City of Wagga Wagga



Wagga Wagga

Urban Salinity Status Report

July 2009 – June 2010

Prepared by the Directorate of Environment and Community Services
Wagga Wagga City Council

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1. INTRODUCTION

Urban salinity is recognised as one of Wagga Wagga's most significant land degradation concerns. Following the identification of urban salinity in 1993, Wagga Wagga City Council has adopted management practices to alleviate urban salinity.

Annually, Wagga Wagga City Council works with the community to manage the ground water tables and salinity in the Wagga Wagga Local Government Area. Wagga Wagga City Council endeavours to manage salinity to minimise the detrimental impact on the natural environment, economic condition or lifestyle of residents living in the City of Wagga Wagga.

Urbanisation and agricultural factors are recognised as the major causes of urban salinity in Wagga Wagga. The factors known to contribute to urban salinity include:

- Replacing native perennial vegetation with urban development and shallow rooted species;
- Over irrigation of gardens, parks and recreation areas;
- Leaking water, stormwater and sewer pipes;
- Leaking septic tanks;
- Disruption of natural surface and subsurface drainage lines;
- Stormwater disposal via backyard rubble pits;
- Development on discharge areas; and
- Rainfall overly exceeding evaporation rates.

In recent years, the prolonged drought may have temporarily relieved Wagga Wagga of the high water tables associated with urban salinity. Rainfall associated with the beginning of a La Niña event has meant rainfall has again exceeded evaporation and in 2009/10 is once again considered a contributing factor to a rising water table.

The procedures and management strategies undertaken by Council in 2009/10 to facilitate the remediation of urban salinity in attempt to manage groundwater tables are discussed in the following urban salinity status report document.

The impact of salinity

Salinity within the urban environment impacts on all members of the community quickly damaging infrastructure and impacting on the surrounding natural environment. The accumulation of salts and water logging resulting from urban salinity has a detrimental impact on the longevity of households, business and infrastructure.

The impact of salinity in urban areas can comprise of:

- Salt damage to pavements, roads and highways includes the breakdown of concrete, bitumen and asphalt associated with pot-holing, cracking and crumbling of the road base;
- Damage to houses, buildings and other structures caused by the weakening of brick (Figure 1), mortar and concrete due to saline water crystallising in the brickwork;
- Shifting or sinking of foundations may result in structural cracking, damage or collapse.
- Damage to heritage buildings and reduction of land values may be of major concern;
- Damage to underground services such as gas, water, stormwater and sewage pipes due to the breakdown of unprotected metal and concrete in high saline water tables;
- Septic tank failures due to high water tables can lead to other environmental and health concerns;
- Loss of amenity in recreational areas such as parks, gardens and sporting fields due to salt and waterlogging causing salt scalds and bare patches where vegetation fails to grow (Figure 1); and
- Adverse effects on the surrounding natural environment affecting water quality, and reduction of native flora and fauna.

Figure 1: Salt damage to footings and mortar at a residential dwelling, Turvey Park, Wagga Wagga.

In 1998, the Department of Land and Water Conservation (DLWC) conducted a study with data provided by Wagga Wagga City Council putting an economic cost to urban salinity in Wagga

Wagga. The estimated cost of salinity damage to infrastructure in Wagga Wagga over the next 30 years is approximately $183 million if no preventative work is carried out. This value is expected to top $20 million even if preventative measures are put in place.

Preventative measures have been in place since 1998 and each year Council expands monitoring and management strategies in an attempt to lessen the effects of urban salinity. Following in excess of 10 years of management, the current economic impact of management and recent data on the cost of urban salinity to Wagga Wagga is yet to be determined.

2. EDUCATION

Educational activities raise awareness of the issues associated with urban salinity in our community. Behavioural change within the community is required to combat urban salinity. An informed community will support and undertake actions to address Urban Salinity.

Wagga Wagga City Council's urban salinity education program aims to:

- Increase community awareness of the causes, impacts and management strategies of urban salinity;
- Promote education programs in the community, schools and tertiary institutes including the Riverina Institute of TAFE and Charles Sturt University;
- Liaise with community, business and industry groups on ways to remediate urban salinity;
- Liaise with other authorities, such as Department of Environment, Climate Change and Water and Riverina Water County Council, to ensure that urban salinity practices are kept up to date and that information is shared across agencies;
- Encourage attitude and behavioural changes to ensure Council works programs are supported by the community; and
- Encourage community involvement in practical projects that will aid the management of urban salinity.

2.1 Sustainability Education Officer

The Sustainability Education Officer focuses on sustainability and education of all environmental issues affecting the Wagga Wagga Local Government Area.

The Sustainability Education Officer performs a wide range of duties including:

- Handling enquiries and directing customers to additional specialist information;
- Facilitating education and consultation in the community in regards to urban salinity and other sustainability issues;
- Preparing information for the website, displays and other educational materials;
- Conducting tours and providing information to visiting groups from other centres; and
- Organising community meetings and workshops to discuss urban salinity and other sustainability issues.

2.2 School programs and contact

Through the Sustainability Education Officer, Council aims to promote an understanding of urban salinity and related environmental problems. In 2009/10, Wagga Wagga City Council contributed more than $5,500 to the 6 schools participating in the annual Schools Sustainability Challenge. The challenge invites local school students to develop practical projects that will enhance their school environment and promote sustainable practices in our community.

The promotion of education for sustainability is receiving increasing recognition within the community of Wagga Wagga. One such example is Erin Earth - a solar passive demonstration house and its surrounding gardens developed using water wise and permaculture principles. The centre has the potential to be an important site for education for sustainability and Council's Sustainability Education Officer is a member of the ErinEarth Management Committee. Open Days are held monthly with workshops focusing on a variety of sustainability issues including urban salinity.

2.3 Urban salinity tours

The Urban Salinity Tour Booklet (Figure 2) allows self guided tours of locations indicating the effects of urban salinity, preventative measures and management strategies in the city of Wagga Wagga. Alternatively, salinity tours can be conducted by Council's Sustainability Education Officer

on request. The tour deals with an extensive range of issues and provides a considerable quantity of information. The tour identifies sources of groundwater recharge in Wagga Wagga and measures implemented by Council to reduce its impact. The tour also identifies areas of groundwater discharge, the consequences associated with a high and saline water table and remedial options available.

During the past year, tours have been conducted for more than two hundred students from four different high schools. A further 50 Scouts participated in an Urban Salinity Tour as part of an Environmental Camp held in Wagga Wagga. A selection of urban salinity publications were given to each of the groups that participated in the tours.

The Urban Salinity Tour and the Urban Salinity Tour Booklet was evaluated and updated in 2009/10 to ensure its application to the school curriculum and relevance to current conditions.

2.4 Wagga Wagga City Council website

The Wagga Wagga City Council website contains information relating to urban salinity. An upgrade to the site was carried out in 2010 to ensure the relevancy of the information to the community. To access this information, navigate to www.wagga.nsw.gov.au and click on the “Environment” and “Land” tabs to navigate to information on salinity. This webpage gives information on how residents can reduce rising water tables in their community, a glossary of terms and links to urban salinity reports and publications that can be downloaded.

2.5 Publications

Wagga Wagga City Council has commissioned a number of publications to provide information on urban salinity and related issues (Figure 2). A selection of these includes:

- *Wagga Wagga Urban Salinity Guide.* Wagga Wagga City Council, 2010.
- *Urban Salinity Management Plan 2008*-2013. Wagga Wagga City Council, 2008.
- *Wagga Wagga Urban Salinity – Water Level and Quality Study (1999-2006)*. Golder & Associates, 2007.
- *Annual Urban Salinity Status Report*. Wagga Wagga City Council.
- *Salinity in the Wagga Wagga Local Government Area*. Wagga Wagga City Council, 2006.

- *Water Wise and Salt Tolerant Plants: Wagga Wagga Region*. Wagga Wagga City Council, 2002.
- *Building in a Saline Environment*. Wagga Wagga City Council, 1999.

These publications are available directly from Council and a selection can also be downloaded from the Wagga Wagga City Council website, www.wagga.nsw.gov.au.

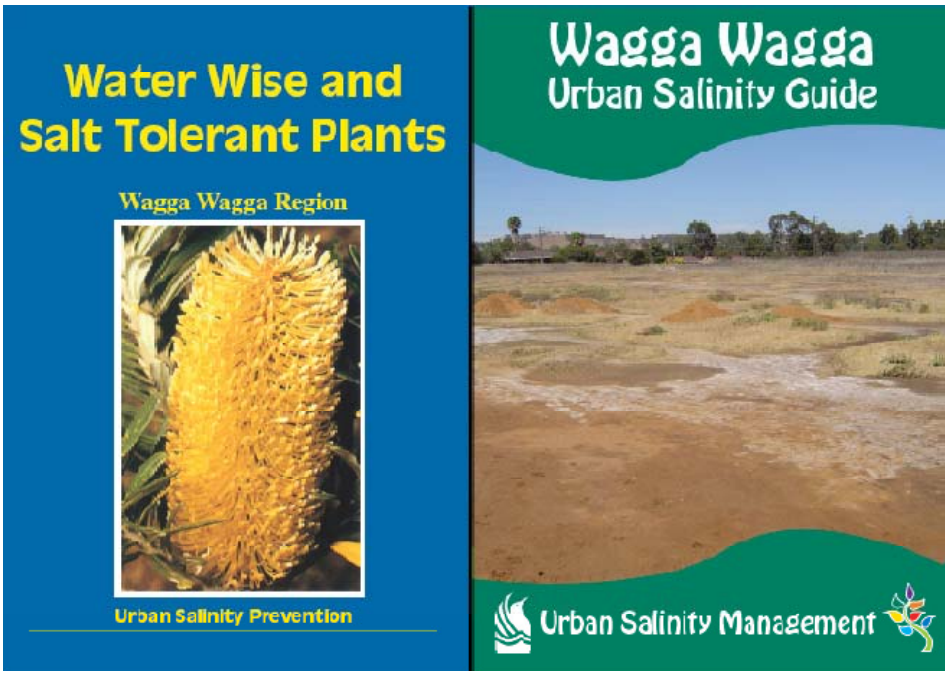


Figure 2: Available Information booklets related to urban salinity.

3. REVEGETATION

The revegetation of recharge or discharge areas with native plants is directly responsible for slowing groundwater recharge and lowering the water table. The Urban Salinity Management Plan 2008- 2013 proposes that Council aims the regenerate 20ha of land annually. Alternatively, as suitable large areas of vacant land within the urban environment become scarce, Council will ensure existing stands of vegetation remain healthy.

Outcomes of the revegetation program as listed in the Urban Salinity Management Plan 2008-2013 include:

- Decreased outbreaks of surface salinity
- Decreased effects on the environment, buildings and infrastructure
- Lowered water tables
- Decreased water usage by encouraging “water wise” practices in the garden
- Lower infrastructure costs

- Increased biodiversity

These outcomes have led to the implementation of the following programs.

3.1 Tree planting on public land

Mitigation and prevention of salinity through replanting areas with native trees, shrubs and grasses requires the help of groups such as Landcare, the Murrumbidgee Catchment Management Authority and private landholders.

Local schools, businesses, Council staff, community members and Landcare groups have planted in excess of half a million trees and shrubs in the local area since 1998. During this time, major plantings of approximately 100,000 trees have occurred near Lake Albert, Wagga Wagga and at various Kyeamba Valley Farm sites. Funding for these tree plantings have come from a variety of sources. The former Department of Environment and Conservation, Greenfleet, the Natural Heritage Trust and Wagga Wagga City Council have all contributed funds.

An assortment of planting and revegetation projects undertaken in 2009/10 is listed in the following sections.

Targeting recharge areas at Gregadoo, Glenfield & Hilltop, the Murrumbidgee Catchment Management Authority funded tree planting for urban salinity management. With the assistance of volunteers from the African Community group, the RAAF and Cargill Beef Australia, in excess of 15,000 native trees & shrubs were planted.

The Wagga Wagga Urban Landcare Group has conducted rehabilitation plantings at two main sites during 2009/2010. Approximately 540 seedlings have been planted within a disused Travelling Stock Route to the north-west of Wagga Wagga. A further 1300 seedlings have been planted as part of rehabilitation works within Pomingalarna Reserve in conjunction with Wagga Wagga City Council and MounTain Bike Wagga Inc.

3.1.1 National Tree Day

National Tree Day is Australia's biggest community tree planting event. National Tree Day is held on the last Sunday of July, with Schools Tree Day taking place on the Friday before. Wagga Wagga City Council has coordinated National Tree Day locally for many years. In 2009, 63

National Tree Day volunteers planted 1400 locally native grasses, shrubs and trees at a site to the east of Wagga Wagga.

Schools National Tree Day was also a great success with Wagga Wagga and district schools in 2009. A total of 25 schools and childcare centres/preschools planted a total of 2080 native seedlings on their grounds.

3.2 Emblen Park demonstration garden

Planting native trees and shrubs and watering wisely will help to prevent the water table from rising and bringing salts to the soil surface. Through the promotion and establishment of water wise gardens especially in recharge areas, local residents become responsible for helping to create a better environment.

The Hardy Avenue Emblen Street roundabout, Emblen Park has been established as a water wise garden for many years. In 2008/09, the garden was overhauled with new technologies and innovations being incorporated into the demonstrate site.

In June 2010, volunteers from G E Money converged on Emblen Park. The volunteers replaced lost plants, weeded garden beds & added additional mulch to the garden. New interpretive signage was placed in the park providing visitors with information on salinity and water wise gardening.

Emblen Park is incorporated as a stop in the urban salinity tour.

Figure 3. GE Money volunteers participating in a working bee in Emblen Park, McAuley School students stopped at Emblen Park on a Salinity Tour.

4. REAR OF BLOCK DRAINAGE

The rear of block drainage scheme commenced in 1998 when the Urban Salinity Working Group identified that a significant amount of water from house roofs was seeping directly into the water table via backyard rubble pits.

Rubble pits are rubble filled holes in the ground used to dispose of rain water from roofs in areas where stormwater connections do not exist. Over time the rubble pit empties as the water soaks into the ground, contributing to a rise in the water table. Rubble pits are usually located in the backyards of houses in older parts of the residential area.

This program aims to supply alternate roof stormwater disposal by providing new stormwater pipes at the rear of residential blocks that slope to the back. House stormwater is then connected to the new drainage system at the rear of the block. Wagga Wagga City Council now prohibits the installation of new rubble pits.

The initial rear of block drainage program was undertaken in Chaston Street, Central Wagga Wagga. This was followed by the Turvey Park area bounded by Coleman Street to the north, Macleay Street to the east, Fernleigh Road to the south and Bourke Street to the west (Figure 4). Between January 2000 and April 2006, all blocks within the original trial area of Turvey Park and three additional blocks north of Coleman Street were added to the rear of block drainage system. The Federal Government through its Natural Heritage Trust Fund contributed funding towards this section of the program.

Construction works in Alexander, Birdwood and Vasey Streets in Ashmont and Wilks Avenue in Kooringal (Figure 3) were completed in 2006/07. In 2007/08 the rear of block drainage program completed works in Ashmont Avenue, Montgomery Street and Alexander Street in Ashmont as well as Dalkeith Avenue in Lake Albert.

The first phase of the Mount Austin rear of block drainage project was completed in 2009/10. The three year project incorporated the investigation, design and construction of rubble pit in sections A1 to A10 (Figure 4), Mount Austin. Using CCTV inspection, water flushing and smoke testing the presence of rubble pits was determined, a total of 279 individual house lots were investigated. Sixty rubble pits were exposed and infrastructure was installed to divert the stormwater from the roofs into the stormwater system. The total cost of project was $666,240, or $2388 per house lot.

Sections B1 to B4 (Figure 4), Mount Austin constitute phase 2 of the Mount Austin rear block drainage project. The investigation of sections B1 to B4 will occur in 2010/11 with completion of construction expected within 2 years dependant on available funding.

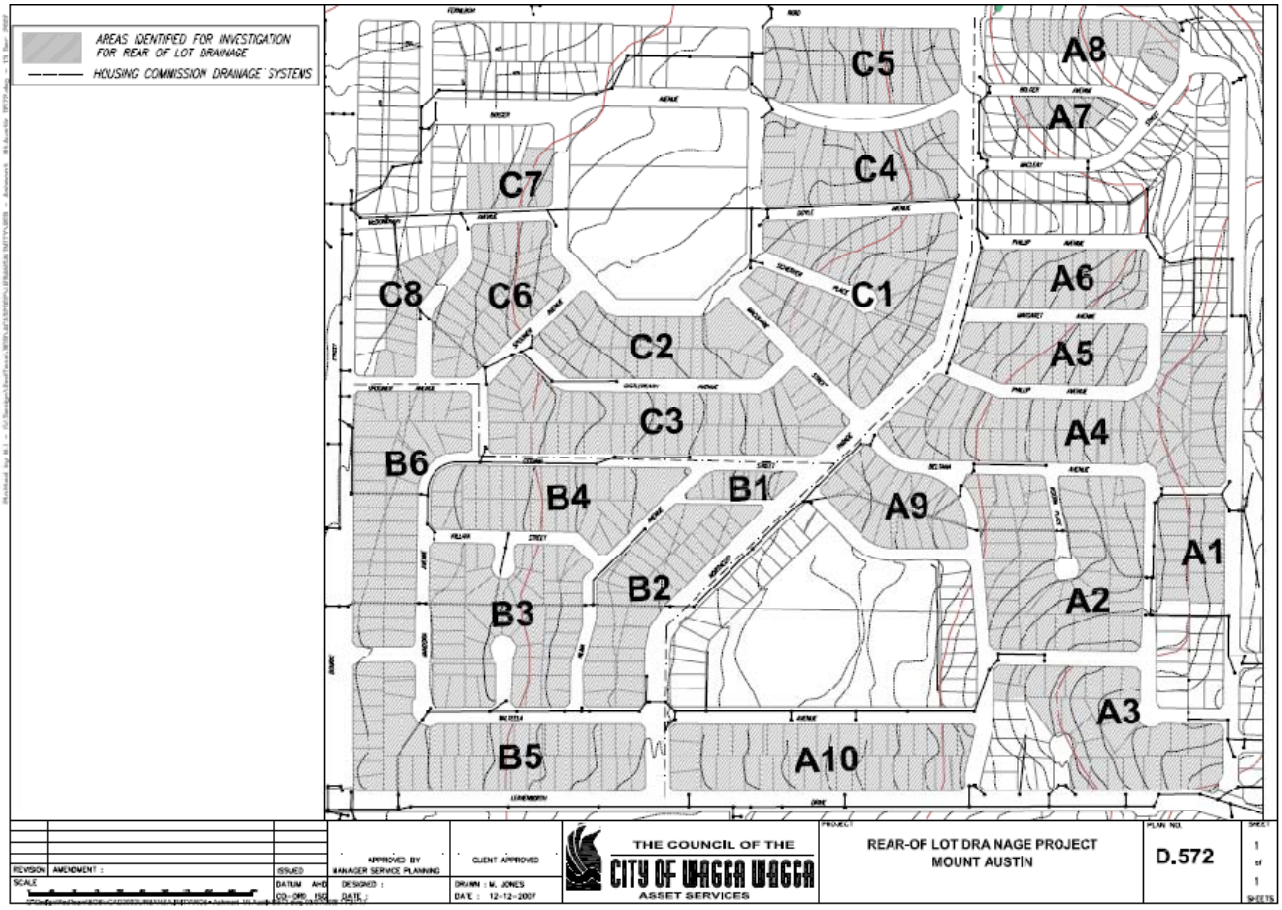


Figure 4: Map of Mount Austin showing the locations of works to be completed during the Rear of Block Drainage Scheme.

5. LEAKAGE REDUCTION

Riverina Water County Council supplies Wagga Wagga and surrounds with reticulated water. Water from various groundwater bores and the Murrumbidgee River services the industrial, residential, commercial and recreational needs of the city. A distribution system consisting of 536,060km of pipe work of varying ages moves water through the city.

Most pipe networks leak to some extent and this can result in excess water reaching the water table. Prior to undertaking major leakage detection works a domestic meter replacement program was required to better determine an accurate water balance. In January 2006 Riverina Water

began a domestic meter replacement programme to reduce unaccounted for water and increase the accuracy of water balance calculations.

To minimise unaccounted for water, to date Riverina Water has replaced 14,210 water meters of which 4760 water meters were replaced in 2009/10. To detect leaks Riverina Water utilises a leak sounding unit. Riverina Water also joined the NSW Water Loss Program in 2009.

A mains replacement program is conducted annually in Wagga Wagga by Riverina Water. In 2009/10 the estimated cost of mains replacement exceeded $700,000. Service upgrades were too completed.

In 2009/10 Riverina Water continued their demand management program. The program included advertising, literature handouts, various promotions and restrictions to reduce water usage. A stepped tariff pricing structure was introduced to cut water usage.

6. SUBSURFACE DRAINAGE & EVAPORATION BASIN

Since 1998, the herringbone drainage system below the ground surface of the main arena at the Wagga Showground has been draining groundwater to the evaporation basin adjacent to the Urana Street and Glenfield Road roundabout. The aim of the basin is to drain excess water from the shallow water table at the Showground during the wetter winter months and evaporate it over the summer months. The level of rainfall and evaporation throughout the year also impacts the water level to a great extent. As the water in the basin evaporates during the summer months, the concentration of salts increases but during the winter months when rainfall and inflows are higher, a dilution occurs and the salt concentration is decreased.

Below the Wagga Showground, groundwater levels have decreased. No groundwater drained into the evaporation basin in 2009/10. A new piezometer installed between the trotting and dog tracks will allow groundwater levels below the main arena to be monitored. If groundwater levels increase to a depth where the herringbone drainage system will drain groundwater, monitoring of the evaporation basin will commence.

7. DEWATERING BORES

One method to reduce rising water tables is to pump and remove the source of the groundwater, therefore lowering the water level in the discharge areas. The groundwater causing many of the urban salinity issues in Wagga Wagga generally has a low salt content until it rises through the water table and collects salts that naturally occur in the soil structure. When groundwater rises through the soil profile it dissolves the salts held in the soil. Evaporation from the soil and uptake of water by vegetation results in the salts being left behind once groundwater comes within 2.0 – 3.0 metres of the soil surface. Over time, the concentrations of salts in the upper soil profile increases. By maintaining the groundwater level 2.5 – 3.0 metres below the ground surface, it is generally expected to prevent accumulation of salts in the top sections of the soil profile and stop waterlogging.

The Calvary Hospital precinct bounded by the Sturt Highway (Edward St) to the north, Docker Street to the east, Chaston Street to the south and Cullen Road to the west was selected as the location to install the dewatering bore scheme. This area is also known as the Intensive Borefield. Figure 6 displays the dewatering bore and piezometer locations of the Intensive Borefield.

Ten bores were drilled in June and July of 1998, with nine of these being fitted with full pumping equipment to allow pumping of moderately saline water from the Calvary Hospital precinct to the Murrumbidgee River. Bore 9, on Gormly Avenue, was decommissioned as a dewatering bore due to a low yield of groundwater which prevented the implementation of full pumping equipment. This bore has since been kept as a deep piezometer for groundwater monitoring.

The bores are spaced approximately 250m apart to allow for even groundwater pumping throughout the entire area. Two of the nine bores were drilled to 40m with the remaining seven drilled to 70m. The Department of Land and Water Conservation publication of 1998 entitled: *Wagga Wagga Urban Salinity Pilot Bore Dewatering Project – Drilling Results and Pumping Test Outcomes of Installation of Spearpoints*, contains further information about the drilling of the dewatering bores.

Forty one piezometers accurately monitor the effect that the dewatering bores were having on the water table of the Intensive Borefield. These piezometers are used to monitor the effect that the deep groundwater pumping is having on the shallower water table. It is expected that pumping will lower the water level in the piezometers to at least 2.5 metres below the ground surface all year round, which is a reality for the vast majority of piezometers in the Intensive Borefield.

The nine dewatering bores are monitored on a monthly basis by Wagga Wagga City Council's Environmental Monitoring Officer for electrical conductivity (EC), temperature, flow meter volumes and pumping hours. The volume and EC data from the dewatering bores allows for calculation of a salt load for the Intensive Bore Field groundwater entering the Murrumbidgee River. Water bearing piezometers within the intensive borefield are monitored fortnightly and all piezometers are monitored monthly for standing water level (SWL), electrical conductivity (EC).

Groundwater extracted through the dewatering bores is discharged to the Murrumbidgee River via the Moorong Pump Station. The extraction of groundwater though the dewatering bores is licensed with the NSW Office of Water under The Water Act, 1912. In August 2010 council was successful in gaining a bore licence renewal certificate for the nine dewatering bores for a further 5 years dated from March 2009. The Licence regulates the rate of extraction of groundwater; extraction shall not exceed 236 megalitres in any 12 month period or 10 litres per second.

7.1 Dewatering bore trial

To identify and record the groundwater response following the switching off of the de-watering bores, a dewatering bore trial was implemented. Positive outcomes of the trail include decreasing the amount of saline groundwater discharged into the Murrumbidgee River. Additionally, the trial will identified if the bores can be switched off regularly to reduce electricity costs without negatively impacting on the SWL in the borefield.

Continuing into 2009/10, the dewatering bore trial aimed to identify if increased garden watering during the summer months has a detectable impact on SWL's. The trial will be indicative of the duration the dewatering bores can remain "off" before a negative impact on the borefield is detected.

On the 11 June 2008, the dewatering bores were switched off. All piezometers were monitored for SWL prior to the dewatering bores being switched off. All piezometers were then measured every week for the next month to identify any early response before changing to a fortnightly monitoring regime including the normal monthly monitoring. Piezometers not yielding groundwater were monitored on a monthly basis as part of the normal regime. As groundwater levels rose and became detectable, fortnightly monitoring was implemented.

The dewatering bores remained off during 2008/09 and 2009/10 with the exception of Bore 4 which was turned on briefly in November 2008.

7.1.1 Dewatering trial results

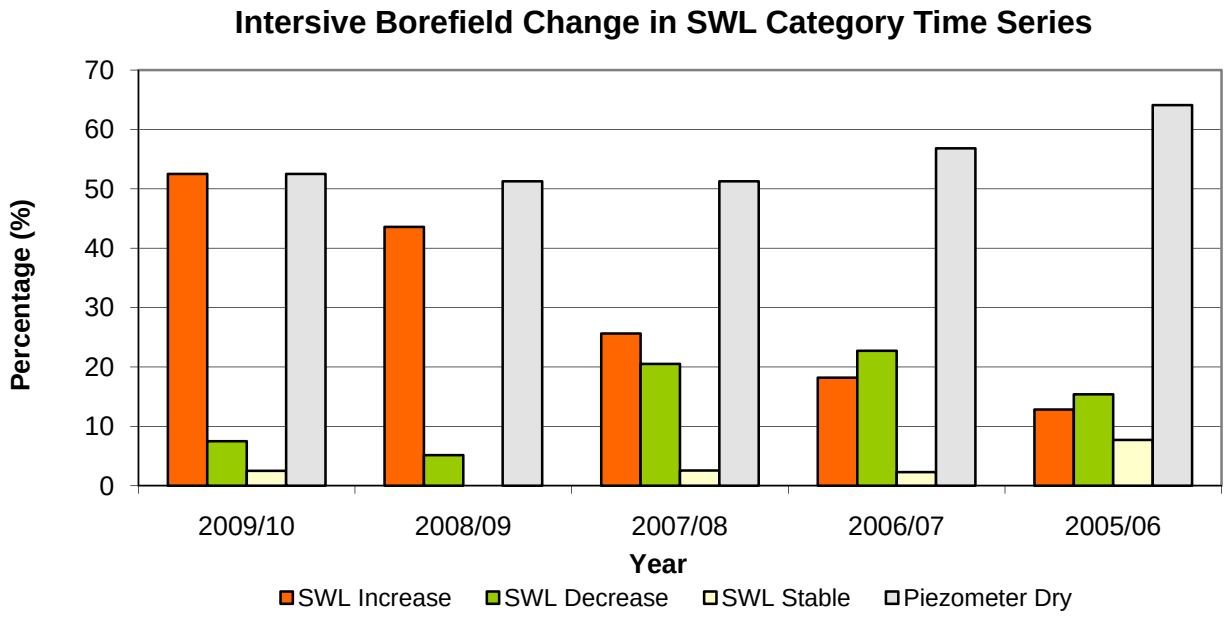


Figure 5. A comparison between change in SWL category in the Intensive Borefield from 2005/06 to 2009/10

The change in SWL over the last five reporting periods is presented in Figure 5. The figure shows an upward trend in the number of increasing piezometers since 2005/06. The number of increasing piezometers has risen significantly since the turning off of the dewatering bores in June 2008. It must be noted that the dewatering bores were previously switched off from February 23 to March 30, 2007.

A significant drop in decreasing piezometers was recorded in the dewatering bore trial compared to the previous three reporting periods. A slow decline in the number of dry piezometers has been recorded.

A graph depicting the response from water bearing piezometers in the intensive borefield to the dewatering trial are shown in Figure 6. Two groups can be distinguished from the figure. The first group incorporates shallow piezometers and the graph shows no distinct change in groundwater levels caused by the switching off of the dewatering bores. The three piezometers (no. 57, no.58 and no.66) unaffected by the switching off of the dewatering bores are all located in Chaston Street or Mortimer Place. This suggested that the radius if influence of the dewatering bores is limited.

Piezometer no. 90 located on the corner of Chaston Street and Cullen Road has experienced a slight but gradual increase in SWL over the trial period.

The second group includes deeper watering bearing piezometers and shows an initial steep increase in SWL, over time the SWL has continued to gradually rise at a steady rate. The deeper piezometers are affected instantaneously and severely by the dewatering bores. Increases in SWL for individual water bearing piezometers in the intensive borefield are described in Table 1. Increases in SWL of up to 20m were recorded for some deep piezometers.

It is predicted the dewatering bores will be switched on in late 2010. Prior to the dewatering bores being switched on, all piezometers will be monitored for SWL. The piezometers will then be measured every week for the next month to identify any early response before changing to a fortnightly monitoring regime including the normal monthly monitoring for the next 6 months. After 6 months, normal monthly monitoring will resume. Data will be used to determine if switching the dewatering bores on and off is a viable option for maintaining low groundwater levels in the Calvary precinct, while reducing the amount of water released into the Murrumbidgee River and operational costs such as electricity for the pumps.

Table 1. Trial change in SWL for Water bearing piezometers in the Intensive Borefield

Piezometer Number	Piezometer Location	Urban sub-catchment	Piezometer Depth	SWL (m) 11-Jun-08	SWL (m) 30-Jun-10	Change in SWL (m)
16	Emblen Park	4	15.10	DRY	-5.62	Increase
57	7 Mortimer Pl	3	3.00	-1.29	-0.65	0.65
58	62 Chaston St	4	3.00	-1.45	-0.98	0.47
60	Opp 16 Cullen Rd	4	3.00	DRY	-2.91	Increase
61	Opp 38 Cullen Rd	4	3.00	DRY	-2.90	Increase
66	18 Chaston St	4	3.00	-1.68	-1.38	0.30
80	Gormly-Harrison Sts roundabout	4	6.00	-2.03	-4.65	-2.62
81	48 Docker St	MA	6.80	-6.52	-3.91	2.61
86	2 Lewisham Ave	4	7.50	DRY	-5.84	Increase
88	2 Chaston St	4	10.00*	DRY	-6.71	Increase
89	31 Chaston St	4	5.50	DRY	-4.57	Increase
90	51 Chaston St	4	6.60	-3.96	-2.46	1.51
99	29 Hardy Ave	4	15.00	DRY	-9.44	Increase
100	29 Hardy Ave	4	31.00	DRY	-9.42	Increase
101	29 Hardy Ave	4	60.00	-28.72	-9.49	19.23
102	Cnr Meurant St - Lewisham Ave	4	15.00	DRY	-6.4	Increase
103	Cnr Meurant St - Lewisham Ave	4	31.50	-27.71	-7.49	20.22
104	Cnr Meurant St - Lewisham Ave	4	61.00	-27.80	-7.36	20.45
176	39 Meurant Avenue	4	9.00	DRY	-5.6	Increase
1/1	Emblen Park	4	15.00	DRY	-5.49	Increase
1/2	Emblen Park	4	30.00	-15.93	-5.36	10.57
1/3	Emblen Park	4	60.00	-16.08	-5.12	10.96
Bore 9	63 Gormly Ave	MA	120.00	-13.24	-13.52	-0.28

* Increase from dry to water bearing

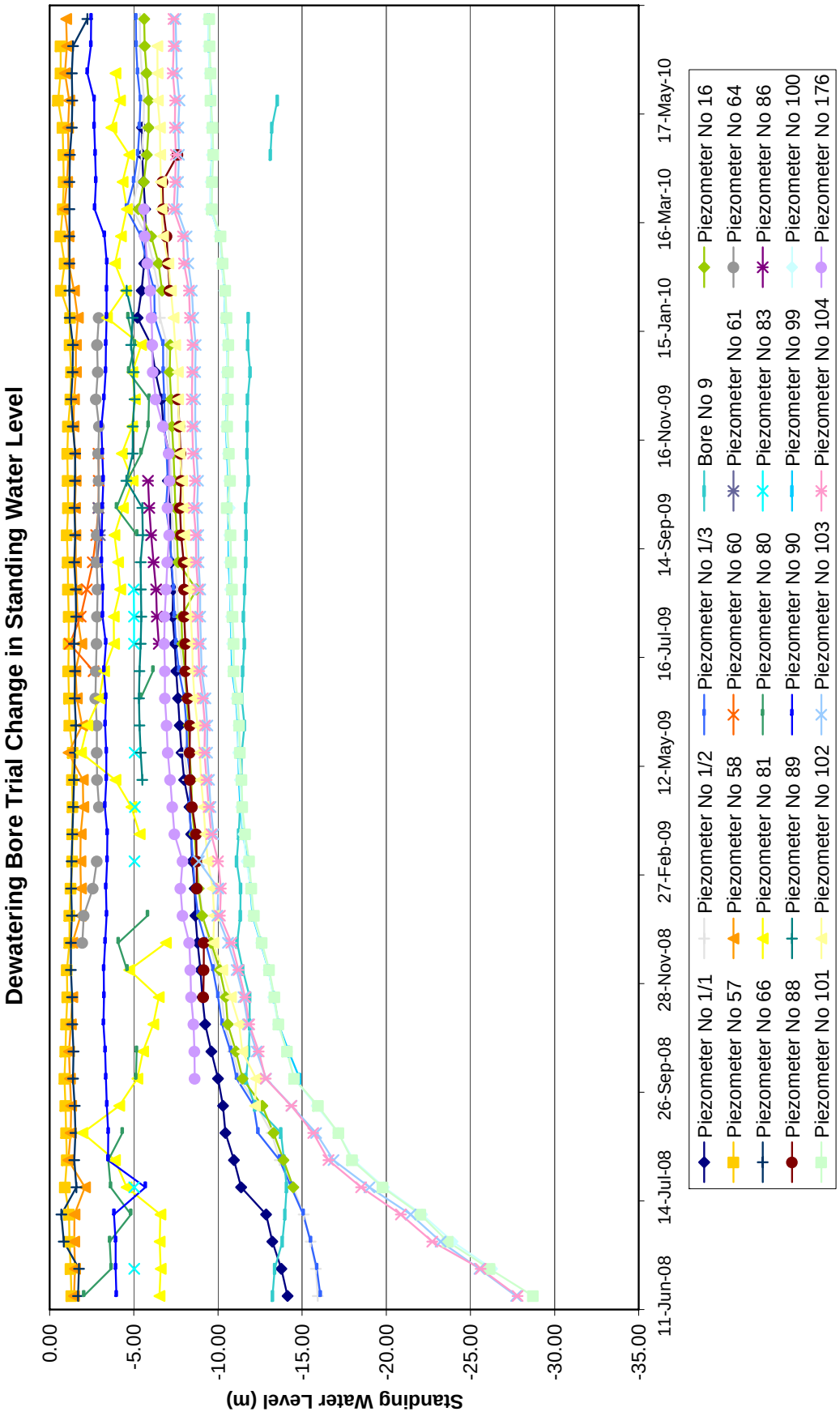


Figure 6. The change in SWL for water bearing piezometers in the intensive borefield during the dewatering trial

8. DEVELOPMENT CONTROL

To conserve existing native vegetation and establish new native vegetation on rural residential or small holding developments Council introduced the “Wagga Wagga Development Control Plan No. 11 - Native Vegetation Cover for Rural Residential Land” (DCP 11). It is intended that the plan will reduce the potential for salinity by controlling the conservation of existing native vegetation and promoting the establishment of new native vegetation.

Under DCP 11, the designated rural land capability class is utilised to determine a minimum native vegetation cover level for the lot. The developer and landowner are responsible for maintaining existing stands of native vegetation or establishing new native vegetation to achieve the minimum native vegetation cover level for the individual lot.

Rural land capability classes determined by the NSW Department of Land and Water Conservation as part of the *Wagga Wagga Draft Natural Resource Management Plan* form the basis of DCP 11.

Following the establishment of required native vegetation, final building certificates are issued by Council. In 2009/10, eight lots in the Stringybark Creek catchment planted 1262 trees and shrubs, establishing a total of 1.3ha of new native vegetation. Seedling numbers within these eight lots ranged from 100 to 273 seedlings with a median of 100 seedlings planted. Final building certificates were issued to these eight lots.

9. RAINFALL & EVAPORATION

Groundwater recharge is significantly affected by the amount of rainfall relative to evaporation. Low rainfall combined with high evaporation rates are expected to result in a slump in the water table. This occurs as insufficient water is available to saturate the upper soil profile and infiltration into the groundwater system is prevented. Alternatively, high rainfall will saturate the soil profile allowing for infiltration to groundwater.

The Bureau of Meteorology field station at Forest Hill, Wagga Wagga recorded rainfall and evaporation data during the period from July 2008 to June 2009. Historical data was gathered from either the ‘Forest Hill’ or the ‘Wagga Wagga Agricultural Institute’ field station dependant on the commenced date. Rainfall data from the 'Wagga Wagga Agricultural Institute' field station was used to determine the historical mean rainfall as data collection commenced in 1898.

Record rainfall recorded in March 2010 notably contributed to the 628mm of rain in 2009/10 which is above the 110 year average of 520.8mm. The annual evaporation rate for 2009/10 is 116.8mm higher than the 68 year average. Rainfall in December 2009, February, March and May 2010 was above the individual long term monthly rainfall averages (Figure 7). Rainfall exceeded the evaporation rate during March, May and June 2010.

Extremes in rainfall and evaporation during 2009/10 may of potentially altered sources of groundwater recharge in 2009/10. High evaporation rates and decreased rainfall events as experienced from July 2009 to January 2010 indicate recharge to the watertable may not have been directly from rainfall but from additional sources such as over irrigation, leaking pipes, leaking septic tanks and rubble pits. Increased rainfall from February 2010 to July 2010 potentially allowed for groundwater recharge directly from rainfall.

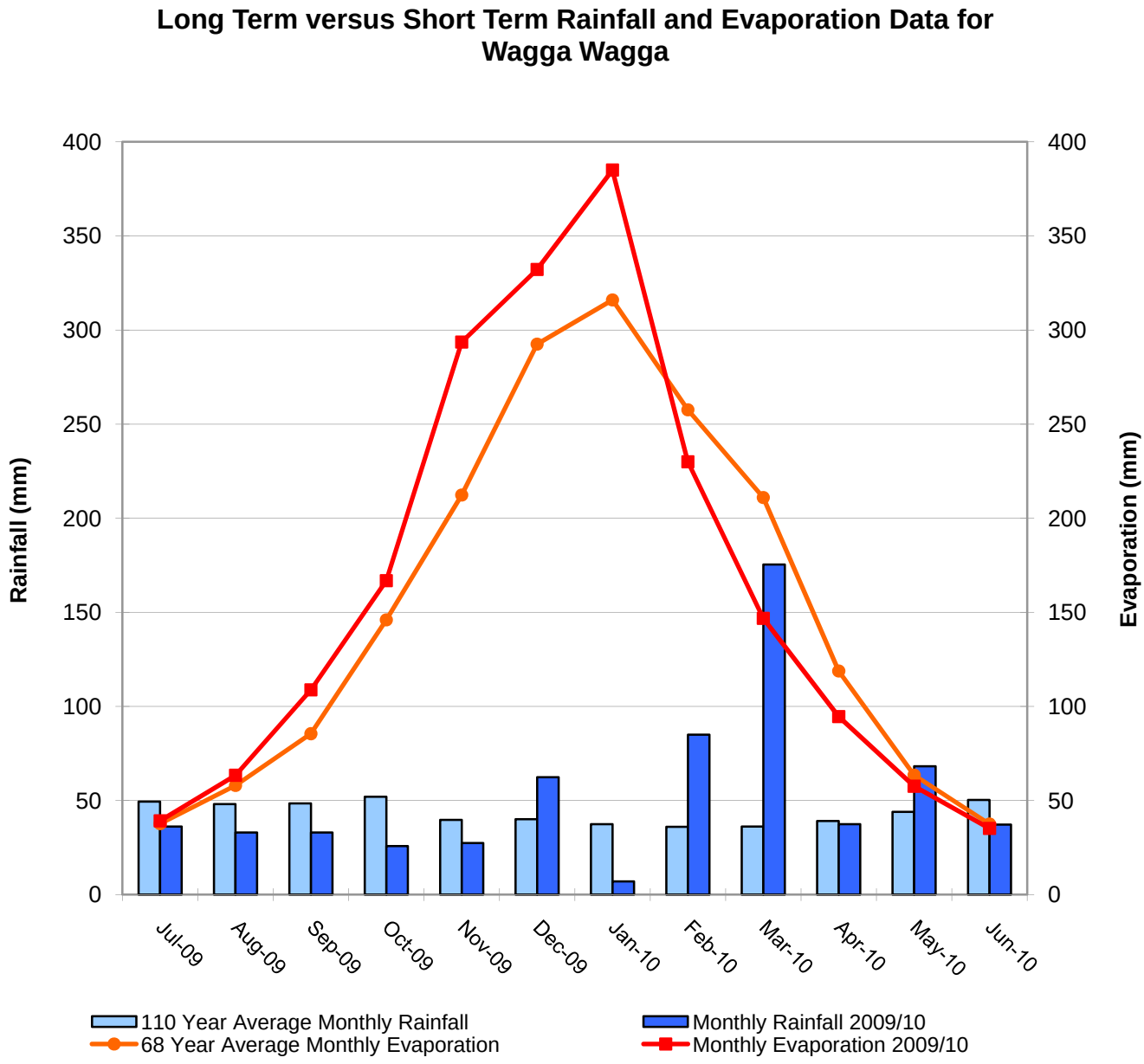


Figure 7: Monthly rainfall and evaporation graph for Wagga Wagga 2009/10.

10. MONITORING PROGRAM

Piezometers located throughout the Wagga Wagga Local Government Area are maintained by Wagga Wagga City Council to monitor urban salinity. Established in 1998, the current monitoring network consists of 179 piezometers. In 2009/10 one piezometer became blocked and was removed from the monitoring schedule. In June 2010 nineteen new piezometers were drilled and will be added to the monitoring schedule in 2010/11. The piezometers were monitored on a monthly, bi-monthly or quarterly basis to examine trends, identify causes of the problem and potential risks areas.

Standing water level (SWL) and electrical conductivity (EC) readings are collected and used to monitor urban salinity. The SWL is measured in metres below the ground surface to the nearest centimetre using a water level meter. Measurements are taken from the height of the piezometer casing and the height of the extension subtracted from the reading. Piezometers at ground level do not require a subtraction. Water is extracted from the piezometer using a bailer to measure for EC. The EC is measured in decisiemens per metre (dS/m) to two decimal places using a handheld conductivity meter.

Data is collected monthly, bi-monthly or quarterly from the network of piezometers depending on water bearing status and location. The 2009/10 monitoring regime consists of 58 piezometers being monitored monthly, 23 bi-monthly and 23 quarterly. As part of the dewatering bore trial 41piezometers located in the Calvary hospital precinct are monitored either fortnightly or monthly, determined monthly. Piezometers yielding water were monitored fortnightly; alternately piezometers not yielding water were monitored monthly.

Results of groundwater monitoring identify areas susceptible to saline discharge and monitor the effectiveness of Council's preventative and remedial measures.

10.1 Piezometer Installation

To increase knowledge of groundwater levels in piezometer categories previously unknown, in categories containing few piezometers or in unrepresented suburbs/area 19 new piezometers were installed. Local consultant DM McMahon Pty Ltd installed the new piezometers in June 2010.
A list of the new piezometers, their location and piezometer category is located in Table 2.

Table 2: New Piezometers installed in June 2010.

Piezometer number	Location	Piezometer category	Date Drilled	Drilled depth (m)
178	Anderson Oval, Tolland	3	24/6/10	7.30
179	Anderson Oval, Tolland	3	24/6/10	7.50
180	Plumpton Rd, Tatton	7	17/6/10	6.80
181	Kimberley Dr, Tatton	7	17/6/10	10.00
182	2 Stirling Blvd, Tatton	7	18/6/10	12.00
183	46 Stirling Blvd, Tatton	7	18/6/10	11.70
184	72 Stirling Blvd, Tatton	7	19/6/10	6.00
185	43A Berembee St, Bourkelands	3	19/6/10	6.30
186	Wilgoma St, Bourkelands	3	20/6/10	9.00
187	Yarrawah Cres, Bourkelands	3	20/6/10	9.00
188	Audervale Cl, Bourkelands	3	21/6/10	5.00
189	46 Riverview Dr, Riverview	1	25/6/10	5.70
190	Roach Rd, Riverview	1	25/6/10	9.20
191	110 Riverview Dr, Riverview	1	25/6/10	5.00
192	Exhibition Centre, East Wagga Wagga	6	27/6/10	10.50
193	Kooringal Rd, Kooringal	6	21/6/10	8.00
194	Copeland St, East Wagga Wagga	5	22/06/10	12.00
195	Macintosh Place, Kooringal	5	23/6/10	6.00
196	Showground, Central Wagga	4	27/6/10	14.60

Monitoring of the new piezometers began in July 2010.

10.2 Piezometer Maintenance

Purging is often required to maintain piezometers. Purging is a way of cleaning the piezometer by removing water and foreign matter with an air compressor. In June 2010 eighteen piezometers were purged. Piezometers chosen for purging either expelled an unpleasant odour often associated with stagnant water, showed discolouration or a high concentration of foreign objects e.g. organic matter or soil particles.

Two piezometer monuments were vandalised and replaced with ground level bolt-down security covers. Four additional ground level bolt-down security covers replaced existing covers to prevent sediment & foreign objects from entering the piezometers.

Table 3: Piezometers requiring maintenance in 2009/10.

Piezometer number	Location	Purged	Cover replaced
3	Cheshire St, Central Wagga	Yes	No
11	3 Dalman Parkway, Glenfield	Yes	Yes
31	Ron Wheeler Park, Lake Albert	Yes	Yes
33	Cooramin St, Boorooma	Yes	No
45	Caloola Hostel, Tatton	Yes	No
53	Lawn Cemetery, Lake Albert	Yes	Yes
54	Derna Pl, Ashmont	Yes	No
56	6 Saxon St, Central Wagga	Yes	No
57	7 Mortimer Pl, Central Wagga	Yes	Yes
58	62 Chaston St, Central Wagga	Yes	No
66	18 Chaston St, Central Wagga	Yes	Yes
88	2 Chaston St, Central Wagga	Yes	No
132	Craft – Graham Sts, Lake Albert	Yes	No
135	Main St – Gregadoo Rd, Lake Albert	Yes	No
152	1 Bedervale St, Bourkelands	Yes	No
168	378 Bakers Lane, Lake Albert	Yes	No
Bore 9	63 Gormly Ave, Central Wagga	Yes	No
1/1	Emblen Park, Central Wagga	Yes	Yes

11. RESULTS

11.1 Standing Water Level Results

The results discussed in this report relate to the change in the depth to the water table (standing water level) for all piezometers in the Wagga Wagga Local Government Area from July 2009 to June 2010 in relation to the results from the previous reporting period (July 2008 – June 2009).

To allow for meaningful interpretation of the data piezometers are grouped into ten categories. The ten categories are based on the major sub-catchments identified by Golder (2007). Two additional groups were added to accommodate for piezometers outside the area recognised in the Golder (2007) study. The ten piezometer categories are:

1. **Mid Murrumbidgee Alluvium (MA).** Forty piezometers are located in the Mid Murrumbidgee Alluvium piezometers 1, 62, 72-76, 79-81, 105-116,118, 120-127, 144-146, 164-166, 171, 177 and Bore 9. These piezometers are associated with the Narrung Street

Sewage Treatment Plant, the disused Wiradjuri Landfill and the northern section of the Calvary hospital precinct.

2. **Far Western Sub-catchment (2).** Seven piezometers are located in the Far Western Sub-catchment piezometers 18, 41, 54-55, 143, 174-175. The Far Western Sub-catchment piezometers incorporate areas of the suburbs of Ashmont and Glenfield.
3. **Western Sub-catchment (3).** Twenty seven piezometers are located in the Western Sub-catchment piezometers 2-3, 6-7, 9-15, 17, 34, 37-38, 40, 42-44, 47, 56-57, 128, 142, 147, 152 and 172-173. These piezometers are located is the suburbs of Ashmont, Turvey Park, Mt Austin, Lloyd, Glenfield, Tolland, central and Bourkelands.
4. **CBD Sub-catchment (4).** Forty one piezometers are located in the CDB Sub-catchment piezometers 5, 16, 19-21, 39, 58-61, 63-69, 70-71, 78, 80, 82-90, 99-104, 176, 1/1, 1/2 and 1/3. These piezometers are located in the Calvary hospital precinct and central Wagga Wagga.
5. **Eastern CBD Sub-catchment (5).** Two piezometers are located in the Eastern CBD Sub-catchment piezometers 91 and 92 situated in the suburb of Kooringal.
6. **Far eastern CBD Sub-catchment (6).** One piezometer is located in the Far eastern CBD Sub-catchment piezometer 50. The piezometer is found in east Wagga.
7. **Eastern Sub-catchment (7).** Forty three piezometers are located in the Eastern Sub-catchment piezometers 23-31, 36, 45, 48-49, 51, 53, 93-98, 129-140, 153-163 and 170. The Eastern Sub-catchment is the largest catchment and incorporates the suburbs of Kooringal, Lake Albert, Glenoak and Springvale.
8. **Far eastern Sub-catchment (8).** Three piezometers are located in the Far eastern Sub-catchment piezometers 167-169 situated in the suburb of Lake Albert.
9. **Undefined (O).** Seven piezometers are grouped within the undefined category as they fall outside the major Sub-catchments defined by Golder (2007). Piezometers 22, 32, 33, 148-151 are located at San Isidore, Forest Hill, Boorooma and Bomen.
10. **Tarcutta/Humula (T/H)** contains the 8 piezometers installed in the villages of Tarcutta and Humula (piezometers T1-T6, H1-H2).

The final major sub-catchment identified by Golder (2007) was omitted as no piezometers are located within the sub-catchment.

Names given to the major sub-catchments by Golder (2007) Mid Murrumbidgee Alluvium, CBD sub-catchment, Western sub-catchment and Eastern sub-catchment formed the basis of names for the piezometers categories.

The change in standing water level for all piezometers is presented in Table 4. The Table illustrates the number of individual piezometers recorded in each piezometer category per group during 2009/10. During 2009/10 one piezometer was destroyed and consequently omitted from the dataset. A discussion of each group can be found in subsequent sections of this report.

Table 4: Changes in standing water levels across piezometer groupings.

Change in SWL category	MA	2	3	4	5	6	7	8	O	T/H	Total
SWL increased	8	3	12	22	0	0	10	0	2	3	**60**
SWL decreased	13	0	7	2	1	1	16	2	3	2	**47**
SWL stable	0	1	1	3	1	0	2	0	1	2	**11**
Piezometer dry	19	3	7	13	0	0	15	1	1	1	**60**
Total	**40**	**7**	**27**	**40**	**2**	**1**	**43**	**3**	**7**	**8**	**178**

The change in SWL for each piezometer category during 2009/10 is presented in Figure 8.

The dataset shows that the greatest number of piezometers 60 (34%) have increased in standing water level (SWL). A comparable proportion (60 piezometers) remained dry during the reporting period. A decrease in SWL was recorded for 47 piezometers, 26%. The remainder, 11 piezometers were stable (those with an increase/decrease of 5cm or less). These results are discussed further in the following sections.

Piezometers that contained water in the previous year that are now dry have been included in the ‘SWL decreased’ category, whereas piezometers that started as dry but now contain groundwater have been included in the ‘SWL increased’ category. These results were omitted from average increase/decrease calculations. Graphs of individual piezometers containing groundwater have been placed in Appendix D.

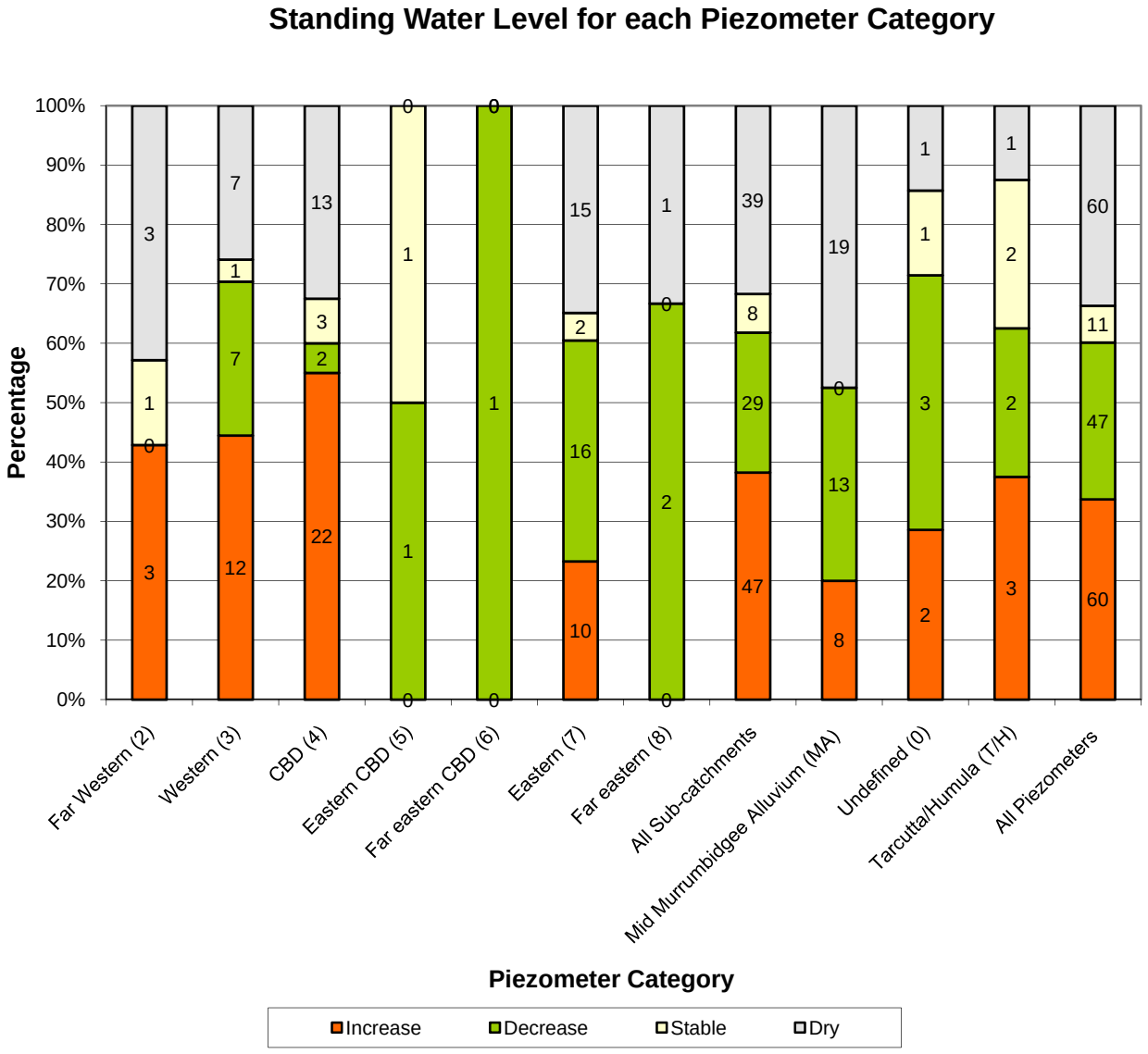


Figure 8: Chart depicting change in Standing Water Levels for each piezometer category

Mid Murrumbidgee Alluvium

The Mid Murrumbidgee Alluvium is the third largest piezometer category and contains 40 individual piezometers. Approximately half (19) of the piezometers located in the Mid Murrumbidgee Alluvium were dry for the complete reporting period. Of the water bearing piezometers more piezometers decreased (13) in SWL compared to those increasing (8).

Mid Murrumbidgee Alluvium			
INCREASED	8	13	DECREASED
Average	0.20	-0.36	Average
Maximum	0.43	-0.82	Maximum
Minimum	0.09	-0.06	Minimum

Piezometers increasing in SWL recorded an average increase of 0.20m. The piezometer with the greatest increase in SWL is located at the Narrung Street Sewage Treatment Works. Decreasing piezometers decreased by an average of -0.36m almost double that of the increasing piezometers. The greatest decrease in SWL was recorded at piezometer no. 124 located in Wiradjuri Crescent. The average depth to groundwater in the Mid Murrumbidgee Alluvium is 11.86m; hence salinity issues in this piezometer category are not expected.

Far Western Sub-catchment

Limited piezometers (7) are located in the Far Western Sub-catchment. Of the piezometers located in the Far Western piezometer category half (3) increased in SWL. Three piezometers were dry and the final piezometer remained stable throughout the reporting period.

Far Western Sub-catchment			
INCREASED	3	0	DECREASED
Average	0.20	-	Average
Maximum	0.21	-	Maximum
Minimum	0.18	-	Minimum

A consistent increase in SWL was recorded for the three increasing piezometers in the Far Western Sub-catchment.

Western Sub-catchment

Twenty seven piezometers are located in the Western Sub-catchment. A large proportion (12 or 44%) of the piezometers located in the Western sub-catchment increased in SWL. Comparable numbers of piezometers decreased (7) or were dry (7) throughout the reporting period. The remaining piezometer stayed stable.

Western Sub-catchment			
INCREASED	12	7	DECREASED
Average	1.01	-0.24	Average
Maximum	8.51	-0.52	Maximum
Minimum	0.12	-0.06	Minimum

Variability for increasing piezometers in the Western sub-catchment was pronounced. Piezometer no.152 located in Bourklands recorded the greatest increase in SWL. Results from piezometer

no.152 are having an enormous influence on average figures for increasing piezometers in the Western sub-catchment. Results recorded for piezometer no.152 show a sudden increase in SWL. Continual monitoring of piezometer no.152 will determine if the SWL is maintained. The average SWL of decreasing piezometers was -0.24m with the maximum decrease -0.52m. The piezometer showing the maximum decrease is at Mt Austin High School. All water bearing piezometers located at Charles Sturt University South Campus showed minimal variation in SWL.

CBD Sub-catchment

The CBD Sub-catchment is greatly influenced by the management of the dewatering bore scheme in the Intensive Borefield. Resulting from the dewatering bore trial and the switching off of the de-watering bores a large proportion (22) of the piezometers in the CBD sub-catchment increased in SWL during 2009/10. High average increases in SWL can be correlated to the dewatering bore trial and combined with the return of above average rainfall towards the end of the reporting period.

CBD Sub-catchment			
INCREASED	22	2	DECREASED
Average	2.28	-0.51	Average
Maximum	3.61	-0.65	Maximum
Minimum	0.21	-0.37	Minimum

Constant increases in SWL were recorded for piezometers in the CBD sub-catchment. The average increase in SWL was 2.28m with a maximum of 3.61m. All piezometers located in the Intensive Borefield with a drilled depth greater than 15m increased in SWL by greater than 2.00m. Too located in the Intensive Borefield are the two decreasing piezometers. These piezometers had a drilled depth of 3m or 6m and averaged a 0.51m decrease.

A large number of piezometers in the CBD sub-catchment remained dry. This trend for dry piezometers is attributed to the large number of shallow (3m) piezometers in the Intensive Borefield

Eastern CBD Sub-catchment

Limited piezometers are situated in the Eastern CBD sub-catchment. Both piezometers showed minimal variation in SWL.

