

## 2. BACKGROUND INFORMATION

### 2.1 DESCRIPTION OF THE CATCHMENT

The Macquarie Park study area includes part of the suburbs of Marsfield, Macquarie Park, Eastwood, Denistone East, Ryde, North Ryde and Chatswood West. For the purposes of Council's stormwater management, the study area traditionally has been divided into a number of catchments. These are known as the Mars Creek, Shrimptons Creek, Industrial Creek, Porters Creek and Lane Cove catchments (**Figure 1.1**). All are tributaries draining to the Lane Cove River while part of the Lane Cove catchment includes the Lane Cove River itself downstream of Fullers Bridge. Details of catchment areas and other details are provided in **Table 2.1**.

**TABLE 2.1 – STUDY CATCHMENT AREAS AND STORMWATER ASSETS**

Catchment	Area (ha)	Total Conduit Length (m)	No. of Stormwater Pits
Mars Creek*	327	15,900	540
Shrimptons Creek	555	47,000	1590
Industrial Creek	148	8,900	340
Porters Creek	225	16,300	540
Lane Cove Catchment	303	8,100	330

\* Includes Culloden, Mars and University Creeks

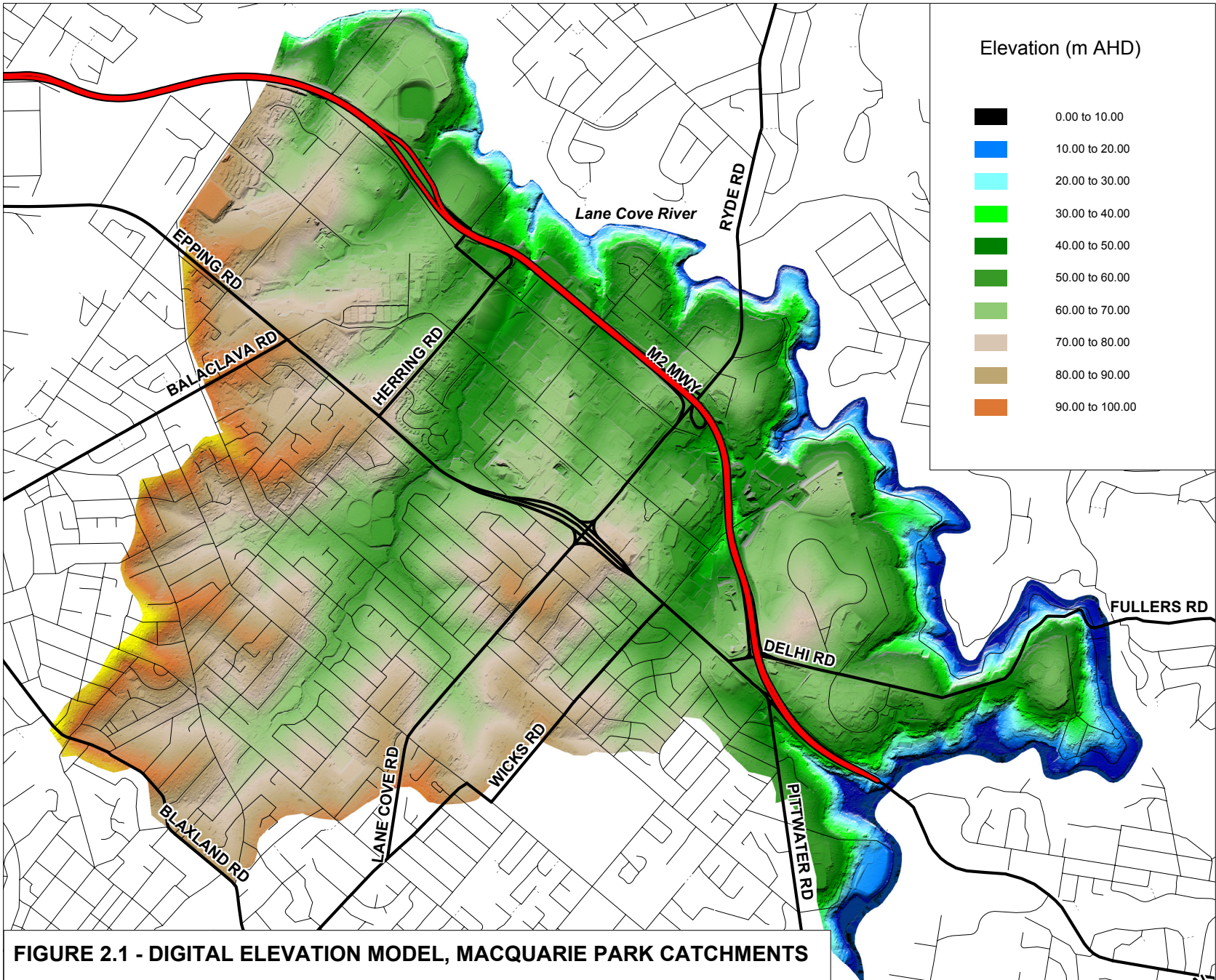
The Mars Creek catchment consists of three separate watercourses, which from north-west to south-east are known as Culloden Creek,<sup>1</sup> Mars Creek (proper) and University Creek. All three are a combination of open channel flow and below ground trunk drainage. The majority of Mars Creek and University Creek are almost totally open channel regimes as they pass through the grounds of Macquarie University.

