

# Water quality in Bull Creek catchment 2010

Prepared by the South East Regional Centre for Urban Landcare  
for the City of Melville



February 2011



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## Executive Summary

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This assessment of the water quality within the Bull Creek catchment was undertaken during the latter half of 2010. The purpose of this stormwater quality sampling program is to determine the water quality entering the Canning River from the Bull Creek catchment and determine the quality of the water in the lakes within the City of Melville.

It should be stressed that this assessment is based on four sampling occasions of water collected over the winter and spring period of 2010. The effect of seasonal and flow variations on the water quality in the catchments were therefore not a part of this investigation. Consequently, the results represent the condition of the water in the catchment at the time of sampling only.

The system being monitored is largely a piped system that captures water running directly off hardstand surfaces such as roads and paved areas. From August to November March 2010 water was sampled at 10 sites throughout the City's stormwater drainage system and lakes, with most of them being located along the drainage catchments that flow into the Canning River.

From a human use perspective waterways in urban catchments are generally not a source of drinking water but are likely to be accessed by the public; therefore, this report comprises a comparison of the results with the Australian and New Zealand guidelines for fresh water quality (ANZECC 2000), specifically aquatic ecosystem and recreational trigger values. Results that exceed the referenced trigger values are an indication that further investigation should be considered.

### Key findings

- Water quality varied spatially throughout the catchment.
- The pH of the surface waters of the Bull Creek catchment was generally within the acceptable range. Only 11 out of 35 samples recorded levels below or above the ANZECC acceptable range for lowland rivers or wetlands. Sites 2 and 7 recorded pHs below the acceptable range when samples were taken. The highest pH (9.44) was recorded at site 12 and the lowest at site 7 (5.6).
- The majority of the samples (30 out of 35) in the surface waters of the Bull Creek catchment recorded dissolved oxygen (DO) concentrations outside the ANZECC acceptable range for lowland rivers or wetlands. Sites 1, 2, 5, 6 and 10 recorded concentrations below the acceptable range when samples were taken. The highest DO concentration (160.4 %) was recorded at site 12 and the lowest (12.1 %) at site 7.
- The majority of the samples (22 out of 32) recorded electrical conductivity concentrations above the ANZECC acceptable range for lowland rivers or wetlands. The highest concentration (4.76 mS/cm) was recorded at site 7 and the lowest (0.181 mS/cm) at site 10.

- More than a third (13 out of 36) of the samples had total suspended solids concentrations above the DoW interim guideline. The highest concentration (184 mg/L) was recorded at site 7
- Almost half (15 out of 36) of the samples in the Bull Creek catchment had total nitrogen (TN) concentrations above the ANZECC trigger value for lowland rivers or wetlands. Similar to 2009/2010 monitoring, TN concentrations recorded at sites 1, 2 and 7 were consistently elevated. The highest concentration (20 mg/L) was recorded at site 7.
- One third (12 out of 36) of the samples recorded total phosphorous concentrations above the ANZECC trigger value for lowland rivers or wetlands. The highest concentration was recorded site 7 (3.9 mg/L). Sites 1, 2, 6, 9 and 10 recorded TP concentrations below the trigger value when samples were taken.
- Arsenic, cadmium, chromium and nickel concentrations were below the ANZECC trigger values at all sites.
- As during the three previous years of sampling, mercury concentrations have been below the limit of reporting at all sites.
- Aluminium was detected at concentrations above ANZECC trigger values in 24 out of 36 samples however only 19 samples recorded pH above 6.5 when trigger value is applicable. Site 2 recorded pHs below 6.5 during all four sampling occasions and site 7 during two sampling events. Site 9 was the only site that did not record concentrations above the trigger value during any of the four sampling events. The highest concentration was recorded at site 6 (0.85 mg/L).
- The majority of the samples (30 out of 36) recorded iron concentrations exceeding the trigger value for lowland rivers. The highest concentrations were recorded at sites 7 and 6 during all the sampling occasions. The highest concentration was recorded at site 7 (19 mg/L). Site 9 was the only site that recorded concentrations below the trigger value during all sampling occasions.
- The majority of the samples (33 out of 36) recorded copper concentrations below the specific adjusted trigger value. 19 samples recorded concentrations below the limit of reporting (0.001 mg/L). Sites 1, 6 and 10 recorded concentrations exceeding the specific trigger value on the first sampling occasion (August). The highest concentration was recorded at site 5 (0.008 mg/L).
- 35 out of 36 samples recorded lead concentrations below the specific adjusted trigger value. Site 11 was the only site that recorded a concentration exceeding the trigger value (0.014 mg/L in November).
- 34 out of 36 samples recorded zinc concentrations below the specific adjusted trigger value. Samples collected during August at sites 5 and 6 exceeded the trigger value (0.054 and 0.021 mg/L respectively). Only 3 samples recorded concentrations below the limit of reporting (0.001mg/L).

## Summary comparison of water quality results against guidelines

Measurement	Parameter	Water Quality Trigger value (TV)		Department of Water Interim Guideline
		Lowland river and Wetland	Freshwater 95% protection	Suspended Solids
Physical	pH <sup>^</sup>	11		
	Dissolved oxygen <sup>^</sup>	30		
	Total suspended solids <sup>^</sup>			13
	Conductivity <sup>^</sup>	22		
Nutrients <sup>^</sup>	Total nitrogen	15		
	Total oxidised nitrogen	12		
	Nitrogen as Ammonia/ Ammonium	8		
	Total phosphorus	12		
	Soluble reactive phosphorus	8		
Metals <sup>^</sup>	Aluminium		19	
	Arsenic		0	
	Cadmium		0	
	Chromium		0	
	Copper		3	
	Iron		30	
	Mercury		0	
	Nickel		0	
	Lead		1	
Zinc		2		

### Key

<sup>^</sup>	Number of samples equal or exceeding trigger value out of 35
<sup>^</sup>	Number of samples equal or exceeding trigger value out of 36
0	All samples less than ANZECC guideline or specific trigger value

## Background

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The City of Melville is located 8 Km from the central business district of Perth and has an area of 52.72 square Km with 18.1 Km of foreshore. The city encompasses 18 suburbs with over 500 km of roads. With a population of approximately 97,000 people within 36,000 dwellings, the City of Melville is the third largest local government in the metropolitan region.

The City of Melville contains the eastern wetland chain of the Beeliar Regional Park including: Booragoon, Blue Gum and Piney Lakes. The chain of wetlands holds significance for the local aboriginal people as they were important camping and ceremonial areas; as well as providing an abundant source of food, offering fish, water fowl, shell fish, vegetable roots and bulbs.

The City of Melville has 210 parks and reserves comprising 600 hectares of public open space and 300 hectares of bushland (Melville 2006). In the 1980's the council drew water from a subterranean bore in the Alfred Cove area and pumped it into Blue Gum and Booragoon lakes during summer to maintain the water level.

In the City of Melville, there are approximately 76 drainage sumps and 290 kilometres of storm water drainage pipes (Melville 2006b). The development of neighbouring urban areas and subsequent management practices has slowly transformed these areas from swamps to semi-permanent lakes.

The City of Melville has been sampling the lakes and Bull Creek drains twice a year since 1996. In 2007 a partnership between the City, SERCUL and the Department of Water was established in order to standardise all water quality monitoring data collection, management and storage methods. Since 2007 the City has been utilising this data to develop some management programs within the city.

The purposes of the sampling are to:

- ✓ Investigate the water quality in the Bull Creek catchment,
- ✓ Determine the quality of the water in the lakes within the City of Melville and
- ✓ Identify any pollutant hotspots throughout the catchment area.

## Methods

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### Site location

Water was sampled at 10 sites within the Bull Creek catchment (Figure 1). All of these sites were located along the drainage system and pick up the major wetlands within the catchment. These sites have been selected so that the water quality in the wetlands can be determined and represent a section of the catchment.

Table 1 provides a detailed description and GPS coordinates of each of the sample sites.

**Table 1: Bull Creek catchment sampling sites 2009/2010**

Site No.	Drain Section/Component	Sampling Point Location	Easting	Northing
PSDTBCMD (MELDR-01)	Bull Creek Park 1	Culvert under Leach Hwy	392965.3	6453785.6
MELDR-02	Brockman Park	Where piped drain opens	393466.5	6453208.5
MELDR-05	John Creaney Park	Comp basin outlet	392359	6452734.7
MELDR-06	Bateman Park	Downstream of the confluence of the two drains	392269.8	6453880.2
MELDR-07	Booragoon Lake	At the lake on Aldridge Rd.	390734.68	6454164.09
MELDR-08	Piney Lakes	At the lake outlet	390151.59	6453473.10
MELDR-09	Quenda Wetland	At the west side	390749.20	6451597.51
MELDR-10	Frederick Baldwin	At the lake outlet	387989.87	6452295.91
MELDR-11	Marmion Reserve	At the lake outlet	387774.89	6454629.75
MELDR-12	Blue Gum Lake	At the lake outlet	391282.81	6454886.75

Site 8, at the outlet of Piney Lakes, was not sampled during any of the four sampling occasions because it was too shallow to sample and the water was full of filamentous algae.



Figure 1: Map showing Bull Creek Sampling Sites for 2009/2010

## Sampling Methodology

Sampling was conducted once a month from August to November 2010. Samples were collected in accordance with the Bull Creek catchment sampling and analysis plan 2010 (SAP 2010). Field observation forms were filled out for all samples and all samples were transported under “chain of custody” to the laboratory and analysed in accordance with the laboratory methods. All water samples collected were analysed by the National Measurement Institute (NMI), a laboratory accredited by the National Association of Testing Authorities (NATA).

Water at each of the sites was measured in situ for physical properties (dissolved oxygen, pH, conductivity and temperature) and samples were collected and analysed for a range of contaminants likely to be present in urban and industrial catchments. Water quality samples were analysed for:

- Nutrients – total nitrogen (TN), total phosphorus (TP), soluble reactive phosphorus (SRP), nitrogen as ammonia (NH<sub>3</sub>-N), total oxidised nitrogen (NO<sub>x</sub>) and dissolved organic nitrogen (DOrgN);
- Total suspended solids (TSS);
- Total heavy metals (10) – aluminium (Al), arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), iron (Fe), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn); and
- Total water hardness (as Ca and Mg);

**Table 2: Analysis method and limit of reporting (LOR) for water samples**

Method description	LOR
Total phosphorus	0.005 mg/L
Total nitrogen	0.025 mg/L
Dissolved organic nitrogen	0.025 mg/L
Soluble reactive phosphorus	0.005 mg/L
Total oxidised nitrogen	0.01 mg/L
Nitrogen as ammonia	0.01 mg/L
Total suspended solids	1.0 mg/L
Total water hardness	5.0 mg/L
Arsenic – total	0.001 mg/L
Aluminium – total	0.005 mg/L
Cadmium – total	0.0001 mg/L
Chromium – total	0.001 mg/L
Copper – total	0.001 mg/L
Iron – total	0.005 mg/L
Lead – total	0.001 mg/L
Nickel – total	0.001 mg/L
Zinc – total	0.001 mg/L
Mercury – total	0.0001 mg/L

## Results and Discussion

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### Comparison of results with guidelines

To provide a general frame of reference as to the state of water quality in Bull Creek catchment, laboratory results will be compared to trigger levels from the ANZECC guidelines. Exceedance of the trigger value indicates that there is the potential for an impact to occur and should therefore trigger a management response (ANZECC & ARMCANZ 2000).