Eastern CBD Sub-catchment			
INCREASED	0	1	DECREASED
Average	-	-0.06	Average
Maximum	-	-0.06	Maximum
Minimum	-	-0.06	Minimum

In the eastern CBD sub-catchment one piezometer showed a slight decrease in SWL (0.06m). The second piezometer remained stable during the reporting period.

Far eastern CBD Sub-catchment

As a small sub-catchment minimal data on the SWL is available for the far eastern CBD piezometer category. Piezometer no. 50 showed a decrease in SWL for the reporting period.

Far eastern CBD Sub-catchment			
INCREASED	0	1	DECREASED
Average	-	-0.19	Average
Maximum	-	-0.19	Maximum
Minimum	-	-0.19	Minimum

Eastern Sub-catchment

The eastern sub-catchment is the largest sub-catchment and contains 43 piezometers the largest number of piezometers. Comprehensive data is available on the SWL of groundwater within the sub-catchment. A large number of piezometers (15) remained dry throughout the reporting period. Few piezometers (2) remained stable through the reporting period.

Eastern Sub-catchment			
INCREASED	10	16	DECREASED
Average	1.54	-0.35	Average
Maximum	7.31	-0.83	Maximum
Minimum	0.13	-0.13	Minimum

The average increase in SWL for piezometers within the eastern sub-catchment is 1.54m. The piezometer showing the greatest increase in SWL is piezometer no. 53 located at Lawn Cemetery. Again monthly SWL readings for this piezometer were irregular suggesting an additional influence on the SWL.

An average of 0.35m was recorded for decreasing piezometers in the sub-catchment. The maximum decrease in SWL recorded was 0.83m from piezometer no. 48 located in Jack Skeers Park, Lake Albert. The number of decreasing is positive for the Wagga Wagga Local Government Area.

The average depth to groundwater in the Eastern sub-catchment is 11.32m; hence overall salinity issues in this piezometer category are not expected.

Far eastern Sub-catchment

The far eastern sub-catchment covers the second largest area of all the sub-catchments. Coverage of piezometers in this sub-catchment is poor and may not be a true indication of the sub-catchment as a whole. Of the three piezometers located in the sub-catchment two piezometers decreased in SWL. The remaining piezometer stayed dry during the reporting period.

Far eastern Sub-catchment			
INCREASED	0	2	DECREASED
Average	-	-0.76	Average
Maximum	-	-1.08	Maximum
Minimum	-	-0.45	Minimum

Two piezometers in the far eastern sub-catchment decreased in SWL. Piezometer no.169 showing the greatest decrease in SWL (1.08m) is located on Bakers Lane, Lake Albert. Results for the 2009/10 reporting period are inverted when compared to 2008/09 reporting period. One reading in June 2008 determined the 2007/08 average, impacting on the change in SWL in 2008/09. As a result the change in SWL in 2008/09 may not have been a true indicator of the change in groundwater depth.

Undefined

Piezometers within this category are located outside the sub-catchments defined by Golder (2007) and are therefore widespread. Seven piezometers are defined in this category. Three piezometers decreased in SWL whilst two piezometers increased. Of the remaining piezometers one remained dry and one stable.

Undefined			
INCREASED	2	3	DECREASED
Average	0.53	-0.23	Average
Maximum	0.77	-0.25	Maximum
Minimum	0.28	-0.20	Minimum

The three decreasing piezometers were consistent with an average decrease of 0.23m. The piezometer showing the maximum decrease of 0.25m is located at San Isidore. Piezometer no. 151, located at the Bomen Industrial Sewage Treatment Facility showed the greatest increase in SWL of 0.77m.

Tarcutta/Humula

Eight piezometers are located in the rural villages of Tarcutta or Humula. Two piezometers decreased in SWL. The decreasing piezometers decreased to dry therefore no average, maximum, minimum is available.

Tarcutta/Humula			
INCREASED	3	2	DECREASED
Average	0.69	-	Average
Maximum	1.26	-	Maximum
Minimum	0.13	-	Minimum

Three piezometers increased in SWL during 2009/10. One of these increasing piezometers was previously dry but in 2009/10 beared water. Piezometer no.T3 located on the corner of Cynthia and Young Streets, Tarcutta showed the maximum increase in SWL. The data collected from piezometers T3, and T4 during 2009/10 was generally irregular and one reading was used to generate the 2009/10 average.

11.3 Piezometers with a high Standing Water Level

Rising groundwater has the potential to damage infrastructure and the environment. As groundwater levels rise to within 5m of the ground surface the potential for damage increases.

In the reporting period 27 piezometers experienced an average standing water level of less than 5m and were highlighted as piezometers with potential to cause damage. Piezometers exhibiting a standing water level of less than 5 metres are presented in Table 5. The number of high standing water level piezometers increased in 2009/10.

Eight of the ten piezometer categories contain piezometers with a high standing water level. The CBD sub-catchment contained the greatest number of high SWL piezometers.

Fifteen piezometers with a high standing water level experienced a further increase in SWL in 2009/10. Seven of these piezometers are located in the Intensive Borefield and may have been influenced by the dewatering bore trial. The high SWL piezometer, piezometer (no. 71) which experienced the greatest increase in SWL (1.24m) is located in CBD sub catchment piezometer category.

Eight high SWL piezometers decreased in SWL in 2009/10. These decreasing piezometers are located across five piezometer categories. The majority of decreasing piezometers are found in the

Western sub-catchment. The high SWL piezometer with the greatest decrease in SWL was piezometer no. 29 (located in the Eastern sub-catchment). This piezometer decreased by -0.63m.

Table 5: Piezometers exhibiting a Standing Water Level of less than 5 metres.

Piezometer number	Location	Piezometer Category	Average SWL 09/10 (m)	Change in SWL (m)
3	Cheshire St, Central Wagga	3	-1.42	0.12
9	South Campus, Turvey Park	3	-0.63	0.22
10	South Campus, Turvey Park	3	-2.79	-0.06
17	Best Park Reserve, Ashmont	3	-4.55	-0.28
18	Nathan Park, Ashmont	2	-3.26	0.18
29	Dalkeith Ave, Lake Albert	7	-3.60	-0.63
36	Lake Albert foreshore, Lake Albert	7	-2.23	-0.33
42	Karoom Dr reserve, Glenfield	3	-2.85	-0.07
54	Derna Pl, Ashmont	2	-2.08	0.21
57	7 Mortimer Pl, Central Wagga	3	-0.95	0.17
58	62 Chaston St, Central Wagga	4	-1.34	0.21
60	Opp 16 Cullen Rd, Central Wagga	4	-2.43	Increase*
61	Opp 38 Cullen Rd, Central Wagga	4	-2.90	Increase*
64	11 Sullivan St, Central Wagga	4	-2.83	-0.37
66	18 Chaston St, Central Wagga	4	-1.38	0.02
68	11 Lewisham Ave, Central Wagga	4	-2.93	Increase*
71	1 Roma St, Central Wagga	4	-3.72	1.24
81	48 Docker St, Central Wagga	MA	-4.21	0.30
90	51 Chaston St, Central Wagga	4	-3.01	0.44
91	Mount St, Kooringal (shallow)	5	-2.05	-0.06
92	Mount St, Kooringal (deep)	5	-2.14	-0.01
135	Cnr Main St - Gregadoo Rd, Lake Albert	7	-4.38	0.17
147	South Campus, Turvey Park	3	-1.01	0.14
149	BISTF, Bomen	0	-0.35	-0.01
150	BISTF, Bomen	0	-4.68	-0.20
151	BISTF, Bomen	0	-1.71	0.77
T6	Breaden Sports Ground, Tarcutta	T	-3.90	-0.03

* Increase from dry to water bearing

11.4 Electrical Conductivity Results

Electrical conductivity (EC) is the electrical current conducted by water and soil measured in decisiemens per metre (dS/m). The greater the electrical conductivity of the water sample, the higher the concentration of salts present. The EC of groundwater is influenced strongly by soil texture or the rock it travels through. Clay soils can hold more salt than sands and gravels because they tend to be less porous and are able to retain the salts more easily. Table 6 gives some examples of EC tolerances for agricultural and domestic use.

Table 6: Salinity tolerances for various water usages.

Water Usage	EC (dS/m)	Tolerances in Livestock	EC (dS/m)
Dead Sea	550.0	Beef cattle	5.9-7.5
Sea water	50.0	Sheep	7.5-14.9
Salt water swimming pool	5.9-8.9	Horses	5.9-8.9
Maximum for human consumption	2.35	Pigs	5.9-8.9
Desirable limit for humans	0.8	Poultry	2.9-4.4

Change in EC was recorded for 98 piezometers in 2009/10. Of piezometers with a measurable EC the majority (52 piezometers) recorded a decrease in EC during the recording period. The remaining piezometers either increased (22) or remained stable (24).

Change in Electrical Conductivity	
Change in EC category	**No. of Piezometers**
Increase	22
Decrease	52
Stable	24
Dry	60
Not Available*	20

* Not available refers to a piezometer that did not contain enough water to sample (NETS) or a piezometer that is not able to be bailed.

The variability in electrical conductivity results is presented below. The piezometer recording the maximum average EC in 2009/10 was piezometer no. 88 located in Chaston Street, Central Wagga Wagga. Piezometer no. 145 located in Wiradjuri recorded the lowest average EC in 2009/10.

Average Electrical Conductivity 2009/10	
Maximum	19.67
Average	4.17
Minimum	0.12

The greatest declines in electrical conductivity were recorded in piezometers no.10, no.56, no.102, no.128 and no.170. Decreases of -1.76 dS/m, -1.48 dS/m, -1.50 dS/m, -2.84 dS/m and -1.47 dS/m respectively were recorded. Three of the piezometers with the greatest decrease in EC are located in the Western sub-catchment.

Recording increases in EC of 2.70 dS/m, 1.34 dS/m, 1.17 dS/m, 1.07 dS/m and 0.86 dS/m were the piezometers showing greatest increases in EC. The piezometers recording these increases were piezometers no. 88, no. 176, no. 103, no. 57 and no.34 respectively. Three of the piezometers with the greatest increase in EC are located in the CBD sub-catchment.

To measure the severity of electrical conductivity results within the Wagga Wagga Local Government Area EC results were sorted into water quality classes. Water quality classes as determined by the Australian Water Resources Council (1976) are presented in Table 7.

Table 7: Water quality classes as determined by Australian Water Resources Council (1976)

Water quality classes	EC (dS/m)
Saline	>4.8
Brackish	1.6 – 4.8
Marginal	0.8 – 1.6
Fresh	<0.8

The number of piezometers in each water quality class is presented in Figure 9. Similar numbers of piezometers were defined within the saline, brackish and marginal water quality classes.

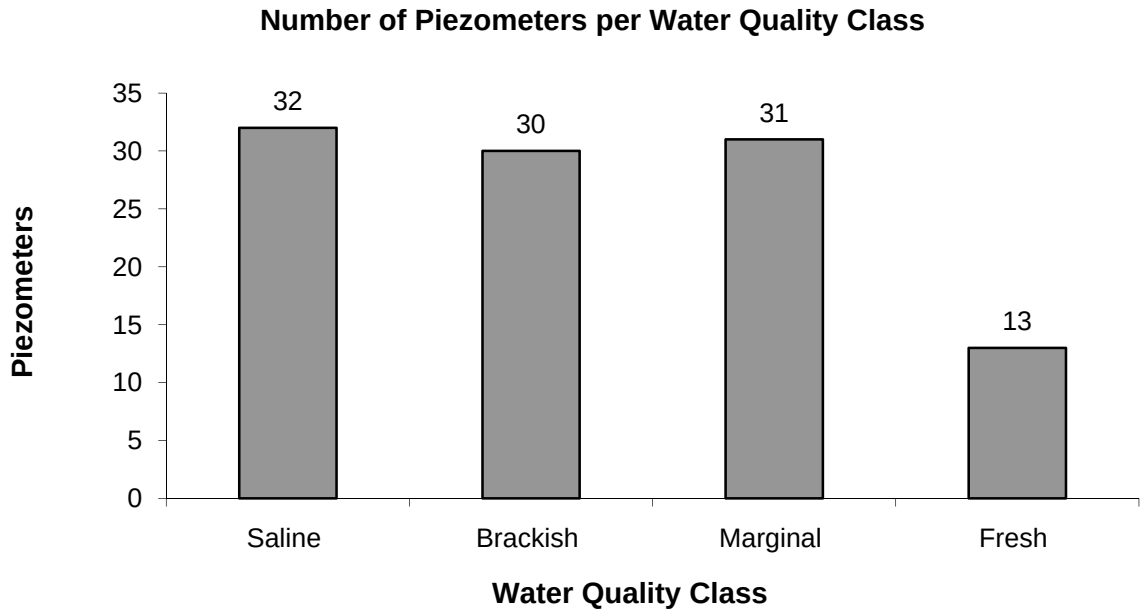


Figure 9: Average EC 2009/10 water quality classes

Piezometers with both EC concentrations (>5 dS/m) and a high SWL (<5m) can indicate urban salinity concerns. The criteria of EC greater than 5 dS/m and SWL of less than 5 metres has been taken from the previous reports to maintain consistency of which piezometers and surrounding areas are most susceptible to urban salinity problems (Table 8).

Table 8: Critical piezometers, piezometers displaying high Standing Water Levels and Electrical Conductivity.

Piezometer number	Location	Piezometer category	Average SWL 2009/10 (m)	Average EC 2009/10 (dS/m)
3	Cheshire St, Central Wagga	3	-1.42	15.56
9	South Campus, Turvey Park	3	-0.63	9.24
18	Nathan Park, Ashmont	2	-3.26	9.53
29	Dalkeith Ave, Lake Albert	7	-3.60	7.20
36	Lake Albert foreshore, Lake Albert	7	-2.23	6.06
54	Derna Pl, Ashmont	2	-2.08	13.33
57	7 Mortimer Pl, Central Wagga	3	-0.95	11.11
58	62 Chaston St, Central Wagga	4	-1.34	6.79
60	Opp 16 Cullen Rd, Central Wagga	4	-2.43	7.89
90	51 Chaston St, Central Wagga	4	-3.01	7.05
147	South Campus, Turvey Park	3	-1.01	13.97

Eleven piezometers recorded both an EC greater than 5 dS/m and SWL of less than 5 metres in the reporting period. Piezometers with these characteristics are critical and have the potential to cause extensive damage to the surrounding environment. The surrounds of piezometers in Table 8 are at risk from urban salinity due to their high standing water levels.

Three critical piezometers (no. 57, no. 58 and 147) increased in both SWL and EC. These critical increasing piezometers are located in areas of high concern e.g. the Intensive Borefield and South Campus.

Critical piezometers provide valuable data on target areas for remediation action. The increasing severity within these critical areas especially in area noted for high salinity levels is concerning for urban salinity management in Wagga Wagga.

11.5 Dewatering Bores

The dewatering bores of the Intensive borefield are monitored monthly allowing for the volume of water and amount of salt discharged to the Murrumbidgee River to be calculated (Table 9). Groundwater from the Intensive Borefield is pumped to the Murrumbidgee River via a pump station adjacent to the intersection of the Sturt Highway and Moorong Street.

Table 9: Intensive Borefield salt load calculations for July 2009 – June 2010.

Bore number	Bore Location	Volume Pumped (m^3)	Pump Hours	Average EC (dS/m)	Salt Discharged (tonnes)
1	Emblen Park	0.5981	0.09	1.068	0.000409
2	Meurant - Emblen roundabout	0.0464	0.16	2.537	0.000075
3	19 Sullivan Ave	NOT WORKING			
4	3 Cullen Rd	1.47	0.18	1.347	0.001267
5	Calvary Hospital Carpark	0.338	0.17	1.955	0.000423
6	Docker St - Meurant Ave	0.5564	0.11	2.757	0.000982
7	9 Hardy Ave	0.584	0.22	3.287	0.001229
8	25 Gormly Ave	0.4613	0.17	1.857	0.000548
10	Chaston St - Foxborough Ave	1.266	0.15	4.455	0.003609
	TOTAL	**5.3202**	**1.25**		**0.008542**
	AVERAGE (PER BORE)	**0.665025**	**0.15625**	**2.408**	**0.001068**
	AVERAGE (PER DAY)	**0.01457589**	**0.003425**		**0.000023**

As a result of a de-watering bore trial the de-watering bores were switched off for the 2009/10 reporting period. Volumes pumped from the dewatering bores were generally associated with sampling and maintenance.

Average groundwater and salt discharged to the Murrumbidgee River from the Intensive Borefield was minimal. An average of approximately 0.015 cubic metres (or 1,500 litres) of groundwater and 0.000023 tonnes (or 23g) of salt are discharged on a daily basis. At present, Wagga Wagga City discharges this saline water to the river. Investments in revegetation, rear of block drainage and education programs are considered by Council as sufficient offsets to permit the discharge of moderately saline water.

12. DISCUSSION & RECOMMENDATIONS

Urban salinity in Wagga Wagga is recognised as major land degradation concern, in 2009/10 34% of all piezometers increased in standing water level compared to 22.3% in 2008/09.

The percentage of piezometers within the “SWL increase” change in SWL category rose in six of the ten piezometer categories. The piezometer category with the greatest rise in the percentage of “SWL increase” piezometers was the Western Sub-catchment which increased from 7.1% in 2008/09 to 44% in 2009/10. Similarly the percentage of piezometers within “SWL decrease” change in SWL category declined in seven of the ten piezometer categories. Again the Western Sub-catchment recorded the largest decrease in the percentage of declining piezometers. In 2008/09 57.1% of piezometers in the Western Sub-catchment declined in SWL compared to 26% in 2009/10.

A rise in the overall percentage of “SWL increase” piezometers and boosts in the “SWL increase” change in SWL category for the majority of piezometer categories indicates rising groundwater levels in Wagga Wagga in 2009/10 compared to 2008/09. Significant rainfall following a major storm event in March, 2010 which saturated to soil profile is likely to have increased direct recharge to the groundwater. The turning off of the dewatering bores in the Intensive Borefield given the dewatering bore trial allowed groundwater to return to a natural state. The factors leading to the continual rise in groundwater within the Intensive Borefield may only be revealed through comprehensive hydrological modelling.

Urban salinity is complicated and while efforts are being made to reduce groundwater recharge the monitoring program continues to gather important data towards understanding how groundwater moves throughout the district and its impact on urban salinity.

Council will work on the following actions to improve urban salinity in Wagga Wagga in 2010/11:

Actions	Description	Priority
Monitoring Program	Continue program to identify potential future problem regions while closely monitoring current problem areas	High
Dewatering bore	Conduct maintenance on dewatering bores in preparation for their “switching on”	High
Dewatering bore trial	Continue trial to closely monitor the grounder water response following the switching on of dewatering bores	High
Hydrological Study	Conduct a hydrological study of the Wagga Wagga LGA to allow for accurate interpretation of SWL and dewatering data	Moderate
Education	Continue to educate school children and the community on water wise gardening and the urban salinity issue. Develop new incentives and programs to encourage water wise gardening and the reduction of lawn areas	High
Soil moisture probe monitoring	Investigate irrigation requirements in council parks using soil moisture probe monitoring	Moderate
Revegetation	Continue revegetation programs, including maintenance of existing revegetation stands	High
Rear block drainage	Conduct investigations of sections B1 to B4, completion	High

	of construction expected within 2 years dependant on available funding.	
Mapping	Liaise with the Soil Conservation service in the potential preparation of an updated “Potentially saline land map”	Moderate

In undertaking measures to mitigate urban salinity, the programs implemented work to improve environmental sustainability as a whole. Council alone is unable to ease urban salinity and community involvement is required if long term reductions in groundwater are to be achieved.

13. DISCLAIMER

This report has been compiled by Wagga Wagga City Council’s Department of Environmental & Community Services exercising all due care and attention. Council does not accept any responsibility for any inaccurate or incomplete information supplied by third parties. No representation is made as to the accuracy, completeness or suitability for any particular purpose of the source material included in this report.

14. REFERENCES

Carter, Antoinette (1998) *Wagga Wagga Urban Salinity Pilot Bore Dewatering Project: Drilling Results and Pumping Test Outcomes of Installation of Spearpoints*. Department of Land and Water Conservation.

Department of Land and Water Conservation (2000), *The Wagga Wagga Urban Salinity Study – Economic Evaluation of Options (Final Draft),* Socio Economic Unit, DLWC.

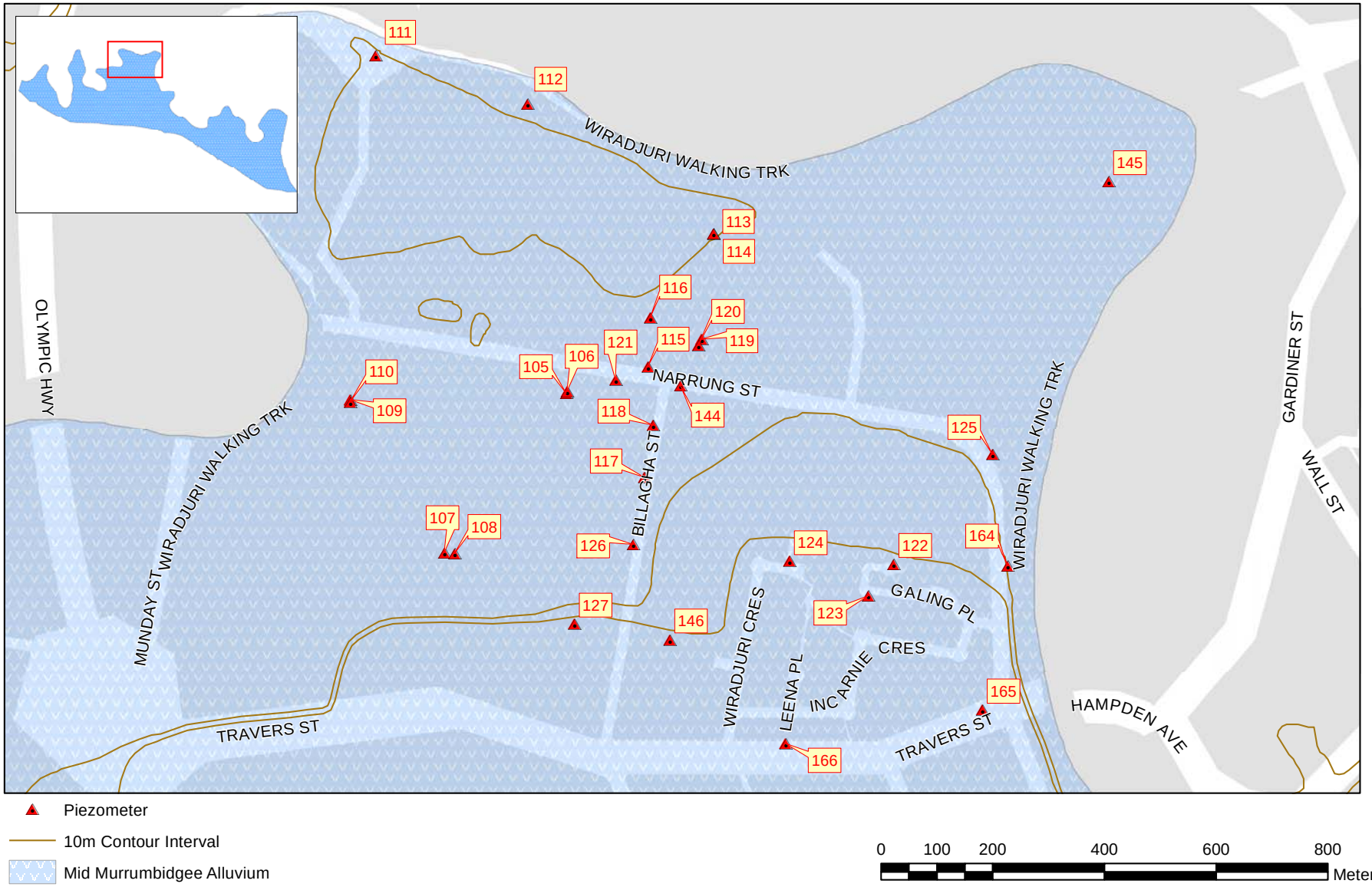
Golder Associates Pty Ltd (2007). *Wagga Wagga Urban Salinity – Water level and Quality Study (1999-2006).* Golder Associates, Perth.

NSW Department of Primary Industries (2005). *Salinity Glove Box Guide: NSW Murrumbidgee Catchment*. Print National, Gosford.

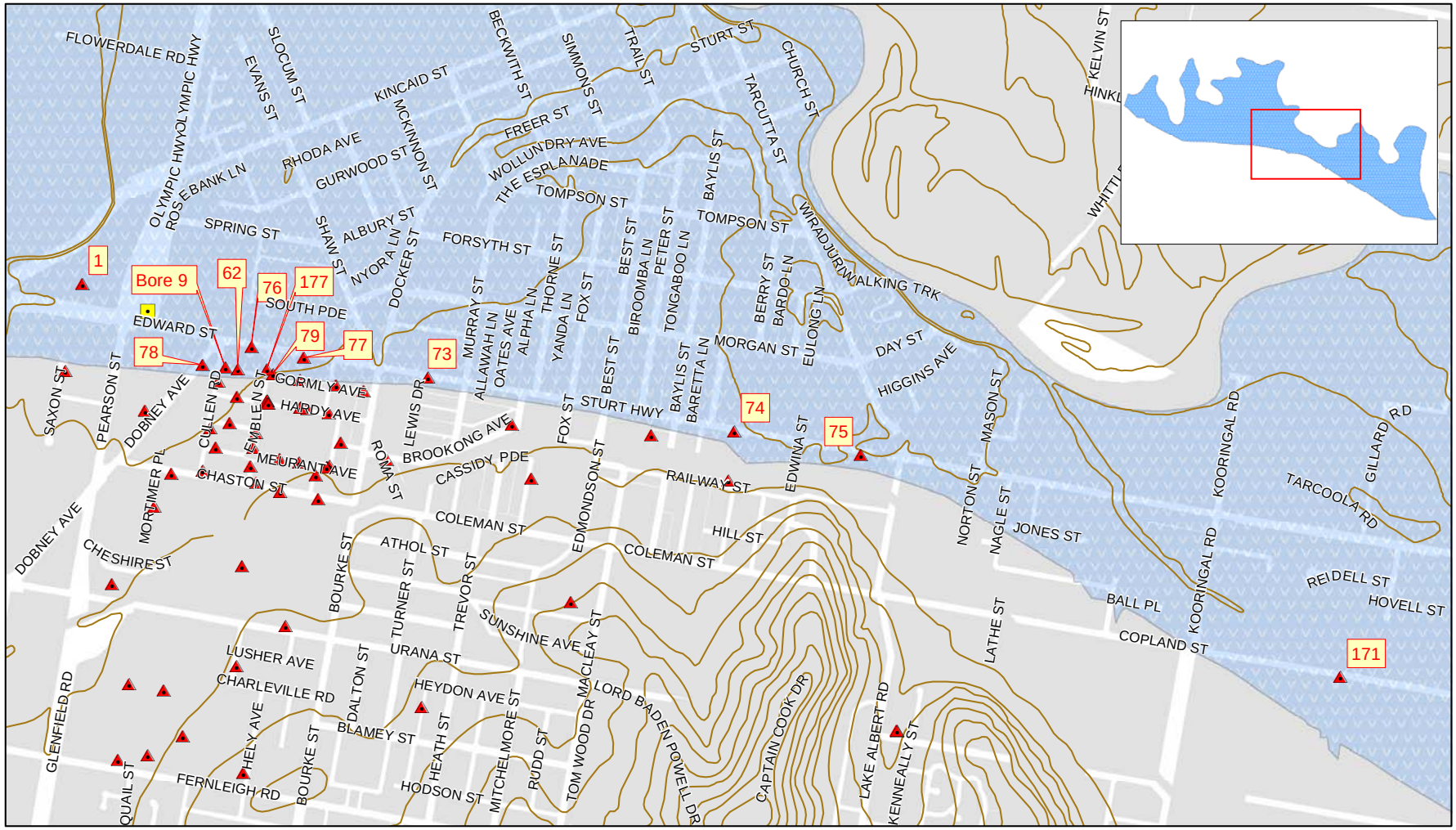
APPENDIX A:

MAPS OF PIEZOMETER LOCATIONS

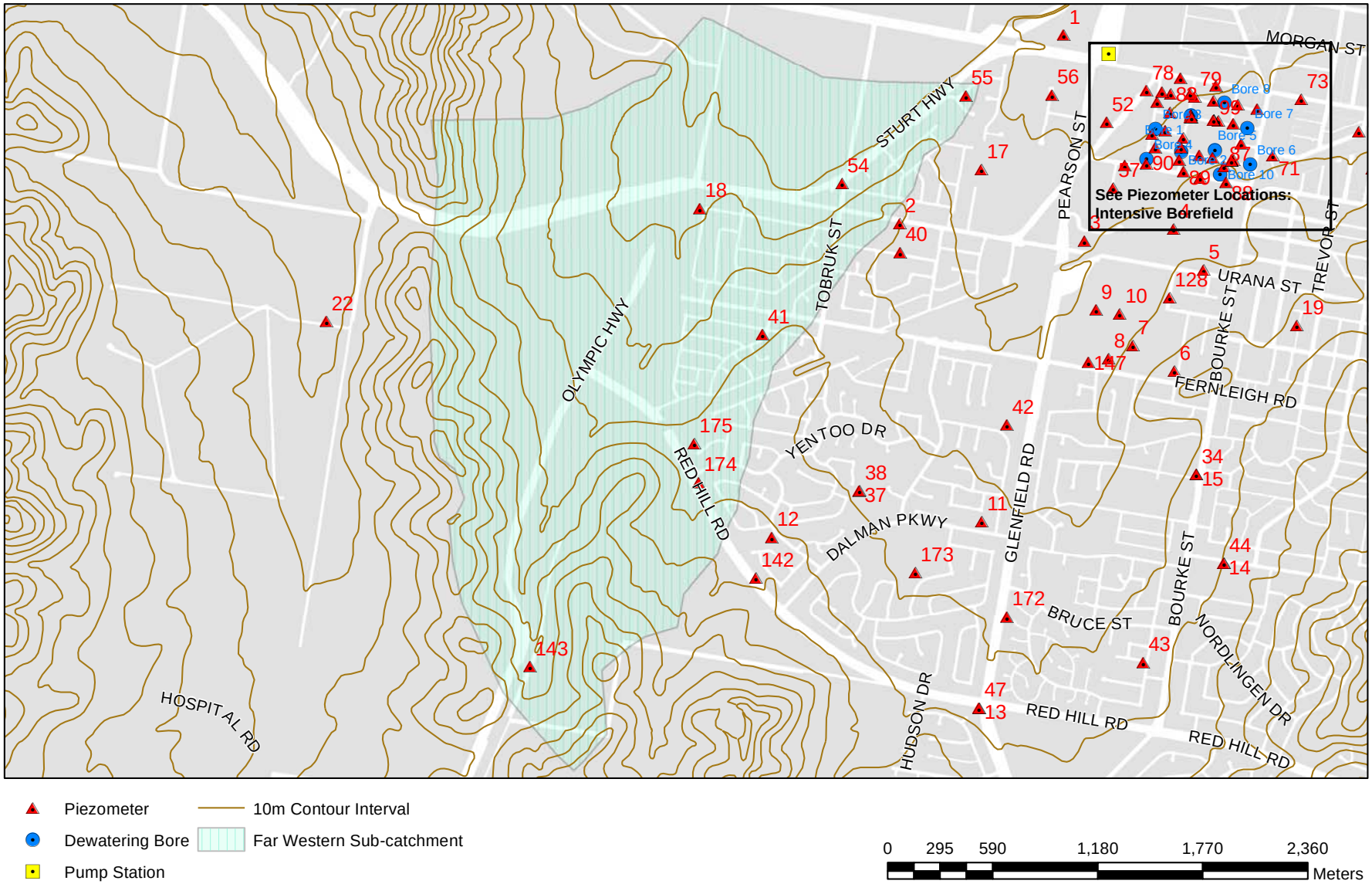
Piezometer Locations: Mid Murrumbidgee Alluvium



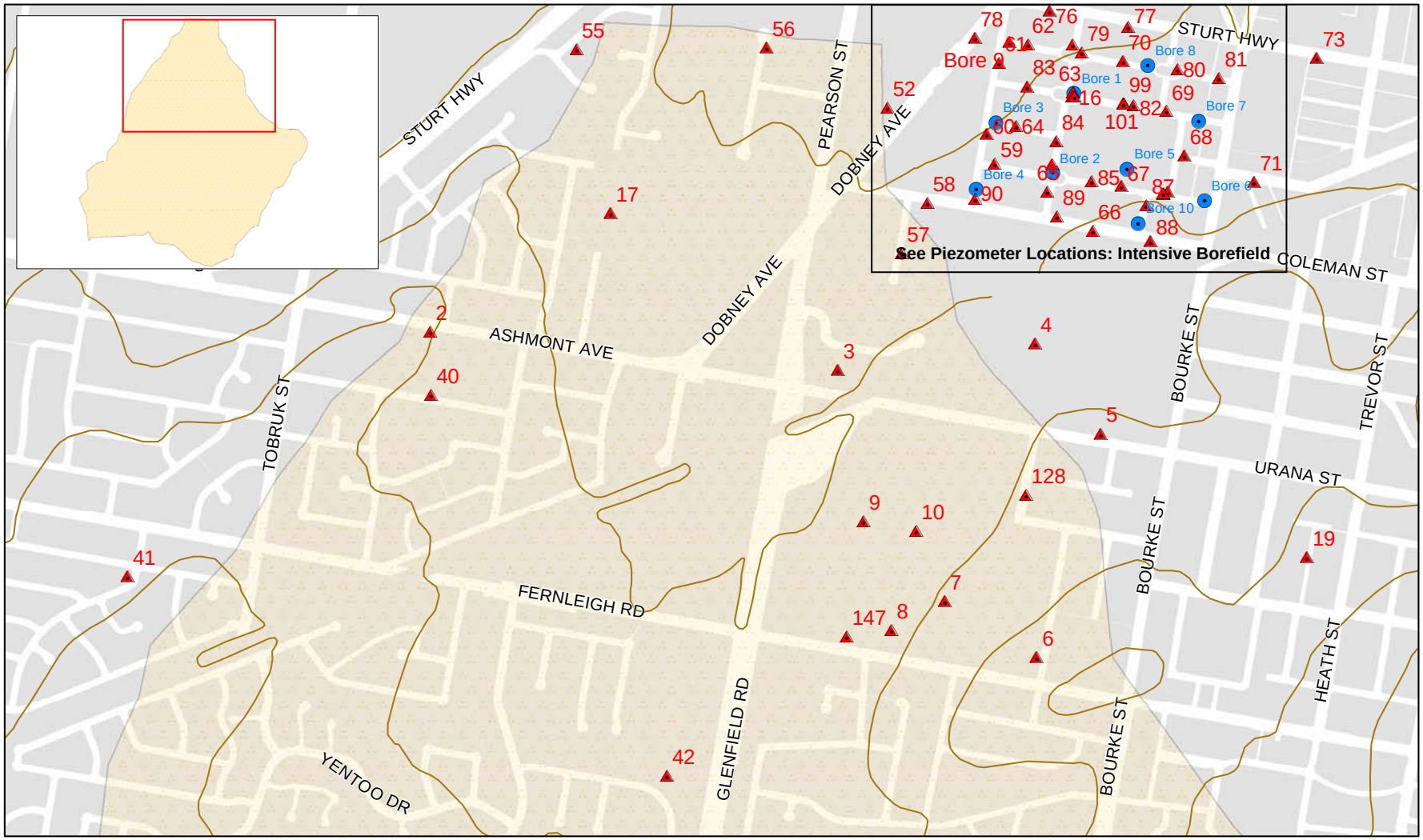
Piezometer Locations: Mid Murrumbidgee Alluvium



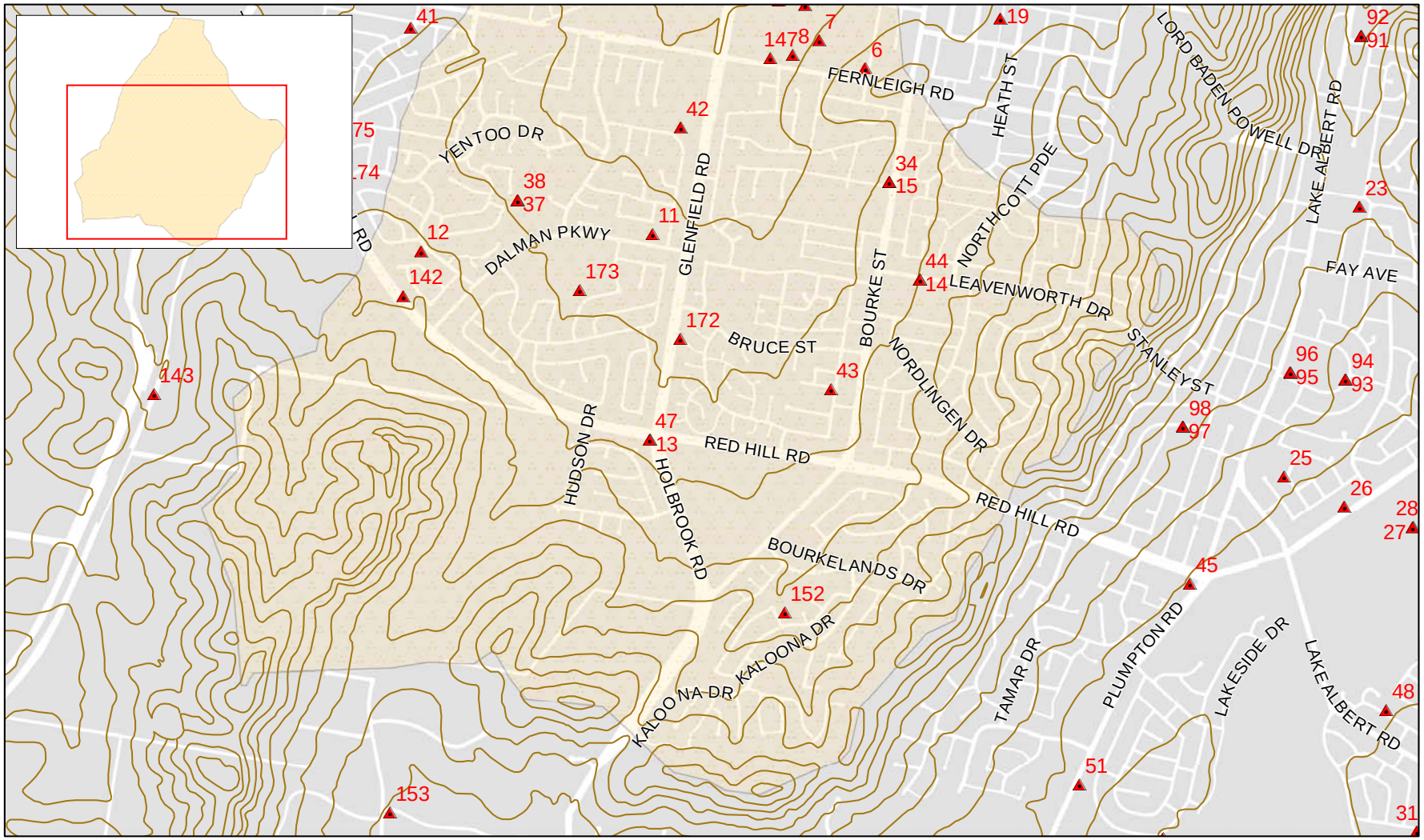
Piezometer Locations: Far Western Sub-catchment



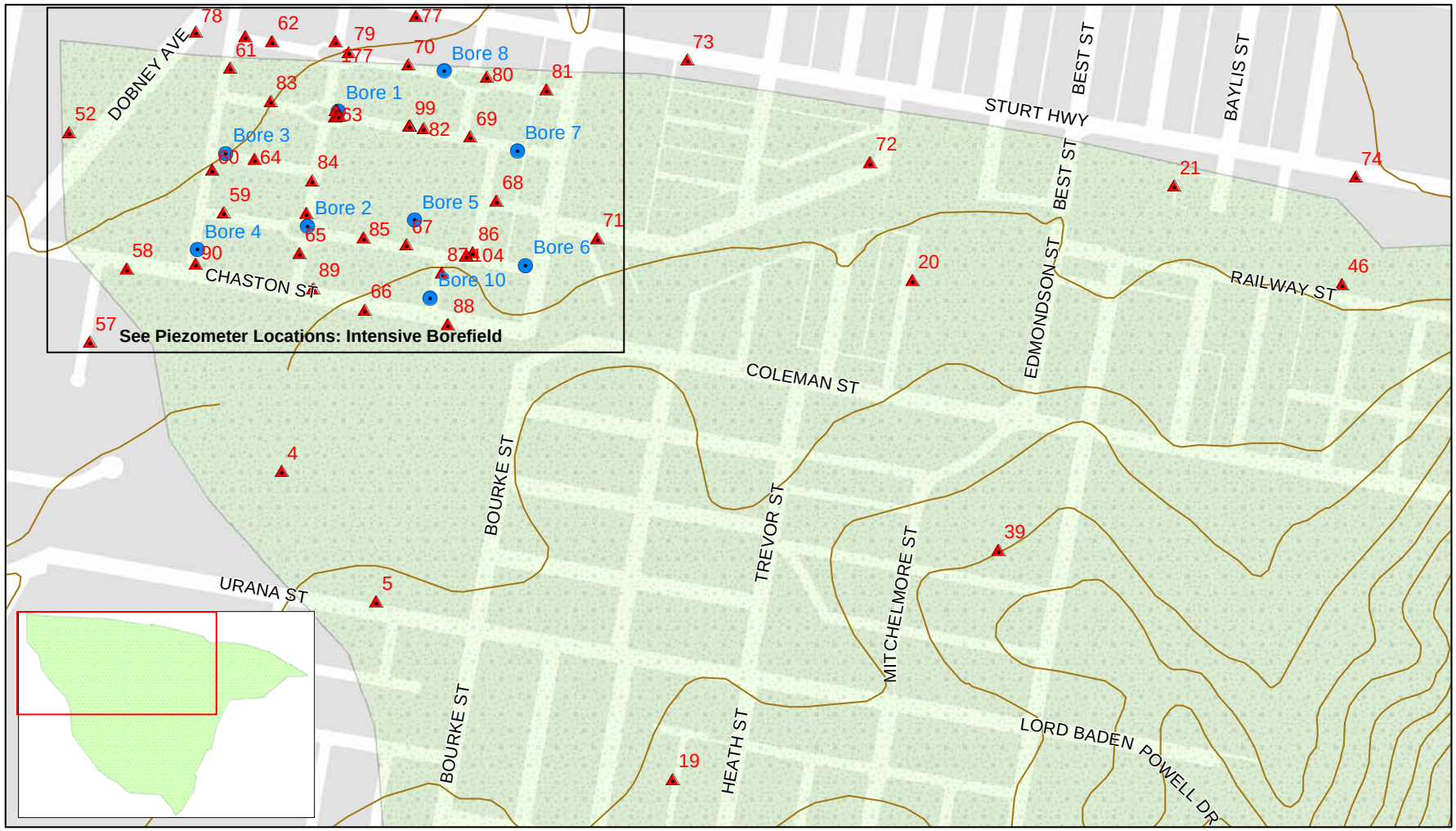
Piezometer Locations: Western Sub-catchment



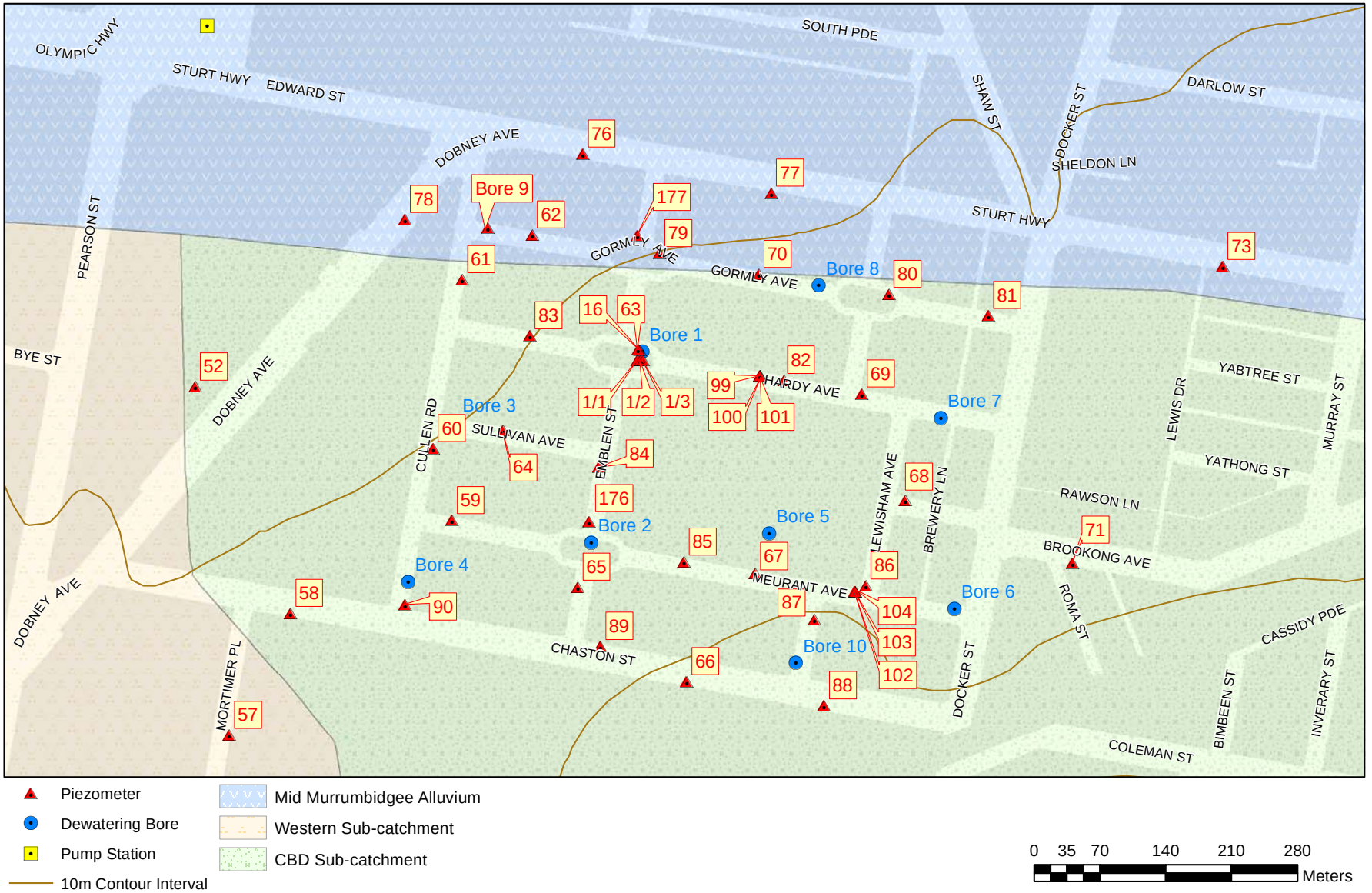
Piezometer Locations: Western Sub-catchment



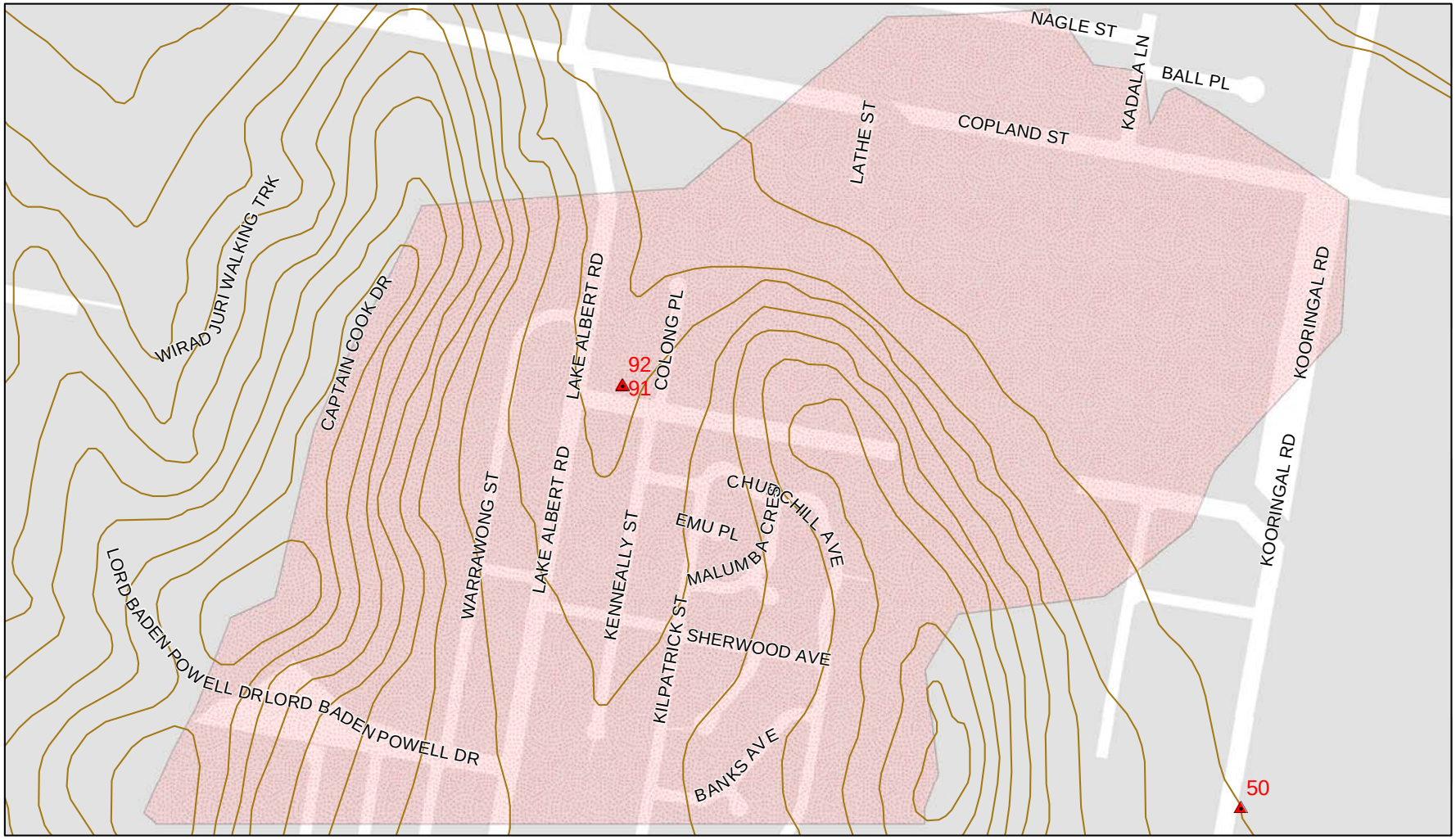
Piezometer Locations: Central Business District (CBD) Sub-catchment



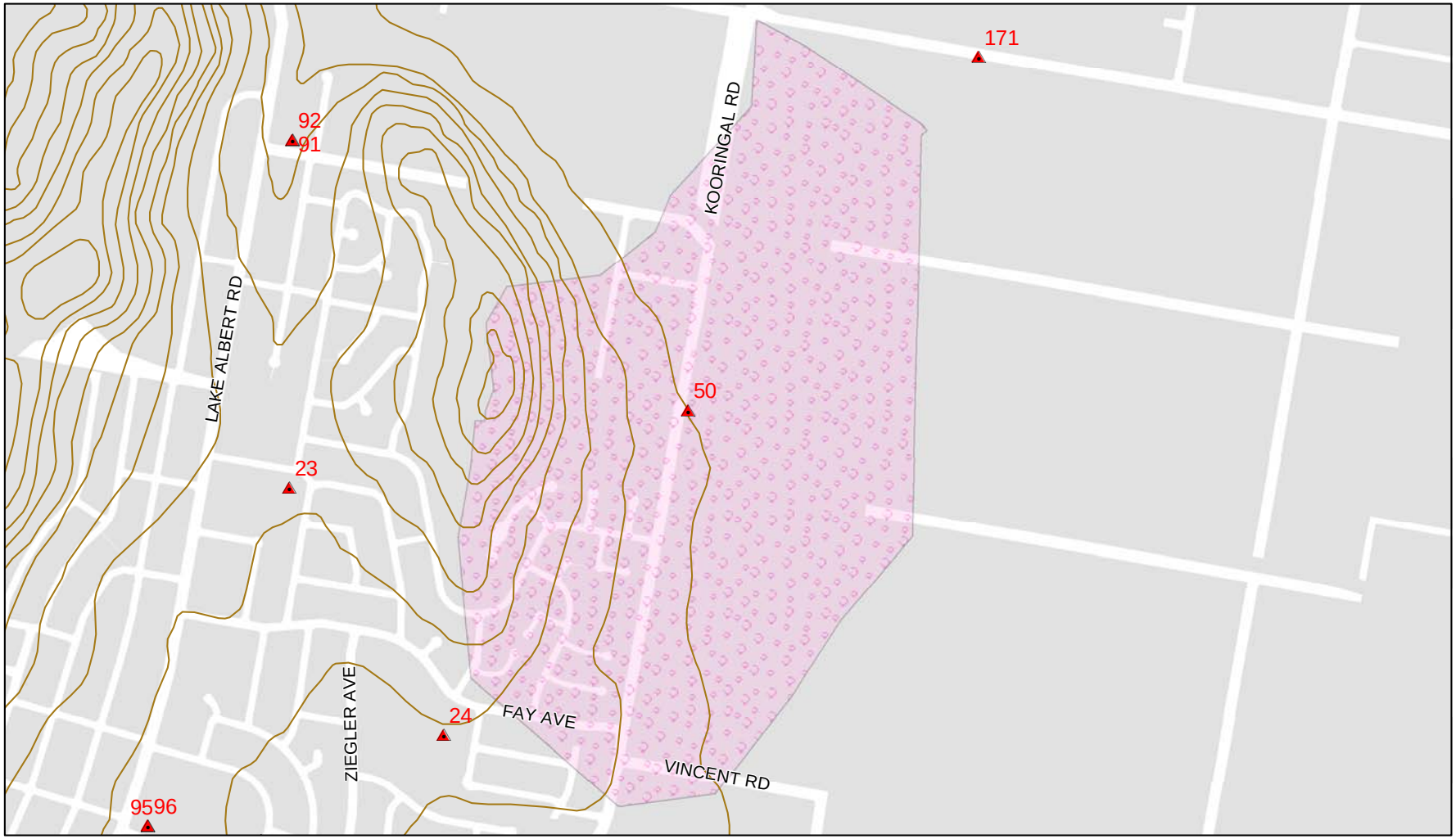
Piezometer Locations: Intensive Borefield



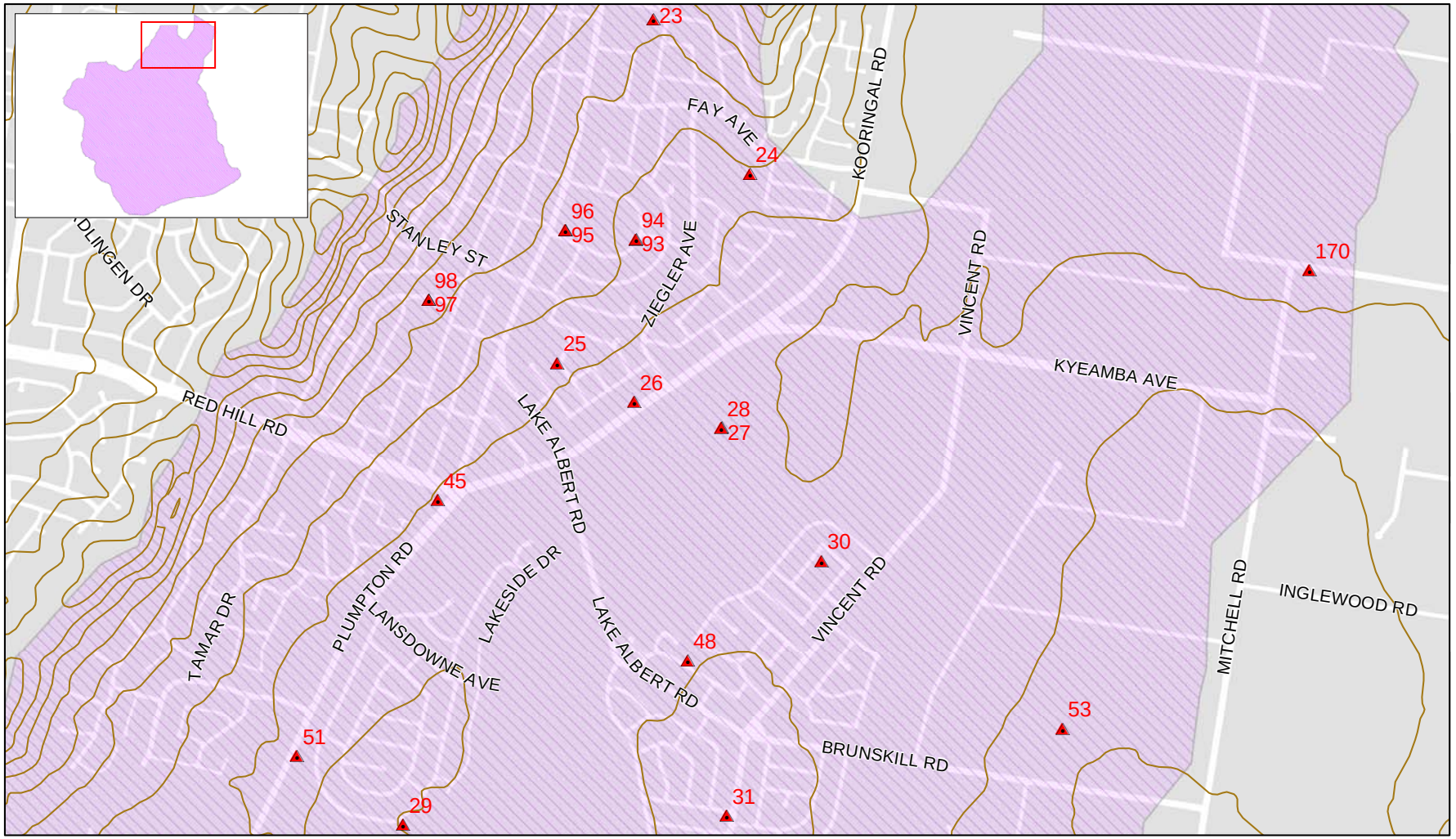
Piezometer Locations: Eastern CBD Sub-catchment