Not surprisingly given its much larger catchment area, Shrimptons Creek has a significantly longer open channel regime, extending from Santa Rosa Park (downstream of Quarry Road) to its confluence with Lane Cove River. Along this reach, the only significant portion of underground conduits occurs where the creek passes under Waterloo Road, the Macquarie Shopping Centre and Talavera Road.

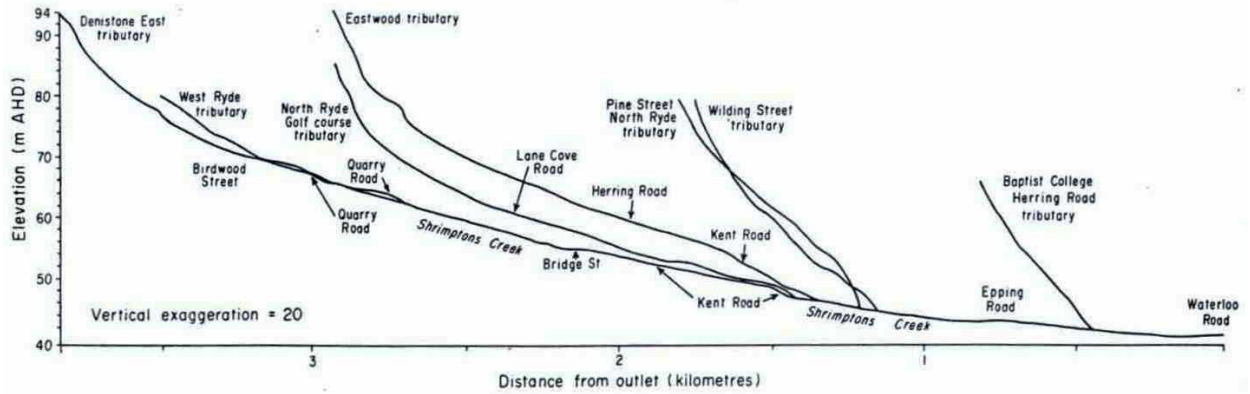
Except for their very downstream ends, close to the Lane Cove River, the Industrial Creek, Porters Creek and Lane Cove catchments have only occasional reaches of open channel flow. Their flow paths mostly consist of depressions through residential or industrial areas which carry flow whenever the storm runoff exceeds the capacity of the underground conduit system.

A Digital Elevation Model (DEM) based on Council's ALS survey data is presented in **Figure 2.1**. The highest land is about 100 metres above sea level near Blaxland Road in

<sup>1</sup> Culloden Creek is an unofficial name, as advised by Macquarie University. In the *Macquarie Park Flood Study* this was referred to as 'Western Mars Creek'.