Nutrient concentrations and physical parameter results of the surface water in Bull Creek will be compared to the statistically derived default trigger values for slightly disturbed ecosystems of southwest Australia (ANZECC & ARMCANZ 2000). The results of some sites are compared to the lowland rivers' and other to 'wetlands' ecosystem type, as this is considered to be most applicable to the drain and lakes respectively and the receiving environment, the Canning River.

Heavy metals and organic toxicant concentrations of the surface waters in Bull Creek catchment will be compared to the ANZECC toxicant trigger values for freshwater at the 95% protection level, applicable to high conservation value and slightly to moderately disturbed ecosystems. Where no guidelines currently exist, results will be compared to interim or low-reliability guidelines provided by ANZECC (2000).

The system being monitored is largely an open system that ultimately discharges into the Canning River. Much of the monitoring captures water running directly off roads and residential areas with no treatment prior to entering the lakes and drains. From a human-use perspective, Bull Creek is not a source of drinking water but may be accessed by the public at several points, on public and privately owned land, and therefore it is reasonable to compare the toxicant results to recreational guidelines that take into account risks to public health.

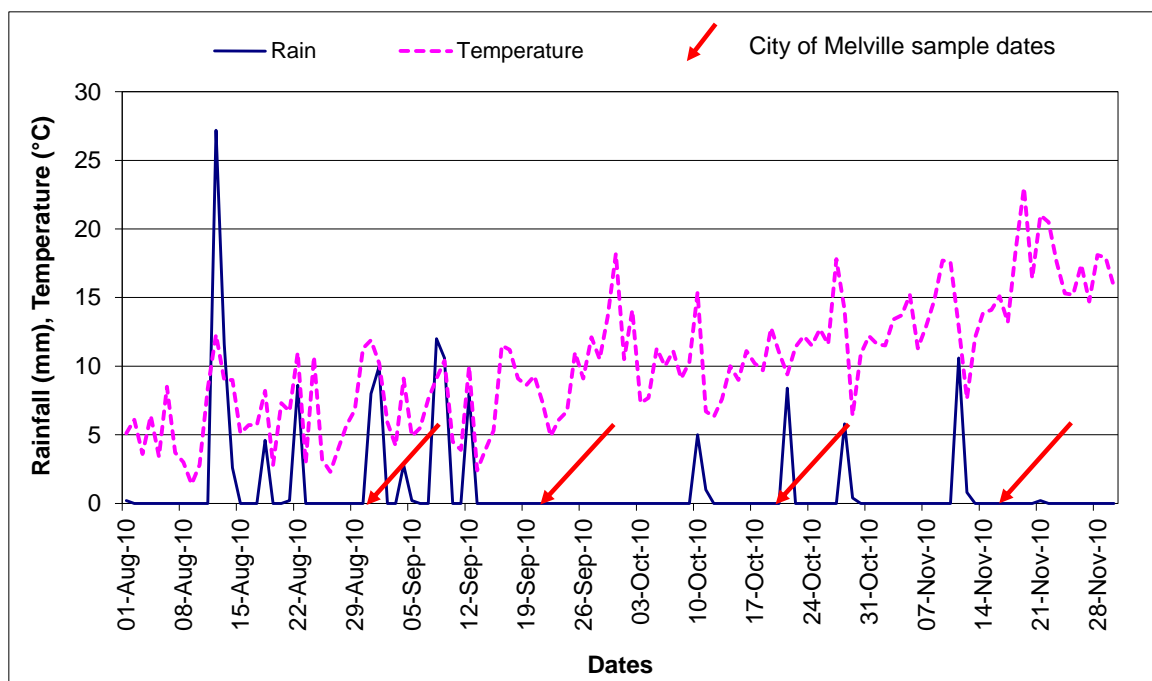
Toxicant concentrations should not exceed the recreational guidelines to ensure that recreational users are not at risk (ANZECC 2000). An exceedance of the referenced trigger level does not indicate that 'standards' are not being met, but is an indication that further consideration should be given to the situation.

# Water Quality

## Flow and temperature

The greatest flow in Bull Creek generally occurs as a result of winter rainfall between June and September. There is a delay between the onset of winter rain and the commencement of consistent flow in the catchment. However, during 2010, very much below average rainfall occurred in western parts of Western Australia (WA). The dry conditions were a result of a very poor wet season (January to April) in much of the Pilbara and Gascoyne regions, combined with persistent and anomalously high pressure over southern WA for most of the year. Both, the winter and autumn of 2010, were characterised by an unusual absence of westerly winds and a very low number of significant cold fronts passing over southern WA. This deprived the region of its main rain producing mechanism (Western Australia Climate Services Centre 2010).

Figure 2 below highlights the sampling dates, the maximum temperature and the daily rainfall received in the Perth metro area at that time. The monthly rainfall totals for August, September, October and November and December were 63, 43.6, 20.6, 11.6 and 17.4mm respectively. Sampling was conducted on August 30<sup>th</sup>, September 21<sup>st</sup>, October 19<sup>th</sup> and November 16<sup>th</sup> and there was no rainfall on these days. The air maximum temperatures recorded for the four sampling days were 20.3, 25.3, 26.8 and 30.3°C respectively.



**Figure 2: Daily Rainfalls and Temperature in Perth from July to December 2010**

Source: Bureau of Meteorology (Commonwealth of Australia 2010)

Due to the very much below average rainfall during the year, there was not a substantial amount of flow of water at some of the sites. At Piney Lakes there was not enough water to take samples during any of the sampling occasions.

## Physical properties

Refer to Appendix B for all physical parameter data (pH, dissolved oxygen, electrical conductivity, total dissolved solids and temperature) for the Bull Creek catchment in 2010 water quality sampling.

### pH

pH is a measure of the acidity (or alkalinity) of a water body. pH is measured on a logarithmic scale, with a pH of 7.0 being neutral, a pH of less than 7 being acidic and a pH of greater than 7 being alkaline or basic. The importance of pH on water quality lies mainly in its effect on other water quality parameters and on chemical reactions. pH can also affect the solubility and toxicity of a wide range of metallic contaminants (IEA 2003).

A pH between 6.5 and 8.0 is required to sustain aquatic life in freshwater lowland rivers and between 7 and 8.5 for wetlands in Western Australia (ANZECC & ARMCANZ 2000). Eleven out of 35 samples collected within the Bull Creek catchment recorded pHs outside these ranges. Only 2 sites, sites 2 and 7, (Brockman Park and Booragoon Lake outlet) recorded pHs outside the acceptable range on all the sampling occasions. The three sites that always recorded pHs within the acceptable range were sites 1, 5 and 6 (Bull Creek main drain, John Creaney Park and Bateman Park respectively). As with the 2009, 2008 and 2007 sampling, site 7 (Booragoon Lake) recorded the lowest pH (5.6 during November sampling).

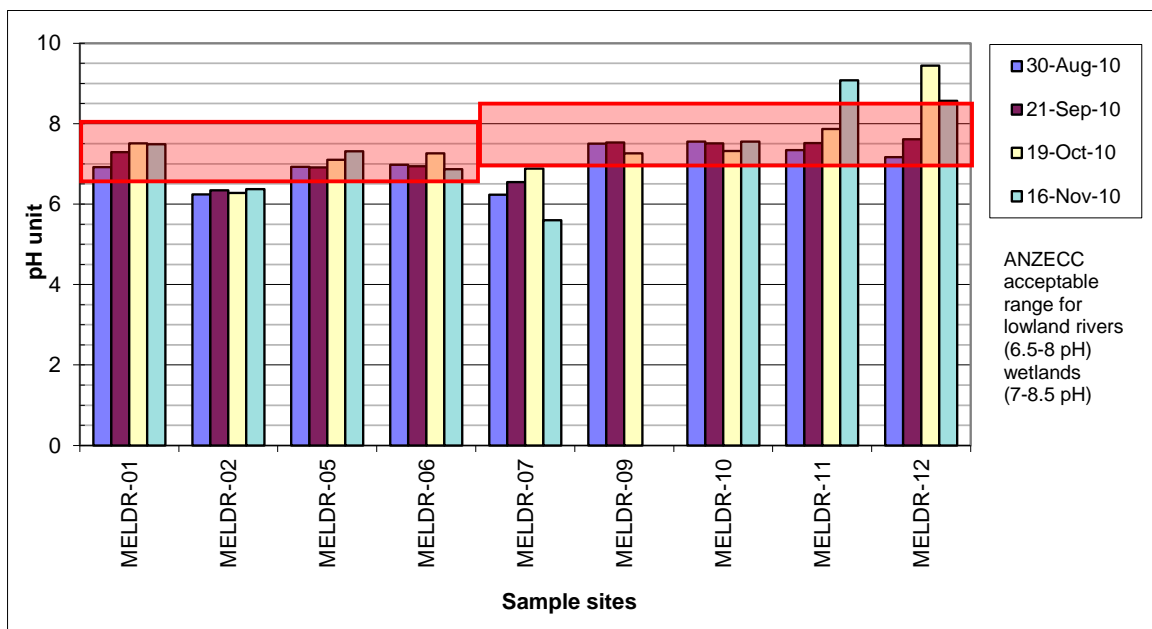


Figure 3: pH of the surface waters of the Bull Creek catchment

The highest pH was recorded at site 12 (Blue Gum Lake outlet) and samples exceeded the acceptable range for wetlands during the October and November sampling occasions (9.44 and 8.57 respectively). This site also recorded pH levels above range in 2009 (9.3 during the November sampling occasion).

Table 3 shows the sites that have recorded pHs below or above the acceptable ranges during the four year sampling period. Sites 2 and 7 have recorded pHs out of the specific acceptable range in all the four year sampling period. Sites 1 (PSDTBCMD), 5 and 9 have only recorded pH outside the acceptable range on only one occasion throughout the four year period.

**Table 3: Record of pH below and above the acceptable ranges in the Bull Creek catchment 2007 – 2010**

	Site	2010				2009/2010				2008/2009				2007/2008			
		Aug	Sep	Oct	Nov	Sep	Nov	Jan	Mar	Sep	Nov	Jan	Mar	Jul	Oct	Jan	Apr
<b>Lowland rivers (6.5 - 8)</b>	PSDTBCMD	NO	NO	NO	NO	NO	NO	NO	NS	NO	NO	NO	NO	NO	NO	<b>6.47</b>	NO
	MELDR-02	<b>6.24</b>	<b>6.34</b>	<b>6.28</b>	<b>6.37</b>	<b>6.29</b>	NO	<b>6.36</b>	NS	<b>6.14</b>	NO	<b>6.34</b>	<b>6.39</b>	<b>6.07</b>	<b>6.21</b>	<b>6.44</b>	<b>6.23</b>
	MELDR-05	NO	NO	NO	NO	NO	NO	NS	NS	<b>6.45</b>	NO	NO	NS	NO	NO	NS	NS
	MELDR-06	NO	NO	NO	NO	NO	NO	NO	NS	<b>6.35</b>	NO	NO	NO	<b>6.17</b>	NO	NO	<b>6.35</b>
<b>Wetlands (7 - 8.5)</b>	MELDR-07	<b>6.23</b>	<b>6.55</b>	<b>6.88</b>	<b>5.60</b>	<b>3.94</b>	<b>6.77</b>	NS	NS	<b>5.71</b>	NO	NO	NS	<b>3.26</b>	<b>4.69</b>	NS	NS
	MELDR-08	NO	NO	NO	NO	<b>5.87</b>	NS	NS	NS	<b>5.67</b>	NO	NS	NS	<b>4.30</b>	<b>5.03</b>	NS	NS
	MELDR-09	NO	NO	NO	NO	NO	NO	<b>6.96</b>	NS	NO	NO	NO	NO	NO	NO	NS	NS
	MELDR-10	NO	NO	NO	NO	<b>9.01</b>	<b>9.39</b>	NS	NS	<b>9.30</b>	NO	NO	NO	NO	NO	NS	NS
	MELDR-11	NO	NO	NO	<b>9.08</b>	<b>8.67</b>	<b>9.30</b>	<b>9.70</b>	<b>9.21</b>	NO	NO	<b>9.08</b>	NO	NO	NO	NS	NS
	MELDR-12	NO	NO	<b>9.44</b>	<b>8.57</b>	<b>6.74</b>	<b>9.30</b>	NO	NS	NO	NO	NO	NS	<b>4.31</b>	NO	NS	NS

NO = pH was not outside the acceptable range  
NS = No sample was taken

## Dissolved oxygen

Dissolved Oxygen (DO) is a measure of the quantity of oxygen present in water and is often used as an indication of the 'general health' of a water body. Low DO levels in water leads to several environmental problems including stresses on the aquatic community and facilitation of chemical reactions (IEA 2003). Stress within the aquatic environment can result in the release of sediment-bound nutrients and toxicants into the water column. Low DO concentrations can also increase the toxicity of certain heavy metals.