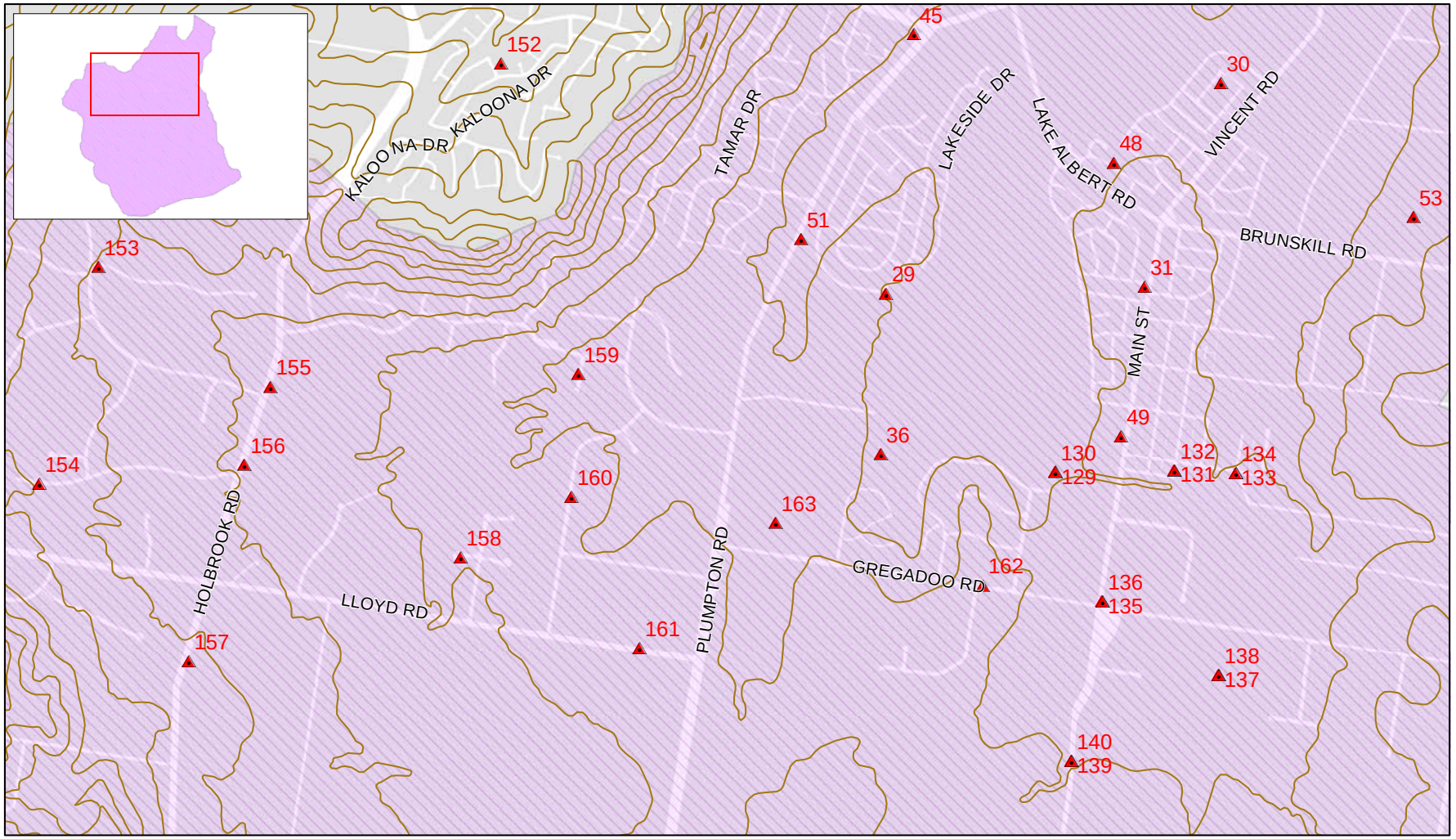
Piezometer Locations: Far Eastern CBD Sub-catchment



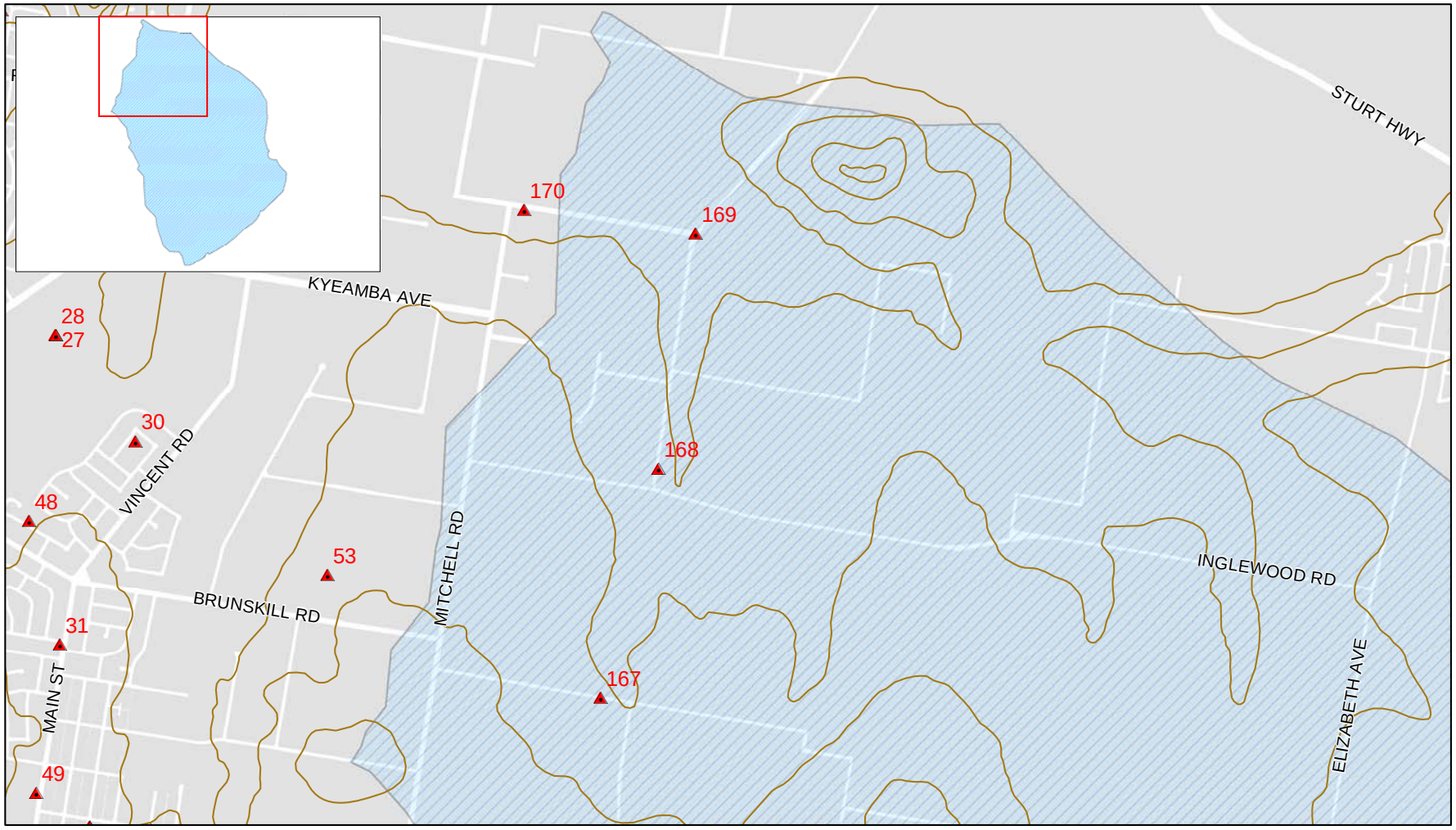
Piezometer Locations: Eastern Sub-catchment



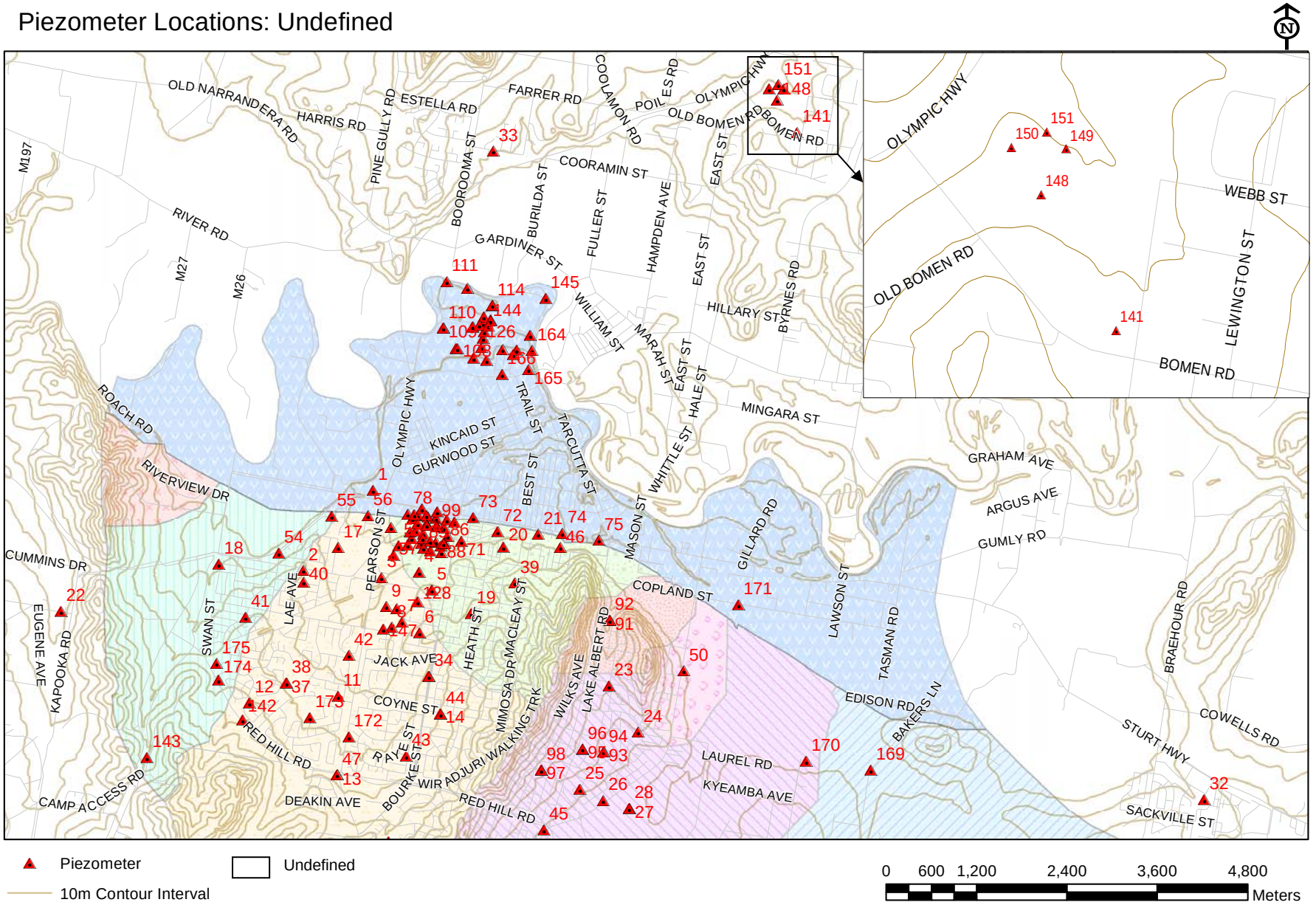
Piezometer Locations: Eastern Sub-catchment



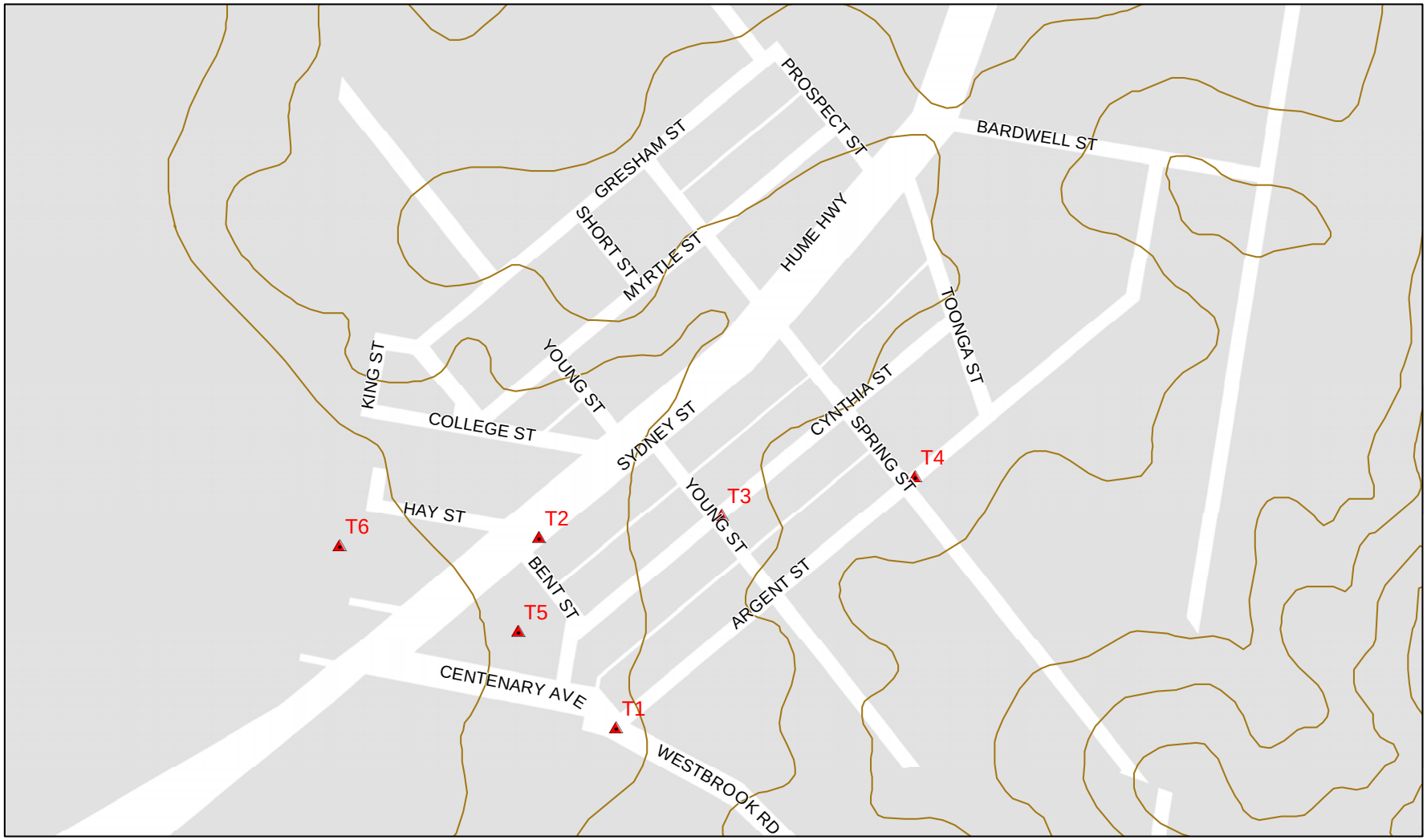
Piezometer Locations: Far Eastern Sub-catchment



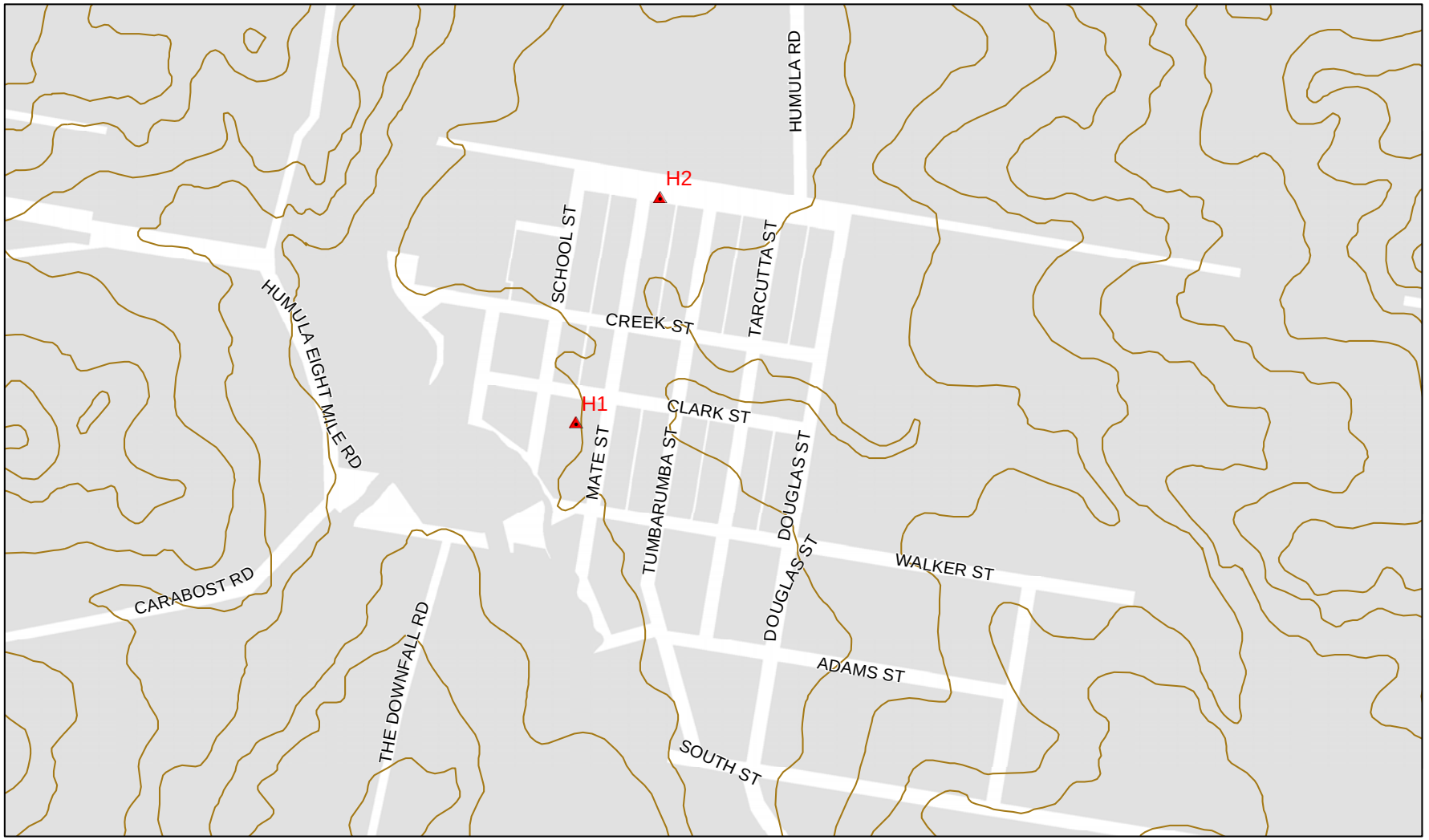
Piezometer Locations: Undefined



Piezometer Locations: Tarcutta



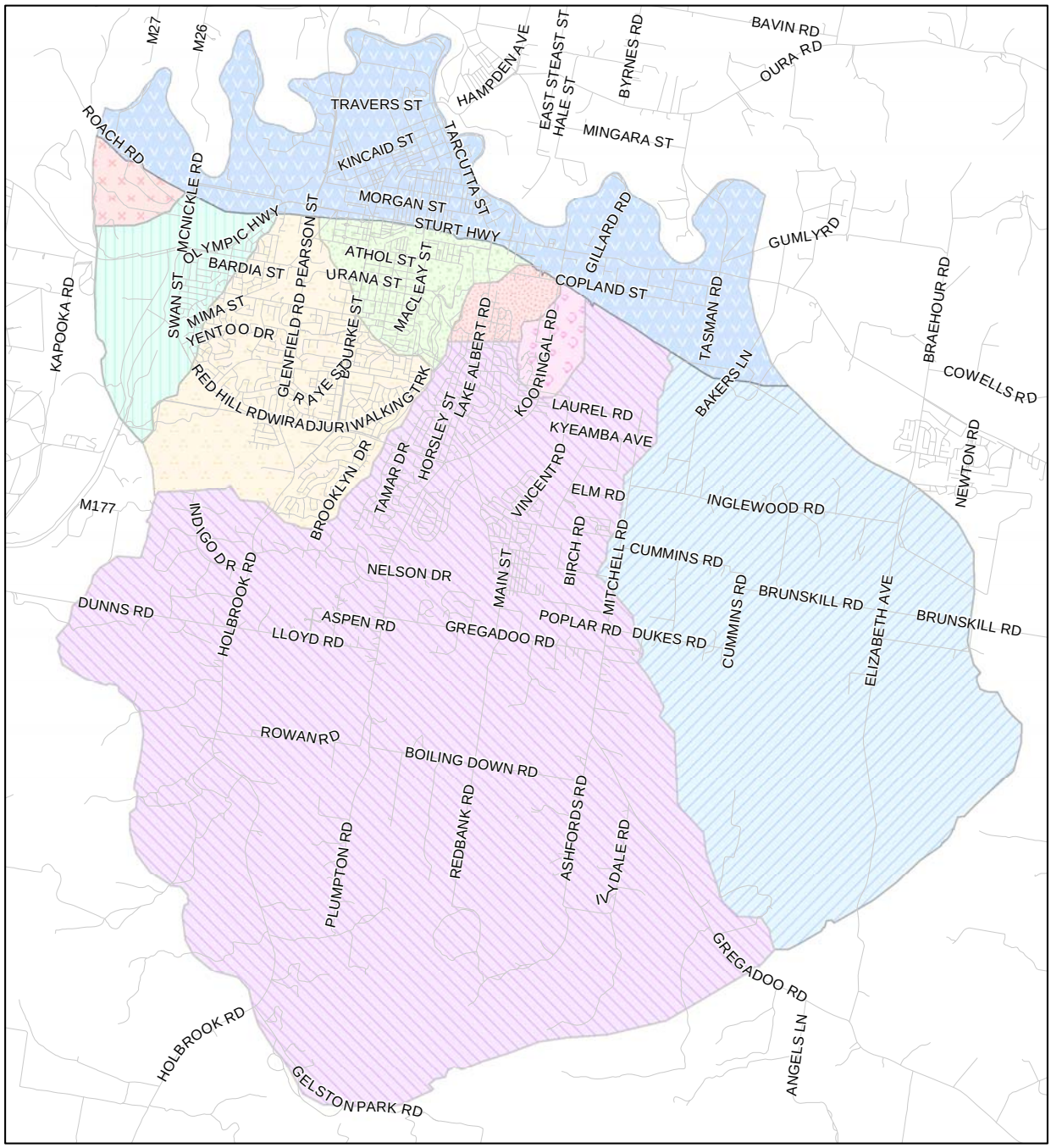
Piezometer Locations: Humula



APPENDIX B:

WAGGA WAGGA MAJOR URBAN SUB-CATCHMENTS

Wagga Wagga Major Urban Sub-catchments



Legend

- Mid Murrumbidgee Alluvium
- North Western Sub-catchment
- Eastern CBD Sub-catchment
- CBD Sub-catchment
- Far Eastern CBD Sub-catchment
- Far Western Sub-catchment
- Western Sub-catchment
- Far Eastern Sub-catchment
- Eastern Sub-catchment

0 0.5 1 2 3 4 Kilometers

Please note that the Undefined and Tarcutta/Humula piezometer categories are not presented on this map

APPENDIX C:

STANDING WATER LEVEL & SALINITY DATA

JULY 2009 TO JUNE 2010

Piezometer Number	Piezometer Location	Urban sub-catchment	Piezometer Depth	Date Drilled	Average SWL 08/09	Average SWL 09/10	Change in SWL	Average EC 08/09	Average EC 09/10	Change in EC
1	Cnr Moorong St - Sturt Hwy, Central Wagga	MA	10.20	May-94	-9.85	-9.92	-0.07	2.03	1.93	-0.11
2	Ashmont Primary School, Ashmont	3	10.30	Jun-94	DRY	DRY	DRY	DRY	DRY	DRY
3	Cheshire St, Central Wagga	3	7.40	May-94	-1.54	-1.42	0.12	16.48	15.56	-0.92
4	Showground arena, Turvey Park		3.30	Mar-94	LOST					
5	Showgrounds, Turvey Park	4	9.70	May-94	DRY	DRY	DRY	DRY	DRY	DRY
6	South Campus, Turvey Park	3	13.20	May-94	DRY	DRY	DRY	DRY	DRY	DRY
7	South Campus, Turvey Park	3	3.90	Mar-94	DRY	DRY	DRY	DRY	DRY	DRY
8	South Campus, Turvey Park		4.20	Mar-94	DESTROYED					
9	South Campus, Turvey Park	3	4.30	Mar-94	-0.85	-0.63	0.22	9.65	9.24	-0.41
10	South Campus, Turvey Park	3	4.10	Mar-94	-2.74	-2.79	-0.06	6.50	4.74	-1.76
11	3 Dalman Parkway, Glenfield	3	7.10	May-94	DRY	-6.16	Increase	DRY	1.616	NA
12	Kimba Dr, Glenfield	3	14.00	May-94	DRY	DRY	DRY	DRY	DRY	DRY
13	Cnr Glenfield - Red Hill Rds, Lloyd (shallow)	3	8.58	May-94	-7.88	-7.85	0.03	1.85	1.51	-0.34
14	Mt Austin High School, Tolland (shallow)	3	9.90	May-94	DRY	DRY	DRY	DRY	DRY	DRY
15	Mt Austin Public School, Mt Austin (shallow)	3	9.90	May-94	DRY	DRY	DRY	DRY	DRY	DRY
16	Emblen Park, Central Wagga	4	15.10	Jan-95	-10.12	-6.75	3.37	1.39	1.32	-0.06
17	Best Park Reserve, Ashmont	3	13.70	Jan-95	-4.27	-4.55	-0.28	4.07	3.75	-0.32
18	Nathan Park, Ashmont	2	11.00	Jan-95	-3.45	-3.26	0.18	9.65	9.53	-0.12
19	Turvey Park Public School, Turvey Park	4	17.20	Jan-95	DRY	DRY	DRY	DRY	DRY	DRY
20	Kildare Catholic College, Turvey Park	4	14.90	Jan-95	DRY	-13.73	Increase	DRY	12.85	NA
21	South Wagga Public School, Central Wagga	4	13.00	Jan-95	DRY	DRY	DRY	DRY	DRY	DRY
22	Norman Duck Oval, San Isidore	0	17.00	Mar-95	-18.03	-18.28	-0.25	1.86	NETS	NA
23	Sacred Heart Primary School, Kooringal	7	23.00	Mar-95	-13.56	-11.37	2.19	0.58	0.63	0.05
24	Kooringal High School, Kooringal	7	22.00	Mar-95	-12.63	-12.97	-0.34	1.94	1.75	-0.19
25	Kooringal Public School, Kooringal	7	15.20*	Jun-07*	DRY	DRY	DRY	DRY	DRY	DRY
26	514 Kooringal Rd, Kooringal	7	27.00	Mar-95	-11.33	-11.31	0.03	11.17	10.83	-0.35
27	Kooringal Rd, Kooringal (shallow)	7	13.50	Mar-95	-7.87	-8.36	-0.50	12.45	13.07	0.62
28	Kooringal Rd, Kooringal (deep)	7	21.50	Mar-95	-7.90	-8.39	-0.50	14.86	14.89	0.03
29	Dalkeith Ave, Lake Albert	7	10.00	Mar-95	-2.98	-3.60	-0.63	7.08	7.20	0.12
30	Croker Park, Lake Albert	7	13.00	Mar-95	-8.08	-8.43	-0.35	0.80	0.72	-0.07
31	Ron Wheeler Park, Lake Albert	7	30.00	Mar-95	-20.67	-20.84	-0.17	1.86	1.97	0.11
32	Fife St Reserve, Forest Hill	0	16.00	Jul-95	DRY	DRY	DRY	DRY	DRY	DRY
33	Cooramin St, Boorooma	0	18.00	Mar-95	-15.83	-15.55	0.28	NETS	7.79	7.79

Piezometer Number	Piezometer Location	Urban sub-catchment	Piezometer Depth	Date Drilled	Average SWL 08/09	Average SWL 09/10	Change in SWL	Average EC 08/09	Average EC 09/10	Change in EC
34	Mt Austin Public School, Mt Austin (deep)	3	24.00	Jun-95	-13.09	-13.29	-0.19	7.13	7.99	0.86
35	Emblen Park, Central Wagga		50.00	Jun-95	DEWATERING BORE NUMBER 1					
36	Lake Albert foreshore, Lake Albert	7	11.80	Jan-96	-1.89	-2.23	-0.33	5.89	6.06	0.16
37	Kaldari Cres, Glenfield (deep)	3	40.00	May-96	-6.96	-6.81	0.15	2.66	2.71	0.05
38	Kaldari Cres, Glenfield (shallow)	3	15.00	May-96	-7.86	-7.38	0.47	1.59	1.53	-0.07
39	Wagga Wagga High School, Turvey Park	4	49.00	May-96	-32.14	-31.86	0.28	2.44	2.33	-0.11
40	Holy Trinity Primary School, Ashmont	3	25.77	Apr-97	-12.03	-11.89	0.14	8.74	8.94	0.19
41	Crisp Park, Ashmont	2	16.85	Apr-97	DRY	DRY	DRY	DRY	DRY	DRY
42	Karoom Dr reserve, Glenfield	3	12.60	Apr-97	-2.79	-2.85	-0.07	4.94	4.74	-0.21
43	Tolland Public School, Tolland	3	9.50*	Jun-07*	-8.42	-7.99	0.43	2.24	1.98	-0.26
44	Mt Austin High School, Tolland (deep)	3	22.54	Apr-97	-17.64	-18.16	-0.52	6.26	6.11	-0.15
45	Caloola Hostel, Tatton	7	12.89	Apr-97	-12.17	-12.04	0.13	5.37	5.05	-0.32
46	Wagga Wagga Railway Station, Central Wagga		16.02	Apr-97	NO ACCESS					
47	Cnr Red Hill - Glenfield Rds, Lloyd (deep)	3	16.27	Apr-97	-11.01	-11.29	-0.27	1.51	1.53	0.02
48	Jack Skeers Park, Lake Albert	7	16.05	Apr-97	-7.69	-8.52	-0.83	2.88	2.75	-0.13
49	Lake Albert Public School, Lake Albert	7	26.93	Apr-97	-20.62	-20.04	0.57	1.74	1.65	-0.09
50	Wagga Wagga Christian College, East Wagga	6	19.20	May-97	-18.07	-18.26	-0.19	1.36	1.31	-0.04
51	Plumpton Rd, Lake Albert	7	16.70	Apr-97	-10.00	-10.31	-0.31	5.30	5.09	-0.22
52	39 Dobney Ave, Central Wagga	3	12.60	May-97	-11.03	-11.03	0.00	5.04	4.93	-0.12
53	Lawn Cemetery, Lake Albert	7	21.50	Jun-97	-15.92	-8.61	7.31	0.40	0.46	0.06
54	Derna Pl, Ashmont	2	3.00	Nov-97	-2.29	-2.08	0.21	13.57	13.33	-0.24
55	1 Clowes Pl, Ashmont	2	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
56	6 Saxon St, Central Wagga	3	6.00*	Jun-07*	-5.90	-5.66	0.24	9.58	8.10	-1.48
57	7 Mortimer Pl, Central Wagga	3	3.00	Nov-97	-1.13	-0.95	0.17	10.04	11.11	1.07
58	62 Chaston St, Central Wagga	4	3.00	Nov-97	-1.55	-1.34	0.21	6.41	6.79	0.37
59	53-55 Meurant Ave, Central Wagga	4	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
60	Opp 16 Cullen Rd, Central Wagga	4	3.00	Nov-97	DRY	-2.43	Increase	DRY	7.89	NA
61	Opp 38 Cullen Rd, Central Wagga	4	3.00	Nov-97	DRY	-2.90	Increase	DRY	NETS	NA
62	59 Gormly Ave, Central Wagga	MA	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
63	Emblen Park, Central Wagga	4	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
64	11 Sullivan St, Central Wagga	4	3.00	Nov-97	-2.45	-2.83	-0.37	2.34	NETS	NA
65	40 Meurant Ave, Central Wagga	4	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
66	18 Chaston St, Central Wagga	4	3.00	Nov-97	-1.41	-1.38	0.02	4.95	4.95	0.01

Piezometer Number	Piezometer Location	Urban sub-catchment	Piezometer Depth	Date Drilled	Average SWL 08/09	Average SWL 09/10	Change in SWL	Average EC 08/09	Average EC 09/10	Change in EC
67	Meurant Ave, Central Wagga	4	6.00*	Jun-07*	DRY	DRY	DRY	DRY	DRY	DRY
68	11 Lewisham Ave, Central Wagga	4	3.00	Nov-97	DRY	2.93	Increase	DRY	NETS	NA
69	19 Hardy Ave, Central Wagga	4	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
70	33 Gormly Ave, Central Wagga	MA	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
71	1 Roma St, Central Wagga	4	9.00*	Jun-08*	-4.97	-3.72	1.24	0.99	1.00	0.02
72	9 Brookong Ave, Central Wagga	MA	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
73	Wagga Wagga Base Hospital, Central Wagga	MA	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
74	Edward St, Central Wagga	MA	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
75	6 Edward St, Central Wagga	MA	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
76	332-334 Edward St, Central Wagga	MA	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
77	312 Edward St, Central Wagga		3.00	Nov-97	DESTROYED					
78	2 Dobney Ave, Central Wagga	4	3.00	Nov-97	DRY	DRY	DRY	DRY	DRY	DRY
79	Gormly-Emblen Sts roundabout, Central Wagga	MA	4.40	Sep-98	DRY	DRY	DRY	DRY	DRY	DRY
80	Gormly-Harrison Sts roundabout, Central Wagga	MA	6.00	Sep-98	-4.53	-5.17	-0.65	1.76	0.95	-0.81
81	48 Docker St, Central Wagga	MA	6.80	Sep-98	-4.51	-4.21	0.30	1.15	0.72	-0.43
82	27 Hardy Ave, Central Wagga	4	2.60	Sep-98	DRY	DRY	DRY	DRY	DRY	DRY
83	57 Hardy Ave, Central Wagga	4	5.20*	Jun-07*	-5.03	-5.03	0.00	NETS	NETS	NETS
84	2 Sullivan Ave, Central Wagga	4	3.40	Sep-98	DRY	DRY	DRY	DRY	DRY	DRY
85	27 Meurant Ave, Central Wagga	4	4.20	Sep-98	DRY	DRY	DRY	DRY	DRY	DRY
86	2 Lewisham Ave, Central Wagga	4	7.50	Sep-98	DRY	-6.16	Increase	DRY	4.21	NA
87	12 Meurant Ave, Central Wagga	4	5.20	Sep-98	DRY	DRY	DRY	DRY	DRY	DRY
88	2 Chaston St, Central Wagga	4	10.00*	May-07*	-8.80	-7.68	1.12	16.97	19.67	2.70
89	31 Chaston St, Central Wagga	4	5.50	Sep-98	DRY	-5.18	Increase	DRY	12.95	NA
90	51 Chaston St, Central Wagga	4	6.60	Sep-98	-3.45	-3.01	0.44	8.01	7.05	-0.96
91	Mount St, Kooringal (shallow)	5	10.60	Jun-99	-1.99	-2.05	-0.06	1.06	1.03	-0.02
92	Mount St, Kooringal (deep)	5	27.70	Jun-99	-2.13	-2.14	-0.01	1.02	0.98	-0.04
93	Henwood Park, Kooringal (shallow)	7	13.60	Jun-99	DRY	12.84	Increase	DRY	NETS	NA
94	Henwood Park, Kooringal (deep)	7	29.90	Jun-99	-16.90	-16.74	0.17	1.38	1.35	-0.03
95	Henwood Park, Kooringal (shallow)	7	7.90	Jun-99	DRY	DRY	DRY	DRY	DRY	DRY
96	Henwood Park, Kooringal (deep)	7	66.00	Jun-99	-26.33	-25.51	0.82	1.00	1.06	0.05
97	Opp 22 Amaroo St, Kooringal (shallow)	7	9.30	Jul-99	DRY	DRY	DRY	DRY	DRY	DRY
98	Opp 22 Amaroo St, Kooringal (deep)	7	83.00	Jul-99	-53.63	-52.63	1.01	1.43	1.39	-0.05
99	29 Hardy Ave, Central Wagga	4	15.00	Mar-01	-12.23	-10.20	2.02	1.13	1.16	0.03

Piezometer Number	Piezometer Location	Urban sub-catchment	Piezometer Depth	Date Drilled	Average SWL 08/09	Average SWL 09/10	Change in SWL	Average EC 08/09	Average EC 09/10	Change in EC
100	29 Hardy Ave, Central Wagga	4	31.00	Mar-01	-13.31	-10.21	3.10	1.25	1.16	-0.10
101	29 Hardy Ave, Central Wagga	4	60.00	Mar-01	-13.36	-10.28	3.08	1.13	1.16	0.04
102	Cnr Meurant St - Lewisham Ave, Central Wagga	4	15.00	Mar-01	-10.03	-7.40	2.63	18.33	16.83	-1.50
103	Cnr Meurant St - Lewisham Ave, Central Wagga	4	31.50	Mar-01	-11.54	-8.31	3.23	1.09	2.26	1.17
104	Cnr Meurant St - Lewisham Ave, Central Wagga	4	61.00	Mar-01	-11.54	-8.13	3.41	1.02	0.96	-0.05
105	Narrung St, Wiradjuri (shallow)	MA	8.09	May-94	DRY	DRY	DRY	DRY	DRY	DRY
106	Narrung St, Wiradjuri (deep)	MA	17.88	Mar-99	-11.72	-11.93	-0.21	1.01	0.92	-0.08
107	Narrung St STW, Wiradjuri (shallow)	MA	8.13	May-94	DRY	DRY	DRY	DRY	DRY	DRY
108	Narrung St STW, Wiradjuri (deep)	MA	16.00	Mar-99	-13.28	-13.69	-0.41	0.82	0.87	0.04
109	Narrung St STW, Wiradjuri (shallow)	MA	7.80	May-94	DRY	DRY	DRY	DRY	DRY	DRY
110	Narrung St STW, Wiradjuri (deep)	MA	11.49	Mar-99	-8.10	-7.68	0.43	0.16	0.39	0.23
111	Narrung St STW, Wiradjuri	MA	7.75	May-94	DRY	DRY	DRY	DRY	DRY	DRY
112	Narrung St STW, Wiradjuri	MA	6.58	May-94	DRY	DRY	DRY	DRY	DRY	DRY
113	Narrung St STW, Wiradjuri (shallow)	MA	7.87	May-94	DRY	DRY	DRY	DRY	DRY	DRY
114	Narrung St STW, Wiradjuri (deep)	MA	16.39	Mar-99	-9.73	-9.62	0.11	0.82	0.80	-0.02
115	Narrung St liquid waste cell, Wiradjuri	MA	10.20	Jan-95	DRY	DRY	DRY	DRY	DRY	DRY
116	Narrung St liquid waste cell, Wiradjuri	MA	15.78	Mar-99	-11.17	-11.24	-0.06	1.75	1.87	0.12
117	Billagha St, Wiradjuri		6.22	Jan-95	DESTROYED					
118	Billagha St, Wiradjuri	MA	15.96	Mar-99	-12.11	-12.28	-0.17	1.24	1.13	-0.11
119	Narrung St sweeper waste dump, Wiradjuri		9.60	May-94	DESTROYED					
120	Narrung St sweeper waste dump, Wiradjuri	MA	16.07	Mar-99	-11.87	-12.06	-0.19	1.02	0.98	-0.04
121	Narrung St, Wiradjuri	MA	16.09	Mar-99	-12.44	-12.55	-0.11	NA	NA	NA
122	59 Galing Pl, Wiradjuri	MA	19.38	Aug-01	-15.69	-15.44	0.25	2.16	1.84	-0.32
123	33 Galing Pl, Wiradjuri	MA	17.48	Aug-01	-15.42	-15.32	0.11	1.48	1.32	-0.16
124	Wiradjuri Cres, Wiradjuri	MA	16.39	Aug-01	-14.36	-15.18	-0.82	1.56	1.72	0.16
125	Cnr Narrung St - Wiradjuri Reserve, Wiradjuri	MA	18.39	Aug-01	-12.67	-13.24	-0.57	0.36	0.34	-0.02
126	Billagha St, Wiradjuri	MA	19.13	Aug-01	-13.97	-14.63	-0.66	0.99	0.93	-0.06
127	Toll Group, Wiradjuri	MA	13.78	Aug-01	DRY	DRY	DRY	DRY	DRY	DRY
128	9 College Ave, Turvey Park	3	10.20*	May-07*	-9.80	-9.32	0.48	6.61	3.77	-2.84
129	Lakehaven Dr, Lake Albert (shallow)	7	5.91	Oct-92	DRY	DRY	DRY	DRY	DRY	DRY
130	Lakehaven Dr, Lake Albert (deep)	7	15.00*	May-07*	-13.62	-14.11	-0.50	7.50	6.57	-0.93
131	Cnr Craft - Graham Sts, Lake Albert (shallow)	7	5.13	Oct-92	DRY	DRY	DRY	DRY	DRY	DRY
132	Cnr Craft - Graham Sts, Lake Albert (deep)	7	12.30	Oct-92	-8.60	-8.79	-0.20	3.42	3.25	-0.16

Piezometer Number	Piezometer Location	Urban sub-catchment	Piezometer Depth	Date Drilled	Average SWL 08/09	Average SWL 09/10	Change in SWL	Average EC 08/09	Average EC 09/10	Change in EC
133	Cnr Craft - Bouquet Sts, Lake Albert (shallow)	7	5.84	Oct-92	DRY	DRY	DRY	DRY	DRY	DRY
134	Cnr Craft - Bouquet Sts, Lake Albert (deep)	7	11.96	Oct-92	DRY	DRY	DRY	DRY	DRY	DRY
135	Cnr Main St - Gregadoo Rd, Lake Albert (shallow)	7	5.04	Oct-92	-4.55	-4.38	0.17	NETS	0.26	NA
136	Cnr Main St - Gregadoo Rd, Lake Albert (deep)	7	12.01	Oct-92	DRY	DRY	DRY	DRY	DRY	DRY
137	10 Gregadoo Rd, Lake Albert (shallow)		4.70	Oct-92	NO ACCESS					
138	10 Gregadoo Rd, Lake Albert (deep)		12.20	Oct-92	NO ACCESS					
139	Redbank Rd, Lake Albert (shallow)	7	5.87	Oct-92	DRY	DRY	DRY	DRY	DRY	DRY
140	Redbank Rd, Lake Albert (deep)	7	12.40	Oct-92	DRY	DRY	DRY	DRY	DRY	DRY
141	Travelling stock reserve, Bomen		16.04	Jun-00	DESTROYED					
142	Red Hill Rd, Glenfield	3	25.60	Apr-02	-23.18	-23.47	-0.28	NA	NA	NA
143	6930 Olympic Hwy, Kapooka	0	42.00	Apr-02	DRY	DRY	DRY	DRY	DRY	DRY
144	Cnr Narrung - Billagha Sts, Wiradjuri	MA	15.50	Nov-06	-11.04	-11.78	-0.74	1.02	1.05	0.03
145	Wiradjuri Reserve, Wiradjuri	MA	14.00	Nov-06	-7.42	-7.33	0.09	0.11	0.12	0.01
146	Orana Pl, Wiradjuri	MA	19.50	Nov-06	-15.52	-15.34	0.18	2.01	1.94	-0.07
147	South Campus, Turvey Park	3	unknown	unknown	-1.15	-1.01	0.14	13.55	13.97	0.42
148	Bomen Industrial Sewage Treatment Facility	0	unknown	unknown	-5.29	-5.53	-0.24	2.17	2.26	0.09
149	BISTF, Bomen	0	unknown	unknown	-0.33	-0.35	-0.01	3.03	2.82	-0.21
150	BISTF, Bomen	0	unknown	unknown	-4.48	-4.68	-0.20	1.89	1.82	-0.06
151	BISTF, Bomen	0	unknown	unknown	-2.47	-1.71	0.77	4.92	4.64	-0.27
152	1 Bedervale St, Bourkelands	3	14.70	Jun-07	-14.86	-6.35	8.51	NETS	1.1974	NA
153	Cnr Burgan - Indigo Dr, Glenoak	7	15.00	May-07	DRY	DRY	DRY	DRY	DRY	DRY
154	19 Mirbelia Dr, Glenoak	7	13.00	Jun-07	-7.55	-7.54	0.00	0.62	0.57	-0.05
155	Cnr Indigo Dr - Holbrook Rd, Springvale	7	10.20	Jun-07	-8.75	-8.98	-0.23	0.75	0.81	0.05
156	Cnr Mirbelia Dr - Holbrook Rd, Springvale	7	15.20	Jun-07	DRY	DRY	DRY	DRY	DRY	DRY
157	Holbrook Rd, Springvale	7	15.00	May-07	-10.28	-10.45	-0.17	5.69	5.36	-0.33
158	Stringybark Pl, Springvale	7	15.00	Jun-07	DRY	DRY	DRY	DRY	DRY	DRY
159	6 Yarran Pl, Springvale	7	10.00	May-07	-6.21	-6.39	-0.18	0.81	0.80	-0.01
160	3 Mallee Rd, Springvale	7	15.30	Jun-07	DRY	DRY	DRY	DRY	DRY	DRY
161	1 Lloyd Rd, Springvale	7	8.60	May-07	-7.18	-5.67	1.51	5.79	4.72	-1.08
162	39 Gregadoo Rd, Lake Albert	7	9.00	May-07	-6.18	-6.30	-0.13	4.54	4.25	-0.29
163	Stringybark Creek Wetland, Gregadoo Rd, L.A	7	8.50	unknown	DRY	DRY	DRY	DRY	DRY	DRY
164	Adjacent to Murrumbidgee River, Narrung Street	MA	unknown	Dec-07	-11.53	-11.44	0.09	0.15	0.13	-0.02

Piezometer Number	Piezometer Location	Urban sub-catchment	Piezometer Depth	Date Drilled	Average SWL 08/09	Average SWL 09/10	Change in SWL	Average EC 08/09	Average EC 09/10	Change in EC
165	Travers St at entrance of Narrung St, Wiradjuri	MA	13.00	Dec-07	-11.70	-12.26	-0.56	0.15	0.19	0.05
166	Travers St behind 10 Incarnie Cres, Wiradjuri	MA	unknown	Dec-07	DRY	DRY	DRY	DRY	DRY	DRY
167	56 Cummins Road, Lake Albert	8	11.00	Jun-08	DRY	DRY	DRY	DRY	DRY	DRY
168	378 Bakers Ln., Lake Albert	8	13.50	Jun-08	-11.04	-12.11	-1.08	2.41	2.47	0.06
169	334 Bakers Ln., Lake Albert	8	13.50	Jun-08	-8.08	-8.52	-0.45	10.65	10.59	-0.06
170	1 Mitchell Road, Lake Albert	7	13.00	Jun-08	-12.47	-12.70	-0.23	5.99	4.52	-1.47
171	124-156 Copland street, East Wagga Wagga	MA	8.50	Jun-08	DRY	DRY	DRY	DRY	DRY	DRY
172	Rear of 5-6 Kenny Place, Tolland	3	9.50	Jun-08	-7.30	BLOCKED	NA	6.40	BLOCKED	NA
173	Rear of 28 Bandera Avenue, Glenfield Park	3	8.00	Jun-08	DRY	DRY	DRY	DRY	DRY	DRY
174	Rear of 48 Paldi Cres, Glenfield Park	2	14.00	Jun-08	-10.58	-10.54	0.04	14.19	12.80	-1.39
175	Rear of 12 Birri Place, Glenfield Park	2	15.00	Jun-08	-10.20	-9.99	0.21	2.95	2.45	-0.50
176	39 Meurant Avenue (on Emblem Street)	4	9.00	Jun-08	-8.27	-6.65	1.61	11.01	12.35	1.34
177	47 Gormly Avenue (on Emblem St)	MA	5.50	Jun-08	DRY	DRY	DRY	DRY	DRY	DRY
Bore 9	63 Gormly Ave, Central Wagga	MA	120.00	Apr-99	-11.89	-11.97	-0.08	0.63	0.52	-0.11
1/1	Emblen Park, Central Wagga	4	15.00	Jun-95	-10.16	-6.60	3.56	0.71995	1.29	0.57
1/2	Emblen Park, Central Wagga	4	30.00	Jun-95	-10.02	-6.47	3.55	1.81	1.86	0.06
1/3	Emblen Park, Central Wagga	4	60.00	Jun-95	-9.83	-6.22	3.61	1.49	1.33	-0.16
T1	26 Centenary Ave, Tarcutta	T	unknown	unknown	-12.13	-12.00	0.13	1.46	1.37	-0.09
T2	Sydney St, Tarcutta	T	unknown	unknown	-9.47	-9.46	0.01	1.35	1.32	-0.03
T3	Cnr Cynthia - Young Sts, Tarcutta	T	16.00	unknown	-16.90	-15.64	1.26	NETS	NETS	NA
T4	Cnr Argent - Spring Sts, Tarcutta	T	19.50	unknown	DRY	-19.34	Increase	DRY	NETS	NA
T5	Sydney St, Tarcutta	T	5.75	unknown	-5.76	DRY	Decrease	NETS	DRY	NA
T6	Breaden Sports Ground, Tarcutta	T	4.15	unknown	-3.88	-3.90	-0.03	1.64	1.01	-0.64
H1	Cnr Clark - Mate Sts, Humula	T	4.50	Dec-03	DRY	DRY	DRY	DRY	DRY	DRY
H2	Cnr Boundary Rd - Mount St, Humula	T	4.20	Dec-03	-4.26	DRY	Decrease	NETS	DRY	NA

NA - Indicates that a piezometer has been dry throughout either period, so an accurate Standing Water Level figure cannot be given. However, piezometers have been place placed in the appropriate categories (i.e. Increase, decrease)

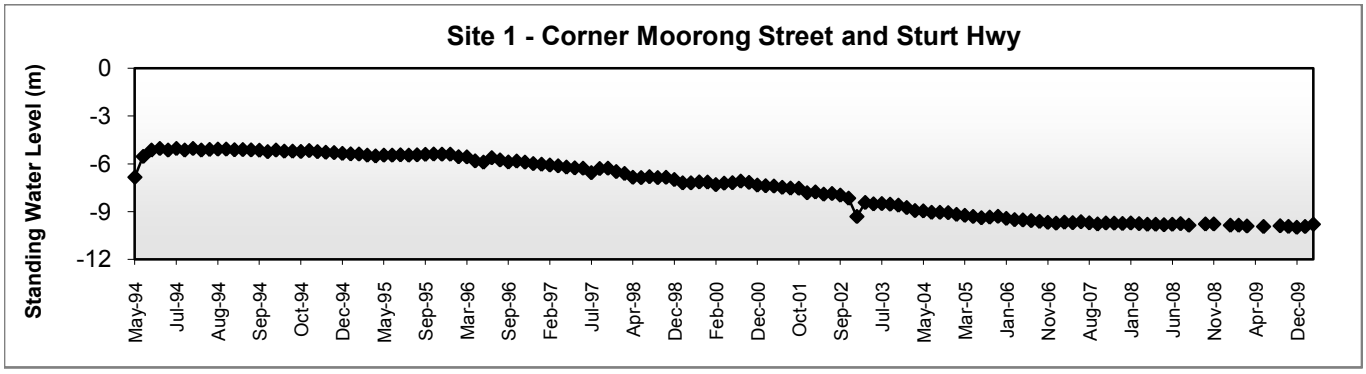
* Denotes piezometers that have been replaced or redrilled. Figures indicate updated depths and drilling dates.

NETS- not enough to sample

APPENDIX D:

GRAPHICAL STANDING WATER LEVEL RESULTS

HISTORICAL


Site 1 - Corner Moorong Street and Sturt Hwy
Standing Water Level (m)
0
-3
-6
-9
-12
May-94
Jul-94
Aug-94
Sep-94
Oct-94
Dec-94
May-95
Sep-95
Mar-96
Sep-96
Feb-97
Jul-97
Apr-98
Dec-98
Feb-00
Dec-00
Oct-01
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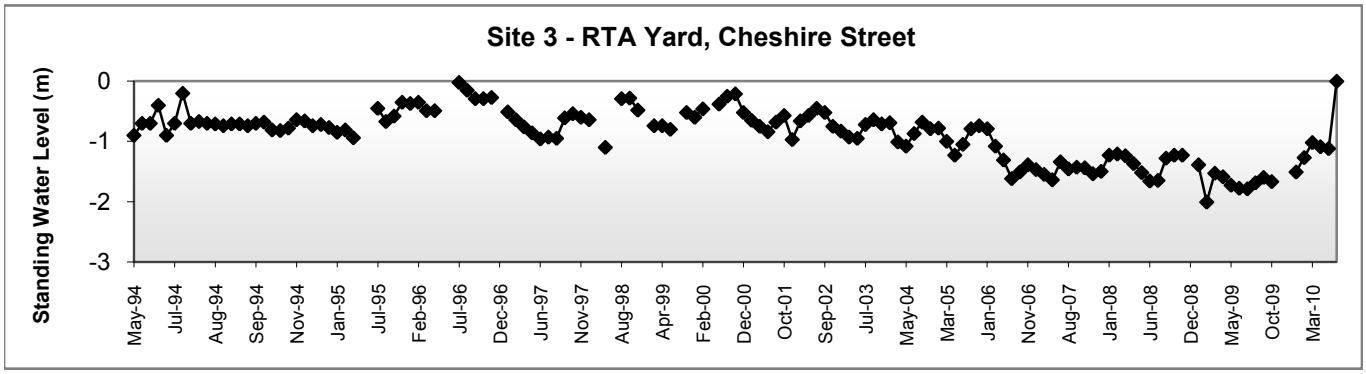
Aug-07
Jan-08
Jun-08
Nov-08
Apr-09
Dec-09


Site 3 - RTA Yard, Cheshire Street
Standing Water Level (m)
0
-1
-2
-3
May-94
Jul-94
Aug-94
Sep-94
Nov-94
Jan-95
Jul-95
Feb-96
Jul-96
Dec-96
Jun-97
Nov-97
Aug-98
Apr-99
Feb-00
Dec-00
Oct-01
Sep-02
Jul-03
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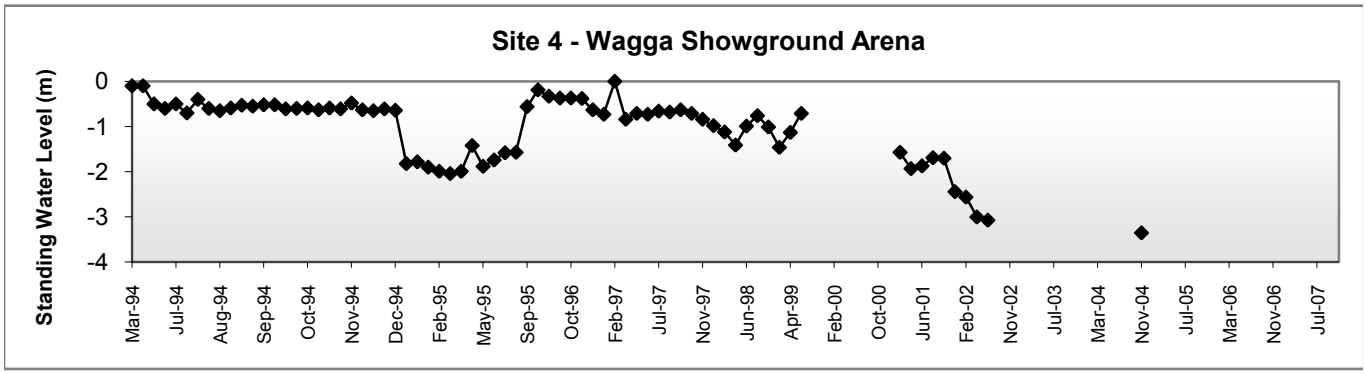
Mar-05
Jan-06
Nov-06
Aug-07
Jan-08
Jun-08
Dec-08
May-09
Oct-09
Mar-10


Site 4 - Wagga Showground Arena
Standing Water Level (m)
0
-1
-2
-3
-4
Mar-94
Jul-94
Aug-94
Sep-94
Oct-94
Nov-94
Dec-94
Feb-95
May-95
Sep-95
Oct-96
Feb-97
Jul-97
Nov-97
Jun-98
Apr-99
Feb-00
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Nov-02
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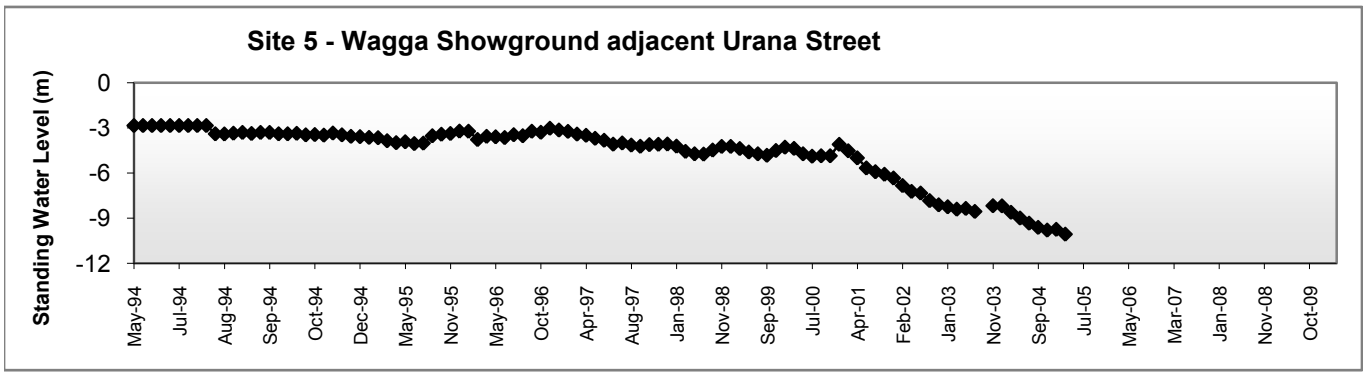
Mar-04
Nov-04
Jul-05
Mar-06
Nov-06
Jul-07


Site 5 - Wagga Showground adjacent Urana Street
Standing Water Level (m)
0
-3
-6
-9
-12
May-94
Jul-94
Aug-94
Sep-94
Oct-94
Dec-94
May-95
Nov-95
May-96
Oct-96
Apr-97
Aug-97
Jan-98
Nov-98
Sep-99
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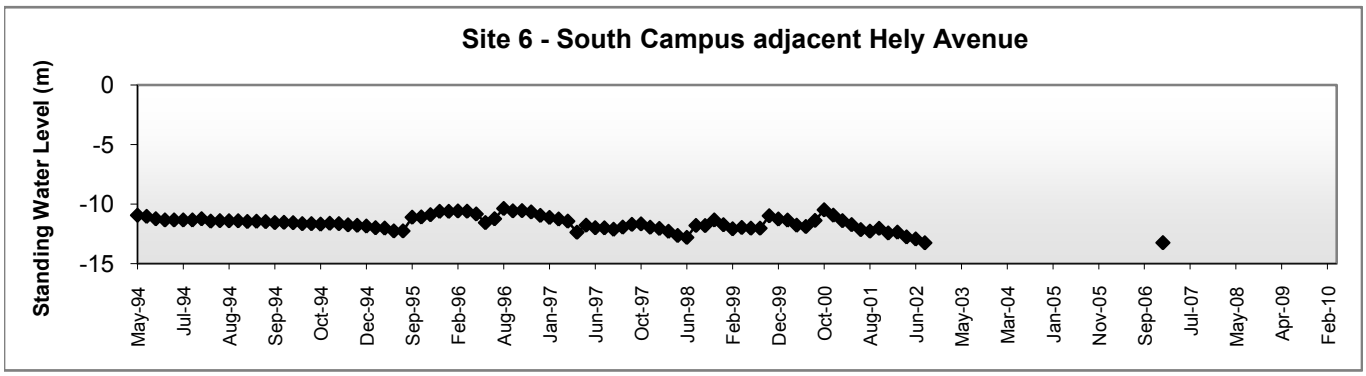
Jul-05
May-06
Mar-07
Jan-08
Nov-08
Oct-09


Site 6 - South Campus adjacent Hely Avenue
Standing Water Level (m)
0
-5
-10
-15
May-94
Jul-94
Aug-94
Sep-94
Oct-94
Dec-94
Sep-95
Feb-96
Aug-96
Jan-97
Jun-97
Oct-97
Jun-98
Feb-99
Dec-99
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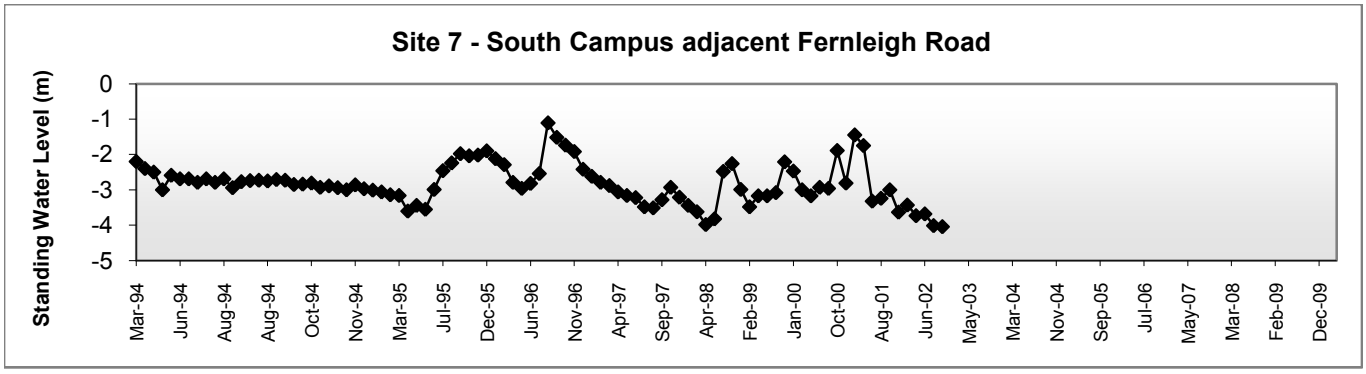
Nov-05
Sep-06
Jul-07
May-08
Apr-09
Feb-10