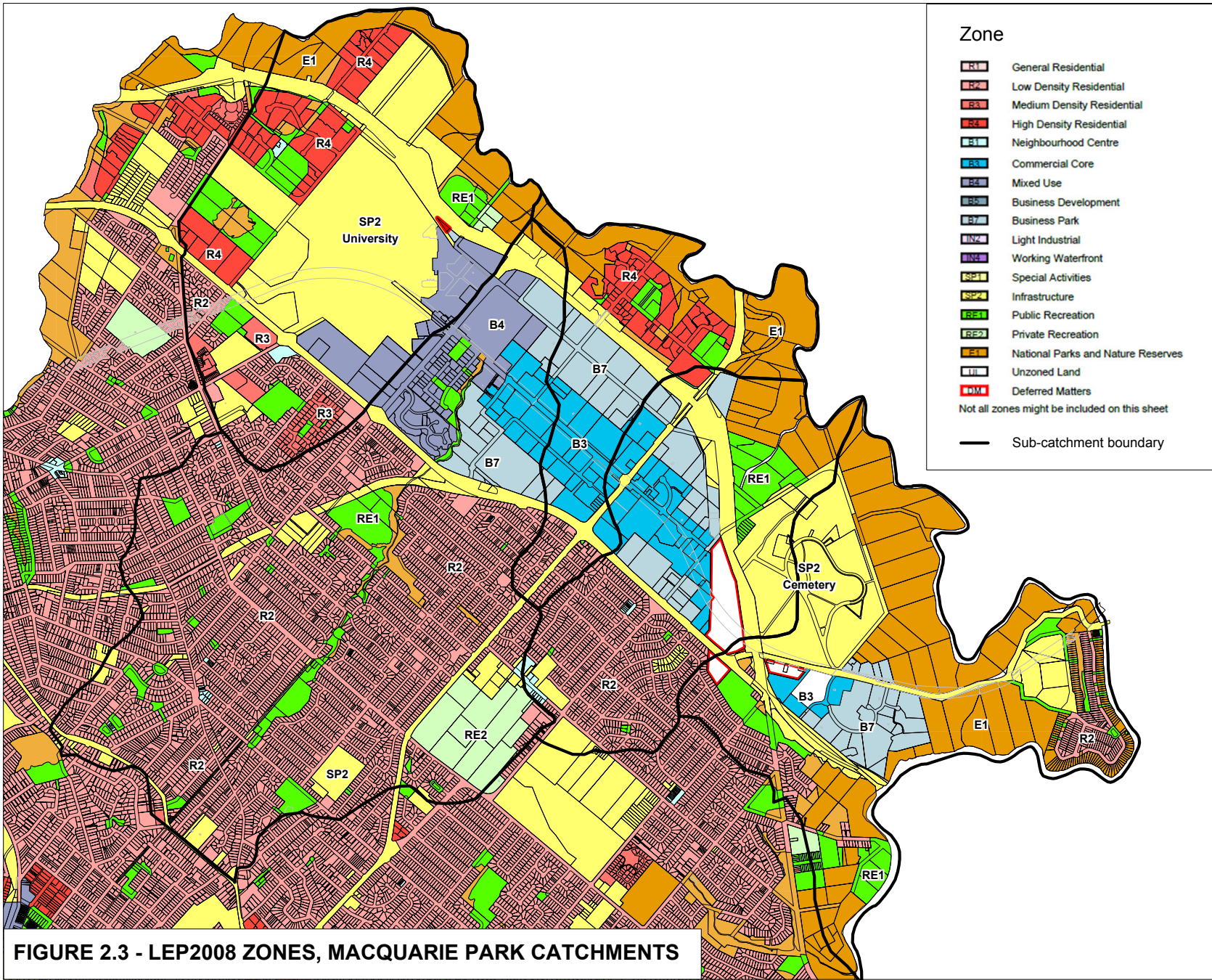
the south-western corner of the study area, whilst the lowest area is the Lane Cove River which is tidal below the weir at Fullers Bridge. **Figure 2.2** plots longitudinal profiles for Shrimptons Creek as far as Waterloo Road. Riley et al. (1985) suggest that the relatively steep slopes of the tributaries, together with the extensive stormwater pipe network, facilitate the rapid delivery of stormwater from the valley sides to the main channel. Downstream of the M2, Shrimptons Creek falls steeply to the Lane Cove River valley, which is incised into the Hawkesbury Sandstone plateau.



