	EE121C	DRP428	EE121D	JPG - Junction Pit Grated	10.99	JPS - Junction Pit Sealed	10.920	RCP - Reinforced Concrete Pipe	0.225	225	27
DPI3296	ee121D121E	DRP428	EE121D	DRP429	EE121E	JPS - Junction Pit Sealed	10.92	JPS - Junction Pit Sealed	10.830	RCP - Reinforced Concrete Pipe	0.225	225	3
DPI3297	ee121E121F	DRP429	EE121E	DRP430	EE121F	JPS - Junction Pit Sealed	10.83	JPS - Junction Pit Sealed	9.270	RCP - Reinforced Concrete Pipe	0.375	375	58
DPI3298	ee121F121G	DRP430	EE121F	DRP434	EE121G	JPS - Junction Pit Sealed	9.27	JPS - Junction Pit Sealed	8.900	RCP - Reinforced Concrete Pipe	0.45	450	32
DPI3299	ee121G121H	DRP434	EE121G	DRP435	EE121H	JPS - Junction Pit Sealed	8.9	JPS - Junction Pit Sealed	8.680	RCP - Reinforced Concrete Pipe	0.825	825	9.4
DPI3300	ee121H121I	DRP435	EE121H	DRP436	EE121I	JPS - Junction Pit Sealed	8.68	JPS - Junction Pit Sealed	8.570	RCP - Reinforced Concrete Pipe	0.825	825	28
DPI3301	ee121I121J	DRP436	EE121I	DRP999999	PIT99999	JPS - Junction Pit Sealed	8.57		8.370	RCP - Reinforced Concrete Pipe	0.9	900	4
	ee121J.83						8.37		8.110	RCP - Reinforced Concrete Pipe	0.9	900	27
											0		
											0		
											0		
											0		

LEGEND

Pipe information changed - please see note in spreadsheet

MISSING/BREAKDOWN - pipe missing or split into two pipes for modelling purposes

Asset Number	Pipe Number	Upstream Asset No	Upstream Node	vnstream Ass	nstream N	Upstream Node Type	Upstrm Invert Lvl	Downstrm Node Type	Downstr Invert Lvl	Pipe Type		Pipe Diameter	Pipe Length
Victoria Road											0		
DPI1223	ee.200.200p	DRP2117	EE200	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.810	BP - Buried Pit	7.710	VC - Clay	0.457	450	1.27
MISSING	ee200p.161Ap		N-EE200				7.310		7.183	BOX - Reinforced Concrete Box Culvert	#VALUE!	1900x1000	7.1
	ee161A.161Ap						7.580		7.330	RCP - Reinforced Concrete Pipe	0.457	450	18.06
MISSING	ee161Ap.161p						7.183		6.930	BOX - Reinforced Concrete Box Culvert	#VALUE!	1900x1000	14.1
	ee.161B.161p						7.620		7.480	RCP - Reinforced Concrete Pipe	0.45	450	10.23
DPI1204	ee.162.161	DRP2144	EE162	DRP2143	EE161	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.340	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.310	RCP - Reinforced Concrete Pipe	0.375	375	2.2
DPI1203	ee.161.161p	DRP2143	EE161	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.310	BP - Buried Pit	7.174	RCP - Reinforced Concrete Pipe	0.45	450	10
DPI1207	ee.168.168p	DRP1562	EE168	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.490	BP - Buried Pit	6.110	VC - Clay	0.3	300	37.76
DPI128	ee.163.165	DRP2222	EE163	DRP1576	EE165	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	13.120	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	12.200	PVC - Plastic	0.225	225	28.52
DPI2950	ee.164.165	DRP848	EE164	DRP1576	EE165	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.960	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.800	RCP - Reinforced Concrete Pipe	0.375	375	6.32
DPI1205	ee.165.233	DRP1576	EE165	DRP365	EE233	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	11.800	JPS - Junction Pit Sealed	7.900	RCP - Reinforced Concrete Pipe	0.45	450	76.32
DPI2952	ee.232.233	DRP2367	EE232	DRP365	EE233	SGGP + EKI - Single Graded Gully Pit + Ext.Kerb Inlet	9.700	JPS - Junction Pit Sealed	9.400	BOX - Reinforced Concrete Box Culvert	#VALUE!	600x200	6.2
DPI1234	ee.233.234	DRP365	EE233	DRP2218	EE234	JPS - Junction Pit Sealed	7.900	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.940	RCP - Reinforced Concrete Pipe	0.45	450	16.19
DPI1206	ee.166.167	DRP2145	EE166	DRP2146	EE167	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	8.760	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.400	RCP - Reinforced Concrete Pipe	0.375	375	38.43
DPI129	ee.167.234	DRP2146	EE167	DRP2218	EE234	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	7.400	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.940	RCP - Reinforced Concrete Pipe	0.45	450	2.57
DPI152	ee.234.169	DRP2218	EE234	DRP2368	EE169	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.940	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.490	RCP - Reinforced Concrete Pipe	0.525	525	29.67
DPI130	ee.169.170	DRP2368	EE169	DRP1561	EE170	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.490	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.220	RCP - Reinforced Concrete Pipe	0.525	525	52.19
DPI1209	ee.170.171	DRP1561	EE170	DRP2125	EE171	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.220	DGGP - Double Graded Gully Pit	6.070	RCP - Reinforced Concrete Pipe	0.525	525	2.51
MISSING	ee.171.172p	DRP2125	EE171		N-EE172	DGGP - Double Graded Gully Pit	6.070	BP - Buried Pit	5.530	RCP - Reinforced Concrete Pipe	0.525	525	2.86
DPI131	ee.173.172	DRP2127	EE173	DRP2126	EE172	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.250	DGGP - Double Graded Gully Pit	6.160	RCP - Reinforced Concrete Pipe	0.45	450	1.71
MISSING	ee.172.172p	DRP2126	EE172		N-EE172	DGGP - Double Graded Gully Pit	6.160	BP - Buried Pit	5.530	RCP - Reinforced Concrete Pipe	0.45	450	4.28
MISSING	ee.172p.175p		N-EE172		N-EE175	BP - Buried Pit	5.525	BP - Buried Pit	5.525	BOX - Reinforced Concrete Box Culvert	#VALUE!	1900x1000	12.26
DPI132	ee.176.175p	DRP1577	EE176	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.050	BP - Buried Pit	5.980	RCP - Reinforced Concrete Pipe	0.45	450	4.42
DPI2422	ee.174.175	DRP2128	EE174	DRP2129	EE175	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	6.160	DGGP - Double Graded Gully Pit	6.010	RCP - Reinforced Concrete Pipe	0.45	450	0.88
MISSING	ee.175.175p	DRP2129	EE175		N-EE175	DGGP - Double Graded Gully Pit	6.010	BP - Buried Pit	5.980	RCP - Reinforced Concrete Pipe	0.45	450	4.49
MISSING	ee.175p.181p		N-EE175		N-EE181	BP - Buried Pit	5.53	BP - Buried Pit	3.967	BOX - Reinforced Concrete Box Culvert	#VALUE!	1900x1000	173
DPI135	ee.182.182p	DRP841	EE182	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.300	BP - Buried Pit	4.250	RCP - Reinforced Concrete Pipe	0.375	375	7.15
DPI1213	ee.181.182p	DRP616	EE181	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.300	BP - Buried Pit	4.250	RCP - Reinforced Concrete Pipe	0.375	375	4.69
DPI134	ee.182p.181p	DRP616	EE181	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.250	BP - Buried Pit	3.966	RCP - Reinforced Concrete Pipe	0.45	450	28.7
DPI137	ee.187.188	DRP842	EE187	DRP843	EE188	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	3.870	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	3.830	VC - Clay	0.3	300	11.25
DPI1217	ee.188.188p	DRP843	EE188	DRP2116	EE199	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	3.830	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	3.580	VC - Clay	0.375	375	17.68
MISSING	ee.188p.190p		N-EE188		N-EE190	BP - Buried Pit	3.32	BP - Buried Pit	3.187	BOX - Reinforced Concrete Box Culvert	#VALUE!	1900x1000	14.71
DPI138	ee.189.190	DRP2221	EE189	DRP2124	EE190	DGGP - Double Graded Gully Pit	4.060	DGGP - Double Graded Gully Pit	3.830	BOX - Reinforced Concrete Box Culvert	#VALUE!	300x300	2.78
DPI1218	ee.190.190p	DRP2124	EE190	DRP666	EEP	DGGP - Double Graded Gully Pit	3.830	BP - Buried Pit	3.500	VC - Clay	0.375	375	7.64
MISSING	ee.190p.198p		N-EE190		N-EE198	BP - Buried Pit	3.19	BP - Buried Pit	2.816	BOX - Reinforced Concrete Box Culvert	#VALUE!	1900x1000	10.3
DPI1221	ee.198.198p	DRP2115	EE198	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	4.150	BP - Buried Pit	2.816	RCP - Reinforced Concrete Pipe	0.375	375	29.78
MISSING	ee.198p.197p					BP - Buried Pit	2.82	BP - Buried Pit	2.797	BOX - Reinforced Concrete Box Culvert	#VALUE!	1900x1000	2.29
DPI2601	ee.197.197p	DRP1560	EE197	DRP666	EEP	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	3.610	BP - Buried Pit	2.797	RCP - Reinforced Concrete Pipe	0.375	375	54.28
MISSING	ee.197p.outf		N-EE197		outflow	BP - Buried Pit	2.797	BP - Buried Pit	2.430	BOX - Reinforced Concrete Box Culvert	#VALUE!	1900x1000	39.86
											0		
Sarah Street / Reiby Street											0		
DPI1190	ee.133.134	DRP850	EE133	DRP851	EE134	JPS - Junction Pit Sealed	17.720	JPS - Junction Pit Sealed	17.030	PVC - Plastic	0.225	225	14.02
DPI114	ee.134.135.1	DRP851	EE134	DRP2226	EE135	JPS - Junction Pit Sealed	17.230	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.160	PVC - Plastic	0.15	150	4.94
DPI2704	ee.134.135.2	DRP851	EE134	DRP2226	EE135	JPS - Junction Pit Sealed	17.230	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.160	PVC - Plastic	0.15	150	4.82
DPI1191	ee.135.136	DRP2226	EE135	DRP2149	EE136	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.160	DGGP - Double Graded Gully Pit	17.150	PVC - Plastic	0.3	300	34.32
MISSING	ee.136.137	DRP2149	EE136	DRP2227	EE137	DGGP - Double Graded Gully Pit	17.150	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.130	PVC - Plastic	0.3	300	16.42
DPI2599	ee.137.222	DRP2227	EE137	DRP356	EE222	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.130	JPS - Junction Pit Sealed	16.720	RCP - Reinforced Concrete Pipe	0.3	300	6.1
DPI1192	ee.138.223	DRP2150	EE138	DRP357	EE223	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	17.050	JPS - Junction Pit Sealed	16.300	VC - Clay	0.225	225	10.46
DPI1228	ee.222.223	DRP356	EE222	DRP357	EE223	JPS - Junction Pit Sealed	16.720	JPS - Junction Pit Sealed	16.300	RCP - Reinforced Concrete Pipe	0.3	300	12.84
DPI2318	ee.223.224	DRP357	EE223	DRP358	EE224	JPS - Junction Pit Sealed	16.300	JPS - Junction Pit Sealed	15.900	RCP - Reinforced Concrete Pipe	0.6	600	36.22
DPI1229	ee224224p	DRP358	EE224	DRP535	EEE	JPS - Junction Pit Sealed	15.900	BP - Buried Pit	15.870	RCP - Reinforced Concrete Pipe	0.6	600	26.3
DPI1237	ee.243.245	DRP2101	EE243	DRP352	EE245	DGGP - Double Graded Gully Pit	17.540	JPS - Junction Pit Sealed	16.820	RCP - Reinforced Concrete Pipe	0.3	300	3.49
DPI1238	ee.244.245	DRP2102	EE244	DRP352	EE245	DGGP - Double Graded Gully Pit	17.690	JPS - Junction Pit Sealed	16.820	RCP - Reinforced Concrete Pipe	0.3	300	2.33
MISSING	ee.245.245A	DRP352	EE245	DRP535	EEE	JPS - Junction Pit Sealed	16.820	BP - Buried Pit	16.600	RCP - Reinforced Concrete Pipe	0.3	300	32.12
MISSING	ee245A224p						16.600		15.870	BOX - Reinforced Concrete Box Culvert	#VALUE!	450x150	13.51
MISSING	ee224A224p						16.310		15.870	BOX - Reinforced Concrete Box Culvert	#VALUE!	450x150	4.9
MISSING	ee224B224p						16.220		15.870	BOX - Reinforced Concrete Box Culvert	#VALUE!	450x150	5.8
DPI1189	ee.131.132	DRP2225	EE131	DRP2294	EE132	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.430	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.310	BOX - Reinforced Concrete Box Culvert	#VALUE!	400x150	3.82
DPI113	ee.132.132e	DRP2294	EE132	DRP535	EEE	DGGP + EKI - Double Graded Gully Pit + Ext.Kerb Inlet	16.310	BP - Buried Pit	15.987	BOX - Reinforced Concrete Box Culvert	#VALUE!	450x150	6.1
DPI1233	ee.230.231	DRP1669	EE230	DRP361	EE231	DGGP - Double Graded Gully Pit	30.230	JPS - Junction Pit Sealed	28.550	RCP - Reinforced Concrete Pipe	0.225	225	13.97
DPI151	ee.231.b	DRP361	EE231	DRP86	EEB	JPS - Junction Pit Sealed	28.550	BP - Buried Pit	26.910	RCP - Reinforced Concrete Pipe	0.225	225	65.71

LEGEND

Modelling Parameters within DRAINS

Modelling parameters such as runoff coefficients (CN), time of concentration (T_c), pipe roughness (n), pressure change coefficients (k_u) and pit types are required for the DRAINS model.

Runoff Coefficient

The runoff coefficient represents the percentage of precipitation that contributes flow to the drainage system based on the landuse. For the pervious (grassed) areas within the catchment, the runoff coefficient C_{10} was calculated based on Equation 14.12 in the Australian Rainfall & Runoff (Institute of Engineers Australia, 1987, *Australian Rainfall and Runoff - Volume 2*. Canberra, ACT).

$C_{10} = 0.1 + 0.0133 \times (I_{10/1} - 25)$ where $I_{10/1}$ is the 10 year 1 hour intensity in mm/hr.

Based on the IFD table developed from the AR&R Manual (Vol 2, IEA 1987) the $I_{10/1} = 61$ mm/hr and the calculated $C_{10} = 0.58$.

Therefore, it is assumed that 58% of the precipitation that falls on the pervious areas would runoff into the drainage system (i.e. CN = 0.58). DRAINS automatically assumes a runoff coefficient of 0.9 (90% runoff) for impervious areas (roof, street and other concrete drainage).

Time of Concentration

The time of concentration is the time it takes, in minutes, for runoff from the upper most point of the catchment to reach the most downstream point of the catchment. The DRAINS manual (O'Loughlin, April 2008) recommends a T_c of 5 minutes along road surfaces and paved areas and 13 to 15 minutes for overland flow based on the slope of the land. A T_c of 13 minutes was used if the average slope of the catchment was between 3% and 6% and 15 minutes was used if the average slope was less than 3%.

Pipe Roughness

The types of pipes varied throughout the catchment and included concrete circular pipes, clay pipes, rectangular concrete pipes (box culverts) and plastic pipes. The pipe roughness was modelled using Manning's n. The recommended roughness value for concrete pipes is n = 0.012. Values adopted within DRAINS were 0.015 for circular concrete pipes and 0.015 for concrete box culverts. The roughness within the concrete box culverts is greater than in circular pipes due to the joints. The roughness for clay pipes is n = 0.015 (E.W. Steel and T.J. McGhee, 5th Edition 1979). Since DRAINS does not have an option to use clay pipes in the model, concrete pipes were chosen and the roughness was changed to 0.015. Some of the pipes within the network were labelled as plastic and an equivalent roughness was used within the model.

Pressure Change Coefficient

The pit pressure change coefficient is dimensionless and defines the change in the hydraulic grade line (HGL) based on entrance loss due to turbulence and other energy and momentum changes. DRAINS (O'Loughlin, April 2008) outlines the following k_u values for each pit type.

Table A4: Approximate Pit Pressure Change Coefficients (k_u)

Type of Pit	k_u
Pit at the top of a line	5.0
Pit with a straight through flow, no sidelines	0.2
Pit with a right angle direction change, no sidelines	1.0
Pit with a straight through flow, one or more sidelines	1.5
Pit with a right angle direction change, one or more sidelines	2.0

Pit Types

The pit type is required for the DRAINS model and is based on the lintel and grate dimensions. All pit types were chosen from the NSW Road and Traffic Authority (RTA) pits listed within the DRAINS manual (O'Loughlin, April 2008). There are five types of pits used within Marrickville: SA1, SA2, SA3, SF1 and RM7. The following table provides a description of each pit.

Table A5: Pit Type

Pit Type	Comment
SA1	One grate and one lintel with a width of approximately 1 m
SA2	One grate and two lintels with a combined width of approximately 2 m
SA3	One grate and three lintels with a combined width of approximately 3 m
SF1	Median Cover – used for Manholes
RM7	A grated pit with no lintel used on access ways

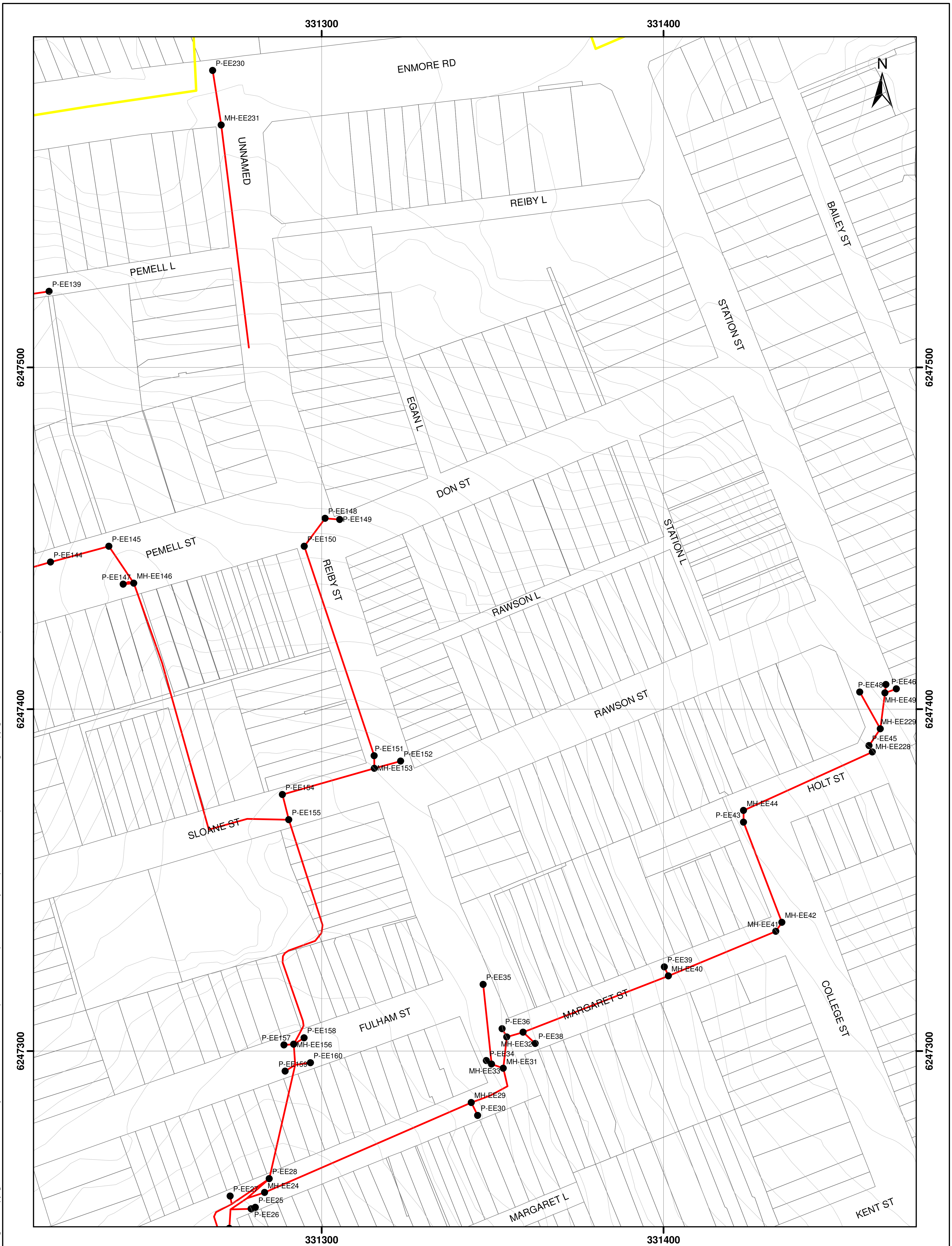
Overland Flow Pathways

Overland flow paths were entered into the DRAINS model to route flow from pits that both re-surfaced and allowed water to flow down roadways or do not have the capacity to handle the incoming flow. In both cases water flows down the street into the next available downstream pit. The overflow pathways were estimated using the topographic mapping and aerial photography to determine the most likely route and the distance travelled in meters. The time it takes for the overland flow to reach the downstream pit is crucial in ensuring that peak flows reach the specific pit at the correct time. After running the model with an assumed overland flow time, the velocity of the flow and distance travelled were used to estimate the appropriate overland flow time. The average slope of the overland flow path was also estimated using the ALS data and was entered into the model.

As part of the overland flow path a cross section type is required. The model provides four options for the cross sectional shape of the overland flow path: 8 m wide half road section, dummy used to model flow across road low points, pathway 4 m wide and grassed swale with 1:4 side slopes. The table below describes when the various cross sectional shapes were used.

Table A6: Overland Flow Path Cross Sectional Types

Cross Sectional Type	Use
8m wide half road section	When overflow water travels along the street gutter to the downstream pit
Dummy used to model flow across road low points	When overflow occurs across the road to a perpendicular pit
Pathway 4 m wide	When water flows between houses, through parks and over large car parks
Grassed swale with 1:4 side slopes	Not used



Legend

- ECE Catchment Boundary
- Tuflow 1D Element Network
- Tuflow 1D Element Network (pipes)

Projection: MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN	GSB	DATE	25-02-10
CHECKED	JRB	DATE	25-02-10
TITLE	PIT/PIPE NETWORK		
SCALE	1:1,000	PROJECT No	097626003-008
FIGURE No	A-1	REV No	0
A3			

File Location: J:\hyd\2009\097626068_Gosford Council_Floodplain Risk Management_Narara\Technical Doc\GIS\Project\
Note: The * beside the typed initials denotes the original drawing issue was signed or initialled by that respective person.

Legend

- ECE Catchment Boundary
- Tuflow 1D Element Network
- Tuflow 1D Element Network (pipes)

Projection: MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN GSB	DATE 25-02-10	TITLE	PIT/PIPE NETWORK
CHECKED JRB	DATE 25-02-10		
SCALE	1:1,000	PROJECT No 097626003-008	FIGURE No A-2 · REV No 0 · A3

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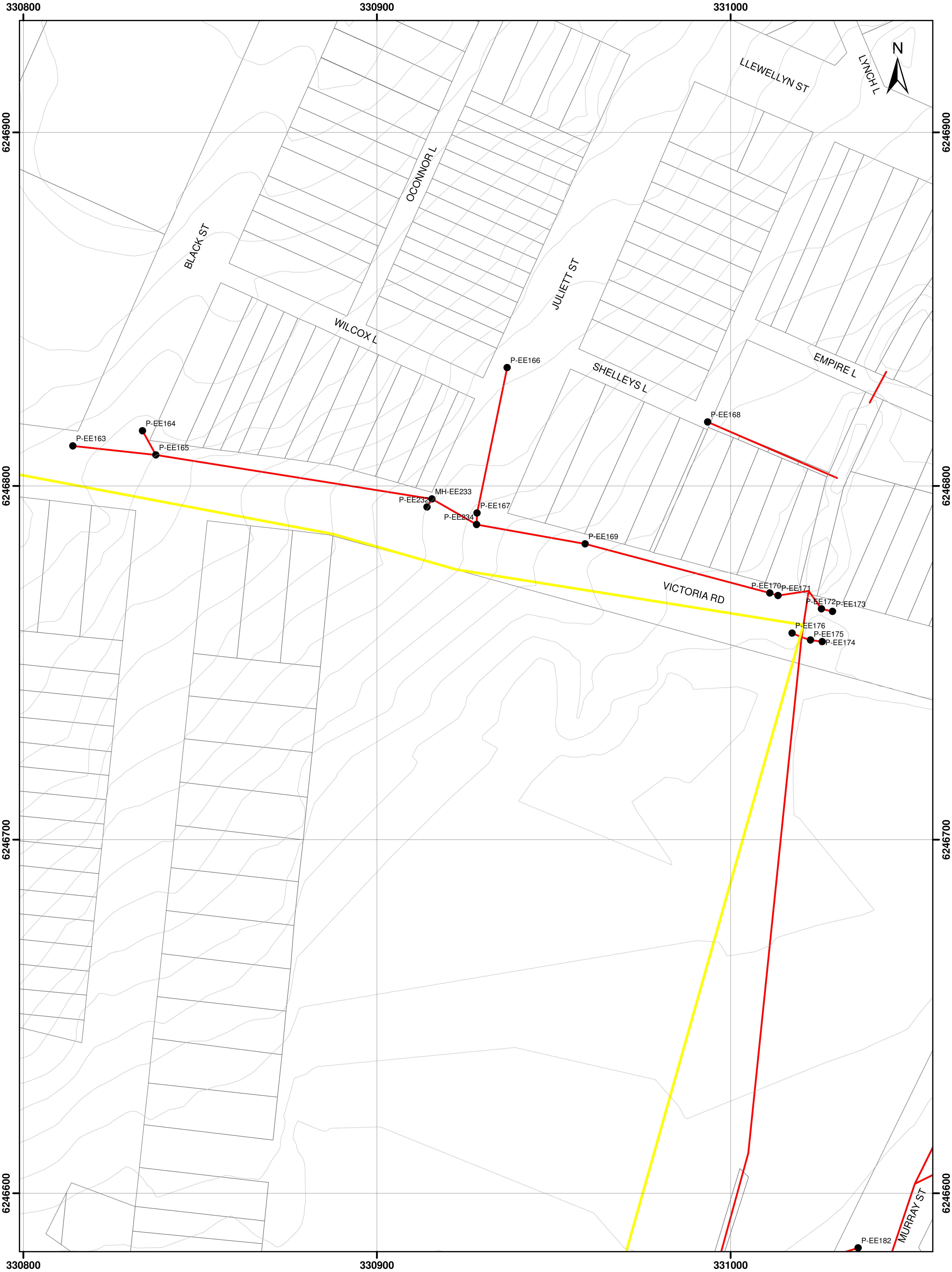

Legend

- ECE Catchment Boundary
- Tuflow 1D Element Network
- Tuflow 1D Element Network (pipes)

Projection: MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN GSB	DATE 25-02-10	TITLE	PIT/PIPE NETWORK
CHECKED JRB	DATE 25-02-10		
SCALE	1:1,000	PROJECT No 097626003-008	FIGURE No A-3 · REV No 0 · A3

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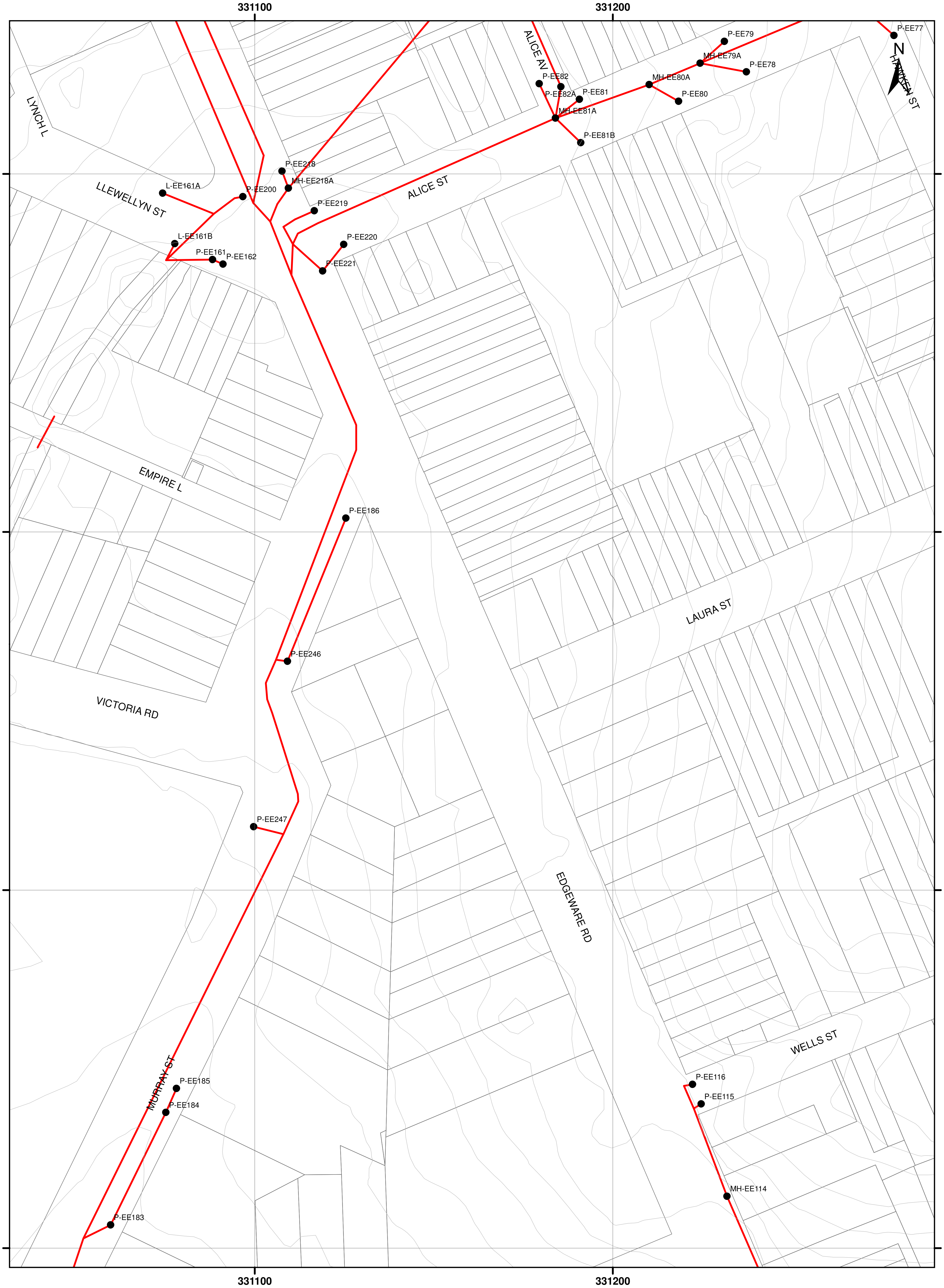

Legend

- ECE Catchment Boundary
- Tuflow 1D Element Network
- Tuflow 1D Element Network (pipes)

Projection: MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN GSB	DATE 25-02-10	TITLE	PIT/PIPE NETWORK
CHECKED JRB	DATE 25-02-10		
SCALE 1:1,000		PROJECT No 097626003-008	FIGURE No A-4 · REV No 0 · A3

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Note: The * beside the typed initials denotes the original drawing issue was signed or initialled by that respective person.

Legend

- ECE Catchment Boundary
- Tuflow 1D Element Network
- Tuflow 1D Element Network (pipes)

Projection: MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN GSB	DATE 25-02-10	TITLE	PIT/PIPE NETWORK
CHECKED JRB	DATE 25-02-10		
SCALE 1:1,000		PROJECT No 097626003-008	FIGURE No A-5 · REV No 0 · A3

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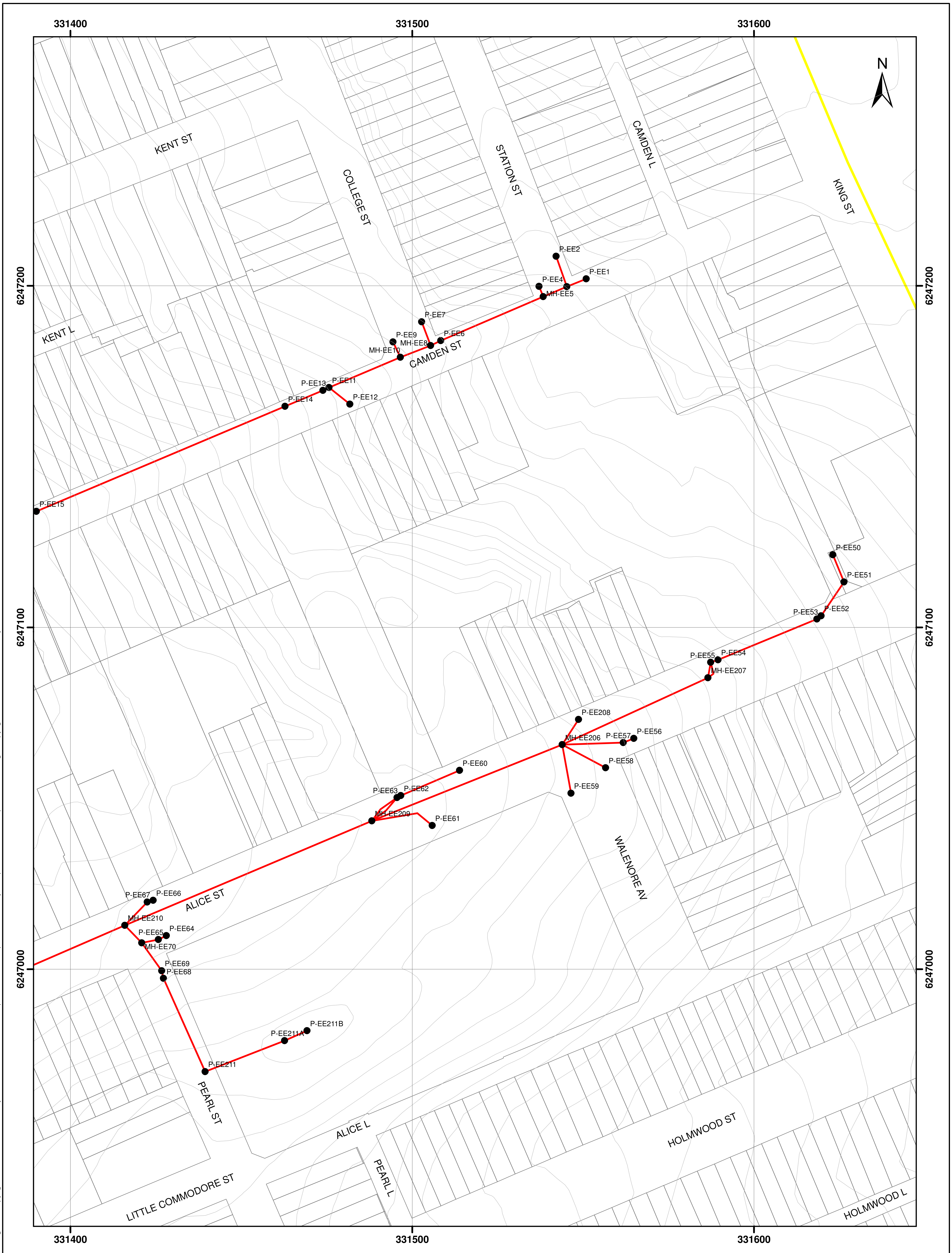

Legend

- ECE Catchment Boundary
- Tuflow 1D Element Network
- Tuflow 1D Element Network (pipes)

Projection: MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN GSB	DATE 25-02-10	TITLE	PIT/PIPE NETWORK
CHECKED JRB	DATE 25-02-10		
SCALE 1:1,000		PROJECT No 097626003-008	FIGURE No A-6 · REV No 0 · A3

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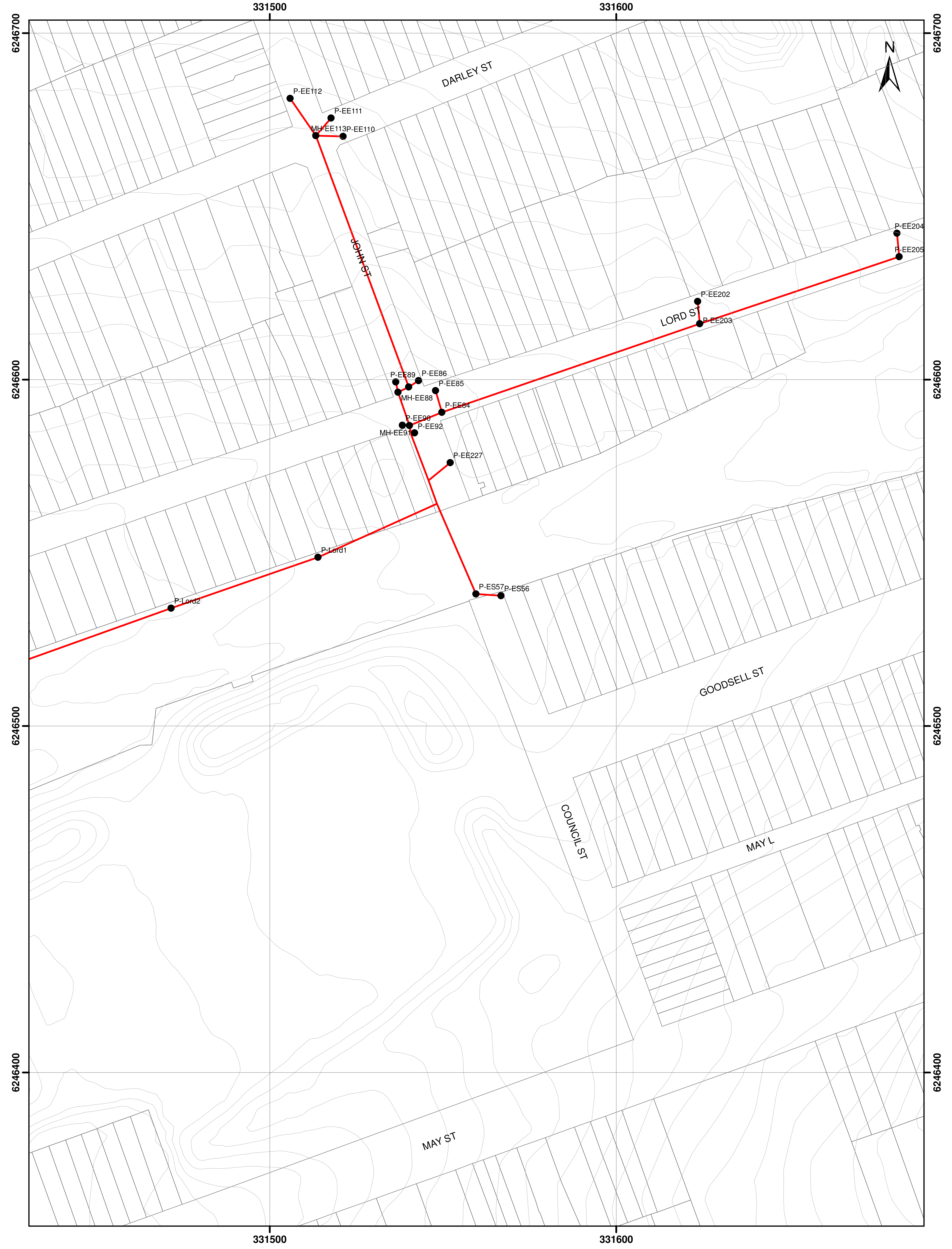

Legend

- ECE Catchment Boundary
- Tuflow 1D Element Network
- Tuflow 1D Element Network (pipes)

Projection: MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN GSB	DATE 25-02-10	TITLE	PIT/PIPE NETWORK
CHECKED JRB	DATE 25-02-10		
SCALE	1:1,000	PROJECT No 097626003-008	FIGURE No A-7 · REV No 0 · A3

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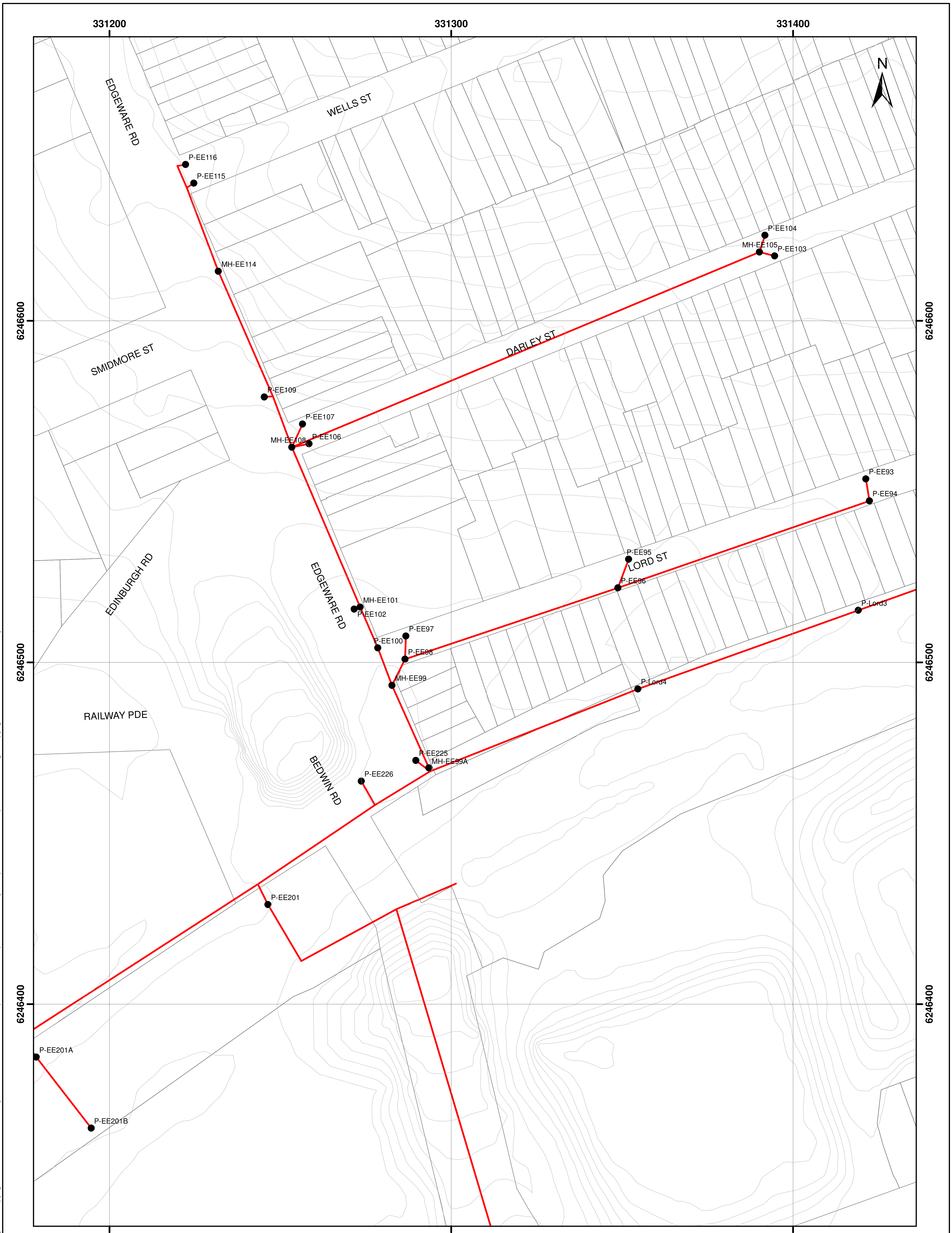

Legend

- ECE Catchment Boundary
- Tuflow 1D Element Network
- Tuflow 1D Element Network (pipes)

Projection: MGA94Z56

Golder Associates

CLIENT: Marrickville Council		PROJECT: Eastern Channel East Flood Study	
DRAWN: GSB	DATE: 25-02-10	TITLE: PIT/PIPE NETWORK	
CHECKED: JRB	DATE: 25-02-10		
SCALE: 1:1,000		PROJECT No: 097626003-008	FIGURE No: A-8 / REV No: 0 / A3

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Note: The * beside the typed initials denotes the original drawing issue was signed or initialled by that respective person.