Systems generally have natural DO concentrations that fluctuate diurnally. Differences can be noted between morning concentrations where only aeration has introduced oxygen to the ecosystem and late afternoon where photosynthesising organisms have also introduced oxygen to the system during the day. Low DO concentrations are normally a result of processes consuming oxygen at a rate faster than the environments capacity to provide or retain oxygen. These include the decay of organic matter, the oxidation of hydrocarbons, the reduction of metals and the microbial conversion of ammonia to nitrate and nitrites through the process of nitrification. These however are still natural processes within the environment. DO concentrations throughout the year also change with seasonal changes. When monitoring for DO low concentrations

usually indicate systems which are under some stress or where large amounts of organic material are being decomposed.

A dissolved oxygen concentration of between 80-120 % saturation is required to sustain aquatic life in freshwater lowland rivers and a concentration between 90-120 % is required in wetlands (ANZECC 2000).

As dissolved oxygen can fluctuate greatly over a diurnal cycle, it is preferable to measure dissolved oxygen over a full diurnal cycle for a few days (ANZECC & ARMCANZ, 2000). This type of dissolved oxygen monitoring was not conducted as part of this monitoring program.

Dissolved oxygen concentrations in the surface water of the Bull Creek catchment sites were generally outside these acceptable ranges. As during 2009, the vast majority of recordings (27 out of 35) show the DO% below the acceptable range. Only 3 out of 35 samples recorded concentrations above the acceptable ranges. The lowest DO reading was recorded at site 7 (12.1 % saturation during the September sampling event) and the highest at site 12 (160.4 % saturation during the October sampling occasion).

The low DO concentrations observed at sites 1, 2, 5, 7 and 11 (Bull Creek main drain – PSDTBCMD, Brockman Park, John Creaney Park, Booragoon Lake outlet and Marmion Reserve respectively) are of concern since they were below the specific acceptable range during all four sampling occasions, with the exception of site 7 during the October sampling occasion.

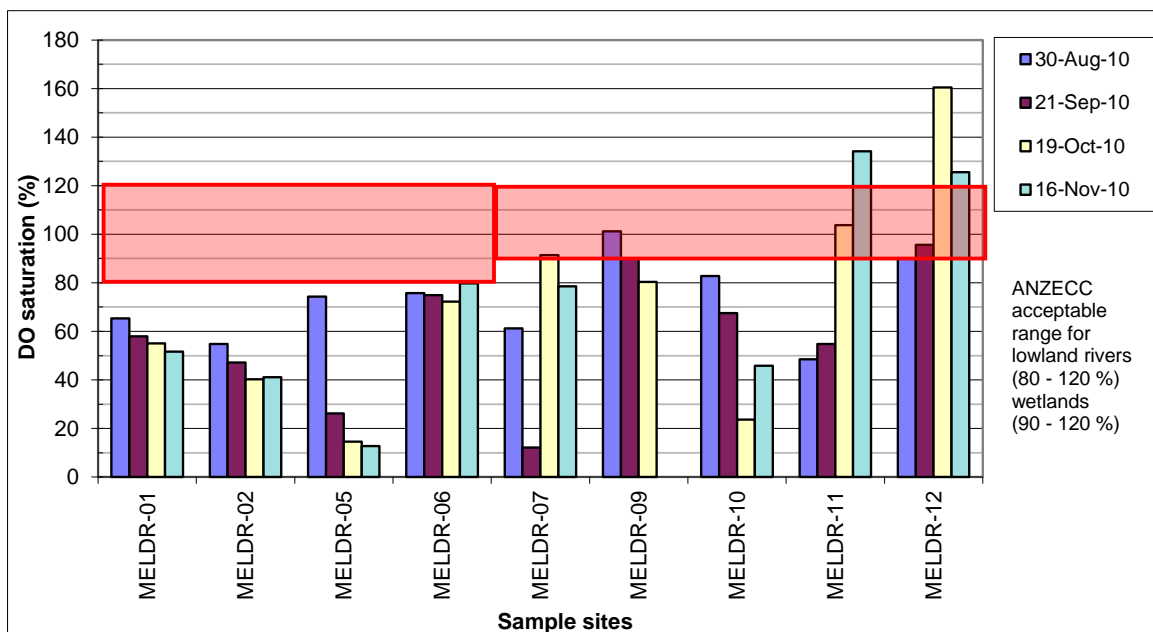


Figure 4: DO% of the surface waters of the Bull Creek catchment

Table 4 shows the recordings of DO% that have been below and above the acceptable ranges for lowland rivers and wetlands during the four year sampling period. Sites 1, 2, 5 and 8 (Bull Creek main drain – PSDTBCMD, Brockman Park,

John Creaney Park and Piney Lakes outlet) have recorded concentrations below the acceptable range for lowland rivers every time samples were collected.

**Table 4: Record of DO below and above the acceptable ranges in the Bull Creek catchment 2007 – 2010**

	Site	2010				2009/2010				2008/2009				2007/2008			
		Aug	Sep	Oct	Nov	Sep	Nov	Jan	Mar	Sep	Nov	Jan	Mar	Jul	Oct	Jan	Apr
<b>Lowland rivers (80-120%)</b>	PSDTBCMD	65	58	55	51.6	67	61.2	68	63	62	67	70	NS	66	71	84	66
	MELDR-02	55	47	40	41.1	53	50.1	47	45	53	50	42	NS	52	54	47	45
	MELDR-05	74	26	15	12.7	30	8.8	2.7	NS	43	65	NS	NS	13	22	NS	NS
	MELDR-06	76	75	72	79.8	76	NO	NO	NO	76	NO	NO	NS	76	NO	63	77
<b>Wetlands (90-120%)</b>	MELDR-07	61	12	NO	78.6	50	47.2	37	NS	NO	19	NS	NS	123	21	NS	NS
	MELDR-08	NS	NS	NS	NS	66	43.4	NS	NS	66	NS	NS	NS	123	38	NS	NS
	MELDR-09	NO	90	80	NS	NO	82.5	NO	76	85	NO	74	NS	62	NO	NS	NS
	MELDR-10	83	68	24	45.8	144	81.9	126	42	NO	156	38	NS	59	NO	NS	NS
	MELDR-11	49	55	NO	134	NO	80	124	NS	NO	207	188	186	85	123	NS	NS
	MELDR-12	NO	NO	160	126	49	88.8	123	84	41	134	88	NS	122	80	NS	NS

NO = DO was not outside the acceptable range

NS = No sample was taken

## Electrical Conductivity

Electrical conductivity (EC) is the total concentration of inorganic ions (particularly sodium, chlorides, carbonates, magnesium, calcium, potassium and sulphates). Conductivity is often used as a measure of salinity.

22 out of 35 samples recorded EC concentrations outside the acceptable range. The lowest conductivity was recorded at site 10 (0.181 mS/cm during the August sampling occasion) and the highest at site 7 (4.76 mS/cm during the November sampling event).

Sites 1, 2, 5 and 6 (Bull Creek main drain – PSDTBCMD, Brockman Park, John Creaney Park and Bateman Park respectively) recorded concentrations above the acceptable range for lowland rivers on all sampling occasions, with the exception of site 5 during the August sampling event. Site 7 (Booragoon Lake outlet) recorded concentrations above the wetlands acceptable range on all four sampling occasions.

Table 5 presents the record of EC along the monitoring period at Bull Creek catchment. Sites 1, 2, 5 and 6 have recorded EC out of the acceptable range for lowland rivers during all sampling events when samples were taken, except at site 5 during the August 2010 sampling occasion. Sites 8, 9, 10 and 12 have not recorded EC concentrations above the acceptable range for wetlands when samples have been collected.