**FIGURE 2.2 – LONGITUDINAL PROFILES OF SHRIMPTONS CREEK TRIBUTARIES**

Source: Riley et al., 1985, p.61

Land uses in the study area can be discerned from aerial photography and LEP zones (**Figure 2.3**). Most of the area is heavily urbanised. Broadly speaking, the land use varies either side of Epping Road. To the south-west, or upslope, of Epping Road the land use is predominantly low density residential while north-east of the road it is a mixture of commercial land uses, tertiary education (Macquarie University) and medium density residential development. Epping Road and the M2 Motorway cross all the catchments while Lane Cove Road passes through the Shrimptons Creek, Industrial Creek and Porters Creek catchments.



## 2.2 HISTORY OF FLOODING

A picture of flood problems in the study catchment has been compiled from three sources: entries in Council's flood database; historic photographs and reports of flooding; and the responses to the study questionnaire.

Council's database includes entries for thirteen flood events which have been experienced between November 1984 and March 1990. The events with the most number of entries are November 1984, August 1986, December 1989, 7 and 8 February 1990 and March 1990.

A selection of flood photos from 1984, 1990, 2003 and 2010 is included in **Figure 2.4**. Steven Riley and colleagues prepared two reports describing features of the November 1984 event (Riley et al., 1985, 1986). A selection of the main points is summarised here:

- ▶ Flooding of urban areas began 10 to 20 minutes after the commencement of heavy rain;
- ▶ In some cases flooding resulted from blocked drains;
- ▶ Concrete slab houses built at ground level were particularly vulnerable;
- ▶ Several houses were inundated near Fullers Bridge;
- ▶ Backyard paling fences diverted and often concentrated floodwaters;
- ▶ Cyclone fences sieved debris from the floodwaters and formed effective dams;
- ▶ Ten people were treated in hospital when water burst through glass doors at a North Ryde child-minding centre;
- ▶ In the Shrimptons Creek catchment, the major waterways contained the flood flows with the stormwater pipe systems giving the greatest problems in terms of surcharging and flood damage;
- ▶ Blockage of the Shrimptons Creek culvert at Waterloo Road exacerbated flooding at the Macquarie Centre: *'A large willow tree was dislodged from the upstream bank and carried down to the inlet of the box-shaped stormwater system that passes beneath the [Macquarie Shopping] complex. Whilst there is ample evidence that the inlet would have been surcharged without the blockage, the blockage increased the discharge that passed through the car park of the centre'* (Riley et al., 1986, p.47);
- ▶ The areas in the Shrimptons Creek catchment most significantly affected were located between Lane Cove Road and Kent Road, between Quarry Road and Kent Road and between Herring Road and Kent Road; and
- ▶ High velocity flow through the Macquarie Centre peeled large sheets of asphalt from the roadway.

As part of the community consultation process for this study, a questionnaire seeking information about personal property and local area flood experiences was mailed to approximately 2,800 property owners in September 2008 (see **Section 3.3**). From the 272 responses that were received, 153 (or 56%) reported a past experience with water on their property, with November 1984 the most commonly reported event (**Figure 2.5**). About 12 respondents reported inundation of house floors and 56 reported inundation of garage floors in the worst flood. Several also reported road closures. For residents who had occupied their properties for at least twenty five years, the most frequently reported 'worst' flood event was November 1984.

**FIGURE 2.4 – FLOOD PHOTOS FROM MACQUARIE PARK STUDY AREA**



a. November 1984, North Ryde Golf Club and Lane Cove Road, North Ryde.