Legend

- ECE Catchment Boundary
- Tuflow 1D Element Network
- Tuflow 1D Element Network (pipes)

Projection: MGA94Z56

Golder Associates

CLIENT Marrickville Council		PROJECT Eastern Channel East Flood Study	
DRAWN GSB	DATE 25-02-10	TITLE PIT/PIPE NETWORK	
CHECKED JRB	DATE 25-02-10		
SCALE 1:1,000		PROJECT No 097626003-008	FIGURE No A-9	REV No 0	A3

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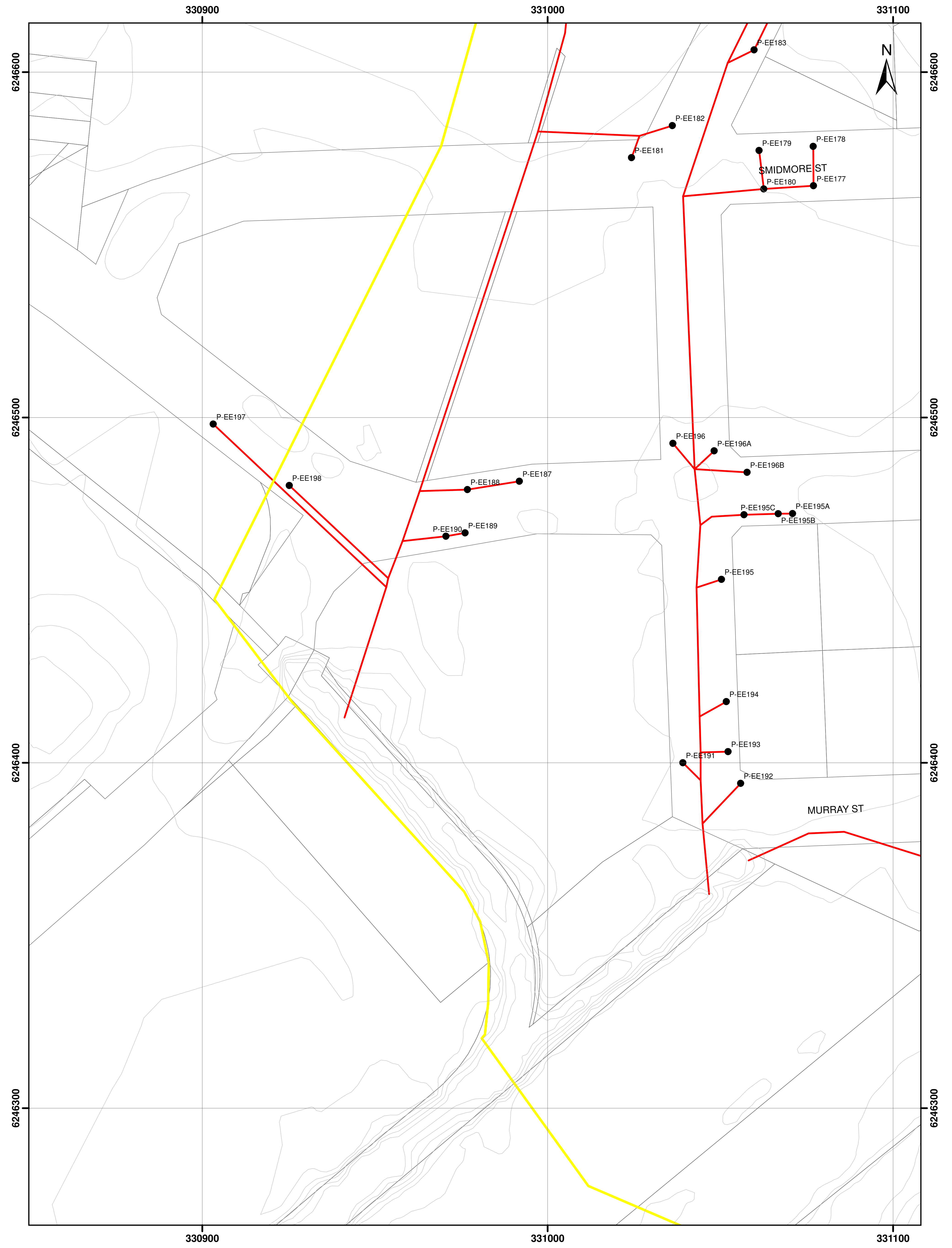

Legend

- ECE Catchment Boundary
- Tuflow 1D Element Network
- Tuflow 1D Element Network (pipes)

Projection: MGA94Z56

Golder Associates

CLIENT: Marrickville Council		PROJECT: Eastern Channel East Flood Study	
DRAWN: GSB	DATE: 25-02-10	TITLE: PIT/PIPE NETWORK	
CHECKED: JRB	DATE: 25-02-10		
SCALE: 1:1,000		PROJECT No: 097626003-008	FIGURE No: A-10 / REV No: 0 / A3

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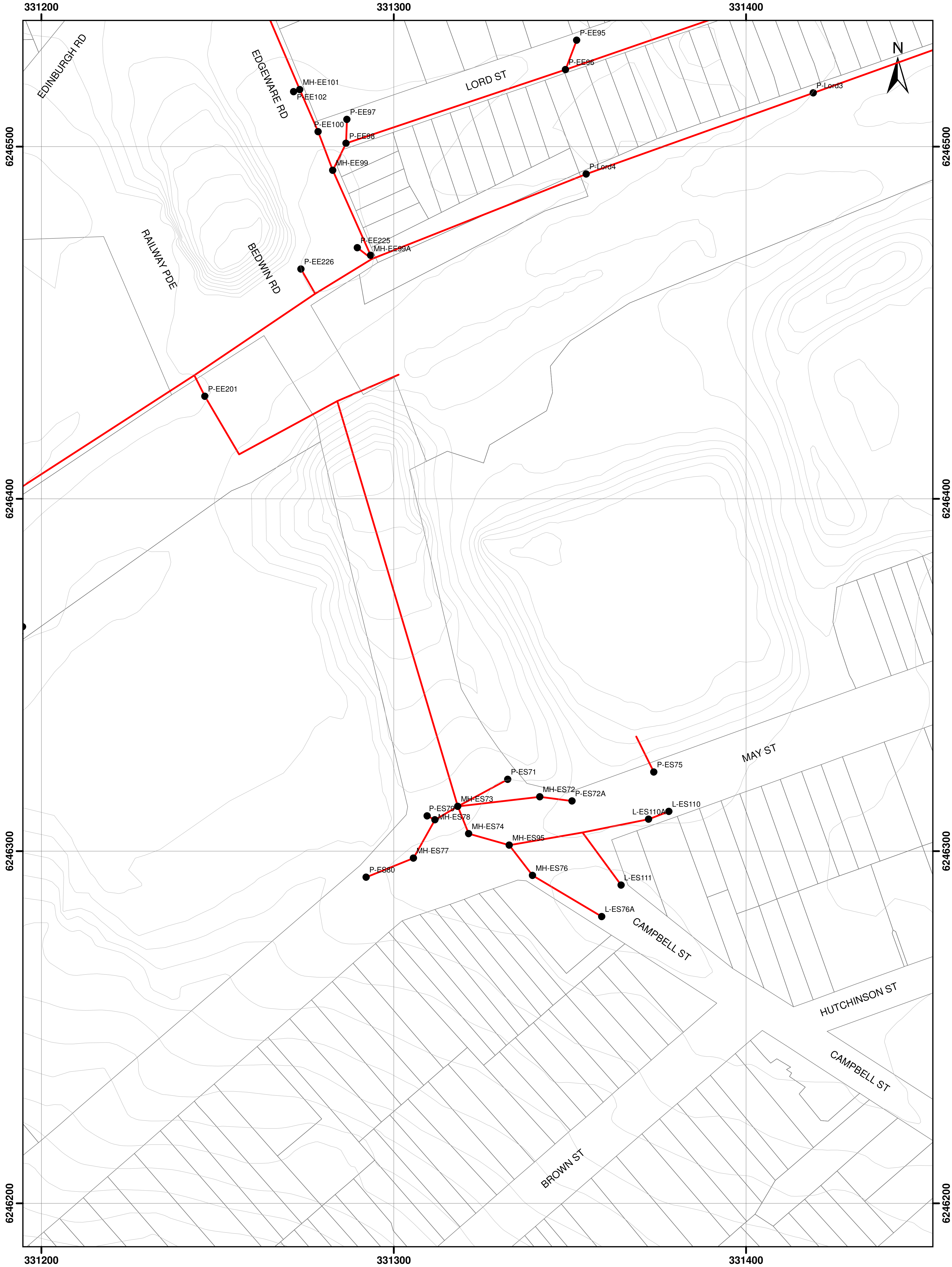

Legend

ECE Catchment Boundary

Tuflow 1D Element Network

Tuflow 1D Element Network (pipes)

Projection: MGA94Z56

Golder Associates

CLIENT	Marrickville Council	PROJECT	Eastern Channel East Flood Study
DRAWN GSB	DATE 25-02-10	TITLE	PIT/PIPE NETWORK
CHECKED JRB	DATE 25-02-10		
SCALE 1:1,000		PROJECT No 097626003-008	FIGURE No A-11 · REV No 0 · A3

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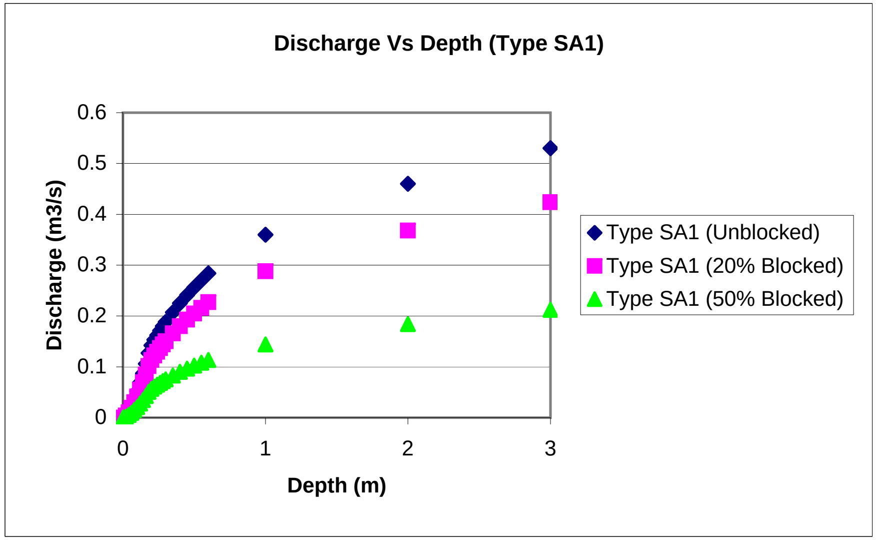
APPENDIX B

TUFLOW – Adopted Pit Hydraulic Characteristic Curves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Discharge (m3/s)
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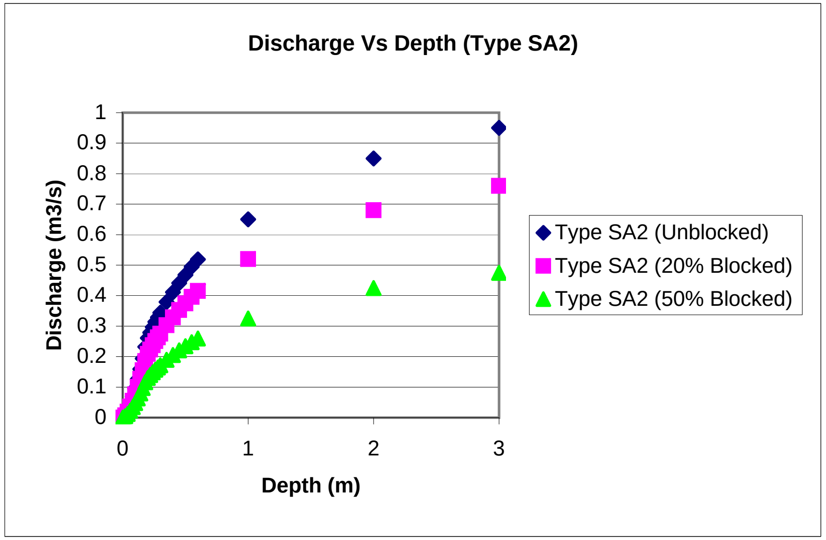
0.5
0.4
0.3
0.2
0.1
0
0
1
2
3
Depth (m)
Type SA1 (Unblocked)
Type SA1 (20% Blocked)
Type SA1 (50% Blocked)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Discharge (m3/s)
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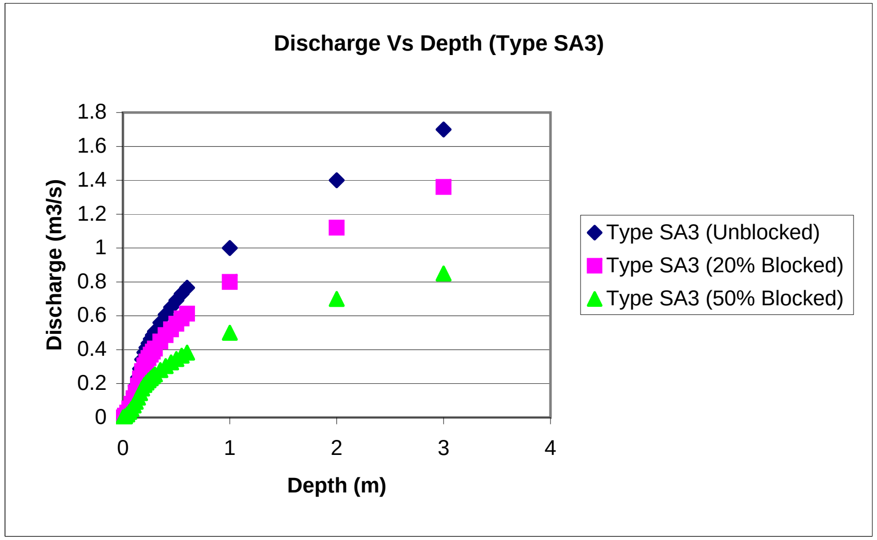
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
1
2
3
Depth (m)
Type SA2 (Unblocked)
Type SA2 (20% Blocked)
Type SA2 (50% Blocked)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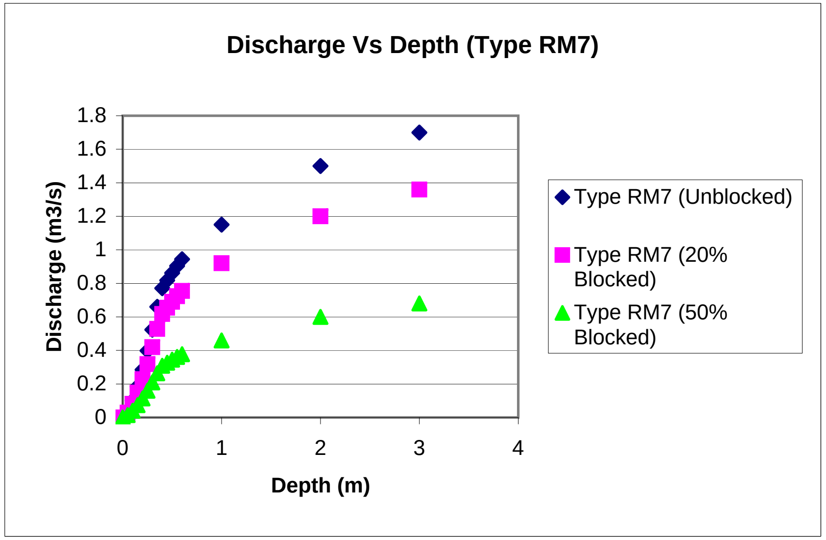
Discharge (m3/s)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
Depth (m)
Type SA3 (Unblocked)
Type SA3 (20% Blocked)
Type SA3 (50% Blocked)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Discharge (m3/s)
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1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
Depth (m)
Type RM7 (Unblocked)
Type RM7 (20% Blocked)
Type RM7 (50% Blocked)

APPENDIX C

Flood Questionnaire

December 2009

EC EAST SUBCATCHMENT PLAN

Results of Community Flood Survey

Submitted to:
Marrickville Council
PO Box 14
Petersham NSW 2049

REPORT

Report Number. 097626003-011-R-Rev1

Distribution:

1 Copy (electronic) - Marrickville Council

Golder Associates

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TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Marrickville Council commissioned Golder Associates to conduct a community survey to obtain historic flooding information from EC East Subcatchment residents as part of the floodplain risk management process for the EC East Subcatchment Management Plan. The data acquired through this survey was used for model calibration purposes.

A community survey was mailed to 3,274 residents in EC East Subcatchment on February 2009 (Copy provided in Appendix A). The number of responses received from the residents was 214 which equates to an approximate response rate of 6.5%. As part of the survey, the community was asked to identify properties/areas that are prone to flooding in the subcatchment. Figure 1 provides the locations of flooding identified from the returned surveys.

Four respondents provided photos of flooding events which are provided in Appendix B.

2.0 SUMMARY OF RESPONSES

The responses were received over a period of six weeks. A large number of respondents provided useful information about the flooding. A large majority of respondents have been living in the catchment for more than 5 years (145 respondents). Only 14 respondents have lived in the subcatchment for more than 30 years, of which 3 have lived for more than 50 years.

Out of a total of 214 responses

- 165 respondents indicated that their property was flooded
- 40 residential properties were reported as flooded
- 7 properties were reported to have over floor flooding in the past
- 10 commercial/industrial properties were reported as flooded

In addition, 101 respondents reported Roads and footpaths being flooded and 24 respondents reported parks and open spaces to be flooded in the past flood events.

Appendix C provides all the responses received from the community.

3.0 MAIN AREAS OF FLOOD AFFECTATION

Several areas where flooding occurs on a regular basis were identified by the EC East Subcatchment residents. The main areas of concern include Sarah St. and Simmons St.; Camden St. and Edgeware Rd.; Llewellyn St. and Edgeware Rd.; Enmore Rd., Ferndale St., Station St., and Reiby St.; Lord St., Darley St., and Wells St.; Goodsell Rd. and May St.; Hutchinson St. and Campbell Rd.; and May St. and Campbell Rd. These areas are shown on Figures 2 - 8. The flooding in these areas is discussed in more detail in the sections 4.0 below.

4.0 PROPERTY FLOODING ISSUES

A number of residents have experienced flooding on their properties. Common areas within the catchment that have experienced flooding in either their front or back yards, garage or other buildings include:

- North-west part of the subcatchment
- North-east part of the subcatchment
- Alice St. and Camden St. in Newtown
- Industrial area on Edinburgh Rd in Newtown
- Lord St. and the Edgeware Rd/Lord St. intersection in Newtown

- Goodsell St./May St. area in St. Peters; and
- Florence St., Brown St., and Campbell St. in St. Peters.

Details of flooding in the above areas are provided below:

4.1 North-west Subcatchment

The area within the north-west corner of the EC East Subcatchment that was identified to experience flooding by various residents is shown on Figure 2. The following table outline the properties that have experienced flooding.

Table 1: North West Part of Subcatchment, Enmore

ID*	Address	Parts of Property Flooded
0017	Metropolitan Rd, Enmore	Front yard
0066	Metropolitan Rd., Enmore	Residential – not specific
0111	Simmons St., Enmore	Residential – not specific
0157	Edgeware Rd Enmore	Backyard
0189	Marian St., Enmore	Building below floor level
0197	Edgeware Rd., Enmore	Building below floor level

* As per Attachment C. This applies to all the following Tables.

A resident at Metropolitan Road noted that the area between Enmore Lane, Sarah St., Edgeware Rd. and Simmons St., as shown on Figure 2, is prone to flooding.

A resident at Edgeware Rd., Enmore has experienced flooding below their house. They noted in the survey that their neighbour to the north found a pool of standing water below the floorboards in the front room of the house when renovating his property. The owner has now had a pump installed which with regularity, even when not raining, is pumping out a substantial amount of water. Another resident on Edgeware Rd has very damp property and also has standing water problems. Fortunately, their neighbour Edgeware Rd has not had standing water but the ground is consistently damp and they have had fans installed under the house.

4.1.1 Additional Flooding Information

Residents at Ferndale St. Newtown reported that the current drainage cannot cope with the heavy rain events and water regularly extends from the footpath to the middle of the street. However, water subsides quickly after the rain and flooding generally occurs only during very heavy rain events.

A resident at Lynch Avenue, Enmore stated that flash flooding occurs at the corner of Edgeware Rd and Sarah St, outside of the TAFE building on the Edgeware Rd side; at the corner of Simmons St. and Margaret St.; and ankle deep rushing torrent of water over Sarah St. and down Edgeware Rd. During heavy rains there is also always water spilling over the pathways at the bottom of Marion St. at Sarah St. and on the footpaths next to the dog park.

4.2 North-east Subcatchment

The area within the north-east corner of the EC East Subcatchment that was identified to experience flooding by various residents is shown on Figure 3. The following table outline the properties that have experienced flooding.

Table 2: North East Part of Subcatchment, Newtown

ID	Address	Parts of Property Flooded
0078	Fulham St., Newtown	Backyard, building above flood level
0096	Pemell Lane, Newtown	Water runs down the driveway the

ID	Address	Parts of Property Flooded
		underground car park.
0115	Margaret St., Newtown	Building above floor level
0133	Station St., Newtown	Building below floor level
0162	Pemell St., Newtown	Front yard
0180	Station St., Newtown	Backyard and flooding at floor level
0194	Rawson St., Newtown	Building below floor level
0196	Pemell St., Newtown	Residential – not specific
0208	Margaret St., Newtown	Front yard – See Attachment B for photos
0020	Enmore Rd, Enmore	Flooding below floor level
0040	King St., Newtown	Building above and below floor level

A resident at Margaret Street, Newtown stated that during a short heavy shower the whole of Margaret St. acts like a river. The drains are constantly blocked on the corner of Margaret and Ferndale streets and since they are at the bottom of the dip from King St. and Enmore Rd., the water rushes into Margaret St. The drains cannot cope with the amount of flow and parked cars cause water to flood onto the pavement. They have digital photos which have not been provided at this time. They also stated that luckily they have a front step; otherwise the water would flood the inside of their house.

Residents at Enmore Road and King Street, Newtown are located at the upstream end of the catchment. Resident at King Street, Newtown stated that severe road flooding occurs in heavy rain. Stormwater backs up in the gutters and cars then spray water into the shop as they drive past.

4.2.1 Additional Flooding Information

A resident at Fulham St., Newtown experienced a lot of damage during a storm event due to backflow from sewers which flooded the backyard up to the kitchen door and up the drain in bathroom. They also noted that the drains near St. Peters Station on King St. and along King St. from Princes Highway, especially at the corner of Sydney Park Rd to about the corner of Church St., are clearly inadequate causing severe flooding and huge pools of water. This makes passage across King St. or along it very difficult in heavy rain. Separation of sewers from stormwater drains is recommended by the resident to be a priority.

Four respondents on Pemell St. experience flooding during heavy rain. A resident at Pemell St. stated that during periods of heavy rain, the storm water over flows from the roadside gutter allowing water to run down the driveway into the underground car park. The car park is fitted with a sump and pump but this cannot keep up with the flow of the storm water. The last occurrence of this event was during October 2008 which left the car park flooded with around 2-3 inches of water. There is not much difference between the top of the driveway and the top of the gutter, the driveway is located approximately 1 metre from a drain which runs into an easement between two properties along Pemell Lane.

Residents at Pemell St., and Pemell St. Newtown (respondents 0162 & 0196) noted that the drains along Pemell, Reiby and Don St. are regularly blocked due to rubbish and tree debris. The drain in front of a property on Pemell St. becomes blocked during rain events and causes flooding in their front yard. A resident at Pemell St. stated that there is a stormwater drain between two properties on Pemell St. which becomes blocked and allows water to pool on the footpath. Respondent 0181 at Pemell St., Newtown noted that stormwater ponds in the gutter and sometimes flows on to nature strip. This occurs when fallen leaves are not cleared from the grid over drain which runs between the two premises.

One respondent, 0194, at Rawson St., wrote that they live in a group of terraces which have stormwater running under them every time it rains. This creates massive rising damp problems and when it rains for days on end, it's like a creek of running water under their homes.

Respondent 0179 of Reiby St., Newtown stated that during heavy rains the stormwater in front of their house is often redirected by wheels of parked cars onto the footpath rather than to the drain, which results in topsoil and plants being carried away from around the street tree. The resident then replaces the topsoil however the soil remains saturated and the tree has not grown very big. This is the third tree planted by council in 12 years. The gutters on Reiby St. flow downhill from Enmore Rd like rivers in heavy rain. Rubbish from the entertainment and eating venues on Enmore Rd result in covering drains and water pooling. For example on Sunday 9 March 2009 at 6:30pm the water was pooling around the blocked drains on the corners of Reiby St. and Don St., and Reiby St. and Pemell Street. The rubbish collecting in the drains is a constant problem (e.g. bottles, plastic bags, etc.).

The resident at Reiby St, Newtown, (respondent 0047) stated that water has risen over the kerb on a few occasions in front of their house.

A resident at Station Street, Newtown noted that Station St., Bailey St. and Holt St. are flood prone, as shown on Figure 3. They stated that every time there is a heavy downpour, the stormwater drain at Holt/Station Streets cannot handle the volumes of water so the roads flood. There also seams to be an aquifer between Bailey St and Station St. Their house always has water under it and they have had to put in a sump pump to handle it. They believe that there were wells that tapped into this aquifer back in the time when Mary Reiby had a farm there.

4.3 Alice Street and Camden Street Area, Newtown

The area surrounding Alice Street and Camden Street, Newtown that was identified to experience flooding by various residents is shown on Figure 4. The following table outline the properties that have experienced flooding.

Table 3: Alice St. and Camden St., Newtown

ID	Address	Parts of Property Flooded
0024	Camden Street, Newtown	Car park
0098	Alice St., Newtown	Backyard
0105	Alice St., Newtown	Backyard
0112	Alice St., Newtown	Backyard
0120	Camden St., Newtown	Backyard, building below floor level
0203	Simmons St., Newtown	Residential

Thirty-one respondents (15%) identified the intersection of Alice St., Edgeware Rd and Llewellyn St. to be a flood affected area. A resident at Edgeware Rd, Newtown experiences flooding at the back of the property and notes that there is major flooding on the road during heavy rain and that after a few days of continual rain (e.g. more than 2 hours) the flooding at the corner of Edgeware Rd and Alice St. ccreates a pool of stormwater that can remain for significant period after the rain has ceased. A resident at Alice St. Newtown stated that there was an extremely heavy rain event which may have caused movement in the sewerage pipes on the rear lane of the property. As a result, the pipes cracked and had to be replaced.

4.3.1 Other Flooding Information

A resident on Alice St., Newtown (respondent 0137) experienced flooding across the rear of their property when neighbours guttering were inadequate. The problem has since been resolved.

Two residents on Simmons St reported flooding and blockage of drains along Simmons St. Respondent 0203 stated that the blockage of drains results in the pooling of water. On multiple occasions water has pooled and they have had to get out a broomstick and try to unblock the drain. They also stated that their insurer made them acquire flood cover for their property.

Respondent 0209 at Simmons St. has reported the flooding to council twice. Stormwater overflows the gutter and floods into the wheels, exhausts and engines of their motorcycles leaving debris and rubbish in/on their motorcycles (Photos provided in Attachment B). The residents have contacted the Council twice; however there doesn't appear to be any drains where the problem occurs. The resident has suggested that the property is at the lowest point in the street and it becomes very damp and musty from the water pooling in this area.

Respondent 0099 (resident at Camden St. Enmore) stated that stormwater regularly overflows on Simmons St., Enmore and is sometimes as high as the bottom of car doors.

Respondents 0111 (Simmons St. Enmore), 0115 (Margaret St. Newtown) and 0120 (Camden St. Newtown) stated concerns of flooding on the corner of Sarah St. & Simmons St.; and along Margaret St., and Marian St. Respondent 0115 (Margaret St. Newtown) stated that Margaret St. floods over the road and footpath and smells like sewage.

4.4 Industrial Area, Newtown

The Industrial area surrounding Edinburgh Rd. Newtown that was identified to experience flooding by various residents is shown on Figure 5. The following table outline the properties that have experienced flooding.

Table 4: Industrial Area on Edinburgh Rd, Newtown

ID	Address	Parts of Property Flooded
0001	Edinburgh Rd, Marrickville	The building above floor level – See Attachment B for photos
0170	Edinburgh Rd., Marrickville	The building below floor level over a prolonged period; days after it had stopped raining
0173	Edinburgh Rd., Marrickville,	In the front of the building

Respondent 0001 have taken photos of a flooding event 10 years ago. They noted that they have not experienced flooding to that degree since, although they are worried about flooding when it rains.

Respondent 0170 stated that in September 2008 they experienced flooding over a number of days. They notified Council of the problem and Council came to fix it.

4.5 Lord St. and Edgeware Rd. Surrounding Areas

The area around Lord St., which includes Darley St., Wells St. and John St. that was identified to experience flooding by various residents, is shown in Figure 6. The following table outline the properties that have experienced flooding.

Table 5: Lord St., Edgeware Rd/Lord St. intersection and Surrounding Area, Newtown

ID	Address	Parts of Property Flooded
0042	Lord St., Newtown	Front yard
0048	Lord St., Newtown	Front yard, building above floor level
0076	Lord St., Newtown	Front yard, building below floor level
0117	Lord St, Newtown	In front of house
0134	Edgeware Rd., Newtown	Front yard, Garage
0172	Edgeware Rd., Newtown	Front yard, Garage
0174	Lord St., Newtown	Front yard
0178	Darley St., Newtown, NSW	Backyard, side laneway
0187	Lord St. – Does not want to be contacted	Front yard

4.5.1 Additional Flooding Information

A number of residents were concerned about flooding along Lord St. and the intersection of Lord St. and Edgeware Rd. A number of respondents from Lord Street stated that Lord St. floods during torrential rain storms and the street resembles a river. Stormwater drainage has been improved by Council (Circa 1998) which has stopped the stormwater drain on John St. from overflowing. A resident at Lord St., Newtown (respondent 0076) stated that a high water table in the Lord St. area caused his house to be prone to flooding until agricultural pipes were put along the side of the house. However, flooding can reach the front door from the road and footpath. Respondent 0174 at Lord St., Newtown said that flooding of the roads and footpaths occurs often and huge amounts of water are seen at the intersection of John St. and Lord St.

Two residents at Edgeware Rd. located at the corner of Edgeware Rd. and Lord St., near the Bedwin Bridge have experienced significant flooding (respondent 0134 and 0172). A resident at Edgeware Rd stated that at times the entire end of the street extending under the bridge has been flooded to the point where buses could not get through. Cars were flooded and water came up to the top of the steps of the house. This resident has a video of the flooding outside of their house. The video was not provided.

A resident at Edgeware Rd. (respondent 0134) stated that the area floods during every heavy rain event and flooding occurs to several garages at a time. They also stated that this is the lowest part of Newtown and Council has planned to fix the problem for 15 years but has still not put a drain in. There are water marks on the inside garages in propoerties along Edgeware Rd and several of the tenants have had their cars badly damaged by the flooding of their garages, i.e. the water was high enough to enter the car.

Residents at Darley St. stated that during heavy rain for several days runoff from the back of Wells St. properties run through Darley St (adjoining laneways) and into Darley St. and pond at the corner of John St. There has also been runoff during smaller events but to a lesser extent. Runoff from Wells St. regularly comes through their backyard when there is heavy rain. Three years ago they installed a retaining wall and drainage to allow them to install decking and to help control the runoff. This has been partially successful but has not been tested by a large rainfall event. Another problem is that the stormwater drain in Darley St. does not seem to be large enough to contain all of the stormwater runoff. So even if the stormwater leaves the property, when it gets to the front, it flows in the gutter rather than in a storm drain.

4.6 Goodsell St. and May St. Area

The area around Goodsell St. and May St. that was identified to experience flooding by various residents as well as the addresses of the residents mentioned in the following table are shown on Figure 7.

Table 6: Goodsell St. and May St., St. Peters

ID	Address	Parts of Property Flooded
0069	Goodsell St., St. Peters	Front yard and backyard, buildings below the floor level
0072	Goodsell St., St. Peters	Backyard, buildings below the floor level
0083	Goodsell St., St. Peters	Backyard
0091	May St., St. Peters	Front yard and backyard, buildings below the floor level
0097	Goodsell St. St. Peters	Backyard, Garage
0119 & 0200	May St., St. Peters	Backyard, building above and below floor level; Note: fabric of building severely salt damaged
0159	Goodsell St., St. Peters	Garage, building below floor level, side of building – see Attachment B for photos
0164	Goodsell St., St. Peters	Garage floor and buildings below the floor level

Residents at May St., St. Peters noted that Council built a gutter at the back of the row of terraces in February 2002 but there has been some flooding since then.

4.6.1 Additional Flooding Information

Five residents on Goodsell St. have stated concerns about flooding. Respondent 0159 (Goodsell St. at the corner of Council St and Goodsell St.) said that the drains are often blocked and are not able to handle the flow of water. Water then backs up the street and into their home via that roller door on Council St. Water also laps at the walls of their house from time to time. Photos of flooding provided by the resident are presented in Attachment B.

Residents in stated that during a rain event the gutters overflow onto the footpath. Respondents 0069 and 0097 said that their backyard submerged from water in the back lane due to May Lane completely overflowing. During a rain event a row of 4 of 5 houses on Goodsell St. were flooded. The water drained away fairly quickly. The garbage bags in May Lane stopped the water from flowing freely. It was also noted that when cars park close to the gutter, the water gets blocked and floods over the footpath on both sides of Goodsell St. They recommend a yellow lane approximately 60cm away from the curb and parallel to the gutter would help water flow freely.

A resident at Darley St. Newtown (respondent 0140) stated that whenever large amounts of rain falls, runoff from Wells St., Holmwood St., Dickson St. and Pearl St. flows to John St. The intersections of John St. and Darley St.; and John St. and Lord St. always flood. Sometimes the stormwater covers on the road are lifted which makes it very dangerous for drivers as they are unable to see that the covers have been lifted. Footpaths also become flooded. When renovating, residents were asked to direct stormwater out to the street. In my view this has increased the amount of runoff which ends up flooding our roads and pavements. Stormwater needs to be connected underground or allowed to flow in the gardens, soak pits or tanks; and tanks should be allowed to have pumps. Respondent 0095 also noted water ponding near the intersection of Darley St and John St., coming from runoff in Wells St.

Residents at May St., St Peters (respondents 119 & 200) stated that flooding occurred in their backyard and in the building both above and below the floor level. Respondent 200 stated that they have some letters that were sent to council dated 1999 and 2002 regarding drainage works both proposed and some completed. A gutter at the back of the row of terraces was completed in February 2002, however flooding has occurred a few times in the last 12 months; the resident attached a survey plan of the installed works. This resident has photos of flooding in the park and at the rear of the properties and letters to council and copies of proposals from council. The photos and other information were not provided. There is a pipe (approximately 60 cm diameter) under the council depot road/entrance to the park which takes all of the water of the surrounding park to the stormwater holding basin. They suggested that the stormwater holding basin on the corner of May St. and Belmont St. could be utilised as water storage and used to water parks. Water is currently only stored temporarily then pumped back into stormwater system when the system can handle water.

Respondent 0116 (Applebee St., St. Peters) said that near the corner of Applebee St. and May St. flooding occurs often for weeks at a time, and is sometimes not related to rainfall.

4.7 Campbell St. and Surrounds, St Peter

The area around Brown St., Florence St. and Campbell St. that was identified to experience flooding by various residents is shown on Figure 8. The following table outline the properties that have experienced flooding.

Table 7: Brown St, Florence St and Campbell St, St. Peters

ID	Address	Parts of Property Flooded
0013	Brown St., St. Peters	Front yard
0025	Brown St., St. Peters	Backyard, Garage
0054	Florence Street, St Peters	Front yard
0086	Brown St., St. Peters	Residential – not specific
0089	Campbell St., St. Peters	Front yard, building below floor level
0106	Campbell St., St Peters	Front yard, building below floor level

ID	Address	Parts of Property Flooded
0146	Unwins Bridge Rd., St. Peters	Building above floor level. Four factories flooded at low lying areas.
0171	Hutchinson St., St. Peters	Backyard
0205	Lackey St., St Peters	Garage, building above and below floor level

Thirty respondents (14% of the total) identified the intersections of Campbell St. and Hutchinson St., and Campbell St. and May St. as a main concern where flooding occurs.

There were three residents who are not located within the main areas of concern that have experienced flooding on their properties, respondent 0014 & 0175 at King St., Newtown, and respondent 0064 at Pearl St., Newtown.

4.7.1 Additional Flooding Information

The area south of Camdenville Oval, as shown on Figure __,experiences flooding which includes the intersection of May St and Campbell St.; Hutchinson St. and Campbell St.; Brown St., Florence St. and Lackey St.

A resident at Campbell St. St Peters (respondent 0106) stated that the flooding affects everyone on Brown St. and Campbell St. The flooding also affects them exiting out their front door and side door of their house. They have contacted both the RTA and Marrickville Council about the flooding and cars breaking down due to water damage. They have recommended putting up Flooding signage but have received no response from either the RTA or council.

Respondent 0089 at Campbell St. St. Peters stated that flooding occurs from Simpson Park across Hutchison St., along Campbell St. and past Brown St. Cars get flooded and stuck in the water and pedestrians are unable to walk past this area. The flooding also affects them while leaving their property.

Respondent 0141 noted flooding in Camdenville Oval at the end of May St. They stated that the site originally was Gumbromorrah swamp before becoming Goodsell's brick pit. Goodsell's brick pit was then filled in. They would like to see heritage panels at the site explaining this history.

Respondent 0141 and 0039 noted that Hutchinson St (East-West) floods immediately after heavy rain which causes overland flow on the downhill slope of the footpath and overfull street gutters carrying a fair volume of water. Another concern was that roof areas on factories are very large and most discharge water directly into the storm sewer and the street. The water carries very large quantities of litter - plastic bottles, bits of polystyrene, wrappers which get washed down in heavy rains.

Respondent 0146 at Unwins Bridge Rd., St. Peters stated that several times after a heavy down pour the corner of Bedwin St. has been down to one lane between due to flooding. The noticed that the water could not drain away since all of the drains were at full capacity.