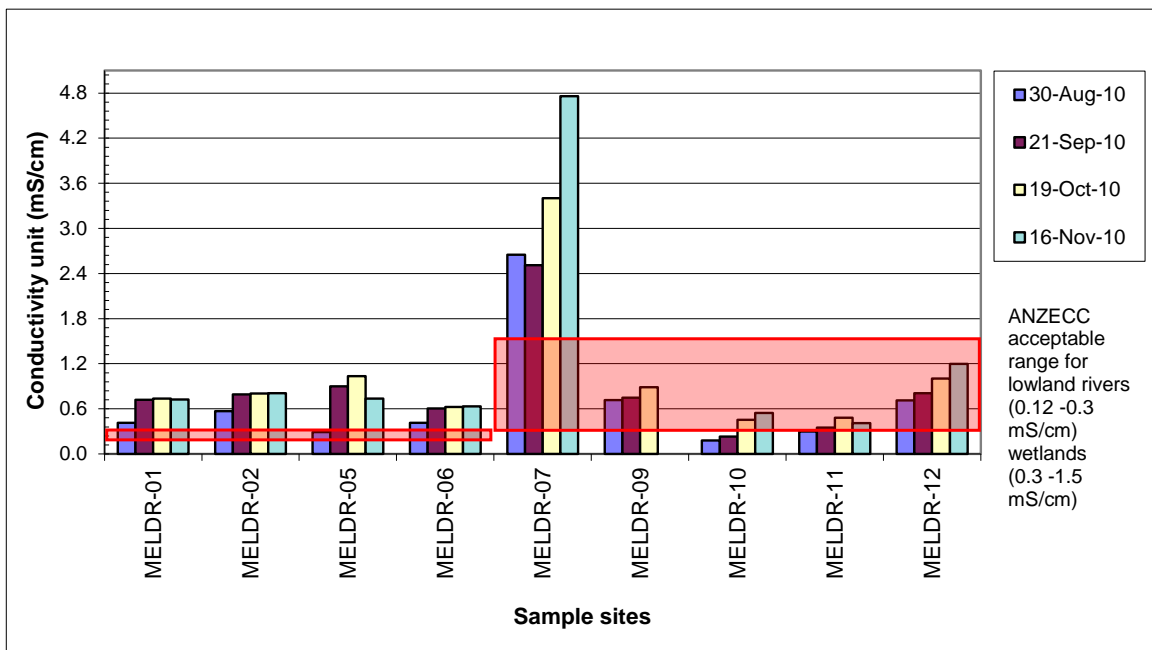


Figure 5: Electrical conductivity of the Bull Creek catchment

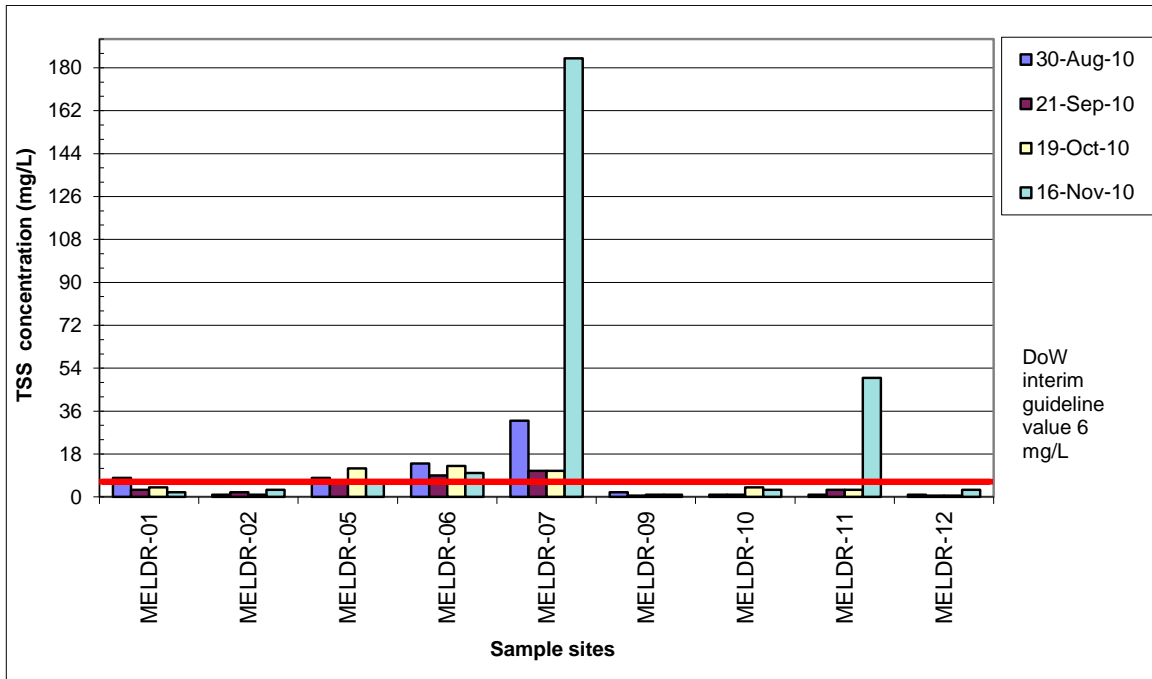
### Total Suspended Solids

Total Suspended Solids (TSS) is the total amount of suspended material in the water that can be removed by filtration. TSS can include a wide variety of material such as silt, sand, organic material such as algae, microorganisms, decaying plant and animal matter or industrial wastes from a variety of sources including erosion by wind and water, construction and demolition operations as well as wear of roads and vehicles. Deposition of suspended solids can block pipes, change flow conditions in open channels and increase turbidity which reduces light penetration (IEA 2003). Nutrients, particularly phosphorus and other contaminants are often adsorbed to the surface of the particles of suspended solids, and therefore a high suspended solid concentration often coincides with high nutrient (particularly phosphorus) or contaminant concentrations.

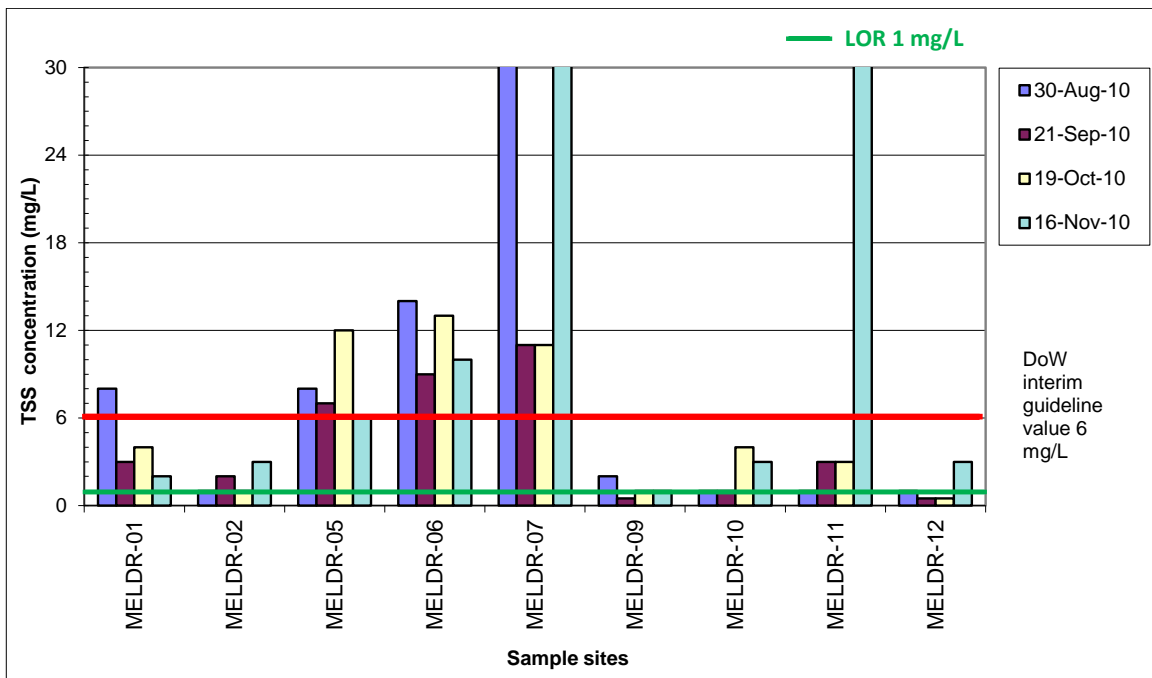
TSS concentrations varied across the catchment. 13 out of 36 samples recorded concentrations above the Department of Water interim guideline of 6 mg/L. The highest concentration was recorded at site 7 (184 mg/L during the November sampling occasion) and the lowest at site 9 and 12 (below the limit of reporting of 1 mg/L during the September sampling occasion at site 9 and at site 12 during the September and October sampling events).

Sites 5, 6 and 7 (John Creaney Park, Bateman Park and Booragoon lake outlet respectively) exceeded this interim trigger value on every sampling occasion; except at site 5 during the November sampling event. Site 5 recorded 8, 7, 12 and 6 mg/L during August, September, October and November respectively. Site 6 recorded 14, 9, 13 and 10 mg/L and site 7 recorded 32, 11, 11 and 184 mg/L respectively.

Table 6 shows the TSS concentrations that exceed the interim guideline during the four year sampling period. Sites 6 and 7 have recorded concentrations above the interim guideline on almost all the occasions when samples have been collected. The exceptions were at site 6 during January 2008 and at site 7 during November 2008.



**Figure 6: Total suspended solids in the Bull Creek catchment**



**Figure 7: Total suspended solids in the Bull Creek catchment (zoom in)\***

\*Please note this graph scale stops at 30mg/L

**Table 5: Record of EC below and above the acceptable range in the Bull Creek Catchment 2007 – 2010**

	Site	2010				2009/2010				2008/2009				2007/2008			
		Aug	Sep	Oct	Nov	Sep	Nov	Jan	Mar	Sep	Nov	Jan	Mar	Jul	Oct	Jan	Apr
<b>Lowland rivers (0.12 -0.3 mS/cm)</b>	PSDTBCMD	0.415	0.72	0.738	0.726	0.693	0.737	0.763	NS	0.706	0.725	0.754	0.665	0.746	0.709	0.736	0.776
	MELDR-02	0.568	0.79	0.805	0.809	0.742	0.806	0.848	NS	0.814	0.788	0.822	0.806	0.79	0.769	0.814	0.809
	MELDR-05	NO	0.9	1.036	0.738	0.761	0.877	NS	NS	1.038	0.796	1.23	NS	0.096	0.798	NS	NS
	MELDR-06	0.415	0.604	0.624	0.632	0.603	0.644	0.661	NS	0.724	0.705	0.769	0.713	0.769	0.711	0.734	0.989
<b>Wetlands (0.3 -1.5 mS/cm)</b>	MELDR-07	2.65	2.51	3.4	4.76	1.93	2.41	NS	NS	1.89	1.92	2.82	NS	3.83	1.92	NS	NS
	MELDR-08	NS	NS	NS	NS	NO	NS	NS	NS	NO	NO	NS	NS	NO	NO	NS	NS
	MELDR-09	NO	NO	NO	NS	NO	NO	NO	NS	NO	NO	NO	NO	NO	NO	NS	NS
	MELDR-10	NO	NO	NO	NO	NO	NO	NO	NS	NO	NO	NO	NO	NO	NO	NS	NS
	MELDR-11	0.297	NO	NO	NO	0.258	NO	NO	NO	NO	NO	NO	NO	NO	NO	NS	NS
	MELDR-12	NO	NO	NO	NO	NO	NO	NO	NS	NO	NO	NO	NS	NO	NO	NS	NS

NO = EC was not outside the acceptable range

NS = No sample was taken

**Table 6: Record of TSS above the DoW interim guideline in the Bull Creek catchment 2007 – 2010**

	Site	2010				2009/2010				2008/2009				2007/2008			
		Aug	Sep	Oct	Nov	Sep	Nov	Jan	Mar	Sep	Nov	Jan	Mar	Jul	Oct	Jan	Apr
<b>Lowland rivers (6mg/L)</b>	PSDTBCMD	8	NO	NO	NO	NO	NO	NO	7	7	NO	NO	12	NO	NO	29	NO
	MELDR-02	NO	NO	NO	NO	NO	NO	NO	54	NO	NO	NO	NO	NO	NO	NO	NO
	MELDR-05	8	7	12	NO	7	NO	NS	NS	NO	10	12	NS	11	NO	NS	NS
	MELDR-06	14	9	13	10	13	8	11	8	35	27	24	14	51	56	NO	44
<b>Wetlands (6mg/L)</b>	MELDR-07	32	11	11	184	37	11	NS	NS	42	NO	58	NS	17	59	NS	NS
	MELDR-08	NS	NS	NS	NS	NO	NS	NS	NS	23	NO	NS	NS	7	27	NS	NS
	MELDR-09	NO	NO	NO	NO	NO	NO	NO	NS	9	NO	NO	NO	NO	NO	NS	NS
	MELDR-10	NO	NO	NO	NO	NO	NO	8	NS	NO	NO	NO	11	NO	NO	NS	NS
	MELDR-11	NO	NO	NO	50	NO	NO	14	15	NO	NO	NO	12	7	NO	NS	NS
	MELDR-12	NO	NO	NO	NO	NO	NO	9	NS	NO	NO	NO	NS	27	NO	NS	NS

NO = TSS was not above the interim guideline

NS = No sample was taken

## Temperature

The temperature of a water body directly affects many physical, biological and chemical characteristics of aquatic organisms and processes within the ecosystem. For example, oxygen is less soluble in warmer water and as such is less available to aquatic organisms. By contrast, salts are more soluble in warmer water, and as such temperature can affect the water's salinity.

Higher temperatures can result in the rapid growth of plant biota in the aquatic ecosystem where other limiting factors, such as nutrients availability, permit. As soon as the temperature cools or other supporting processes cease, this growth dies and as such biological decay commences requiring more oxygen. This begins to deplete the oxygen in the ecosystem and as such has a compounding effect.