Source: Jenny Murrey



b. November 1984, Lane Cove Road near Ford Street, North Ryde.

Source: Jenny Murrey



c. November 1984, Ford Street, North Ryde.

Source: David McKechnie



d. November 1984, Eastview Avenue, North Ryde.

Source: City of Ryde



e. November 1984, Ada Avenue near Eastview Avenue, North Ryde.

Source: City of Ryde



f. November 1984, Macquarie Shopping Centre, Macquarie Park.

Source: City of Ryde



g. November 1984, Macquarie Shopping Centre, Macquarie Park. Shows damaged internal road as asphalt was stripped away.

Source: Riley et al., 1986, p.46



h. November 1984, River Avenue, Chatswood West.

Source: Bruce Blong



i. February 1990, Warren Street, Ryde.

Source: Bill Lalor



j. December 2003, Durham Close, Macquarie Park.

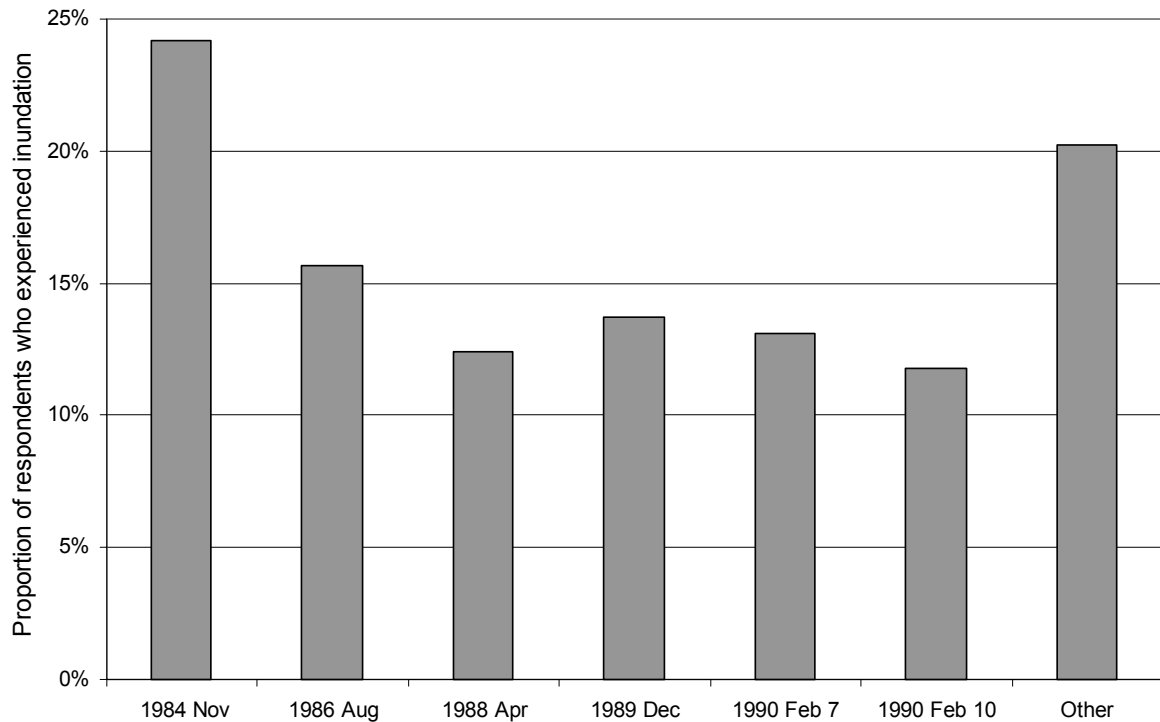
Source: Chris Pridmore



k. February 2010, blockage at the Shrimptons Creek culvert, Waterloo Road, Macquarie Park.

Source: City of Ryde.