A resident at Lackey St., St Peters (respondent 0205) stated that Lackey St is unable to cope in heavy rain and the street fills with water above the gutter height and usually runs off into the park. Around 2 years ago, flooding caused sewer back up resulting in raw sewage flowing through their garage, possibly from the next doors sewer line, the odour is still present at times.

4.8 Calibration Data

The information provided by residents was processed to identify historic events that could be used for calibration. In addition, the anecdotal evidence of flooding was also summarised to compare the model results with general description of flooding provided by the residents.

4.9 Common Recommendations from the Residents

Common recommendations from the respondents of the flood survey are:

- Several respondents requested more frequent cleaning of the streets from leaf debris and rubbish;
- Flood signage in flood prone areas – respondent 0106;
- Stormwater harvesting, providing industry in the area with recycled stormwater – respondents 0123 & 0186;
- Council should expand the rainwater incentive into this region – respondent 0036;
- The stormwater holding basin on the corner of May St. and Bedwin Rd. could be utilised as water storage and used to water parks. Water is currently only stored temporarily then pumped back into stormwater system when the system can handle water. – respondent 0200;
- Respondent 0184 suggested that a stormwater retention pond which collected runoff from the Department of Education facilities (St. Peters Primary School & James Bannerman Reserve) would provide relief. Currently the runoff from these areas flows to Campbell St.
- Respondent 0141 noted flooding in Camdenville Oval at the end of May St. They stated that the site originally was Gumbromorrah swamp before becoming Goodsell's brick pit. Goodsell's brick pit was then filled in. They would like to see heritage panels at the site explaining this history.
- Respondent 0156 wonders why the area around the Enmore TAFE, which is low lying and an obvious collection area for stormwater, aren't there underground pipes to catch runoff from flooding in Simmons, James and the street on the other side of TAFE?

Respondent 0021 would like Council to consider the potential implications of climate change to overland flows in the subcatchment. The resident understands that typical flood modelling, including local drainage modelling typically uses historical data from Australian Rainfall and Run-off. However with storm events predicted to become more intense and frequent, it is important that future flood modelling use contemporary data and factor in a potential increase in rainfall of 15% based on CSIRO predictions of climate change impacts in the Sydney catchments.

Report Signature Page

GOLDER ASSOCIATES PTY LTD

Justin M W Bell

Dr. Justin Bell
Senior Environmental Engineer

MK, JRB/HR,LBJ/mk, jrb

A.B.N. 64 006 107 857

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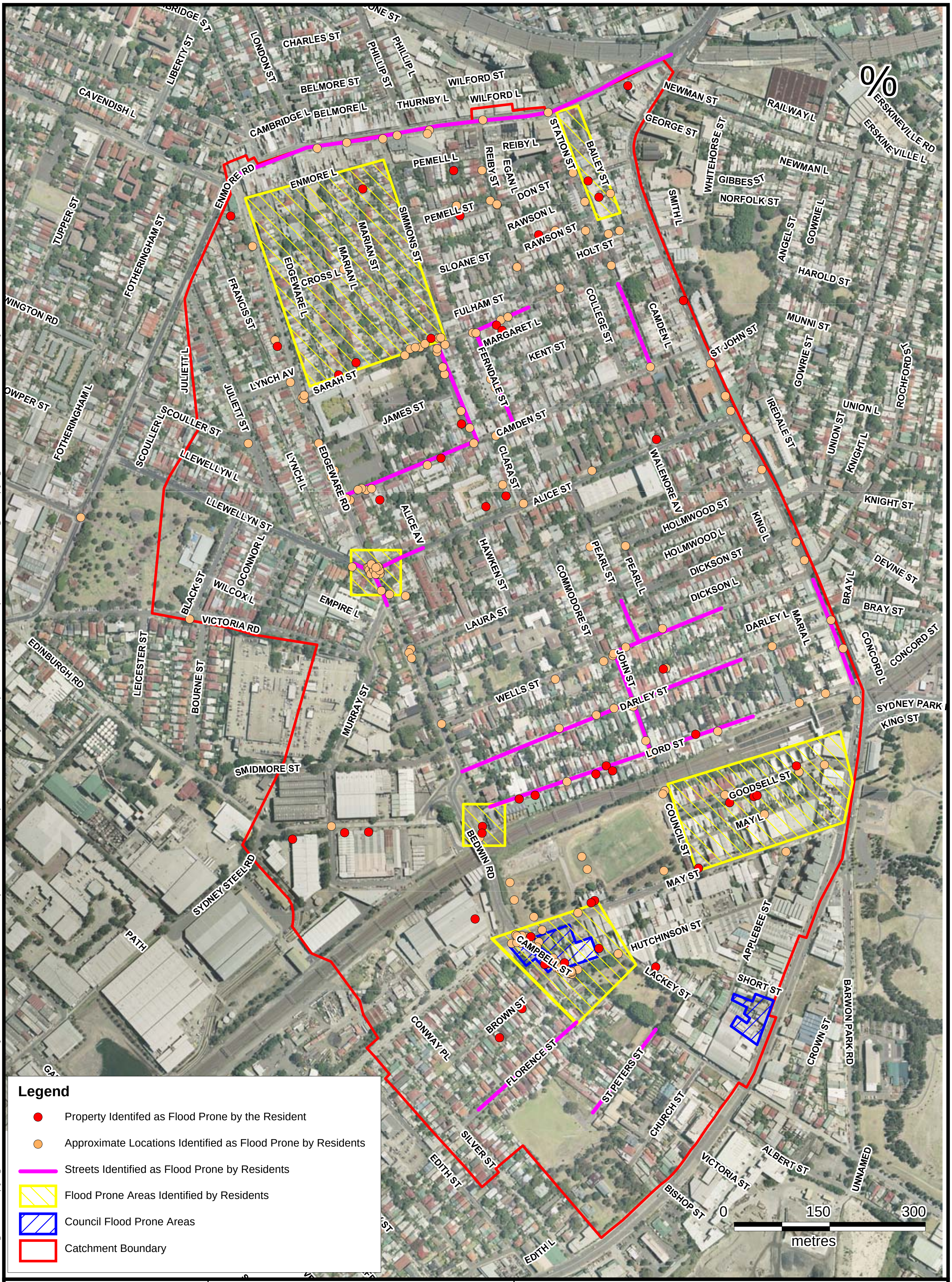

CLIENT MARRICKVILLE COUNCIL		PROJECT Results of Community Flood Study		
DRAWN AJW	DATE 9/06/2011	TITLE **CATCHMENT AREA WITH OVERVIEW OF FLOODING CONCERNS**		
CHECKED JRB	DATE 9/06/2011			
SCALE 1:800		PROJECT No 097626003	FIGURE No **1**	REV No 1 A4

Golder Associates

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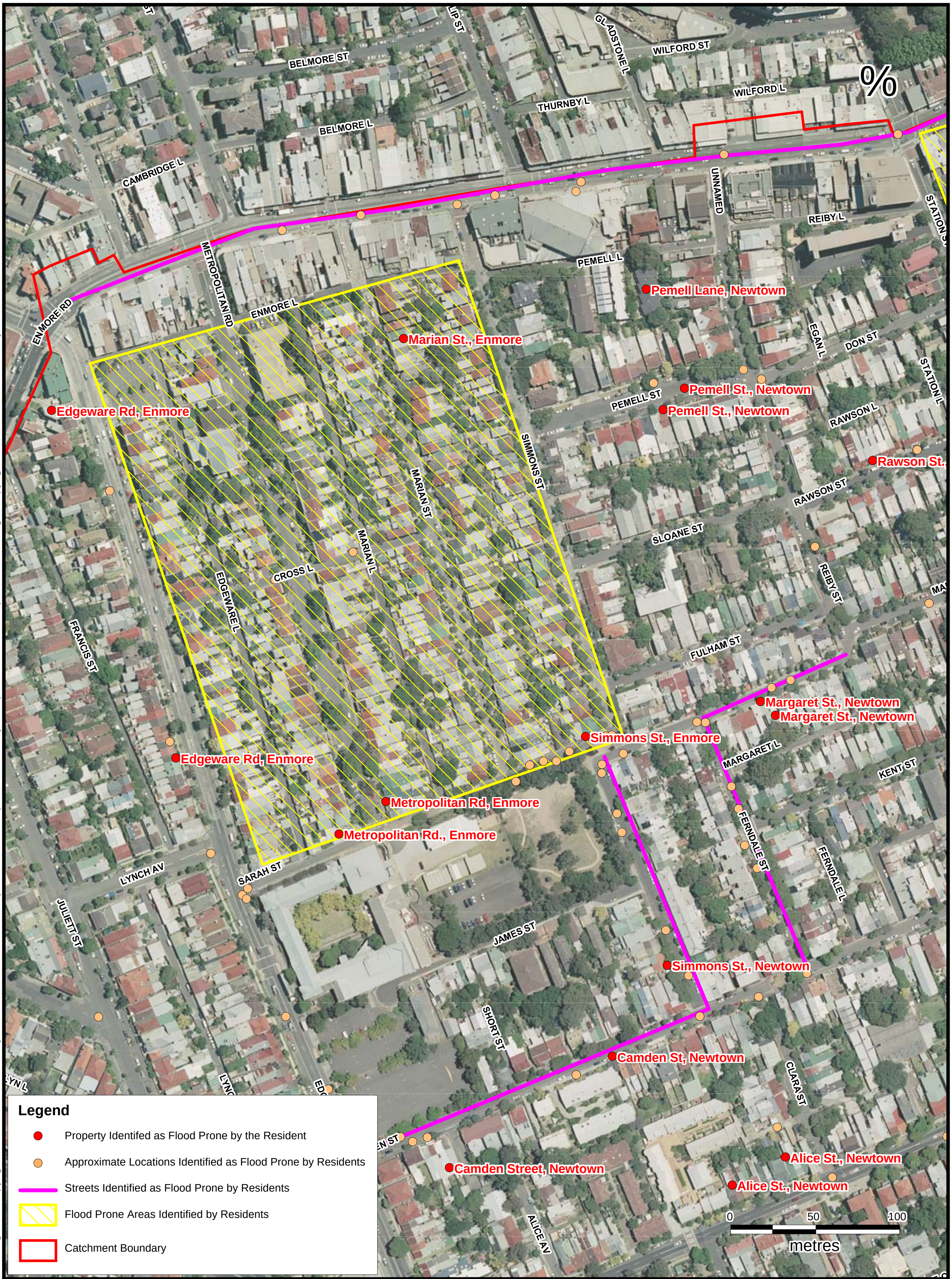

Golder Associates

CLIENT		PROJECT		
MARRICKVILLE COUNCIL		Results of Community Flood Study		
DRAWN AJW	DATE 9/06/2011	TITLE NORTH WEST PORTION OF SUBCATCHMENT ENMORE		
CHECKED JRB	DATE 9/06/2011			
SCALE 1:300		PROJECT No 097626003	FIGURE No 2	REV No 1 A4

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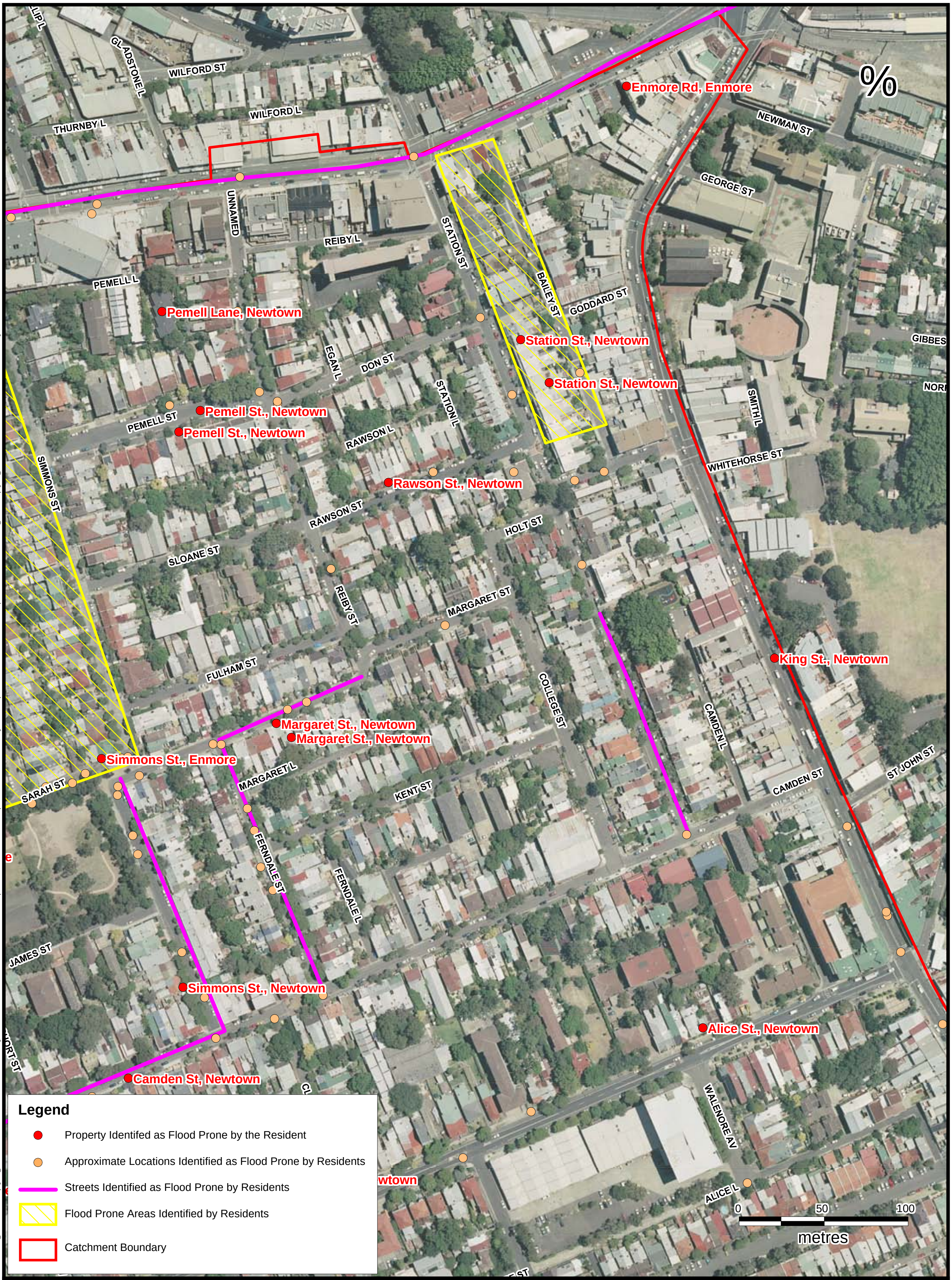

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CLIENT MARRICKVILLE COUNCIL		PROJECT Results of Community Flood Study	
DRAWN AJW	DATE 9/06/2011	TITLE **NORTH EAST PORTION OF SUBCATCHMENT ENMORE**	
CHECKED JRB	DATE 9/06/2011		
SCALE 1:300		PROJECT No 097626003	FIGURE No **3** / REV No 1 / A4

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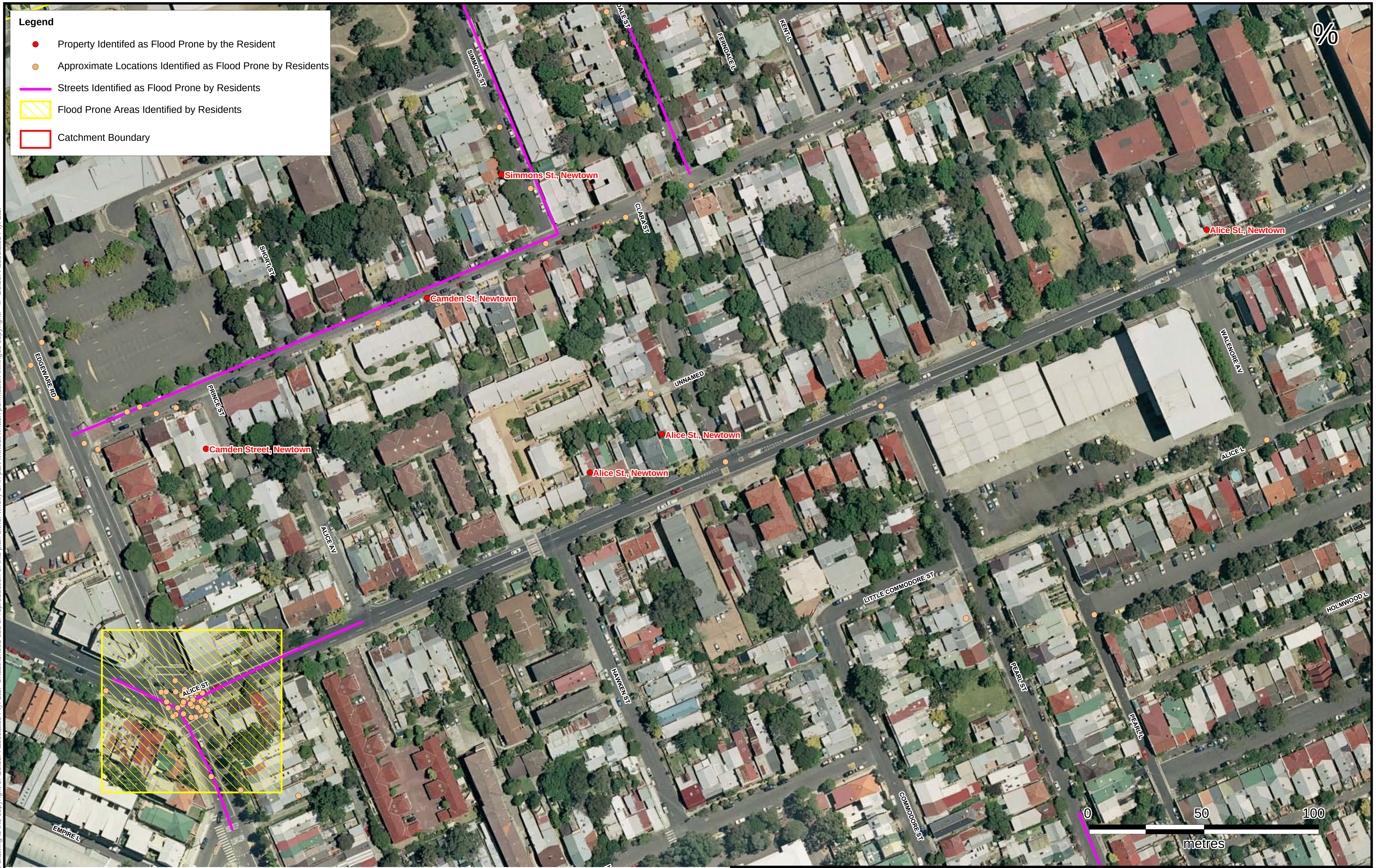

CLIENT MARRICKVILLE COUNCIL		PROJECT Results of Community Flood Study	
DRAWN AJW	DATE 9/06/2011	TITLE ALICE ST. AND CAMDEN ST NEWTOWN	
CHECKED JRB	DATE 9/06/2011		
SCALE 1:150		PROJECT No 097626003	FIGURE No 4 · REV No 1 · A3

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CLIENT	MARRICKVILLE COUNCIL	PROJECT	Results of Community Flood Study
DRAWN	AJW	DATE	9/06/2011
CHECKED	JRB	DATE	9/06/2011
SCALE	1:150	PROJECT No	097626003

TITLE: INDUSTRIAL AREA ON EDIMBURGH RD NEWTOWN

FIGURE No 5 | REV No 1 | A3

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Golder Associates

CLIENT: MARRICKVILLE COUNCIL		PROJECT: Results of Community Flood Study	
DRAWN: AJW	DATE: 9/06/2011	TITLE: LORD ST., EDGEWARE RD/LORD ST. INTERSECTION AND SURROUNDING AREA, NEWTOWN	
CHECKED: JRB	DATE: 9/06/2011		
SCALE: 1:150		PROJECT No: 097626003	FIGURE No: 6 / REV No: 1 / A3

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Golder Associates

CLIENT	MARRICKVILLE COUNCIL	PROJECT	Results of Community Flood Study
DRAWN	AJW	DATE	9/06/2011
CHECKED	JRB	DATE	9/06/2011
TITLE	BROWN ST., FLORENCE ST. AND CAMPBELL ST. ST. PETERS		
SCALE	1:150	PROJECT No	097626003
FIGURE No	7	REV No	1
A3			

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CLIENT		PROJECT
MARRICKVILLE COUNCIL		Results of Community Flood Study
DRAWN AJW	DATE 9/06/2011	TITLE BROWN ST., FLORENCE ST. AND CAMPBELL ST. ST. PETERS
CHECKED JRB	DATE 9/06/2011	
SCALE 1:150		PROJECT No 097626003 · FIGURE No 8 · REV No 1 · A3

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APPENDIX A

Community Survey

EC EAST SUBCATCHMENT MANAGEMENT PLAN

QUESTIONNAIRE

Please answer the following eight questions as best you can. When you have finished answering the questions, please return these pages in the enclosed "reply-paid" envelope by **Friday 20 March 2009**.

Q1. Could you please provide us with your contact details as we may need to verify some of the information with you (Your contact details will remain completely CONFIDENTIAL).

Name: ……………………………………………………………………………………….

Address: …………………………………………………………………………………….
…………………………………………………………………………………………………..
…………………………………………………………………………………………………..

Day time phone number: ………………………………………………………………….

E-mail: ……………………………………………………………………………………....

Q2. How long have you lived / worked / shopped / run a business in the EC East Subcatchment?

.... months
.... years

Q3. Have you ever observed or experienced stormwater ponding or overland flows in the EC East Subcatchment? If so can you indicate below what you observed of experienced?

For example, your property may have been affected by stormwater from the street entering your habitable areas or just the front or backyards. You may also have observed overland flow in your street that affected a neighbours property or perhaps near where you work or shop. (Please tick the appropriate box).

PROPERTY FLOODED ☐ ROAD FLOODED ☐

INCONVENIENCED ☐

Q4. If possible, can you please give the address and / or show the location of stormwater ponding or overland flow on the map included at the end of this questionnaire?

Address:……………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

Q5. Do you remember when the stormwater ponding or overland flow occured? (Tick one box)

YES ☐ NO ☐

If you answered YES, please give us the specific time of flooding as far as you can remember.

No.	Time of day	Day	Month	Year
1				
2				
3				
4				

Details of the event:
....
....
....
....
....
....

Q6. (a) Can you describe what type of property was affected?
(You may tick more than one box)

RESIDENTIAL ☐ ROADS & PATHS ☐
COMMERCIAL ☐ OTHER ☐
PARKS ☐

If 'OTHER', please specify: ....

(b) Can you describe the area of the property that was affected?
(You may tick more than one box)

FRONTYARD ☐ BUILDING (ABOVE FLOOR LEVEL) ☐
BACKYARD ☐ BUILDING (BELOW FLOOR LEVEL) ☐
GARAGE ☐ OTHER ☐

If 'OTHER', please specify: ....

Q7. If you have experienced stormwater ponding or overland flow in the EC 1 East subcatchment, do you have any evidence of the extent of the affected areas? (Tick one box)

YES ☐ NO ☐

If you answered YES, please give as much detail as possible.

It could be a photograph or a video that you may have taken of the event. You may be able to point out a mark on the wall or a post in the street that relates to the depth of ponding or flow during a particular event.

We would also appreciate if you could inquire from someone you know, who has lived in the area for a long time and may have the above information.

Details of the information:

....
....
....
....
....
....
....
....
....
....

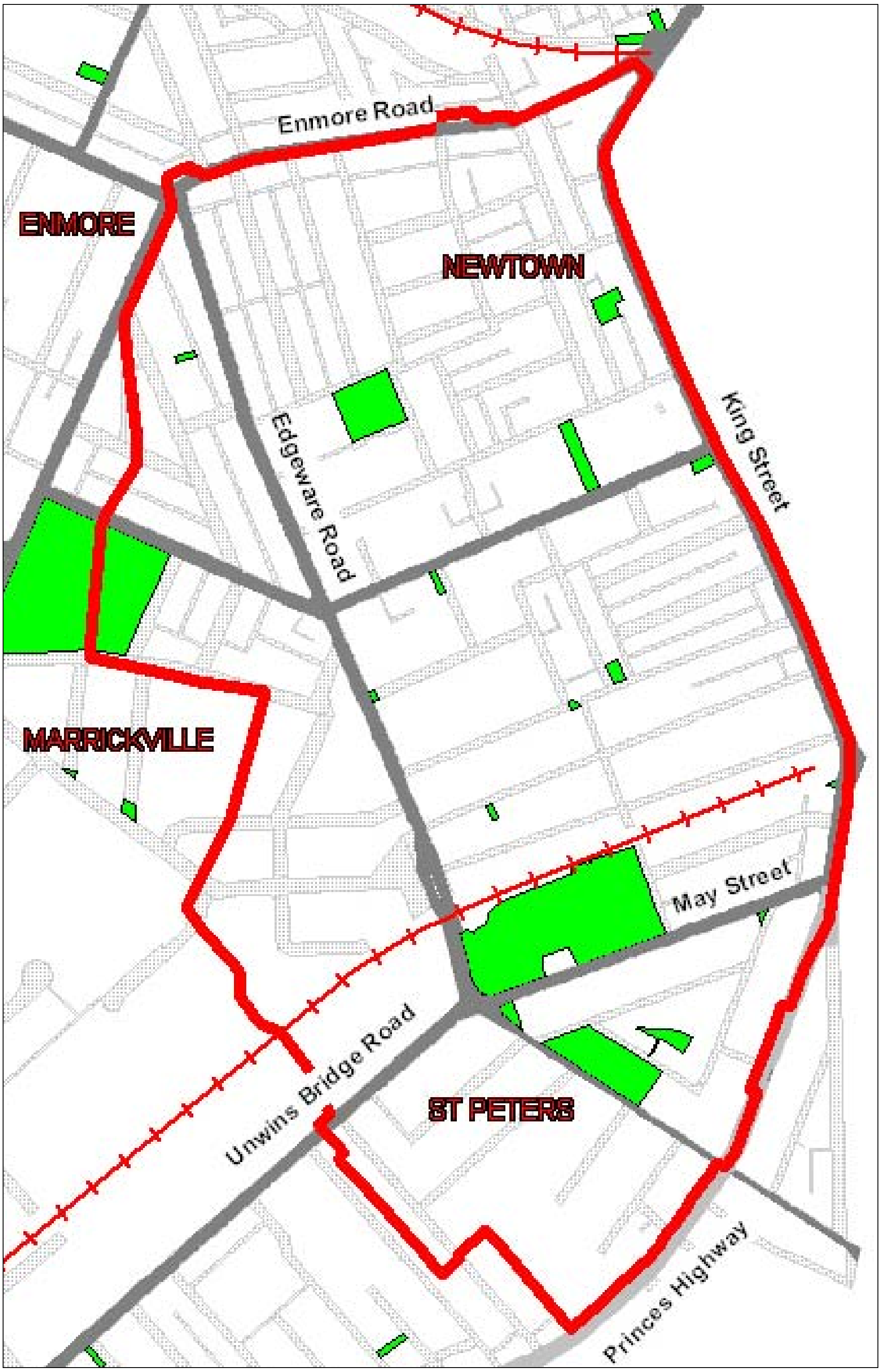
Q8. Is there anything else you would like to tell us about stormwater ponding or overland flows in the EC 1 East subcatchment?

If so, please provide the information below:

....
....
....
....
....
....
....
....
....
....
....
....

Thank you for providing the above information.

EC East Subcatchment Map



APPENDIX B

Provided Photos

Photo 1 – Respondent 0001 - Edinburgh Rd, Marrickville;
Edinburgh Rd approximately 10 years ago.

Photo 2 – Respondent 0001 - Edinburgh Rd, Marrickville;
Inside garage approximately 10 years ago

Photo 3 – Respondent 0001 - Edinburgh Rd, Marrickville;
Edinburgh Rd approximately 10 years ago

Photo 4 – Respondent 0159 – Photo taken at the north end of Council St. where the street meets the rail access gates.

Photo 5 – Respondent 0208 –Margaret St., Newtown; March 14, 2009 at 4:15pm

Photo 6 – Respondent 0208 –Margaret St., Newtown; March 14, 2009 at 4:15pm

Photo 7 – Respondent 0208 –Margaret St., Newtown; March 14, 2009 at 4:15pm

Photo 8 – Respondent 0208 –Margaret St., Newtown; March 14, 2009 at 4:15pm

Photo 9 – Respondent 0209 –Simmons St., Newtown

Photo 10 – Respondent 0209 –Simmons St., Newtown

Photo 11 – Respondent 0209 –Simmons St., Newtown

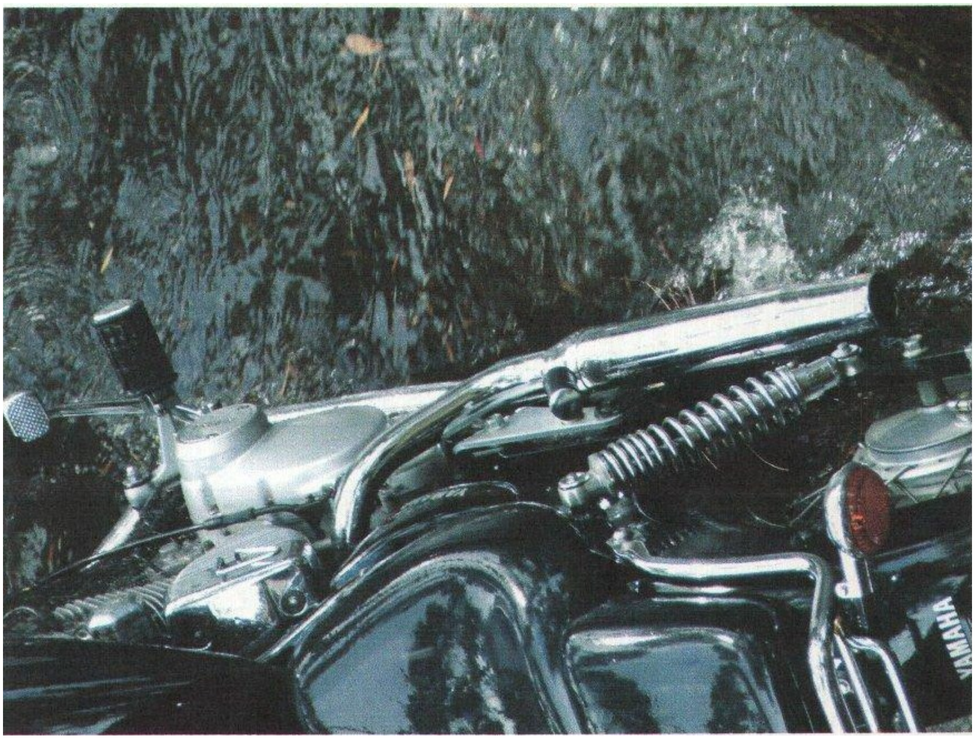


Photo 12 – Respondent 0209 –Simmons St., Newtown

Photo 13 – Respondent 0209 –Simmons St., Newtown

Photo 14 – Respondent 0209 –Simmons St., Newtown

Photo 15 – Respondent 0209 –Simmons St., Newtown

Photo 16 – Respondent 0209 –Simmons St., Newtown

Photo 17 – Respondent 0209 –Simmons St., Newtown

Photo 18 –Ferndale St. from Margaret Lane to Kent St.

Photo 19 –Ferndale St. from Margaret Lane to Kent St.

Photo 20 –Ferndale St. from Margaret Lane to Kent St.

Photo 21 –Ferndale St. from Margaret Lane to Kent St.

Photo 22 –Ferndale St. from Margaret Lane to Kent St.

Photo 23 –Ferndale St. from Margaret Lane to Kent St.

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APPENDIX C

Community Flood Survey Details

ID	Length of time they have lived/worked/shopped etc. in EC subcatchment	Have they observed ponding or flooding	Address of flooding	When flooding occurred	Details of Event	Type of property affected	Area of property affected	Evidence of flooded extent/area	Photos provided	Details of Flooding extent	Any other Information	Locations marked on Survey Map	Calibration data available Y/N?	Details of calibration data
0001	40 years	Yes	Cnr Edinburgh & Murray St, Marrickville	10 years ago or more		Smash Repairs business	Building above floor level	This was 10 years or more. I think they have replaced the storm water pipes since then and we haven't had it like that since. Although we are very worried when it rains heavily	Yes		Our drains build up it causes flooding when it rains heavy		Yes	Cnr Edinburgh & Murray St, Marrickville. Flooding above floor level of building, 10 years ago or more.
0002	10 months	No							No				No	
0003	9 months	No							No				No	
0004	2 years	Yes	Intersection of Hutchinson St. and Campbell St, St Peters	-	It occurs in all heavy rains.	Roads and paths		None	No			Yes	Yes	Intersection of Hutchinson St. and Campbell St, St Peters. Floods whenever there is heavy rain
0005	Over 40 years	Yes	Where Campbell St. meets Brown St and Hutchinson St.	-	Every time we get heavy rain	Roads and paths		None	No			Yes	Yes	Cnr Campbell St., Brown St and Hutchinson St. Floods whenever there is heavy rain
0006	12 years	Yes	Cnr. May St. and Campbell St., St Peters (opposite Town and Country Pub)	-				None	No				Yes	Cnr. May St. and Campbell St., St Peters (opposite Town and Country Pub)
0007	19 years	Yes	Cnr. Margaret St. and Ferndale St.	Regularly	Whenever it rains there is substantial ponding on the corner of Margaret and Ferndale St, Newtown	Roads and paths		None	No				Yes	Whenever it rains there is substantial ponding on the corner of Margaret and Ferndale St, Newtown
0008	3 years	Yes	All of Ferndale St.	Always floods during extensive rain events		Roads and paths		None	No		Ferndale St. sits on the bottom end of a small hill. Current drainage cannot cope with the heavy rain events. Water subsides quickly after the rain finishes. Generally only occurs during very heavy rain events. Fine during lighter rain		Yes	All of Ferndale St. Always floods during extensive rain events
0009	12 years	No							No				No	
0010	4.5 years	No							No				No	
0011	1 month	Yes	1. Camden St cnr Edgeware alongside TAFE car park. 2. Cnr Alice and Edgeware SE corner	1. February 2009 2. Weekend 20-22 Feb 09	1. Has been water on road almost every day since I moved here (has been raining lots). 2. Water formed large pool on road on corner - both Alice and Edgeware Roads - after heavy rain during week	Roads and paths	Gutter, road edges	None	No				Yes	1. Camden St cnr Edgeware alongside TAFE car park. 2. Cnr Alice and Edgeware SE corner. 1. February 2009 2. Weekend 20-22 Feb 09
0012	2.5 years	Yes	Liberty Street, Edgeware and Alice Street corner plus Edgeware Rd	1. 15th(ish) December 08 2. 6:30pm 5th? Dec 07 3. 5:30pm Jan 09		Roads and paths		None	No			Yes	Yes	Liberty Street, Edgeware and Alice Street corner plus Edgeware Rd. Three occasions noted: 15th(ish) December 08, 6:30pm 5th? Dec 07, 5:30pm Jan 09
0013	1 year	Yes	Cnr Brown St. and Campbell St., St Peters	Whenever it rains		Residential	Front yard		No				Yes	Cnr Brown St. and Campbell St., St Peters. Floods whenever it rains
0014	15 years	Yes	King St., Newtown, Sydney			Residential			No				Yes	King St., Newtown, Sydney. Residential property
0015	5.25 years	Yes	1. Lord St. Newtown, near King Street. 2. King St between Lord and Alice		During rain, north side of Lord Street (near King Street) floods to almost the middle of the road, several inches deep at kerbside.	Roads and paths			No			Yes	Yes	1. Lord St. Newtown, near King Street. 2. King St between Lord and Alice. During rain, north side of Lord Street (near King Street) floods to almost the middle of the road, several inches deep at kerbside.
0016	42 years	No							No				No	
0017	20.5 years	Yes	Junction of May/Unwins Bridge/ Campbell/Bedford as far as Hutchinson St.	Following any heavy rain		Residential, Roads and Paths, Commercial	Front yard	Yes	No	Well known problem area			Yes	Junction of May/Unwins Bridge/ Campbell/Bedford as far as Hutchinson St. Flooding to Residential, Roads and Paths, Commercial. Well known problem area
0018	2 years	No							No				No	
0019	9 years	Yes	Road flooded on Margaret St. and Holt St.			Roads and paths	Street		No				Yes	Road flooded on Margaret St. and Holt St.
0020	3 years	Yes	All along Enmore Rd	After heavy rain	Water comes up onto the footpath	Roads and paths	Building (below floor level)	None	No				Yes	All along Enmore Rd. Water comes up onto the footpath
0021	0 months, 0 years	No							No		We are keen that the Council consider the potential implications of climate change to overland flows in the subcatchment. We understand that typical flood modelling, including local drainage modelling typically uses historical data from Australian Rainfall and Run-off. However with storm events predicted to become more intense and frequent, it is important that future flood modelling use contemporary data and factor in a potential increase in rainfall of 15% based on CSIRO predictions of climate change impacts in the Sydney catchments. If you have any queries on the issue, please don't hesitate to contact us.		No	
0022	25 years	No							No				No	
0023	5 years	Yes	Cnr May St and Campbell St.	Whenever it rains	On any rainy day water 'backflows' and pools outside drain mentioned. Road often blocked, large pool on ongoing basis	Roads and paths		Explained in details of event	No	Explained in details of event		Yes	Yes	Cnr May St and Campbell St., Road often blocked. Whenever it rains water backflows and pools outside drain
0024	15.25 years	Yes	Stormwater drain in the TAFE, Camden St. end.	Overflows every time it rains heavily.	There is a path into the car park which gets flooded. One year there was a lot of rain and it overflowed across the street up to my front door. The drain appears to be blocked	Roads and paths	Car park		No				Yes	1. Camden Street, Newtown NSW 2042. Came up to front door one year. 2. Stormwater drain in the TAFE, Camden St. end. Path into the car park gets flooded.
0025	2 years	Yes	Brown St, St Peters and the road next to the house	After heavy rain		Residential, Roads and Paths	Backyard, garage		No			Yes	Yes	1 Brown St, St Peters and the road next to the house. Flooded the backyard and garage.
0026	3 years	Yes	End of Camden St. Within 100m of Edgeware Rd.	10pm, 11th Feb 2008	Road was flooded consistently over period Thursday to Sunday due to persistent heavy rain	Roads and paths			No				Yes	End of Camden St. Within 100m of Edgeware Rd. 10pm, 11th Feb 2008. Road flooded consistently for 4 days
0027	1.75 years	Yes	Cnr Edgeware Rd and Alice St. and Ferndale St.	After heavy rain	May have been due to a rupture to water supply lines.				No		Along Ferndale Street, I have regularly noticed flows after heavy rain extending from the footpath to the middle of the street. I realise that this is not ponding but there is always a concern that if the stormwater drainage at the south end of the street fails, there would be a large quantity of water ponding in Ferndale St.	Yes	Yes	Cnr Edgeware Rd and Alice St. and Ferndale St. After heavy rain
0028	20 years	No							No		I own a property at Edgeware Rd, but have rented it out. I have never seen any water event in the 20 years I have owned this property.		No	
0029	3 years	Yes	Park on the corner of Edgeware Rd and May St.	1 to 3 years ago during winter		Parks			No			Yes	Yes	Park on the corner of Edgeware Rd and May St. 1 to 3 years ago during winter
0030	4 years	No							No				No	