The time of sampling varies between 8 am and 4 pm which has an obvious effect on the water temperature, especially during sunnier months. For example, early morning temperatures may be cooler by a few degrees as opposed to late afternoon. Aquatic organisms also have no or limited capability of regulating their internal body temperature and are therefore held at the mercy of their surrounding environment (Richard & Moss, 2005). Natural seasonal temperature changes occur in these ecosystems and generally aquatic flora and fauna are adapted to these changes. Monitoring for representative temperature is undertaken to ensure that no thermal pollution such as illegal dumping of heated or cooled water has taken place and to give a representative of the water temperature during a particular month and in a particular location.

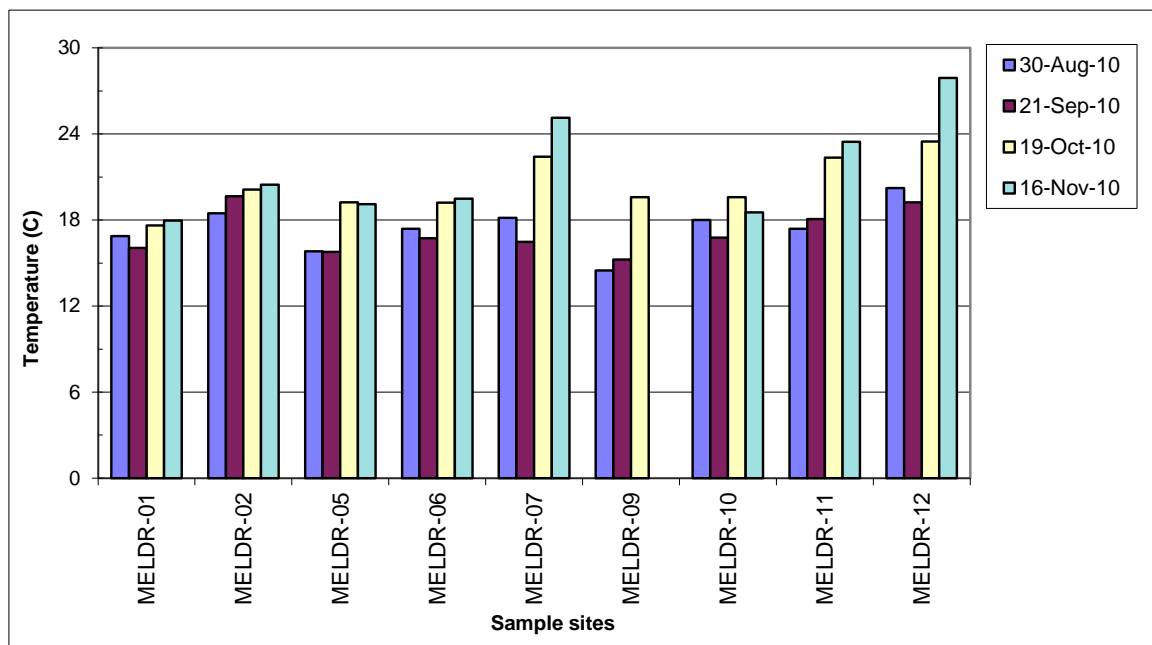


Figure 8: Temperature in the Bull Creek catchment

## **Nutrient concentrations in water**

The general sources of nutrients in water are from fertilisers, soil erosion, detergents, sewerage, plant matter, animal wastes, organic wastes and vehicle exhausts (IEA 2003). Excessive amounts of nutrients can result in eutrophication of waterways. Eutrophication is broadly described as the enrichment of waters by inorganic (and to a lesser extent organic) plant nutrients (predominantly nitrogen and phosphorus). When an ecosystem is in a eutrophic condition, plant and algae density and productivity generally increases, but species diversity is often reduced, nuisance insect numbers often increase, and eventually the ecosystem becomes less diverse and more degraded with more frequent nuisance algal blooms and higher plant nutrient flux.

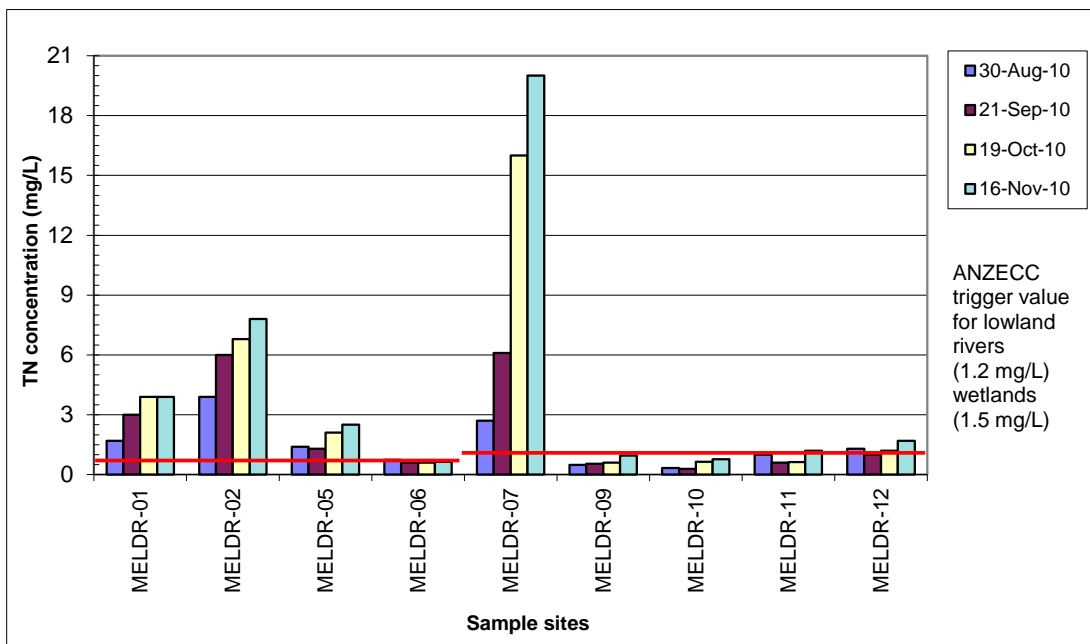
Nutrients analysed as part of this project include total nitrogen, nitrogen in the form of ammonia, nitrate and nitrite and dissolved organic nitrogen as well as total phosphorus and soluble reactive phosphorus.

Nutrient concentration data for water samples of the Bull Creek catchment are displayed in Appendix B.

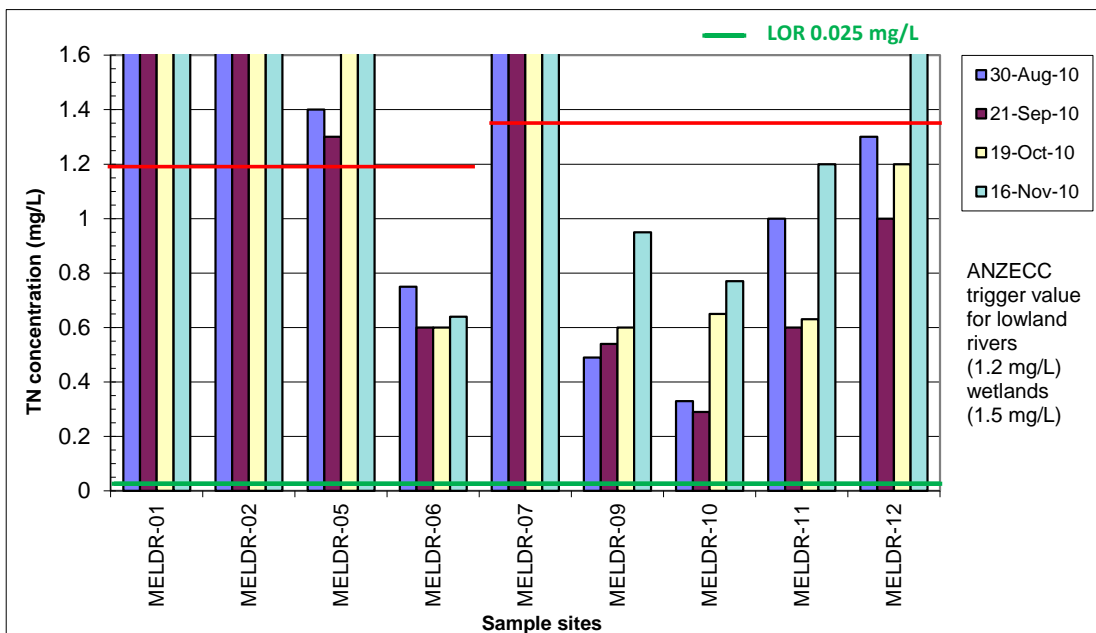
### **Total Nitrogen**

Nitrogen is recycled continually by plants and animals in a number of inorganic and organic forms. Forms include nitrate, nitrite and ammonium. Nitrogen concentrations vary considerably under natural conditions, depending on factors such as local soil types, vegetation and seasonal conditions. Total nitrogen (TN) is a measure of all forms of nitrogen in the water including ammonia, nitrate and nitrite and organic nitrogen. External or additional sources of nitrogen include fertilisers, industrial and household cleaning products; feed lots, animal droppings combustion of fossil fuels and plant debris.

TN concentrations varied across the catchment. 15 out of 36 samples in the Bull Creek catchment had TN concentrations above the ANZECC lowland rivers trigger value of 1.2 mg/L or wetlands trigger value of 1.5 mg/L. The highest concentration of 20 mg/L was recorded in November at site 7 (Booragoon Lake outlet) and the lowest of 0.29 mg/L at site 10 (Frederick Baldwin) in September. Sites 1, 2, 5 and 7 (Bull Creek main drain, Brockman Park, John Creaney Park and Booragoon Lake outlet respectively) did record concentrations exceeding the specific trigger value on all four sampling occasions. Sites 6, 9, 10 and 11 (Bateman Park, Quenda Lake outlet, Frederick Baldwin and Marmion Reserve respectively) did not record concentrations above the trigger value on any sampling occasion.



**Figure 9: Total nitrogen concentration in water throughout the Bull Creek catchment.**



**Figure 10: Total nitrogen concentration in water throughout the Bull Creek catchment (zoom in\*)**

\*Please note this graph scale stops at 1.6mg/L

Table 7 shows the record of TN concentrations exceeding the trigger value for lowland rivers and wetlands during the four year sampling period. Of particular concern is the constantly highly elevated TN concentrations recorded at sites 1 and 2, which have always exceeded the trigger value in all the samples that have been collected during the four year sampling period. This is especially concerning as site 1 (PSDTBCMD) is where the Bull Creek drain discharges directly into the Canning River.

During the four year sampling period, the highest and lowest concentrations have been always recorded during spring. The highest concentrations have been recorded in October or November at site 7 (Booragoon lake) and the lowest in September or October at site 10 (Frederick Baldwin).

Sites 6, 9 and 10 (Bateman Park, Quenda Lake outlet and Frederick Baldwin respectively) have always recorded concentrations below the ANZECC trigger value.