**FIGURE 2.5 – FLOODS EXPERIENCED BY COMMUNITY**

**Figure 2.6** plots the locations where the community reported garage inundation and repeated road closures due to inundation. This cannot be taken to represent the entirety of the scope of flooding problems because it is dependent on people’s submissions. Also, some historical flooding problems may have been addressed through drainage improvements. Nevertheless, the map shows that inundation problems have been widely experienced throughout the Macquarie Park study area. Historical inundation ‘hot-spots’ identified from the questionnaires include:

*Mars Creek catchment (including Culloden, Mars and University Creeks):*

- University Creek flow path downstream of Dunbar Park;

*Shrimptons Creek catchment:*

- Flow path through Abuklea Road/Danbury Close/Herring Road/Lucinda Road, Marsfield;
- Flow path through Cecil Street/North Road/Rocca Street, Denistone East/Ryde;
- Flow path through Milroy Street/Michael Street, North Ryde;

*Industrial Creek catchment:*

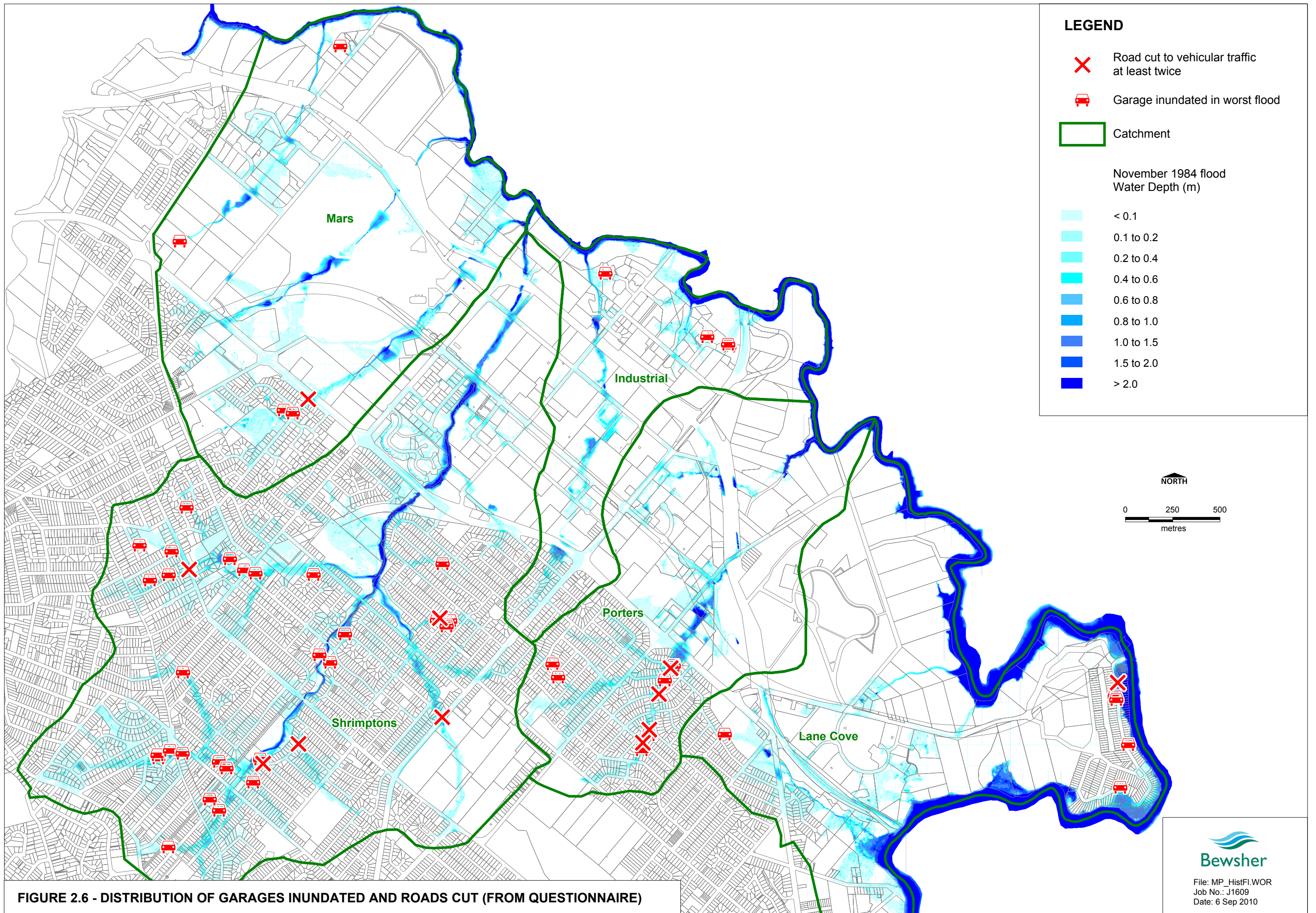
- Flow path through townhouse developments in Tuckwell Place, Macquarie Park;