ID	Length of time they have lived/worked/shopped etc. in EC subcatchment	Have they observed ponding or flooding	Address of flooding	When flooding occurred	Details of Event	Type of property affected	Area of property affected	Evidence of flooded extent/area	Photos provided	Details of Flooding extent	Any other Information	Locations marked on Survey Map	Calibration data available Y/N?	Details of calibration data
0031	30 years	Yes				Residential, roads and paths			No				No	
0032	25 years	Yes	Cnr Unwins Bridge Rd/May St//Brown St/Hutchinson St	Whenever there is heavy rain		Roads and Paths, commercial, parks			No		The 2 stormwater drains cannot take the rain water away. All streets including Campbell St. from Princess Highway flow down to this intersection. Lowest point for the whole area	Yes	Yes	Cnr Unwins Bridge Rd/May St//Brown St/Hutchinson St. Whenever there is heavy rain
0033	3 years	Yes	Cnr of Simmons St. and Sarah St.	Whenever there is heavy rain		Roads and Paths			No			Yes	Yes	Cnr of Simmons St. and Sarah St. Whenever there is heavy rain
0034	2.5 years	No							No				No	
0035	4 years	No							No		Lived at address for 4 years and drainage has always worked ok. Worked in Marrickville area for a year and the drainage works very well.		No	
0036	1 year		Ferndale St.						No		Council should expand the rainwater incentive to this region.		Yes	Ferndale St.
0037	4.5 years	Yes	Cnr Wells St and Edgeware Rd	Following fairly heavy showers	Results in temporary flooding at the bottom of Wells St, causing southbound traffic to spray up large sheets of water. This flooding usually subsides fairly quickly	Roads and Paths			No			Yes	Yes	Cnr Wells St and Edgeware Rd. Following heavy showers
0038	1 month	No							No				No	
0039	8 years	Yes	Cnr Hutchinson St. and Campbell Rd.						No		Hutchinson St. is always full of rubbish from factories at top end and this washes down in heavy rains into the catchment area.		Yes	Cnr Hutchinson St. and Campbell Rd.
0040	7 years	Yes	King St.	Every time it rains heavily. Numerous times each year	Road floods badly in heavy rain. Water backs up in the gutters - cars then spray is into the shop as they drive past.	Roads and paths, commercial	Building (above floor level), Building (below floor level)		No			Yes	Yes	King St. Building above and below floor level. Every time it rains heavily. Numerous times each year
0041	17 years	Yes	Wells St and John St.	2008. 6:30pm (Tuesday) Can't remember date.	Rain was so heavy gutters etc. unable to cope with flow. I knew because I had to help someone on crutches in John St.	Roads and paths			No				Yes	Wells St and John St. 2008. 6:30pm (Tuesday) Can't remember date.
0042	3 years	Yes	All along Lord St.		I opened my front door and saw water lapping against our front steps	Residential, roads and paths, parks	Front yard		No				Yes	All along Lord St.
0043	2 years	Yes	All of King St, Enmore Rd, cnr of Camden St. and Edgeware Rd	Every time there is continuous rain	The ponding was so wide in the gutter, I couldn't jump over it and landed in the middle of the water. The cars splash you on King St when you are walking along. At Enmore Rd. near service station, especially when waiting for the bus, you get drenched by the bus as it is pulling up.	Roads and paths			No		My clothing and boots were wrecked.		Yes	All of King St, Enmore Rd, cnr of Camden St. and Edgeware Rd. At bus stop near service station on Enmore Rd, get drenched when bus pulls up. Every time there is continuous rain
0044	50 years	Yes	Corner of Alice St. and Edgeware Rd., Enmore park, Matt Hogan Park, Car park of Marrickville Memorial Anzac Club, Near Newtown Station.	Morning, Mid Feb 2009	I was on my way to go to Marrickville Metro, when I had to cross the road I found it was flooded with the heavy rain. I saw people try to cross they had to lift their clothes and remove their shoes. Further down Edgeware Rd., where the school is was flooded too. I often witness children have to go into the puddles of water	Roads and paths, parks			No	Crossing the road, water comes up to ankle.	The day it rained heavy in mid February, Cnr of Alice St and Edgeware Rd, the drainage was blocked with all the tree leaves. This caused water to rise high in the street. It was difficult to cross the road and was terrifying because I was trying to avoid going into the water so I had to go in the middle of the street where the other traffic was going through. I could have been knocked over by a car. Because I was going out for the day, I didn't want to have wet shoes all day.	Yes	Yes	Corner of Alice St. and Edgeware Rd., Enmore park, Matt Hogan Park, Car park of Marrickville Memorial Anzac Club, Near Newtown Station. Morning, Mid Feb 2009
0045	42 years	No							No				No	
0046	28 years	Yes	John St. and Darley St.	Whenever there is heavy rain	You cannot walk across Darley St. without being at least ankle deep in water.	Roads and paths			No			Yes - drainage pathway	Yes	John St. and Darley St. Whenever there is heavy rain You cannot walk across Darley St. without being at least ankle deep in water.
0047	10 years	Yes	Bottom of Reiby St.		Water has risen over the curb once of twice	Roads and paths			No		I am not sure if the drains along Reiby St are clear enough and maintained in good condition to deal with heavy rain		Yes	Bottom of Reiby St. (in front of 64 Reiby St). Water has risen over the curb once of twice
0048	20 years	Yes	Cnr Lord St and John St., Cnr Unwins Bridge Rd/May St//Brown St/Hutchinson St	Whenever there is heavy rain		Residential, roads and paths, parks	Front yard, Building (above floor level)		No		Heavy rain appears to be the biggest problem - with litter and rubbish including organic rubbish (i.e. Leaves) blocking drain and storm water covers	Yes	Yes	Cnr Lord St and John St., Cnr Unwins Bridge Rd/May St//Brown St/Hutchinson St. Whenever there is heavy rain
0049	5 years	Yes	Sarah St. between Simmons St. and Marian St.	Feb 2009 and every time there is heavy rain	Drains can't cope	Roads and Paths			No	Blocks at least 1 third of roadway	Another area just out side of EC1 east area is cnr Liberty and Bedford Sts., Newtown. Water regularly pools in heavy rain, usually right across the roadway.	Yes	Yes	Sarah St. between Simmons St., and Marian St. Feb 2009 and every time there is heavy rain
0050	6 years	Yes	Ferndale St	Always in heavy rain		Roads and Paths			No			Yes - shows area of flooded roadway	Yes	Ferndale St. Always in heavy rain
0051	4.5 years	Yes	Cnr or Llewellyn St. and Edgeware Rd, Enmore. Also between Alice St and Victoria Rd, on Edgeware			Roads and Paths			No			Yes	Yes	Cnr or Llewellyn St. and Edgeware Rd, Enmore. Also between Alice St and Victoria Rd, on Edgeware.
0052	22 years	Yes	1.Cnr or Llewellyn St. and Edgeware Rd, Enmore. 2. Cnr Edinburgh and Murray St. 3. Cnr Unwins Bridge Rd, Edgeware Rd, May St.	1. pm February 2009. 2 and 3. a year ago	Flooded our road				No			Yes	Yes	1.Cnr or Llewellyn St. and Edgeware Rd, Enmore. 2. Cnr Edinburgh and Murray St. 3. Cnr Unwins Bridge Rd, Edgeware Rd, May St. 1.Febuary 2009 (pm). 2 and 3. a year ago
0053	40 years	Yes	Cnr Alice and Edgeware Rd.	Always after heavy rain	After heavy rain, rain water from Alice and Edgeware Rd gather at the corner of Alice and Edgeware Roads, the road drains blocks up with leaves and other debris	Roads and Paths			No		I suggest that the streets around the area be cleaned of the leaves and other debris. Enlarge drain to take a larger volume of water	Yes	Yes	Cnr Alice and Edgeware Rd. Always after heavy rain
0054	6 years	Yes	Florence Street, St Peters			Residential, roads and paths	Front yard		No				No	
0055	2 years	Yes	Camden St, near Edgeware Rd.	Whenever very heavy rain for half an hour or more there are very strong flows down Simmons St. and pools on the road in Camden St.		Roads and Paths			No			Yes	Yes	Camden St, near Edgeware Rd. Whenever very heavy rain for half an hour or more there are very strong flows down Simmons St. and pools on the road in Camden St.
0056		Yes			Council ignored the problem				No		Graffiti removal is more important that this, decreasing property value by hundreds of thousands of dollars		No	
0057	1.5 years	Yes	Cnr Edgeware Rd and Sarah St, including running down to outside TAFE on Edgeware Rd side. Cnr Simmons St. and Margaret St.	Dec 08 or Jan 09	Flash flooding over Sarah St. and down Edgeware Rd to the point that as a pedestrian I had to walk in ankle deep rushing torrent of water. During heavy rains there is also always water spilling over pathways bottom of Marion St where it meets Sarah St. and footpaths next to the dog park.	Roads and Paths			No			Yes	Yes	Cnr Edgeware Rd and Sarah St, including running down to outside TAFE on Edgeware Rd side. Cnr Simmons St. and Margaret St. Dec 08 or Jan 09. Flash flooding over Sarah St. and down Edgeware Rd to the point that as a pedestrian I had to walk in ankle deep rushing torrent of water.
0058	7 years	Yes	Edgeware Rd			Roads and Paths			No				Yes	Edgeware Rd
0059	20 years +	No							No				No	
0060	3 years								No				No	

ID	Length of time they have lived/worked/shopped etc. in EC subcatchment	Have they observed ponding or flooding	Address of flooding	When flooding occurred	Details of Event	Type of property affected	Area of property affected	Evidence of flooded extent/area	Photos provided	Details of Flooding extent	Any other Information	Locations marked on Survey Map	Calibration data available Y/N?	Details of calibration data
0061	1.5 years	Yes	1. Cnr of May St., Unwins Bridge Rd. 2. Goodsell St.	1&2. When lots of rain falls in a very short period of time	2. Goodsell St. experiences extreme water flow down gutter when heavy rain	Roads and Paths			No			Yes	Yes	1. Cnr of May St., Unwins Bridge Rd. 2. Goodsell St. 1&2. When lots of rain falls in a very short period of time
0062	16 years	Yes	Enmore Rd, Alice St., King St., and Edgeware Rd.	Drains regularly blocked i.e.; on a weekly basis.					No		I have never experienced severe stormwater pooling, however drains are regularly blocked in the before mentioned streets. When we experience rain, water cannot get away and pools for days in some instances. More regular cleaning of streets and footpaths would obviously eliminate this build up of water. No doubt this problem attracts rats etc. something we have had a huge increase in recent times.		Yes	Enmore Rd, Alice St., King St., and Edgeware Rd. Drains regularly blocked i.e.; on a weekly basis.
0063	10 years	Yes	Cnr of Alice St., and Edgeware Rd	15/02/09 am	Drove to Marrickville Metro and the footpath, gutter and road were flooded	Roads and Paths			No		I don't recall any other incidents within the specified area.		Yes	Cnr of Alice St., and Edgeware Rd. 15/02/09 (am)
0064	2 years	Yes	Cnr Edgeware Rd and Alice St, opposite convenience store on Alice Street	5.30pm Early Feb 2009	It was raining heavily all day, and the entire corner was flooded. It looked as if one of the drains was blocked. At it's deepest it was probably 50cm. Pedestrians couldn't walk around it and it was coming right out onto the road.	Roads and Paths, residential	Front yard		No				Yes	Cnr Edgeware Rd and Alice St, opposite convenience store on Alice Street. 5.30pm Early Feb 2009. At it's deepest it was probably 50cm.
0065	60 years	No							No		Flooding does not occur at Edgeware Rd, Enmore. I am happy with the drainage in the area surrounding my property		No	
0066	7 years	Yes	1. Enmore Rd. 2. The block surrounded by Sarah St., Simmons St., Enmore Rd. and Edgeware Rd.	Always after heavy rain	As a pedestrian, I have been up to my ankles in rushing water which has nowhere to go because all the stormwater sumps are full of dirt and rubbish. Riding a bike is dangerous in these conditions as are small children which could be knocked over by the water	Residential, Roads and Paths			No			Yes - Map shows shaded area	Yes	
0067	5 years +	Yes	1. End of Council St. (Near Railway) 2. In Camdenville Park (see map)	Every time it rains heavily		Roads and Paths, Parks			No		See owner who lives in May St., next door to shop on cnr of Council and May St. See owner at 9 Council St., both have been in the area for 20+ years	Yes	Yes	1. End of Council St. (Near Railway) 2. In Camdenville Park (see map). Every time it rains heavily
0068	10 years	Not stated							No				No	
0069	4 years	Yes	Goodsell St., May Lane, Goodsell Street	5pm November 2007	Gutters overflow footpath. May lane completely overflows. Backyard submerged. Water from back lane could not get away quick enough. Water in front street was too much for the gutters. A row of 4 of 5 houses flooded through. The water drained away fairly quickly.	Residential, Roads and Paths	Front yard, backyard, building (below floor level).		No		The garbage bags in May Lane stopped the water from flowing freely. When cars park closely to the gutter, the water gets blocked and flood over the path on both sides of Goodsell St., A yellow lane 60cm away and parallel to the gutter would help water flow freely.	Yes	Yes	Goodsell St., May Lane, Goodsell Street. 5pm November 2007. Backyard submerged.
0070	8 years	No							No				No	
0071	38 years	Yes	Rawson St., Enmore, NSW 2042			Roads and Paths	Footpath		No				Yes	17 Rawson St., Enmore, NSW 2042
0072	2 years	Yes	Laneway between Goodsell St. and May St.	Approximately 12 months ago	Next door neighbours property had ground floor flooded due to water entering via back gate. Our garden was saved by garage door which didn't let water in	Residential	Backyard, Building (Below floor level)		No			Yes	Yes	Laneway between Goodsell St. and May St. Neighbours house flooded on ground floor. Approximately 1 year ago
0073	18 years	Yes	Cnr Alice St. and Walenore Ave	During heavy rain	Stormwater drain becomes blocked by leaf litter	Roads and Paths			No			Yes	Yes	Cnr Alice St. and Walenore Ave. During heavy rain.
0074	28 years	No							No				No	
0075	25 years	Yes	Not stated						No				No	
0076	16.5 years	Yes	Lord St., Between John St and Edgeware Rd.	Various occasions over the past 16 years	Lord St (South end) floods during torrential rain storms. Street resembles a river. Stormwater drainage has been improved by Council (Circa 1998) - has stopped stormwater drain in John St from overflowing. Low water table in Lord St. Area under property was prone to flooding until agricultural pipes drain put along side of house. However, flooding can reach front door from road and footpath.	Residential, Roads and Paths	Front yard, Building (below floor level)		No			Yes	Yes	Lord St., Between John St and Edgeware Rd. Can reach front door of 126 Lord St.
0077		Yes	Cross Lane						No				Yes	Cross Lane
0078	15 years	Yes	1. Fulham St. 2&3. King St. near St Peters Station	1. 2003 2. Weekday (am 2006-08) 3. Weekday (pm 2006-08)	1. Storm water caused backflow from sewers to flood backyard up to kitchen door and up drain in bathroom - lots of damage. 2&3. Road near St. Peters Station on King St. - bad flooding and huge pools of water on road. Drains unable to cope.	Residential, Roads and Paths	Backyard, building (above floor level)		No		Separation of sewers from stormwater drains should be a priority. Drains along King St from Princes Highway (Cnr Sydney Park Rd) to about the cnr Church St. clearly inadequate making passage across King St or along it seriously unpleasant in heavy rain.	Yes	Yes	1. Fulham St. 2003. Storm water caused backflow from sewers to flood backyard up to kitchen door and up drain in bathroom - lots of damage. 2&3. King St. near St Peters Station. Weekday (am 2006-08) and Weekday (pm 2006-08)
0079	7 years	Not stated							No				No	
0080	11 years	Yes	East end of Sarah St.	-		Roads and Paths, Parks			No				Yes	East end of Sarah St
0081	10 years	Yes	Simmons St., at end of Margaret St., near Enmore TAFE Park (the "Dog Park")	On many occasions when there is heavy rain		Roads and Paths			No				Yes	Simmons St., at end of Margaret St., near Enmore TAFE Park (the "Dog Park"). Whenever there is heavy rain
0082	30 years	Not stated							No		No evidence to provide		No	
0083	9 years	Yes	May Lane, and Goodsell St.	-		Roads and Paths, Residential	Backyard		No				Yes	Max Lane and Goodsell St.
0084	30 years		Not stated						No				No	
0085	8 years	Yes	Cnr Campbell and Hutchinson	Whenever there is heavy rain		Roads and Paths			No				Yes	Cnr Campbell and Hutchinson. Whenever it rains heavily
0086	9 years	Yes	Campbell St, adjacent to Brown St.	Whenever is rained heavily about a month ago	The road and footpath floods	Residential, Roads and Paths			No			Yes	Yes	Campbell St, adjacent to Brown St. Whenever is rained heavily about a month ago
0087	25 years	Yes	Station St. and Edgeware Rd		The roads get flooded				No			Yes - Area highlighted	Yes	Between Station St. and Edgeware Rd
0088	2 years	Yes	Cnr Brown St and Campbell St., St. Peters	Whenever is rains consistently and heavily		Roads and Paths			No			Yes	Yes	Cnr Brown St and Campbell St., St. Peters
0089	13.5 years	Yes	From Simpson Park across Hutchison St., along Campbell St., past Brown St.	14/02/09 and every time it rains hard.	The water floods the road. Cars get flooded and stuck in the water. Pedestrians can't walk past. I can't leave my property	Residential, commercial, parks, roads and paths	Front yard, Building (below floor level)		No			Yes	Yes	From Simpson Park across Hutchison St., along Campbell St., past Brown St. 14/02/09 and every time it rains hard.
0090	-	Yes	Corner of Alice St. and Edgeware Rd. Cnr of May St., Unwins Bridge Rd.						No			Yes - Area highlighted	Yes	Corner of Alice St. and Edgeware Rd. Cnr of May St., Unwins Bridge Rd

ID	Length of time they have lived/worked/shopped etc. in EC subcatchment	Have they observed ponding or flooding	Address of flooding	When flooding occurred	Details of Event	Type of property affected	Area of property affected	Evidence of flooded extent/area	Photos provided	Details of Flooding extent	Any other Information	Locations marked on Survey Map	Calibration data available Y/N?	Details of calibration data
0091	6 years	Yes	Cnr Campbell and May Streets.		Cars flooded	Residential, Commercial, Parks, Roads and Paths	Front yard, Backyard, Garage, Building (Below floor level)		No			Yes	Yes	Cnr Campbell and May Streets.
0092	15 years	No							No				No	
0093	24 years	Yes	Cnr Campbell St, May St and Unwins Bridge Rd	Every time there is heavy rain	When we get heavy rain, the footpath, plus Campbell St., from near Town and Country Hotel, up to Brown St, plus the small park on the corner of Campbell and May St always covered in water and you can't even drive through	Roads and Paths			No			Yes	Yes	Cnr Campbell St, May St and Unwins Bridge Rd
0094	10 years	Yes	Darley St.			Roads and Paths			No		More frequent cleaning of leaves on street required to prevent drains being blocked and to enable water to drain properly	Yes	Yes	Darley St.
0095	11 years	Yes	Cnr Darley St and John St.	4pm, 2009	Water was ponding near intersection of Darley St and John St., coming from runoff in Wells St.				No				Yes	Cnr Darley St and John St.
0096	3.4 years	Yes	Pemell Lane	Oct-08	During periods of heavy rain, the storm water over flows from the gutter outside 1 Pemell Lane and runs down the driveway into our underground car park. Our car park is fitted with a sump and pump but this cannot keep up with the flow of the storm water. The last occurrence of this event was during October 2008 which left our car park with flooding of around 2-3 inches.				No		There is not much difference between the top of our driveway and the top of the gutter, the driveway is located approximately 1 meter from a drain which runs into an easement between properties on Pemell Lane.	Yes	Yes	Pemell Lane, underground car park. October 2008 (2-3 inches in our car park) and during periods of heavy rain
0097	6 years	Yes	May St., Bottom of Camdenville Oval near Edgeware Rd. (behind the fence line) and May Lane	2007	Behind Camdenville Oval (behind the fence line). It's the higher ground behind the row of Terrace houses in May St. Also the backyards of many houses flooded when stormwater came through the backyards due to May Lane flooding	Residential, parks	Backyard, Garage		No	Many residents in Goodsell St. had their backyards/garages flooded due to the stormwater run off in May Lane. Also, Camdenville oval regularly floods or pools water at the bottom end		Yes	Yes	May St., Bottom of Camdenville Oval near Edgeware Rd. (behind the fence line) and May Lane. 2007
0098	25 years	Yes	Alice St., Newtown	1-Dec-07	There was extremely heavy rain which we suspect caused movement in the sewerage pipes on the rear lane of a property on Alice St., Newtown. As a result, the pipes cracked and had to be replaced.	Residential	Backyard		No		I have observed flooding at the Liberty St., underpass - some time ago (several years)	Yes	Yes	Alice St., Newtown. 12/1/2007.
0099	8 years	Yes	Simmons St., Enmore. Enmore TAFE park	Regularly	Stormwater regularly overflows in Simmons St., Enmore, sometimes as high as car doors (bottom of them)	Parks, roads and paths			No			Yes	Yes	Simmons St., Enmore. Enmore TAFE park. Regularly
0100	7 months	No							No				No	
0101	12 years	Yes	Dog Park, Cnr Simmons St and Camden St, Cnr Camden St and Clara St	In heavy rain when grating is blocked	The iron gratings are often blocked by twigs and leaves = flooding every down pour. The gutter outside the dog park has been totally blocked by rubbish for at least two years	Roads and paths			No		The current street sweeper and leaf blowers is a cause for derision from most residents, as it only moves around some of the fallen leaves which build up and block drain gratings and cause road flooding. Some residents do sweep leaves from their footpaths and gutters, the problem is how to encourage more of this.	Yes	Yes	Dog Park, Cnr Simmons St and Camden St, Cnr Camden St and Clara St, 144 Camden St. During heavy rain when grating is blocked
0102	19 years	Yes	Ferndale St., Newtown	During storms	Particularly when people have skips or vehicles blocking the water near the kerb, but whenever it rains anyway	Roads and Paths			No			Yes	Yes	Ferndale St., Newtown
0103	25 years	Yes	Cnr Brown St and Campbell St. Cnr May St. and Unwins Bridge Rd.	In heavy down pours over the last 10 years	Road gets blocked, very difficult to cross road on any length of Campbell St.	Roads and Paths			No				Yes	Cnr Brown St and Campbell St. Cnr May St. and Unwins Bridge Rd. During heavy downpours over the last 10 years
0104	-		Enmore Theatre car park						No		Please fix Enmore theatre car park business		No	
0105	6 years	Yes	Cnr Alice and Clara Streets and rear lane of Alice and Clara Streets	Morning, Sat or Sun, Winter? 2007. Whenever it rains heavily	Muddy water flows freely down the rear lane behind my house.	Residential, roads and paths, rear lane	Backyard		No		On some occasions the litter/debris in gutter gets piled up and water builds up on the grass embankment beside the footpath	Yes	Yes	Cnr Alice and Clara Streets and rear lane of Alice and Clara Streets. Morning, Sat or Sun, Winter? 2007. Whenever it rains heavily
0106	7 years	Yes	Campbell St., St Peters 2044	It occurs in every rainfall.	The heavier the rainfall, the worse it is. It affects everyone in Brown St. and Campbell St. Cars and pedestrians, when trying to cross the road or walking up Campbell St. It affects us exiting the front door, and side of the house.	Residential, roads and path	Front yard, Building (below floor level).	We have photos	No		I've contacted both RTA and Marrickville Council when there has been flooding and cars have broken down in the flood water. For at least to put out flooding signs. But no one seams to give a s**t, either from RTA of the Council	Yes	Yes	Campbell St., St Peters 2044. Occurs in every rainfall
0107	24 years	Yes	Cnr Alice St. and Edgeware Rd, SE corner	Every time of heavy rain	A huge puddle forms that can cover one road lane and nearly the footpath	Roads and paths			No	After an event, you can see the "high water" mark of debris. This has shown the water extending to the garden wall of the nearest house and covering the first road lane		Yes	Yes	Cnr Alice St. and Edgeware Rd, SE corner. Every time there is heavy rain. Can block one lane of the road
0108	23 years	Yes	SE cnr of Edgeware Rd and Alice St	On several occasions during particularly heavy rains. I have not noticed it happening in the last few years though	1-2 lanes of the road (Edgeware Rd) i.e. both south bound lanes. Maybe 1 lane of Alice Street, and at least partially over the footpath/verge	Roads and Paths			No			Yes	Yes	SE cnr of Edgeware Rd and Alice St. On several occasions during particularly heavy rains. I have not noticed it happening in the last few years though. 1-2 lanes (southbound)
0109	11 months	Yes	All of Enmore Rd	August 08	The whole road flooded in the gutters when it rained, whenever a car drove past, the entire footpath (and the people on it) were drenched	Roads and Paths, commercial			No			Yes	Yes	All of Enmore Rd. August 08
0110	1.5 years	No							No				No	
0111	41 years	Yes	Cnr or Sarah and Simmons St., Enmore	Sunday to Wednesday Feb 2009	Water banks up from Margaret, Marian, Sarah and Simmons St and becomes a water pond overflow	Residential, drains become blocked, roads and paths		When heavy rain or continuous rain, it becomes a pond. Water banks up, drains get blocked	No		It makes it difficult for people passing by and traffic flow. My mother lives on the corner, she witnesses everything then phones the council to come and clean up		Yes	Cnr or Sarah and Simmons St., Enmore. Sunday to Wednesday Feb 2009
0112	0.5 years	Yes	Alice St., Newtown NSW	-		Residential, roads and paths	Backyard		No				yes	Alice St., Newtown NSW
0113	16 years	No	-						No				No	
0114	3 years	yes	Cnr May St and Unwins Bridge Rd		The road gets flooded on both sides of Campbell St and it is impossible to cross by foot.	Roads and paths			No			Yes	Yes	Cnr May St and Unwins Bridge Rd
0115	20 years	yes	Margaret St., Newtown	Every time there is heavy rain.	Road drains block and road floods	Roads and Paths	Building (above floor level)		No		With heavy rain footpath and road is flooded and smells of sewage		Yes	Margaret St., Newtown
0116	4 years	Yes	Near cnr of Applebee and May St	Often for weeks at a time, sometimes not related to rainfall		Roads and paths		I can point out marks on the road. Lines up to a stormwater drain from the block of units	No		When it ponds a lot in summer it looks like a health risk	Yes	Yes	Near cnr of Applebee and May St
0117	6 years	Yes	Lord St, Newtown	Jan or Feb 2007. There was another occasion, can't remember exactly, I think it was the summer before.	The street was so high, I feared my neighbours motorbike would be swept away.	Roads and paths		I have a good quality movie of it which you are welcome to.	No				Yes	Lord St, Newtown. Jan or Feb 2007. There was another occasion, can't remember exactly, I think it was the summer before.
0118	8 years	No							No				No	
0119	10 years	Yes	May St., St. Peters	1999-2000		Residential	Backyard		No		Problem was subsequently corrected, council built a gutter at the back of the row of terraces of which May St is one. No further problems since		Yes	May St., St Peters. 1999-2000

ID	Length of time they have lived/worked/shopped etc. in EC subcatchment	Have they observed ponding or flooding	Address of flooding	When flooding occurred	Details of Event	Type of property affected	Area of property affected	Evidence of flooded extent/area	Photos provided	Details of Flooding extent	Any other Information	Locations marked on Survey Map	Calibration data available Y/N?	Details of calibration data	
0120	23 years	Yes	1. Camden St from James St and Dog/TAFE park. 2. Simmons St, Margaret St. 3. Camden St, Edgeware Rd end/ 4. Margaret St at junction with Ferndale St.	1. Heavy Rain - not in last 6 years. 2. Most rains all months of the year. 3. Major heavy rain, all months of the year. 4. Heavy Rain, not in the last 6 years.	Within 2cm of flowing into house	Residential, Parks, Roads and paths	Backyard, building (below floor level)	Marks on road, depth on footpath	No		Recent stormwater ponding and overland flows is less primarily because of a reduction in rainfall in recent years. A repeat of wet years like 1988/9 would be considerable more stormwater ponding and overland flows. There was some council drainage works in the Margaret St area but there has not been heavy enough rain to test if these are adequate	Yes	Yes	1. Camden St James St and Dog/TAFE park. 2. Simmons St, Margaret St. 3. Camden St, Edgeware Rd end/ 4. Margaret St at junction with Ferndale St. 1. Heavy Rain - not in last 6 years. 2. Most rains all months of the year. 3. Major heavy rain, all months of the year. 4 Heavy Rain, not in the last 6 years.	
0121	7 years	Yes	King St., Near Bray St.	Feb 2009 (am)	Heavy rain	Roads and paths			No			Yes - Section of road highlighted	Yes	King St., Near Bray	
0122	22 years	Yes	Dickson St	Regularly		Commercial, Parks, roads and paths			No		Dickson St gutters regularly blocked by leaves as street not swept/blown as often now.	Yes	Yes	Dickson St. Regularly	
0123	10.5 years	Yes	Cnr May St and Unwins Bridge Rd. Also Goodsell St., St Peters close to King St.						No		It would be great to see less wastage of stormwater		Yes	Cnr May St and Unwins Bridge Rd. Also Goodsell St., St Peters close to King St.	
0124	6 years	No							No		No problem in Rawson St area		Yes		
0125	12 years	Yes	King St.			Roads and paths			No		I live at the top end of Edgeware Rd, so I do not experience stormwater ponding but I have observed it in King St, mainly due to storm water drains not working properly. Water overflows on to footpaths and not down the drains.		Yes	King St.	
0126	54 years	Yes	Cnr Alice St and Edgeware Rd	Every time there is heavy rain		Roads and paths			No		The drains in Alice St. were effective when they were first installed. Then came the wonderful trees (never worked since)	Yes	Yes	Cnr Alice St and Edgeware Rd. Every time there is heavy rain	
0127	2 years	No							No		I do not personally consider this such a big problem, however I can understand how some people may be affected.		No		
0128	8 years	Yes	1. Under railway bridge at bottom of Edgeware Rd/Lord St. 2. Lord St. flooded once 3. Park in May St often has water at the Edgeware Rd end			Roads and Paths, Parks			No		Visit the park on the other side of the railway bridge, Lord St., and you will often see large pools of water over the grass after rain - I think this park is State rail property - it is fenced off. Once or twice the road (Lord St) has flooded, but not above the gutter (to my knowledge). However, there is often a problem with water pooling at the bottom of the street (Under the bridge)	Yes	Yes	Under railway bridge at bottom of Edgeware Rd/Lord St. Lord St., Park in May St often has water at the Edgeware Rd end	
0129	10 months	Yes	Wells St	During heavy rain					No			Yes	Yes	Wells St	
0130	1.5 years	No							No				No		
0131	10 years	Yes	Outside of Catchment Area						No		Note: Area described is out of the catchment area - Cnr Percival Rd at roundabout Stanmore. On numerous occasions but appears to be fixed now		No		
0132	2 years	Yes	Cnr Edgeware and Alice St	4pm, Saturday 27 December 2008	Builds up during heavy rain then goes away after about 1 hour	Roads and paths			No			Yes	Yes	Cnr Edgeware and Alice St. 4pm, Saturday 27 December 2008	
0133	10 years	Yes	Baily St/Station St/Holt St	Jan 09, Nov 08, Jun 08, Apr 08. Every time there is heavy rain	Every time there is a heavy downpour, the stormwater drain at Holt/Station Sts cannot handle the volumes of water so the roads are covered. There also seams to be an aquifer between Bailey St and Station St. Our house always has water under it and we have put in a sump pump to handle it.	Residential, roads and paths	Building below floor level		No		Have 2 problems in this area: 1. Pooling of stormwater because of inadequate drainage. 2. A possible aquifer that runs down Station St. Apparently there were wells that tapped into this back in the time Mary Reiby had a farm here. There is nearly always water under the house even in the dry periods	Yes - Area highlighted	Yes	Baily St/Station St/Holt St. Jan 09, Nov 08, Jun 08, Apr 08. Every time there is heavy rain	April 2008
0134	20 years	Yes	Edgeware Rd.	Floods in every heavy rain. Twice 2007, twice 2006, 3 times 2008.	Drain has been planned for 15 years but council has still not put it in. This is the lowest part of Newtown but council won't fix it. Floods every heavy rain. Flooding up to garages several time. I did a flood study at great expense for "Newtown" in the middle of the city Does this tell you that something needs fixing? Please spend less time workshopping this and do something.	Roads and paths, garages	Garage		No	I can show you water marks on the inside garages in Edgeware Rd. Several of my tenants have had their cars badly damaged by the flooding of their garages. I.e. it was high enough to enter the car.	Marrickville council has plans for a drain (grate) under the road bridge that crosses the railway. This flows into the drain (1200 Deep x 1800 wide) and would probably alleviate the problem	Yes	Yes	Edgeware Rd.	
0135	6 years	No							No		This survey is a monumental waste of rate payers money.		No		
0136	6 years	yes	Cnr John St. and Darley St.		Difficult to cross the road and get into car	Roads and paths			No				Yes	Cnr John St. and Darley St.	
0137	13 years	Yes	Alice St., Newtown. Cnr Edgeware Rd and Alice St.		We had flooding across the rear of our property when neighbours guttering was inadequate. The problem has been resolved	Roads and paths			No			Yes	Yes	Cnr Edgeware Rd and Alice St.	
0138	9 years	No							No				No		
0139	4 years	Yes	Cnr Holmwood and Pearl Lane	Evening (once only)	Occurred during heavy rain				No				Yes	Cnr Holmwood and Pearl Lane	
0140	20 years	Yes	Cnr Darley St and John St. & Cnr of Lord St and John St.	9am February 2009 (The week is bucketed down)	Whenever large amounts of rain falls, runoff from Wells, Holmwood, Dickson and Pearl Sts finds its way to John St. The intersections of John and Darley and John and Lord always flood. Sometimes the stormwater covers on the road are lifted. Very dangerous for drivers as they can't see this. Also footpaths are flooded and pedestrians need gumboots.	Roads and Paths			No		When renovating, residents are asked to put stormwater out to the street. In my view this has increased the amount of runoff that ends up flooding our roads and pavements. Stormwater need to be connected underground or allowed to flow in the gardens, soak pits or tanks. Tanks should be allowed to have pumps.		Yes	Cnr Darley St and John St. & Cnr of Lord St and John St.	
0141	4 months	Yes	Hutchinson St. Camdenville oval at the end of May St	2pm Thursday 12th Feb 09	Overland Flow on Downhill Slope of footpath and overfull street gutters carrying fair volume of water down Hutchinson St (E-W) Immediately after heavy rain. NB: Roof areas on factories very large and most discharge water directly into stormwater and street.	Roads and Paths, Industrial			No	Camdenville oval at the end of May St. which is now a stormwater detention basin was formerly Goodsell's brick pit and before that, filled land and before that Gumbromorrah swamp. I would like to see heritage panels at the site explaining this. It would help 'tie' this low-lying area into the Shea's creek/Cooks River flows, perhaps build 'ownership' of problems	The water carries very large quantities of litter - plastic bottles, bits of polystyrene, wrappers etc. Along the gutters so the anti-pollution message isn't getting through. Good luck with the project!	Yes	Yes	Hutchinson St. Camdenville oval at the end of May St. 2pm Thursday 12th Feb 09	
0142	1 year	Yes	Cnr Alice and Edgeware Rd. Cnr Hutchinson and Campbell	Mid Feb 09	Water not draining away	Roads and Paths, parks			No			Yes		Cnr Alice and Edgeware Rd. Cnr Hutchinson and Campbell. Mid Feb 09	
0143	8 years	No							No				No		
0144	10 years	No							No				No		
0145	5 years	Yes	Darley St.	Whenever there is heavy rain	Half the road is flooded, up to my ankle when I step out of the car. The flow is down Wells St. from King and Pearl then down John St on even numbers side then around my corner.	Roads and paths			No			Yes - directional flow arrows	Yes	Darley St. Up to ankles whenever there is heavy rain.	
0146	6.5 years	Yes	Unwins Bridge Rd, St Peters, Cnr Bedwin St.	4:30pm Thursday sometime in 2008. Several times in the last 5 years	A late afternoon heavy down pour. One lane between B4 and B2 flooded water could not drain away as all drains were full to capacity.	Industrial/Commercial, Parks	Building (above floor level), roadways. 4 factories flooded at low lying areas.		No			Yes		Unwins Bridge Rd, St Peters, Cnr Bedwin St. 4:30pm Thursday sometime in 2008. Several times in the last 5 years. 4 factories flooded.	

ID	Length of time they have lived/worked/shopped etc. in EC subcatchment	Have they observed ponding or flooding	Address of flooding	When flooding occurred	Details of Event	Type of property affected	Area of property affected	Evidence of flooded extent/area	Photos provided	Details of Flooding extent	Any other Information	Locations marked on Survey Map	Calibration data available Y/N?	Details of calibration data
0147	20 years	Yes	Cnr Laura St and Edgeware Rd	After heavy rain		Roads and paths			No		Several times the council (I presume) cleaned out the drains but the flooding would re-occur during the next heavy rain	Yes	Yes	Cnr Laura St and Edgeware Rd
0148	12 years	Yes	Cnr Camden St and Ferndale St, Newtown	Afternoon 2008 sometime	The stormwater drains at the bottom of Camden St (Where it meets Ferndale St. and turns into a road closure in the form of a park) couldn't cope with the flow coming down Camden St from King St. The water rose above the gutter and flooded the park/road closure. It didn't affect houses as far as I know.	Roads and Paths, Parks			No			Yes	Yes	Cnr Camden St and Ferndale St, Newtown. Afternoon 2008 sometime
0149	8 years	Yes	Goodsell St			Roads and Paths			No			Yes	Yes	Goodsell St
0150	7 years	Yes	Campbell St., St Peters			Roads and Paths, Parks			No				Yes	Campbell St., St Peters
0151	2 years	No							No				No	
0152	4 years	Yes	Cnr Scouller St and Juliet St			Roads and Paths			No				Yes	Cnr Scouller St and Juliet St
0153	31 years	No							No				No	
0154	17 years	Yes	Cnr Alice St and Edgeware Rd.	Whenever there is a sudden heavy deluge	The water cannot escape down via the stormwater drainage	Roads and Paths			No			Yes	Yes	Cnr Alice St and Edgeware Rd.
0155	6.5 years	Yes	Cnr May and Campbell St.	Always when heavy storms	road flooded	Roads and Paths			No			Yes	Yes	Cnr May and Campbell St.
0156	11 years	Yes	Border of Enmore TAFE Park i.e. streets surrounding and down into Simmons and James Sts.	Evening	Heavy rain resulted in large pools of water collecting on the road and footpath resulting in wet shoes when I attempted to jump the puddles (very large) and had to go to work with wet shoes and socks	Roads and Paths			No		I would like to ask why the flooding of the streets continued year after year?? Why wasn't/isn't the council able to manage stormwater catchment?? Why when the area around the Enmore TAFE is so low lying and an obvious collection area for stormwater, why there aren't underground pipes to catch runoff from flooding in Simmons, James and the street on the other side of TAFE?	Yes	Yes	Border of Enmore TAFE Park i.e. streets surrounding and down into Simmons and James Sts.
0157	10+years	Yes	Edgeware Rd Enmore			Residential	Backyard		No		Backyard and adjoining footpath and street get damp. Has become more frequent in last 12 months	Yes	Yes	Edgeware Rd Enmore
0158	30 years								No		Please do not contact this resident as he is unable to assist in any matter due to a mental health issue.		No	
0159	7.5 years	Yes	Goodsell St (cnr Council St and Goodsell). Where the street meets the rail access gates in Council St.	Whenever we get really heavy rainfall	The drains often block or are not able to handle the flow and water backs up the street into our home via the roller door on Council St, also water laps at the walls of my house from time to time	Residential, commercial, roads and paths, zone 2B2 home industry	Garage, Building (below floor level), side of building	Yes, I have taken photos on different occasions	Yes			Yes	Yes	Goodsell St (cnr Council St and Goodsell). Where the street meets the rail access gates in Council St. Whenever we get really heavy rainfall
0160	5 years	Yes	Lord St.	Evening, December 2007	Drainage could not cope with flow/volume. Water flowing from east to west above gutter height. No flooding of homes, but overflow onto pavements	Roads and Paths			No				Yes	Lord St.
0161	3 years	No							No				No	
0162	13 years	Yes	Pemell St. & Cnr of Reiby and Don St.	Whenever there are storms or a heavy down pour.	The drain will block (or water can't go fast enough). Road at side starts flooding and property in front of drain starts to flood. (Front yard). Cnr of Reiby and Don St. regularly has blocked drains (from rubbish from Enmore Rd).	Residential, roads and paths	Front yard		No		Probably people who's house is affected will have info and I know they intend to respond to this survey.		Yes	Pemell St. & Cnr of Reiby and Don St.
0163	4 years	No							No				No	
0164	1.5 years	Yes	Goodsell St., St. Peters	10:00 Saturday April 2008. 5:00 Tuesday April 2008. June. July	Extensive rain short time - water pumping up through the road adding to storm drain flows. Leaf litter blocking runoff. Water ankle deep across whole footpath (North side of Street)	Residential, roads and paths	Garage, Building (below floor level)	Yes, mobile phone photos	No		It is simply a case of leaf litter and shallow drains not able to handle large water flow.		Yes	Goodsell St., St. Peters
0165	17 years	No							No		The water catchment on the corner of Station St. and Camden St. seems to work well	Yes	Yes	Drains work well at cnr of Station St and Camden St.
0166	2.5 years	Yes	Bottom of Alice St.			Roads and paths			No			Yes	Yes	Bottom of Alice St.
0167	3 months	No							No				No	
0168	10 months	Yes	Both sides of Edgeware Rd	During heavy rain	Overflowing gutters	Roads and paths			No				Yes	Both sides of Edgeware Rd. Overflowing gutters. During heavy rain
0169	6 months	Yes	Llewellyn St. Also Edgeware Rd and Alice St	18:00 13/02/09. 14:00 14/09/08. 19:00 12/12/08 At least 1 other event.	Ponding over Edgeware Rd. Could not cross Edgeware Rd on South Side. Had to cross Alice, Edgeware and Llewellyn to get to SW corner	Roads and paths			No				Yes	Llewellyn St. Also Edgeware Rd and Alice St. 18:00 13/02/09. 14:00 14/09/08. 19:00 12/12/08 At least 1 other event.
0170	1 year	Yes	Edinburgh Rd., Marrickville	All day. Mon-Sun September 2008	Everyday for a month there would always be water in the gutter and going onto the road. The water would always be there even when it didn't rain previous days. Notified Sydney Water, they did nothing about it. Notified council and they fixed the problem. Much appreciated	Roads and Paths	Building (Below Floor level)		No				Yes	Edinburgh Rd., Marrickville. All day. Mon-Sun September 2008. Council has since fixed problem.
0171	1.5 years	Yes	Cnr Campbell/May and Hutchinson St		Roads flooded fast. Traffic stopped, couldn't access Campbell St. 1 car broke down because of water. Backyard build up of water	Residential, Parks, Roads and paths	Backyard		No			Yes - Area highlighted	Yes	Cnr Campbell/May and Hutchinson St. Backyard of 85 Hutchinson St.
0172	1.25 years	Yes	Edgeware Rd. - the entire end of the street extending under the bridge	6pm Friday, December 2007	Flash flooding I guess. Heavy rain flooded the street extending under the bridge not even buses could get through. Bin floated around. Cars would have had wet floors. Came up to the top step of the house	Residential, roads and paths	Front yard, garage	Video of flooding in Street out the front of a peroperty on Edgeware Rd. Short perhaps 1min. Very clear but only shown from front door looking outside	No			Yes	Yes	Edgeware Rd. - the entire end of the street extending under the bridge. 6pm Friday, December 2007
0173	7 years	Yes	-	-	-	Roads and Paths	Front yard		No				No	
0174	7.5 years	Yes	Lord St., Newtown	Whenever there is sudden heavy rain.	For example yesterday road floods onto footpaths. Huge amount of water especially at John St/Lord St Corner	Roads and Paths	Front yard	Did see pictures on the Sydney Morning Herald website once about 2 years ago of flash flooding on Lord St taken by local photographer. SMH may be able to provide.	No			Yes	Yes	Lord St., Newtown. 5pm ish, Sunday 15th March 05
0175	15.5 years	Yes	King St., Newtown, Sydney	-	-	-	-	-	no				No	
0176	9 years	Yes	1. Bowden St., Alexandria. 2. Oriordan St	Whenever there has been a heavy downpour of rain	Car actually floated as the road was so badly flooded in Bowden St. Oriordan St is regularly flooded	Roads and Paths			No				No	Areas mentioned are well outside the catchment area
0177	5 years	Yes	Cnr Edgeware Rd and Alice St	Frequently floods in heavy rain		Roads and Paths			No			Yes	Yes	Cnr Edgeware Rd and Alice St. Frequently floods in heavy rain
0178	14 years	Yes	Darley St	1999	There was heavy rain for several days and runoff from back of Wells St properties ran through Darley St (adjoining laneways) and into Darley St. and ponded at corner of John St. Has also been runoff in other smaller events but to a lesser extent	Residential, roads and paths	Backyard, side laneway	We have a photo somewhere but can't find it a the moment	No		Runoff from Wells St. regularly comes through our backyard where there is heavy rain. Three years ago we installed a retaining wall and drainage to allow us to install decking and to help control the runoff. This has been partial successful but has not been tested by a large rainfall event. One problem is also that the stormwater drain in Darley St does not seem to be large enough to contain all of the stormwater runoff. So even if we can get it out of our yard, when it gets to the front, it flows in the gutter rather than in a storm drain.	Yes	Yes	Darley St. 1999