**Table 7: Record of TN concentrations above the trigger value in the Bull Creek catchment 2007 - 2010**

	Site	2010				2009/2010				2008/2009				2007/2008			
		Aug	Sep	Oct	Nov	Sep	Nov	Jan	Mar	Sep	Nov	Jan	Mar	Jul	Oct	Jan	Apr
<b>Lowland rivers (1.2mg/L)</b>	PSDTBCMD	1.7	3	3.9	3.9	2.8	3.1	3.8	4.1	2.6	2.9	4	2.9	2.7	2.4	0.6	3.5
	MELDR-02	3.9	6	6.8	7.8	4.5	5.8	6.9	6.8	4.4	5.5	7.2	6.8	5.3	3.8	5.8	6.1
	MELDR-05	1.4	1.3	2.1	2.5	1.3	NO	NS	NS	1.5	1.9	2.4	NS	NO	NO	NS	NS
	MELDR-06	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<b>Wetlands (1.5mg/L)</b>	MELDR-07	2.7	6.1	16	20	3	7.6	NS	NS	6.3	11	11	NS	NO	10	NS	NS
	MELDR-08	NS	NS	NS	NS	NO	NS	NS	NS	2.3	NO	NS	NS	NO	1.7	NS	NS
	MELDR-09	NO	NO	NO	NO	NO	NO	NO	NS	NO	NO	NO	NO	NO	NO	NS	NS
	MELDR-10	NO	NO	NO	NO	NO	NO	NO	NS	NO	NO	NO	NO	NO	NO	NS	NS
	MELDR-11	NO	NO	NO	NO	NO	NO	NO	1.9	NO	NO	NO	NO	NO	NO	NS	NS
	MELDR-12	NO	NO	NO	1.7	NO	NO	2.4	NS	NO	NO	1.7	NS	2.6	2	NS	NS

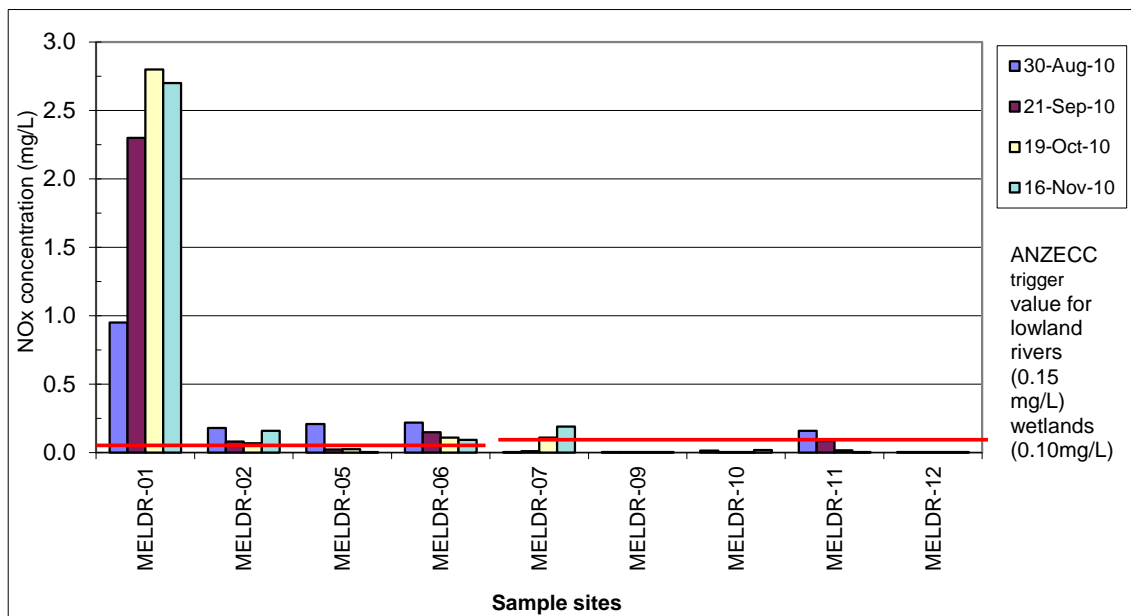
NO = TN was not above the trigger value

NS = No sample was taken

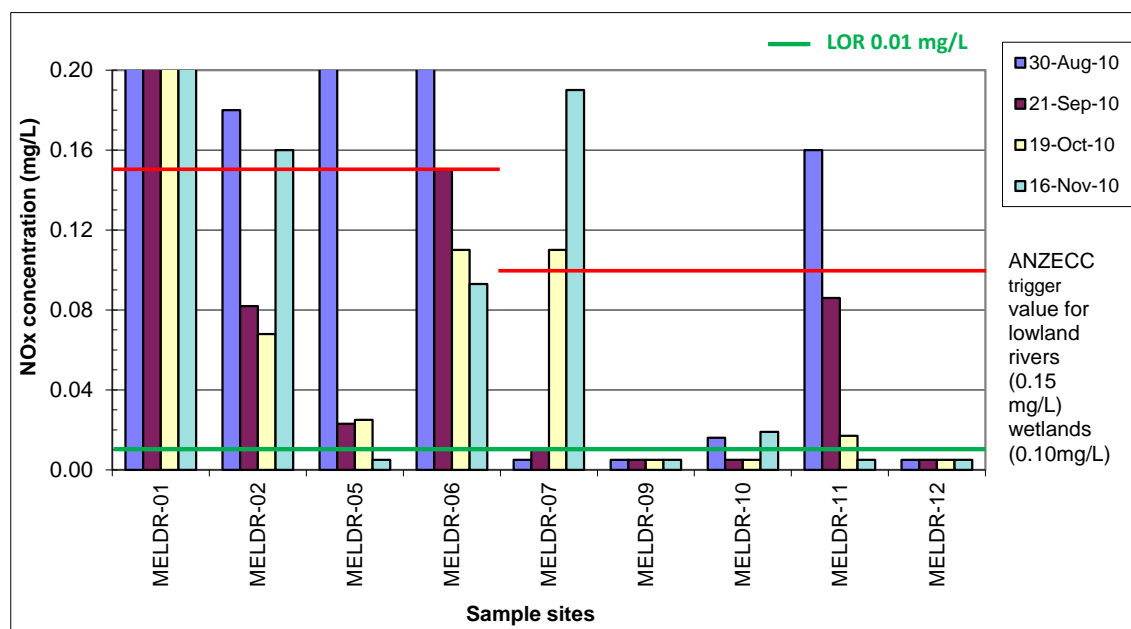
## Total Oxidised Nitrogen

Total oxidised nitrogen (TON or NO<sub>x</sub>) is the sum of the oxidised forms of nitrogen and includes nitrite (NO<sub>2</sub>) and nitrate (NO<sub>3</sub>). Nitrates in excessive amounts with phosphorous can cause eutrophication, causing dramatic increases in aquatic plant growth and changes in the types of plants and animals that live in the waterway. This, in turn, may lower dissolved oxygen levels and increase temperature. TON is a stimulant for algal growth and is a common ingredient in fertilisers.

TON concentrations varied across the catchment. 12 out of 36 samples in the Bull Creek catchment had TON concentrations above the ANZECC lowland rivers trigger value of 0.15 mg/L or wetlands trigger value of 0.10mg/L. The highest concentration of 2.8 mg/L was recorded at site 1 (Bull Creek MD - PSDTBCMD) in August. 13 samples recorded concentrations below the limit of reporting of 0.01 mg/L at sites 5, 7, 9, 10 and 12 (John Creaney Park, Booragoon Lake outlet, Quenda Lake outlet, Frederick Baldwin and Blue Gum Lake outlet respectively). Sites 9 and 12 were the only sites that recorded TON concentrations below the trigger value of 0.1 mg/L for wetlands on all sampling occasions.



**Figure 11: Total oxidised nitrogen concentrations in the surface of Bull Creek catchment.**



**Figure 12: Total oxidised nitrogen concentrations in the surface of Bull Creek catchment (zoom in\*)**

\*Please note this graph scale stops at 0.20mg/L

The TON concentrations exceeding the trigger value at site 1 especially but also at site 6 are of concern as these two sites are the bottom of their respective catchments and they discharge directly into the Canning River. Both sites recorded concentrations exceeding the trigger value on all four sampling occasions. Site 1 recorded 0.95, 2.3, 2.8 and 2.7 mg/L and site 6 recorded 0.22, 0.15, 0.11 and 0.093 mg/L in August, September, October and November respectively. TON was a significant component of total nitrogen at site 1. It

represented 55.88 in August, 76.67% in September, 71.79% in October and 69.23% in November.

Site 1 has recorded concentrations exceeding the trigger value on all the sampling occasions during the four year sampling period, with the exception of January 2008.

## Dissolved Organic Nitrogen

Figure 13 shows that sites 7 and to a lesser extent 12 (Booragoon Lake outlet and Blue Gum Lake outlet) recorded the highest levels of dissolved organic nitrogen during 2010 sampling. Dissolved organic nitrogen is a significant component of the total nitrogen at site 12. It represented 63% in August, 89% in September, 92% in October and 82% in November. At site 7 it represented 56% in August, 44% in September, 22% in October and only 6% in November.

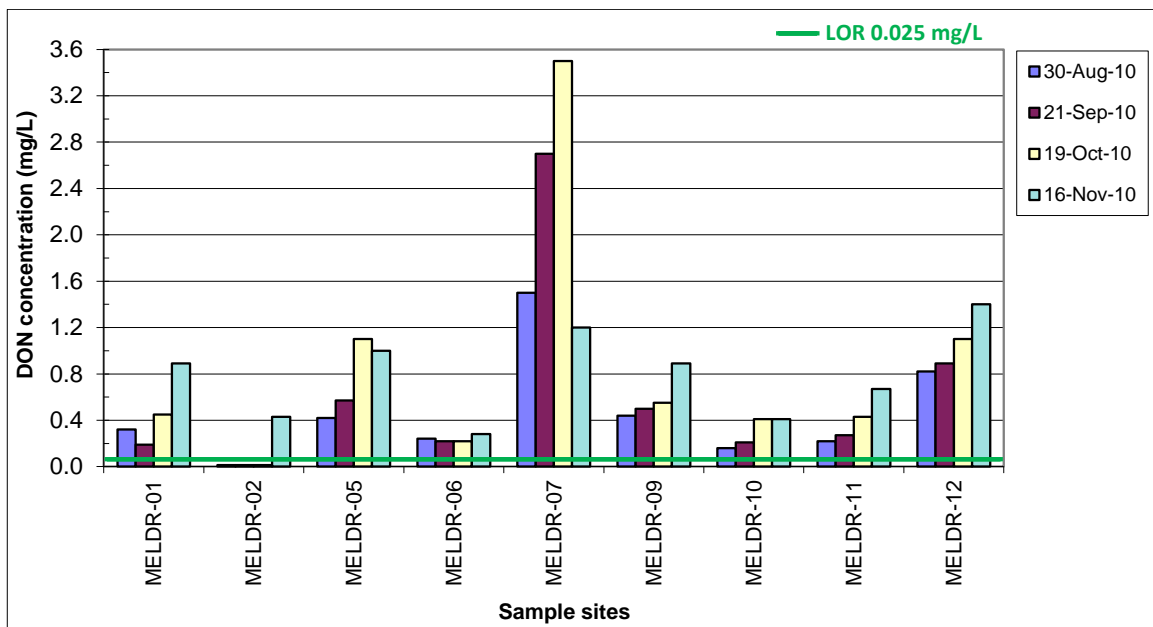


Figure 13: Dissolved organic nitrogen concentrations in the surface of Bull Creek catchment

## Nitrogen as Ammonia/Ammonium

When plants and animals die or when animals excrete their wastes, nitrogen is released in the form of ammonium ( $\text{NH}_4$ ), which is oxidised and converted to nitrite ( $\text{NO}_2$ ), which is converted to nitrates ( $\text{NO}_3$ ) by nitrifying bacteria (nitrification process). Nitrites, ammonia ( $\text{NH}_3$ ) and ammonium ions are intermediate forms of nitrogen in aquatic systems and are oxidised by bacteria to nitrate or, in the case of ammonia and ammonium, are returned back to the atmosphere as nitrogen gas (NHT 2002).