*Porters Creek catchment:*

- Flow path through Betty Hendry Parade/Rowell Street/Ryrie Street/Chisholm Street/Morshead Street, North Ryde;

*Lane Cove catchment:*

- Lane Cove River flow path along River Avenue, Chatswood West (one resident of 63 years reports that the sole access road has been cut 8-10 times).



## 2.3 SOCIAL PROFILE

An understanding of social characteristics is an important consideration for floodplain risk management studies. Data from the 2006 Census was extracted for the City of Ryde LGA and compared to the NSW average. Key points are summarised in **Table 2.2**. The outstanding feature is the higher proportion of people in the City of Ryde born overseas and speaking a language other than English at home. Cantonese, Mandarin, Italian and Korean are the four most common languages other than English. This points to the need for any flood educational materials to be made available in other languages. Second, almost half of the population is not at the same address as they were five years previously. This suggests that any flood educational initiatives need to be repeated regularly (or integrated into the everyday).

Further information, including at a finer scale, is available at the City of Ryde Community Profile web-site. It shows that a high concentration of persons aged 75 years and over is located in the Census Collection District north of Epping Road and south of Macquarie University (corresponding to the Baptist Community Services' retirement village). Any inundation of this area from University Creek is undesirable given the heightened vulnerability of the residents.

Also, residents around Macquarie Park suburb (including students of Macquarie University) are predominately tenants who have not been many years at their current address. These people are less likely to have experienced flooding in the catchment and more likely to respond inappropriately in a flood situation.

## 2.4 HERITAGE

Heritage issues are important in forming an understanding of the social and cultural context of the floodplain and ensuring that flood mitigation measures do not unduly impact upon the heritage of the study area. Heritage items are classified as having either Local, Regional or State significance. Development consent (and where relevant advice from the Heritage Council and/or local aboriginal communities) is required prior to demolition, moving or altering a heritage item or disturbing or excavating an archaeological site.

The Ryde Local Environmental Plan 2008 provides a schedule of heritage items within the City of Ryde. Those heritage items that are within the proximity of the Macquarie Park study area have been listed in **Table 2.3**. Only one item (part of Lane Cove National Park) is known to be within the modelled floodplain.

**TABLE 2.2 – CENSUS DATA FOR CITY OF RYDE**

Source: 2006 Census Basic Community Profiles, [www.censusdata.abs.gov.au/](http://www.censusdata.abs.gov.au/)