ID	Length of time they have lived/worked/shopped etc. in EC subcatchment	Have they observed ponding or flooding	Address of flooding	When flooding occurred	Details of Event	Type of property affected	Area of property affected	Evidence of flooded extent/area	Photos provided	Details of Flooding extent	Any other Information	Locations marked on Survey Map	Calibration data available Y/N?	Details of calibration data
0179	12 years	Yes	Reiby St., Newtown	Every heavy rain	Stormwater outlet in front on Reiby St., Newtown is often redirected by wheels of parked cars onto footpath and heavy rains result in topsoil being carried away from around street tree (which I then have to replace) and drowning or carrying away plants around the tree. The soil remains saturated and the tree has not grown very big (It is the third planted by council in 12 years)	Tree	Footpath		No		The gutters on Reiby St flow downhill from Enmore Rd like rivers in heavy rain. Rubbish from the entertainment and eating venues on Enmore Rd result in covering drains and water pooling. For example this Sunday 9 March 6:30pm the water was pooling around the blocked drains on the corners of Reiby and Don Sts and Reiby and Pemell Street. The rubbish collecting in the drains is a constant problem (e.g. bottles, plastic bags, etc.)	Yes	Yes	Reiby Street. Sunday 9 March 6:30pm
0180	25 years	Yes	Station St., Newtown	2005, 2006, 2007, 2008	There seams to be an overload in a storm and that water cannot escape. It doesn't drain quickly enough	Residential, roads and paths	Backyard, floor level		No		We do not have adequate drainage in a storm there is always overflow lots of flooding. The water simple doesn't drain quickly enough	Yes	Yes	Station St., Newtown
0181	12.5 years	Yes	Pemell St, Newtown			Roads and paths	Nature strip		No		Stormwater ponds in gutter and sometimes flows on to nature strip between 9 and 11 Pemell St., Newtown. This occurs when fallen leaves are not cleared from grid over drain which runs between the two above premises		Yes	Pemell St
0182	21 years	Yes	1. Despointes St near Sydenham Rd 2. Illawarra Rd., near Steel Park Bridge to Earlwood area	1. Morning June 2008 2. Midday 2006	The problems are mainly Illawarra Rd near Cooks River and Bayview Ave Earlwood, near Whitlam Park, on the Canterbury Council side near the Velodrome	Roads and paths, parks	car parking areas, playgrounds, sports fields		No				No	Areas mentioned are well outside the catchment area
0183	11 years	Yes	Cnr Edgeware Rd and Sarah St.		Lots of leaves blocking drain at cnr of Edgeware Rd and Sarah St. after heavy rain the road became flooded	Roads and paths			No				Yes	Cnr Edgeware Rd and Sarah St.
0184	-	Yes	Campbell St from Church St to Unwins Bridge Rd and lower end of Brown St and lower end of Hutchinson St.	5.15pm, Sat 14th March 2009 and many other events	Electrical storm with heavy rain caused flooding of Campbell St from Brown St to Unwins Bridge Rd., resulting in road closure. One motor vehicle (BMW) stranded in flood waters with at least one occupant, Newtown police attended.	Roads and paths		Publican of Town and Country Hotel (Cnr of Campbell St. and Unwins Bridge Rd) would be able to advise of depth of flooding	No	Scanned in Questionnaires\Provided data from Residents\0184.pdf	As per attachment, the area bounded by Princes HWY/Campbell St/Unwins Bridge Rd/Silver St is basically served by 2 stormwater inlets at the corner of Campbell St and Unwins Bridge Rd. The total land area is 16Ha (approx) and in times of heavy rain, these 2 stormwater inlets are inadequate and water floods the road resulting in road closure. There appears to be a former drain adjacent to a property on Unwins Bridge Rd but it has been covered over with road base. The stormwater pipeline from James Mannerman reserve (Sept of Education) exits into the Southern Gutter of Florence St adjacent to a property on Florence St. This leads to .....refer to attachment on survey (link in previous cell)	Yes - provided a lot of detail	Yes	Campbell St from Church St to Unwins Bridge Rd and lower end of Brown St and lower end of Hutchinson St. 5.15pm, Sat 14th March 2009 and many other events
0185	16 years		Cnr Alice St and Edgeware Rd			Roads and paths			No			Yes	Yes	Cnr Alice St and Edgeware Rd
0186	12 years	Yes	Cnr Edgeware Rd and Alice St	Frequently with heavy rain	The road itself is not blocked, but pedestrians cannot cross at this corner until it drains away	Roads and paths			No		I really wish this stormwater could be harvested and not wasted. Can the possibility of industry in the area being supplied with such water be investigated?	Yes	Yes	Cnr Alice St and Edgeware Rd
0187	15 years	Yes	Lord St	Every time there is heavy rain	The road turns into a river and cars cannot drive on it. When cars start to drive, it causes waves of water which flood front yards	Residential, roads and paths	front yard	I have photos and video	No			Yes - Area highlighted	Yes	Lord St. Every time there is heavy rain
0188	14 years	Yes	Wells St	8pm, Saturday 15th March 2009	heavy downpour was over high gutters and could have leaked into parked cars.	Roads and paths	Footpath		No		The ponding marked on the map is caused by leaf litter (Wells st) or other areas by gradient of the land/road	Yes - several points	Yes	Wells St. 8pm, Saturday 15th March 2009. John St
0189	32 years	Yes	Cnr Edgeware and Alice St., Enmore Rd	After heavy rain on several occasions		Roads and paths	Building (Below Floor level)		No			Yes - several points	Yes	Cnr Edgeware and Alice St., Enmore Rd. After heavy rain on several occasions
0190	18 years	Yes	King St., Edgeware Rd	-		Roads and paths			No				Yes	King St., Edgeware Rd
0191	50 years	Yes	Cnr Edgeware Rd and Sarah St		Flooding across Edgeware Rd, Sarah St, Lynch Ave	Roads and paths	Front yard		No			Yes	Yes	Cnr Edgeware Rd and Sarah St
0192	17 years	Yes	Cnr John St. and Darley St. Cnr Alice St and Edgeware Rd.	Fairly often	Blocked drains probably	Roads and paths			No		John St. struggles to cope every time there is heavy rain	Yes	Yes	Cnr John St. and Darley St. Cnr Alice St and Edgeware Rd
0193	1.5 years	Yes	Edgeware Rd to Cnr Alice St.	Feb 2009	There is major flooding on the road during heavy rain. Also, flooding at the back of a property on Edgeware. When walking home, I have been splashed by passing traffic to flooding from the gutter to the middle of the road (on Edgeware Rd.)	Roads and paths, residential	Garage	Yes	No	Photographs taken during rain. Who can I send these to? Please email a response/address where I can send in the digital images.	After a few days of continual rain (e.g. 2+) the flooding remains, i.e./flooding can remain for some time after it has rained, if there was a continuous period of rain. When walking to my place, it is difficult to avoid getting saturated by passing cars which drive through the flooded parts of the road	Yes	Yes	From Edgeware Rd to Cnr Alice St. Feb 2009
0194	15.5 years	Yes	Rawson St., Newtown. NSW 2042	Every time it rains	The group of terraces I live in along Rawson St. have stormwater running under them every time it rains. This creates massive rising damp problems. When it rains for days on end, it's like a creek running water under our homes	Residential	Building (Below Floor level)		No		The problem I've discussed needs urgent attention	Yes	Yes	Rawson St., Newtown. NSW 2042. Every time it rains
0195	1 year	No							No				No	
0196	2.5 years	Yes	Pemell St, Newtown	mid afternoon Fri, Dec 2006. During extreme rainfall	Drains can get blocked by street tree debris so it may not be a strict capacity issue. Water pools onto the footpath at the lowest point on the street. (Can I stress that tree debris is a significant factor. The crepe myrtle (?) is not a drain friendly species)	Residential (possible rising damp), roads and paths			No		Once more, the tree species (Street trees) are not kind to the drainage system. I believe they play an important role in the functioning of the stormwater drain in Pemell St. I believe they should be removed and other more appropriate species be replanted	Yes	Yes	Pemell St. mid afternoon Fri, Dec 2006. During extreme rainfall
0197	2 years	Yes	Edgeware Rd		My neighbour to the north when renovating his property showed me in the front room of the house after he removed the floorboards that there was a pool of water standing. He has had a pump installed which with regularity, even when not raining, is pumping out a substantial amount of water. Fortunately, I haven't had standing water but the ground is consistently damp (I've had fans installed under the house). Another neighbour has brought to my attention his property is very damp and has standing water problems	Residential	Building (below floor level)		No		As you'd be aware, Edgeware Rd is a steep descending Street (South) from Enmore Rd. From my neighbour he's not sure the exact source of the water coming under the property, but there is obvious concern for all, especially in heavy rains of the potential damage done underneath our homes. When having this property inspected, it was noted that most homes on the west side of Edgeware Rd have had part of the connecting walls knocked out (ventilation?). that is definitely a hazard, especially for fire. I've had my walls sealed.	Yes	Yes	Edgeware Rd.
0198	27 years	Yes	Cnr Edgeware and Alice St	Always after heavy rain	Flooding happens in the gutters	Roads and paths			No			Yes	yes	Cnr Edgeware and Alice St. Always after heavy rain

ID	Length of time they have lived/worked/shopped etc. in EC subcatchment	Have they observed ponding or flooding	Address of flooding	When flooding occurred	Details of Event	Type of property affected	Area of property affected	Evidence of flooded extent/area	Photos provided	Details of Flooding extent	Any other Information	Locations marked on Survey Map	Calibration data available Y/N?	Details of calibration data
0199	26 years	Yes	Cnr Alice and Edgeware Rd	5:30pm, Saturday 14th March 2009. Whenever there is heavy rain	very heavy rainfall occurred causing a huge flood at the intersection identified	Roads and paths			No	Please see the circled area overleaf. When there is heavy rain and we had that last Saturday (March 14), this intersection floods because the stormwater drains cannot handle the volume of water coming down Edgeware Rd. It has been like this for the 26 years I have lived here and been a rate payer.	I've lived here 26 years and every time there is heavy rain the flooding occurs at the intersection. Also, it is over knee deep to try to cross, I had to carry my dog across on Saturday as the force of the water was so great. Also Council are not moving leaves very often, they clog up the stormwater gutters and thus clog the drains	Yes	yes	Cnr Alice and Edgeware Rd. 5:30pm, Saturday 14th March 2009. Whenever there is heavy rain. Water is knee deep
0200	12 years	Yes	May St., St Peters and cnr May, Unwins Bridge Rd, Belmont and Campbell	1999, 2002.	Some letters to council dated 1999 and 2002 re drainage and works to drainage (proposed and some completed). Flooding has occurred a few times in the last 12 months also see diagram of works completed Feb 2002. Flooding still occurs	Residential, Commercial, Parks, Roads and paths, fabric of building severely salt - damages	Backyard, Building above and below floor level	Photos - of flooding in park and at rear of properties and letters to council and copies of proposals from council. Largely drought conditions since then but some recent flooding has occurred in past year.	No	I suggest that the stormwater holding basin on the corner of May and Belmont Sts could be utilised as water storage and used to water parks. Water is currently only stored temporarily then pumped back into stormwater system when system can handle water.	Scanned in Questionnaires\Provided data from Residents\0200.pdf	Yes	Yes	May St., St Peters and cnr May, Unwins Bridge Rd, Belmont and Campbell. 1999, 2002
0201	5 years	Yes	Cnr Addison and Enmore park	Whenever it rains	The road drains filling and swell across the road - pedestrians have to wade through the water to cross the street (ankle deep in places)	Roads and paths, parks			No			Yes - 2 points shown on map	Yes	Cnr Addison and Enmore park. Whenever it rains
0202	19 years	yes	Cnr Edgeware and Alice	During heavy rain	This has happened several times during heavy or prolonged rain and I think the drain on the south east section of this junction gets blocked. It seams to collect a lot of leaves etc. The water extends on to the pavement and leaves a tide mark when it recedes. I have on occasion phoned council to report blocked drain if I have been there when it happened	Roads and paths			No			Yes	Yes	Cnr Edgeware and Alice. During heavy rain
0203	5 years	Yes	Simmons St.	Multiple occasions on 2006. Now I live in another city and have tenants in house		Residential, roads and paths, pavements			No		Blockage of drains seams to cause the pooling of water. On multiple occasions water has pooled and I have had to get out a broomstick and try to unblock the drain. Another point I would like to make is that Suncorp insurance has made flood cover compulsory for my property adding $500 extra annually to insurance premium.	Yes	Yes	Simmons St.
0204	2 years	No							No				No	
0205	10 years	Yes	Lackey St	In heavy rain	Lackey St is unable to cope in heavy rain. The street fills with water that usually runs off into the park. Street floods to above gutter height. Around 2 years ago, flooding caused sewer back up resulting in raw sewage flowing through my garage (From next doors sewer line I believe) odour still present at times	Residential, roads and paths, parks	Garage, building above floor level, building below floor level	Yes - I have some photos of sewerage event. Water gushing from sewer lids on street and running through my garage	No				Yes	Lackey St. In heavy rain
0206	20 years	Yes	Darley St., Lord St and King St.	Usually after only a short period of rain		Roads and paths			No	Maria Lane which runs across the back of my property has no overflow outlet or any damage facilities. King St itself starts to pool and overflow very soon after any rain. I have noticed this very strongly between Darley to Lord running south. I have lived in the area on and off for 20 years.	There is so much construction with multi-storied apartments. I do wonder how this rapid growth is being addressed drainage wise etc by the council	Yes - various points on map	Yes	Darley St., Lord St and King St.
0207	55 years	No							No		Dear Sir, Sorry I have no knowledge or information of any stormwater problems around my property in the shown area. All in the hands of Kelly's Estate Agent		No	
0208	25 years	Yes	Margaret St., Newtown	4:15pm 14/03/09 and every time we have heavy rain	We had a heavy short shower and the whole street was like a river. The drains are constantly blocked on the cnr of Margaret and Ferndale and as we are at the bottom of the dip.hill from King St and Enmore Rd, the water rushes into Margaret St. The drains cannot cope and the parked cars mean that the water floods onto the pavement. we have digital photos if you would like to see them. Luckily we have a front step, otherwise the water would flood the inside of our house	Roads and paths	Porch area at front		Yes	As Q5., every time there is a heavy rainfall, the pavement floods up to our step. The street is like a river and at times I have to wade in inches deep water to get to my front door and to get out into the street. We can email a photo if you can supply an address	The drains should be cleared of debris and leaves more often as they get blocked which causes more water to pool in the street. Parked cars act like paddles forcing the flow of water onto the pavements (not sure what can be done about this as we all need to park our cars on the street).	Yes - Area highlighted	Yes	Margaret St. 4:15pm 14/03/09 and every time we have heavy rain
0209	2.5 years	Yes	Simmons St	Multiple occasions, every time there is heavy rain	Has been reported to council twice. Water overflows in gutter and floods into the wheels, exhausts and engines of our motorcycles. Flooding deposits debris and rubbish into our motorcycles	Roads and paths.		Yes - see photos	Yes		Have phoned the council twice about this and they have said they will come and clean out the debris. However there doesn't appear to be any drains where the problem occurs. We are at the lowest point in the street and our house becomes very damp and musty from the water pooling in this area.		Yes	Simmons St. Every time there is heavy rain
0210	23 years	Yes	St. Peters as marked on map. In front of TAFE (dog) park as indicated.	When heavy rain fell but remained for days		Roads and paths			No		I have lived in St. Peters/Enmore since 1986. I have marked 4 places I know that pond/flood during storms	Yes - 4 points on map	Yes	Cnr Unwins Bridge Rd and May St. In front of TAFE (dog) park as indicated. Whenever heavy rain falls
0211	4 years	Yes	Cnr Alice St and Edgeware	Too often to list	Pedestrian crossing of Edgeware not possible because of flooding water extending 3m out from gutter. Dangerous for traffic as well	Roads and paths			No		I am concerned about the rubbish and number of plastic bottles sitting in the stormwater opposite my house. I have been tempted to remove the grate and clean it out myself, but that may not be very safe. Is there a program for collection of this rubbish? Surely it would increase the efficiency of the drain. PS. I recently rode the length of the cooks river cycleway, what a fabulous resource! I felt very fortunate to live near it. Thanks very much!		Yes	Cnr Alice St and Edgeware. Too often to list
0212	8 years	Yes	At blocked section of Wells St.			Roads and Paths			No				Yes	At blocked section of Wells St.
0213	12 years	Yes	St Peters school as marked on map	Whenever there is heavy rain		Parks, roads and paths, school hall	Building (below floor level), playing fields	Information provided from St Peters School vision session - Talking about water management in the area	No		Please see school administration manager		Yes	St Peters school as marked on map. Whenever there is heavy rain
0214	10 years	No											No	

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Golder Associates

APPENDIX D

Property Survey Data

The habitable floor level survey for the ECE Subcatchment Management Plan was commissioned on 3 September 2009 and the field program was conducted by Golder personnel between September and October 2009. A total of 1,953 properties were surveyed that were identified as being potentially subject to flooding under existing conditions during the PMF design flood event. After discussions with the Department of Environment, Climate Change and Water (DECCW), it was agreed that the floor level elevations could be based on Council's recently acquired Aerial Laser Scanning (ALS) topographic dataset.

Accordingly, the following information was collected on-site and documented in a standard form:

- street name and number;
- property type;
- property size;
- number of storeys;
- type of construction;
- if people live on the ground floor; and
- the habitable floor height from the point of measurement.

Photographs were taken at each property for reference. It is noted that properties in the photographs were identified by the address written on a small white board, which was placed in front of the relevant property.

The following outlines the methodology which was undertaken to measure the floor level:

- Prior to the field program, maps were created highlighting the individual properties that required surveying and these were used to check that all properties that were intended to be surveyed were completed. A list of all properties that required surveying was also provided to the field staff.
- Once on-site, the property that required surveying was identified and cross-referenced against the maps and list of addresses. Once a property was surveyed the list of all properties was checked off so as to ensure all locations were completed.
- The habitable floor level of the property, usually indicated by the front entrance, assuming no step is present, was measured in centimetres (cm) using a tape measure.
- If the property was accessible, the height of the habitable floor level of the building was measured relative to the pavement at the front gate/boundary.
- If there was a vertical rise (i.e. steps) between the pavement at the front gate/boundary and the habitable floor level, the height of each step was combined to give a total rise from the level of the pavement.
- If a sloped path was present between the front gate/boundary and the toe of the sets of steps then the rise of the path was measured using a straight building structure such as the front brick fence or wall of adjacent building as a visual reference.
- If a straight building structure was not available to estimate the rise of the path then the floor level was estimated by sighting a straight line between habitable floor level and the pavement using a surveyor's staff.
- When properties faced onto a sloping street, then the floor level measurement was taken at the base of the mid point of the front door.

- When physical access was not possible between the front gate/boundary and the building, but the ground floor level could be sighted, the height difference was estimated by sighting a straight line from the ground floor level to the pavement at the boundary.
- Estimations are noted within the forms where applicable.

Other assumptions include:

- When the height of the habitable floor level was lower than the pavement at the front gate/boundary, the level was recorded as a negative value.

If the property had a basement an assumed depth was noted. If the property type was unknown it was assumed that the property was inhabited at the ground floor level. Where multiple doorways are present on one property such as a school, factory or industrial building the lowest habitable floor level was measured.

APPENDIX E

Damage Curve Data

SITE SPECIFIC INFORMATION FOR RESIDENTIAL DAMAGE CURVE DEVELOPMENT

Version 3.00 October 2007 — Queries to duncan.mcluckie@dnr.nsw.gov.au

PROJECT	DETAILS	DATE	JOB No.
Eastern Channel East Subcatchment Plan	**Marrickville Council**	**241209**	**97626003**

BUILDINGS

Regional Cost Variation Factor	1.00	*From Rawlinsons*				
Post late 2001 adjustments	1.38	*Changes in AWE see AWE Stats Worksheet*				
Post Flood Inflation Factor	1.00	*1.0*	*to*	*1.5*		
Multiply overall structural costs by this factor		*Judgement to be used. Some suggestions below*				
	Regional City			*Regional Town*		
	Houses Affected		*Factor*	*Houses Affected*		*Factor*
Small scale impact	*<*	*50*	*1.00*	*<*	*10*	*1.00*
Medium scale impacts in Regional City		*100*	*1.20*		*30*	*1.30*
Large scale impacts in Regional City	*>*	*150*	*1.40*	*>*	*50*	*1.50*
Typical Duration of Immersion	1	hours				
Building Damage Repair Limitation Factor	0.85	*due to no insurance*	*short duration*			*long duration*
		Suggested range	*0.85*	*to*		*1.00*
Typical House Size	120	m^2	*240 m^2 is Base*			
Building Size Adjustment	0.5					
Total Building Adjustment Factor	**0.59**					

CONTENTS

Average Contents Relevant to Site	$ 100,000	*Base for 240 m^2 house*	*$ 60,000*		
Post late 2001 adjustments	1.38	*From above*			
Contents Damage Repair Limitation Factor	0.75	*due to no insurance*	*short duration*		*long duration*
Sub-Total Adjustment Factor	1.04	*Suggested range*	*0.75*	*to*	*0.90*
Level of Flood Awareness	low	*low or high only. Low default unless otherwise justifiable.*			
Effective Warning Time	0	hour			
Interpolated DRF adjustment (Awareness/Time)	1.00	IDRF = Interpolated Damage Reduction Factor			
Typical Table/Bench Height (TTBH)	0.90	*0.9m is typical height. If typical is 2 storey house use 2.6m.*			
Total Contents Adjustment Factor AFD <= TTBH	**1.04**	AFD = Above Floor Depth			
Total Contents Adjustment Factor AFD > TTBH	**1.04**				

Most recent advice from Victorian Rapid Assessment Method

Low level of awareness is expected norm (long term average) any deviation needs to be justified.

Basic contents damages are based upon a DRF of	*0.9*				
Effective Warning time (hours)	***0***	***3***	***6***	***12***	***24***
RAM Average IDRF Inexperienced (Low awareness)	*0.90*	*0.80*	*0.80*	*0.80*	*0.70*
DRF (ARF/0.9)	*1.00*	*0.89*	*0.89*	*0.89*	*0.78*
RAM AIDF Experienced (High awareness)	*0.80*	*0.80*	*0.60*	*0.40*	*0.40*
DRF (ARF/0.9)	*0.89*	*0.89*	*0.67*	*0.44*	*0.44*
Site Specific DRF (DRF/0.9) for Awareness level for iteration	*1.00*	*0.89*	*0.89*	*0.89*	*0.78*
Effective Warning time (hours)	*0*	*3*	*0*		
Site Specific iterations	*1.00*	*0.89*	*1.00*		

ADDITIONAL FACTORS

Post late 2001 adjustments	1.38	*From above*
External Damage	$ 6,700	*$6,700 recommended without justification*
Clean Up Costs	$ 4,000	*$4,000 recommended without justification*
Likely Time in Alternate Accommodation	3	weeks
Additional accommodation costs /Loss of Rent	$ 400	*$220 per week recommended without justification*

TWO STOREY HOUSE BUILDING & CONTENTS FACTORS

Up to Second Floor Level, less than	2.6	m	70%	Single Storey Slab on Ground
From Second Storey up, greater than	2.6	m	110%	Single Storey Slab on Ground

Base Curves

AFD = Above Floor Depth

Single Storey Slab/Low Set	13164	+	4871	x	AFD in metres	
Structure with GST	AFD	greater than	0.0	m		
Validity Limits	AFD	less than or equal to		6	m	
Single Storey High Set	16586	+	7454	x	AFD	
Structure with GST	AFD	greater than	-1.50	m		
Validity Limits	AFD	less than or equal to		6	m	
Contents	20000	+	20000	x	AFD	
Contents with GST	AFD	greater than		0		
Validity Limits	AFD	less than or equal to		2		

Floodplain Specific Damage Equations

Components

Structural

Single Storey Slab/Low Set	$	7,721	+	$	2,857	x	AFD	m
Validity Limits		AFD	>		0.00	m		
Single Storey High Set	$	9,728	+	$	4,372	x	AFD	m
Validity Limits		AFD	>		-1.50	m		

Contents

AFD <= TTBH (Typical Table/Bench Height)	$	34,500	+	$	34,500	x	AFD	m
Validity Limits - (DRF negated above TTBH)		AFD	>		0	<	0.90	m
AFD > TTBH	$	34,500	+	$	34,500	x	AFD	m
Validity Limits - (DRF only operates below TTBH)		AFD	>		0.91	< =	2	m
AFD > 2m	$	103,500						

Additional Costs - Total $ 16,422

Made up of:

External Damage	$	9,246
Clean Up Costs	$	5,520
Additional accommodation costs /Loss of Rent	$	1,656

Total Equations

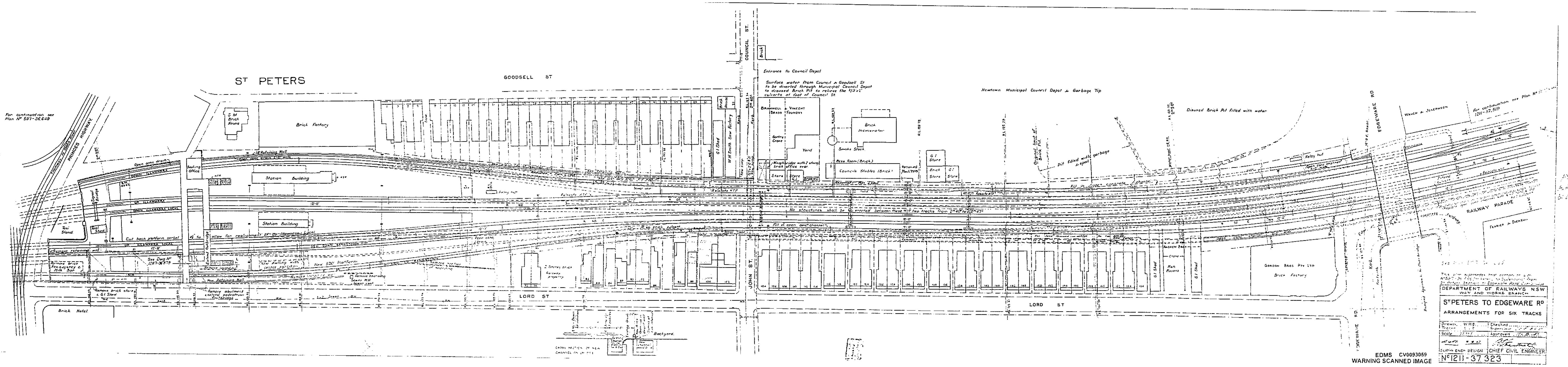
Single Storey Slab/Low Set

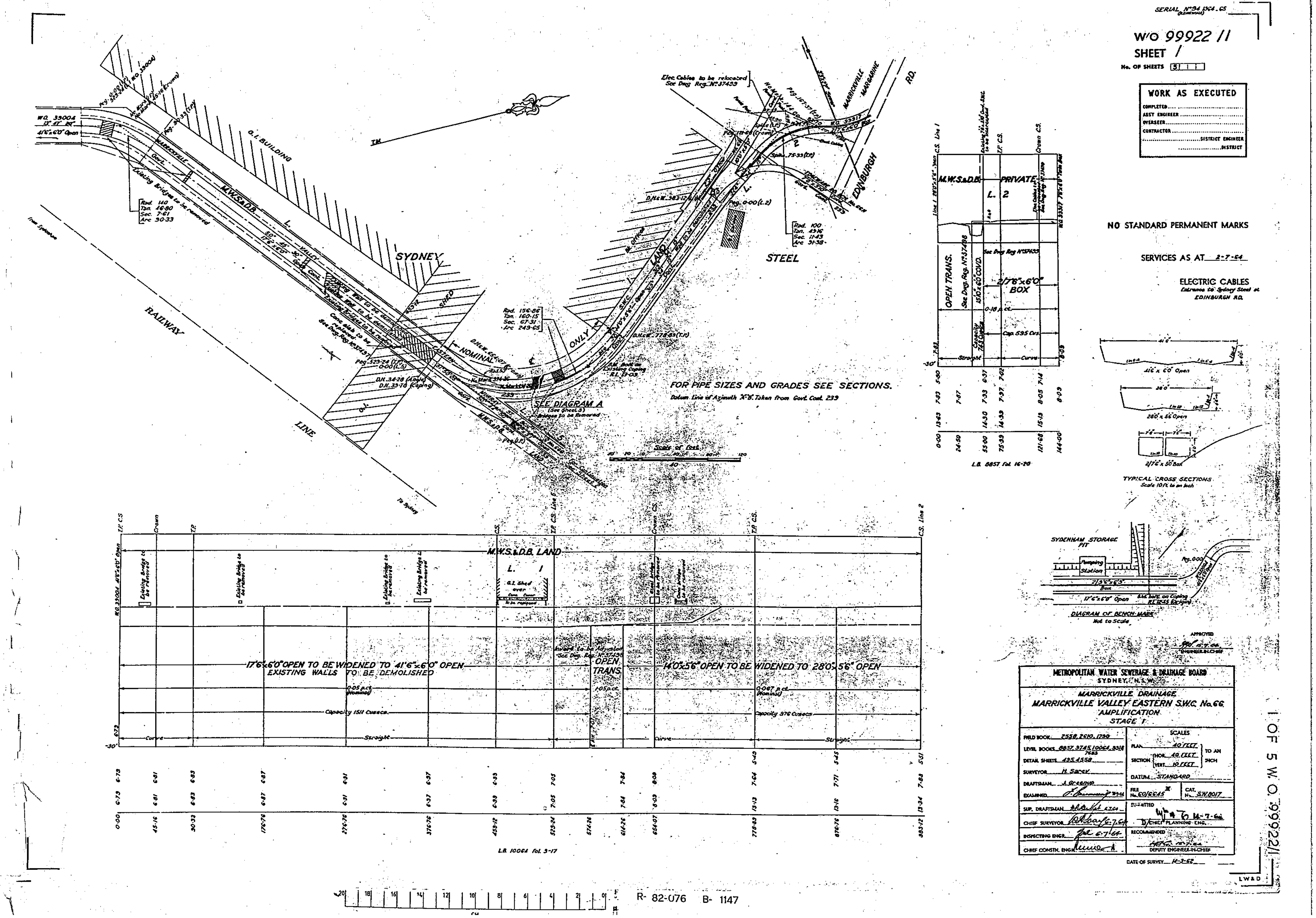
								eqn
Flooding above floor depth (AFD) <=		-0.10	Plus water level above ground level					1
	$	9,246						
Flooding above floor depth (AFD) between		-0.10	and		0.01	m		2
	$	16,967	+	$	2,857	*x*	*AFD*	
Flooding above floor depth (AFD) between		0.01	and		0.90	m		3
	$	58,643	+	$	37,357	*x*	*AFD*	
Flooding above floor depth (AFD) between		0.90	and		2.00	m		4
	$	58,643	+	$	37,357	*x*	*AFD*	
Flooding above floor >		2.00	m					5
	$	127,643	+	$	2,857	*x*	*AFD*	

Single Storey High Set

Flooding above floor depth (AFD) <=		-1.50						6
	$	9,246						
Flooding above floor depth (AFD) between		-1.50	and		-0.10			7
	$	18,974	+	$	4,372	*x*	*AFD*	
Flooding above floor depth (AFD) between		-0.10	and		0.90	m		8
	$	60,650	+	$	38,872	*x*	*AFD*	
Flooding above floor depth (AFD) between		0.90	and		2.00	m		9
	$	60,650	+	$	38,872	*x*	*AFD*	
Flooding above floor >		2.00	m					10
	$	129,650	+	$	4,372	*x*	*AFD*	

APPENDIX F
Referenced Drawings


ST PETERS
GOODSELL ST
COUNCIL ST.
Entrance to Council Depot
Newtown Municipal Council Depot & Garbage Tip
Disused Brick Pit filled with water
Brick Factory
Motion Building
Station Building
Brick Incinerator
Smoke Stack
Council's Stables (Brick)
JOHN ST.
LORD ST
EDGEWARE RD
RAILWAY PARADE
Brick Factory
Brick Hotel
Backyard
DEPARTMENT OF RAILWAYS N.S.W
WAY AND WORKS BRANCH
STPETERS TO EDGEWARE RD
ARRANGEMENTS FOR SIX TRACKS
Drawn W.H.B.
Checked
Scale
Approved
SUPTG ENGR DESIGN
CHIEF CIVIL ENGINEER
No 1211-37 323
EDMS CV0093059
WARNING SCANNED IMAGE

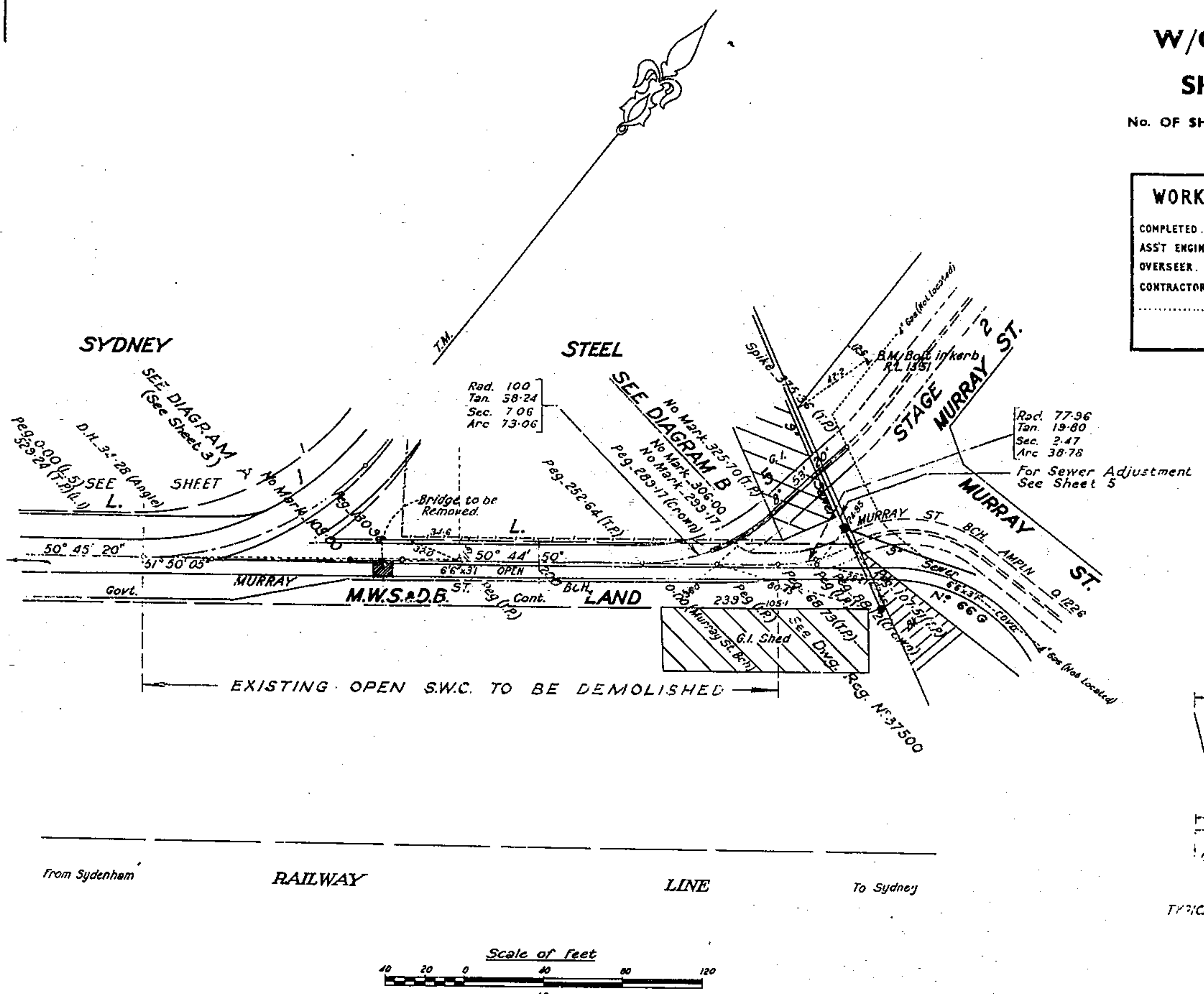

SERIAL No 94 1964 GS
W/O 99922 /1
SHEET 1
No. OF SHEETS 5
WORK AS EXECUTED
NO STANDARD PERMANENT MARKS
SERVICES AS AT 2-7-64
ELECTRIC CABLES
Entrance to Sydney Steel at Edinburgh Rd.
FOR PIPE SIZES AND GRADES SEE SECTIONS.
Datum Line of Azimuth X-B Taken from Govt. Cost. 239
SEE DIAGRAM A
G.I. BUILDING
SYDNEY
STEEL
RAILWAY
LINE
MARRICKVILLE
MARGARINE
EDINBURGH
RD.
Elec Cables to be relocated See Dwg. Reg. No 37433
Existing Bridges to be removed
Rad. 140
Tan. 46·80
Sec. 7·61
Arc 50·33
Rad. 156·86
Tan. 160·15
Sec. 67·31
Arc 249·65
Rad. 100
Tan. 49·16
Sec. 11·43
Arc 51·38
M.W.S.&D.B. LAND
PRIVATE
L. 2
OPEN TRANS.
2/17'6"x6'0" BOX
Cap. 595 Crs.
L.B. 8857 fol. 16-20
41'6" x 6'0" Open
28'0" x 5'6" Open
2/17'6" x 5'0" Box
TYPICAL CROSS SECTIONS
Scale 10 ft. to an Inch
SYDENHAM STORAGE PIT
Pumping Station
DIAGRAM OF BENCH MARK
Not to Scale
17'6"x6'0" OPEN TO BE WIDENED TO 41'6"x6'0" OPEN
EXISTING WALLS TO BE DEMOLISHED
OPEN TRANS.
14'0"x5'6" OPEN TO BE WIDENED TO 28'0"x5'6" OPEN
Capacity 1511 Cusecs
Capacity 976 Cusecs
L.B. 10064 fol. 3-17
APPROVED
ENGINEER-IN-CHIEF
METROPOLITAN WATER SEWERAGE & DRAINAGE BOARD
SYDNEY, N.S.W.
MARRICKVILLE DRAINAGE
MARRICKVILLE VALLEY EASTERN S.W.C. No. 66
AMPLIFICATION
STAGE 1
FIELD BOOK 2558, 2610, 1730
LEVEL BOOKS 8857, 9745, 10064, 3318 7683
DETAIL SHEETS 495, 4558
SURVEYOR H. Sarev
DRAFTSMAN J. Greenup
EXAMINED
SUP. DRAFTSMAN
CHIEF SURVEYOR
INSPECTING ENGR.
CHIEF CONSTN. ENGR.
SCALES
PLAN 40 FEET
SECTION HOR. 40 FEET VERT. 10 FEET
TO AN INCH
DATUM STANDARD
FILE No. 60/6645
CAT. No. SW 8017
SUBMITTED
D/CHIEF PLANNING ENG.
RECOMMENDED
DEPUTY ENGINEER-IN-CHIEF
DATE OF SURVEY 14-3-62
LWAD
1 OF 5 W.O. 99922/1
R- 82-076 B- 1147

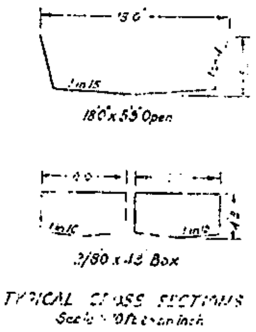
W/O 99922/1

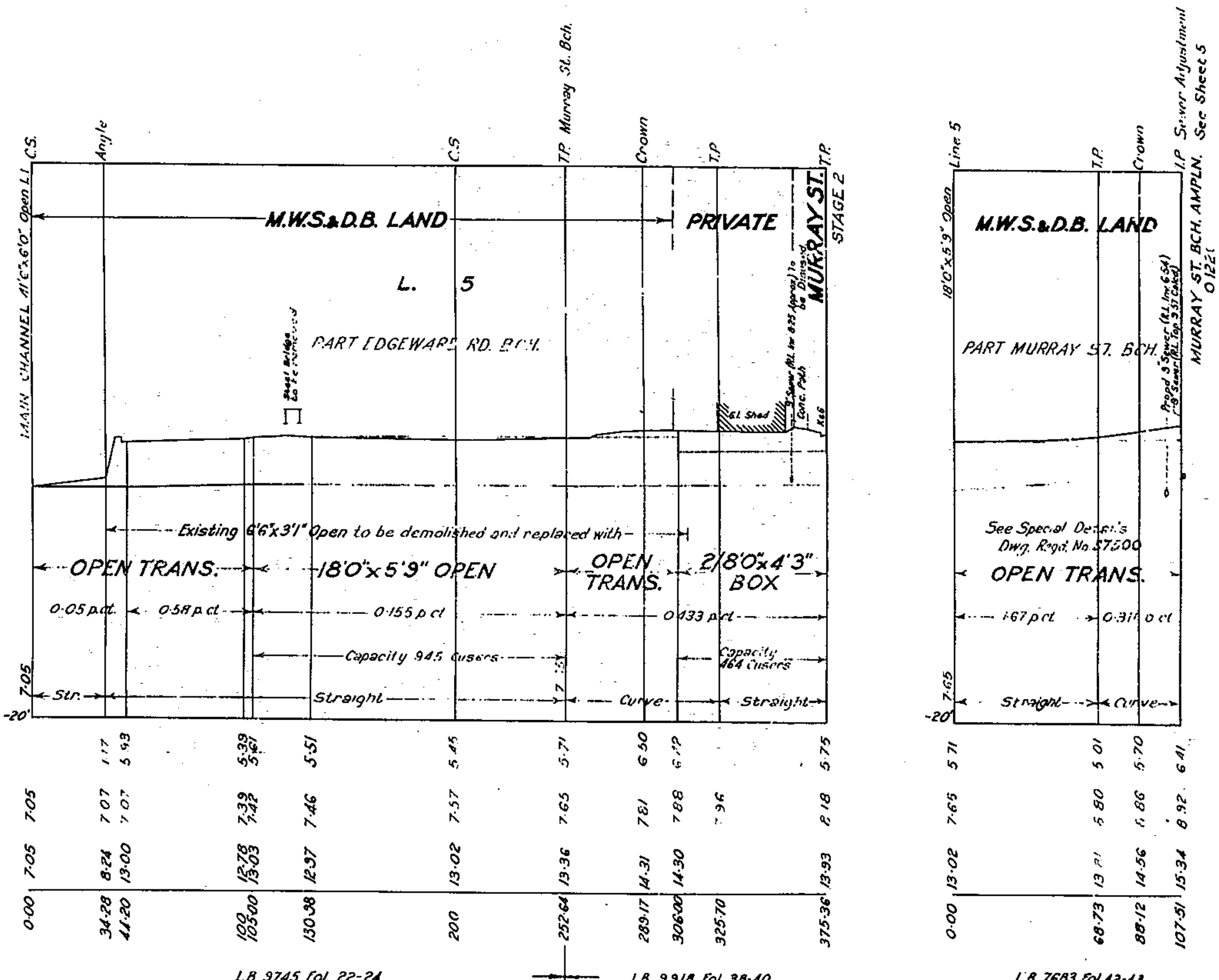
SHEET 2

No. OF SHEETS 5

WORK AS EXECUTED
COMPLETED ......
ASS'T ENGINEER ......
OVERSEER ......
CONTRACTOR ......
...... DISTRICT ENGINEER
...... DISTRICT







L.B. 9745 Fol. 22-24 | L.B. 9318 Fol. 38-40 | L.B. 7683 Fol. 42-43

MARRICKVILLE DRAINAGE

MARRICKVILLE VALLEY EASTERN S.W.C. No. 66

EDGEWARE RD. BCH. — MURRAY ST. BCH.