Ammonia (NH<sub>3</sub>) can be a nutrient or a toxicant. Ammonium (NH<sub>4</sub><sup>+</sup>) is the ionised form and is a non-toxic nutrient and Ammonia (NH<sub>3</sub>) is the unionised form and is a toxin. Sources of ammonia include a range of industrial processes, agricultural fertilisers and the decomposition of organic wastes (IEA 2003).

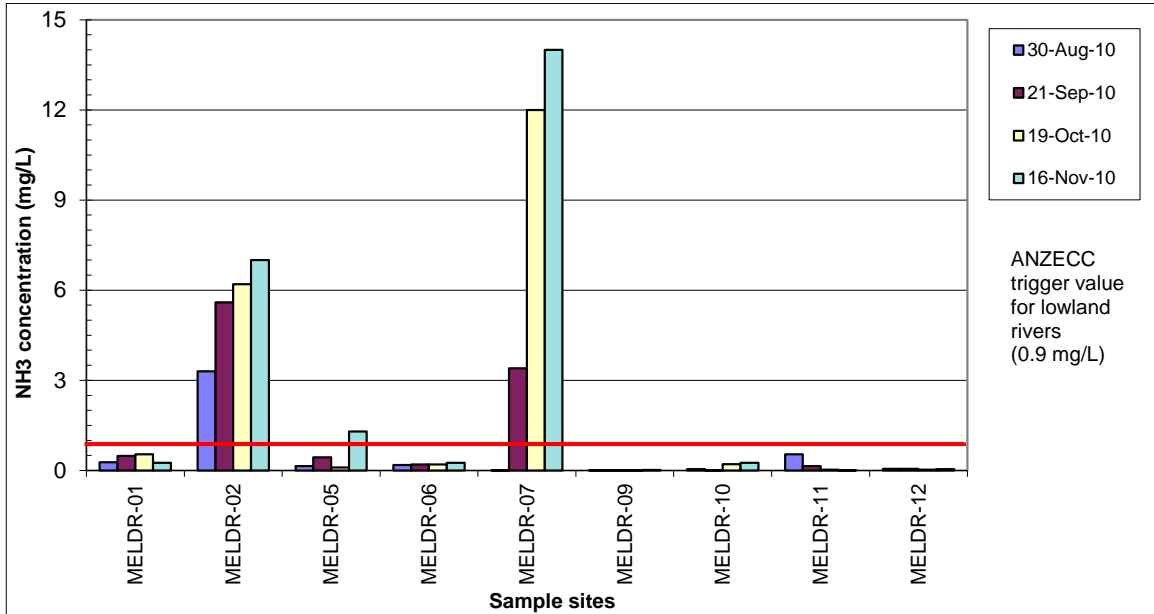


Figure 14: Nitrogen as ammonia/ammonium concentrations in the waters of Bull Creek catchment.

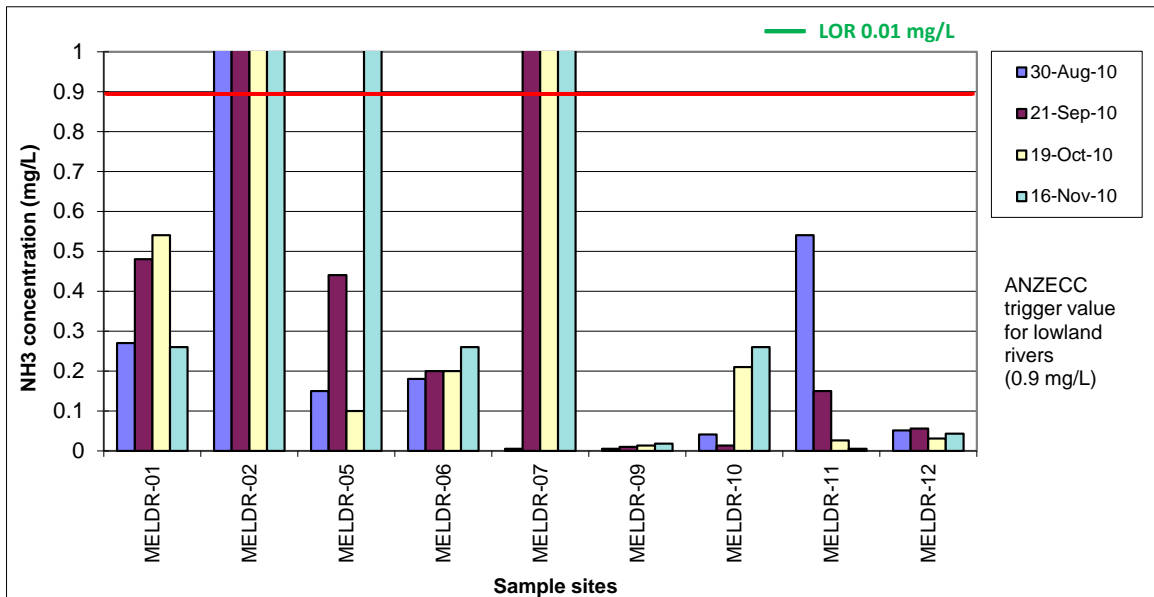


Figure 15: Nitrogen as ammonia/ammonium concentrations in the waters of Bull Creek catchment (zoom in\*).

\*Please note this graph scale stops at 1mg/L

This measures the portion of nitrogen present as ammonia (NH<sub>3</sub>) or ammonium (NH<sub>4</sub><sup>+</sup>). Concentrations in the Bull Creek catchment were generally below the ANZECC trigger value for lowland rivers and wetlands of 0.9 mg/L. Only 8 out of

36 samples recorded  $\text{NH}_3/\text{NH}_4^+$  concentrations above the trigger value. Those sites were 2, 5 and 7 (Brockman Park, John Creaney Park and Booragoon Lake outlet). However, only site 2 recorded concentrations above the trigger value on all four sampling events (3.3 mg/L in August, 5.6 mg/L in September, 6.2 mg/L in October and 7 mg/L in November).

The highest concentration of 14 mg/L was recorded in November at site 7 (Booragoon Lake outlet). The lowest concentrations, below of the limit of reporting (0.01 mg/L), were recorded in August at sites 7 and 9 and during November at site 11.

Ammonia/ammonium was a significant component of the total nitrogen at site 2; it represented 85% in August, 93% in September, 91% in October and 90% in November. At site 7, ammonia/ammonium was also a significant component of TN except for the sample taken in August (which was below of the limit of reporting of 0.01 mg/L); it only represented 0.2% in August, but represented 56% in September, 75% in October and 70% in November.

## **Total Phosphorus**

Total Phosphorus (TP) is a measure of all phosphorus in the water including the bio-available, soluble, particulate forms and the unavailable (but potentially available) forms of phosphorus. Sources of phosphorus include fertilisers, plant debris, detergents, industrial wastes and lubricants.

As in the previous year's sampling projects, total phosphorus concentrations in 2010 were generally low and below the ANZECC aquatic ecosystem lowland rivers trigger value (0.065 mg/L) and wetland trigger value (0.06 mg/L). 12 out of 36 samples recorded concentrations above the specific trigger value. The highest concentration of 3.9 mg/L was recorded at site 7 (Booragoon Lake outlet) in November and the lowest of 0.01 mg/L at site 2 (Brockman Park) in September.

Sites 7 and 12 (Booragoon Lake outlet and Blue Gum Lake outlet) were the only sites that recorded concentrations exceeding the trigger value for wetlands on every sampling occasion. Sites 5 and 11 (Brockman Park and Marmion Reserve) recorded concentrations above on at least one occasion.

Table 8 shows the record of TP concentrations above the trigger value in the Bull Creek catchment for the four year sampling period. Sites 7 and 12 are of concern because they have recorded concentrations exceeding the trigger value for wetlands whenever samples have been collected.

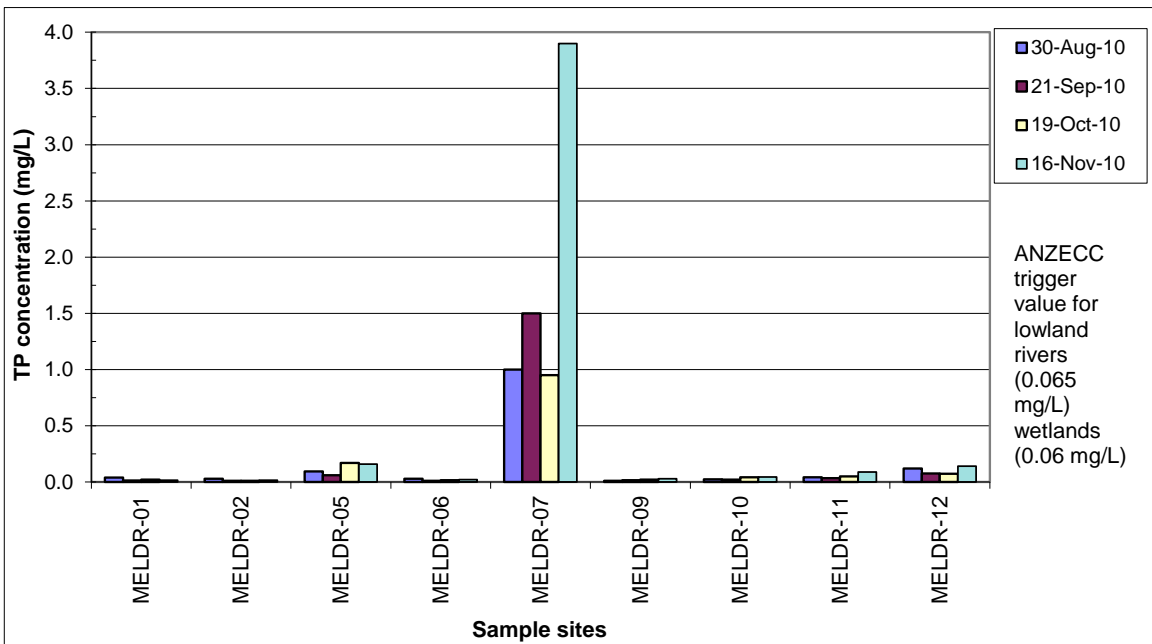


Figure 16: Total phosphorus concentrations in the surface waters of the Bull Creek catchment.