	City of Ryde	NSW		City of Ryde	NSW
<b>SELECTED PERSON CHARACTERISTICS [B01]: % of persons</b>			<b>NUMBER OF MOTOR VEHICLES BY DWELLINGS [B29]: % of occupied private dwellings</b>		
Total persons	96,948	100.0%	Dwellings with 0 motor vehicles	13.4%	11.6%
Aged 14 years and under	16.7%	19.8%	Dwellings with 1 motor vehicle	42.7%	38.3%
Aged 65 years and over	14.5%	13.8%	Dwellings with 2 motor vehicles	30.9%	33.1%
Aboriginal/Torres Strait Islander	0.3%	2.1%	Dwellings with 3+ motor vehicles	9.7%	13.0%
Australian born	55.4%	69.0%	Average number of motor vehicles per occupied private dwelling	1.4	1.5
Born overseas	37.6%	23.8%	<b>DWELLING STRUCTURE [B31]: % of occupied private dwellings</b>		
Speaks English only at home	58.0%	74.0%	Separate house	56.1%	71.4%
Speaks language other than English at home	36.3%	20.1%	Semi-detached, row or terrace house, townhouse etc	15.1%	9.7%
Australian citizen	80.4%	85.8%	Flat, unit or apartment	28.5%	17.7%
<b>SELECTED MEDIANS AND AVERAGES [B02]</b>			Other dwelling	0.3%	1.1%
Median age	37	37	<b>TENURE TYPE BY DWELLING STRUCTURE [B32]: % of occupied private dwellings</b>		
Median individual income (\$/week)	\$528	\$461	Fully owned	34.7%	34.8%
Median household income (\$/week)	\$1,158	\$1,036	Being purchased	29.1%	31.9%
Median housing loan repayment (\$/month)	\$1,907	\$1,517	Rented	32.7%	29.5%
Median rent (\$/week)	\$252	\$210	<b>TYPE OF INTERNET CONNECTION [B35]: % of occupied private dwellings</b>		
Average household size	2.5	2.6	No internet connection	27.5%	35.1%
<b>LANGUAGE SPOKEN AT HOME [B12]</b>			<b>POPULATION CONTINUITY [B37,B38]: % of persons aged 1 or 5 years and over</b>		
Other language speakers as % of all other language speakers (results shown >5.0%)	Cantonese 19.4%	Arabic 9.7%	Persons enumerated same address 1 year ago	79.6%	79.5%
	Mandarin 16.4%	Cantonese 7.6%	Persons enumerated same address 5 years ago	55.7%	55.0%
	Italian 8.4%	Mandarin 5.9%			
	Korean 8.2%	Italian 5.1%			
		Greek 5.1%			

**TABLE 2.3 – HERITAGE ITEMS WITHIN THE STUDY AREA**

<b>Suburb</b>	<b>Item name</b>	<b>Address</b>	<b>Significance</b>	<b>Item number</b>	<b>Flood-liable</b>
Macquarie Park	Macquarie University (Ruins)	192 Balaclava Road (Part Lot 18, DP 1058168)	Local	10	Possibly (location unclear)
Macquarie Park	Northern Suburbs Cemetery	12 Delhi Road	Local	44	No
Marsfield	Curzon Hall	53 Agincourt Road	State	1	No
Marsfield	Eastwood Town Hall	74 Agincourt Road	Local	2	No
Marsfield	Open space	Lane Cove National Park	State	59	Yes (part)
North Ryde	House	50-52 Bridge Road	Local	22	No
North Ryde	North Ryde Public School	154 Cox's Road	Local	39	No
North Ryde	Rock engraving	Delhi Road (near Lane Cove River National Park)	Aboriginal	41	Possibly (location unclear)
North Ryde	Rock engraving	Delhi Road (near Lane Cove River National Park)	Aboriginal	42	Possibly (location unclear)
North Ryde	Axe grinding	Delhi Road (near Lane Cove River, west side)	Aboriginal	43	Possibly (location unclear)
North Ryde	Experimental building	39 Delhi Road, 3 Julius Road and 2 and 4 Richardson Place	Local	45	Possibly
North Ryde	Northern Suburbs Crematorium	197 Delhi Road	Local	46	No
North Ryde	Rock Engraving	Lane Cove Road (near) Lane Cove National Park	Aboriginal	60	Possibly (location unclear)
North Ryde	Axe grinding	Martin's Creek, Lane Cove National Park	Aboriginal	68	Possibly (location unclear)
North Ryde	Substation	293 Pittwater Road	Local	97	No
North Ryde	Russ in Urbe (Building)	2 Richardson Road	Local	104	Possibly
North Ryde	'Bensonville' (House)	126 Twin Road	Local	134	No
North Ryde	House	60 Wicks Road	Local	173	No
North Ryde	House	62 Wicks Road	Local	173	No
Ryde	House	87 North Road	Local	81	No