LAS

2 OF 5 W.O. 99922/1

W/O 99922 / I
SHEET 3
No. OF SHEETS 5

WORK AS EXECUTED

COMPLETED
ASST. ENGINEER
OVERSEER
CONTRACTOR
DISTRICT ENGINEER
DISTRICT

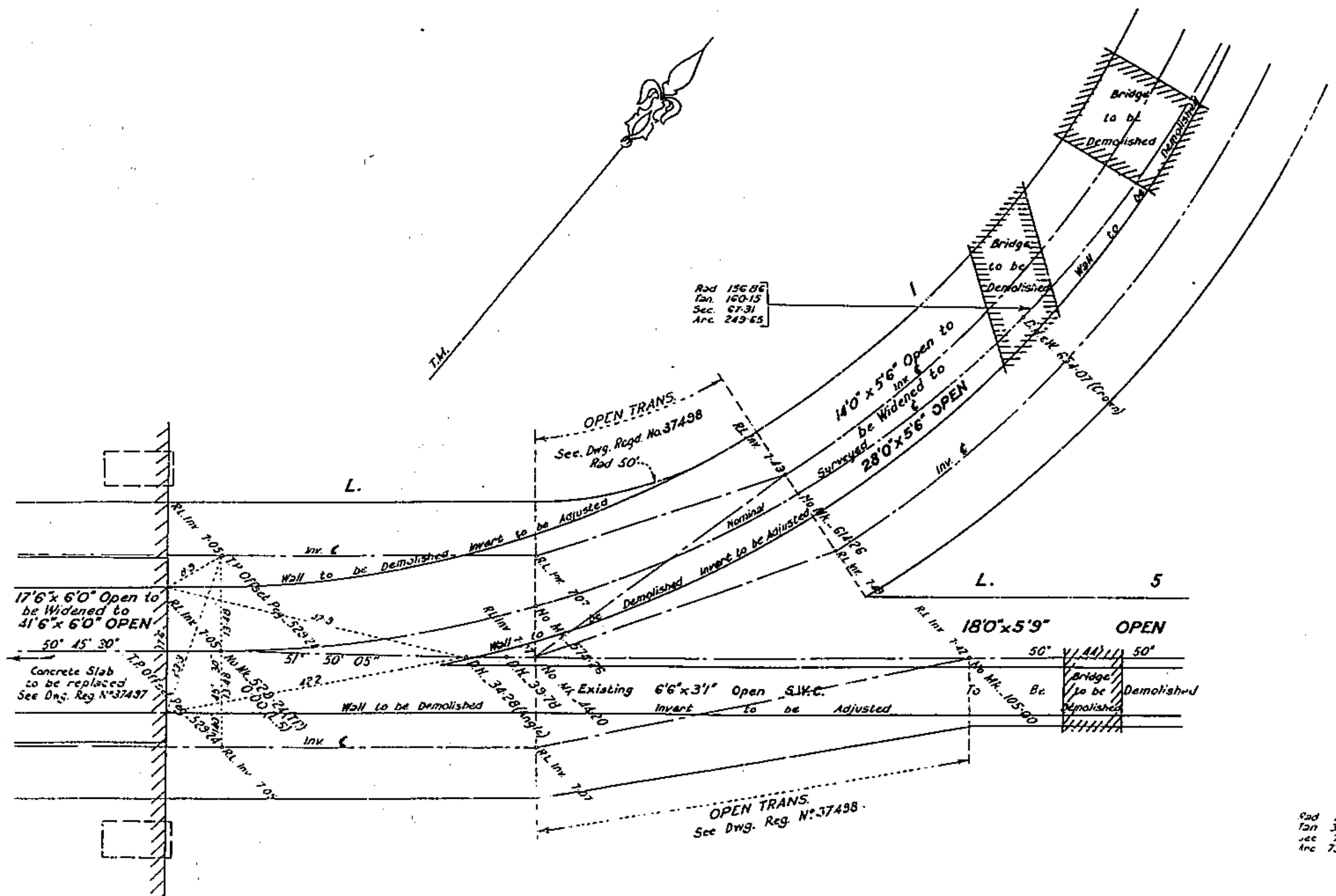


DIAGRAM A
Scale:- 10 Feet to an Inch.

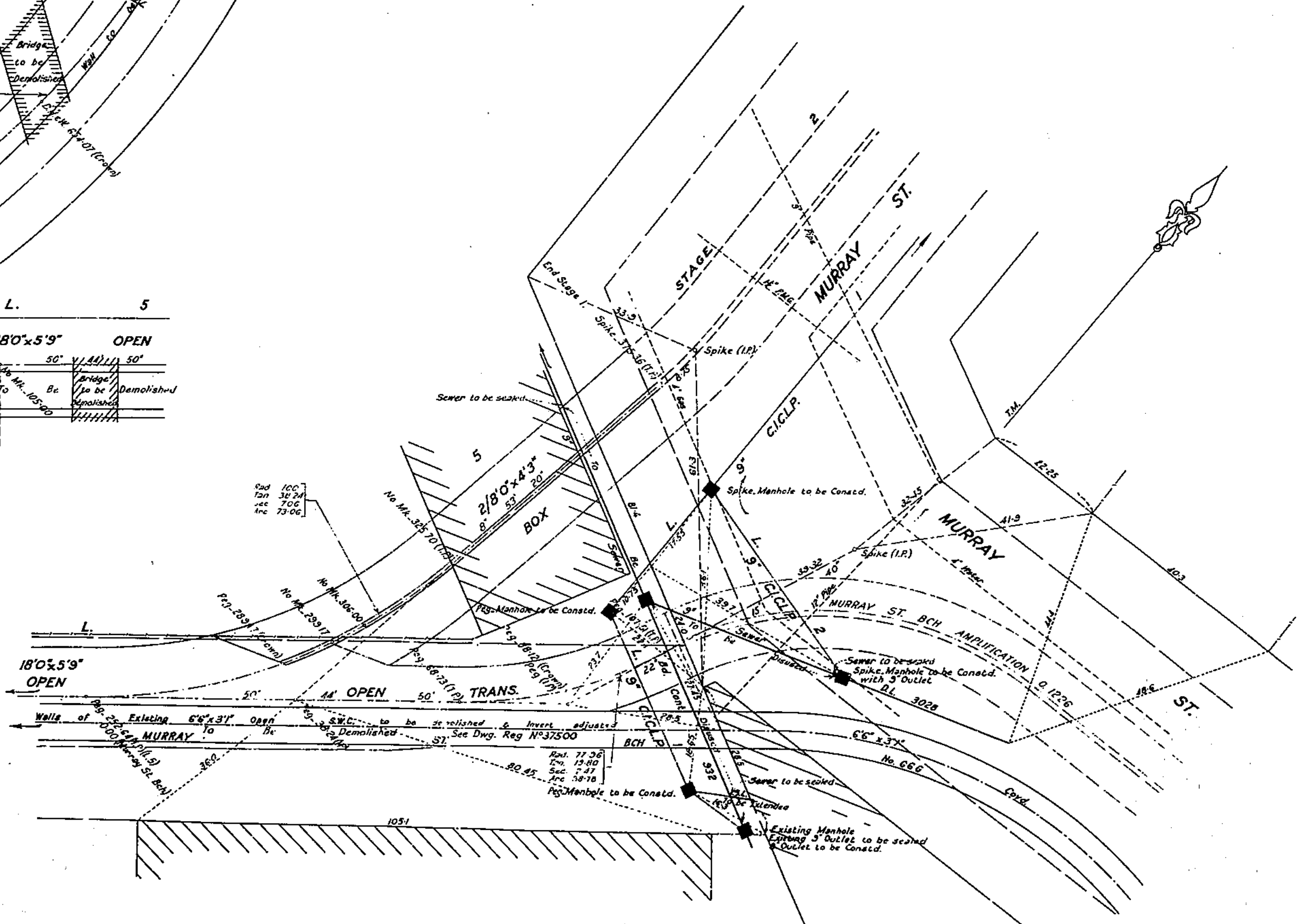


DIAGRAM B
Scale:- 10 Feet to an Inch.

3 OF 5 W.O. 99922/I

MARRICKVILLE DRAINAGE
MARRICKVILLE VALLEY EASTERN S.W.C. No. 66
EDGEWARE RD. BCH.-MURRAY ST. BCH.

WO 99922/I

W/O 99922/1

SHEET 4

No. OF SHEETS 5

WORK AS EXECUTED

COMPLETED ____________

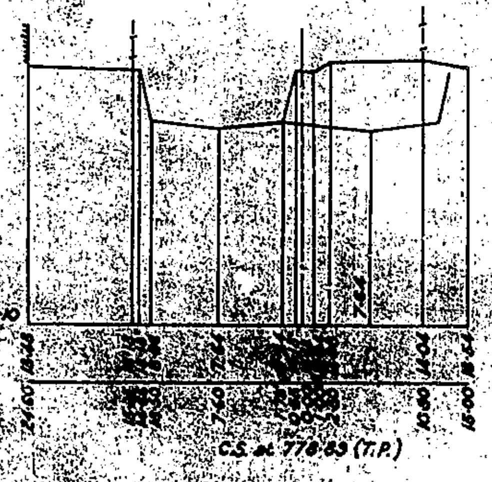
ASS'T. ENGINEER ____________

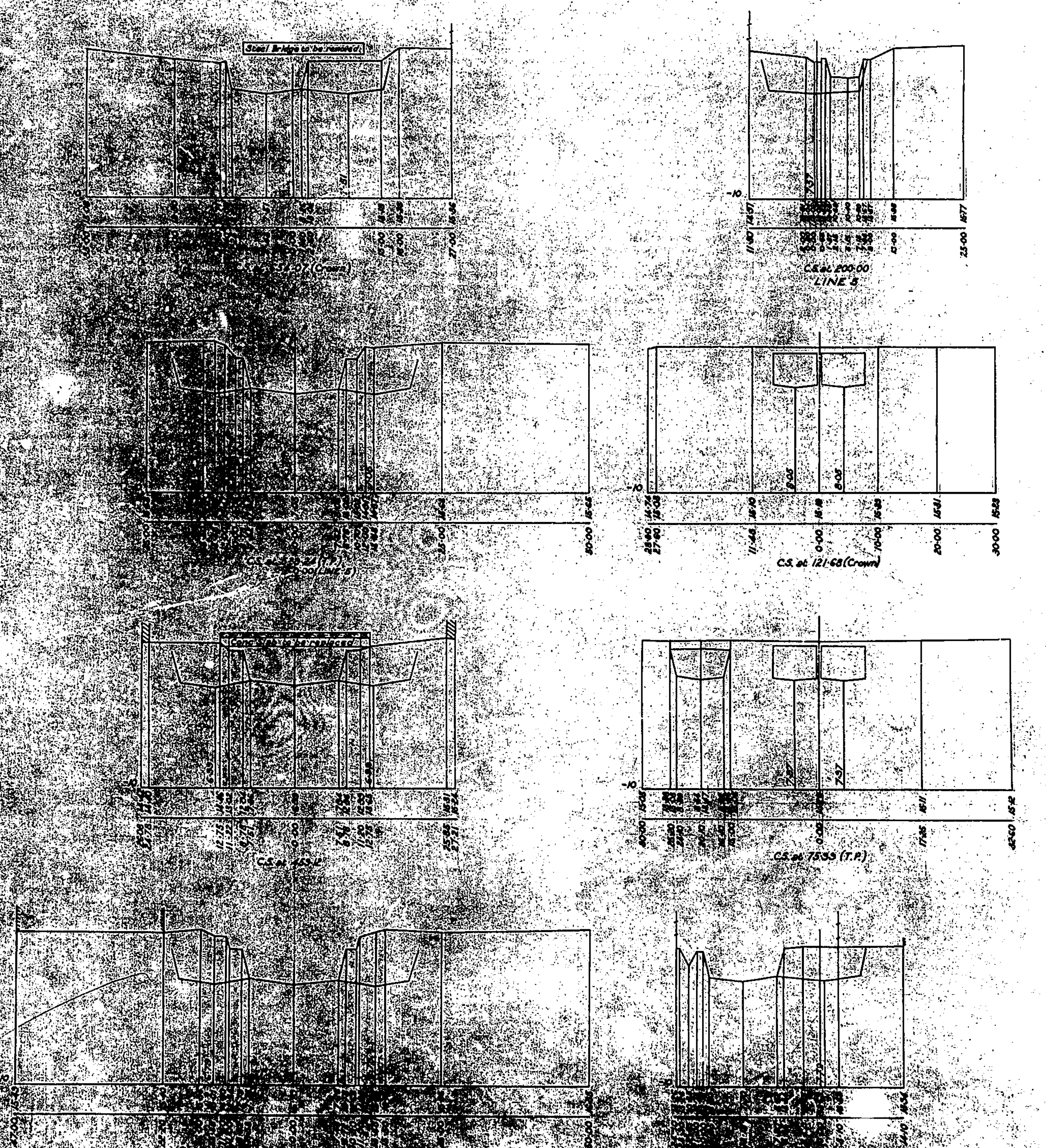
OVERSEER ____________

CONTRACTOR ____________

____________ DISTRICT ENGINEER

____________ DISTRICT



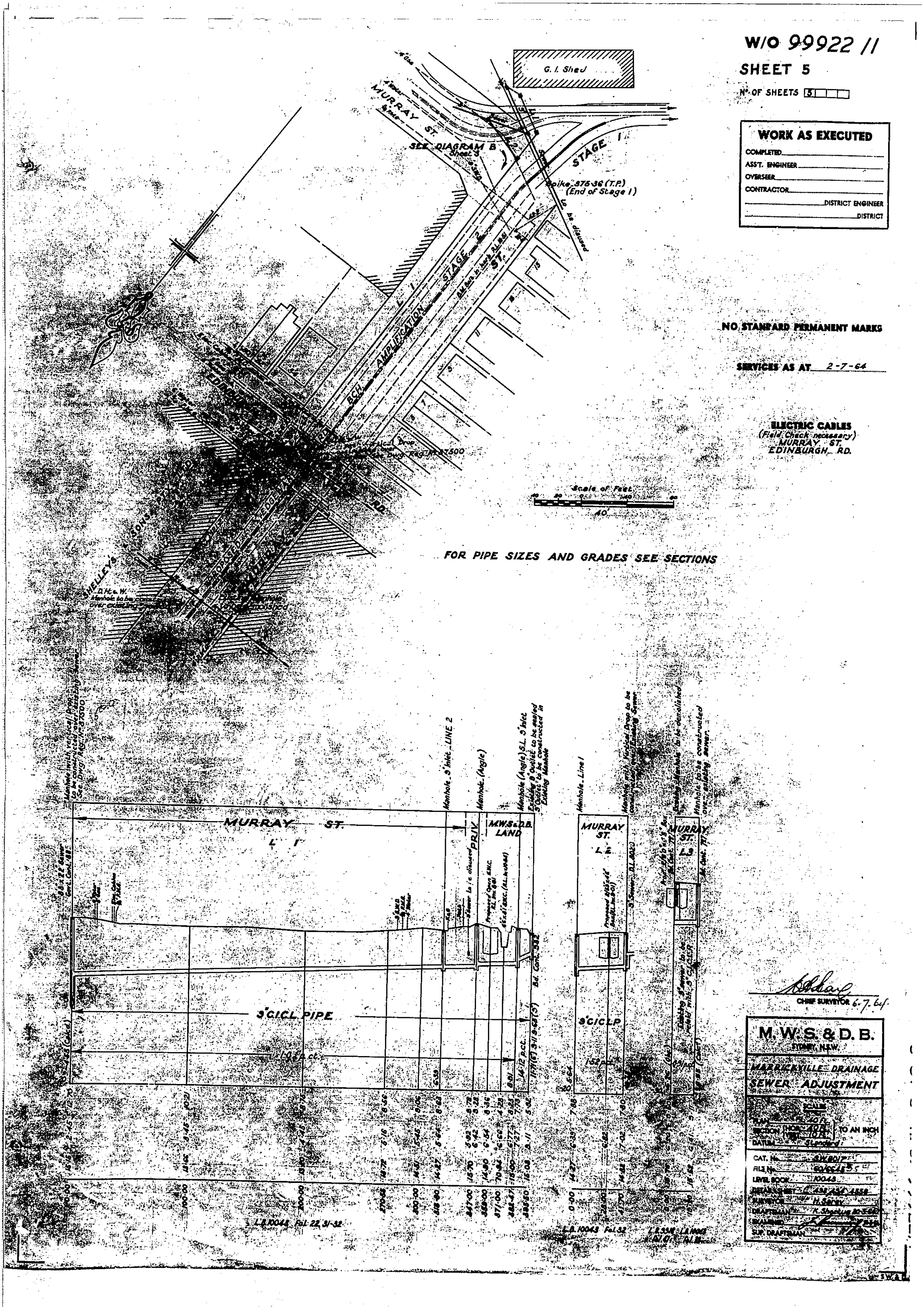


LINE 4

MARRICKVILLE DRAINAGE

MARRICKVILLE VALLEY EASTERN SWC No 66

AMPLIFICATION

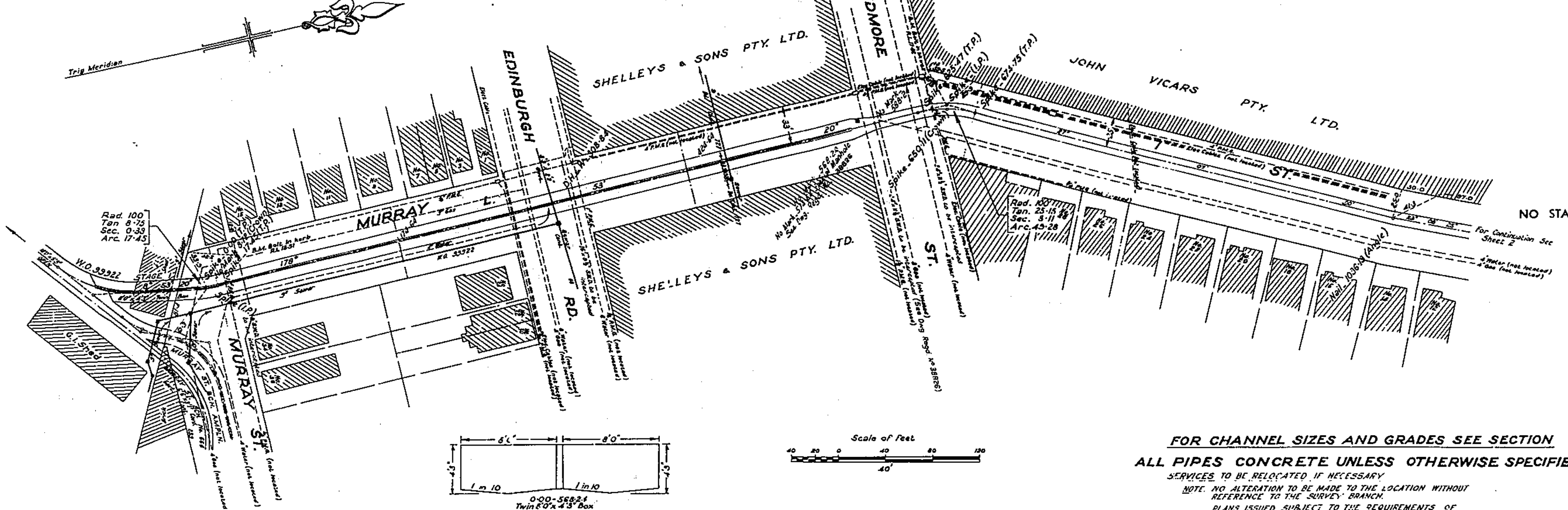

W/O 99922 /1
SHEET 5
Nº OF SHEETS 5
WORK AS EXECUTED
COMPLETED
ASST. ENGINEER
OVERSEER
CONTRACTOR
DISTRICT ENGINEER
DISTRICT
G. I. Shed
MURRAY ST.
SEE DIAGRAM B
STAGE I
Spike 375·36 (T.P.)
(End of Stage I)
to be disused
EDINBURGH RD.
SHELLEYS
NO STANDARD PERMANENT MARKS
SERVICES AS AT 2-7-64
ELECTRIC CABLES
(Field Check necessary)
MURRAY ST.
EDINBURGH RD.
Scale of Feet
40
FOR PIPE SIZES AND GRADES SEE SECTIONS
MURRAY ST.
L 1
PRIV.
M.W.S.&D.B. LAND
Manhole. Line 1
MURRAY ST.
L 2
MURRAY ST.
L 3
Manhole. (Angle)
Manhole. 5" Inlet. LINE 2
5" C.I.C.L. PIPE
5" C.I.C.L.P.
L.B. 10043 Fol. 22, 31-32
L.B. 10043 Fol. 32
CHIEF SURVEYOR 6-7-64
M.W.S. & D.B.
SYDNEY, N.S.W.
MARRICKVILLE DRAINAGE
SEWER ADJUSTMENT
SCALES
PLAN 40 Ft.
SECTION HOR. 40 Ft. VERT. 10 Ft. TO AN INCH
DATUM Standard
CAT. No.
FILE No.
LEVEL BOOK 10043
SURVEYOR H. Seiler
DRAFTSMAN
EXAMINED
SUP. DRAFTSMAN

SERIAL No. 152 1965-66 (RENEWAL)

W/O 99922 /2
SHEET /
No. OF SHEETS 5

WORK AS EXECUTED

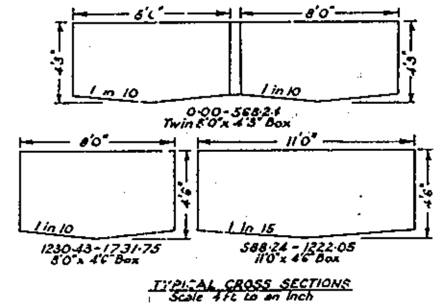
COMPLETED	
ASST ENGINEER	
OVERSEER	
CONTRACTOR	
	DISTRICT ENGINEER
	DISTRICT



NO STANDARD PERMANENT MARKS

SERVICES AS AT 12-1-66

ELECTRIC CABLES
(Field check necessary)
Murray St. (S.C.C.)
Edinburgh Rd. (S.C.C.)
Smidmore St. (S.C.C.)
Victoria Rd. (S.C.C.)



TYPICAL CROSS SECTIONS
Scale 4 ft. to an Inch

Scale of Feet
40 20 0 40 80 120

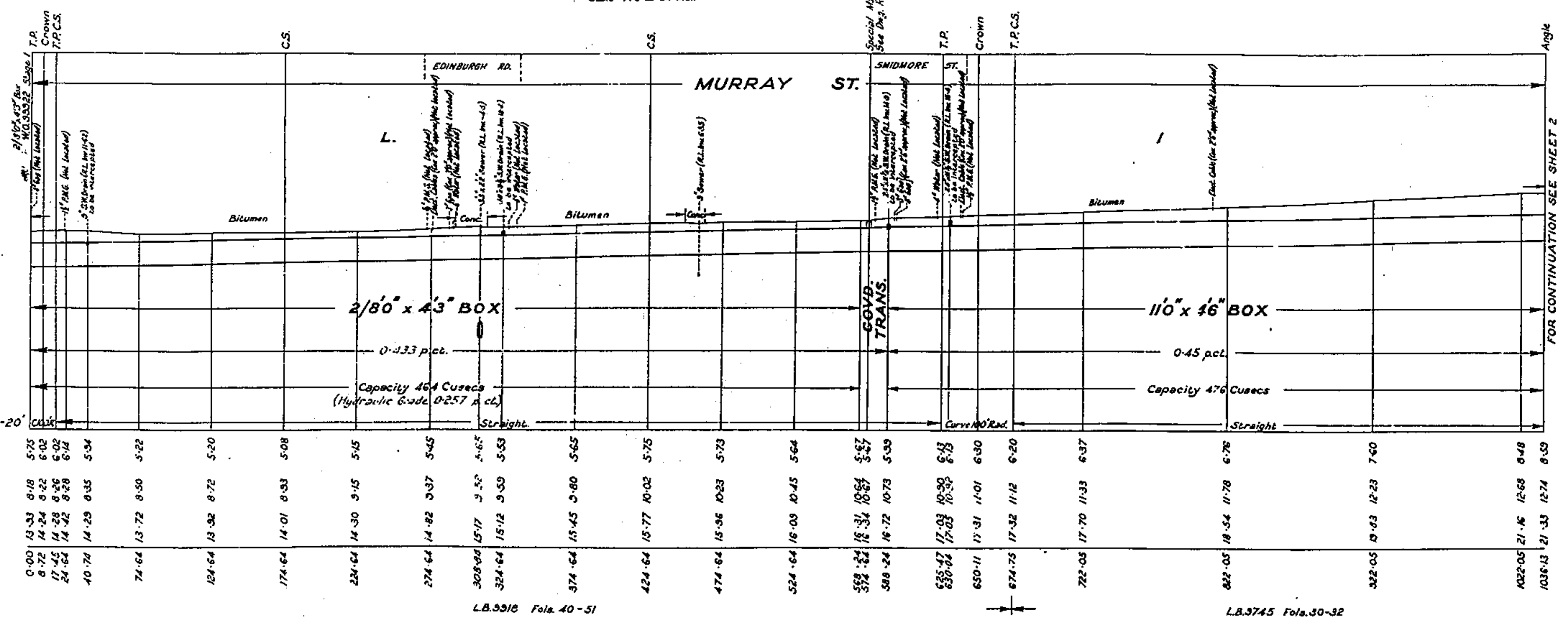
FOR CHANNEL SIZES AND GRADES SEE SECTION

ALL PIPES CONCRETE UNLESS OTHERWISE SPECIFIED

SERVICES TO BE RELOCATED IF NECESSARY

NOTE. NO ALTERATION TO BE MADE TO THE LOCATION WITHOUT REFERENCE TO THE SURVEY BRANCH.
PLANS ISSUED SUBJECT TO THE REQUIREMENTS OF THE DESIGN BRANCH.

Datum Line of Azimuth
A-B on Sheet 1 Stage 1 (W.O. 99922)
Taken from Govt. Cont. 233



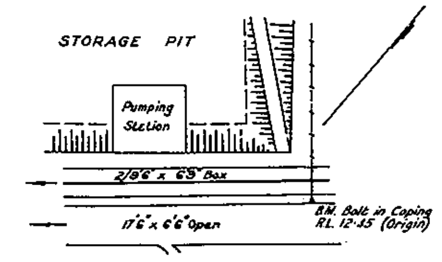


DIAGRAM OF BENCH MARK
(Not to scale)

APPROVED
ENGINEER-IN-CHIEF

METROPOLITAN WATER SEWERAGE & DRAINAGE BOARD
SYDNEY, N.S.W.

CITY OF SYDNEY - MARRICKVILLE DRAINAGE
MARRICKVILLE VALLEY EASTERN S.W.C. No. 66
EDGEWARE RD. BCH. No. 66H
AMPLIFICATION - STAGE 2

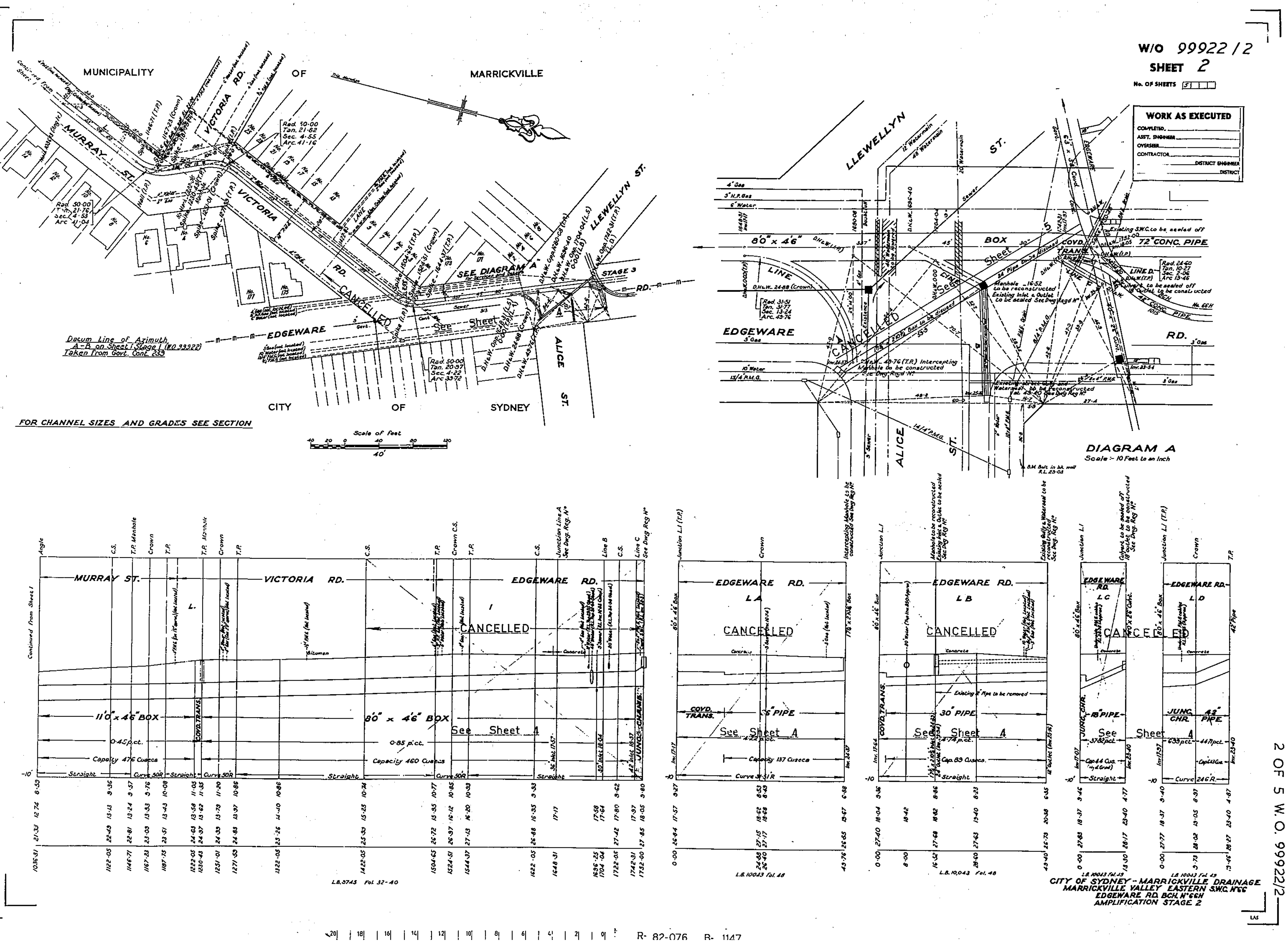
FIELD BOOK	2558 B.C. 7610 B.C.	SCALES	PLAN 40 feet; SECTION HOR. 40 feet, VERT. 10 feet TO AN INCH
LEVEL BOOKS	3745, 3318, 19043		
DETAIL SHEETS	477, 453, 454, 573, 4558		
SURVEYOR	K. Saxer	DATUM	Standard
DRAFTSMAN	K. Sharlow, J. Greenup	FILE No.	60/6645 III
EXAMINED	2-3-65	CAT. No.	0. 864 SH. 9036
SUP. DRAFTSMAN	13-2-65	SUBMITTED	18-1-66 D/CHIEF PLANNING ENG.
CHIEF SURVEYOR	18-1-66		
INSPECTING ENGR.	17-1-66	RECOMMENDED	20-1-66 DEPUTY ENGINEER-IN-CHIEF
CHIEF CONSTN. ENGR.			

B CAN. SHEET 16

DATE OF SURVEY 14-2-65

1 OF 5 W.O. 99922/2

L W & D



W/O 99922/2
SHEET 2
No. OF SHEETS 5
WORK AS EXECUTED
COMPLETED
ASST. ENGINEER
OVERSEER
CONTRACTOR
DISTRICT ENGINEER
DISTRICT
MUNICIPALITY OF MARRICKVILLE
CITY OF SYDNEY
MURRAY ST.
VICTORIA RD.
LLEWELLYN ST.
EDGEWARE RD.
ALICE ST.
SEE DIAGRAM A
STAGE 3
CANCELLED
See Sheet 4
Datum Line of Azimuth A-B on Sheet 1, Stage 1 (W.O. 99922) Taken from Govt. Cont. 239
FOR CHANNEL SIZES AND GRADES SEE SECTION
Scale of Feet
DIAGRAM A
Scale :- 10 Feet to an Inch
8'0" x 4'6" BOX
72" CONC. PIPE
11'0" x 4'6" BOX
Capacity 476 Cusecs
Capacity 460 Cusecs
EDGEWARE RD. LA
EDGEWARE RD. LB
EDGEWARE RD. LC
EDGEWARE RD. LD
L.B. 3745 Fol. 32-40
L.B. 10043 Fol. 48
CITY OF SYDNEY - MARRICKVILLE DRAINAGE
MARRICKVILLE VALLEY EASTERN S.W.C. No. 66
EDGEWARE RD. BCH. No. 66H
AMPLIFICATION STAGE 2
2 OF 5 W.O. 99922/2
R- 82-076 B- 1147

W/O 99922 / 2

SHEET 3

No. OF SHEETS 5

WORK AS EXECUTED

COMPLETED

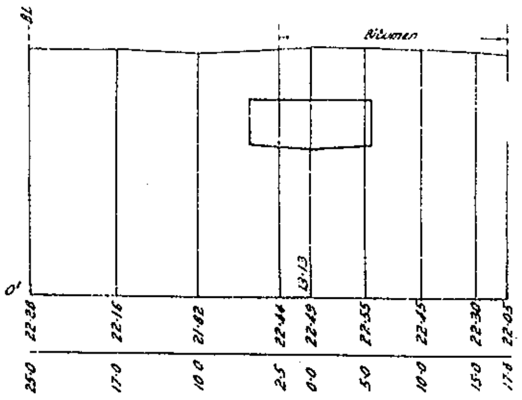
ASS'T. ENGINEER

OVERSEER

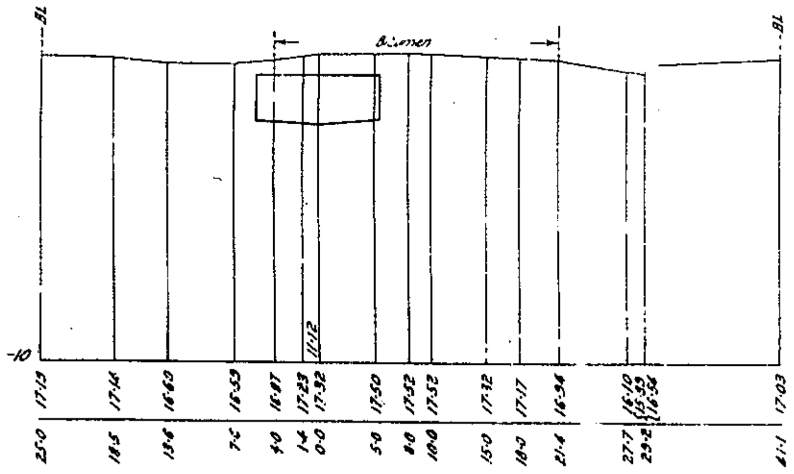
CONTRACTOR

DISTRICT ENGINEER

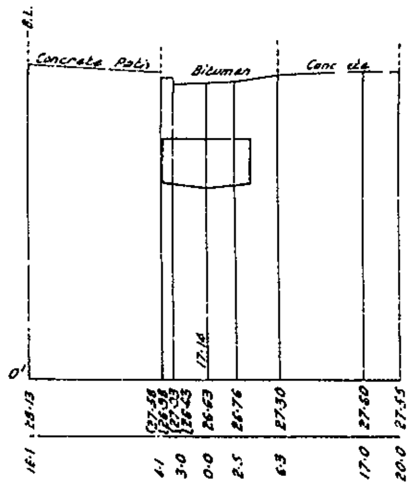
DISTRICT



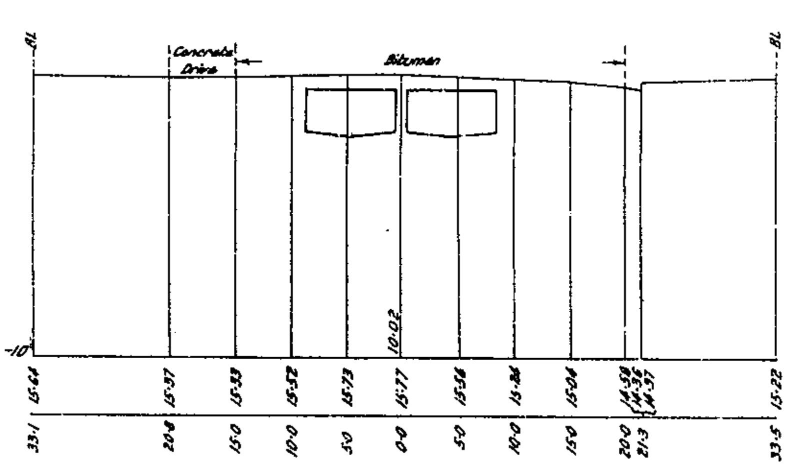
C.S. at 1122·05



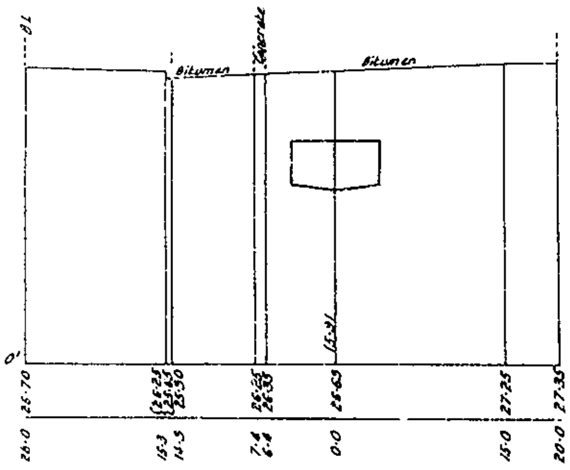
C.S. at 674·75(T.P.)