Site 7 - South Campus adjacent Fernleigh Road
Standing Water Level (m)
0
-1
-2
-3
-4
-5
Mar-94
Jun-94
Aug-94
Aug-94
Oct-94
Nov-94
Mar-95
Jul-95
Dec-95
Jun-96
Nov-96
Apr-97
Sep-97
Apr-98
Feb-99
Jan-00
Oct-00
Aug-01
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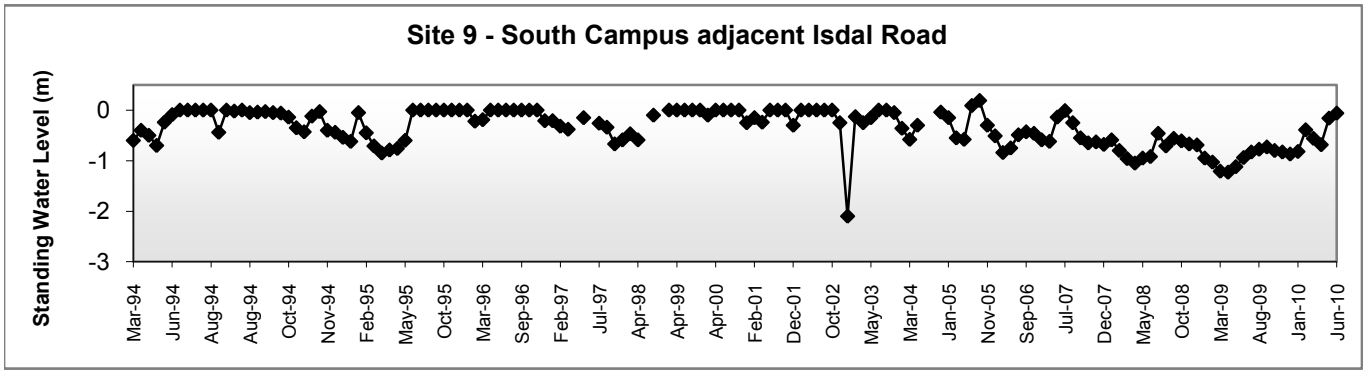
Sep-05
Jul-06
May-07
Mar-08
Feb-09
Dec-09


Site 9 - South Campus adjacent Isdal Road
Standing Water Level (m)
0
-1
-2
-3
Mar-94
Jun-94
Aug-94
Aug-94
Oct-94
Nov-94
Feb-95
May-95
Oct-95
Mar-96
Sep-96
Feb-97
Jul-97
Apr-98
Apr-99
Apr-00
Feb-01
Dec-01
Oct-02
May-03
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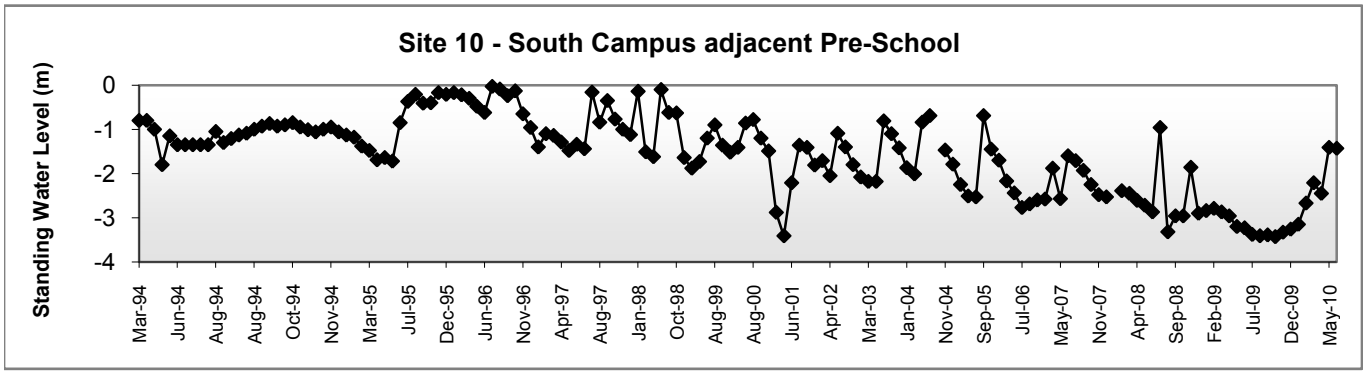
May-08
Oct-08
Mar-09
Aug-09
Jan-10
Jun-10


Site 10 - South Campus adjacent Pre-School
Standing Water Level (m)
0
-1
-2
-3
-4
Mar-94
Jun-94
Aug-94
Aug-94
Oct-94
Nov-94
Mar-95
Jul-95
Dec-95
Jun-96
Nov-96
Apr-97
Aug-97
Jan-98
Oct-98
Aug-99
Aug-00
Jun-01
Apr-02
Mar-03
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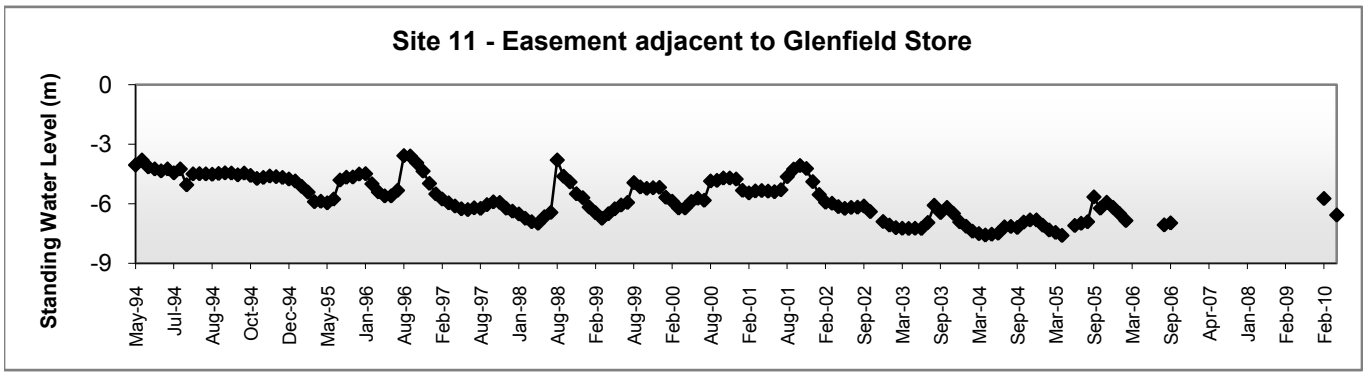
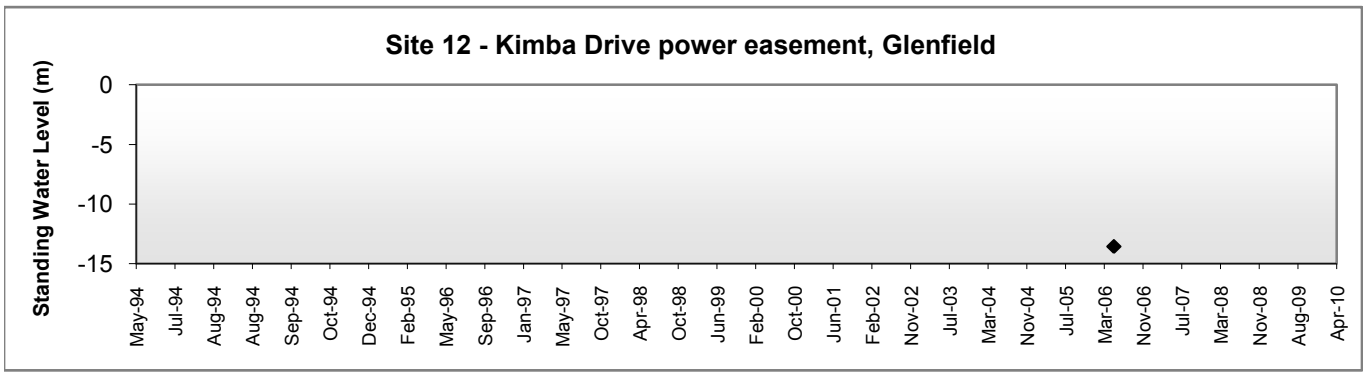
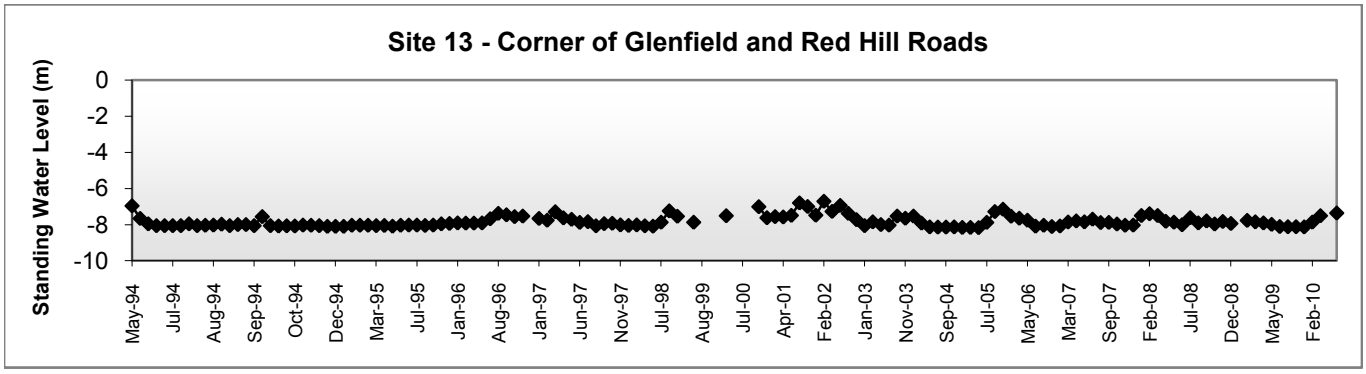
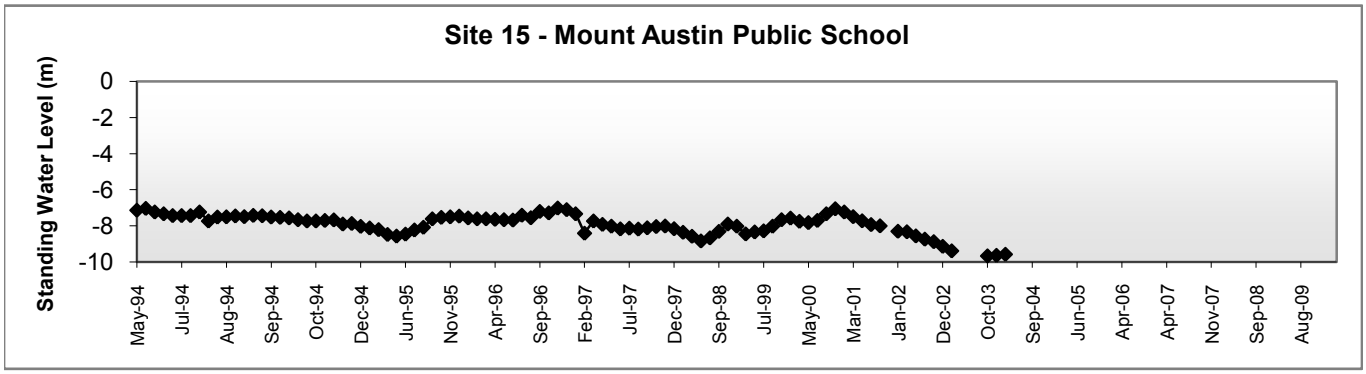
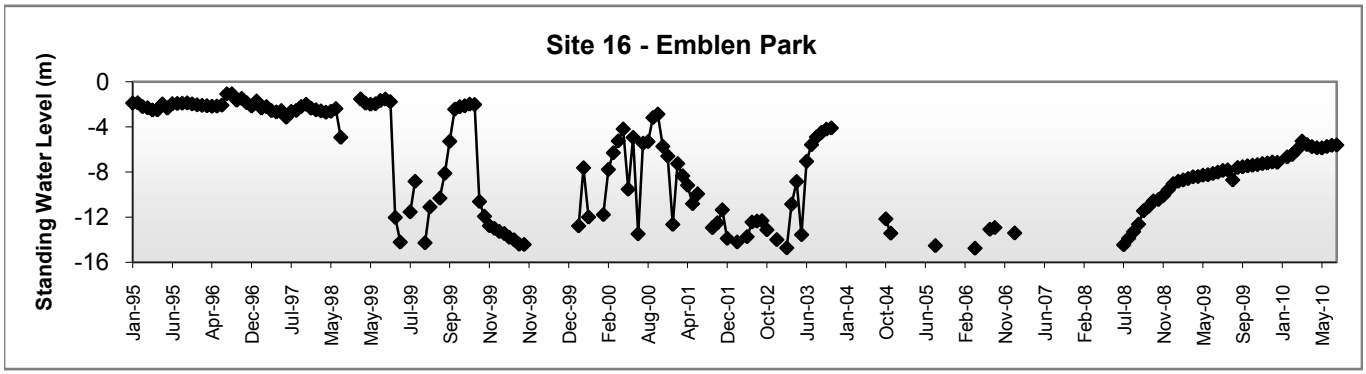
Apr-08
Sep-08
Feb-09
Jul-09
Dec-09
May-10

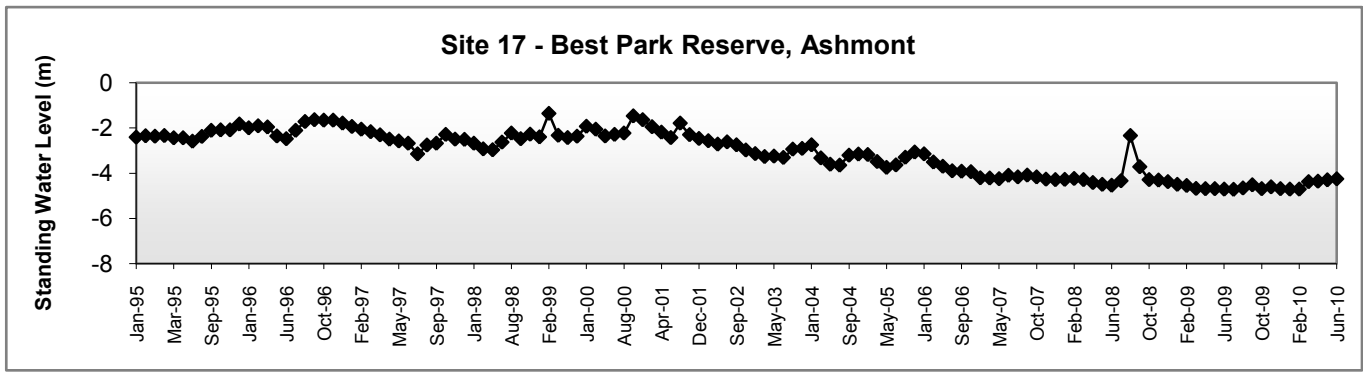

Site 11 - Easement adjacent to Glenfield Store
Standing Water Level (m)
0
-3
-6
-9
May-94
Jul-94
Aug-94
Oct-94
Dec-94
May-95
Jan-96
Aug-96
Feb-97
Aug-97
Jan-98
Aug-98
Feb-99
Aug-99
Feb-00
Aug-00
Feb-01
Aug-01
Feb-02
Sep-02
Mar-03
Sep-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Apr-07
Jan-08
Feb-09
Feb-10

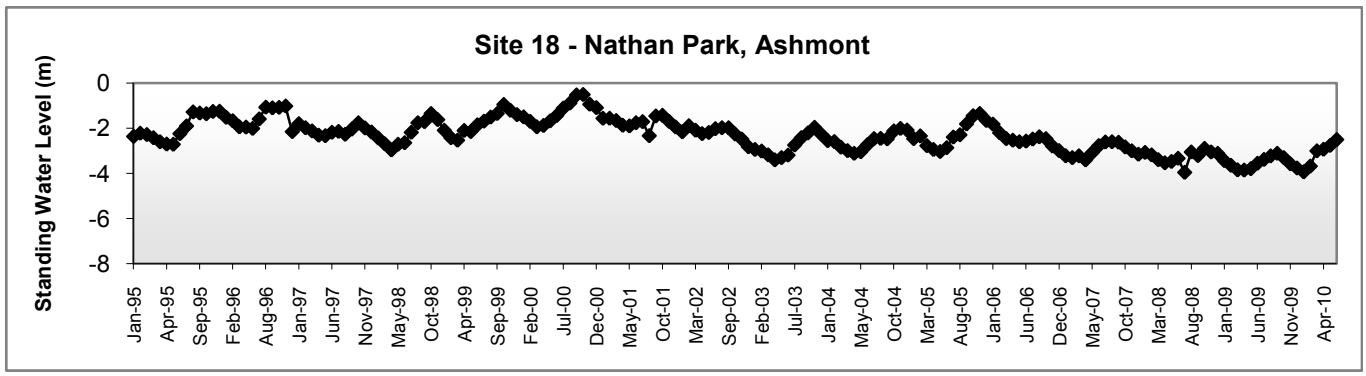

Site 12 - Kimba Drive power easement, Glenfield
Standing Water Level (m)
0
-5
-10
-15
May-94
Jul-94
Aug-94
Aug-94
Sep-94
Oct-94
Dec-94
Feb-95
May-96
Sep-96
Jan-97
May-97
Oct-97
Apr-98
Oct-98
Jun-99
Feb-00
Oct-00
Jun-01
Feb-02
Nov-02
Jul-03
Mar-04
Nov-04
Jul-05
Mar-06
Nov-06
Jul-07
Mar-08
Nov-08
Aug-09
Apr-10

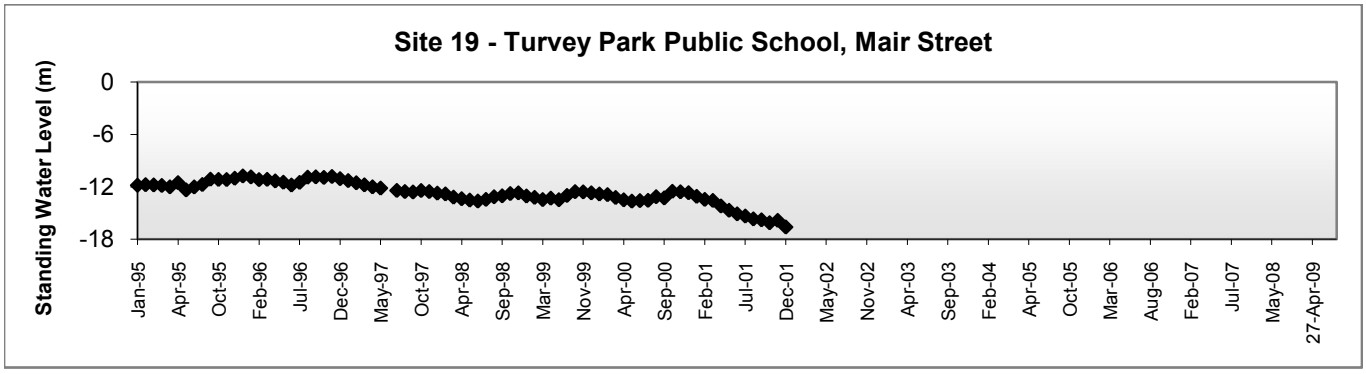

Site 13 - Corner of Glenfield and Red Hill Roads
Standing Water Level (m)
0
-2
-4
-6
-8
-10
May-94
Jul-94
Aug-94
Sep-94
Oct-94
Dec-94
Mar-95
Jul-95
Jan-96
Aug-96
Jan-97
Jun-97
Nov-97
Jul-98
Aug-99
Jul-00
Apr-01
Feb-02
Jan-03
Nov-03
Sep-04
Jul-05
May-06
Mar-07
Sep-07
Feb-08
Jul-08
Dec-08
May-09
Feb-10

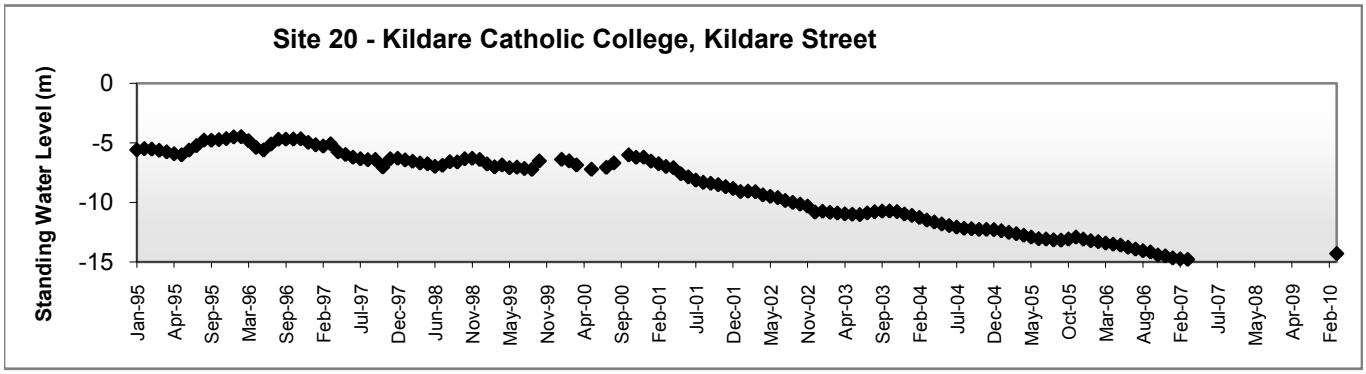

Site 15 - Mount Austin Public School
Standing Water Level (m)
0
-2
-4
-6
-8
-10
May-94
Jul-94
Aug-94
Sep-94
Oct-94
Dec-94
Jun-95
Nov-95
Apr-96
Sep-96
Feb-97
Jul-97
Dec-97
Sep-98
Jul-99
May-00
Mar-01
Jan-02
Dec-02
Oct-03
Sep-04
Jun-05
Apr-06
Apr-07
Nov-07
Sep-08
Aug-09

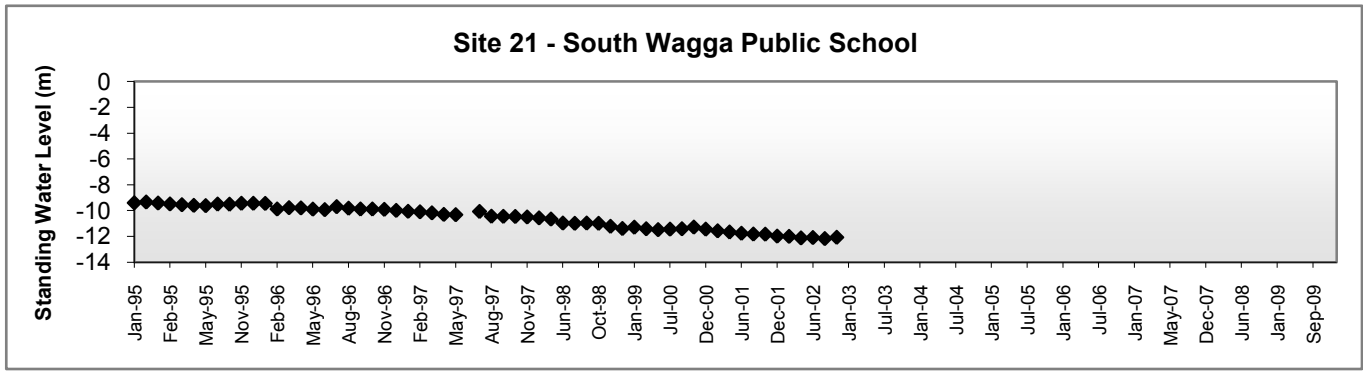

Site 16 - Emblen Park
Standing Water Level (m)
0
-4
-8
-12
-16
Jan-95
Jun-95
Apr-96
Dec-96
Jul-97
May-98
May-99
Jul-99
Sep-99
Nov-99
Nov-99
Dec-99
Feb-00
Aug-00
Apr-01
Dec-01
Oct-02
Jun-03
Jan-04
Oct-04
Jun-05
Feb-06
Nov-06
Jun-07
Feb-08
Jul-08
Nov-08
May-09
Sep-09
Jan-10
May-10

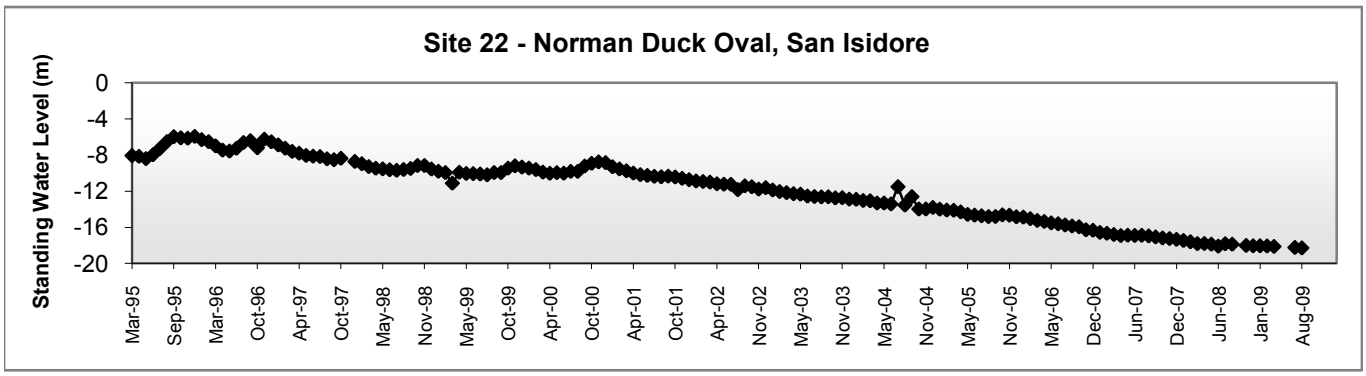

Site 17 - Best Park Reserve, Ashmont
Standing Water Level (m)
0
-2
-4
-6
-8
Jan-95
Mar-95
Sep-95
Jan-96
Jun-96
Oct-96
Feb-97
May-97
Sep-97
Jan-98
Aug-98
Feb-99
Jan-00
Aug-00
Apr-01
Dec-01
Sep-02
May-03
Jan-04
Sep-04
May-05
Jan-06
Sep-06
May-07
Oct-07
Feb-08
Jun-08
Oct-08
Feb-09
Jun-09
Oct-09
Feb-10
Jun-10

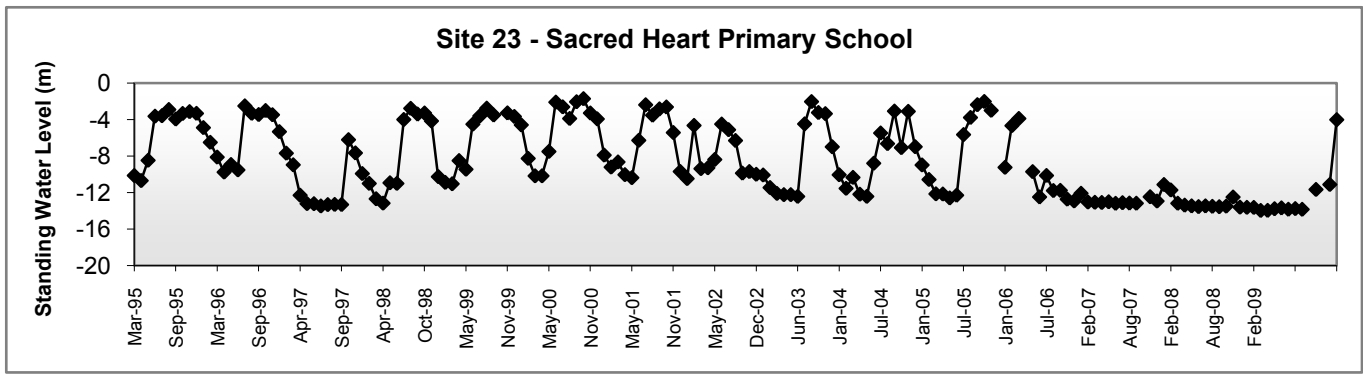

Site 18 - Nathan Park, Ashmont
Standing Water Level (m)
0
-2
-4
-6
-8
Jan-95
Apr-95
Sep-95
Feb-96
Aug-96
Jan-97
Jun-97
Nov-97
May-98
Oct-98
Apr-99
Sep-99
Feb-00
Jul-00
Dec-00
May-01
Oct-01
Mar-02
Sep-02
Feb-03
Jul-03
Jan-04
May-04
Oct-04
Mar-05
Aug-05
Jan-06
Jun-06
Dec-06
May-07
Oct-07
Mar-08
Aug-08
Jan-09
Jun-09
Nov-09
Apr-10

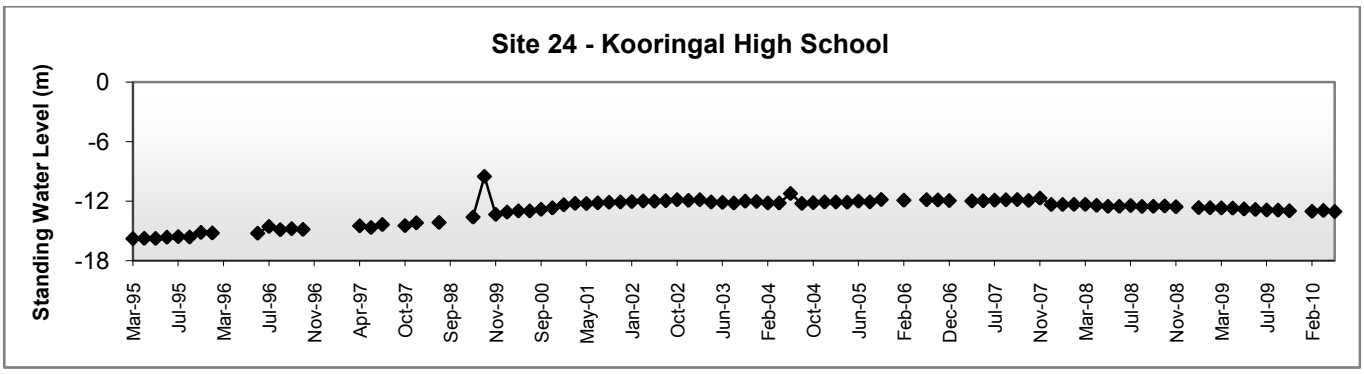

Site 19 - Turvey Park Public School, Mair Street
Standing Water Level (m)
0
-6
-12
-18
Jan-95
Apr-95
Oct-95
Feb-96
Jul-96
Dec-96
May-97
Oct-97
Apr-98
Sep-98
Mar-99
Nov-99
Apr-00
Sep-00
Feb-01
Jul-01
Dec-01
May-02
Nov-02
Apr-03
Sep-03
Feb-04
Apr-05
Oct-05
Mar-06
Aug-06
Feb-07
Jul-07
May-08
27-Apr-09

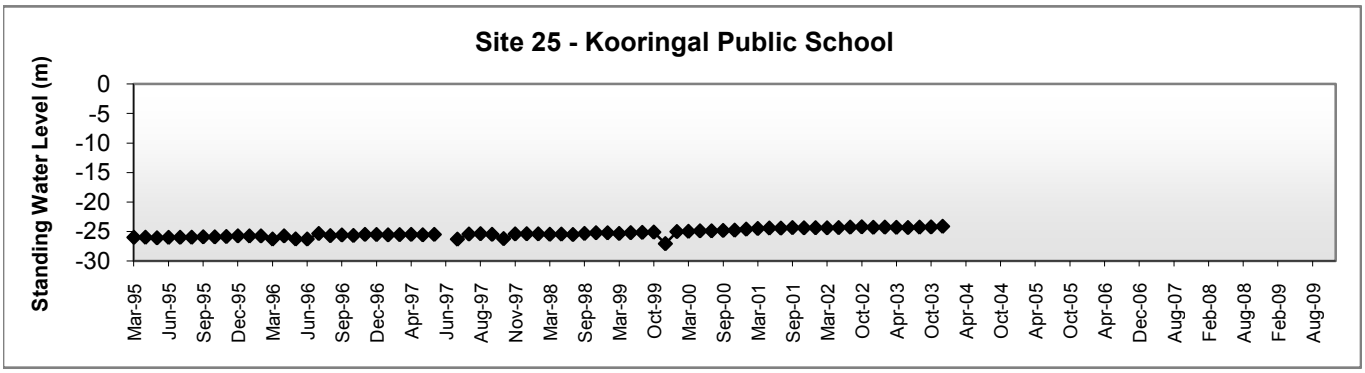

Site 20 - Kildare Catholic College, Kildare Street
Standing Water Level (m)
0
-5
-10
-15
Jan-95
Apr-95
Sep-95
Mar-96
Sep-96
Feb-97
Jul-97
Dec-97
Jun-98
Nov-98
May-99
Nov-99
Apr-00
Sep-00
Feb-01
Jul-01
Dec-01
May-02
Nov-02
Apr-03
Sep-03
Feb-04
Jul-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Jul-07
May-08
Apr-09
Feb-10

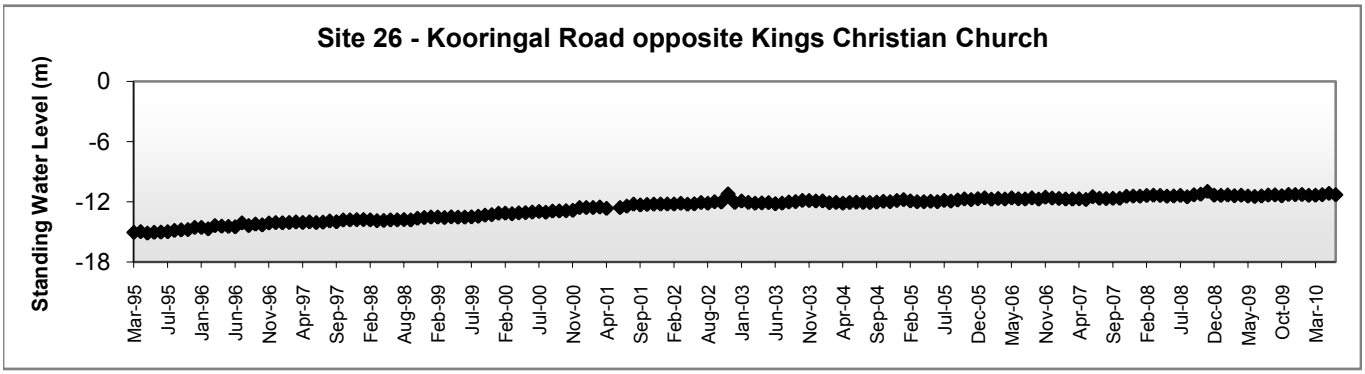

Site 21 - South Wagga Public School
Standing Water Level (m)
0
-2
-4
-6
-8
-10
-12
-14
Jan-95
Feb-95
May-95
Nov-95
Feb-96
May-96
Aug-96
Nov-96
Feb-97
May-97
Aug-97
Nov-97
Jun-98
Oct-98
Jan-99
Jul-00
Dec-00
Jun-01
Dec-01
Jun-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
May-07
Dec-07
Jun-08
Jan-09
Sep-09


Site 22 - Norman Duck Oval, San Isidore
Standing Water Level (m)
0
-4
-8
-12
-16
-20
Mar-95
Sep-95
Mar-96
Oct-96
Apr-97
Oct-97
May-98
Nov-98
May-99
Oct-99
Apr-00
Oct-00
Apr-01
Oct-01
Apr-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Dec-06
Jun-07
Dec-07
Jun-08
Jan-09
Aug-09


Site 23 - Sacred Heart Primary School
Standing Water Level (m)
0
-4
-8
-12
-16
-20
Mar-95
Sep-95
Mar-96
Sep-96
Apr-97
Sep-97
Apr-98
Oct-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Dec-02
Jun-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Feb-07
Aug-07
Feb-08
Aug-08
Feb-09


Site 24 - Kooringal High School
Standing Water Level (m)
0
-6
-12
-18
Mar-95
Jul-95
Mar-96
Jul-96
Nov-96
Apr-97
Oct-97
Sep-98
Nov-99
Sep-00
May-01
Jan-02
Oct-02
Jun-03
Feb-04
Oct-04
Jun-05
Feb-06
Dec-06
Jul-07
Nov-07
Mar-08
Jul-08
Nov-08
Mar-09
Jul-09
Feb-10


Site 25 - Kooringal Public School
Standing Water Level (m)
0
-5
-10
-15
-20
-25
-30
Mar-95
Jun-95
Sep-95
Dec-95
Mar-96
Jun-96
Sep-96
Dec-96
Apr-97
Jun-97
Aug-97
Nov-97
Mar-98
Sep-98
Mar-99
Oct-99
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Oct-02
Apr-03
Oct-03
Apr-04
Oct-04
Apr-05
Oct-05
Apr-06
Dec-06
Aug-07
Feb-08
Aug-08
Feb-09
Aug-09


Site 26 - Kooringal Road opposite Kings Christian Church
Standing Water Level (m)
0
-6
-12
-18
Mar-95
Jul-95
Jan-96
Jun-96
Nov-96
Apr-97
Sep-97
Feb-98
Aug-98
Feb-99
Jul-99
Feb-00
Jul-00
Nov-00
Apr-01
Sep-01
Feb-02
Aug-02
Jan-03
Jun-03
Nov-03
Apr-04
Sep-04
Feb-05
Jul-05
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Nov-06
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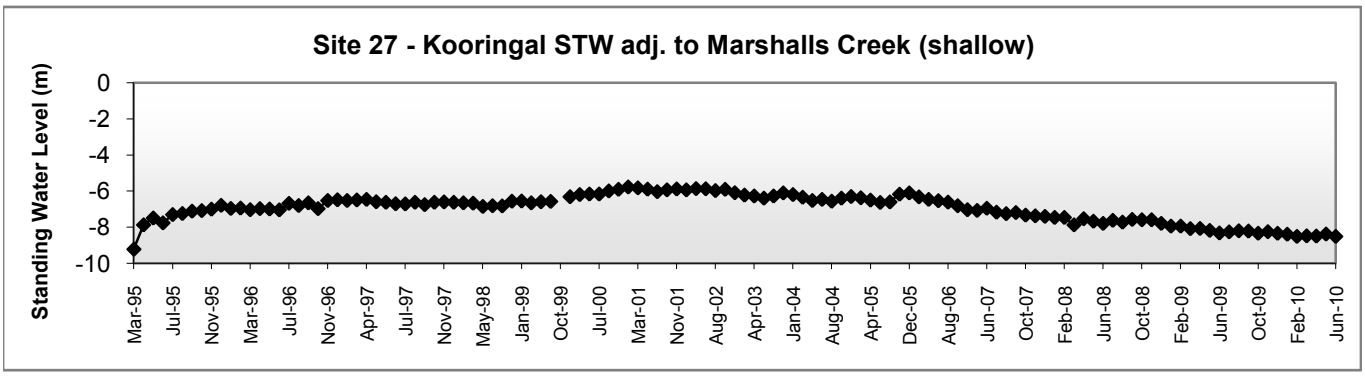
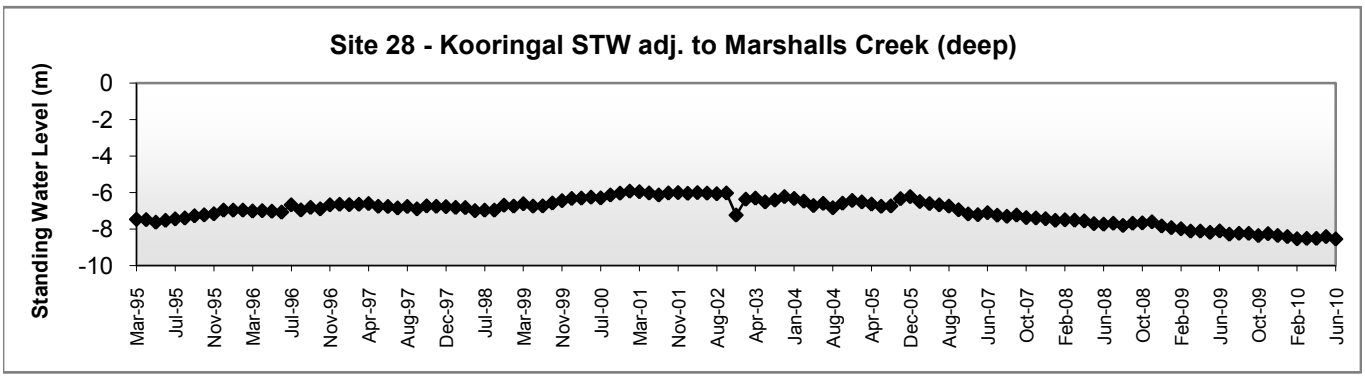
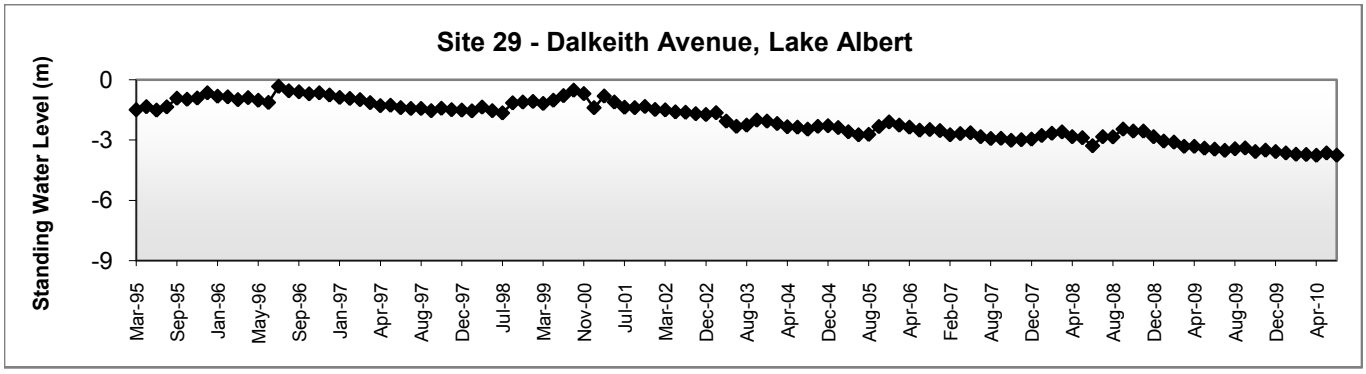
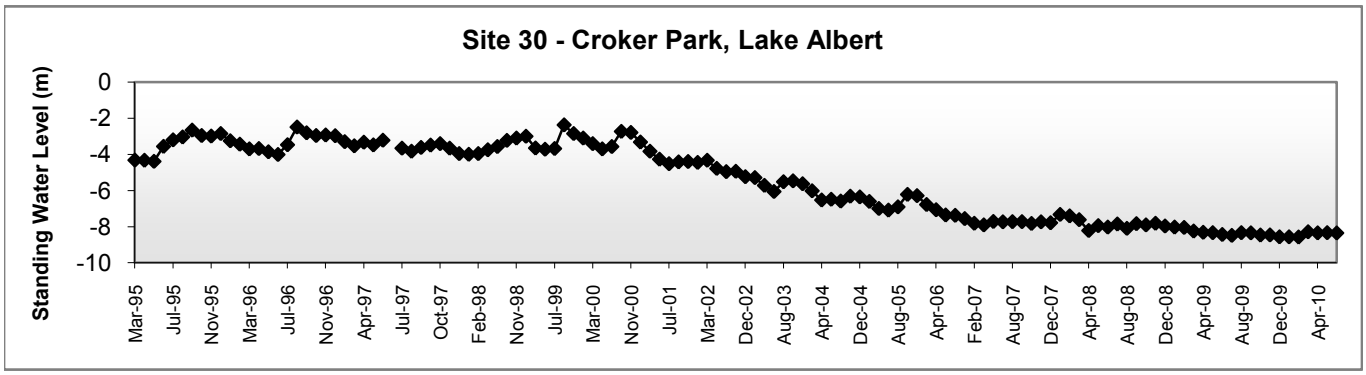
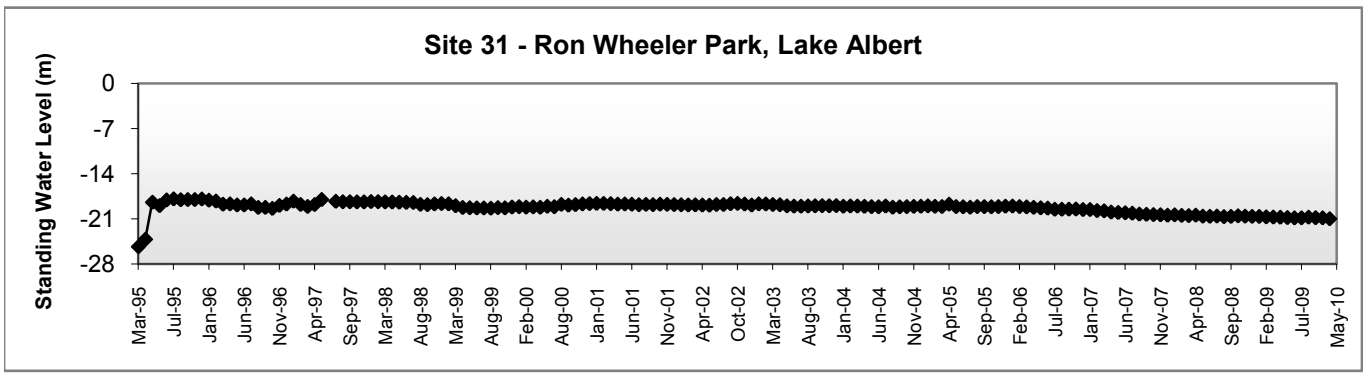
Feb-08
Jul-08
Dec-08
May-09
Oct-09
Mar-10

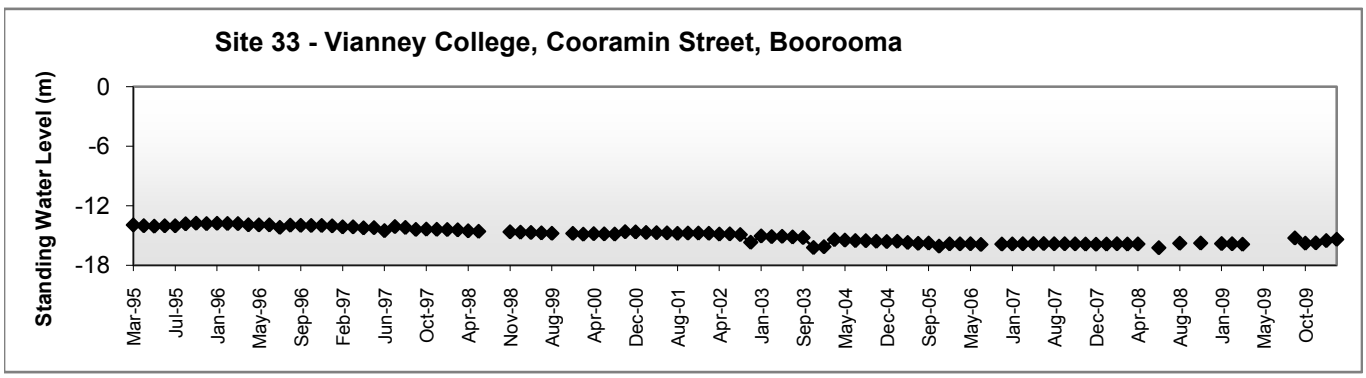

Site 27 - Kooringal STW adj. to Marshalls Creek (shallow)
Standing Water Level (m)
0
-2
-4
-6
-8
-10
Mar-95
Jul-95
Nov-95
Mar-96
Jul-96
Nov-96
Apr-97
Jul-97
Nov-97
May-98
Jan-99
Oct-99
Jul-00
Mar-01
Nov-01
Aug-02
Apr-03
Jan-04
Aug-04
Apr-05
Dec-05
Aug-06
Jun-07
Oct-07
Feb-08
Jun-08
Oct-08
Feb-09
Jun-09
Oct-09
Feb-10
Jun-10

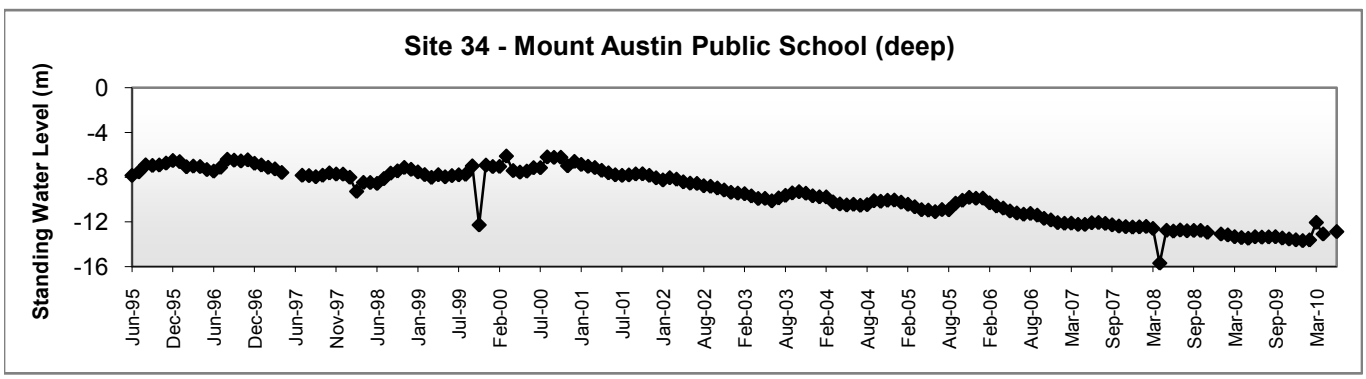

Site 28 - Kooringal STW adj. to Marshalls Creek (deep)
Standing Water Level (m)
0
-2
-4
-6
-8
-10
Mar-95
Jul-95
Nov-95
Mar-96
Jul-96
Nov-96
Apr-97
Aug-97
Dec-97
Jul-98
Mar-99
Nov-99
Jul-00
Mar-01
Nov-01
Aug-02
Apr-03
Jan-04
Aug-04
Apr-05
Dec-05
Aug-06
Jun-07
Oct-07
Feb-08
Jun-08
Oct-08
Feb-09
Jun-09
Oct-09
Feb-10
Jun-10

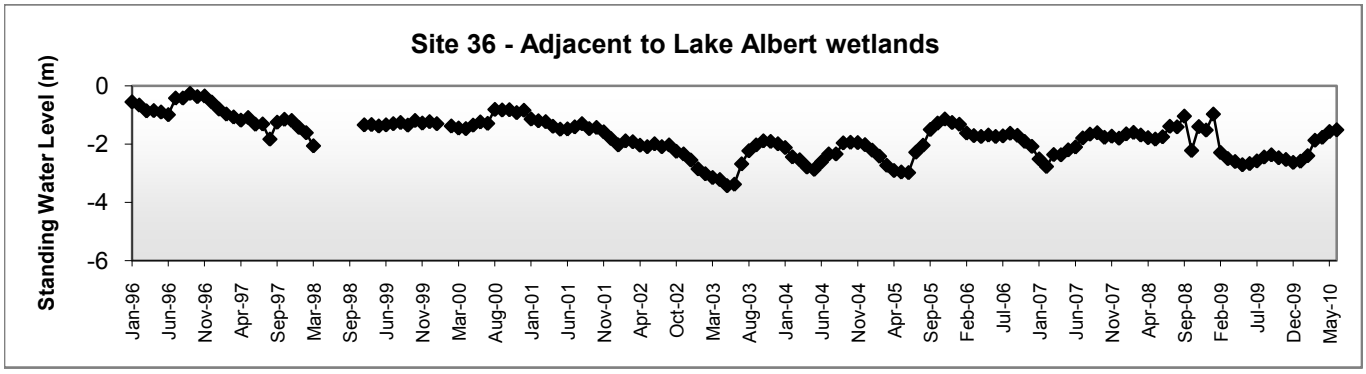

Site 29 - Dalkeith Avenue, Lake Albert
Standing Water Level (m)
0
-3
-6
-9
Mar-95
Sep-95
Jan-96
May-96
Sep-96
Jan-97
Apr-97
Aug-97
Dec-97
Jul-98
Mar-99
Nov-00
Jul-01
Mar-02
Dec-02
Aug-03
Apr-04
Dec-04
Aug-05
Apr-06
Feb-07
Aug-07
Dec-07
Apr-08
Aug-08
Dec-08
Apr-09
Aug-09
Dec-09
Apr-10

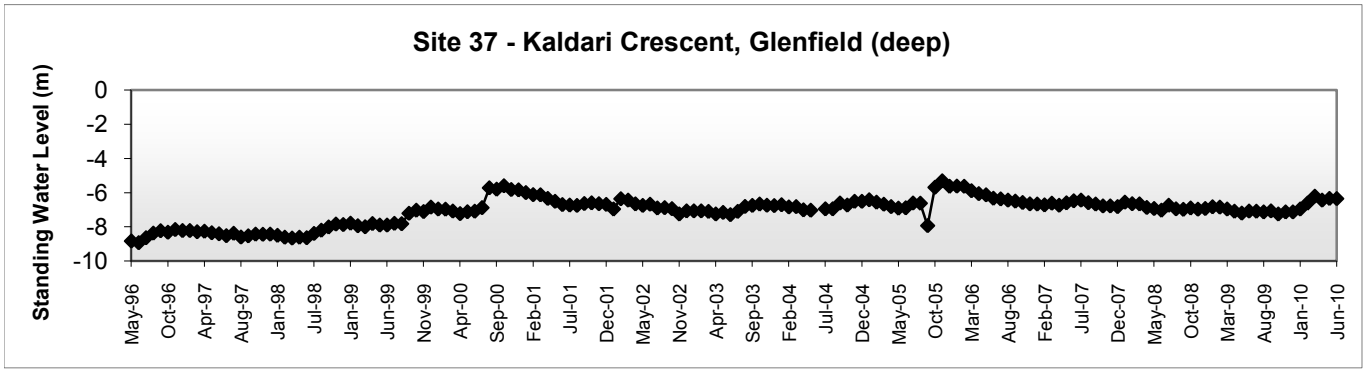

Site 30 - Croker Park, Lake Albert
Standing Water Level (m)
0
-2
-4
-6
-8
-10
Mar-95
Jul-95
Nov-95
Mar-96
Jul-96
Nov-96
Apr-97
Jul-97
Oct-97
Feb-98
Nov-98
Jul-99
Mar-00
Nov-00
Jul-01
Mar-02
Dec-02
Aug-03
Apr-04
Dec-04
Aug-05
Apr-06
Feb-07
Aug-07
Dec-07
Apr-08
Aug-08
Dec-08
Apr-09
Aug-09
Dec-09
Apr-10

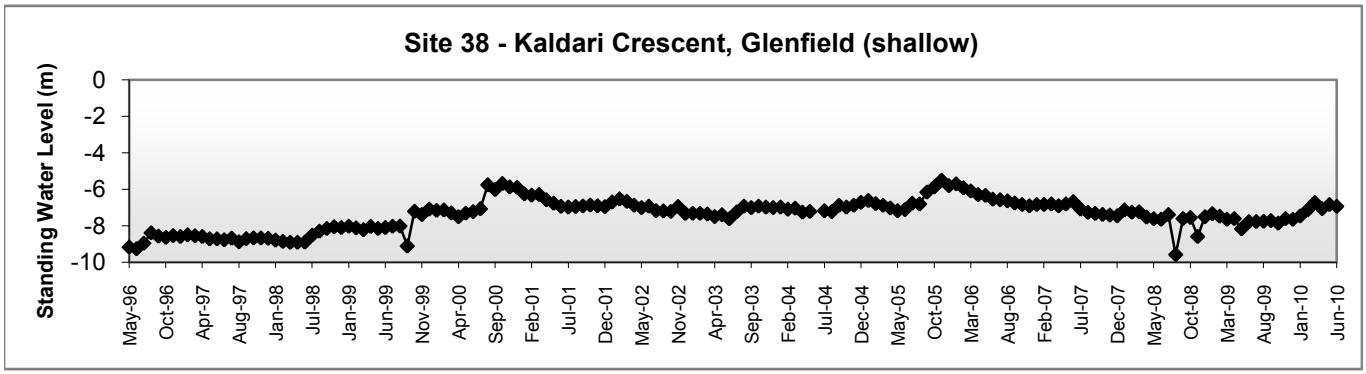

Site 31 - Ron Wheeler Park, Lake Albert
Standing Water Level (m)
0
-7
-14
-21
-28
Mar-95
Jul-95
Jan-96
Jun-96
Nov-96
Apr-97
Sep-97
Mar-98
Aug-98
Mar-99
Aug-99
Feb-00
Aug-00
Jan-01
Jun-01
Nov-01
Apr-02
Oct-02
Mar-03
Aug-03
Jan-04
Jun-04
Nov-04
Apr-05
Sep-05
Feb-06
Jul-06
Jan-07
Jun-07
Nov-07
Apr-08
Sep-08
Feb-09
Jul-09
May-10

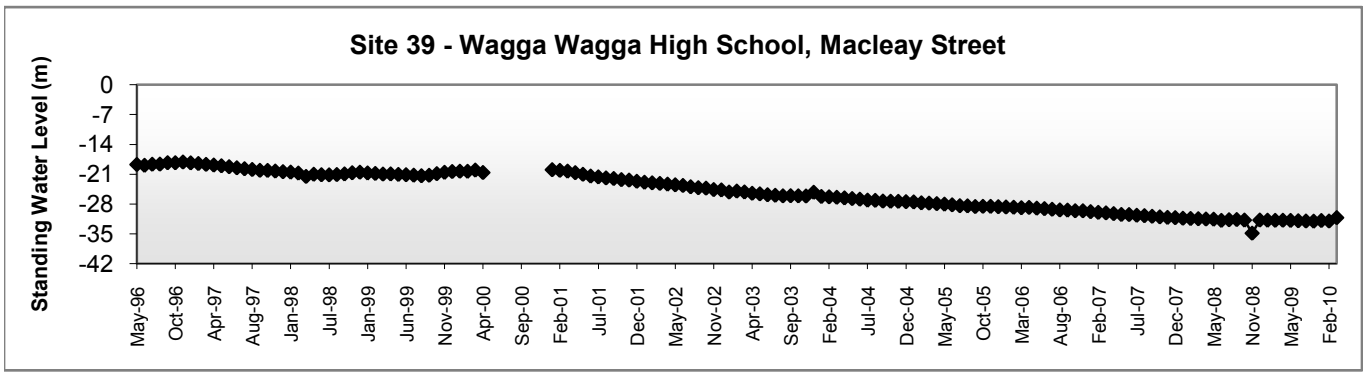

Site 33 - Vianney College, Cooramin Street, Boorooma
Standing Water Level (m)
0
-6
-12
-18
Mar-95
Jul-95
Jan-96
May-96
Sep-96
Feb-97
Jun-97
Oct-97
Apr-98
Nov-98
Aug-99
Apr-00
Dec-00
Aug-01
Apr-02
Jan-03
Sep-03
May-04
Dec-04
Sep-05
May-06
Jan-07
Aug-07
Dec-07
Apr-08
Aug-08
Jan-09
May-09
Oct-09