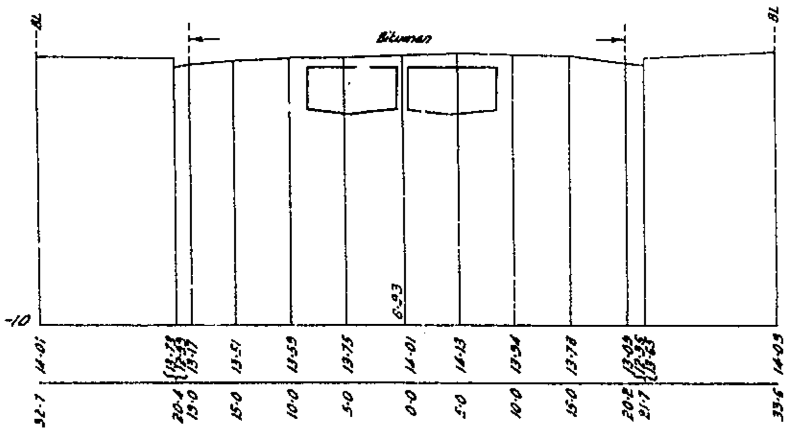
C.S. at 1643·01



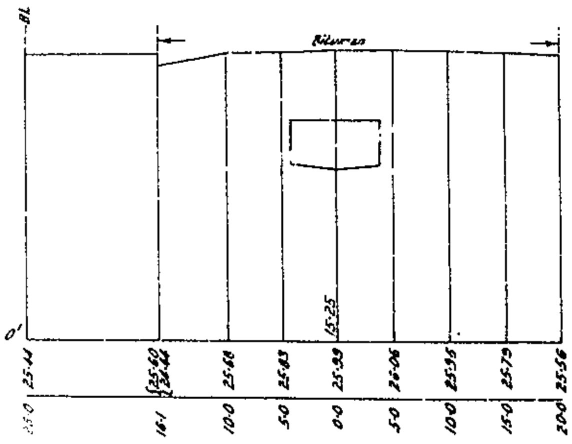
C.S. at 124·64



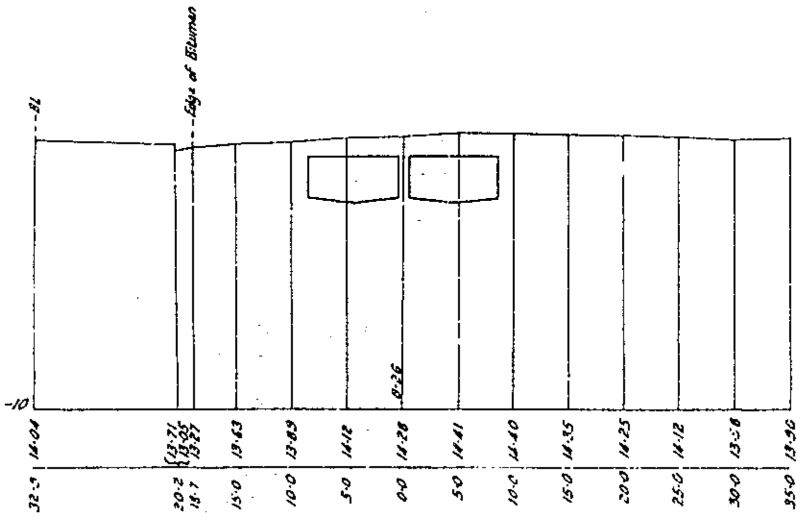
C.S. at 1499·33(T.P.)



C.S. at 174·64



C.S. at 1422·05



C.S. at 17·45(T.P.)

CITY OF SYDNEY – MARRICKVILLE DRAINAGE
MARRICKVILLE VALLEY EASTERN S.W.C. No. 66
EDGEWARE RD. BCH. No. 66H
AMPLIFICATION STAGE 2
Scale: 10 Feet to an Inch Natural

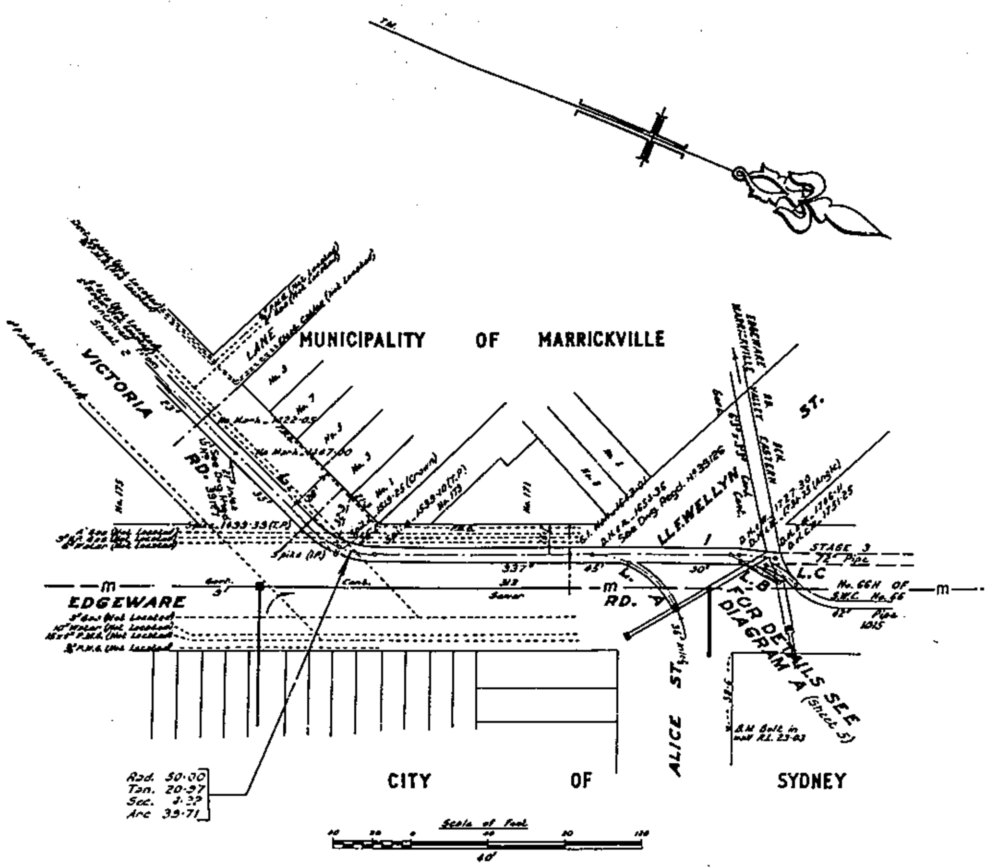
3 OF 5 W.O. 99922/2

W/O 99922 / 2
SHEET 4

No. OF SHEETS 5

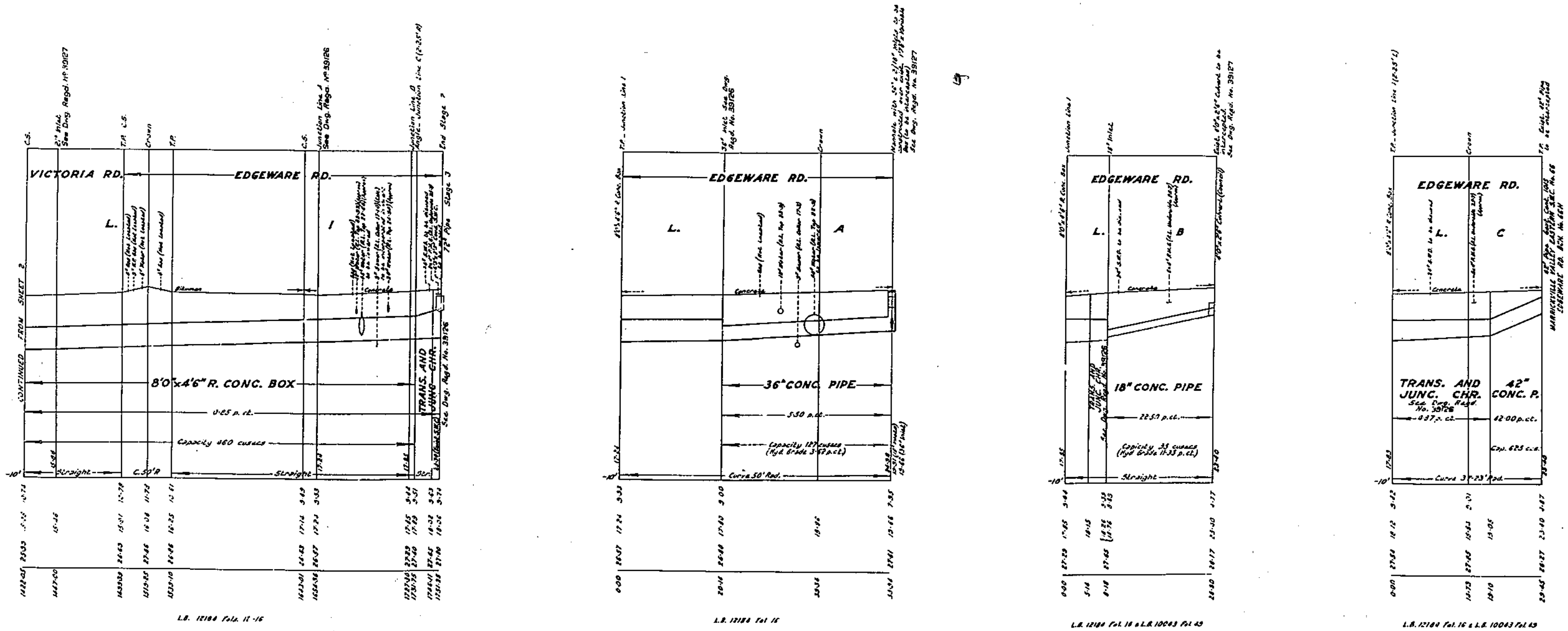
WORK AS EXECUTED

COMPLETED
ASS'T. ENGINEER
OVERSEER
CONTRACTOR
DISTRICT ENGINEER
DISTRICT



FOR CHANNEL SIZES AND GRADES SEE SECTIONS

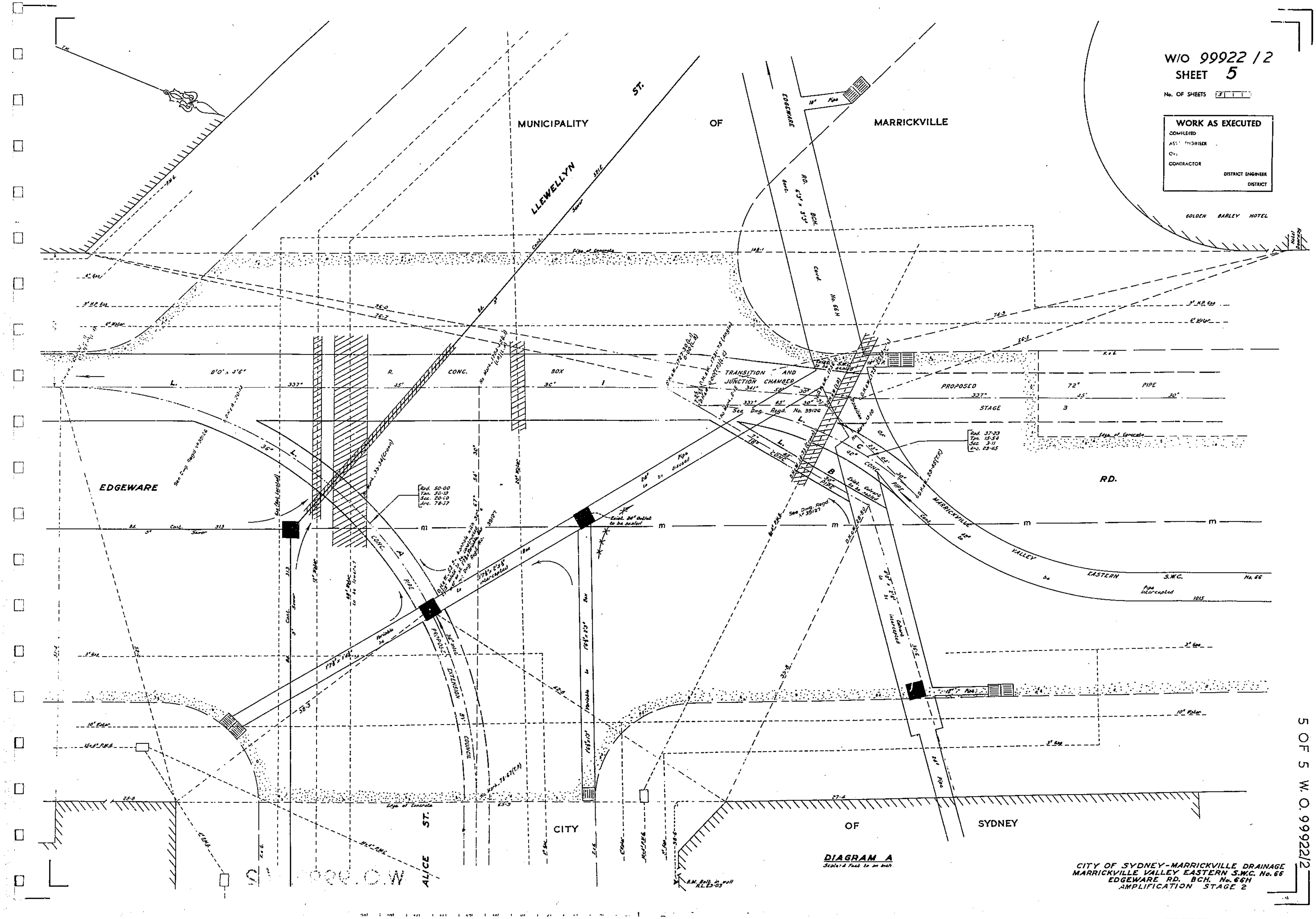
NOTE: SCALE FOR SECTIONS OF LINES A, B & C (Hor.: 10 Feet to an Inch; Vert.: 10 Feet to an Inch)



CITY OF SYDNEY – MARRICKVILLE DRAINAGE
MARRICKVILLE VALLEY EASTERN S.W.C. No. 66
EDGEWARE RD. BCH. No. 66H
AMPLIFICATION STAGE 2

4 OF 5 W.O. 9992/2

R- 82-076 B- 1147


W/O 99922 / 2
SHEET 5
No. OF SHEETS
WORK AS EXECUTED
COMPLETED
CONTRACTOR
DISTRICT ENGINEER
DISTRICT
GOLDEN BARLEY HOTEL
MUNICIPALITY OF MARRICKVILLE
LLEWELLYN ST.
EDGEWARE RD. BCH.
TRANSITION AND JUNCTION CHAMBER
See Drg. Regd. No. 39126
PROPOSED 72" PIPE STAGE 3
8'0" x 3'6" R. CONC. BOX
EDGEWARE
RD.
MARRICKVILLE VALLEY EASTERN S.W.C. No. 66
Pipe intercepted
PROPOSED EXTENSION BY COUNCIL
ALICE ST.
CITY OF SYDNEY
DIAGRAM A
Edge of Concrete
5 OF 5 W.O. 99922/2
CITY OF SYDNEY - MARRICKVILLE DRAINAGE
MARRICKVILLE VALLEY EASTERN S.W.C. No. 66
EDGEWARE RD. BCH. No. 66H
AMPLIFICATION STAGE 2

SHEET 1

No. OF SHEETS 4

WORK AS EXECUTED

COMPLETED

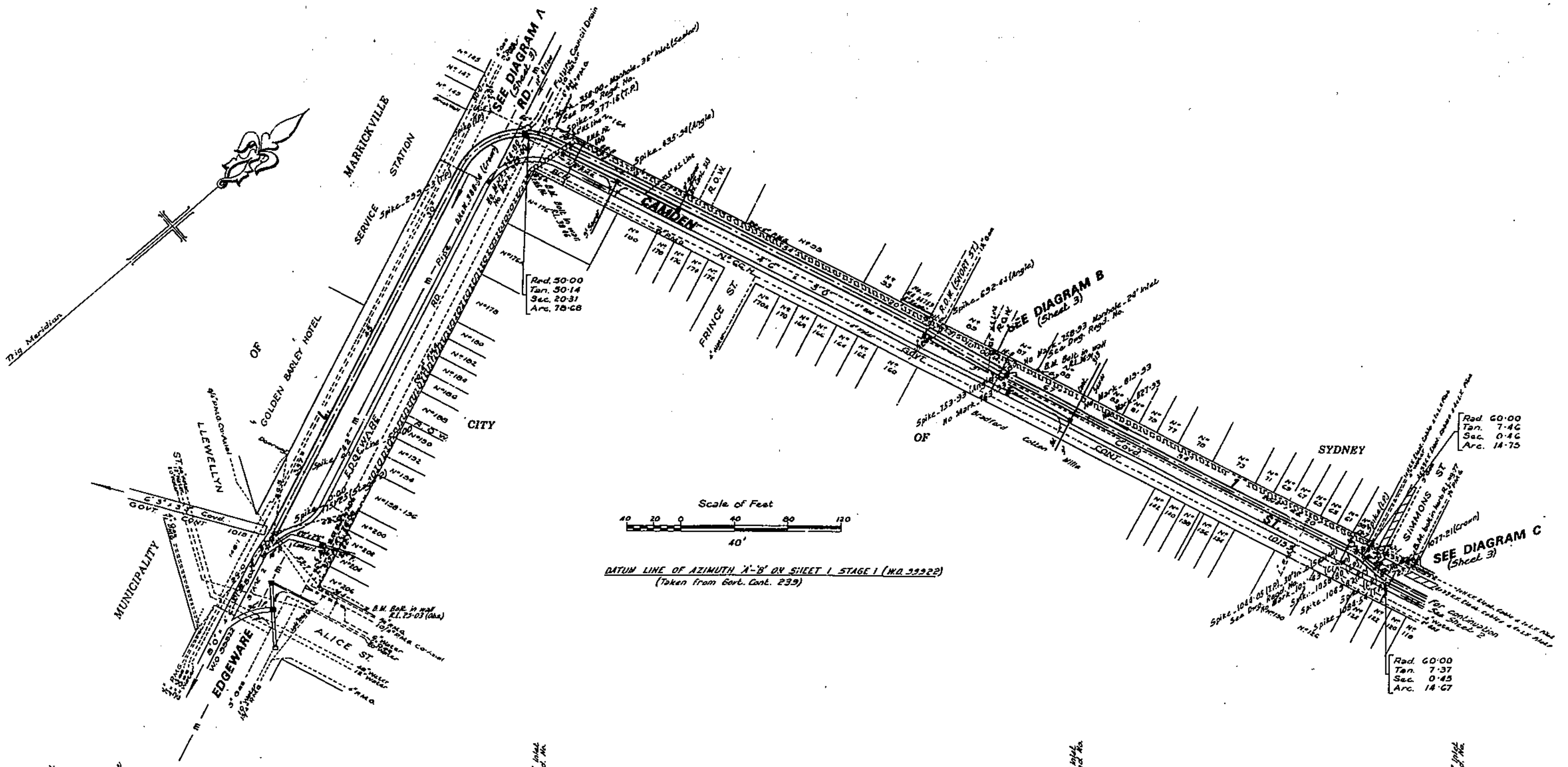
ASST ENGINEER

OVERSEER

CONTRACTOR

DISTRICT ENGINEER

DISTRICT



NO STANDARD PERMANENT MARKS

SERVICES AS AT 11-5-67

ELECTRIC CABLES FIELD CHECK NECESSARY

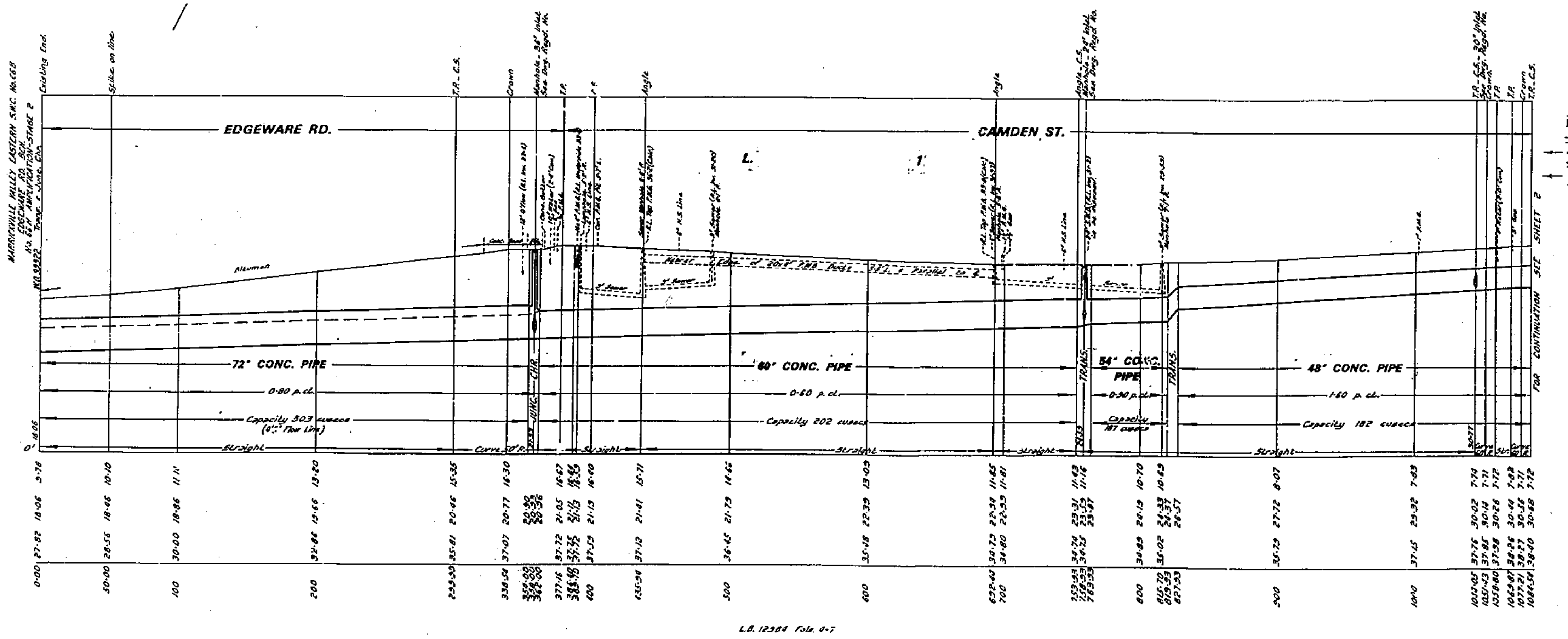
West side Simmons St.(S.C.C.)
Both sides Camden St.(S.C.C.)
Both sides Clara St.(S.C.C.)

P.M.G. CO-AXIAL CABLE
North side Llewellyn St.
Across Edgeware Rd.
North side Alice St.

FOR CHANNEL SIZES AND GRADES, SEE SECTIONS

NO AMENDMENTS ARE TO BE MADE TO THIS PLAN WITHOUT REFERENCE TO CHIEF SURVEYOR.

PLANS ISSUED SUBJECT TO THE REQUIREMENTS OF THE DESIGN BRANCH.



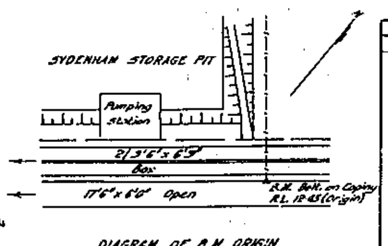


DIAGRAM OF B.M. ORIGIN
Not to Scale.

AMENDMENTS				
No.	LINES	APPD.	DATE	ISSUED

APPROVED ______ 12.7.67 ENGINEER-IN-CHIEF

METROPOLITAN WATER SEWERAGE & DRAINAGE BOARD
SYDNEY, N.S.W.

CITY OF SYDNEY—MARRICKVILLE DRAINAGE
MARRICKVILLE VALLEY EASTERN S.W.C. No. 66
EDGEWARE RD. BCH. No. 66H
AMPLIFICATION—STAGE 3

SURVEYOR J. Minter 17/3/67
DRAFTSMAN A. Cambridge / J. Greenup 21/3/67
EXAMINED 30/5/67
SUP. DRAFTSMAN 10.7.67
CHIEF SURVEYOR 7.7.67
INSPECTING ENGR. 11/7/67
CHIEF CONSTN. ENGR. 11/7/67
SUBMITTED CHIEF PLANNING ENGR.
RECOMMENDED 12.7.67 DEPUTY ENGINEER-IN-CHIEF (E.S.)

SCALES
PLAN 40 Ft.
LONG SECTION HOR. 40 Ft. VERT. 10 Ft. TO AN INCH
CROSS SECTIONS 10 Ft. TO AN INCH NATURAL

STANDARD DATUM

FIELD BOOKS 2550 R.E., 3107 R.E., 3334 R.E.
LEVEL BOOKS 3318, 12384
DETAILED SHEETS 476, 573, 576
8 CHN. SHEET 14
FILE No. 60/6645 K
C. 8648
S.W. 8044
SERIAL No. 5005 PROG. 1967/68

W/O 99922/3

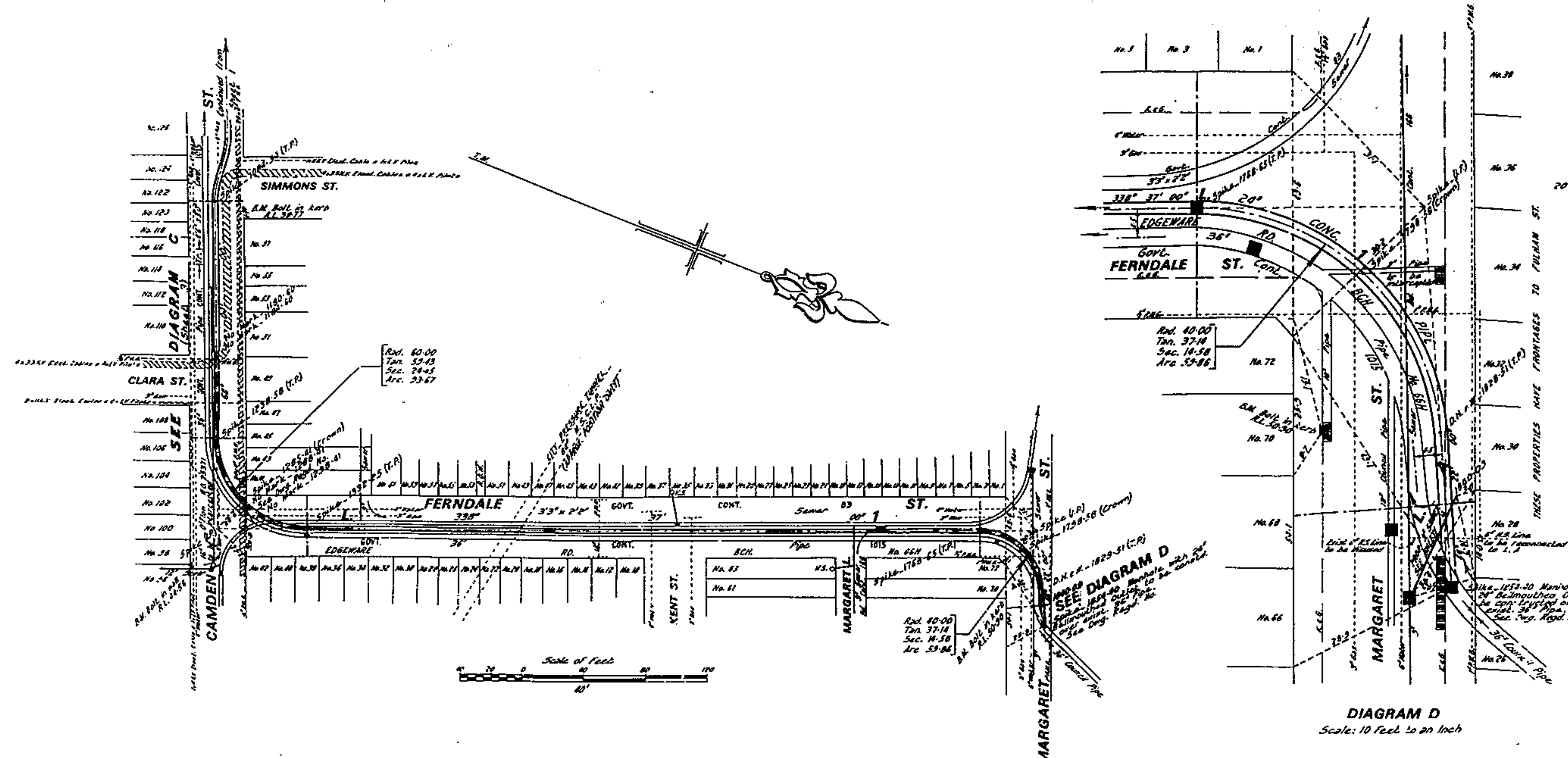
ROBINSONS DIRECTORY Map 17, D-1

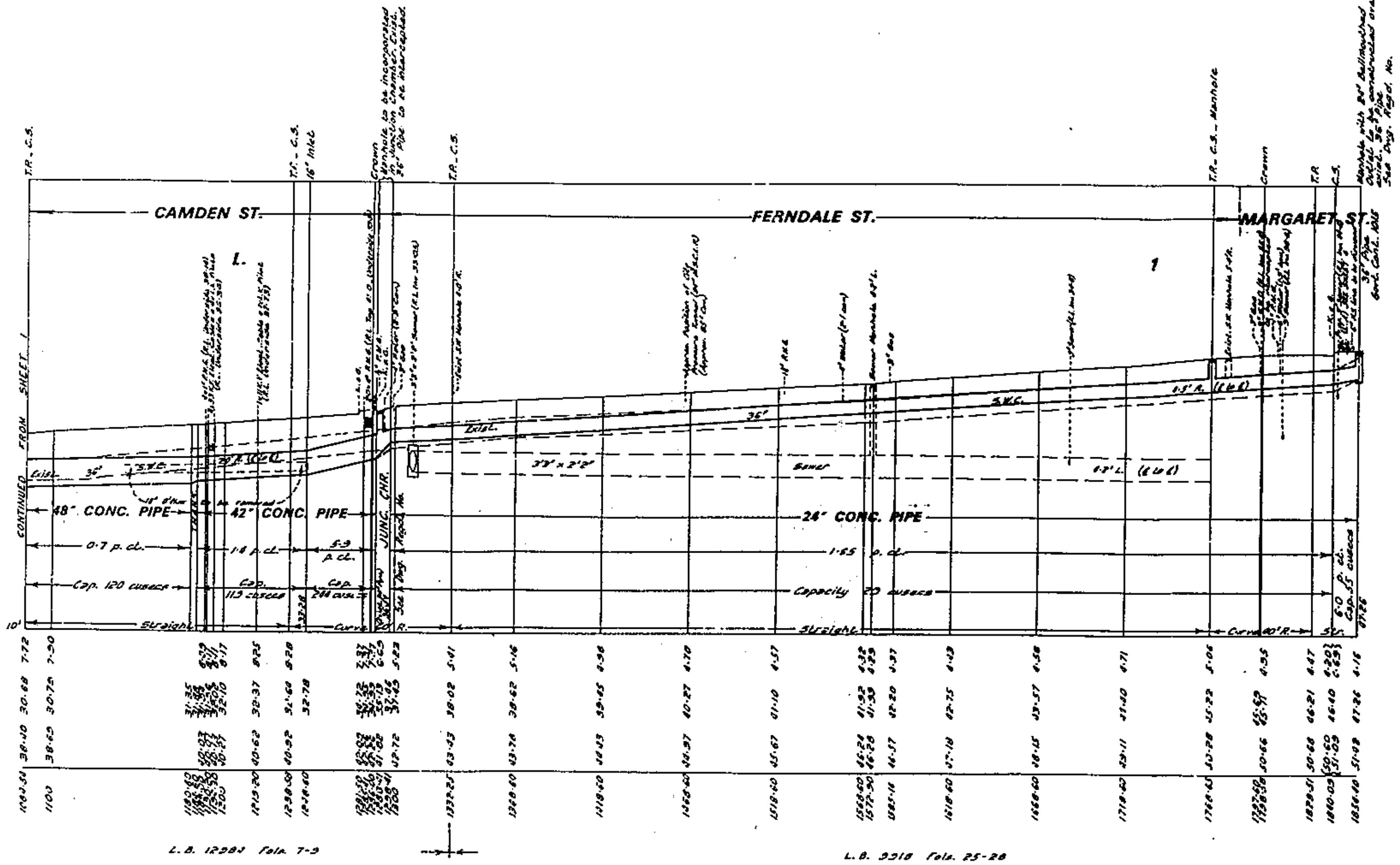
1 OF 4 W.O. 99922/3

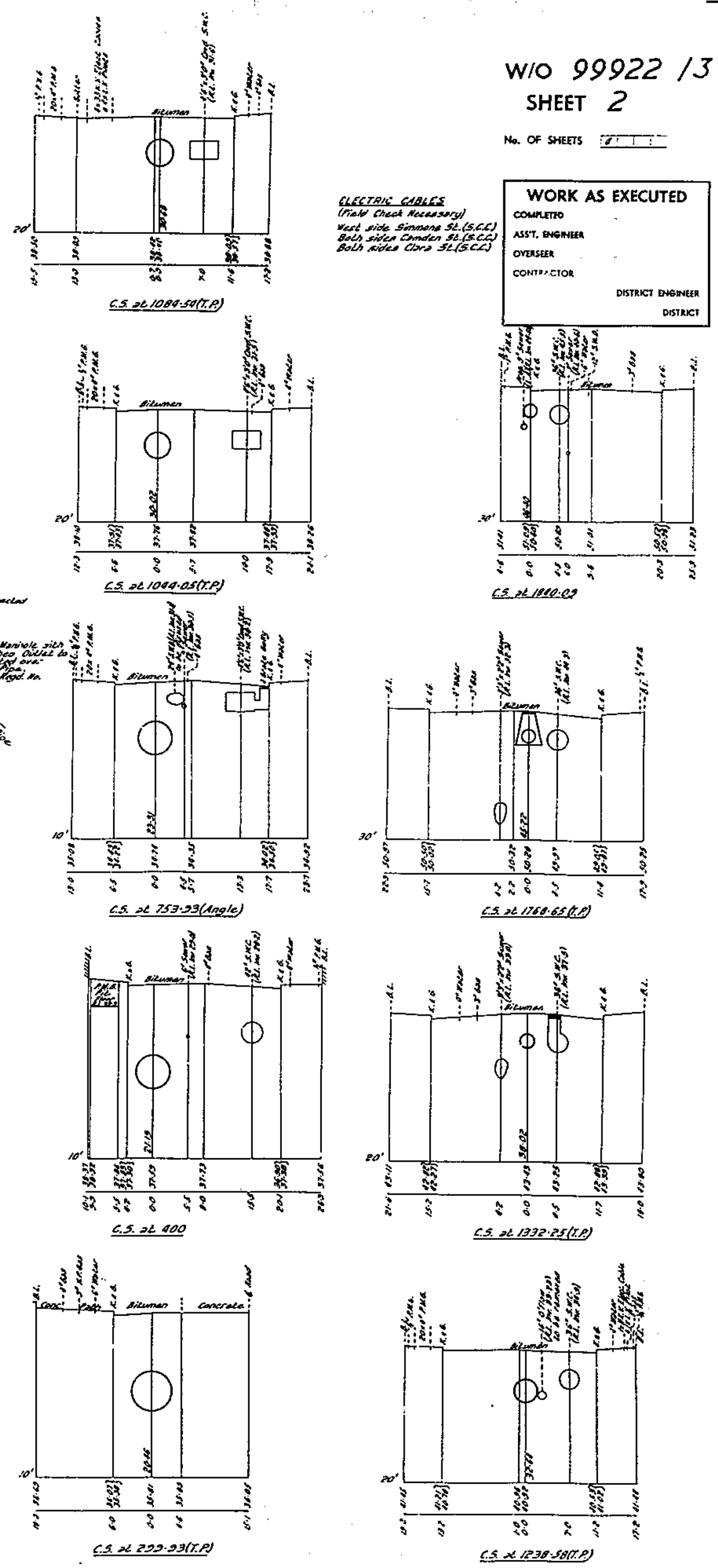
R- 82-076 B- 1147

W/O 99922 /3
SHEET 2
No. OF SHEETS

WORK AS EXECUTED
COMPLETED
ASS'T. ENGINEER
OVERSEER
CONTRACTOR
DISTRICT ENGINEER
DISTRICT







CITY OF SYDNEY—MARRICKVILLE
MARRICKVILLE VALLEY EASTERN S.W.C. No. 66
EDGEWARE RD. BCH. No. 66H
AMPLIFICATION—STAGE 3

2 OF 4 W.O. 99922/3

R- 82-076 B- 1147

W/O 99922 /3
SHEET 3

No. OF SHEETS

WORK AS EXECUTED
COMPLETED
ASST. ENGINEER
OVERSEER
CONTRACTOR
DISTRICT ENGINEER
DISTRICT

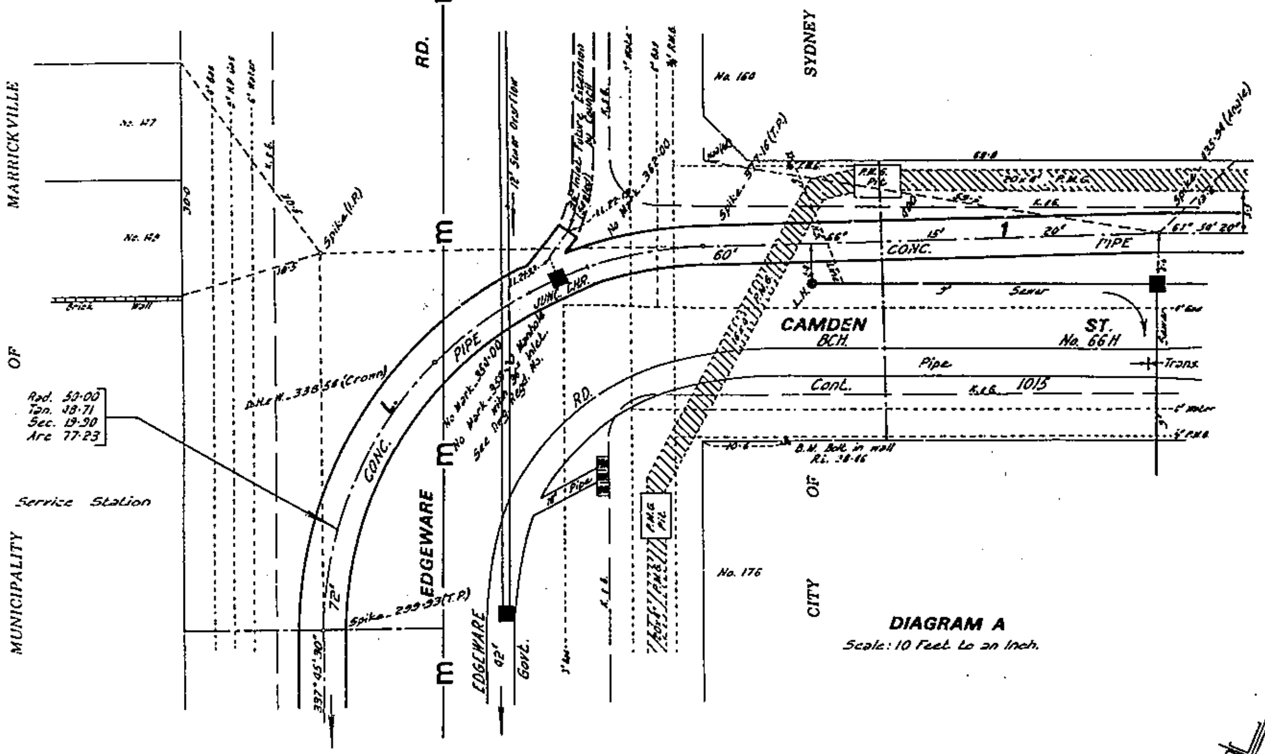


DIAGRAM A
Scale: 10 Feet to an Inch.