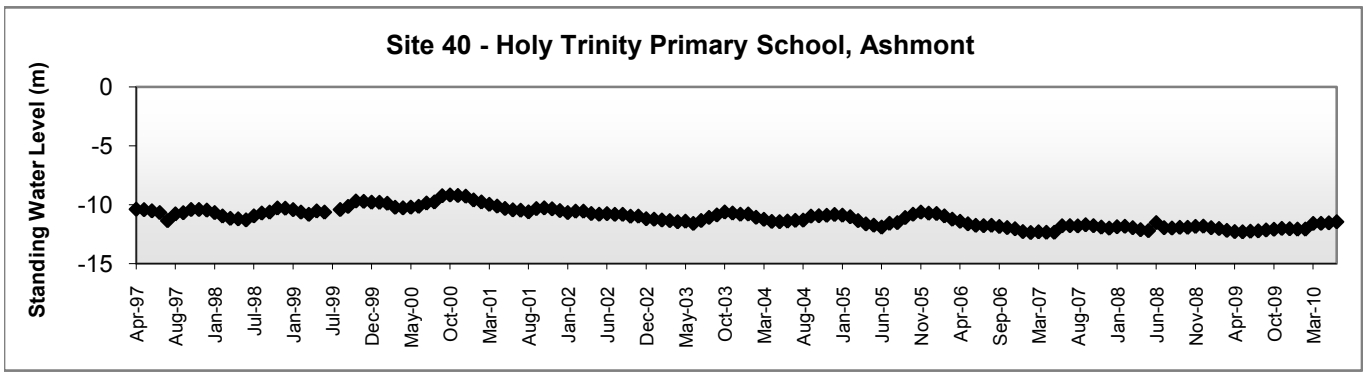

Site 34 - Mount Austin Public School (deep)
Standing Water Level (m)
0
-4
-8
-12
-16
Jun-95
Dec-95
Jun-96
Dec-96
Jun-97
Nov-97
Jun-98
Jan-99
Jul-99
Feb-00
Jul-00
Jan-01
Jul-01
Jan-02
Aug-02
Feb-03
Aug-03
Feb-04
Aug-04
Feb-05
Aug-05
Feb-06
Aug-06
Mar-07
Sep-07
Mar-08
Sep-08
Mar-09
Sep-09
Mar-10


Site 36 - Adjacent to Lake Albert wetlands
Standing Water Level (m)
0
-2
-4
-6
Jan-96
Jun-96
Nov-96
Apr-97
Sep-97
Mar-98
Sep-98
Jun-99
Nov-99
Mar-00
Aug-00
Jan-01
Jun-01
Nov-01
Apr-02
Oct-02
Mar-03
Aug-03
Jan-04
Jun-04
Nov-04
Apr-05
Sep-05
Feb-06
Jul-06
Jan-07
Jun-07
Nov-07
Apr-08
Sep-08
Feb-09
Jul-09
Dec-09
May-10


Site 37 - Kaldari Crescent, Glenfield (deep)
Standing Water Level (m)
0
-2
-4
-6
-8
-10
May-96
Oct-96
Apr-97
Aug-97
Jan-98
Jul-98
Jan-99
Jun-99
Nov-99
Apr-00
Sep-00
Feb-01
Jul-01
Dec-01
May-02
Nov-02
Apr-03
Sep-03
Feb-04
Jul-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Jul-07
Dec-07
May-08
Oct-08
Mar-09
Aug-09
Jan-10
Jun-10


Site 38 - Kaldari Crescent, Glenfield (shallow)
Standing Water Level (m)
0
-2
-4
-6
-8
-10
May-96
Oct-96
Apr-97
Aug-97
Jan-98
Jul-98
Jan-99
Jun-99
Nov-99
Apr-00
Sep-00
Feb-01
Jul-01
Dec-01
May-02
Nov-02
Apr-03
Sep-03
Feb-04
Jul-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Jul-07
Dec-07
May-08
Oct-08
Mar-09
Aug-09
Jan-10
Jun-10


Site 39 - Wagga Wagga High School, Macleay Street
Standing Water Level (m)
0
-7
-14
-21
-28
-35
-42
May-96
Oct-96
Apr-97
Aug-97
Jan-98
Jul-98
Jan-99
Jun-99
Nov-99
Apr-00
Sep-00
Feb-01
Jul-01
Dec-01
May-02
Nov-02
Apr-03
Sep-03
Feb-04
Jul-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Jul-07
Dec-07
May-08
Nov-08
May-09
Feb-10


Site 40 - Holy Trinity Primary School, Ashmont
Standing Water Level (m)
0
-5
-10
-15
Apr-97
Aug-97
Jan-98
Jul-98
Jan-99
Jul-99
Dec-99
May-00
Oct-00
Mar-01
Aug-01
Jan-02
Jun-02
Dec-02
May-03
Oct-03
Mar-04
Aug-04
Jan-05
Jun-05
Nov-05
Apr-06
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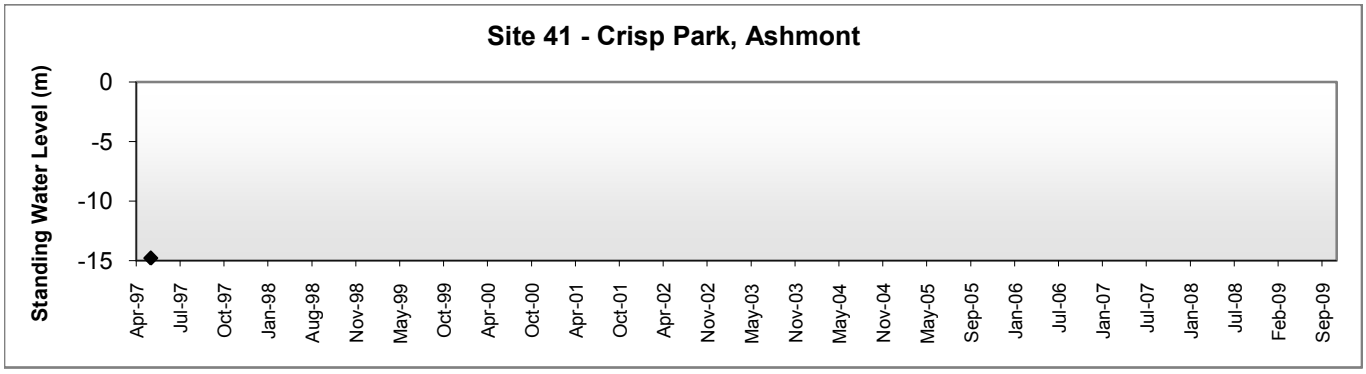
Mar-07
Aug-07
Jan-08
Jun-08
Nov-08
Apr-09
Oct-09
Mar-10


Site 41 - Crisp Park, Ashmont
Standing Water Level (m)
0
-5
-10
-15
Apr-97
Jul-97
Oct-97
Jan-98
Aug-98
Nov-98
May-99
Oct-99
Apr-00
Oct-00
Apr-01
Oct-01
Apr-02
Nov-02
May-03
Nov-03
May-04
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May-05
Sep-05
Jan-06
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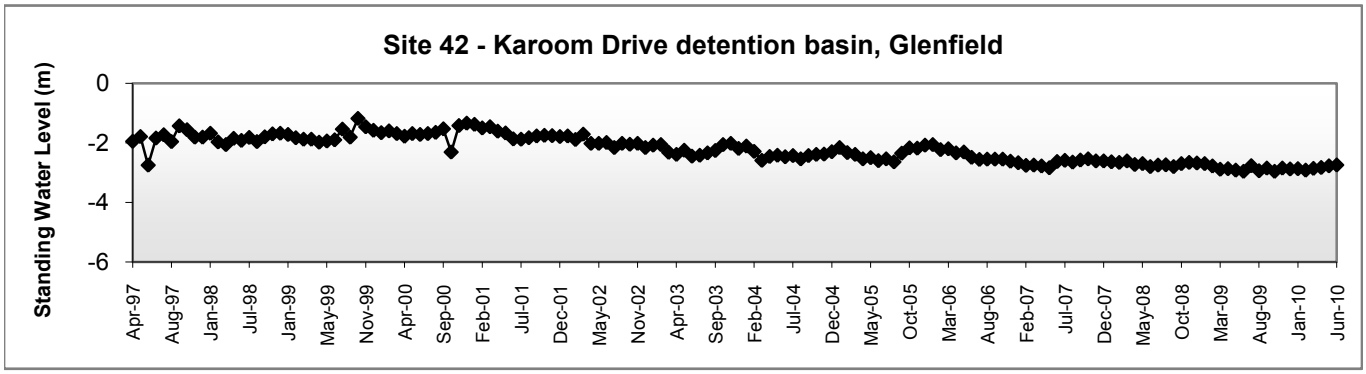
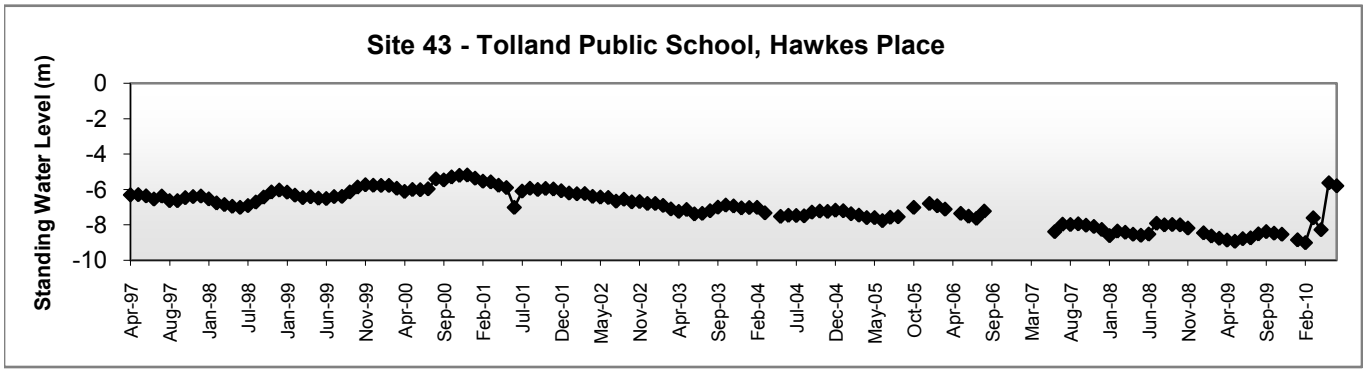
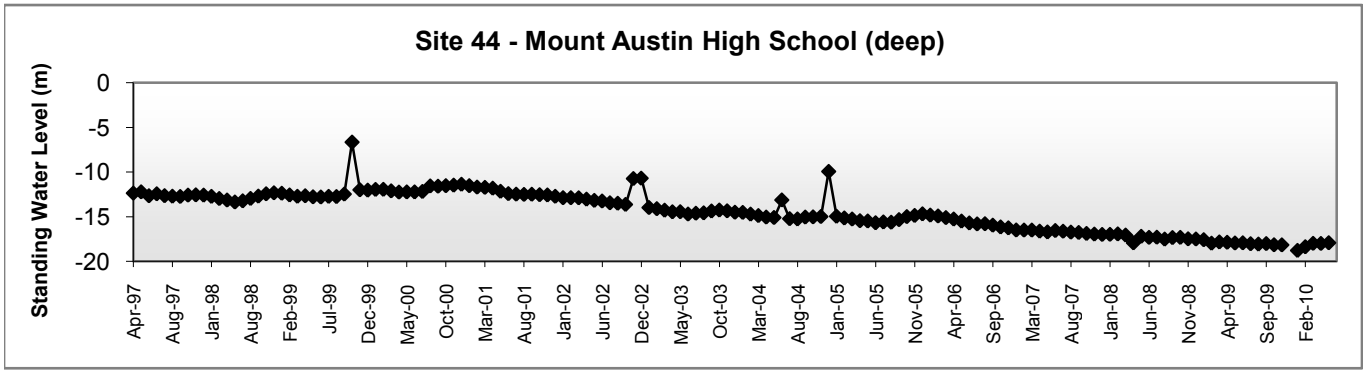
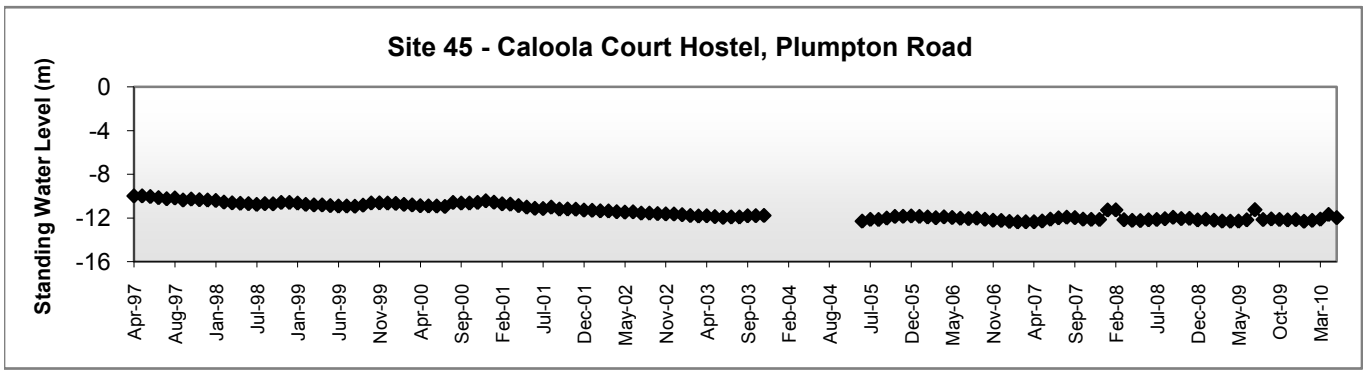
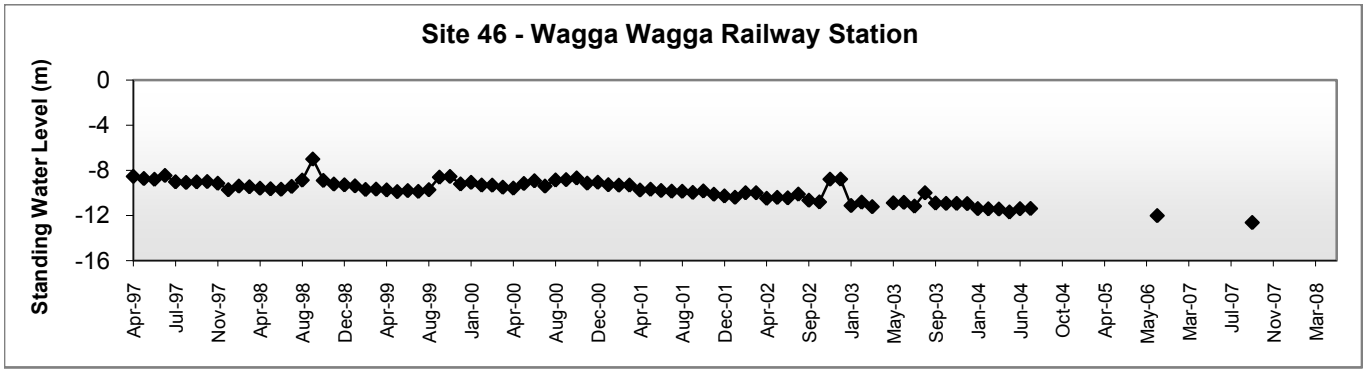
Jan-07
Jul-07
Jan-08
Jul-08
Feb-09
Sep-09

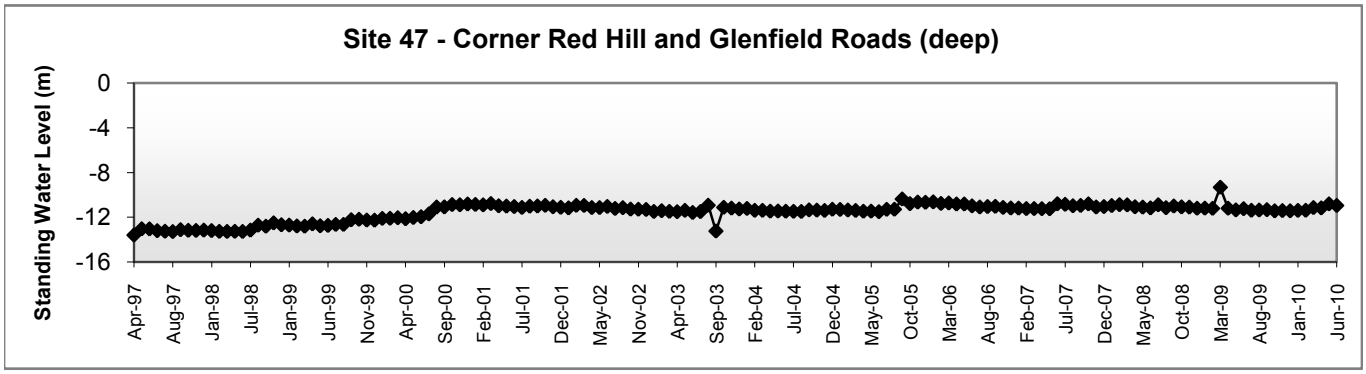

Site 42 - Karoom Drive detention basin, Glenfield
Standing Water Level (m)
0
-2
-4
-6
Apr-97
Aug-97
Jan-98
Jul-98
Jan-99
May-99
Nov-99
Apr-00
Sep-00
Feb-01
Jul-01
Dec-01
May-02
Nov-02
Apr-03
Sep-03
Feb-04
Jul-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Jul-07
Dec-07
May-08
Oct-08
Mar-09
Aug-09
Jan-10
Jun-10

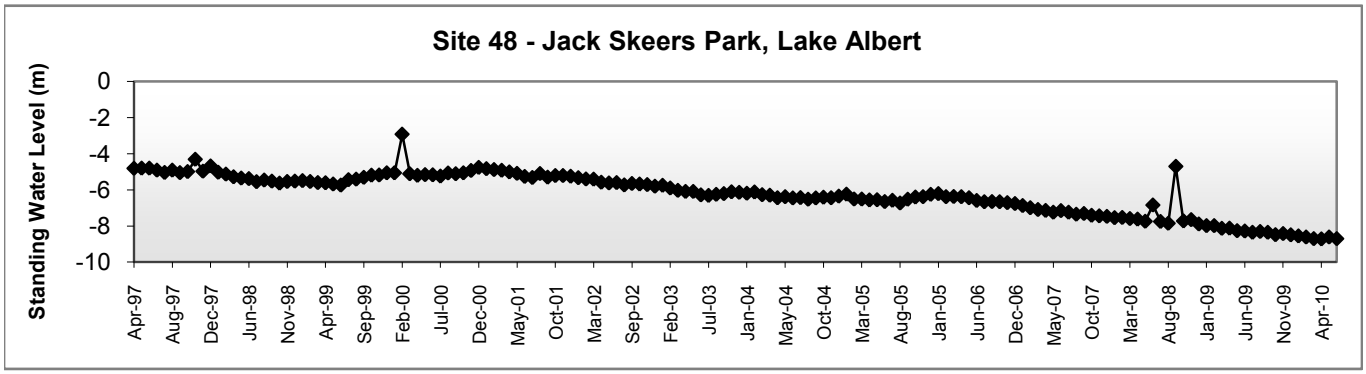

Site 43 - Tolland Public School, Hawkes Place
Standing Water Level (m)
0
-2
-4
-6
-8
-10
Apr-97
Aug-97
Jan-98
Jul-98
Jan-99
Jun-99
Nov-99
Apr-00
Sep-00
Feb-01
Jul-01
Dec-01
May-02
Nov-02
Apr-03
Sep-03
Feb-04
Jul-04
Dec-04
May-05
Oct-05
Apr-06
Sep-06
Mar-07
Aug-07
Jan-08
Jun-08
Nov-08
Apr-09
Sep-09
Feb-10

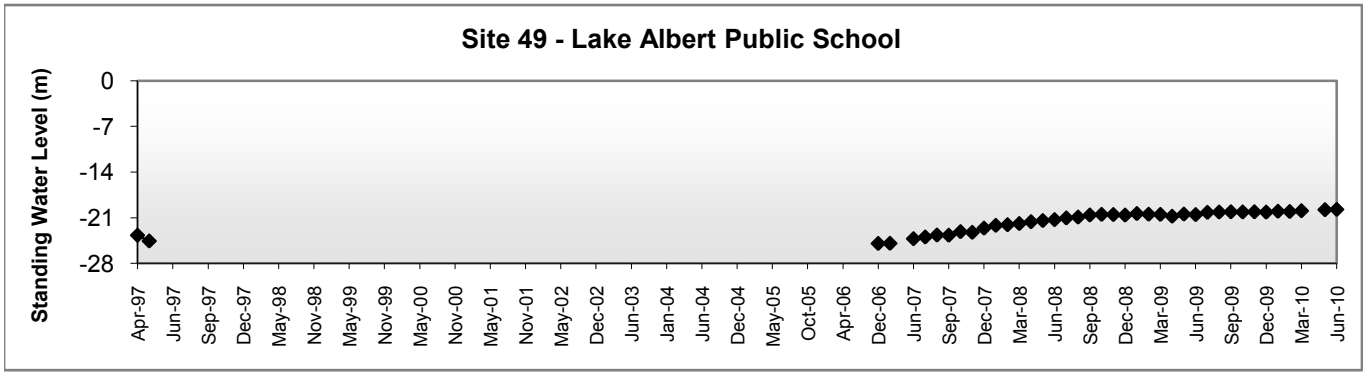

Site 44 - Mount Austin High School (deep)
Standing Water Level (m)
0
-5
-10
-15
-20
Apr-97
Aug-97
Jan-98
Aug-98
Feb-99
Jul-99
Dec-99
May-00
Oct-00
Mar-01
Aug-01
Jan-02
Jun-02
Dec-02
May-03
Oct-03
Mar-04
Aug-04
Jan-05
Jun-05
Nov-05
Apr-06
Sep-06
Mar-07
Aug-07
Jan-08
Jun-08
Nov-08
Apr-09
Sep-09
Feb-10

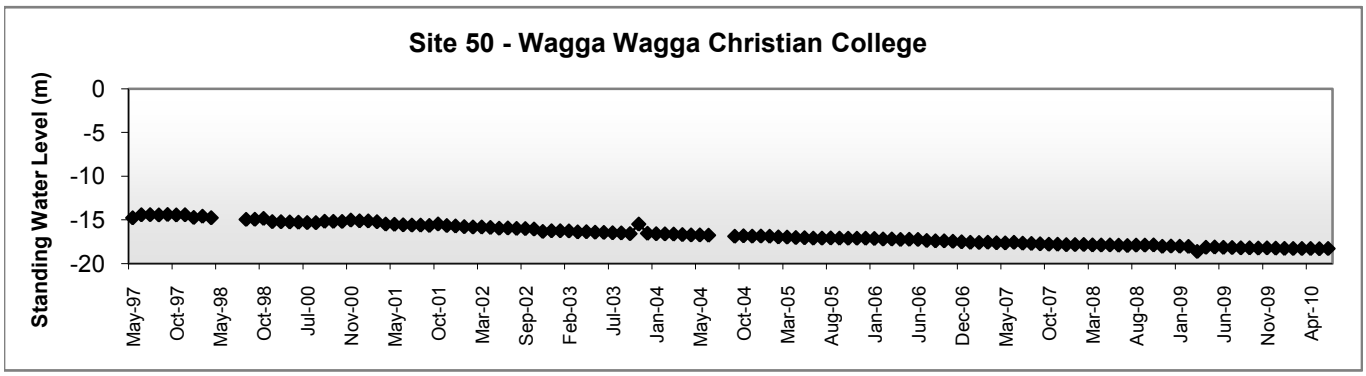

Site 45 - Caloola Court Hostel, Plumpton Road
Standing Water Level (m)
0
-4
-8
-12
-16
Apr-97
Aug-97
Jan-98
Jul-98
Jan-99
Jun-99
Nov-99
Apr-00
Sep-00
Feb-01
Jul-01
Dec-01
May-02
Nov-02
Apr-03
Sep-03
Feb-04
Aug-04
Jul-05
Dec-05
May-06
Nov-06
Apr-07
Sep-07
Feb-08
Jul-08
Dec-08
May-09
Oct-09
Mar-10

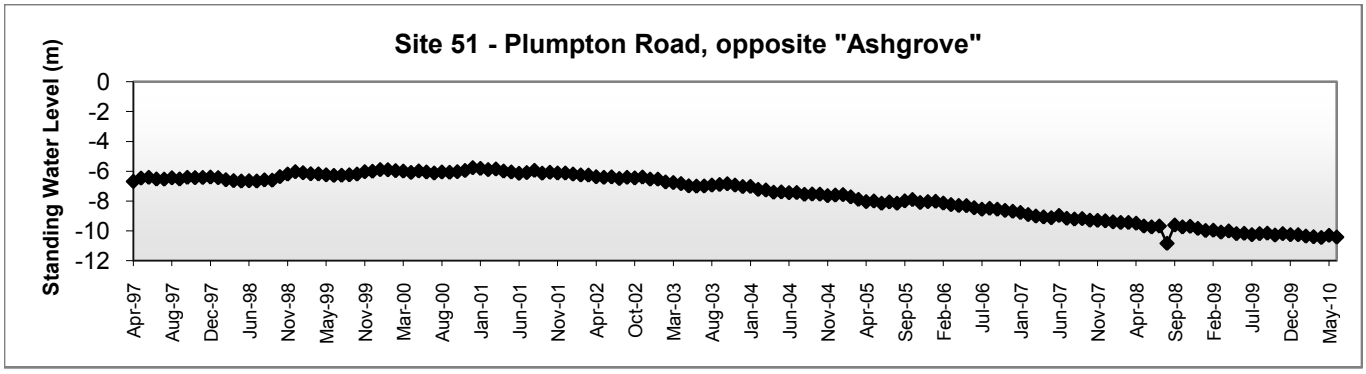

Site 46 - Wagga Wagga Railway Station
Standing Water Level (m)
0
-4
-8
-12
-16
Apr-97
Jul-97
Nov-97
Apr-98
Aug-98
Dec-98
Apr-99
Aug-99
Jan-00
Apr-00
Aug-00
Dec-00
Apr-01
Aug-01
Dec-01
Apr-02
Sep-02
Jan-03
May-03
Sep-03
Jan-04
Jun-04
Oct-04
Apr-05
May-06
Mar-07
Jul-07
Nov-07
Mar-08

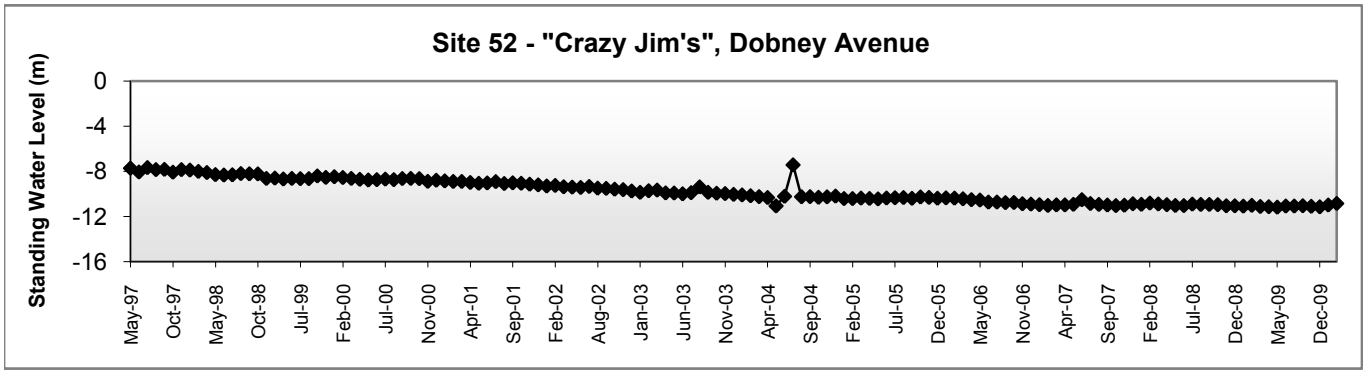

Site 47 - Corner Red Hill and Glenfield Roads (deep)
Standing Water Level (m)
0
-4
-8
-12
-16
Apr-97
Aug-97
Jan-98
Jul-98
Jan-99
Jun-99
Nov-99
Apr-00
Sep-00
Feb-01
Jul-01
Dec-01
May-02
Nov-02
Apr-03
Sep-03
Feb-04
Jul-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Jul-07
Dec-07
May-08
Oct-08
Mar-09
Aug-09
Jan-10
Jun-10


Site 48 - Jack Skeers Park, Lake Albert
Standing Water Level (m)
0
-2
-4
-6
-8
-10
Apr-97
Aug-97
Dec-97
Jun-98
Nov-98
Apr-99
Sep-99
Feb-00
Jul-00
Dec-00
May-01
Oct-01
Mar-02
Sep-02
Feb-03
Jul-03
Jan-04
May-04
Oct-04
Mar-05
Aug-05
Jan-05
Jun-06
Dec-06
May-07
Oct-07
Mar-08
Aug-08
Jan-09
Jun-09
Nov-09
Apr-10


Site 49 - Lake Albert Public School
Standing Water Level (m)
0
-7
-14
-21
-28
Apr-97
Jun-97
Sep-97
Dec-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Dec-02
Jun-03
Jan-04
Jun-04
Dec-04
May-05
Oct-05
Apr-06
Dec-06
Jun-07
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10


Site 50 - Wagga Wagga Christian College
Standing Water Level (m)
0
-5
-10
-15
-20
May-97
Oct-97
May-98
Oct-98
Jul-00
Nov-00
May-01
Oct-01
Mar-02
Sep-02
Feb-03
Jul-03
Jan-04
May-04
Oct-04
Mar-05
Aug-05
Jan-06
Jun-06
Dec-06
May-07
Oct-07
Mar-08
Aug-08
Jan-09
Jun-09
Nov-09
Apr-10


Site 51 - Plumpton Road, opposite "Ashgrove"
Standing Water Level (m)
0
-2
-4
-6
-8
-10
-12
Apr-97
Aug-97
Dec-97
Jun-98
Nov-98
May-99
Nov-99
Mar-00
Aug-00
Jan-01
Jun-01
Nov-01
Apr-02
Oct-02
Mar-03
Aug-03
Jan-04
Jun-04
Nov-04
Apr-05
Sep-05
Feb-06
Jul-06
Jan-07
Jun-07
Nov-07
Apr-08
Sep-08
Feb-09
Jul-09
Dec-09
May-10


Site 52 - "Crazy Jim's", Dobney Avenue
Standing Water Level (m)
0
-4
-8
-12
-16
May-97
Oct-97
May-98
Oct-98
Jul-99
Feb-00
Jul-00
Nov-00
Apr-01
Sep-01
Feb-02
Aug-02
Jan-03
Jun-03
Nov-03
Apr-04
Sep-04
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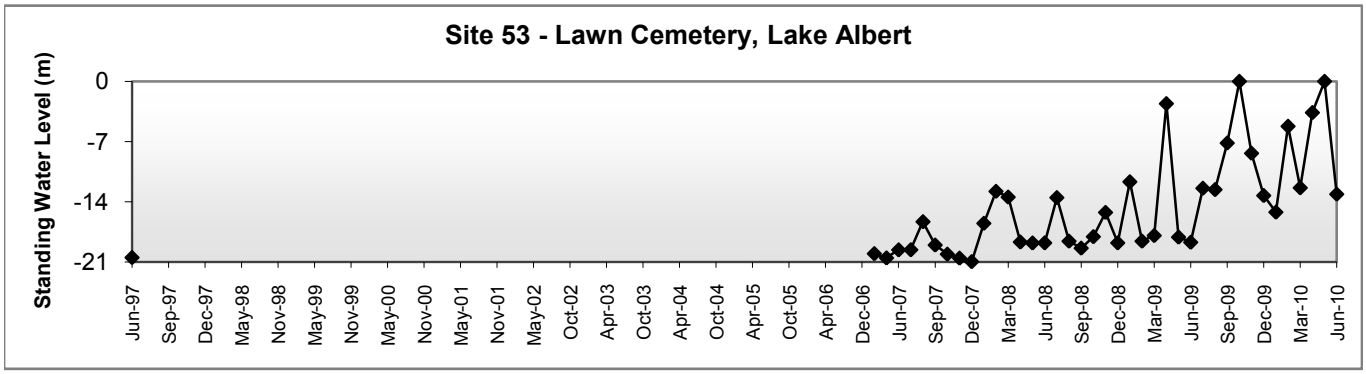
Sep-07
Feb-08
Jul-08
Dec-08
May-09
Dec-09


Site 53 - Lawn Cemetery, Lake Albert
Standing Water Level (m)
0
-7
-14
-21
Jun-97
Sep-97
Dec-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Oct-02
Apr-03
Oct-03
Apr-04
Oct-04
Apr-05
Oct-05
Apr-06
Dec-06
Jun-07
Sep-07
Dec-07
Mar-08
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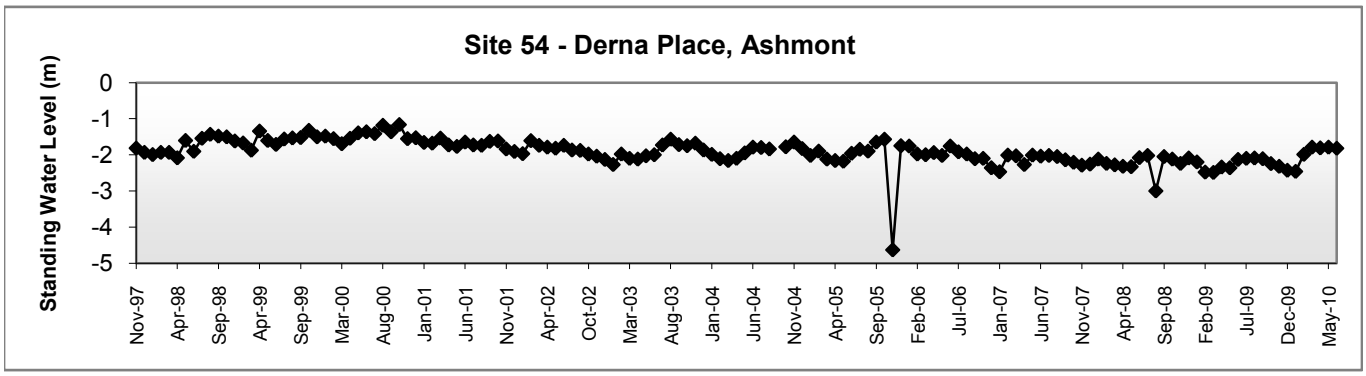
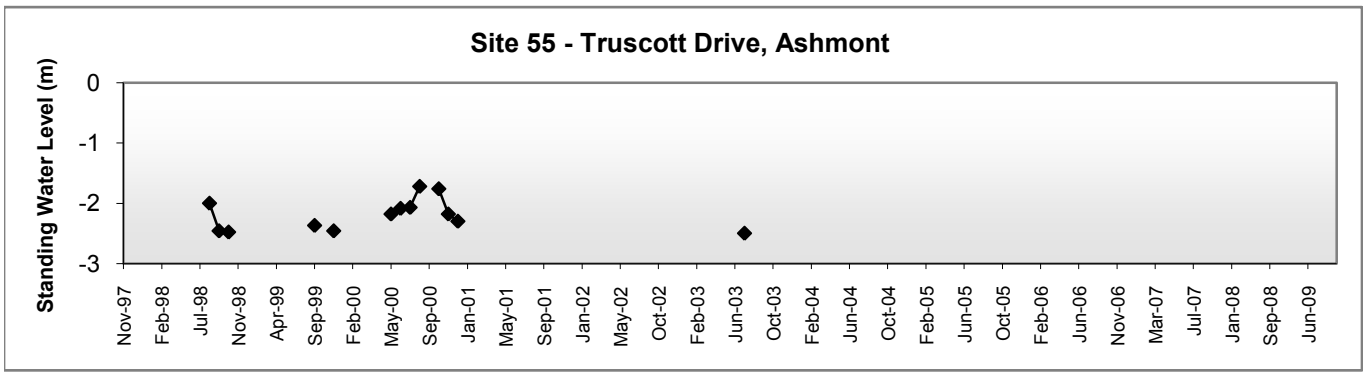
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10


Site 54 - Derna Place, Ashmont
Standing Water Level (m)
0
-1
-2
-3
-4
-5
Nov-97
Apr-98
Sep-98
Apr-99
Sep-99
Mar-00
Aug-00
Jan-01
Jun-01
Nov-01
Apr-02
Oct-02
Mar-03
Aug-03
Jan-04
Jun-04
Nov-04
Apr-05
Sep-05
Feb-06
Jul-06
Jan-07
Jun-07
Nov-07
Apr-08
Sep-08
Feb-09
Jul-09
Dec-09
May-10


Site 55 - Truscott Drive, Ashmont
Standing Water Level (m)
0
-1
-2
-3
Nov-97
Feb-98
Jul-98
Nov-98
Apr-99
Sep-99
Feb-00
May-00
Sep-00
Jan-01
May-01
Sep-01
Jan-02
May-02
Oct-02
Feb-03
Jun-03
Oct-03
Feb-04
Jun-04
Oct-04
Feb-05
Jun-05
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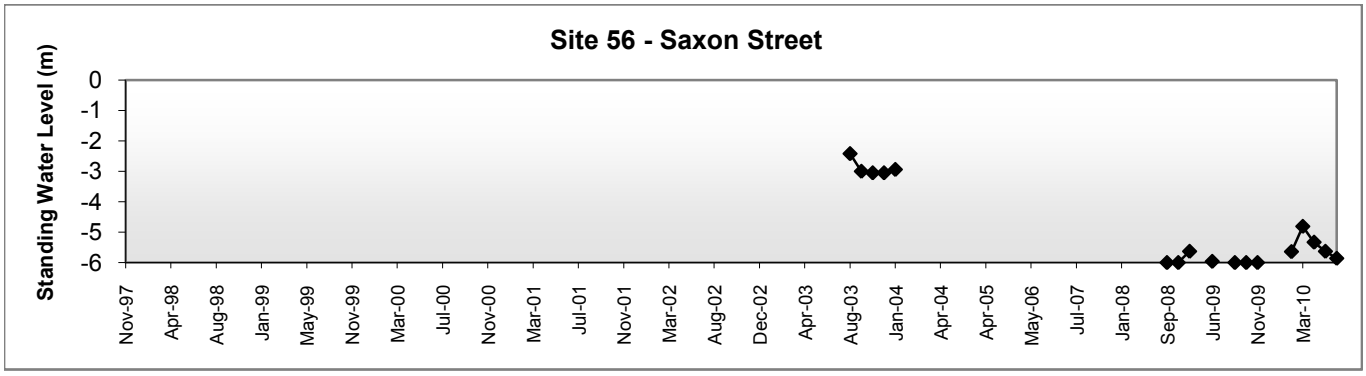
Nov-06
Mar-07
Jul-07
Jan-08
Sep-08
Jun-09


Site 56 - Saxon Street
Standing Water Level (m)
0
-1
-2
-3
-4
-5
-6
Nov-97
Apr-98
Aug-98
Jan-99
May-99
Nov-99
Mar-00
Jul-00
Nov-00
Mar-01
Jul-01
Nov-01
Mar-02
Aug-02
Dec-02
Apr-03
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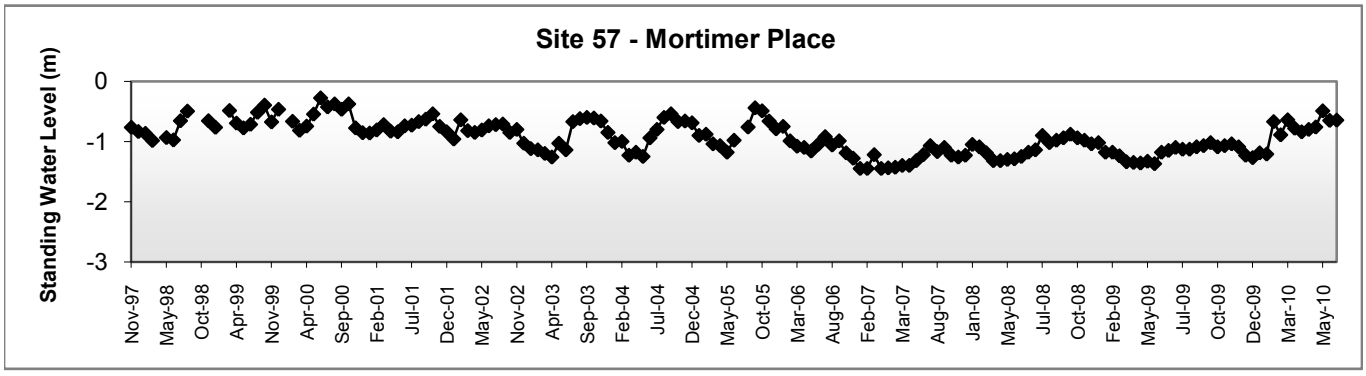
May-06
Jul-07
Jan-08
Sep-08
Jun-09
Nov-09
Mar-10


Site 57 - Mortimer Place
Standing Water Level (m)
0
-1
-2
-3
Nov-97
May-98
Oct-98
Apr-99
Nov-99
Apr-00
Sep-00
Feb-01
Jul-01
Dec-01
May-02
Nov-02
Apr-03
Sep-03
Feb-04
Jul-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Mar-07
Aug-07
Jan-08
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Jul-08
Oct-08
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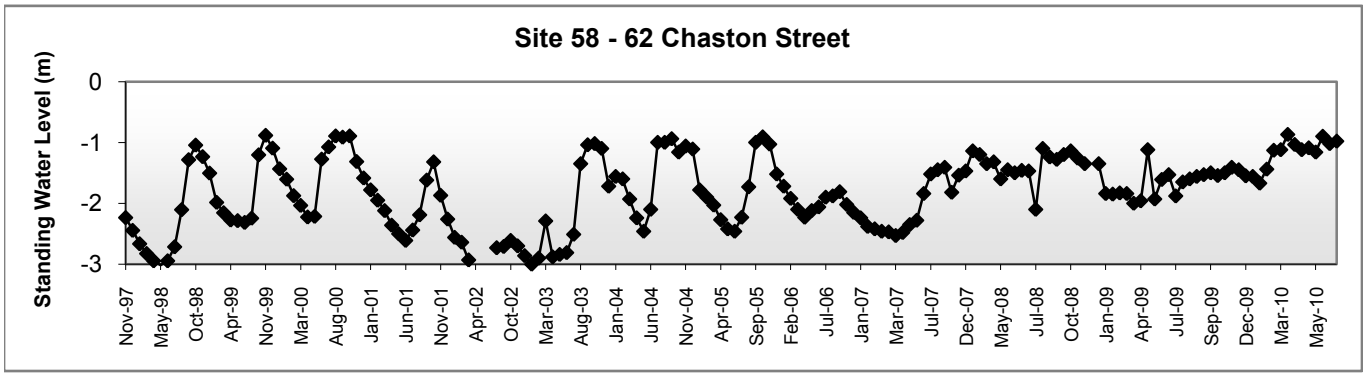
May-09
Jul-09
Oct-09
Dec-09
Mar-10
May-10


Site 58 - 62 Chaston Street
Standing Water Level (m)
0
-1
-2
-3
Nov-97
May-98
Oct-98
Apr-99
Nov-99
Mar-00
Aug-00
Jan-01
Jun-01
Nov-01
Apr-02
Oct-02
Mar-03
Aug-03
Jan-04
Jun-04
Nov-04
Apr-05
Sep-05
Feb-06
Jul-06
Jan-07
Mar-07
Jul-07
Dec-07
May-08
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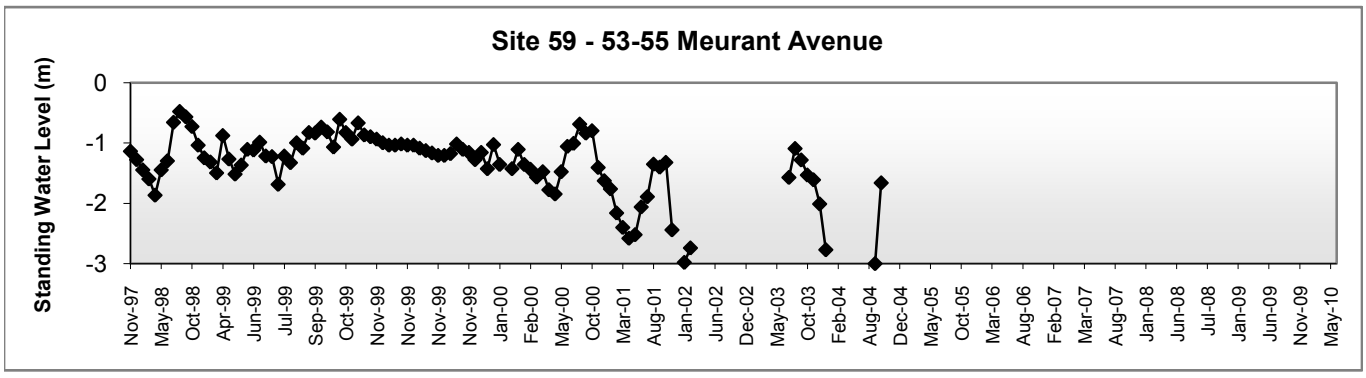
Jan-09
Apr-09
Jul-09
Sep-09
Dec-09
Mar-10
May-10


Site 59 - 53-55 Meurant Avenue
Standing Water Level (m)
0
-1
-2
-3
Nov-97
May-98
Oct-98
Apr-99
Jun-99
Jul-99
Sep-99
Oct-99
Nov-99
Nov-99
Nov-99
Nov-99
Jan-00
Feb-00
May-00
Oct-00
Mar-01
Aug-01
Jan-02
Jun-02
Dec-02
May-03
Oct-03
Feb-04
Aug-04
Dec-04
May-05
Oct-05
Mar-06
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Aug-07
Jan-08
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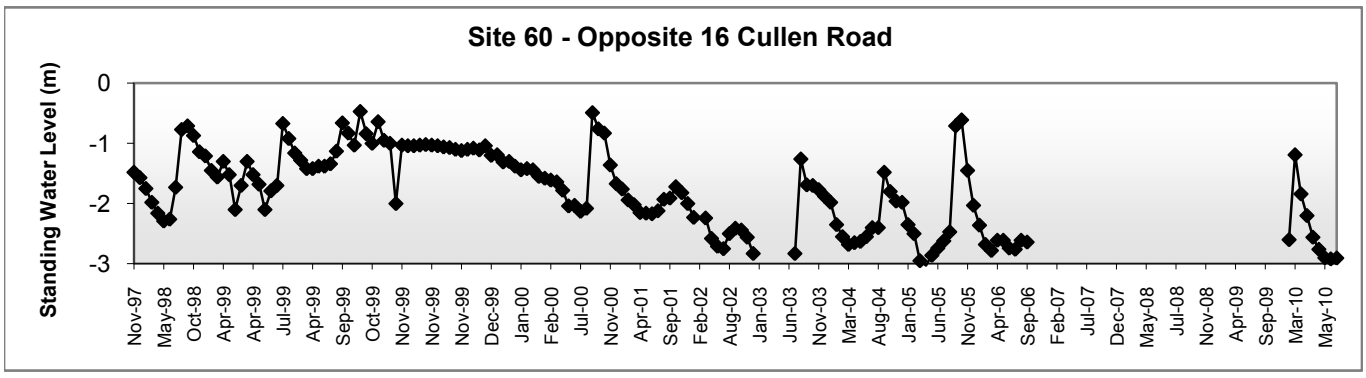
Jul-08
Jan-09
Jun-09
Nov-09
May-10


Site 60 - Opposite 16 Cullen Road
Standing Water Level (m)
0
-1
-2
-3
Nov-97
May-98
Oct-98
Apr-99
Apr-99
Jul-99
Apr-99
Sep-99
Oct-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Feb-00
Jul-00
Nov-00
Apr-01
Sep-01
Feb-02
Aug-02
Jan-03
Jun-03
Nov-03
Mar-04
Aug-04
Jan-05
Jun-05
Nov-05
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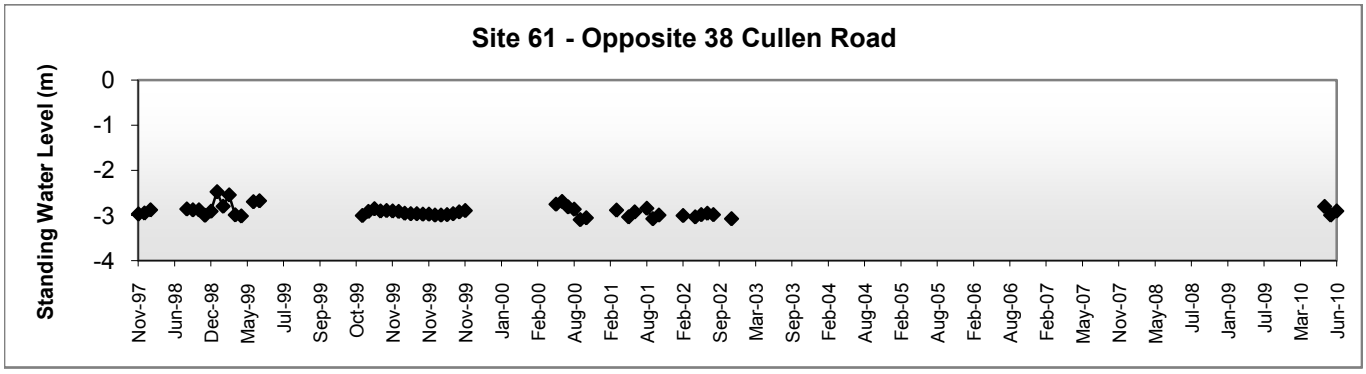
Jul-08
Nov-08
Apr-09
Sep-09
Mar-10
May-10


Site 61 - Opposite 38 Cullen Road
Standing Water Level (m)
0
-1
-2
-3
-4
Nov-97
Jun-98
Dec-98
May-99
Jul-99
Sep-99
Oct-99
Nov-99
Nov-99
Nov-99
Jan-00
Feb-00
Aug-00
Feb-01
Aug-01
Feb-02
Sep-02
Mar-03
Sep-03
Feb-04
Aug-04
Feb-05
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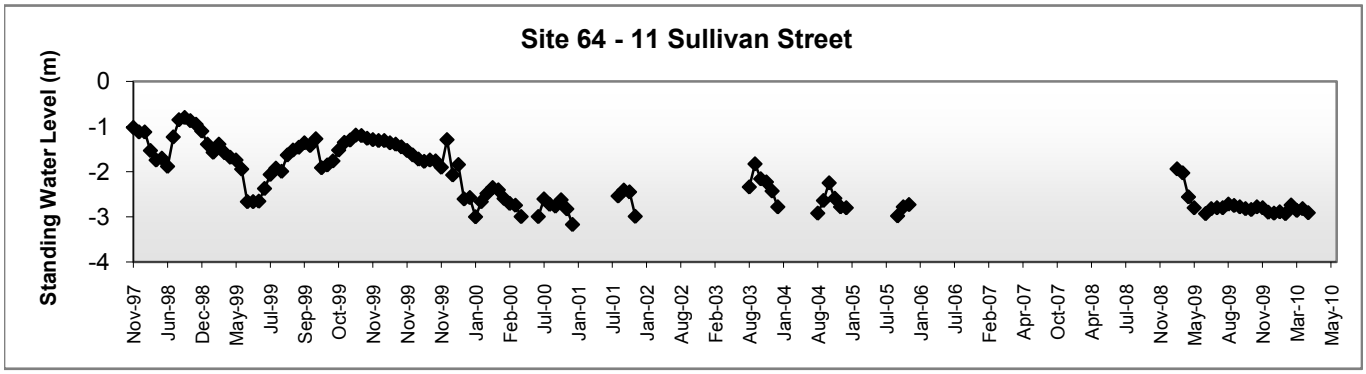
Jan-09
Jul-09
Mar-10
Jun-10


Site 64 - 11 Sullivan Street
Standing Water Level (m)
0
-1
-2
-3
-4
Nov-97
Jun-98
Dec-98
May-99
Jul-99
Sep-99
Oct-99
Nov-99
Nov-99
Nov-99
Jan-00
Feb-00
Jul-00
Jan-01
Jul-01
Jan-02
Aug-02
Feb-03
Aug-03
Jan-04
Aug-04
Jan-05
Jul-05
Jan-06
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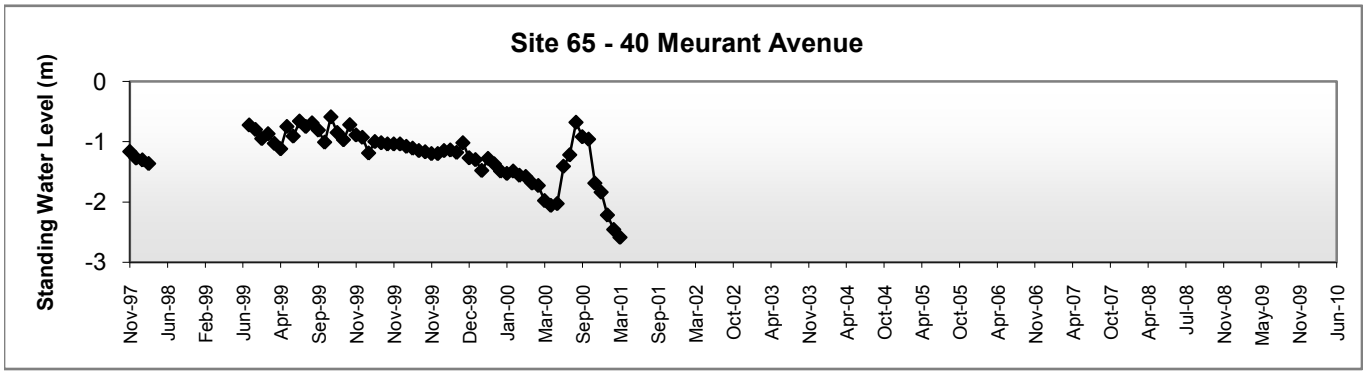
Nov-09
Mar-10
May-10


Site 65 - 40 Meurant Avenue
Standing Water Level (m)
0
-1
-2
-3
Nov-97
Jun-98
Feb-99
Jun-99
Apr-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Oct-02
Apr-03
Nov-03
Apr-04
Oct-04
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Apr-08
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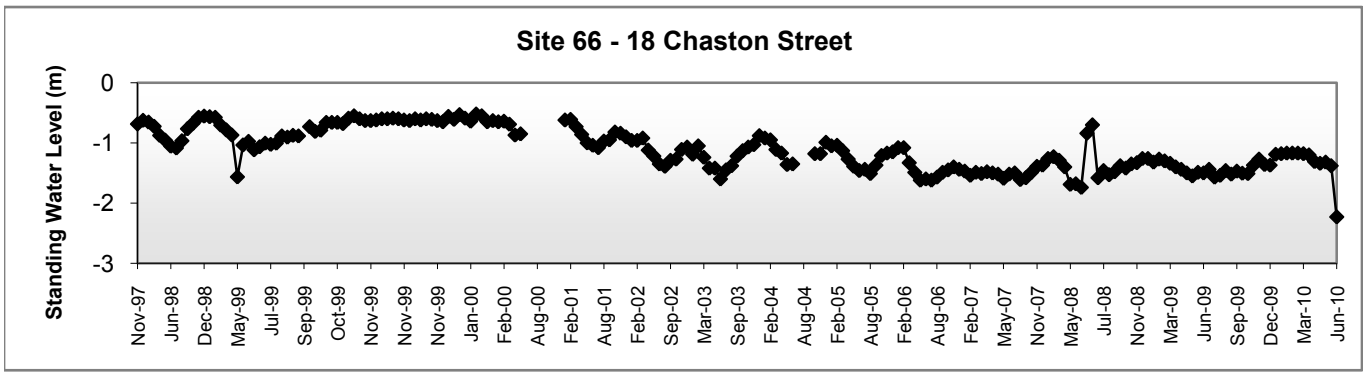
Nov-08
May-09
Nov-09
Jun-10


Site 66 - 18 Chaston Street
Standing Water Level (m)
0
-1
-2
-3
Nov-97
Jun-98
Dec-98
May-99
Jul-99
Sep-99
Oct-99
Nov-99
Nov-99
Nov-99
Jan-00
Feb-00
Aug-00
Feb-01
Aug-01
Feb-02
Sep-02
Mar-03
Sep-03
Feb-04
Aug-04
Feb-05
Aug-05
Feb-06
Aug-06
Feb-07
May-07
Nov-07
May-08
Jul-08
Nov-08
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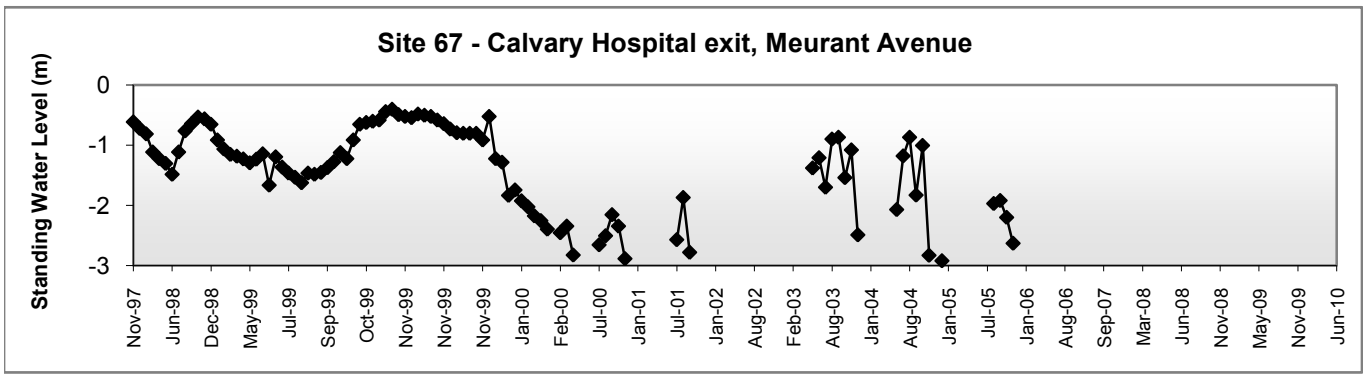
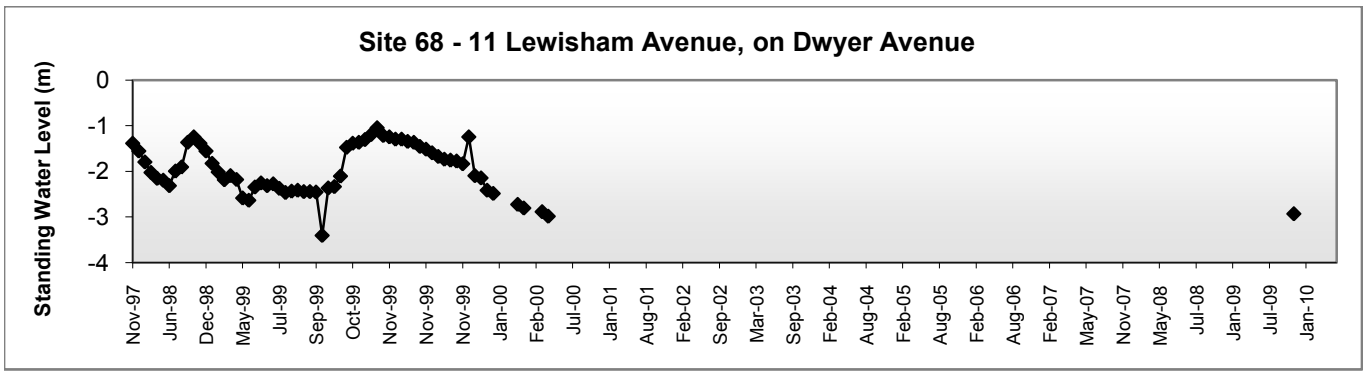
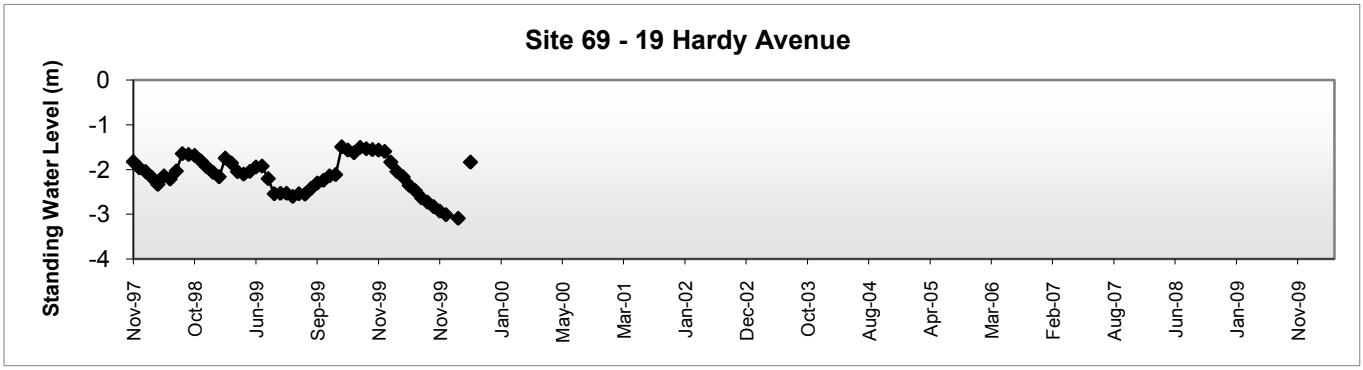
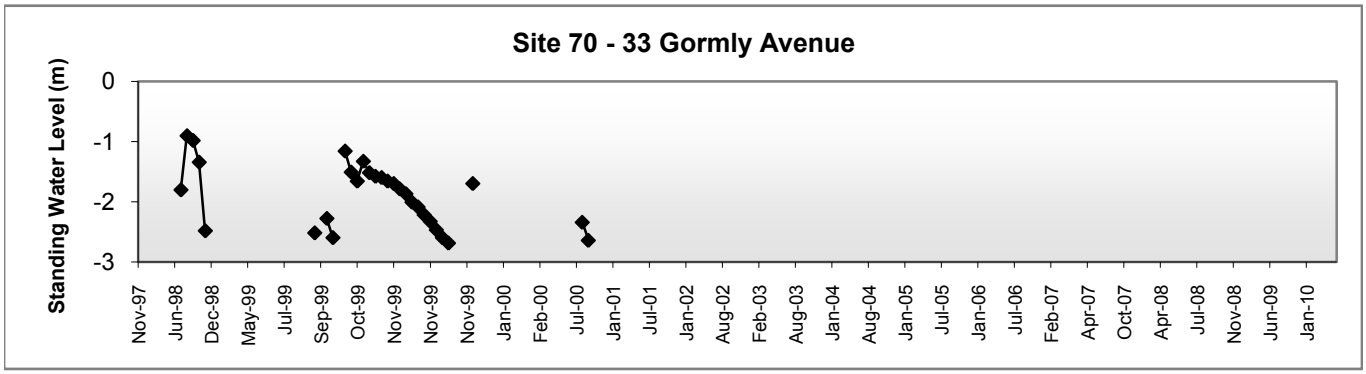
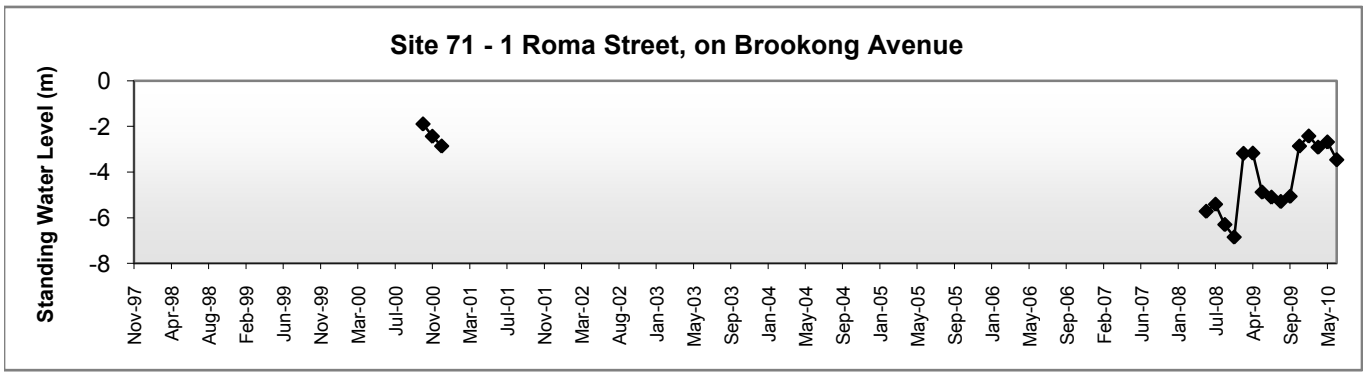
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10

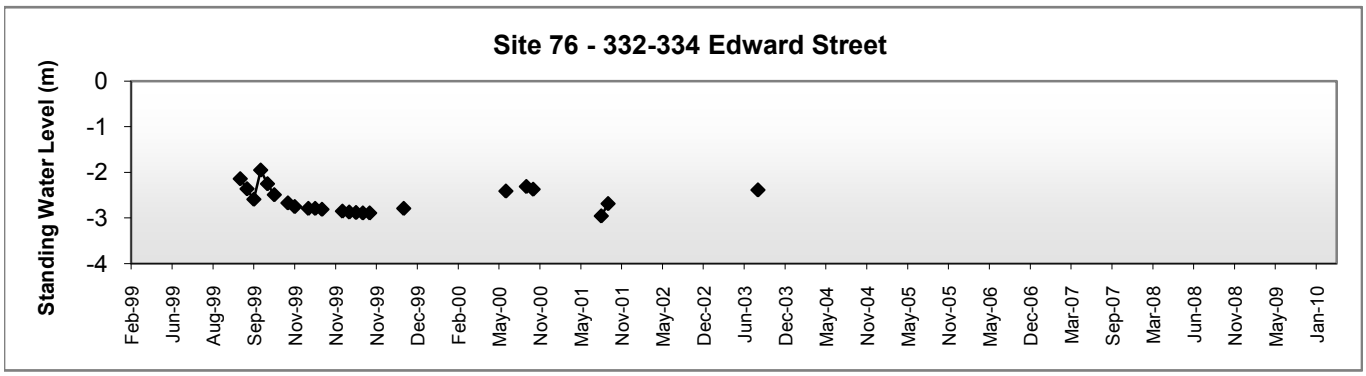

Site 67 - Calvary Hospital exit, Meurant Avenue
Standing Water Level (m)
0
-1
-2
-3
Nov-97
Jun-98
Dec-98
May-99
Jul-99
Sep-99
Oct-99
Nov-99
Nov-99
Nov-99
Jan-00
Feb-00
Jul-00
Jan-01
Jul-01
Jan-02
Aug-02
Feb-03
Aug-03
Jan-04
Aug-04
Jan-05
Jul-05
Jan-06
Aug-06
Sep-07
Mar-08
Jun-08
Nov-08
May-09
Nov-09
Jun-10

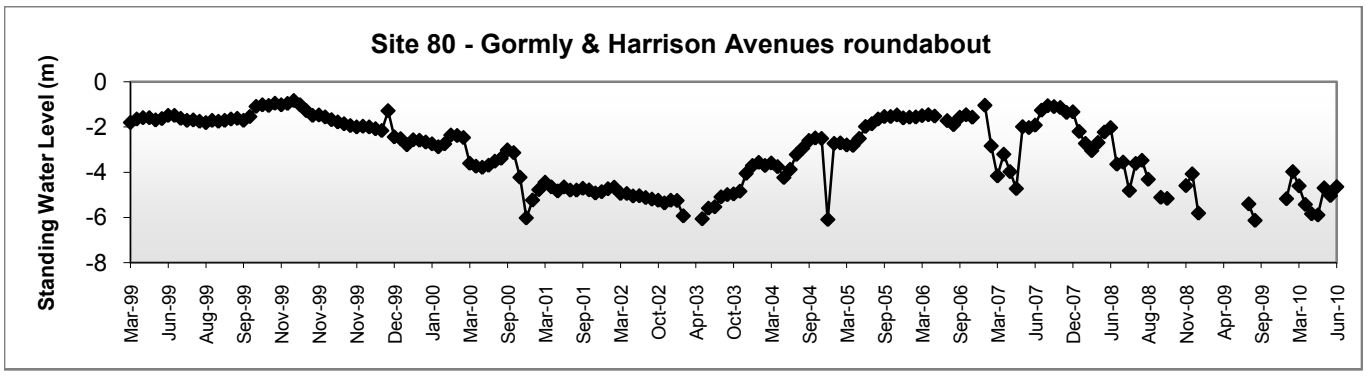

Site 68 - 11 Lewisham Avenue, on Dwyer Avenue
Standing Water Level (m)
0
-1
-2
-3
-4
Nov-97
Jun-98
Dec-98
May-99
Jul-99
Sep-99
Oct-99
Nov-99
Nov-99
Nov-99
Jan-00
Feb-00
Jul-00
Jan-01
Aug-01
Feb-02
Sep-02
Mar-03
Sep-03
Feb-04
Aug-04
Feb-05
Aug-05
Feb-06
Aug-06
Feb-07
May-07
Nov-07
May-08
Jul-08
Jan-09
Jul-09
Jan-10

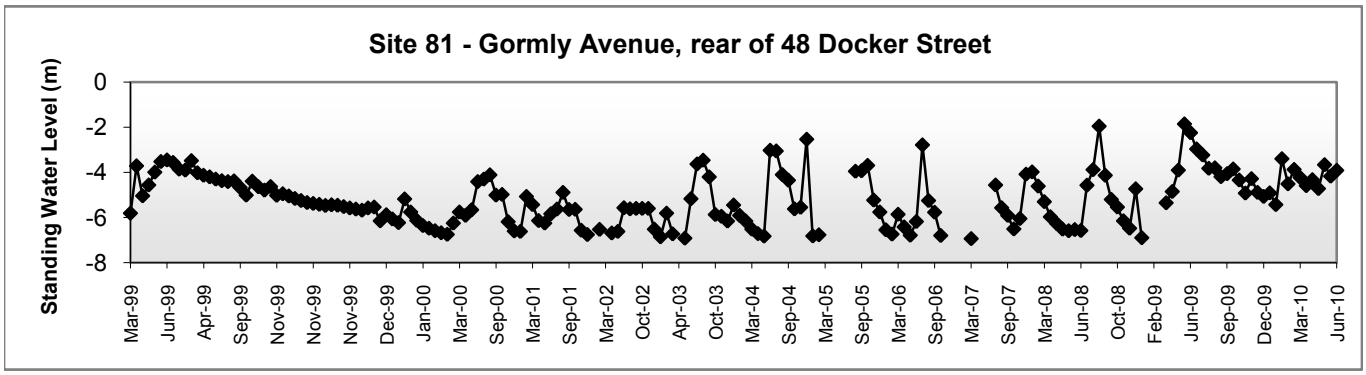

Site 69 - 19 Hardy Avenue
Standing Water Level (m)
0
-1
-2
-3
-4
Nov-97
Oct-98
Jun-99
Sep-99
Nov-99
Nov-99
Jan-00
May-00
Mar-01
Jan-02
Dec-02
Oct-03
Aug-04
Apr-05
Mar-06
Feb-07
Aug-07
Jun-08
Jan-09
Nov-09

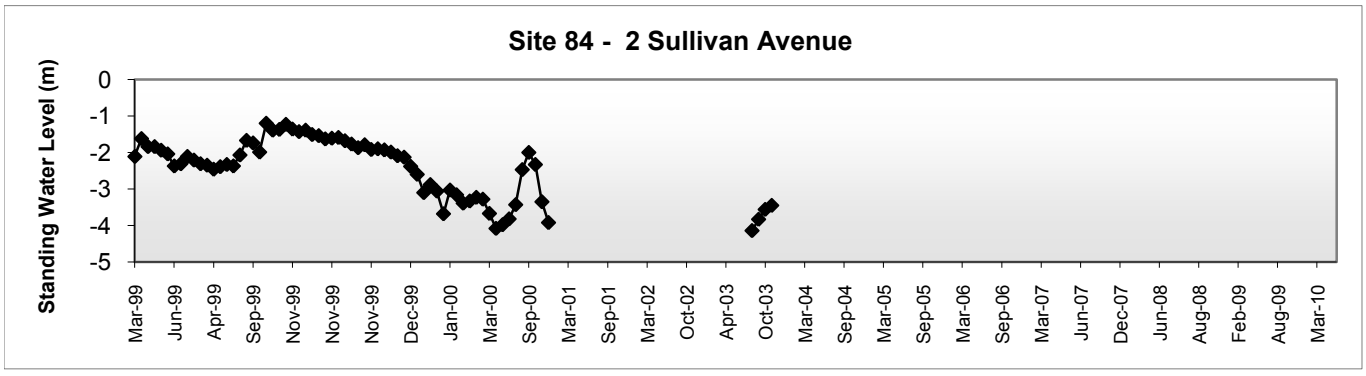

Site 70 - 33 Gormly Avenue
Standing Water Level (m)
0
-1
-2
-3
Nov-97
Jun-98
Dec-98
May-99
Jul-99
Sep-99
Oct-99
Nov-99
Nov-99
Nov-99
Jan-00
Feb-00
Jul-00
Jan-01
Jul-01
Jan-02
Aug-02
Feb-03
Aug-03
Jan-04
Aug-04
Jan-05
Jul-05
Jan-06
Jul-06
Feb-07
Apr-07
Oct-07
Apr-08
Jul-08
Nov-08
Jun-09
Jan-10

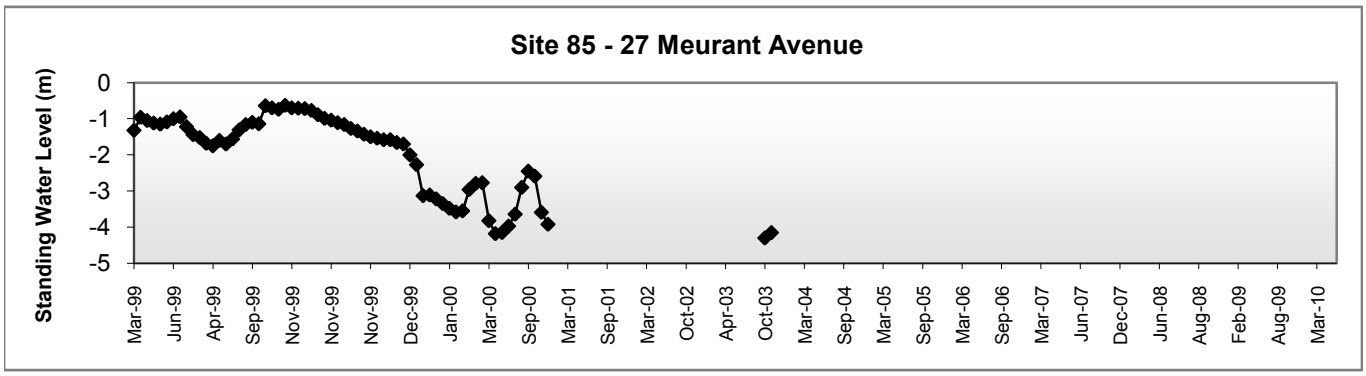

Site 71 - 1 Roma Street, on Brookong Avenue
Standing Water Level (m)
0
-2
-4
-6
-8
Nov-97
Apr-98
Aug-98
Feb-99
Jun-99
Nov-99
Mar-00
Jul-00
Nov-00
Mar-01
Jul-01
Nov-01
Mar-02
Aug-02
Jan-03
May-03
Sep-03
Jan-04
May-04
Sep-04
Jan-05
May-05
Sep-05
Jan-06
May-06
Sep-06
Feb-07
Jun-07
Jan-08
Jul-08
Apr-09
Sep-09
May-10

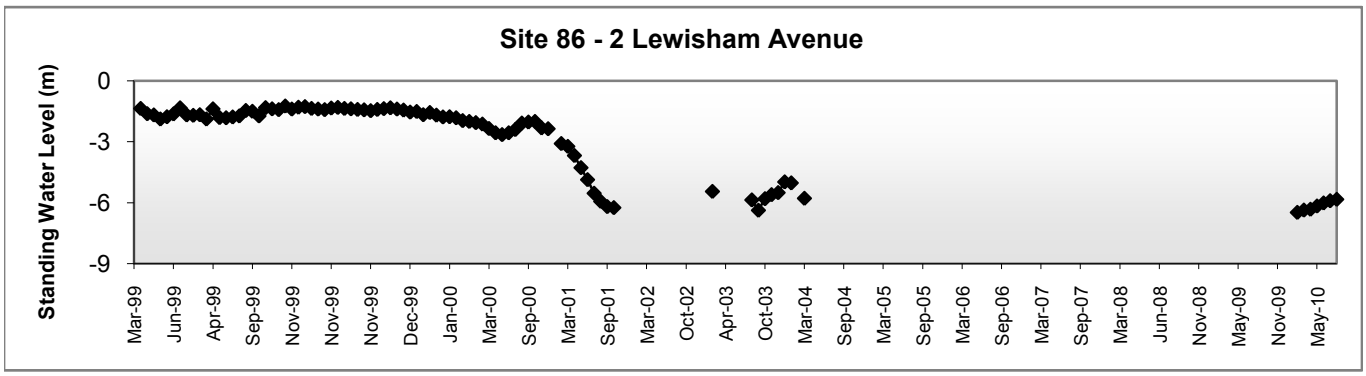

Site 76 - 332-334 Edward Street
Standing Water Level (m)
0
-1
-2
-3
-4
Feb-99
Jun-99
Aug-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Feb-00
May-00
Nov-00
May-01
Nov-01
May-02
Dec-02
Jun-03
Dec-03
May-04
Nov-04
May-05
Nov-05
May-06
Dec-06
Mar-07
Sep-07
Mar-08
Jun-08
Nov-08
May-09
Jan-10

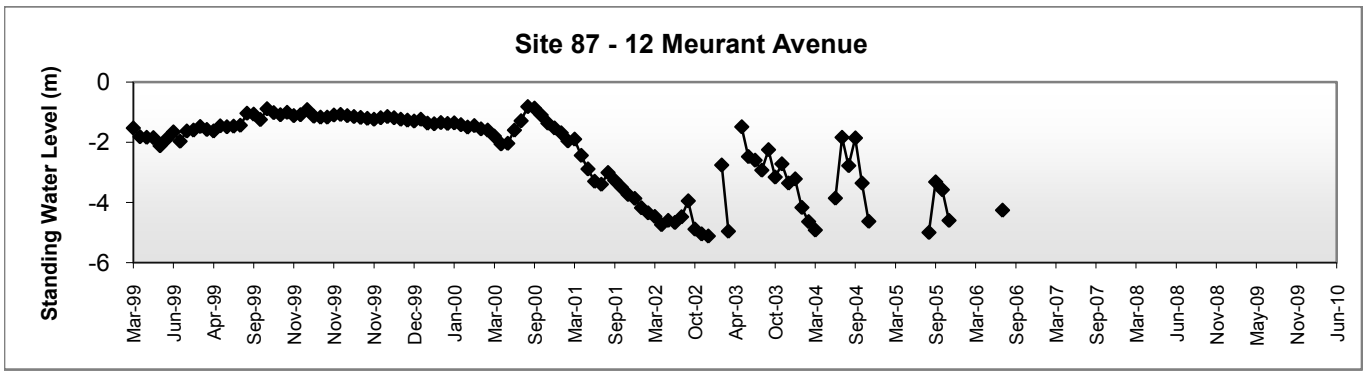

Site 80 - Gormly & Harrison Avenues roundabout
Standing Water Level (m)
0
-2
-4
-6
-8
Mar-99
Jun-99
Aug-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Jun-07
Dec-07
Jun-08
Aug-08
Nov-08
Apr-09
Sep-09
Mar-10
Jun-10

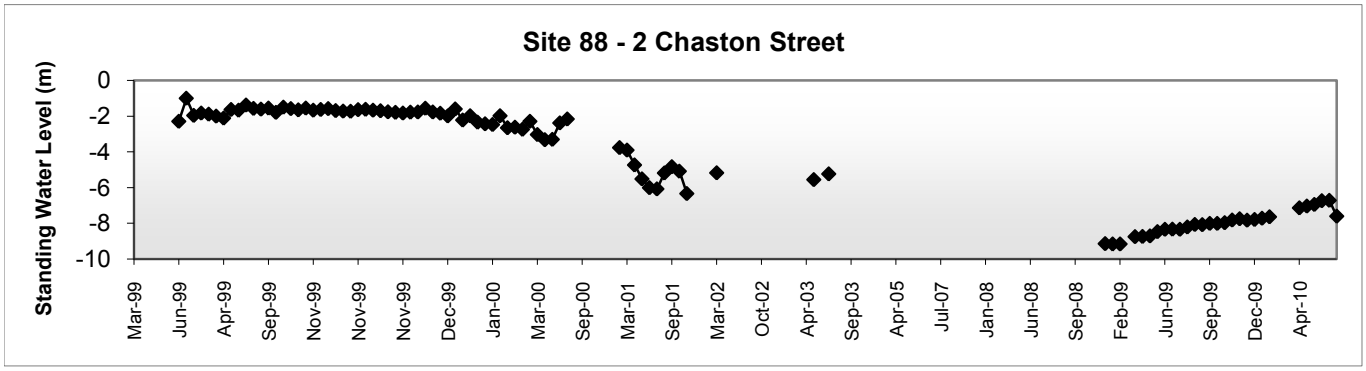

Site 81 - Gormly Avenue, rear of 48 Docker Street
Standing Water Level (m)
0
-2
-4
-6
-8
Mar-99
Jun-99
Apr-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Jun-08
Oct-08
Feb-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10

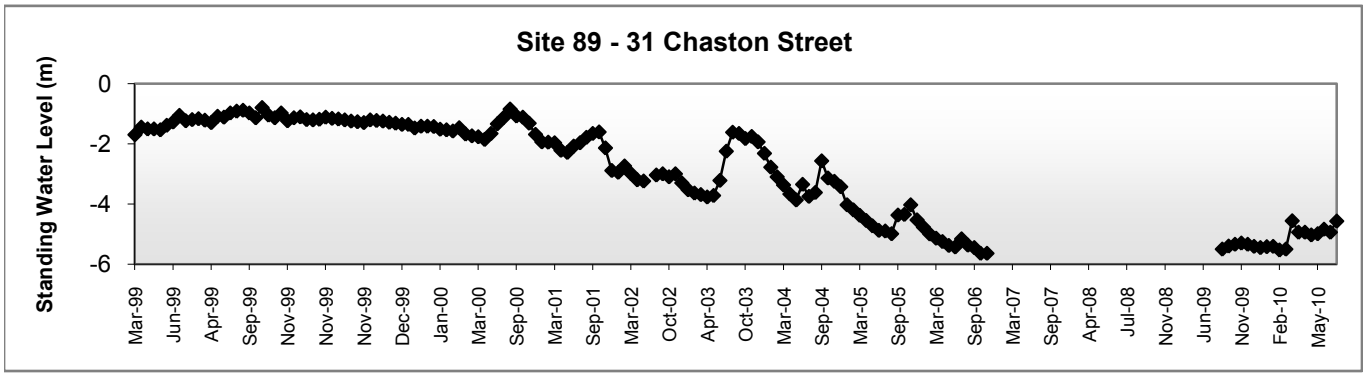

Site 84 - 2 Sullivan Avenue
Standing Water Level (m)
0
-1
-2
-3
-4
-5
Mar-99
Jun-99
Apr-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Jun-07
Dec-07
Jun-08
Aug-08
Feb-09
Aug-09
Mar-10

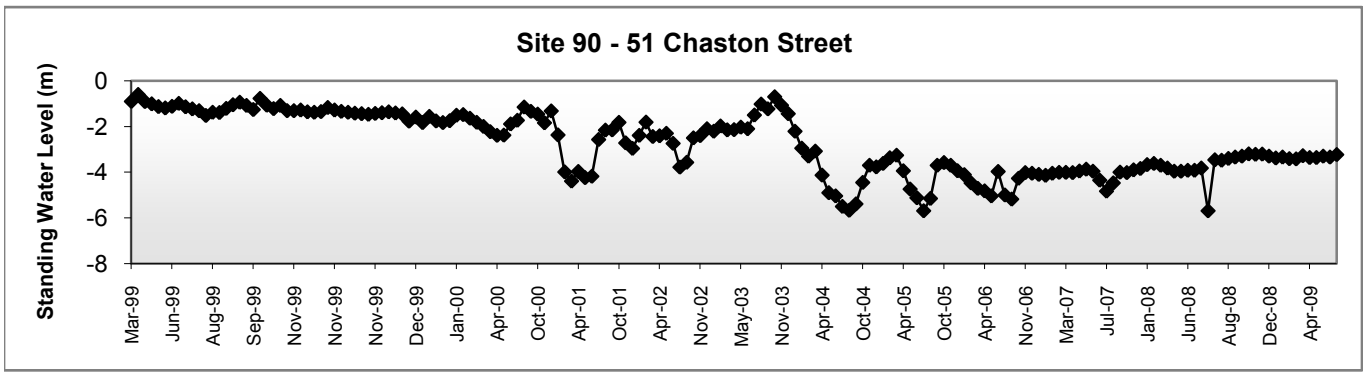

Site 85 - 27 Meurant Avenue
Standing Water Level (m)
0
-1
-2
-3
-4
-5
Mar-99
Jun-99
Apr-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Jun-07
Dec-07
Jun-08
Aug-08
Feb-09
Aug-09
Mar-10

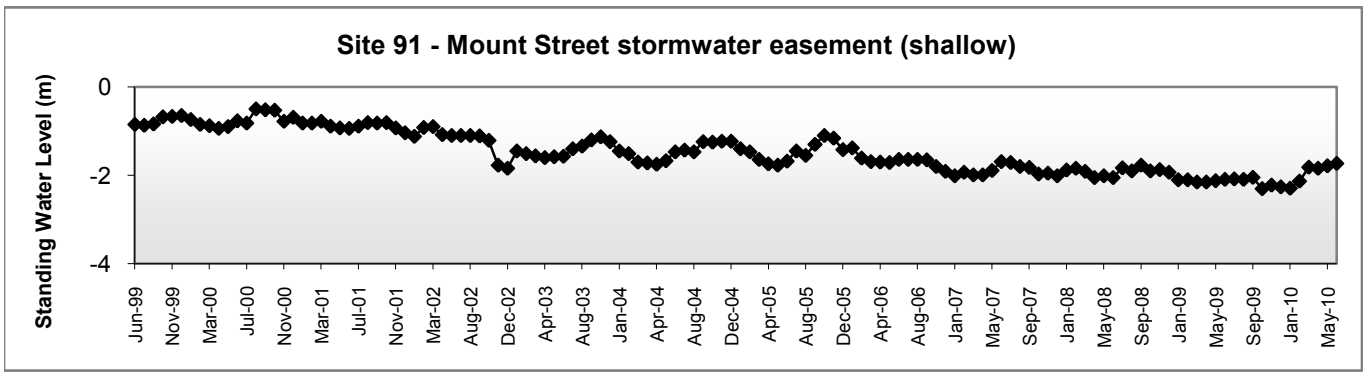

Site 86 - 2 Lewisham Avenue
Standing Water Level (m)
0
-3
-6
-9
Mar-99
Jun-99
Apr-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Jun-08
Nov-08
May-09
Nov-09
May-10

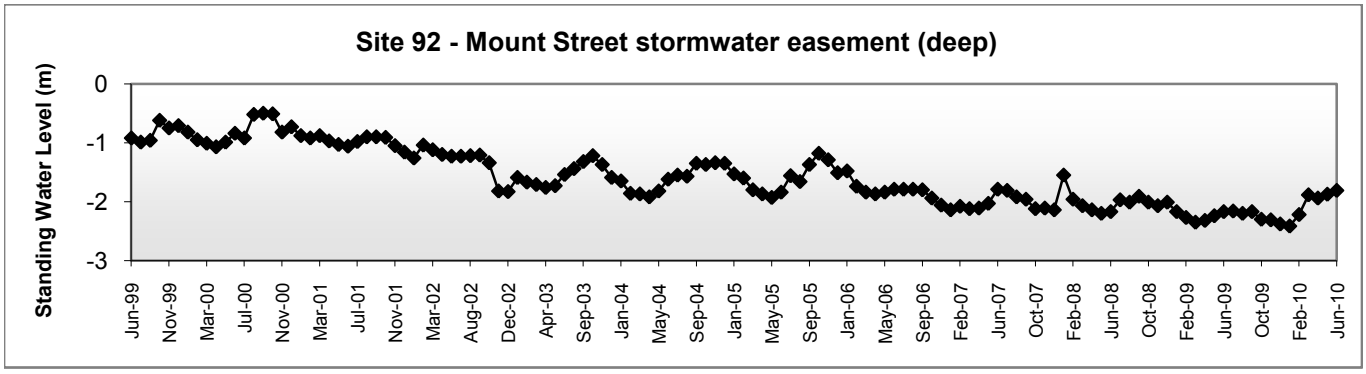

Site 87 - 12 Meurant Avenue
Standing Water Level (m)
0
-2
-4
-6
Mar-99
Jun-99
Apr-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
Jun-08
Nov-08
May-09
Nov-09
Jun-10

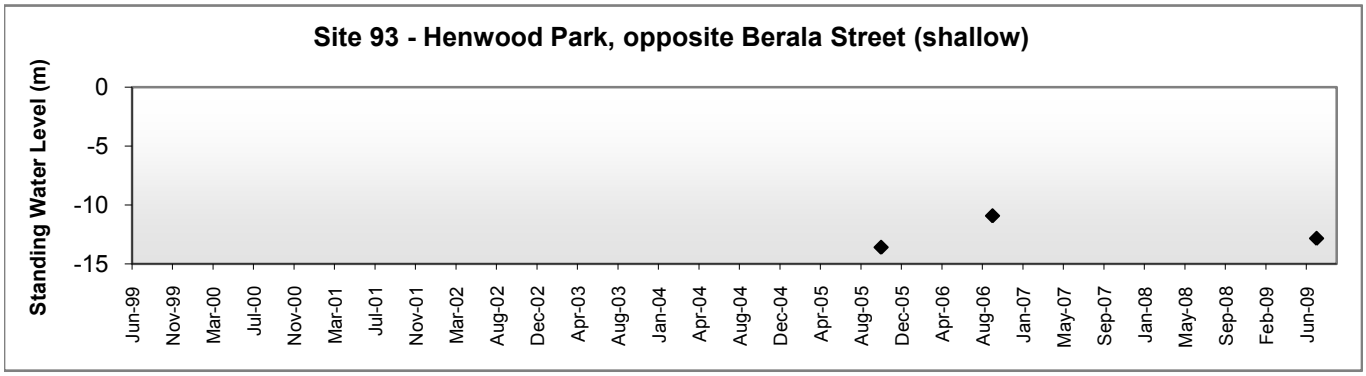

Site 88 - 2 Chaston Street
Standing Water Level (m)
0
-2
-4
-6
-8
-10
Mar-99
Jun-99
Apr-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Oct-02
Apr-03
Sep-03
Apr-05
Jul-07
Jan-08
Jun-08
Sep-08
Feb-09
Jun-09
Sep-09
Dec-09
Apr-10


Site 89 - 31 Chaston Street
Standing Water Level (m)
0
-2
-4
-6
Mar-99
Jun-99
Apr-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Oct-02
Apr-03
Oct-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Apr-08
Jul-08
Nov-08
Jun-09
Nov-09
Feb-10
May-10


Site 90 - 51 Chaston Street
Standing Water Level (m)
0
-2
-4
-6
-8
Mar-99
Jun-99
Aug-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Apr-00
Oct-00
Apr-01
Oct-01
Apr-02
Nov-02
May-03
Nov-03
Apr-04
Oct-04
Apr-05
Oct-05
Apr-06
Nov-06
Mar-07
Jul-07
Jan-08
Jun-08
Aug-08
Dec-08
Apr-09


Site 91 - Mount Street stormwater easement (shallow)
Standing Water Level (m)
0
-2
-4
Jun-99
Nov-99
Mar-00
Jul-00
Nov-00
Mar-01
Jul-01
Nov-01
Mar-02
Aug-02
Dec-02
Apr-03
Aug-03
Jan-04
Apr-04
Aug-04
Dec-04
Apr-05
Aug-05
Dec-05
Apr-06
Aug-06
Jan-07
May-07
Sep-07
Jan-08
May-08
Sep-08
Jan-09
May-09
Sep-09
Jan-10
May-10


Site 92 - Mount Street stormwater easement (deep)
Standing Water Level (m)
0
-1
-2
-3
Jun-99
Nov-99
Mar-00
Jul-00
Nov-00
Mar-01
Jul-01
Nov-01
Mar-02
Aug-02
Dec-02
Apr-03
Sep-03
Jan-04
May-04
Sep-04
Jan-05
May-05
Sep-05
Jan-06
May-06
Sep-06
Feb-07
Jun-07
Oct-07
Feb-08
Jun-08
Oct-08
Feb-09
Jun-09
Oct-09
Feb-10
Jun-10


Site 93 - Henwood Park, opposite Berala Street (shallow)
Standing Water Level (m)
0
-5
-10
-15
Jun-99
Nov-99
Mar-00
Jul-00
Nov-00
Mar-01
Jul-01
Nov-01
Mar-02
Aug-02
Dec-02
Apr-03
Aug-03
Jan-04
Apr-04
Aug-04
Dec-04
Apr-05
Aug-05
Dec-05
Apr-06
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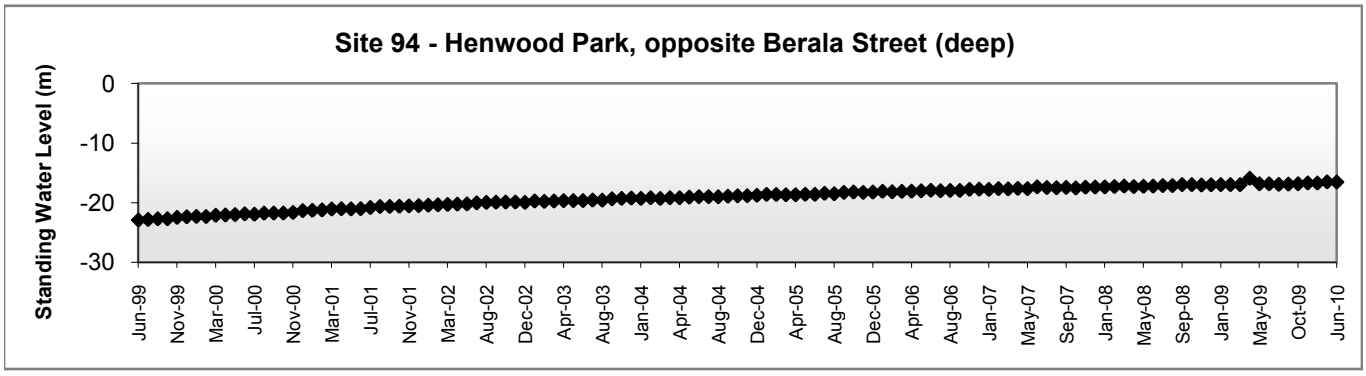
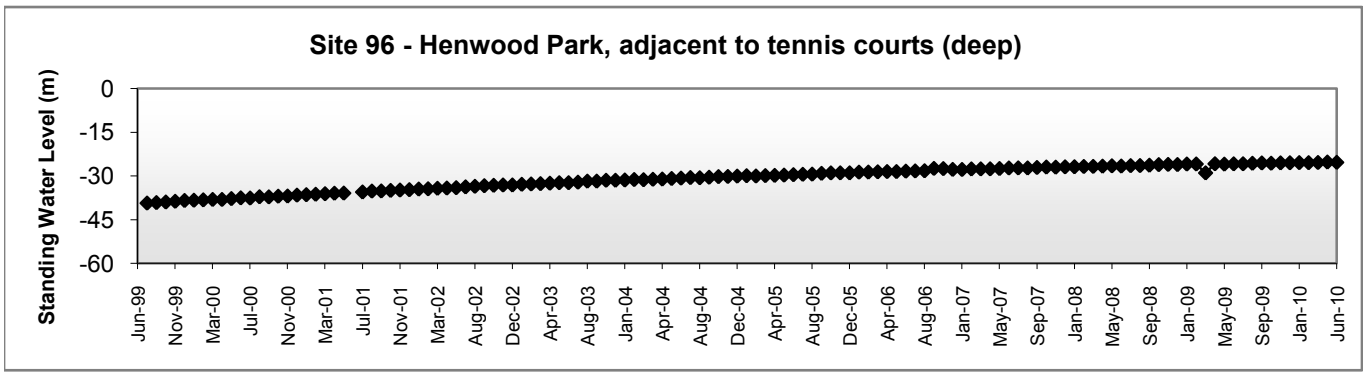
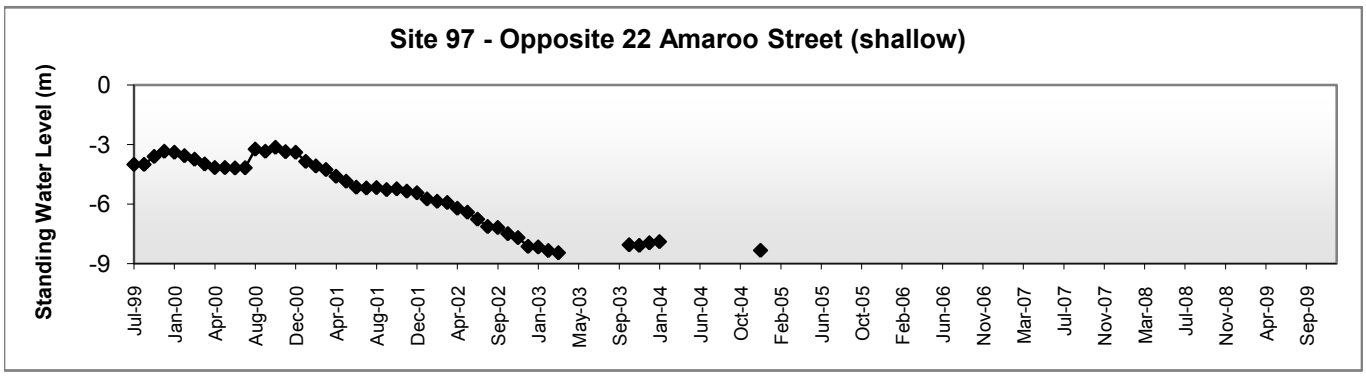
May-07
Sep-07
Jan-08
May-08
Sep-08
Feb-09
Jun-09


Site 94 - Henwood Park, opposite Berala Street (deep)
Standing Water Level (m)
0
-10
-20
-30
Jun-99
Nov-99
Mar-00
Jul-00
Nov-00
Mar-01
Jul-01
Nov-01
Mar-02
Aug-02
Dec-02
Apr-03
Aug-03
Jan-04
Apr-04
Aug-04
Dec-04
Apr-05
Aug-05
Dec-05
Apr-06
Aug-06
Jan-07
May-07
Sep-07
Jan-08
May-08
Sep-08
Jan-09
May-09
Oct-09
Jun-10


Site 96 - Henwood Park, adjacent to tennis courts (deep)
Standing Water Level (m)
0
-15
-30
-45
-60
Jun-99
Nov-99
Mar-00
Jul-00
Nov-00
Mar-01
Jul-01
Nov-01
Mar-02
Aug-02
Dec-02
Apr-03
Aug-03
Jan-04
Apr-04
Aug-04
Dec-04
Apr-05
Aug-05
Dec-05
Apr-06
Aug-06
Jan-07
May-07
Sep-07
Jan-08
May-08
Sep-08
Jan-09
May-09
Sep-09
Jan-10
Jun-10


Site 97 - Opposite 22 Amaroo Street (shallow)
Standing Water Level (m)
0
-3
-6
-9
Jul-99
Jan-00
Apr-00
Aug-00
Dec-00
Apr-01
Aug-01
Dec-01
Apr-02
Sep-02
Jan-03
May-03
Sep-03
Jan-04
Jun-04
Oct-04
Feb-05
Jun-05
Oct-05
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Jul-07
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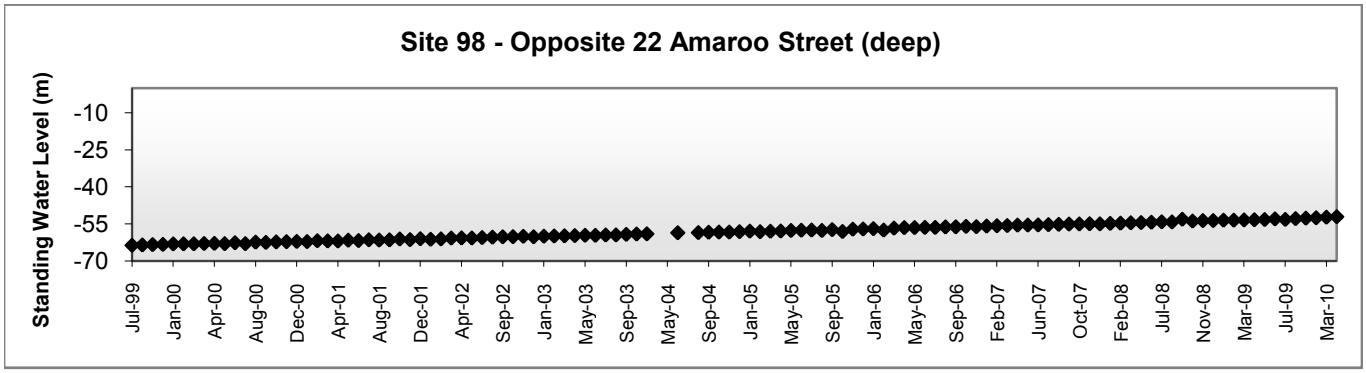
Mar-08
Jul-08
Nov-08
Apr-09
Sep-09


Site 98 - Opposite 22 Amaroo Street (deep)
Standing Water Level (m)
-10
-25
-40
-55
-70
Jul-99
Jan-00
Apr-00
Aug-00
Dec-00
Apr-01
Aug-01
Dec-01
Apr-02
Sep-02
Jan-03
May-03
Sep-03
May-04
Sep-04
Jan-05
May-05
Sep-05
Jan-06
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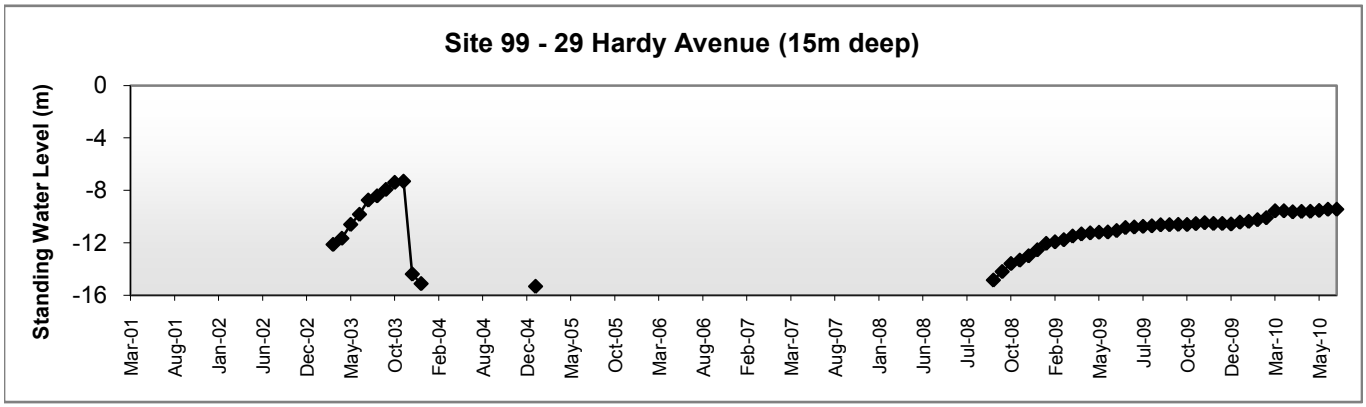
Feb-08
Jul-08
Nov-08
Mar-09
Jul-09
Mar-10


Site 99 - 29 Hardy Avenue (15m deep)
Standing Water Level (m)
0
-4
-8
-12
-16
Mar-01
Aug-01
Jan-02
Jun-02
Dec-02
May-03
Oct-03
Feb-04
Aug-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Mar-07
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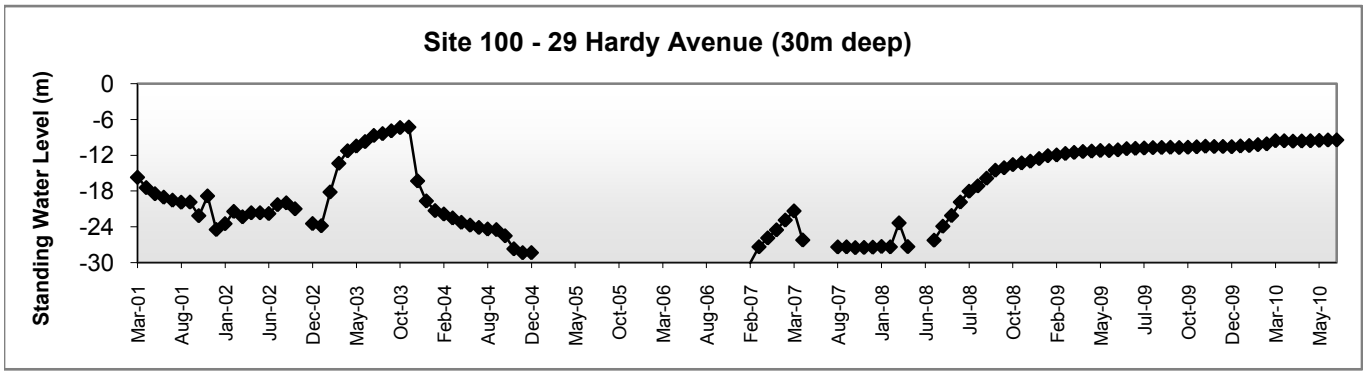
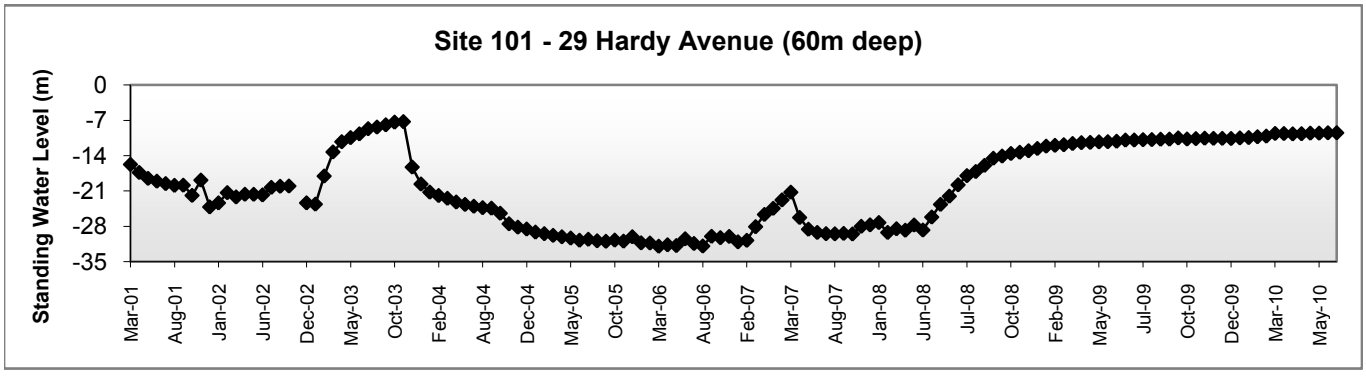
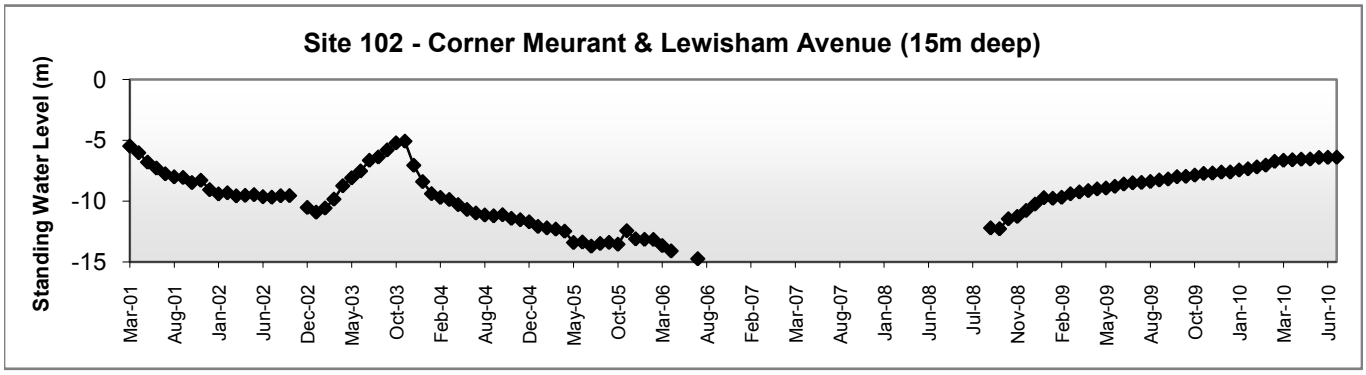
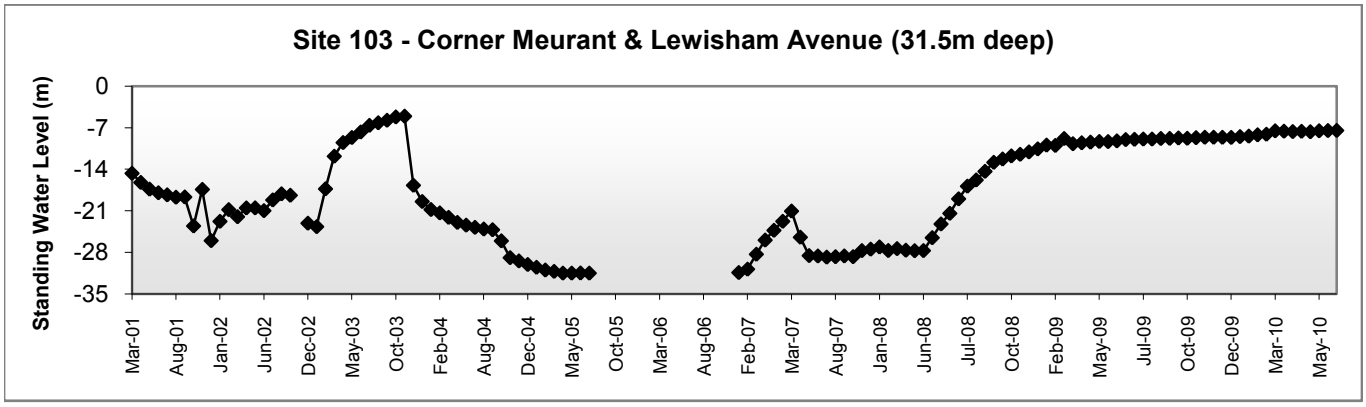
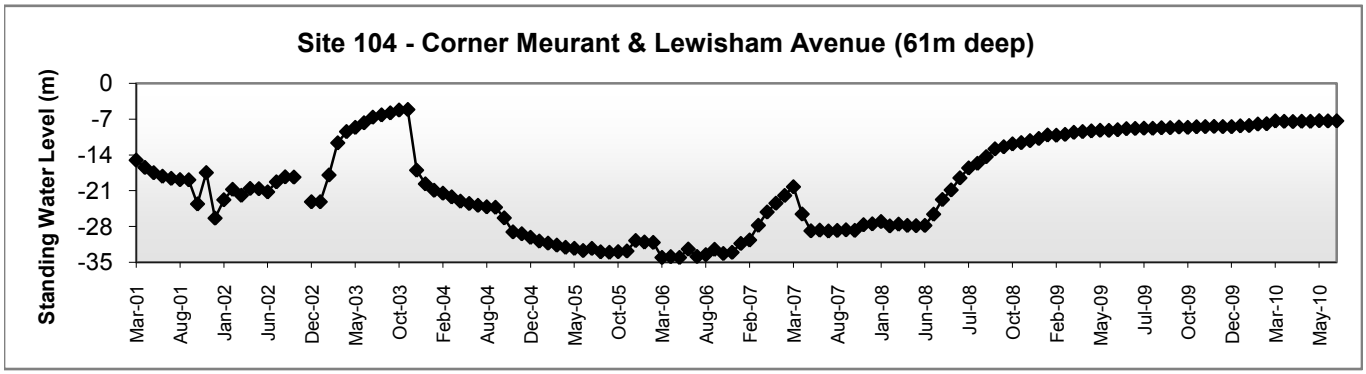
May-09
Jul-09
Oct-09
Dec-09
Mar-10
May-10

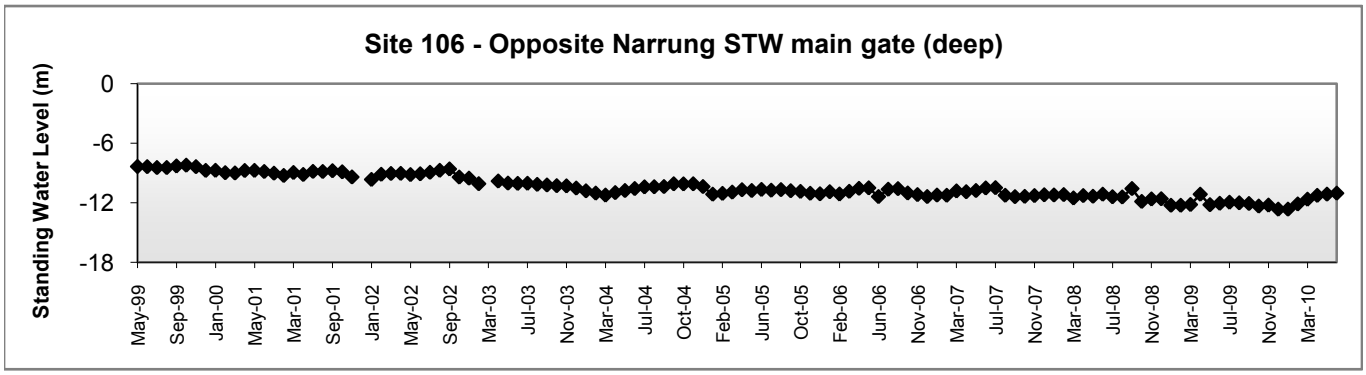

Site 100 - 29 Hardy Avenue (30m deep)
Standing Water Level (m)
0
-6
-12
-18
-24
-30
Mar-01
Aug-01
Jan-02
Jun-02
Dec-02
May-03
Oct-03
Feb-04
Aug-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Mar-07
Aug-07
Jan-08
Jun-08
Jul-08
Oct-08
Feb-09
May-09
Jul-09
Oct-09
Dec-09
Mar-10
May-10

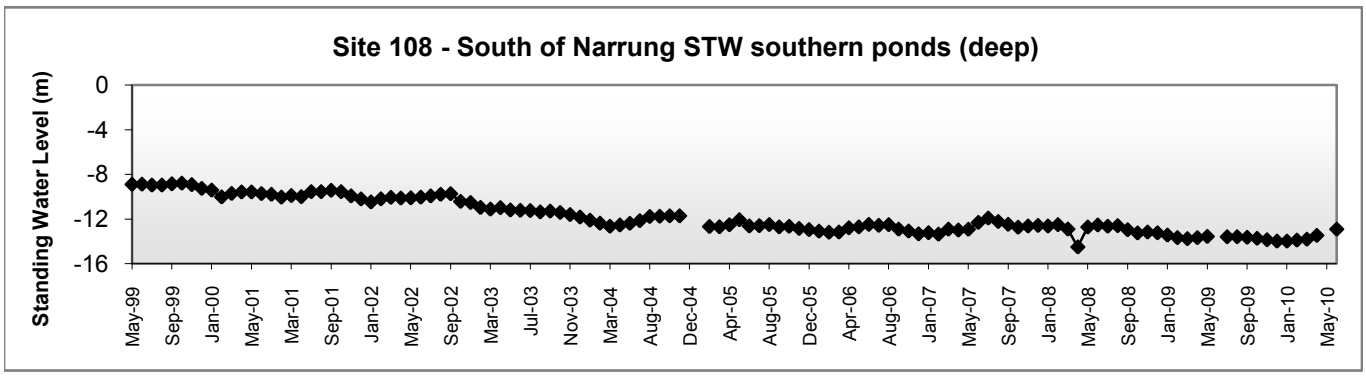

Site 101 - 29 Hardy Avenue (60m deep)
Standing Water Level (m)
0
-7
-14
-21
-28
-35
Mar-01
Aug-01
Jan-02
Jun-02
Dec-02
May-03
Oct-03
Feb-04
Aug-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Mar-07
Aug-07
Jan-08
Jun-08
Jul-08
Oct-08
Feb-09
May-09
Jul-09
Oct-09
Dec-09
Mar-10
May-10

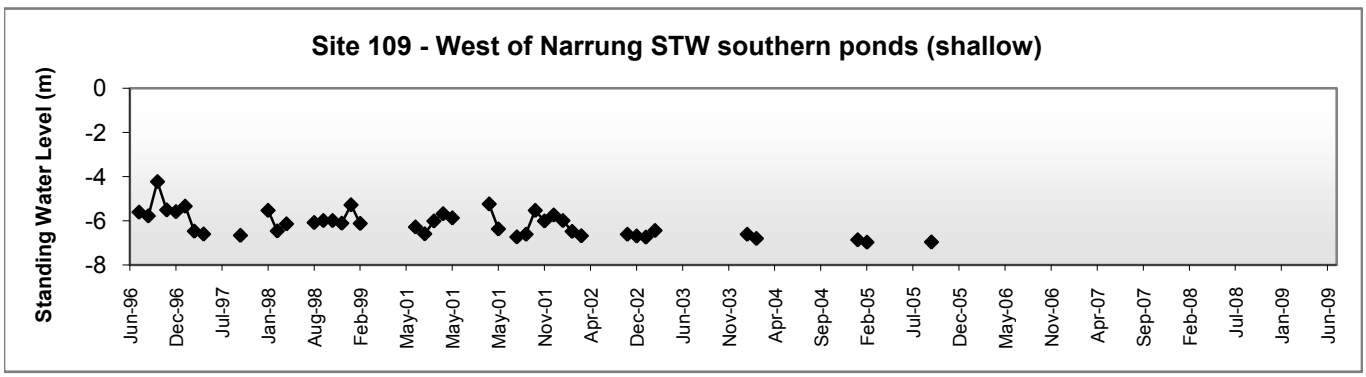

Site 102 - Corner Meurant & Lewisham Avenue (15m deep)
Standing Water Level (m)
0
-5
-10
-15
Mar-01
Aug-01
Jan-02
Jun-02
Dec-02
May-03
Oct-03
Feb-04
Aug-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Mar-07
Aug-07
Jan-08
Jun-08
Jul-08
Nov-08
Feb-09
May-09
Aug-09
Oct-09
Jan-10
Mar-10
Jun-10


Site 103 - Corner Meurant & Lewisham Avenue (31.5m deep)
Standing Water Level (m)
0
-7
-14
-21
-28
-35
Mar-01
Aug-01
Jan-02
Jun-02
Dec-02
May-03
Oct-03
Feb-04
Aug-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Mar-07
Aug-07
Jan-08
Jun-08
Jul-08
Oct-08
Feb-09
May-09
Jul-09
Oct-09
Dec-09
Mar-10
May-10


Site 104 - Corner Meurant & Lewisham Avenue (61m deep)
Standing Water Level (m)
0
-7
-14
-21
-28
-35
Mar-01
Aug-01
Jan-02
Jun-02
Dec-02
May-03
Oct-03
Feb-04
Aug-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Mar-07
Aug-07
Jan-08
Jun-08
Jul-08
Oct-08
Feb-09
May-09
Jul-09
Oct-09
Dec-09
Mar-10
May-10


Site 106 - Opposite Narrung STW main gate (deep)
Standing Water Level (m)
0
-6
-12
-18
May-99
Sep-99
Jan-00
May-01
Mar-01
Sep-01
Jan-02
May-02
Sep-02
Mar-03
Jul-03
Nov-03
Mar-04
Jul-04
Oct-04
Feb-05
Jun-05
Oct-05
Feb-06
Jun-06
Nov-06
Mar-07
Jul-07
Nov-07
Mar-08
Jul-08
Nov-08
Mar-09
Jul-09
Nov-09
Mar-10


Site 108 - South of Narrung STW southern ponds (deep)
Standing Water Level (m)
0
-4
-8
-12
-16
May-99
Sep-99
Jan-00
May-01
Mar-01
Sep-01
Jan-02
May-02
Sep-02
Mar-03
Jul-03
Nov-03
Mar-04
Aug-04
Dec-04
Apr-05
Aug-05
Dec-05
Apr-06
Aug-06
Jan-07
May-07
Sep-07
Jan-08
May-08
Sep-08
Jan-09
May-09
Sep-09
Jan-10
May-10