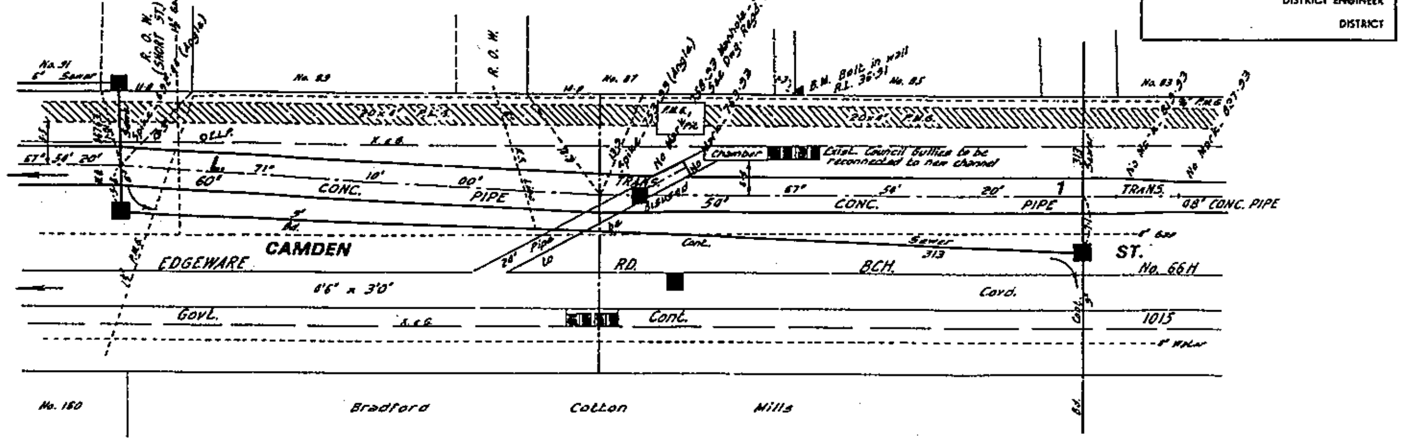


DIAGRAM B
Scale: 10 Feet to an Inch

ELECTRIC CABLES
(Field Check Necessary)
West side Simmons St.(S.C.C.)
Both sides Camden St.(S.C.C.)
Both sides Clara St.(S.C.C.)

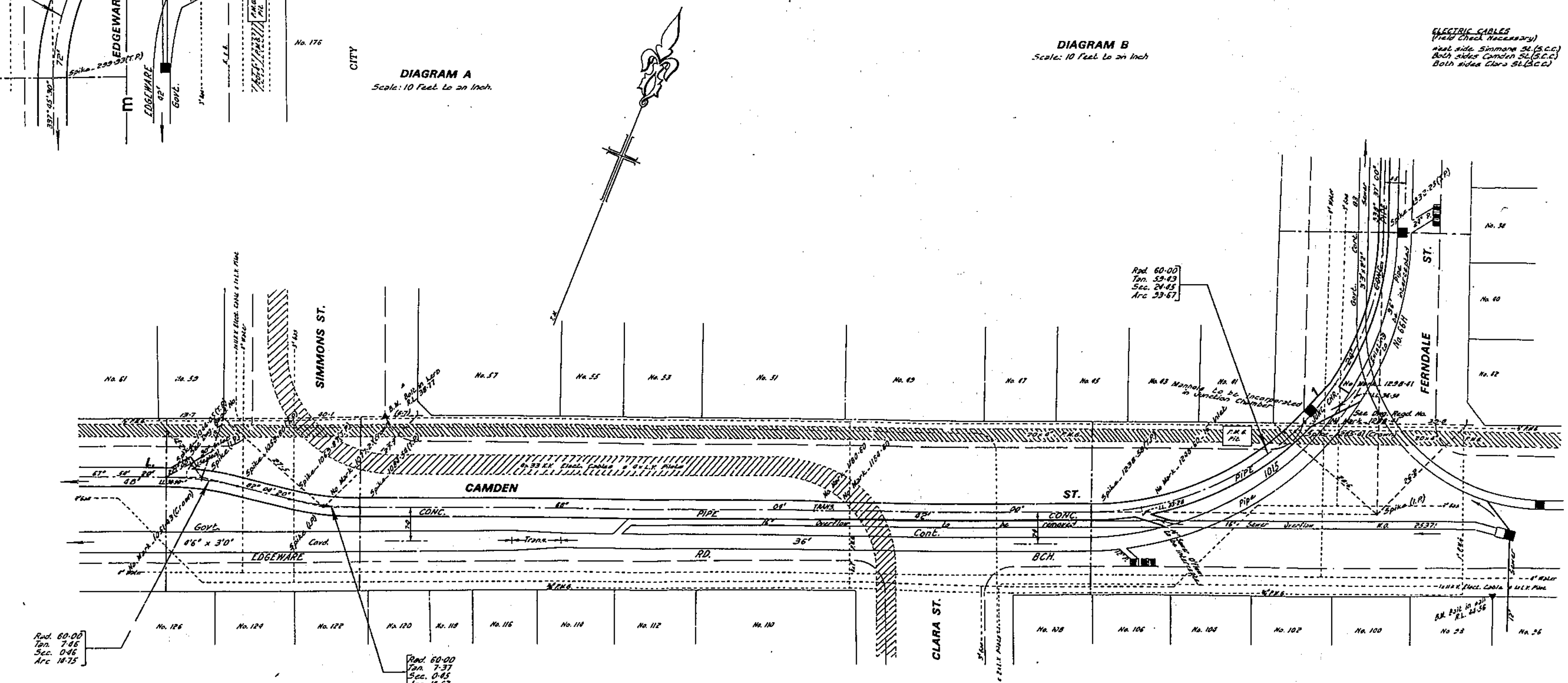


DIAGRAM C
Scale: 10 Feet to an Inch

CITY OF SYDNEY— MARRICKVILLE DRAINAGE
MARRICKVILLE VALLEY EASTERN S.W.C. No. 66
EDGEWARE RD. BCH. No. 66H
AMPLIFICATION— STAGE 3

W.O. 99922/3

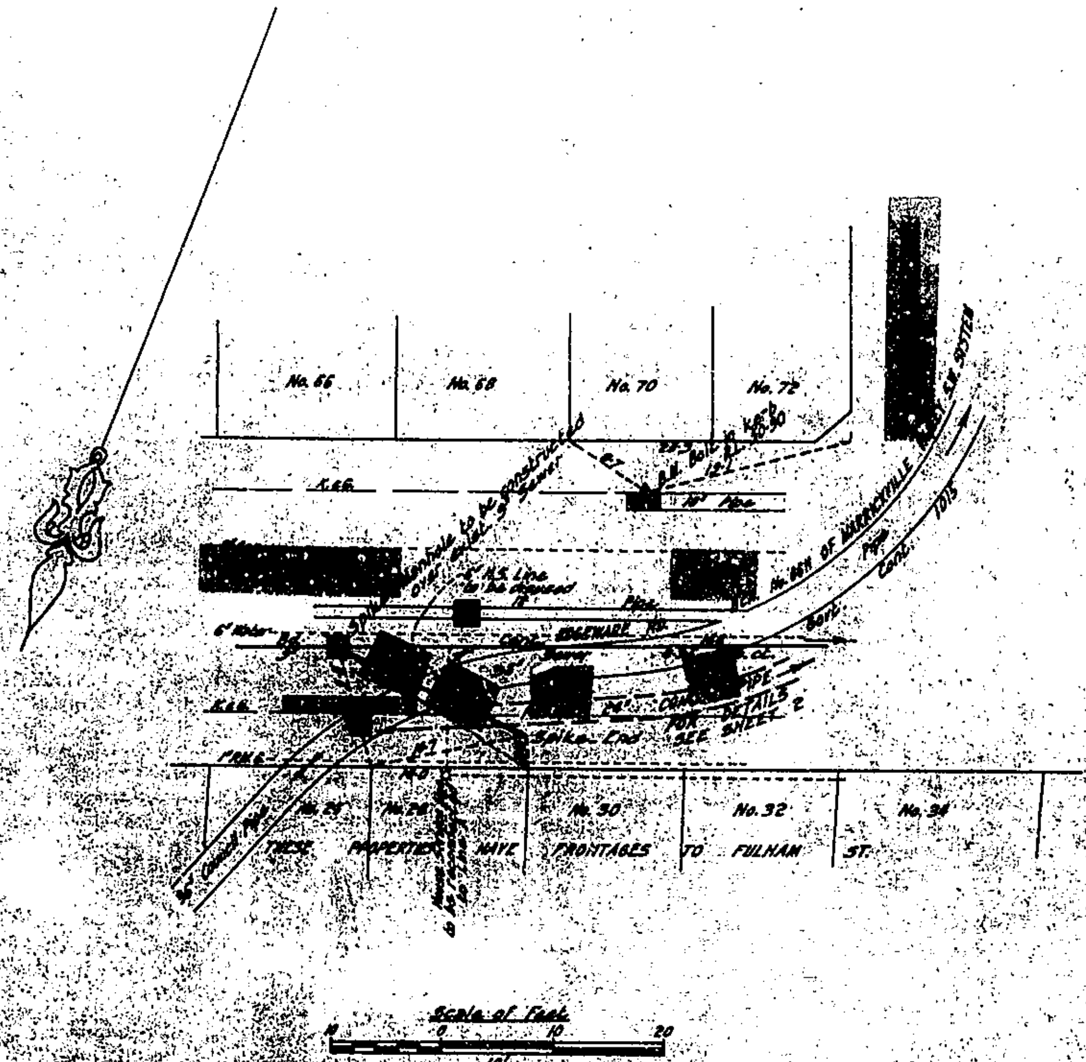
3 OF 4 W.O. 99922/3

R- 82-076 R- 1147

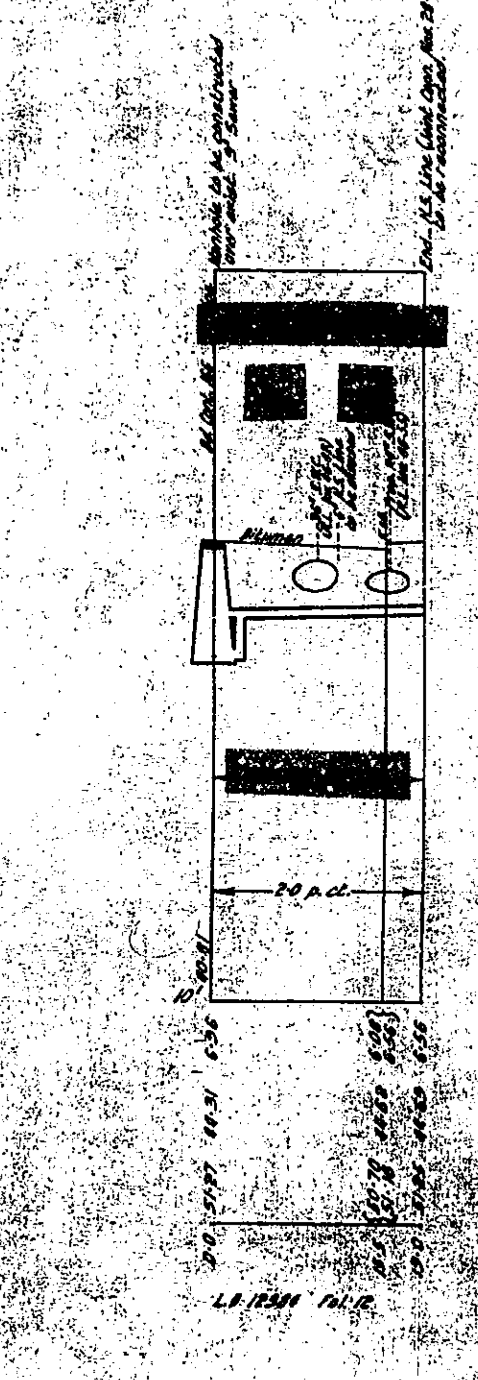
W/O 99922/3
SHEET 4
No. OF SHEETS 4

WORK AS EXECUTED

COMPLETED ________
ENGINEER ________
OVERSEER ________
CONTRACTOR ________
________ DISTRICT ENGINEER
________ DISTRICT



FOR PIPE SIZE AND GRADE SEE SECTION



BOUNDARY TRAPS REQUIRED

NO **STANDARD PERMANENT MARKS**

SERVICES AS AT 11-5-67
WATER AVAILABLE

NO RECORD OF
ELECTRIC CABLES FIELD CHECK NECESSARY

APPROXIMATE STRATA AND DEPTH
STRATA ________
AVERAGE DEPTH ________

ALL SURVEY MARKS ARE PEGS UNLESS OTHERWISE INDICATED

INTERMEDIATES

PIPE DATA		
Size	Type	Surveyed Length
9"	C.I.C.L.P.	19·0

ALL PIPES ARE VITRIFIED CLAY UNLESS OTHERWISE INDICATED

SIDE LINES UNDER TEN FEET IN LENGTH ARE NOT SHOWN ON PLAN, BUT ARE TO BE CONSTRUCTED AS DIRECTED BY DISTRICT ENGINEER

FOR CHIEF SURVEYOR
10.7.67

M.W.S. & D.B.
SYDNEY, N.S.W.

SEWER ADJUSTMENT

SCALES
PLAN ________
SECTION ________ TO AN INCH

STANDARD DATUM

CAT. No. ________
FIL. ________
LEVEL BOOK ________
DETAIL SHEET ________
SURVEYOR ________
DRAFTSMAN ________
SUR. DRAFTSMAN ________
8 CHAIN SHEET No. ________
ROBINSON'S DIR. ________

SM—09

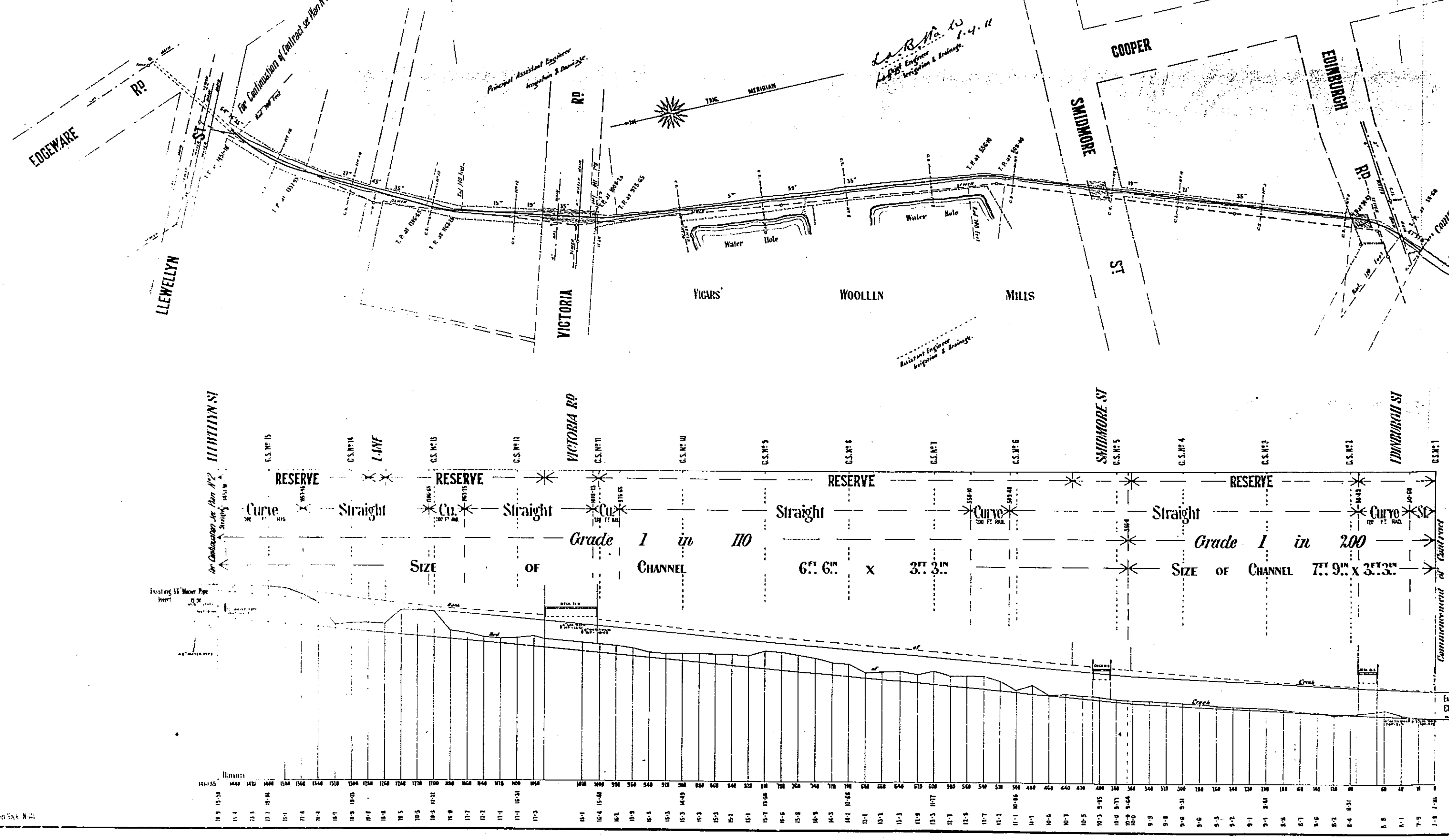
DEPARTMENT OF PUBLIC WORKS.
IRRIGATION AND DRAINAGE

NEWTOWN-MARRICKVILLE STORMWATER DRAINAGE

EDGEWARE ROAD S.W. CHANNEL.

Scales { Horizontal – 40 Feet / Vertical – 4 Feet } to one Inch

Sydney Sewerage Datum

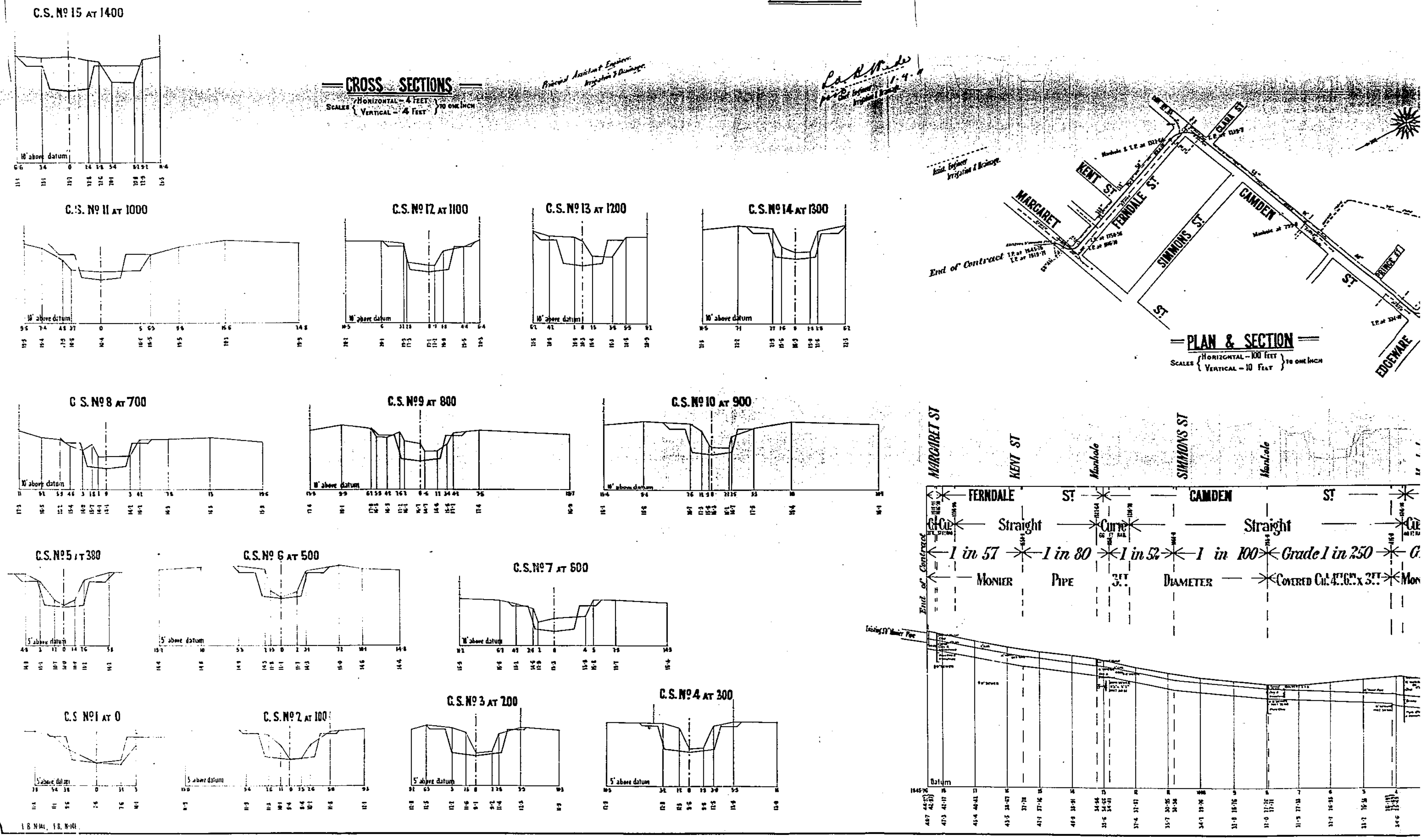


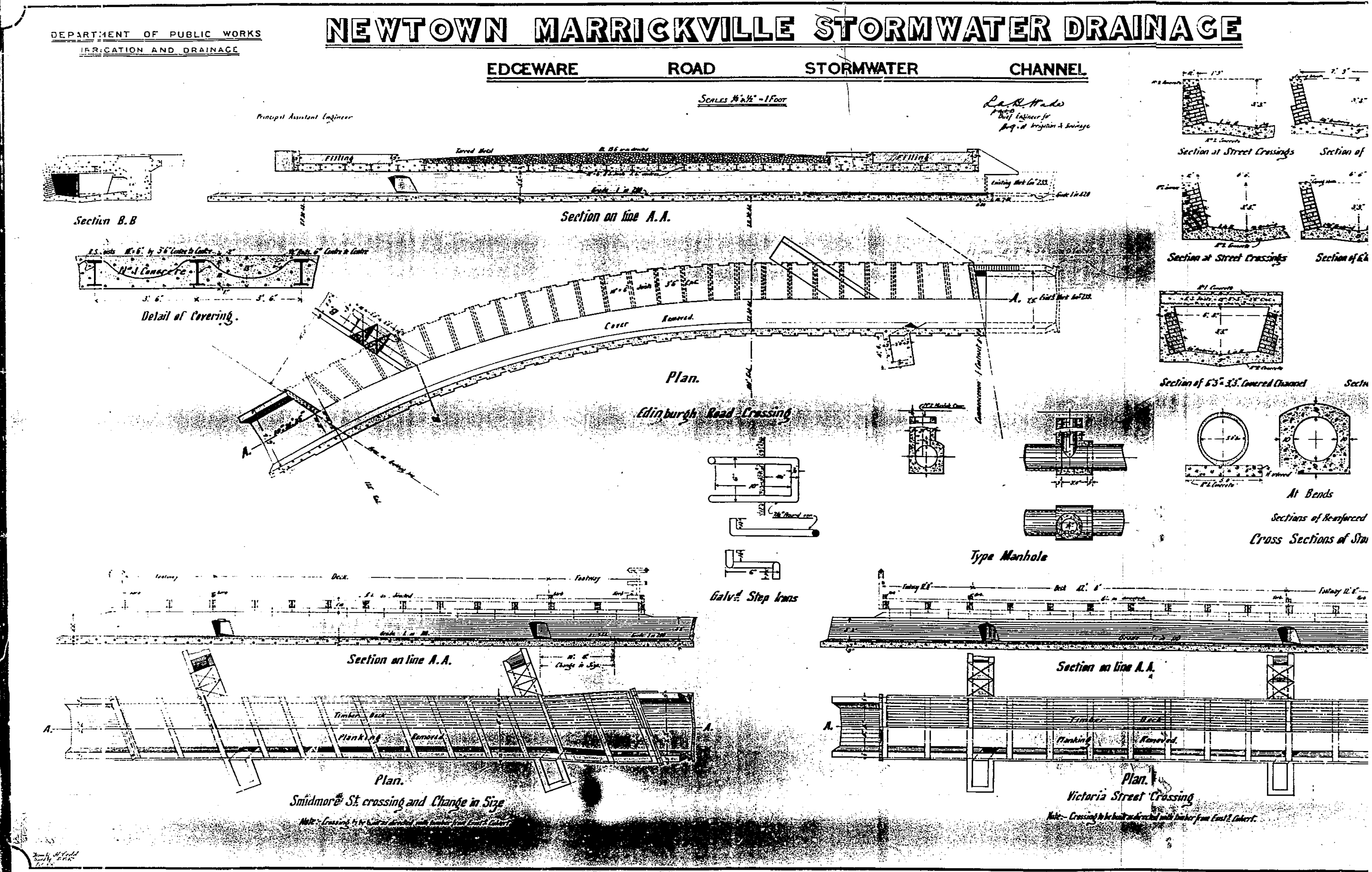
DEPARTMENT OF PUBLIC WORKS
IRRIGATION AND DRAINAGE

NEWTOWN-MARRICKVILLE STORMWATER DRAINAGE

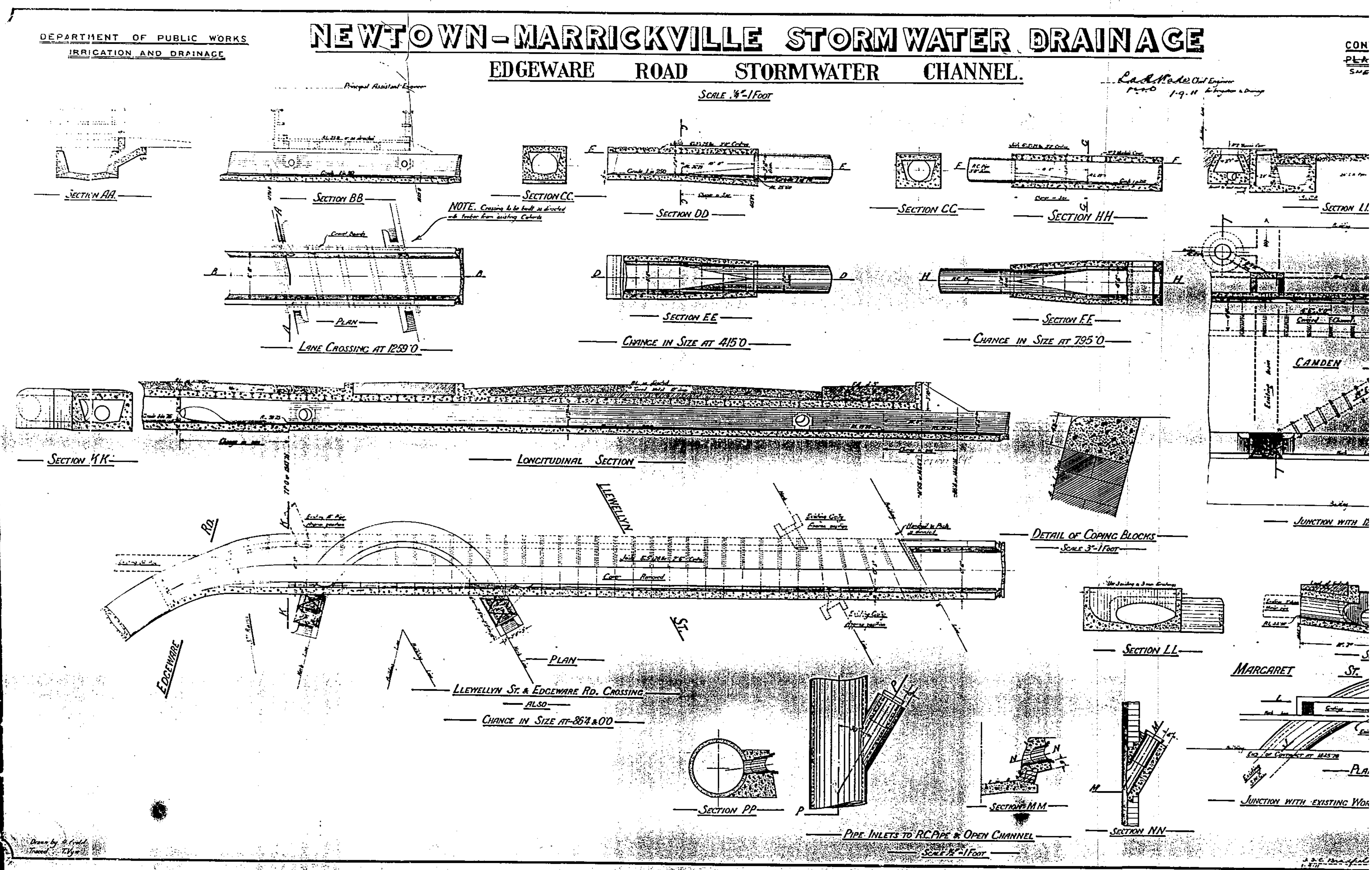
EDGEWARE ROAD S.W. CHANNEL.

SYDNEY SEWERAGE DATUM




DEPARTMENT OF PUBLIC WORKS
IRRIGATION AND DRAINAGE
NEWTOWN MARRICKVILLE STORMWATER DRAINAGE
EDGEWARE ROAD STORMWATER CHANNEL
Principal Assistant Engineer
Chief Engineer for Irrigation & Drainage
Section B.B
Section on line A.A.
Detail of Covering.
Plan.
Edinburgh Road Crossing
Cover Removed.
Galvd. Step Irons
Type Manhole
Section at Street Crossings
Section of 6'3" × 3'3" Covered Channel
At Bends
Cross Sections of St
Section on line A.A.
Timber Deck
Planking Removed
Plan.
Smidmore St. crossing and Change in Size
Section on line A.A.
Plan.
Victoria Street Crossing

MICROBOX 97


DEPARTMENT OF PUBLIC WORKS
IRRIGATION AND DRAINAGE
NEWTOWN - MARRICKVILLE STORMWATER DRAINAGE
EDGEWARE ROAD STORMWATER CHANNEL.
SCALE 1/4" - 1 FOOT
Principal Assistant Engineer
Chief Engineer
1-9-11
SECTION AA.
SECTION BB
NOTE. Crossing to be built as directed
SECTION CC.
SECTION DD
SECTION CC.
SECTION HH
PLAN
LANE CROSSING AT 1259'0
SECTION EE
CHANGE IN SIZE AT 415'0
SECTION FF
CHANGE IN SIZE AT 795'0
CAMDEN
SECTION KK
LONGITUDINAL SECTION
LLEWELLYN
RD.
EDGEWARE
ST.
PLAN
LLEWELLYN ST. & EDGEWARE RD. CROSSING
ALSO
CHANGE IN SIZE AT 864'&0'0
DETAIL OF COPING BLOCKS
SCALE 3" - 1 FOOT
SECTION LL
MARGARET ST.
JUNCTION WITH EXISTING WOR
SECTION PP
PIPE INLETS TO R.C. PIPE & OPEN CHANNEL
SCALE 1/2" - 1 FOOT
SECTION MM
SECTION NN
Drawn by
Traced
MICROBOX
97

APPENDIX G

Results of Sensitivity Analysis and Climate Change Impact Assessment

Golder Associates

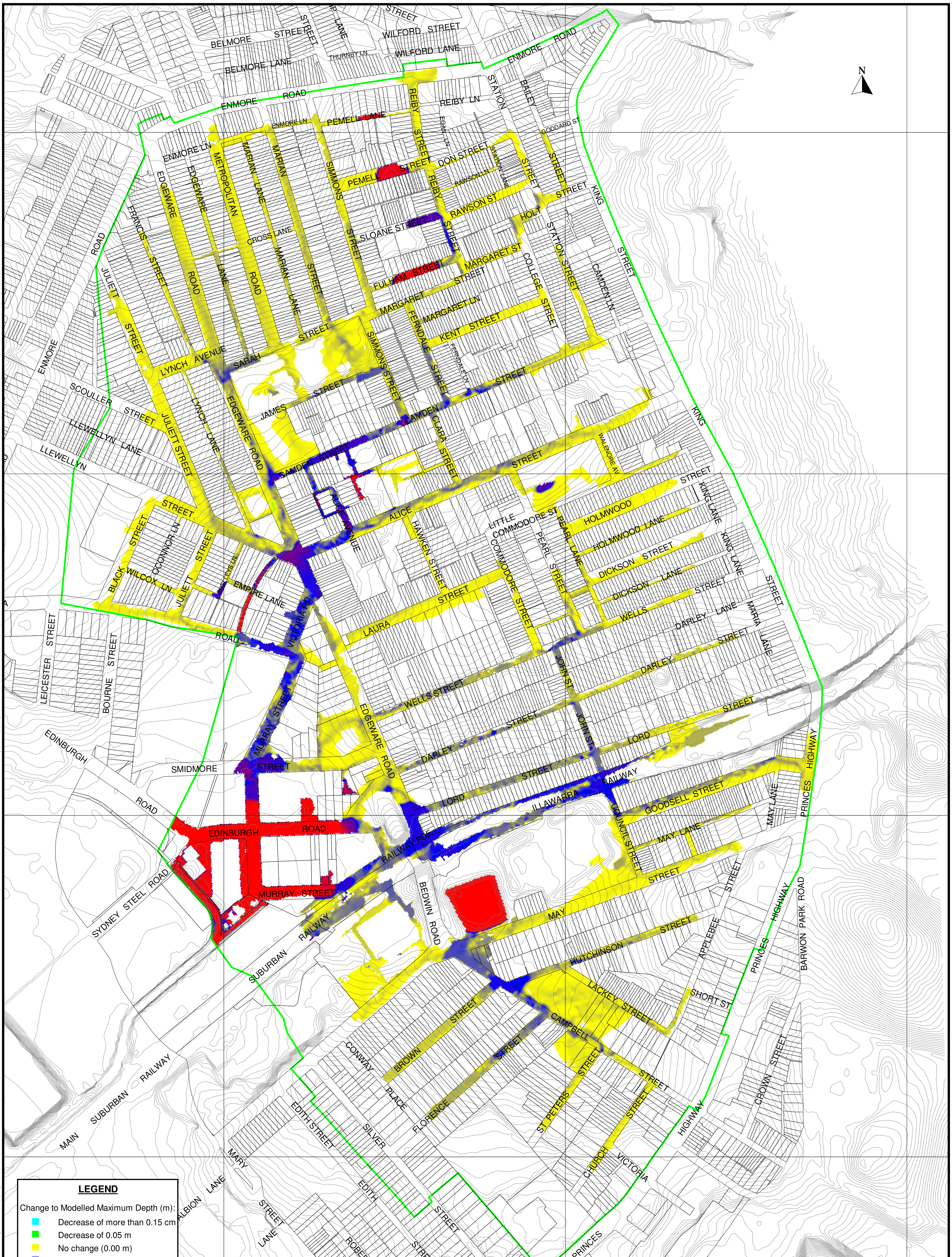
CLIENT	Marrickville Council	PROJECT	ECE Subcatchment Management Plan
DRAWN JRB	DATE 19-08-10	TITLE	**CHANGE TO FLOOD DEPTH (m) INCREASED ROUGHNESS - 5 YR EVENT**
CHECKED HR	DATE 19-08-10		
SCALE 1:5,000		PROJECT No 097626003-008	FIGURE No G1 / REV No 3 / A3

File Location: J:\hyd\2009\097626003 Marrickville Council EC1 Study\Technical Doc\GIS\Project\

Golder Associates

CLIENT	Marrickville Council	PROJECT	ECE Subcatchment Management Plan
DRAWN JRB	DATE 19-08-10	TITLE	CHANGE TO FLOOD DEPTH (m) DECREASED ROUGHNESS - 5 YR EVENT
CHECKED HR	DATE 19-08-10		
SCALE	1:5,000	PROJECT No 097626003-008	FIGURE No G2 · REV No 3 · A3

File Location: J:\hyd\2009\097626003 Marrickville Council EC1 Study\Technical Doc\GIS\Project\



LEGEND

Change to Modelled Maximum Depth (m):

- Decrease of more than 0.15 cm
- Decrease of 0.05 m
- No change (0.00 m)
- Increase of 0.05 m
- Increase of more than 0.15 cm

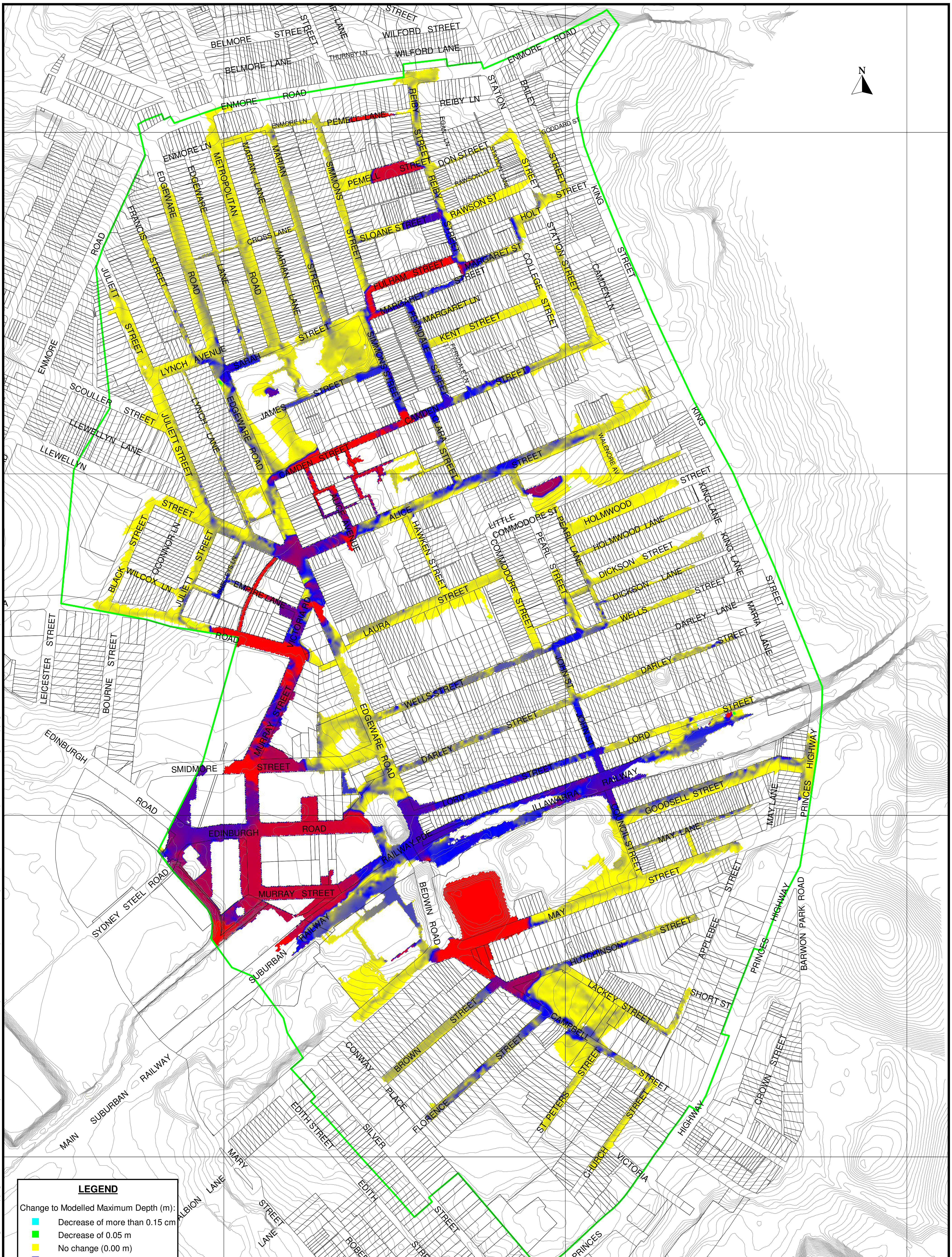
General Items:

- ECE Catchment Boundary

Note: Datum GDA94, Projection MGA94Z56

Golder Associates	CLIENT: Marrickville Council		PROJECT: ECE Subcatchment Management Plan
	DRAWN: JRB	DATE: 19-08-10	TITLE: CHANGE TO FLOOD DEPTH (m) CLIMATE CHANGE - 5 YR EVENT
	CHECKED: HR	DATE: 19-08-10	
	SCALE: 1:5,000		PROJECT No: 097626003-008 · FIGURE No: G3 · REV No: 3 · A3

File Location: J:\hyd\2009\097626003 Marrickville Council EC1 Study\Technical Doc\GIS\Project\



Golder Associates	CLIENT: Marrickville Council		PROJECT: ECE Subcatchment Management Plan	
	DRAWN: JRB	DATE: 19-08-10	TITLE: CHANGE TO FLOOD DEPTH (m) CLIMATE CHANGE - 100 YR EVENT	
	CHECKED: HR	DATE: 19-08-10		
	SCALE: 1:5,000		PROJECT No: 097626003-008	FIGURE No: G4 · REV No: 3 · A3

File Location: J:\hyd\2009\097626003 Marrickville Council EC1 Study\Technical Doc\GIS\Project\

At Golder Associates we strive to be the most respected global group of companies specialising in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organisational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
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