Site 109 - West of Narrung STW southern ponds (shallow)
Standing Water Level (m)
0
-2
-4
-6
-8
Jun-96
Dec-96
Jul-97
Jan-98
Aug-98
Feb-99
May-01
May-01
May-01
Nov-01
Apr-02
Dec-02
Jun-03
Nov-03
Apr-04
Sep-04
Feb-05
Jul-05
Dec-05
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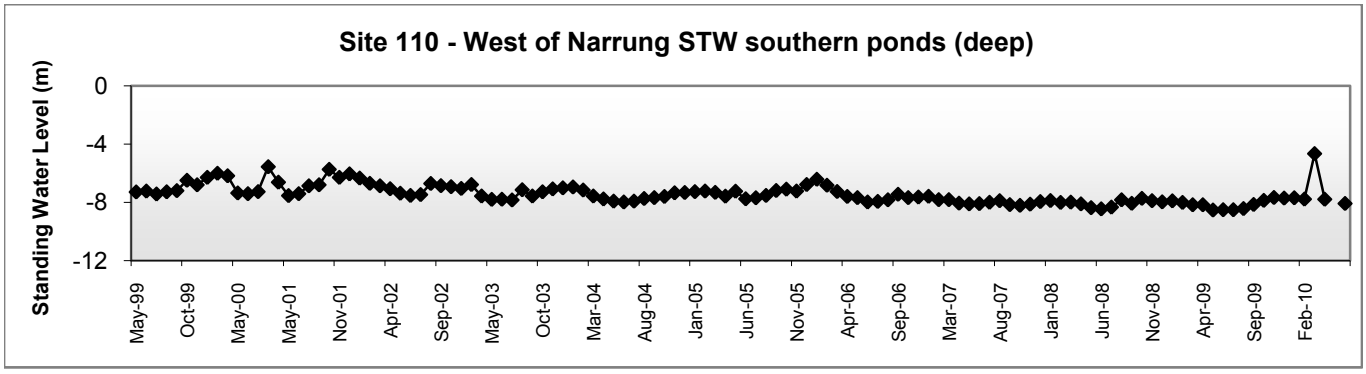
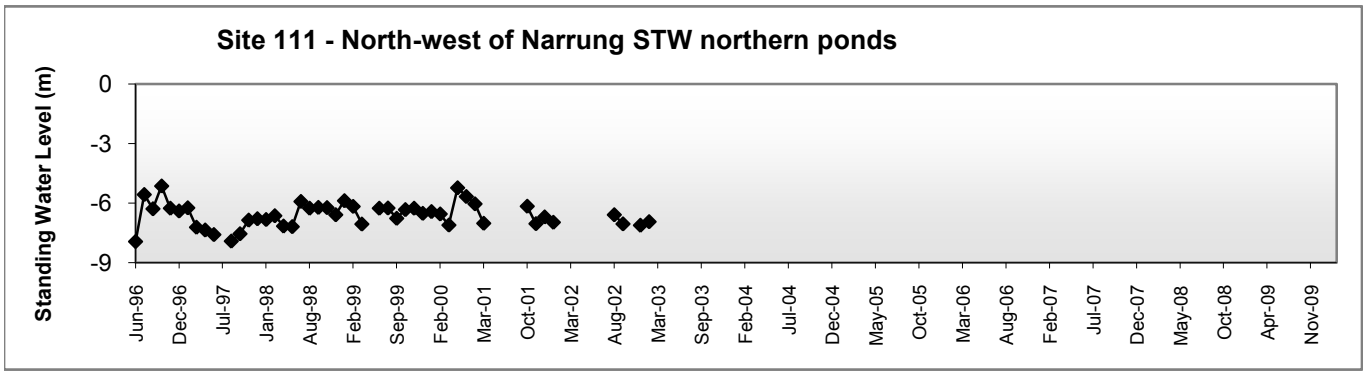
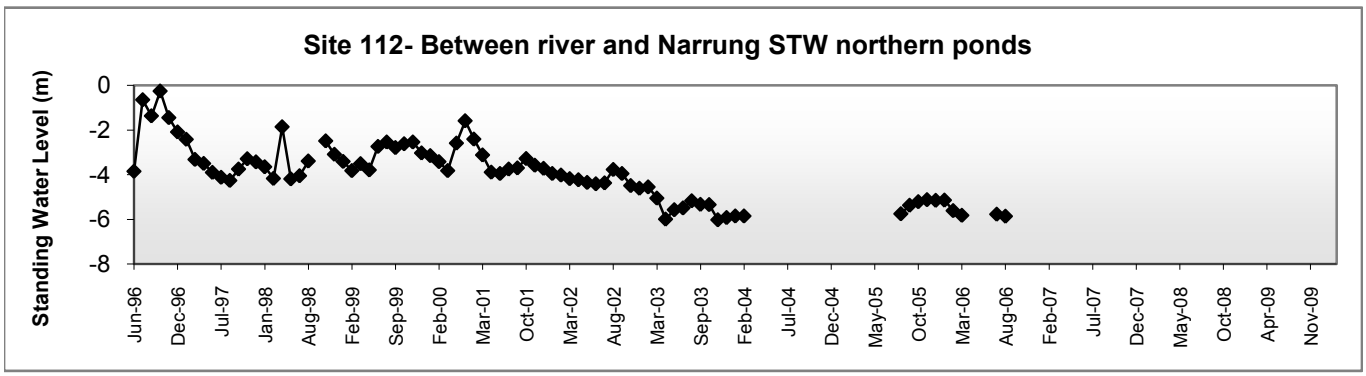
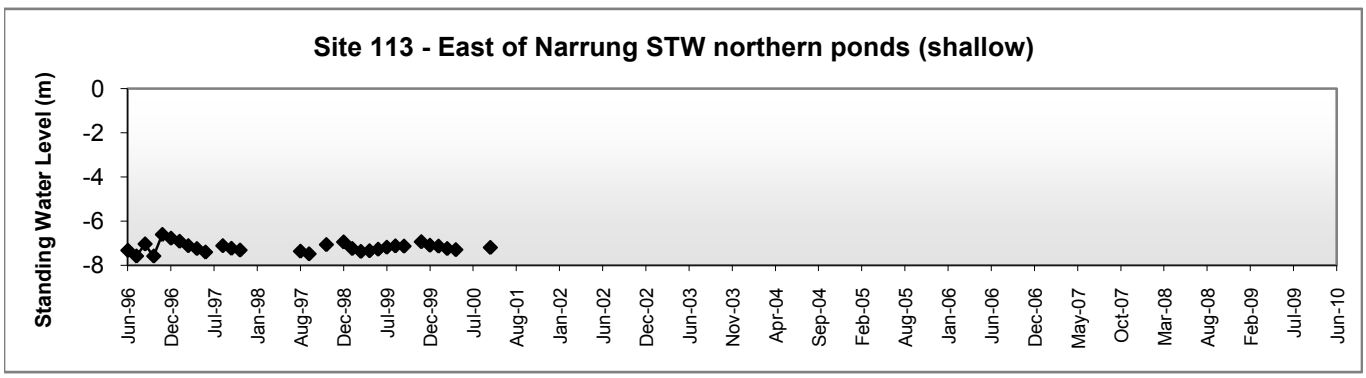
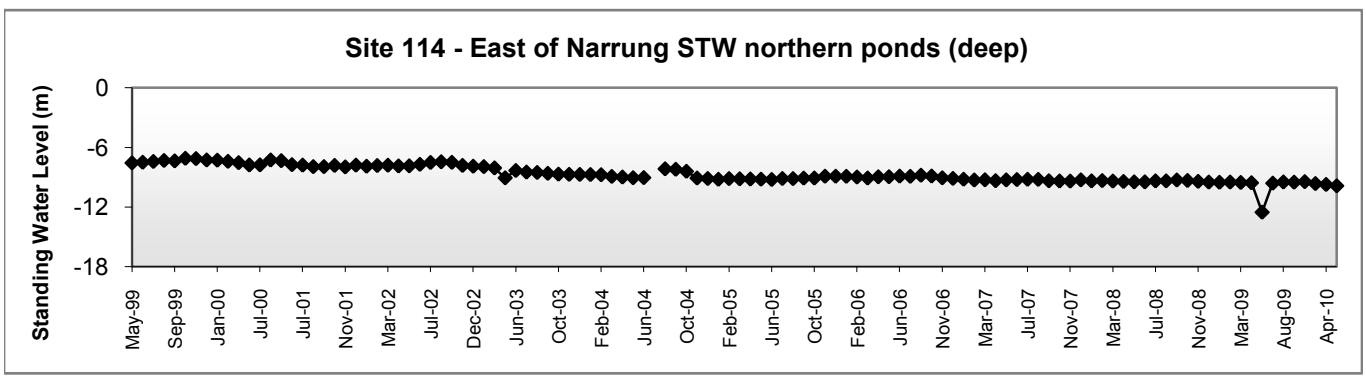
Apr-07
Sep-07
Feb-08
Jul-08
Jan-09
Jun-09

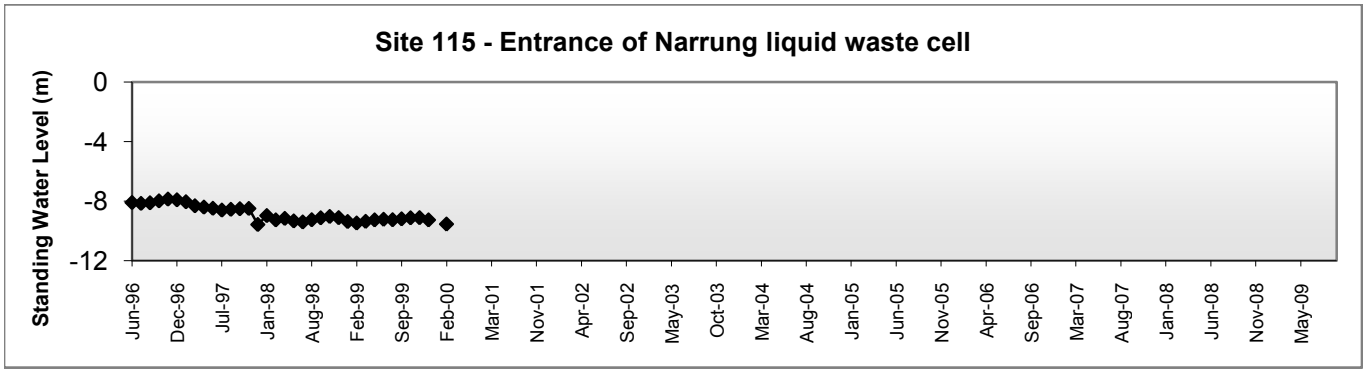

Site 110 - West of Narrung STW southern ponds (deep)
Standing Water Level (m)
0
-4
-8
-12
May-99
Oct-99
May-00
May-01
Nov-01
Apr-02
Sep-02
May-03
Oct-03
Mar-04
Aug-04
Jan-05
Jun-05
Nov-05
Apr-06
Sep-06
Mar-07
Aug-07
Jan-08
Jun-08
Nov-08
Apr-09
Sep-09
Feb-10

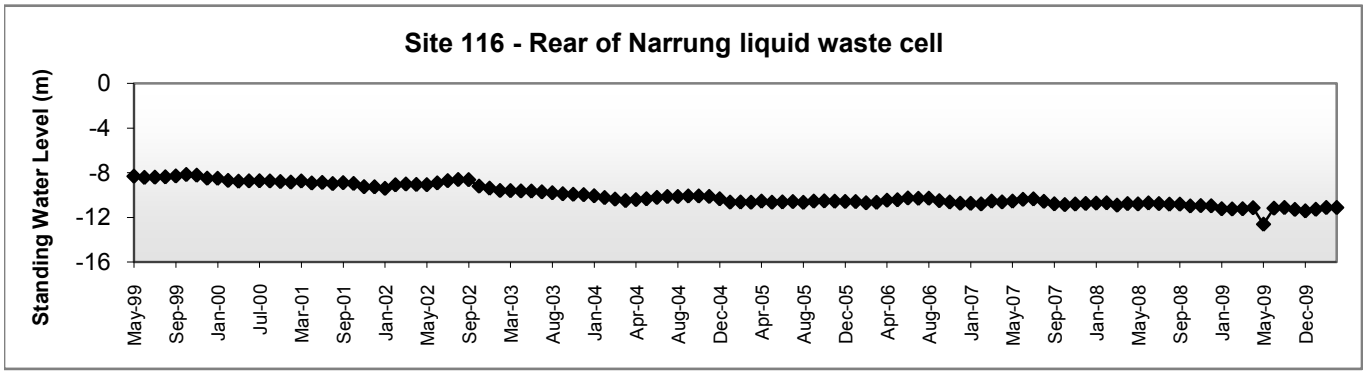

Site 111 - North-west of Narrung STW northern ponds
Standing Water Level (m)
0
-3
-6
-9
Jun-96
Dec-96
Jul-97
Jan-98
Aug-98
Feb-99
Sep-99
Feb-00
Mar-01
Oct-01
Mar-02
Aug-02
Mar-03
Sep-03
Feb-04
Jul-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Jul-07
Dec-07
May-08
Oct-08
Apr-09
Nov-09

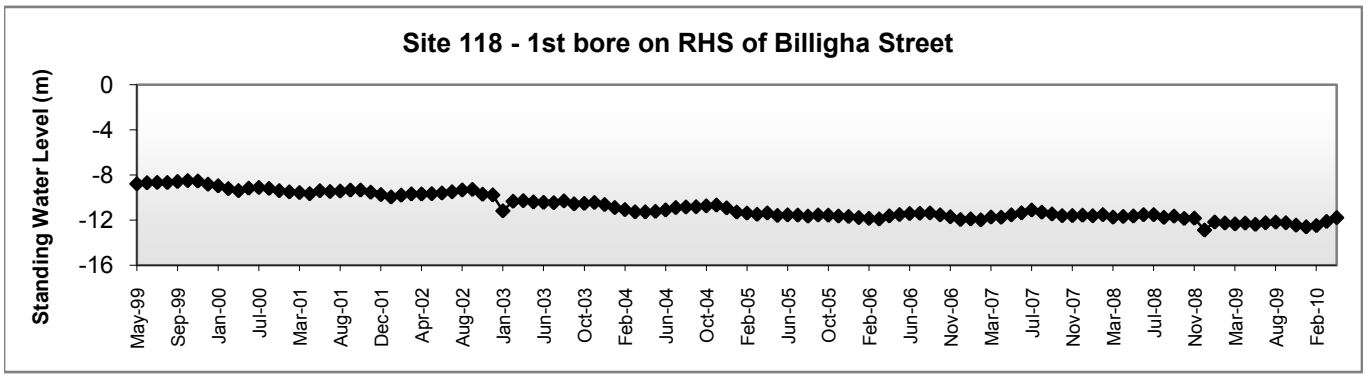

Site 112- Between river and Narrung STW northern ponds
Standing Water Level (m)
0
-2
-4
-6
-8
Jun-96
Dec-96
Jul-97
Jan-98
Aug-98
Feb-99
Sep-99
Feb-00
Mar-01
Oct-01
Mar-02
Aug-02
Mar-03
Sep-03
Feb-04
Jul-04
Dec-04
May-05
Oct-05
Mar-06
Aug-06
Feb-07
Jul-07
Dec-07
May-08
Oct-08
Apr-09
Nov-09

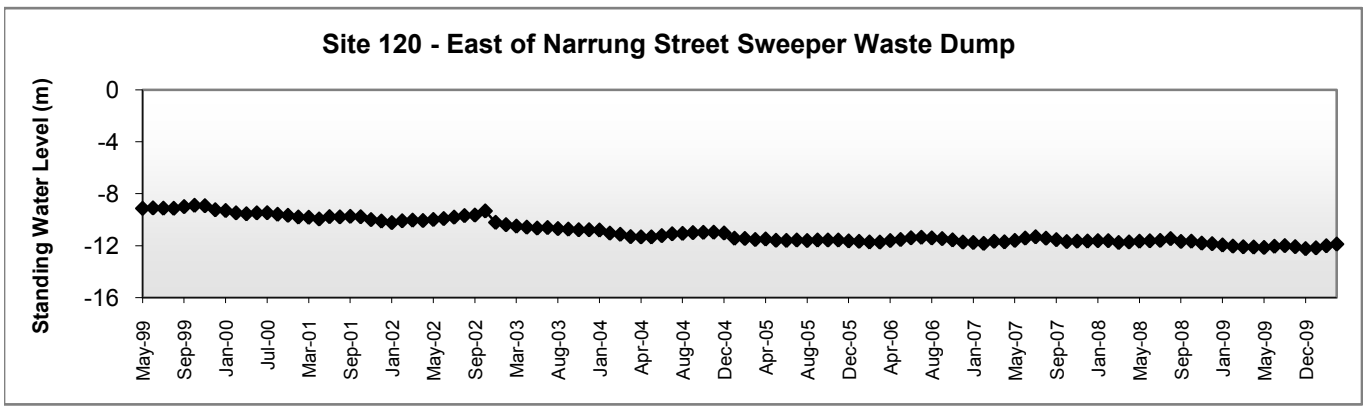

Site 113 - East of Narrung STW northern ponds (shallow)
Standing Water Level (m)
0
-2
-4
-6
-8
Jun-96
Dec-96
Jul-97
Jan-98
Aug-97
Dec-98
Jul-99
Dec-99
Jul-00
Aug-01
Jan-02
Jun-02
Dec-02
Jun-03
Nov-03
Apr-04
Sep-04
Feb-05
Aug-05
Jan-06
Jun-06
Dec-06
May-07
Oct-07
Mar-08
Aug-08
Feb-09
Jul-09
Jun-10

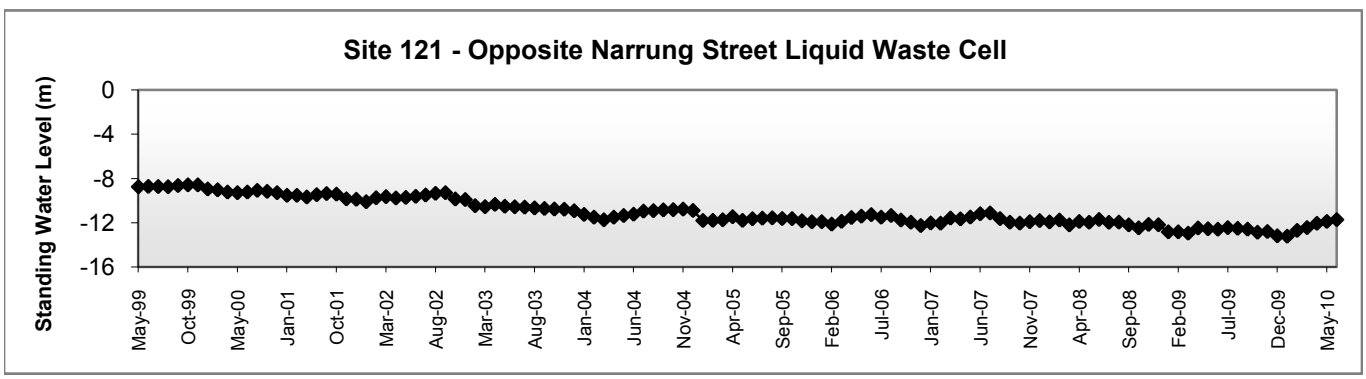

Site 114 - East of Narrung STW northern ponds (deep)
Standing Water Level (m)
0
-6
-12
-18
May-99
Sep-99
Jan-00
Jul-00
Jul-01
Nov-01
Mar-02
Jul-02
Dec-02
Jun-03
Oct-03
Feb-04
Jun-04
Oct-04
Feb-05
Jun-05
Oct-05
Feb-06
Jun-06
Nov-06
Mar-07
Jul-07
Nov-07
Mar-08
Jul-08
Nov-08
Mar-09
Aug-09
Apr-10

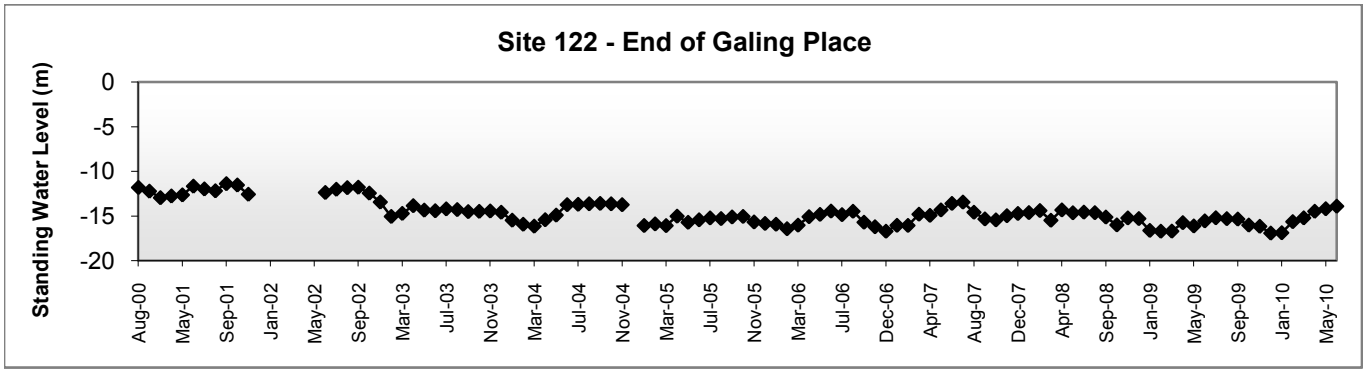

Site 115 - Entrance of Narrung liquid waste cell
Standing Water Level (m)
0
-4
-8
-12
Jun-96
Dec-96
Jul-97
Jan-98
Aug-98
Feb-99
Sep-99
Feb-00
Mar-01
Nov-01
Apr-02
Sep-02
May-03
Oct-03
Mar-04
Aug-04
Jan-05
Jun-05
Nov-05
Apr-06
Sep-06
Mar-07
Aug-07
Jan-08
Jun-08
Nov-08
May-09

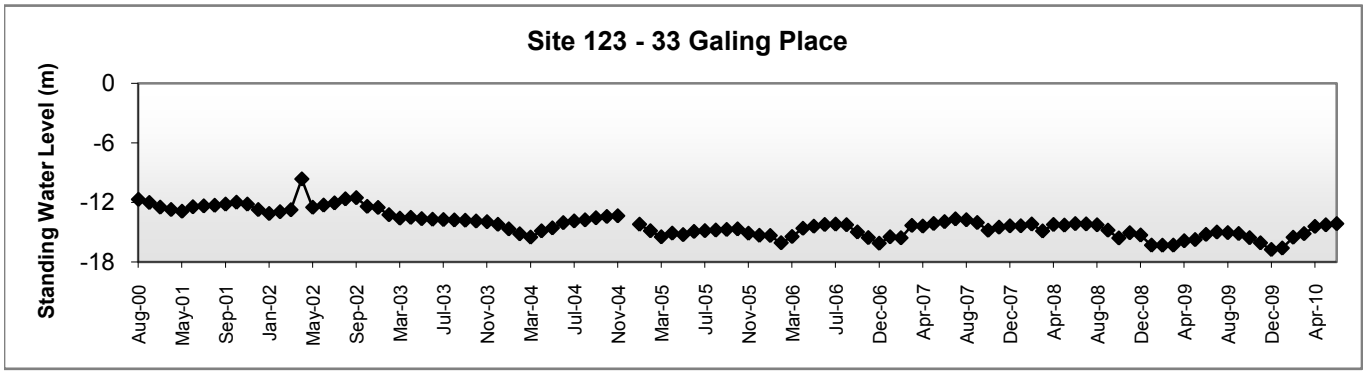

Site 116 - Rear of Narrung liquid waste cell
Standing Water Level (m)
0
-4
-8
-12
-16
May-99
Sep-99
Jan-00
Jul-00
Mar-01
Sep-01
Jan-02
May-02
Sep-02
Mar-03
Aug-03
Jan-04
Apr-04
Aug-04
Dec-04
Apr-05
Aug-05
Dec-05
Apr-06
Aug-06
Jan-07
May-07
Sep-07
Jan-08
May-08
Sep-08
Jan-09
May-09
Dec-09

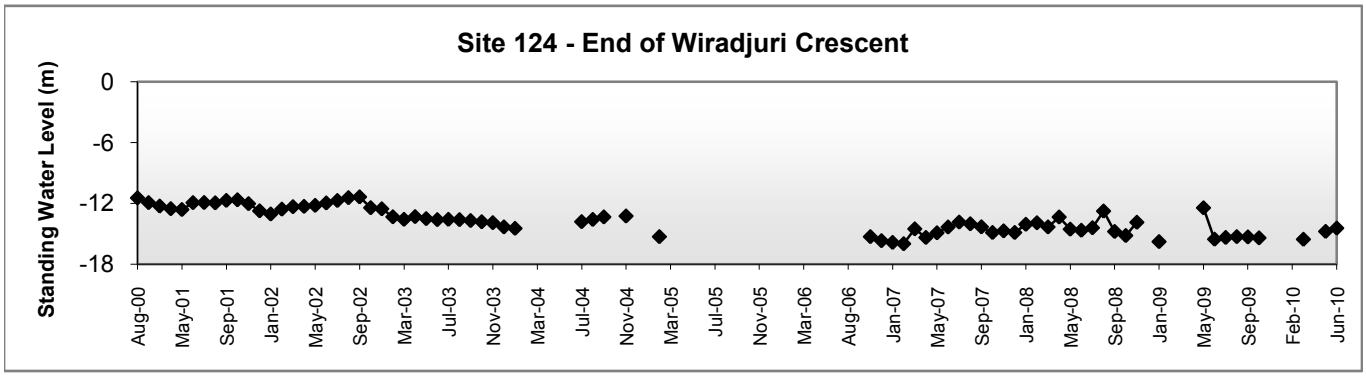

Site 118 - 1st bore on RHS of Billigha Street
Standing Water Level (m)
0
-4
-8
-12
-16
May-99
Sep-99
Jan-00
Jul-00
Mar-01
Aug-01
Dec-01
Apr-02
Aug-02
Jan-03
Jun-03
Oct-03
Feb-04
Jun-04
Oct-04
Feb-05
Jun-05
Oct-05
Feb-06
Jun-06
Nov-06
Mar-07
Jul-07
Nov-07
Mar-08
Jul-08
Nov-08
Mar-09
Aug-09
Feb-10

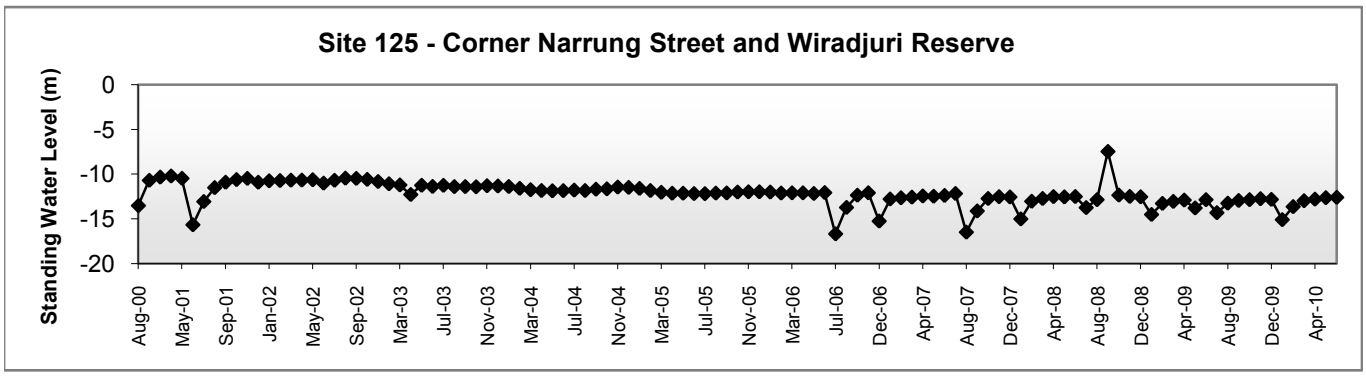

Site 120 - East of Narrung Street Sweeper Waste Dump
Standing Water Level (m)
0
-4
-8
-12
-16
May-99
Sep-99
Jan-00
Jul-00
Mar-01
Sep-01
Jan-02
May-02
Sep-02
Mar-03
Aug-03
Jan-04
Apr-04
Aug-04
Dec-04
Apr-05
Aug-05
Dec-05
Apr-06
Aug-06
Jan-07
May-07
Sep-07
Jan-08
May-08
Sep-08
Jan-09
May-09
Dec-09

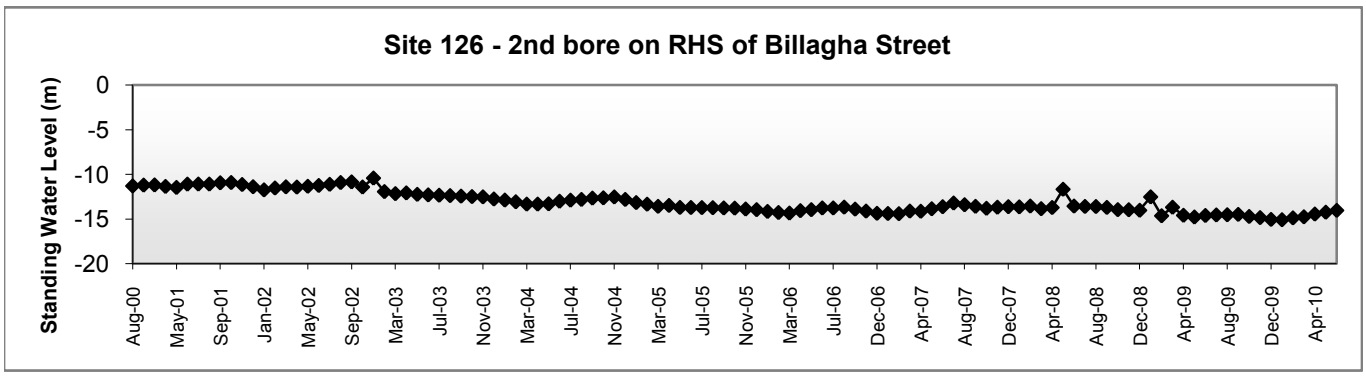

Site 121 - Opposite Narrung Street Liquid Waste Cell
Standing Water Level (m)
0
-4
-8
-12
-16
May-99
Oct-99
May-00
Jan-01
Oct-01
Mar-02
Aug-02
Mar-03
Aug-03
Jan-04
Jun-04
Nov-04
Apr-05
Sep-05
Feb-06
Jul-06
Jan-07
Jun-07
Nov-07
Apr-08
Sep-08
Feb-09
Jul-09
Dec-09
May-10

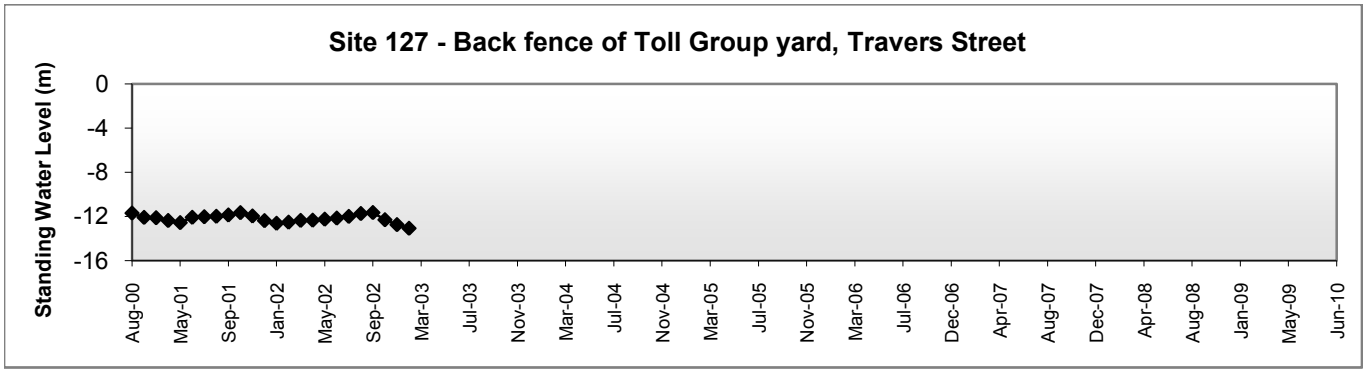

Site 122 - End of Galing Place
Standing Water Level (m)
0
-5
-10
-15
-20
Aug-00
May-01
Sep-01
Jan-02
May-02
Sep-02
Mar-03
Jul-03
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Jul-06
Dec-06
Apr-07
Aug-07
Dec-07
Apr-08
Sep-08
Jan-09
May-09
Sep-09
Jan-10
May-10

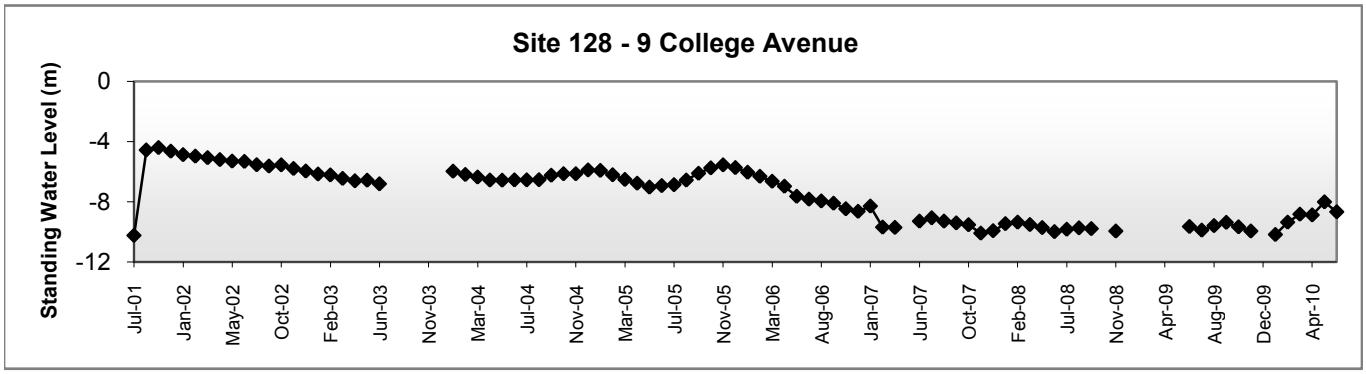

Site 123 - 33 Galing Place
Standing Water Level (m)
0
-6
-12
-18
Aug-00
May-01
Sep-01
Jan-02
May-02
Sep-02
Mar-03
Jul-03
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Jul-06
Dec-06
Apr-07
Aug-07
Dec-07
Apr-08
Aug-08
Dec-08
Apr-09
Aug-09
Dec-09
Apr-10

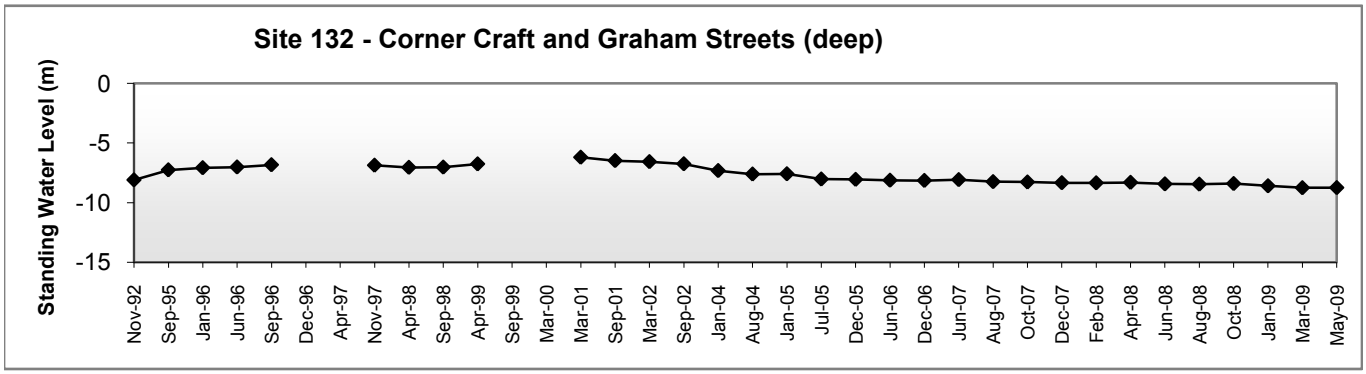

Site 124 - End of Wiradjuri Crescent
Standing Water Level (m)
0
-6
-12
-18
Aug-00
May-01
Sep-01
Jan-02
May-02
Sep-02
Mar-03
Jul-03
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Aug-06
Jan-07
May-07
Sep-07
Jan-08
May-08
Sep-08
Jan-09
May-09
Sep-09
Feb-10
Jun-10

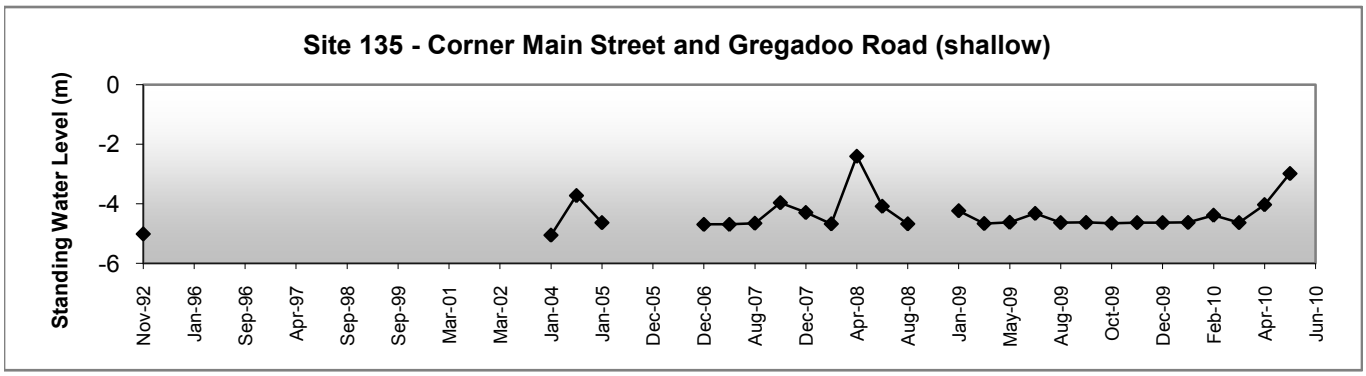

Site 125 - Corner Narrung Street and Wiradjuri Reserve
Standing Water Level (m)
0
-5
-10
-15
-20
Aug-00
May-01
Sep-01
Jan-02
May-02
Sep-02
Mar-03
Jul-03
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Jul-06
Dec-06
Apr-07
Aug-07
Dec-07
Apr-08
Aug-08
Dec-08
Apr-09
Aug-09
Dec-09
Apr-10

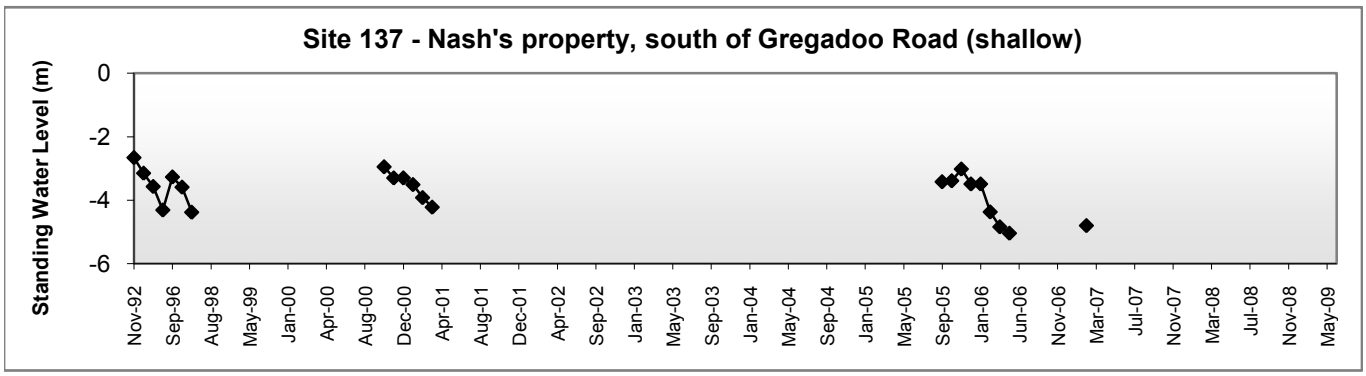

Site 126 - 2nd bore on RHS of Billagha Street
Standing Water Level (m)
0
-5
-10
-15
-20
Aug-00
May-01
Sep-01
Jan-02
May-02
Sep-02
Mar-03
Jul-03
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Jul-06
Dec-06
Apr-07
Aug-07
Dec-07
Apr-08
Aug-08
Dec-08
Apr-09
Aug-09
Dec-09
Apr-10

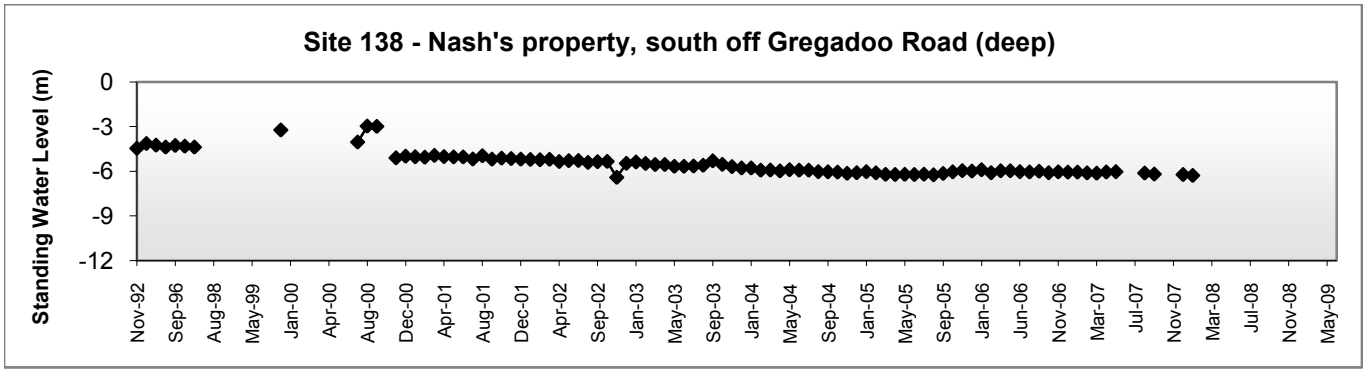

Site 127 - Back fence of Toll Group yard, Travers Street
Standing Water Level (m)
0
-4
-8
-12
-16
Aug-00
May-01
Sep-01
Jan-02
May-02
Sep-02
Mar-03
Jul-03
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Jul-06
Dec-06
Apr-07
Aug-07
Dec-07
Apr-08
Aug-08
Jan-09
May-09
Jun-10

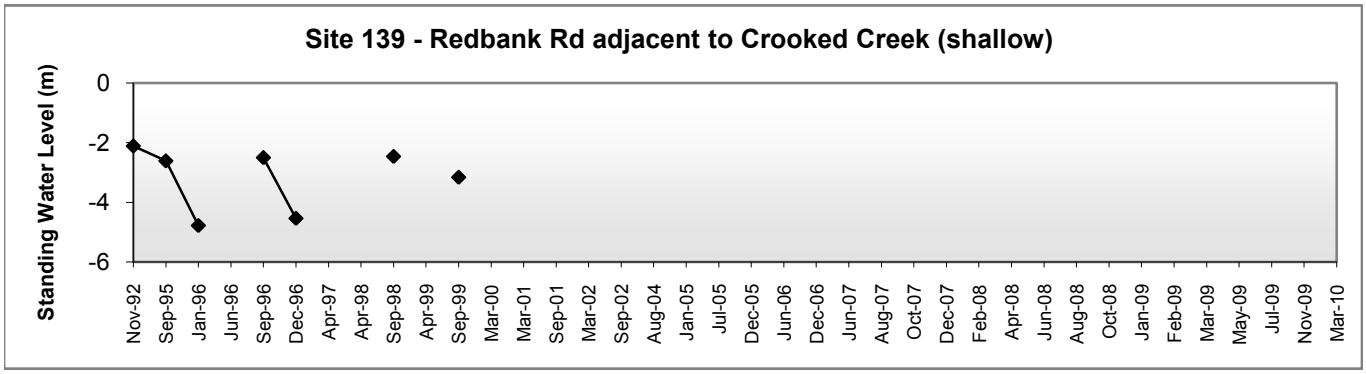

Site 128 - 9 College Avenue
Standing Water Level (m)
0
-4
-8
-12
Jul-01
Jan-02
May-02
Oct-02
Feb-03
Jun-03
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Aug-06
Jan-07
Jun-07
Oct-07
Feb-08
Jul-08
Nov-08
Apr-09
Aug-09
Dec-09
Apr-10

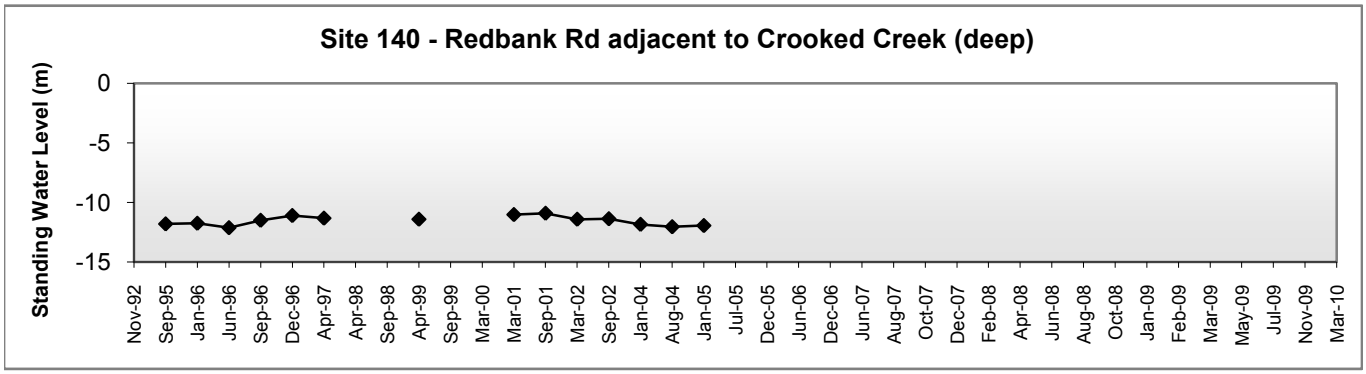

Site 132 - Corner Craft and Graham Streets (deep)
Standing Water Level (m)
0
-5
-10
-15
Nov-92
Sep-95
Jan-96
Jun-96
Sep-96
Dec-96
Apr-97
Nov-97
Apr-98
Sep-98
Apr-99
Sep-99
Mar-00
Mar-01
Sep-01
Mar-02
Sep-02
Jan-04
Aug-04
Jan-05
Jul-05
Dec-05
Jun-06
Dec-06
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
Apr-08
Jun-08
Aug-08
Oct-08
Jan-09
Mar-09
May-09

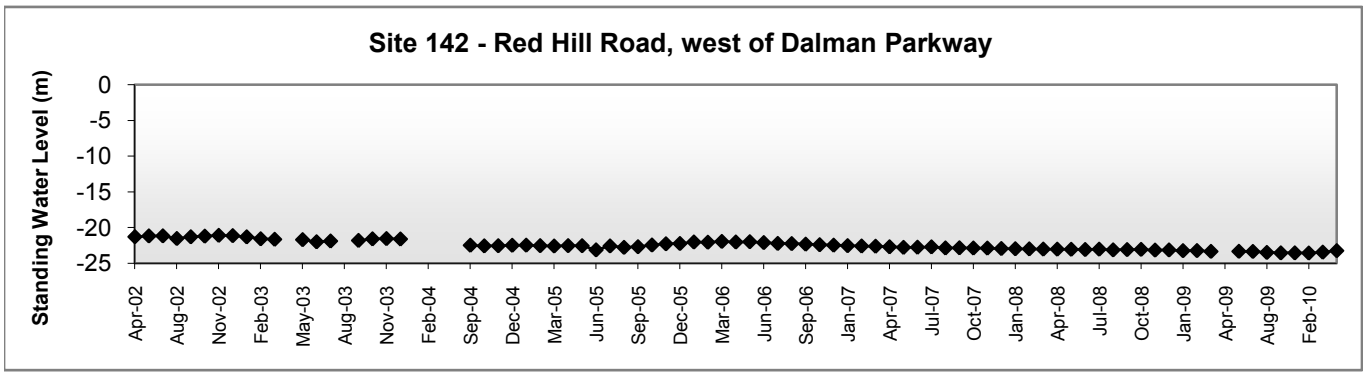

Site 135 - Corner Main Street and Gregadoo Road (shallow)
Standing Water Level (m)
0
-2
-4
-6
Nov-92
Jan-96
Sep-96
Apr-97
Sep-98
Sep-99
Mar-01
Mar-02
Jan-04
Jan-05
Dec-05
Dec-06
Aug-07
Dec-07
Apr-08
Aug-08
Jan-09
May-09
Aug-09
Oct-09
Dec-09
Feb-10
Apr-10
Jun-10

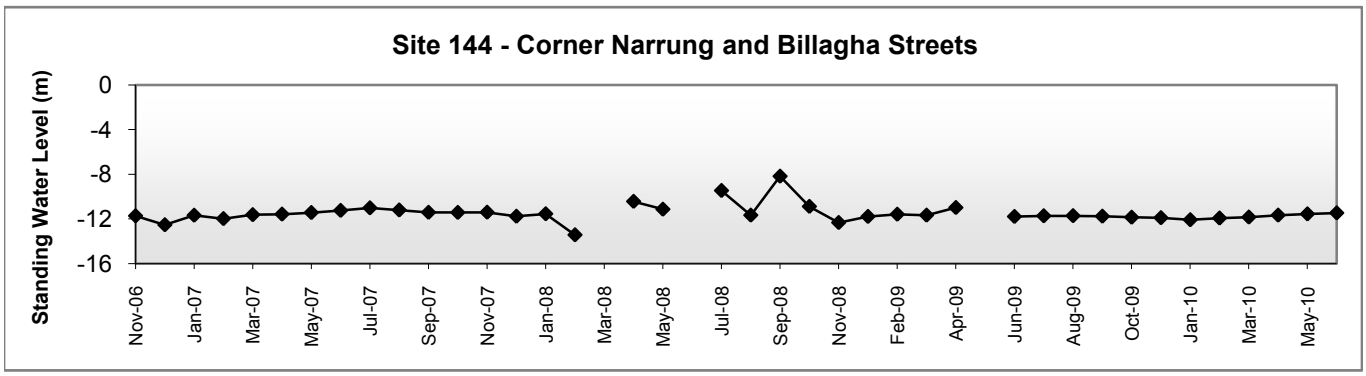

Site 137 - Nash's property, south of Gregadoo Road (shallow)
Standing Water Level (m)
0
-2
-4
-6
Nov-92
Sep-96
Aug-98
May-99
Jan-00
Apr-00
Aug-00
Dec-00
Apr-01
Aug-01
Dec-01
Apr-02
Sep-02
Jan-03
May-03
Sep-03
Jan-04
May-04
Sep-04
Jan-05
May-05
Sep-05
Jan-06
Jun-06
Nov-06
Mar-07
Jul-07
Nov-07
Mar-08
Jul-08
Nov-08
May-09

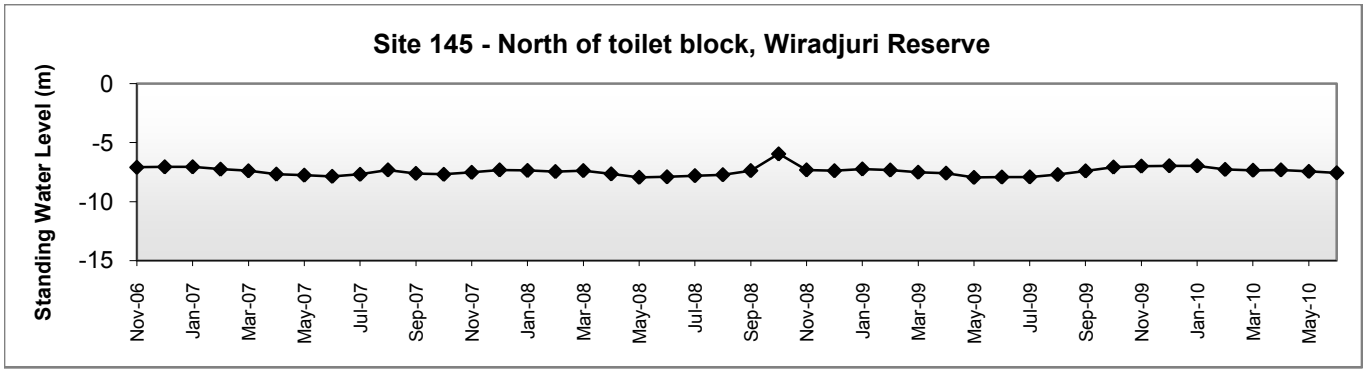

Site 138 - Nash's property, south off Gregadoo Road (deep)
Standing Water Level (m)
0
-3
-6
-9
-12
Nov-92
Sep-96
Aug-98
May-99
Jan-00
Apr-00
Aug-00
Dec-00
Apr-01
Aug-01
Dec-01
Apr-02
Sep-02
Jan-03
May-03
Sep-03
Jan-04
May-04
Sep-04
Jan-05
May-05
Sep-05
Jan-06
Jun-06
Nov-06
Mar-07
Jul-07
Nov-07
Mar-08
Jul-08
Nov-08
May-09

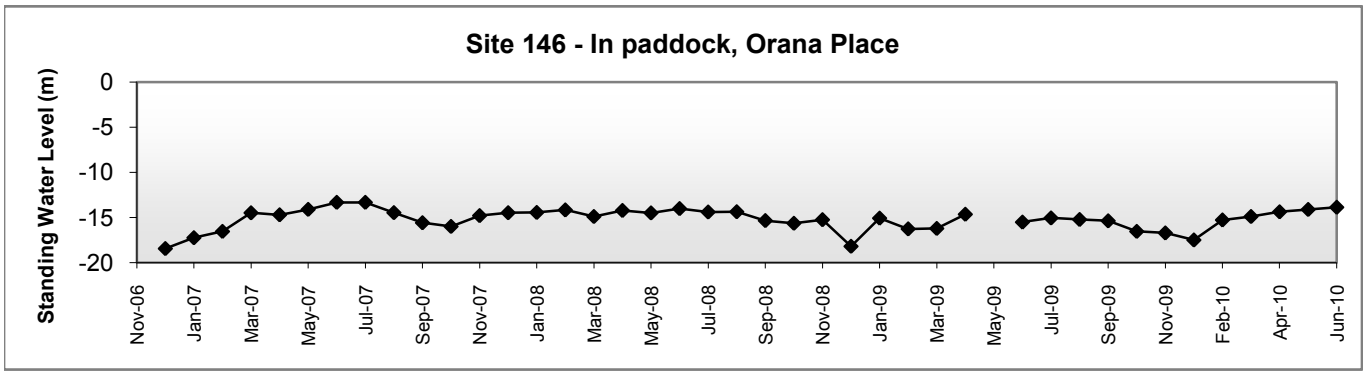

Site 139 - Redbank Rd adjacent to Crooked Creek (shallow)
Standing Water Level (m)
0
-2
-4
-6
Nov-92
Sep-95
Jan-96
Jun-96
Sep-96
Dec-96
Apr-97
Apr-98
Sep-98
Apr-99
Sep-99
Mar-00
Mar-01
Sep-01
Mar-02
Sep-02
Aug-04
Jan-05
Jul-05
Dec-05
Jun-06
Dec-06
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
Apr-08
Jun-08
Aug-08
Oct-08
Jan-09
Feb-09
Mar-09
May-09
Jul-09
Nov-09
Mar-10

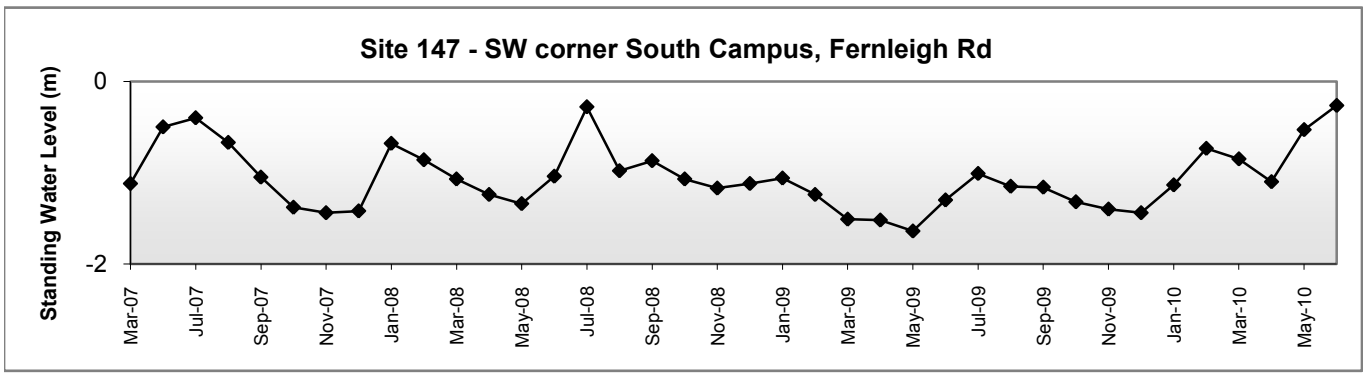

Site 140 - Redbank Rd adjacent to Crooked Creek (deep)
Standing Water Level (m)
0
-5
-10
-15
Nov-92
Sep-95
Jan-96
Jun-96
Sep-96
Dec-96
Apr-97
Apr-98
Sep-98
Apr-99
Sep-99
Mar-00
Mar-01
Sep-01
Mar-02
Sep-02
Jan-04
Aug-04
Jan-05
Jul-05
Dec-05
Jun-06
Dec-06
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
Apr-08
Jun-08
Aug-08
Oct-08
Jan-09
Feb-09
Mar-09
May-09
Jul-09
Nov-09
Mar-10

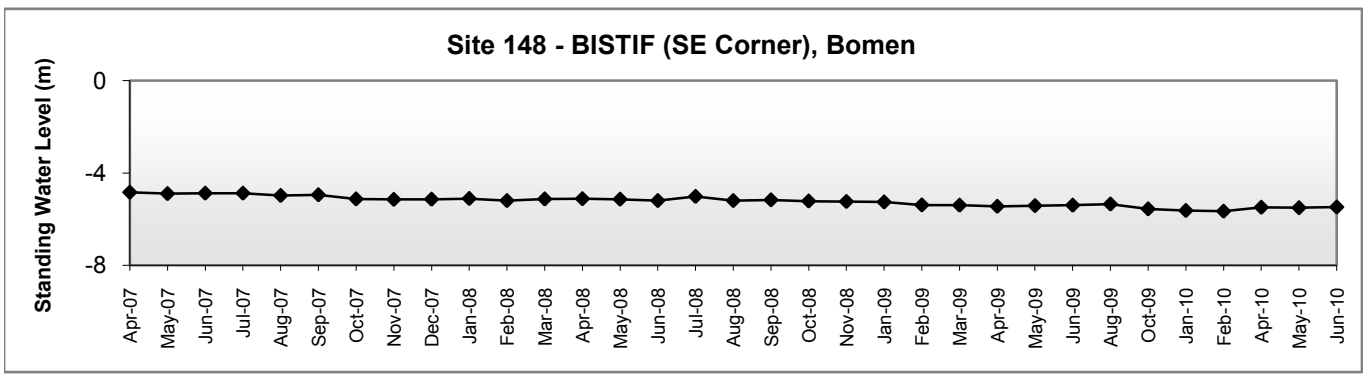

Site 142 - Red Hill Road, west of Dalman Parkway
Standing Water Level (m)
0
-5
-10
-15
-20
-25
Apr-02
Aug-02
Nov-02
Feb-03
May-03
Aug-03
Nov-03
Feb-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Aug-09
Feb-10

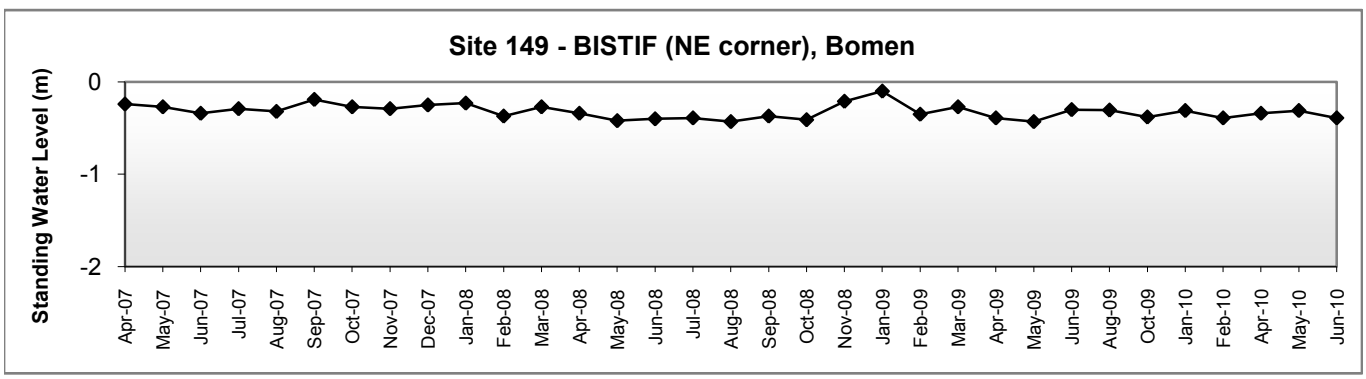

Site 144 - Corner Narrung and Billagha Streets
Standing Water Level (m)
0
-4
-8
-12
-16
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Feb-09
Apr-09
Jun-09
Aug-09
Oct-09
Jan-10
Mar-10
May-10

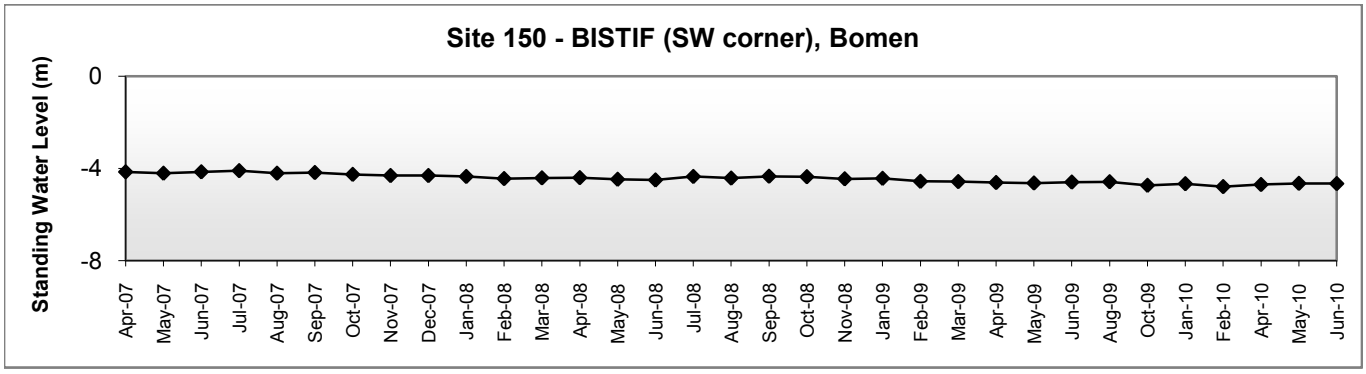

Site 145 - North of toilet block, Wiradjuri Reserve
Standing Water Level (m)
0
-5
-10
-15
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10

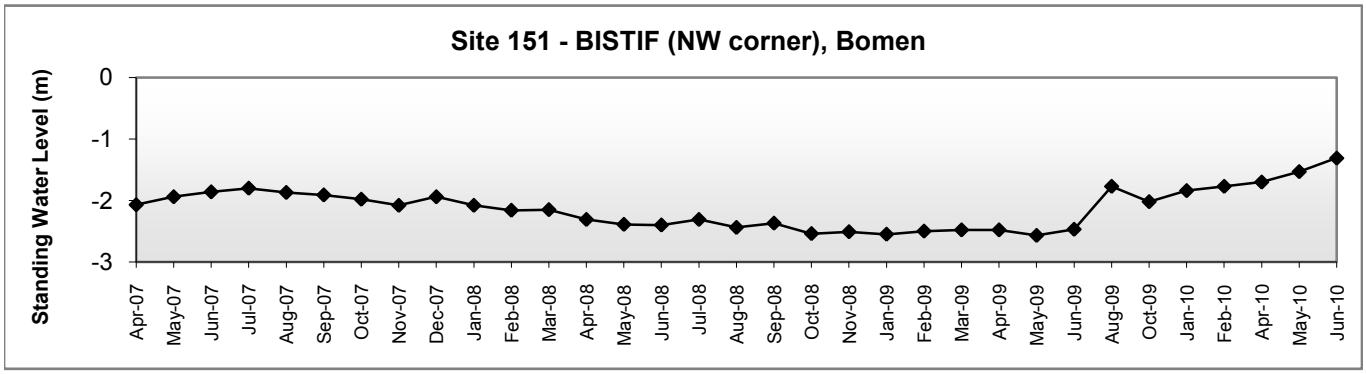

Site 146 - In paddock, Orana Place
Standing Water Level (m)
0
-5
-10
-15
-20
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Feb-10
Apr-10
Jun-10

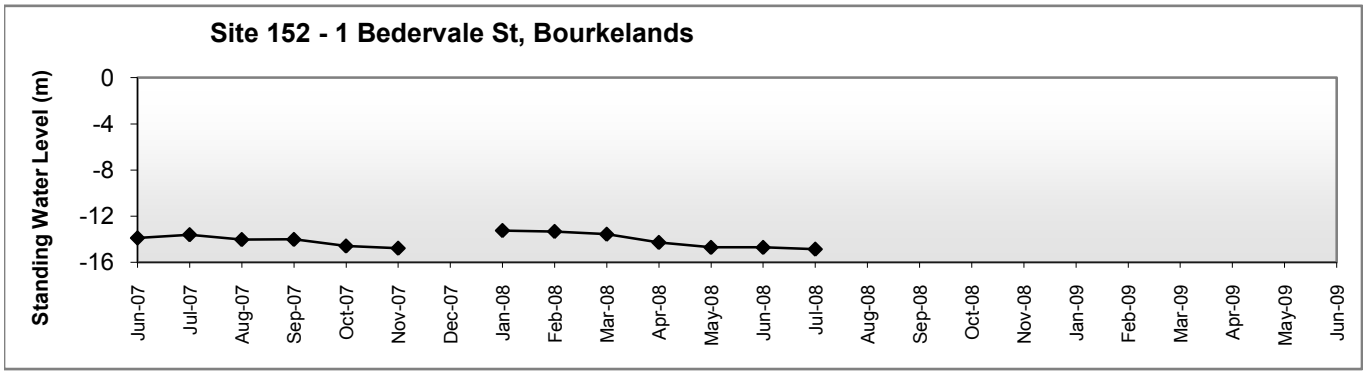

Site 147 - SW corner South Campus, Fernleigh Rd
Standing Water Level (m)
0
-2
Mar-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10

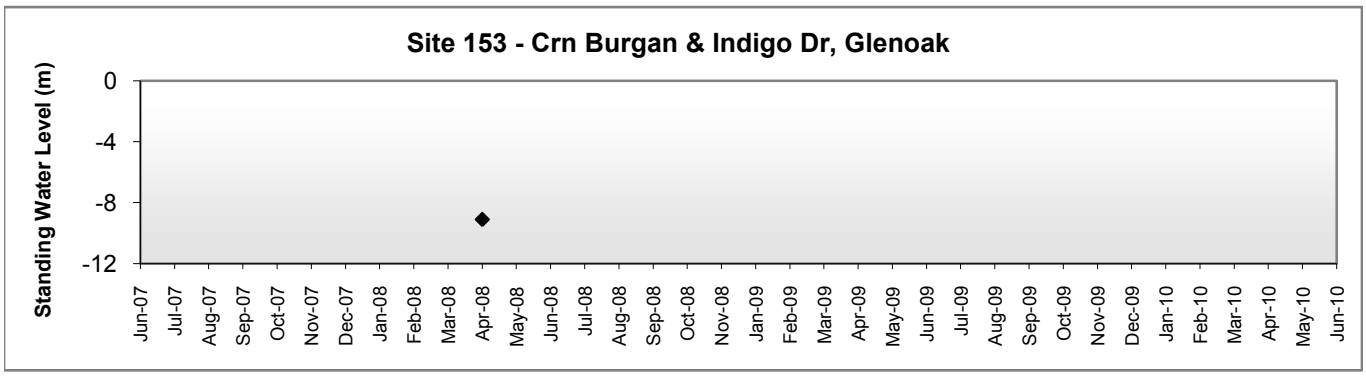

Site 148 - BISTIF (SE Corner), Bomen
Standing Water Level (m)
0
-4
-8
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Aug-09
Oct-09
Jan-10
Feb-10
Apr-10
May-10
Jun-10

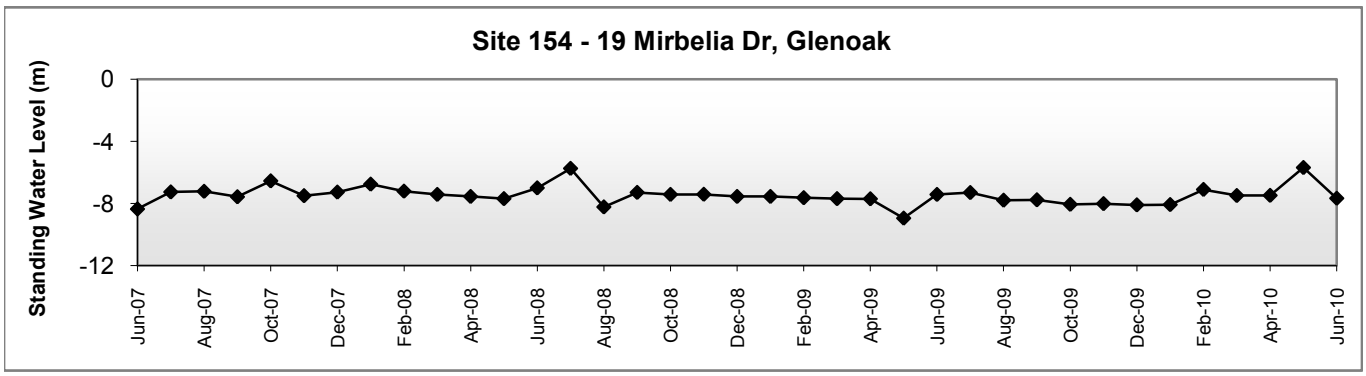

Site 149 - BISTIF (NE corner), Bomen
Standing Water Level (m)
0
-1
-2
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Aug-09
Oct-09
Jan-10
Feb-10
Apr-10
May-10
Jun-10

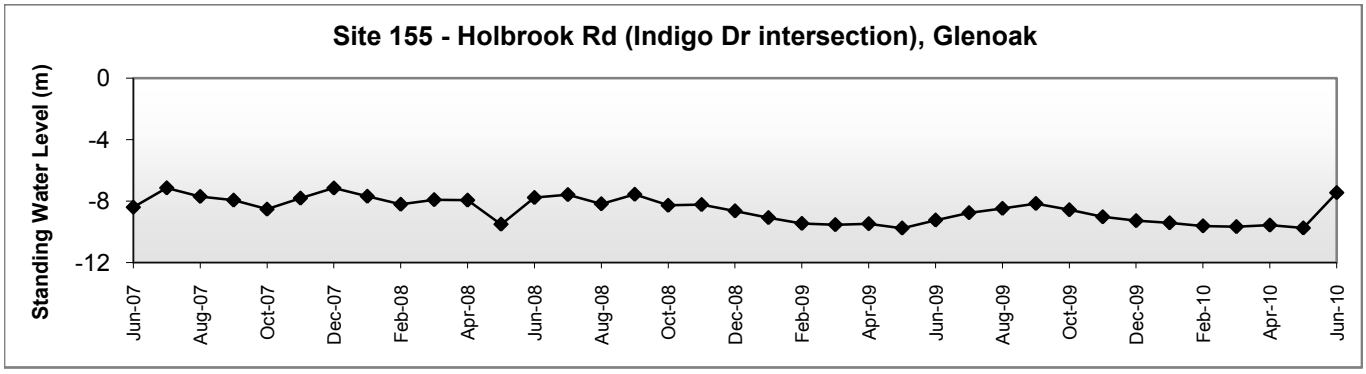

Site 150 - BISTIF (SW corner), Bomen
Standing Water Level (m)
0
-4
-8
Apr-07 May-07 Jun-07 Jul-07 Aug-07 Sep-07 Oct-07 Nov-07 Dec-07 Jan-08 Feb-08 Mar-08 Apr-08 May-08 Jun-08 Jul-08 Aug-08 Sep-08 Oct-08 Nov-08 Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Aug-09 Oct-09 Jan-10 Feb-10 Apr-10 May-10 Jun-10

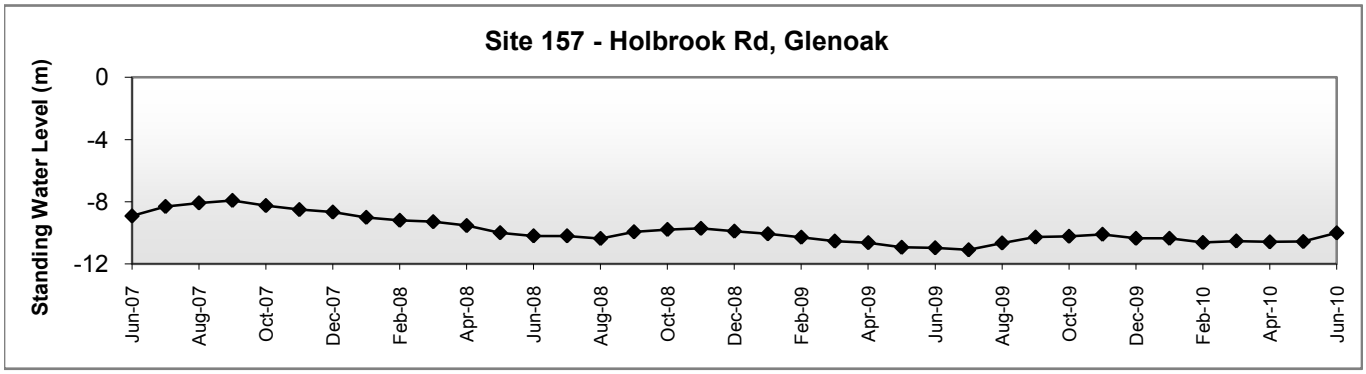

Site 151 - BISTIF (NW corner), Bomen
Standing Water Level (m)
0
-1
-2
-3
Apr-07 May-07 Jun-07 Jul-07 Aug-07 Sep-07 Oct-07 Nov-07 Dec-07 Jan-08 Feb-08 Mar-08 Apr-08 May-08 Jun-08 Jul-08 Aug-08 Sep-08 Oct-08 Nov-08 Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Aug-09 Oct-09 Jan-10 Feb-10 Apr-10 May-10 Jun-10

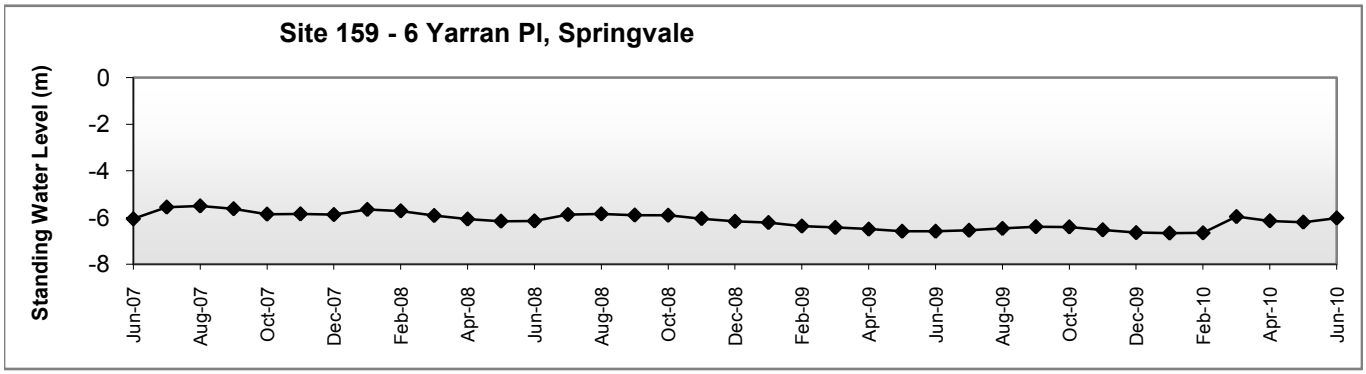

Site 152 - 1 Bedervale St, Bourkelands
Standing Water Level (m)
0
-4
-8
-12
-16
Jun-07 Jul-07 Aug-07 Sep-07 Oct-07 Nov-07 Dec-07 Jan-08 Feb-08 Mar-08 Apr-08 May-08 Jun-08 Jul-08 Aug-08 Sep-08 Oct-08 Nov-08 Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09

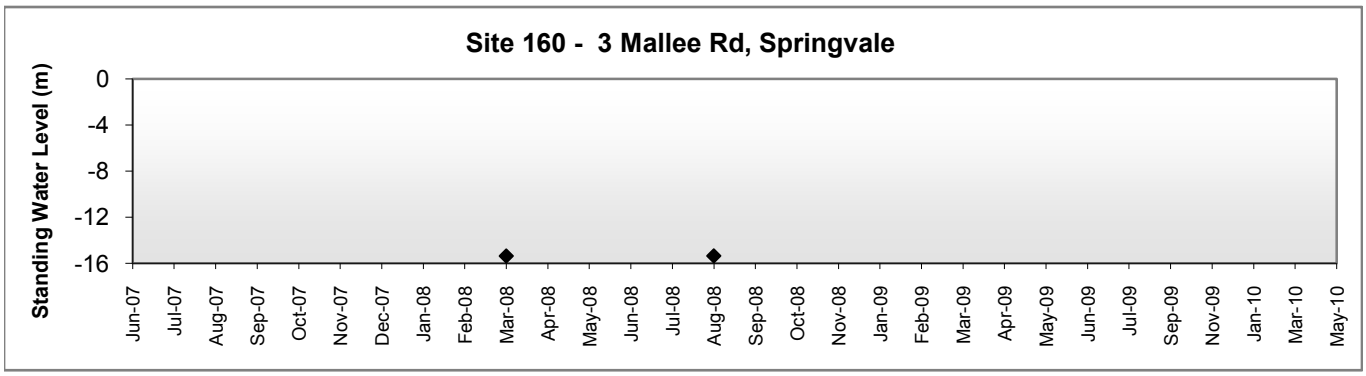

Site 153 - Crn Burgan & Indigo Dr, Glenoak
Standing Water Level (m)
0
-4
-8
-12
Jun-07 Jul-07 Aug-07 Sep-07 Oct-07 Nov-07 Dec-07 Jan-08 Feb-08 Mar-08 Apr-08 May-08 Jun-08 Jul-08 Aug-08 Sep-08 Oct-08 Nov-08 Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09 Jan-10 Feb-10 Mar-10 Apr-10 May-10 Jun-10

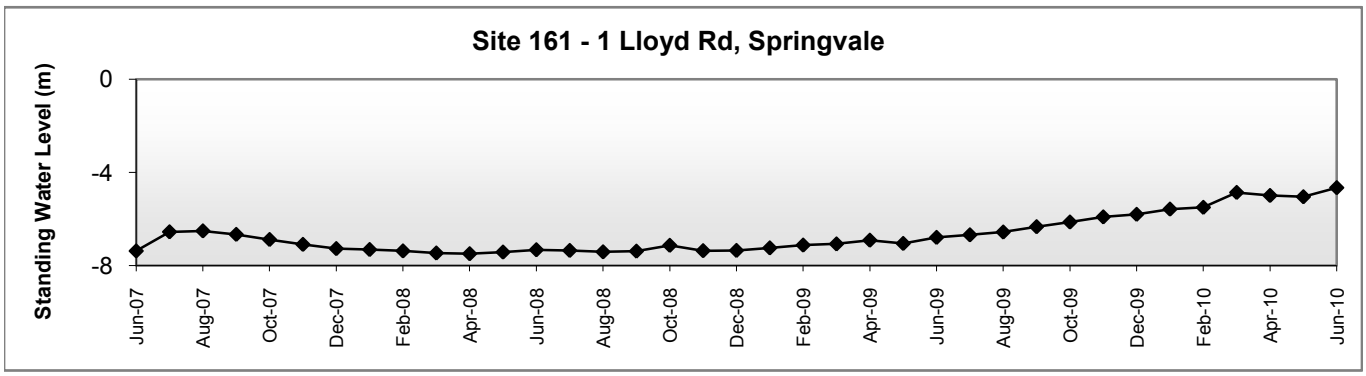

Site 154 - 19 Mirbelia Dr, Glenoak
Standing Water Level (m)
0
-4
-8
-12
Jun-07 Aug-07 Oct-07 Dec-07 Feb-08 Apr-08 Jun-08 Aug-08 Oct-08 Dec-08 Feb-09 Apr-09 Jun-09 Aug-09 Oct-09 Dec-09 Feb-10 Apr-10 Jun-10

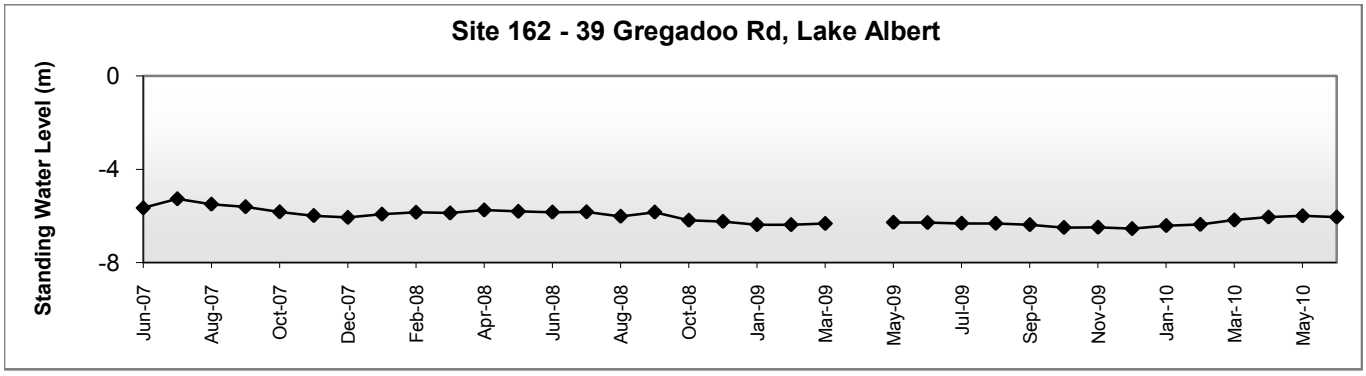

Site 155 - Holbrook Rd (Indigo Dr intersection), Glenoak
Standing Water Level (m)
0
-4
-8
-12
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
Apr-08
Jun-08
Aug-08
Oct-08
Dec-08
Feb-09
Apr-09
Jun-09
Aug-09
Oct-09
Dec-09
Feb-10
Apr-10
Jun-10

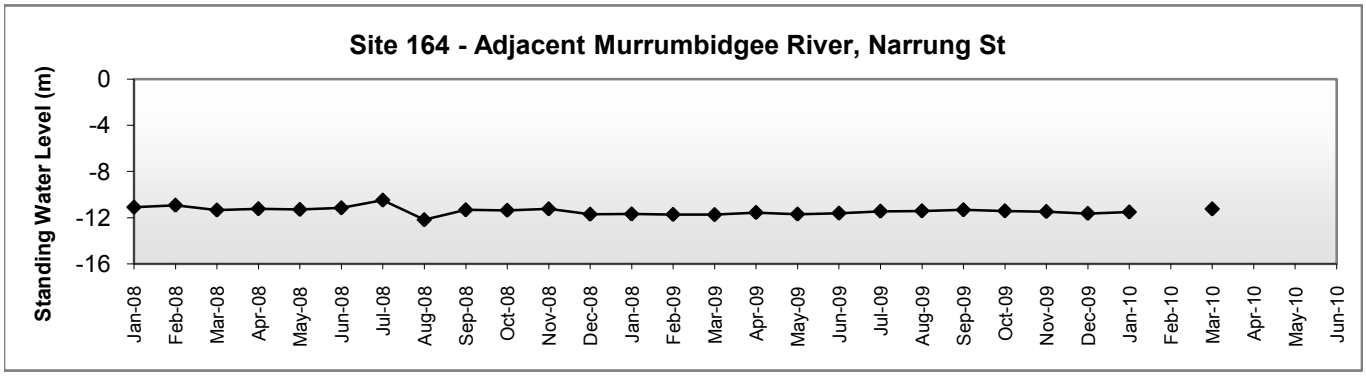

Site 157 - Holbrook Rd, Glenoak
Standing Water Level (m)
0
-4
-8
-12
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
Apr-08
Jun-08
Aug-08
Oct-08
Dec-08
Feb-09
Apr-09
Jun-09
Aug-09
Oct-09
Dec-09
Feb-10
Apr-10
Jun-10

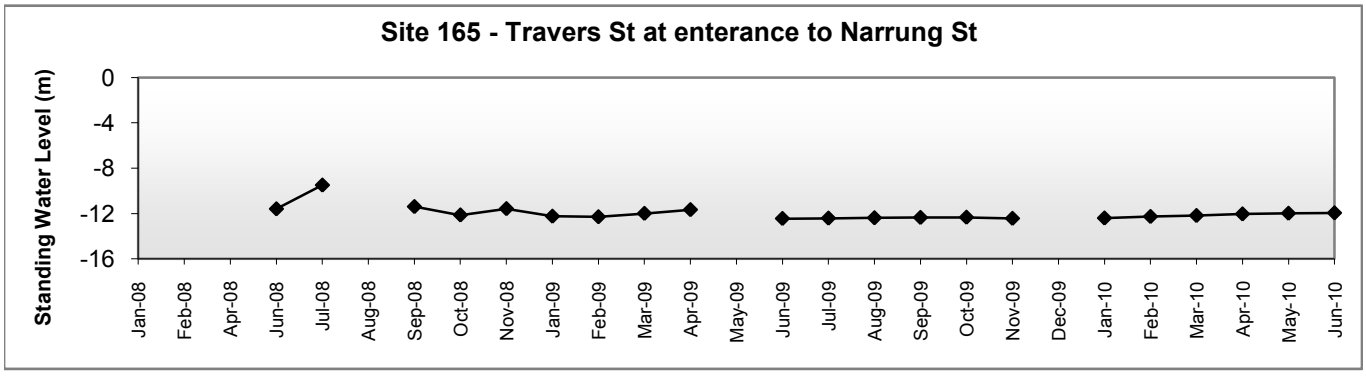

Site 159 - 6 Yarran Pl, Springvale
Standing Water Level (m)
0
-2
-4
-6
-8
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
Apr-08
Jun-08
Aug-08
Oct-08
Dec-08
Feb-09
Apr-09
Jun-09
Aug-09
Oct-09
Dec-09
Feb-10
Apr-10
Jun-10

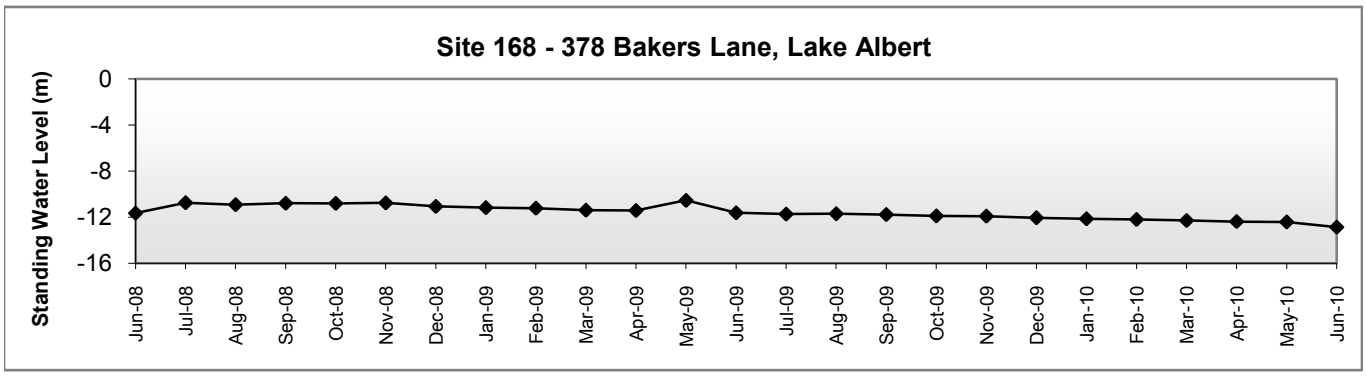

Site 160 - 3 Mallee Rd, Springvale
Standing Water Level (m)
0
-4
-8
-12
-16
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10

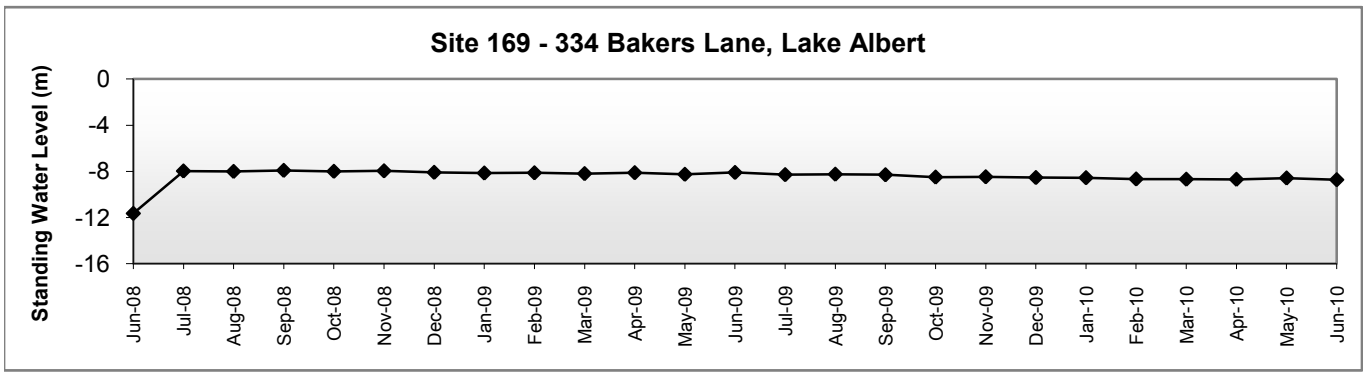

Site 161 - 1 Lloyd Rd, Springvale
Standing Water Level (m)
0
-4
-8
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
Apr-08
Jun-08
Aug-08
Oct-08
Dec-08
Feb-09
Apr-09
Jun-09
Aug-09
Oct-09
Dec-09
Feb-10
Apr-10
Jun-10

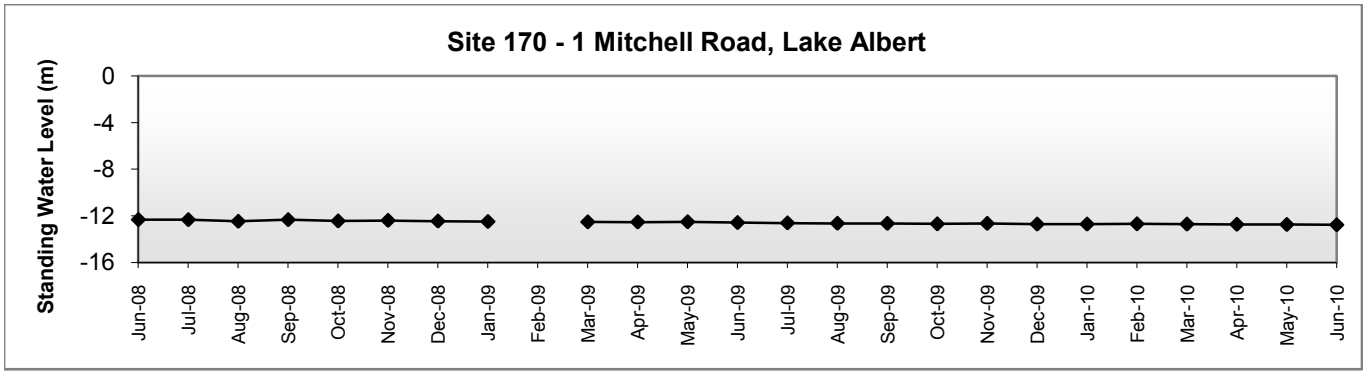

Site 162 - 39 Gregadoo Rd, Lake Albert
Standing Water Level (m)
0
-4
-8
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
Apr-08
Jun-08
Aug-08
Oct-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10


Site 164 - Adjacent Murrumbidgee River, Narrung St
Standing Water Level (m)
0
-4
-8
-12
-16
Jan-08
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-08
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10


Site 165 - Travers St at enterance to Narrung St
Standing Water Level (m)
0
-4
-8
-12
-16
Jan-08
Feb-08
Apr-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10


Site 168 - 378 Bakers Lane, Lake Albert
Standing Water Level (m)
0
-4
-8
-12
-16
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10


Site 169 - 334 Bakers Lane, Lake Albert
Standing Water Level (m)
0
-4
-8
-12
-16
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10


Site 170 - 1 Mitchell Road, Lake Albert
Standing Water Level (m)
0
-4
-8
-12
-16
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
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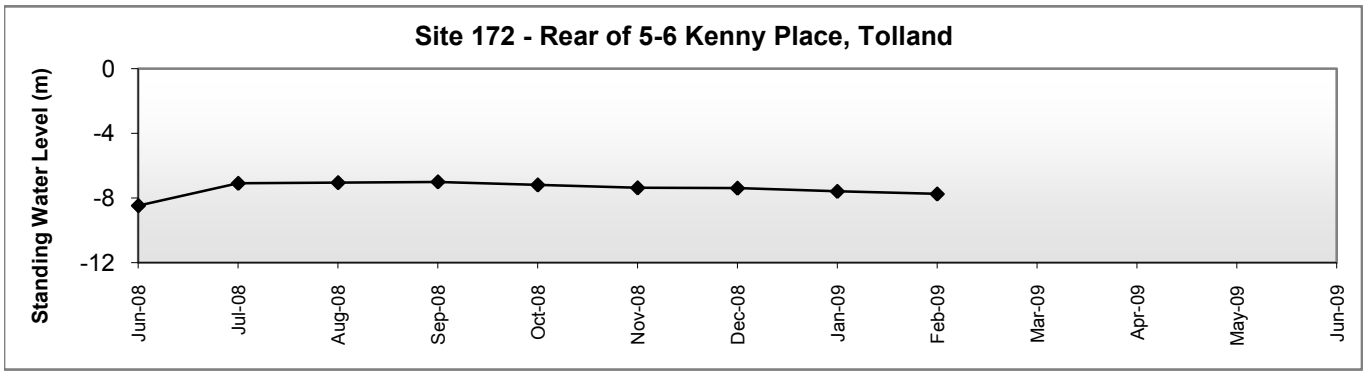
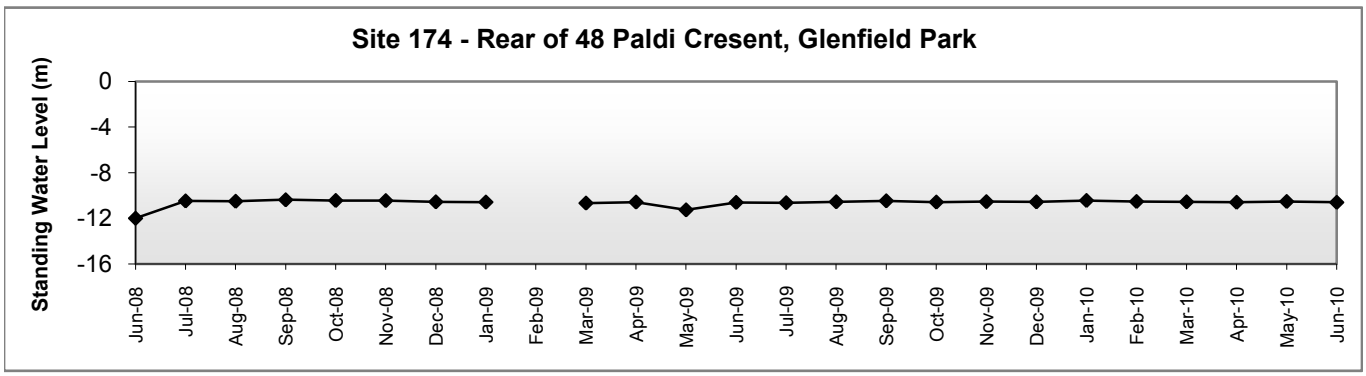
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10


Site 172 - Rear of 5-6 Kenny Place, Tolland
Standing Water Level (m)
0
-4
-8
-12
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09


Site 174 - Rear of 48 Paldi Cresent, Glenfield Park
Standing Water Level (m)
0
-4
-8
-12
-16
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
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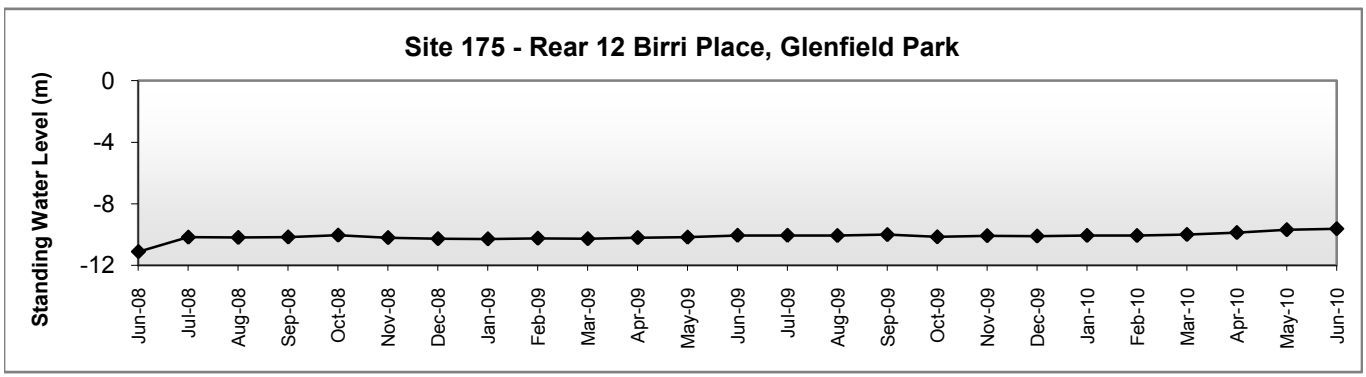
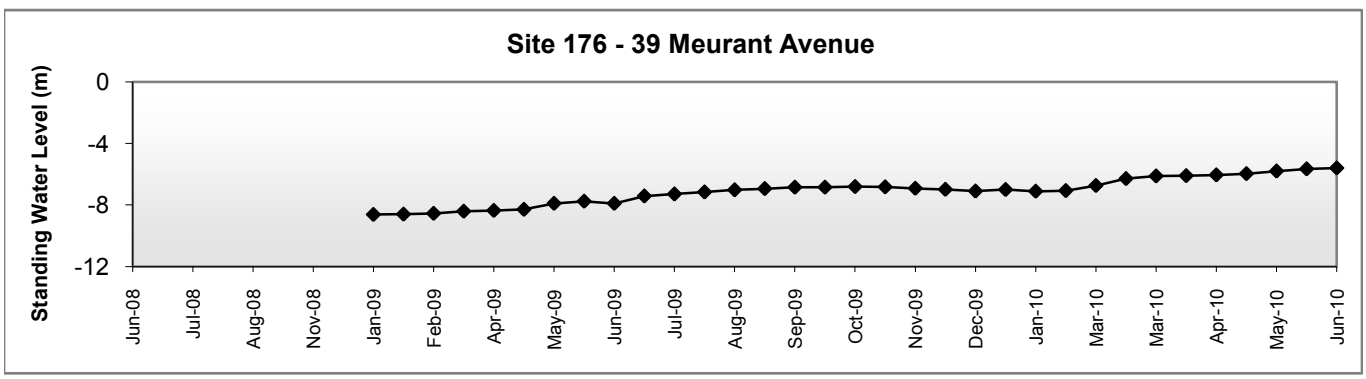
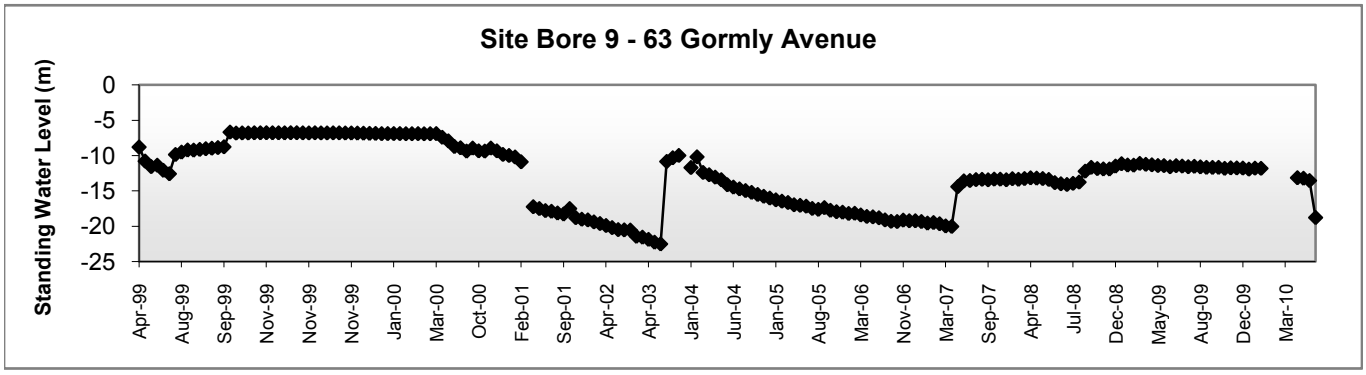
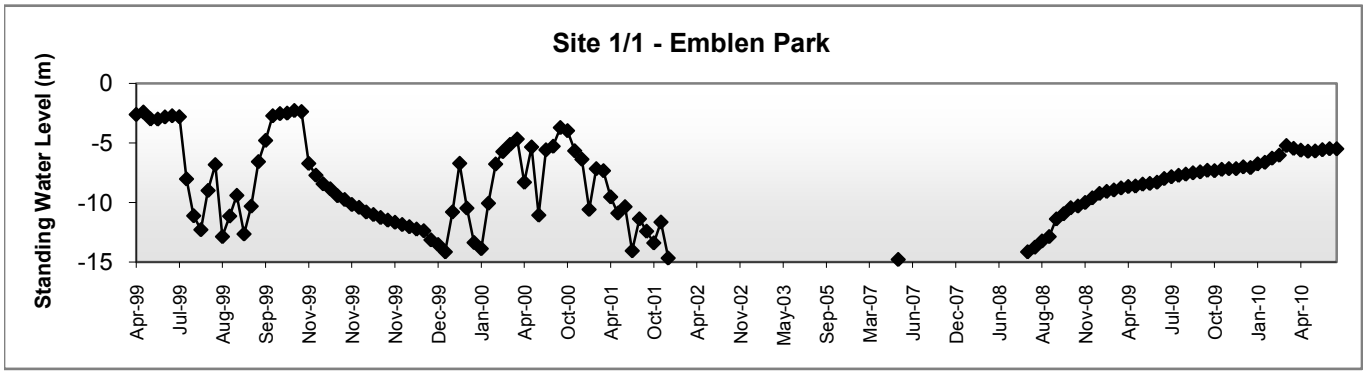
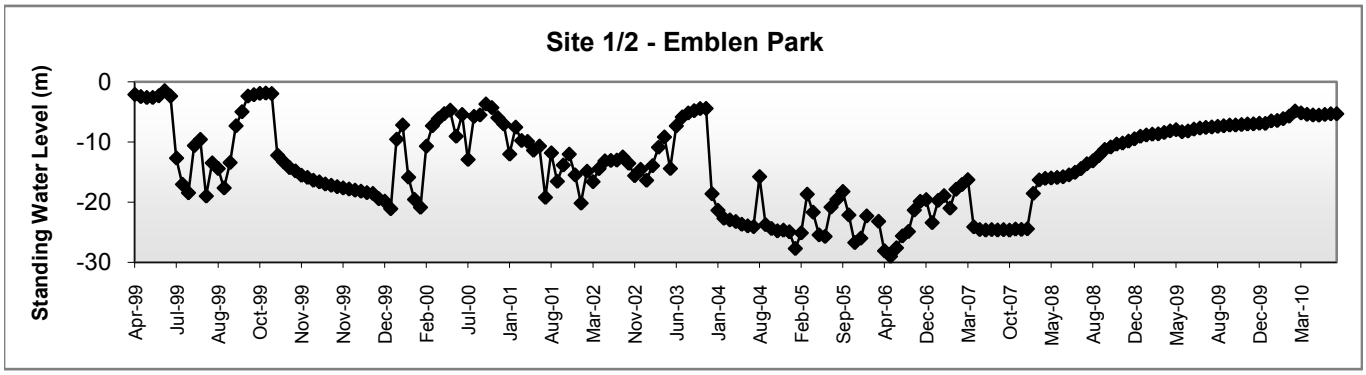
Apr-10
May-10
Jun-10

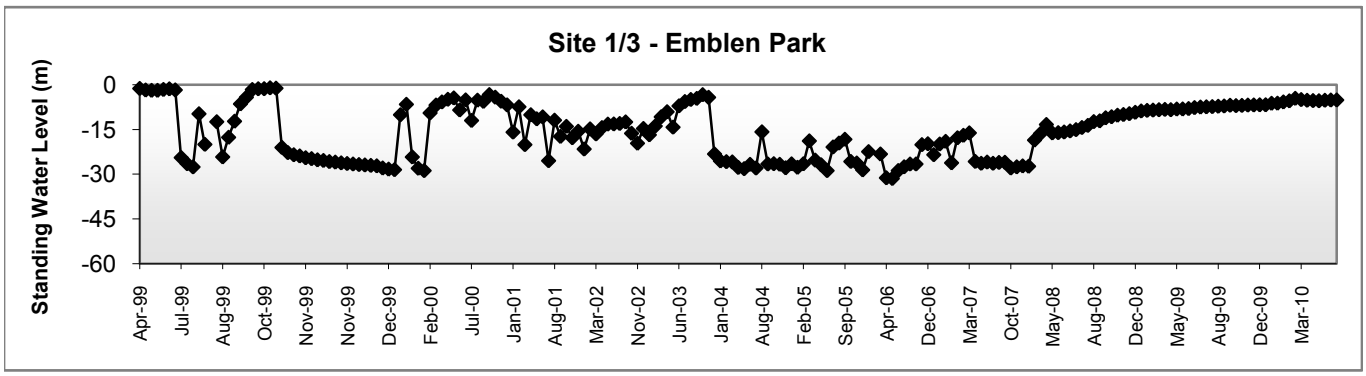

Site 175 - Rear 12 Birri Place, Glenfield Park
Standing Water Level (m)
0
-4
-8
-12
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10

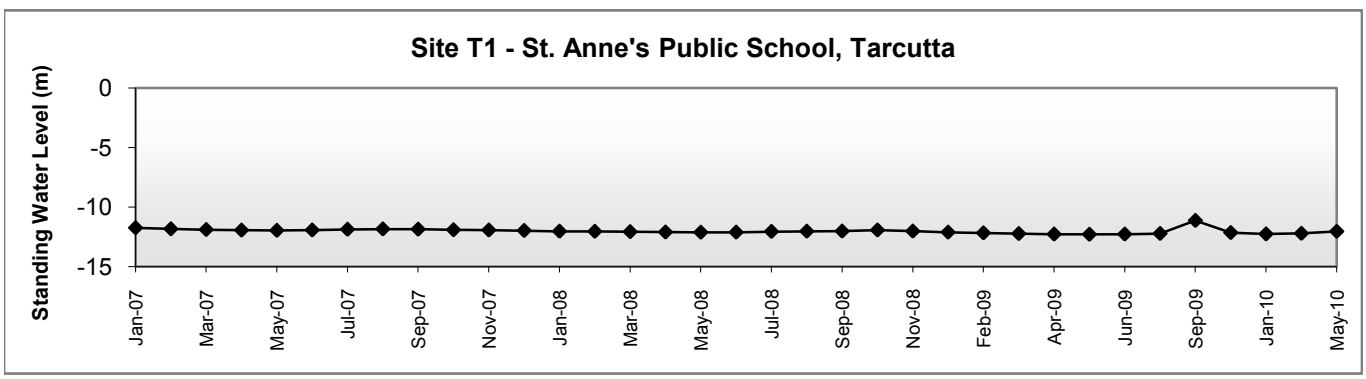

Site 176 - 39 Meurant Avenue
Standing Water Level (m)
0
-4
-8
-12
Jun-08
Jul-08
Aug-08
Nov-08
Jan-09
Feb-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Mar-10
Mar-10
Apr-10
May-10
Jun-10

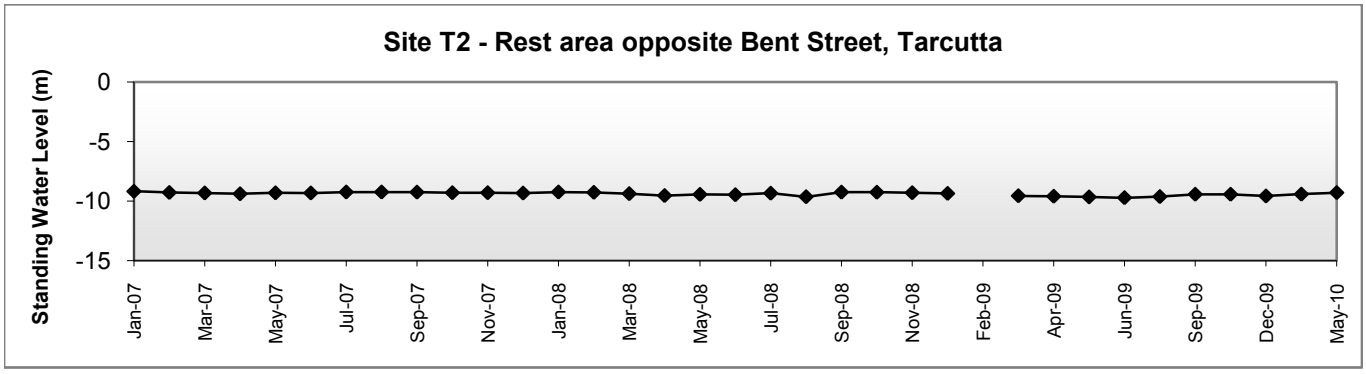

Site Bore 9 - 63 Gormly Avenue
Standing Water Level (m)
0
-5
-10
-15
-20
-25
Apr-99
Aug-99
Sep-99
Nov-99
Nov-99
Nov-99
Jan-00
Mar-00
Oct-00
Feb-01
Sep-01
Apr-02
Apr-03
Jan-04
Jun-04
Jan-05
Aug-05
Mar-06
Nov-06
Mar-07
Sep-07
Apr-08
Jul-08
Dec-08
May-09
Aug-09
Dec-09
Mar-10

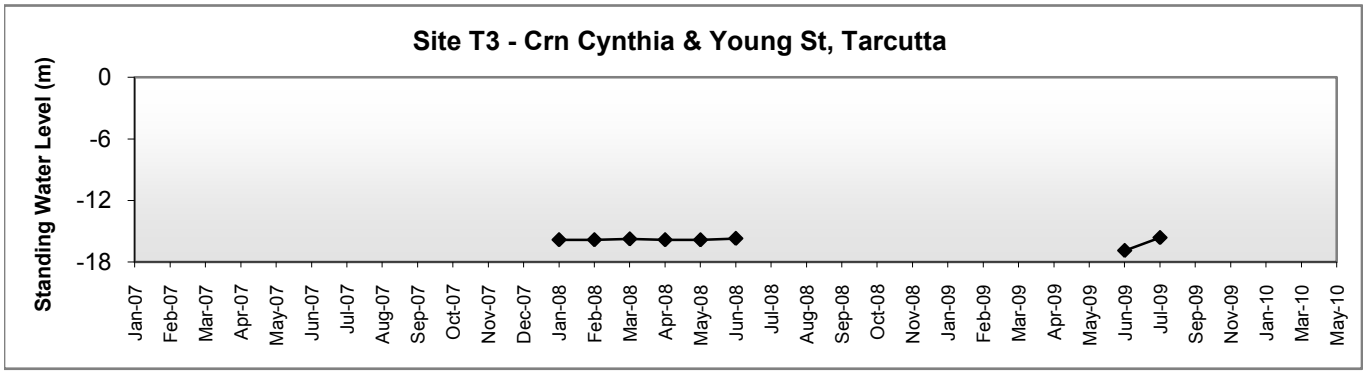

Site 1/1 - Emblen Park
Standing Water Level (m)
0
-5
-10
-15
Apr-99
Jul-99
Aug-99
Sep-99
Nov-99
Nov-99
Nov-99
Dec-99
Jan-00
Apr-00
Oct-00
Apr-01
Oct-01
Apr-02
Nov-02
May-03
Sep-05
Mar-07
Jun-07
Dec-07
Jun-08
Aug-08
Nov-08
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10

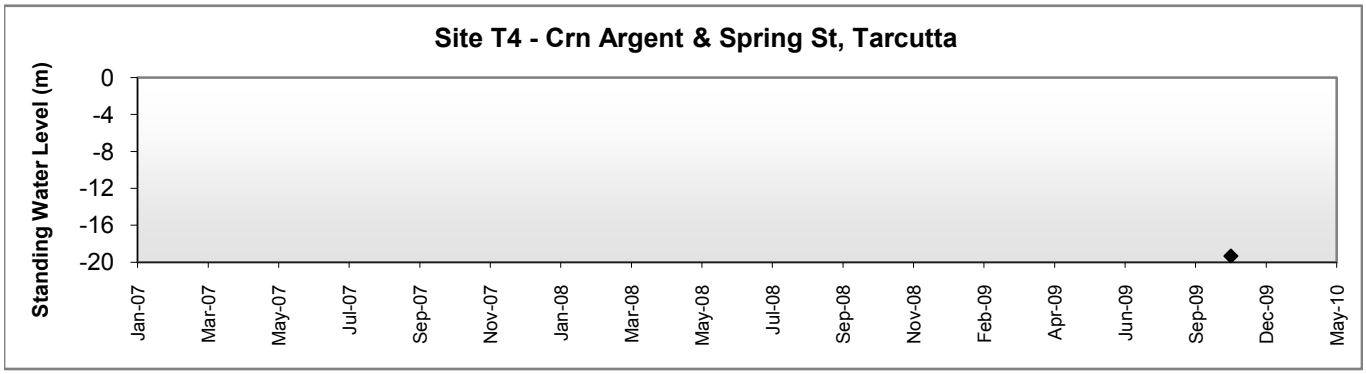

Site 1/2 - Emblen Park
Standing Water Level (m)
0
-10
-20
-30
Apr-99
Jul-99
Aug-99
Oct-99
Nov-99
Nov-99
Dec-99
Feb-00
Jul-00
Jan-01
Aug-01
Mar-02
Nov-02
Jun-03
Jan-04
Aug-04
Feb-05
Sep-05
Apr-06
Dec-06
Mar-07
Oct-07
May-08
Aug-08
Dec-08
May-09
Aug-09
Dec-09
Mar-10

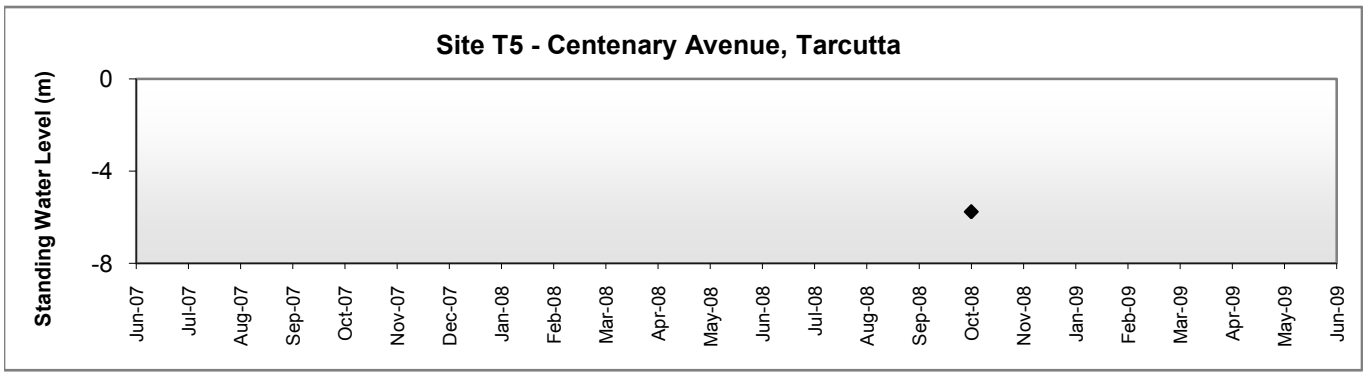

Site 1/3 - Emblen Park
Standing Water Level (m)
0
-15
-30
-45
-60
Apr-99
Jul-99
Aug-99
Oct-99
Nov-99
Nov-99
Dec-99
Feb-00
Jul-00
Jan-01
Aug-01
Mar-02
Nov-02
Jun-03
Jan-04
Aug-04
Feb-05
Sep-05
Apr-06
Dec-06
Mar-07
Oct-07
May-08
Aug-08
Dec-08
May-09
Aug-09
Dec-09
Mar-10

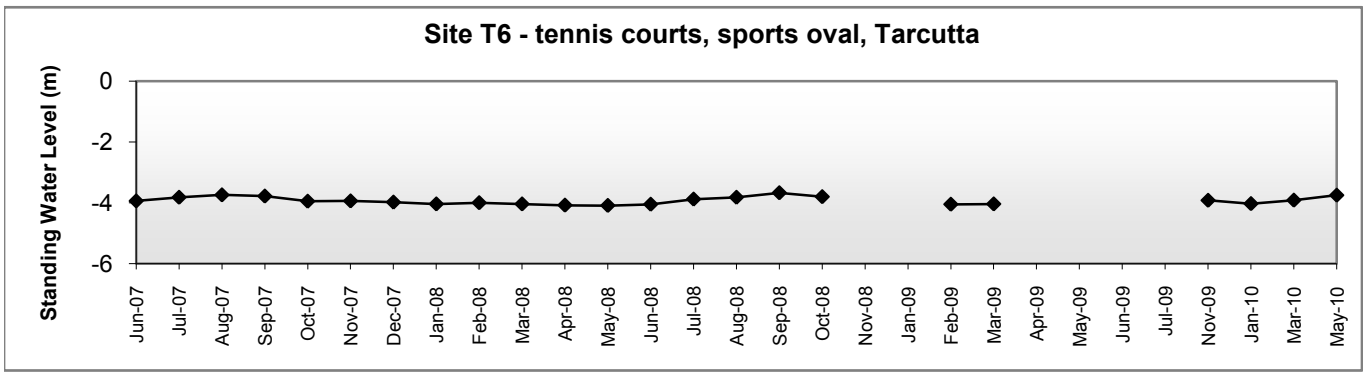

Site T1 - St. Anne's Public School, Tarcutta
Standing Water Level (m)
0
-5
-10
-15
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Feb-09
Apr-09
Jun-09
Sep-09
Jan-10
May-10


Site T2 - Rest area opposite Bent Street, Tarcutta
Standing Water Level (m)
0
-5
-10
-15
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Feb-09
Apr-09
Jun-09
Sep-09
Dec-09
May-10


Site T3 - Crn Cynthia & Young St, Tarcutta
Standing Water Level (m)
0
-6
-12
-18
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10


Site T4 - Crn Argent & Spring St, Tarcutta
Standing Water Level (m)
0
-4
-8
-12
-16
-20
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Feb-09
Apr-09
Jun-09
Sep-09
Dec-09
May-10


Site T5 - Centenary Avenue, Tarcutta
Standing Water Level (m)
0
-4
-8
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09


Site T6 - tennis courts, sports oval, Tarcutta
Standing Water Level (m)
0
-2
-4
-6
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Nov-09
Jan-10
Mar-10
May-10