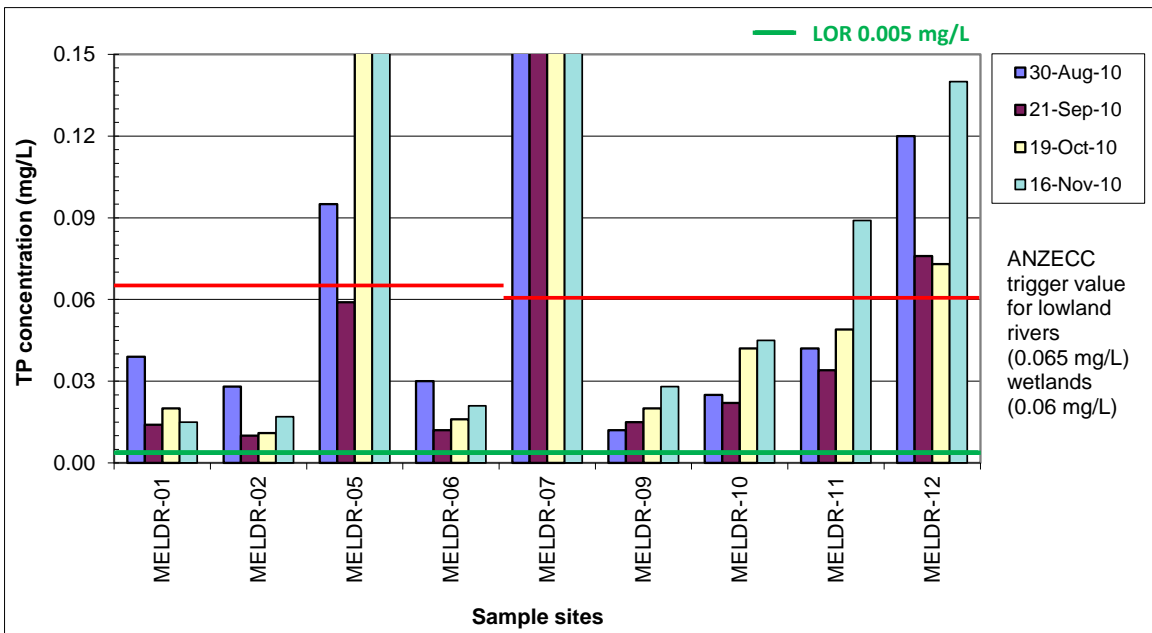


Figure 17: Total phosphorus concentrations in the surface waters of the Bull Creek catchment (zoom in\*).

\*Please note this graph scale stops at 0.15mg/L

**Table 8: Recording of TP concentrations above the trigger value in the Bull Creek catchment 2007-2010**

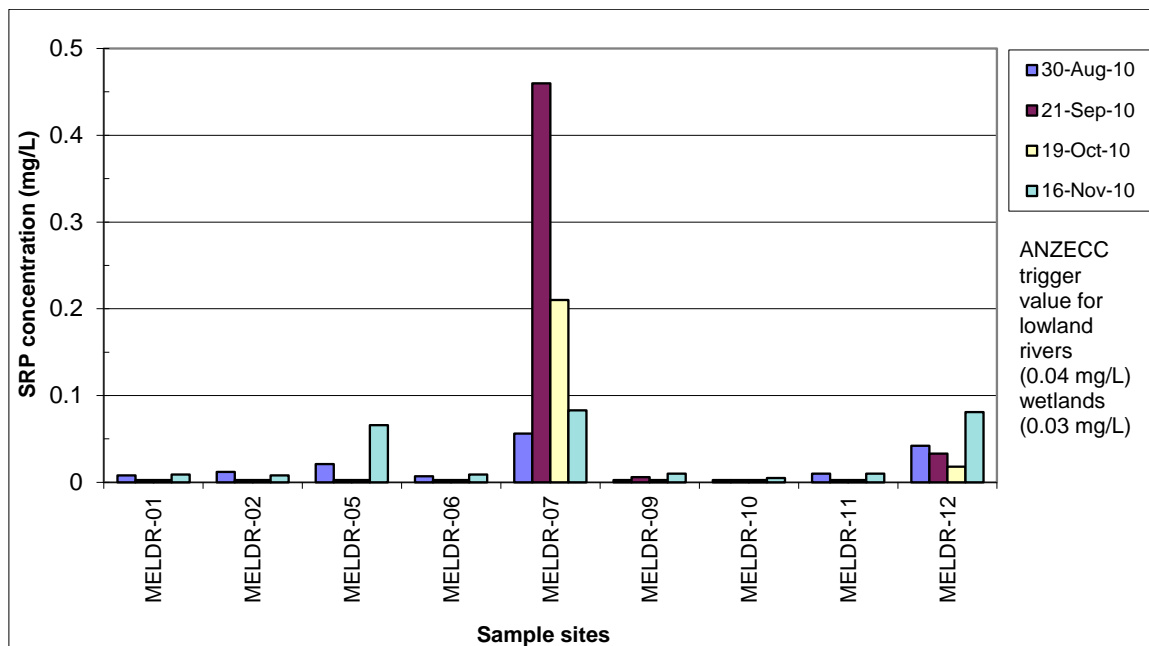
	Site	2010				2009/2010				2008/2009				2007/2008			
		Aug	Sep	Oct	Nov	Sep	Nov	Jan	Mar	Sep	Nov	Jan	Mar	Jul	Oct	Jan	Apr
Lowland rivers (0.065 mg/L)	PSDTBCMD	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	MELDR-02	NO	NO	NO	NO	NO	NO	NO	0.072	NO	NO	NO	NO	NO	NO	NO	NO
	MELDR-05	0.095	NO	0.17	0.16	NO	NO	NS	NS	NO	0.086	0.12	NS	0.14	NO	NS	NS
	MELDR-06	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Wetlands (0.06 mg/L)	MELDR-07	1	1.5	0.95	3.9	0.66	3.2	NS	NS	1.3	2.6	8.3	NS	0.12	3.2	NS	NS
	MELDR-08	NS	NS	NS	NS	NO	NS	NS	NS	0.15	NO	NS	NS	0.077	0.11	NS	NS
	MELDR-09	NO	NO	NO	NO	NO	NO	NO	NS	NO	NO	NO	NO	NO	NO	NS	NS
	MELDR-10	NO	NO	NO	NO	NO	NO	0.06	NS	NS	NO	NO	NO	0.1	NO	NS	NS
	MELDR-11	NO	NO	NO	0.089	NO	NO	0.11	0.16	NO	NO	NO	0.077	NO	NO	NS	NS
	MELDR-12	0.12	0.076	0.073	0.14	0.12	0.09	0.21	NS	0.28	0.19	0.19	NS	0.18	0.31	NS	NS

NO = TP was not above the trigger value  
NS = No sample was taken

### Soluble Reactive Phosphorus

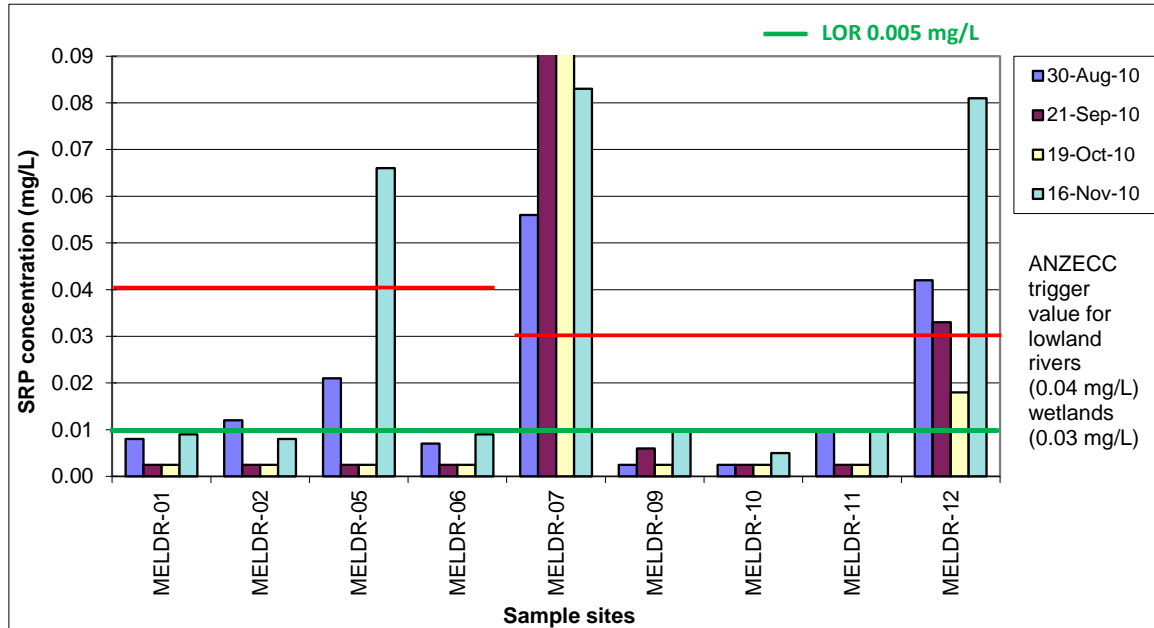
Soluble Reactive Phosphorus (SRP) measures only the dissolved phosphorus in water and provides a measure of the immediately available phosphate in the system at the time of sampling. SRP is readily available for plant uptake and as such is attributed to algal blooms of rapid growth in aquatic flora.

SRP concentrations in the Bull Creek catchment were generally low. Only 8 samples out of 36 recorded concentrations above the ANZECC aquatic ecosystem lowland rivers trigger value of 0.04 mg/L or wetland trigger value of 0.03 mg/L. 15 samples recorded concentrations below the limit of reporting of 0.005 mg/L.



**Figure 18: Soluble reactive phosphorus concentrations in the waters of the Bull Creek catchment.**

The highest concentrations were recorded at site 7 (Booragoon Lake outlet) which was the only site that recorded SRP concentrations above the trigger value for wetlands on every sampling occasion (0.056 mg/L in August, 0.46 mg/L in September, 0.21 mg/L in October and 0.083mg/L in November). Site 12 (Blue Gum Lake outlet) recorded concentrations exceeding the trigger value in August, September and November (0.042, 0.033 and 0.081 mg/L respectively).



**Figure 19: Soluble reactive phosphorus concentrations in the waters of the Bull Creek catchment (zoom in\*).**

\*Please note this graph scale stops at 0.09mg/L

## Water Hardness

Total hardness, expressed as calcium carbonate ( $\text{CaCO}_3$ ), is the combined concentration of earth-alkali metals, predominantly magnesium ( $\text{Mg}^{2+}$ ) and calcium ( $\text{Ca}^{2+}$ ), and some strontium ( $\text{Sr}^{2+}$ ) in the water. The source of this hardness is limestone dissolved by water that is rich in carbon dioxide. Hardness levels range from <60mg/L being very soft to >400 mg/L being extremely hard.

Water hardness can have an effect on trigger values for particular metals concentrations such as copper, cadmium, zinc, lead, nickel and chromium. Water samples with higher concentrations of water hardness need to have the trigger values for these metals amended by a certain multiplication factor, as recommended in ANZECC (2000) guidelines. As water hardness is variable between sites, the trigger values for these particular heavy metals can be different for each site. Trigger values for these metals have been corrected based on the concentration of water hardness for each site, using the hardness-dependant algorithm provided in ANZECC and ARMCANZ (2000). The calculated site-specific trigger values are displayed on the graphs for these metals, where applicable. For the details and calculations see Appendix B.

In 2010 water hardness in the surface waters of Bull Creek catchment varied from a minimum of 56 mg/L recorded in August at site 10 (Frederick Baldwin) to a maximum of 1,300 mg/L recorded in November at site 9 (Quenda Lake outlet). 1 out of 36 samples recorded soft water hardness (0-59 mg/L), 11 recorded moderate levels (60 to 119 mg/L), 18 samples recorded hard levels (120 to 179 mg/L), 1 sample were very hard (180-240 mg/L) and 5 extremely hard (>240 mg/L). There is no ANZECC guideline regarding water hardness and ecosystem health, however 5 samples were above the ANZECC recreational guideline of 500 mg/L.

Similarly to the 2009 sampling events, site 7 (Booragoon Lake) recorded elevated total water hardness. In 2010 this site recorded 910, 850, 1,100 and 970 mg/L in August, September, October and November respectively. In 2009 it recorded 620 mg/L in September and 700 in November.

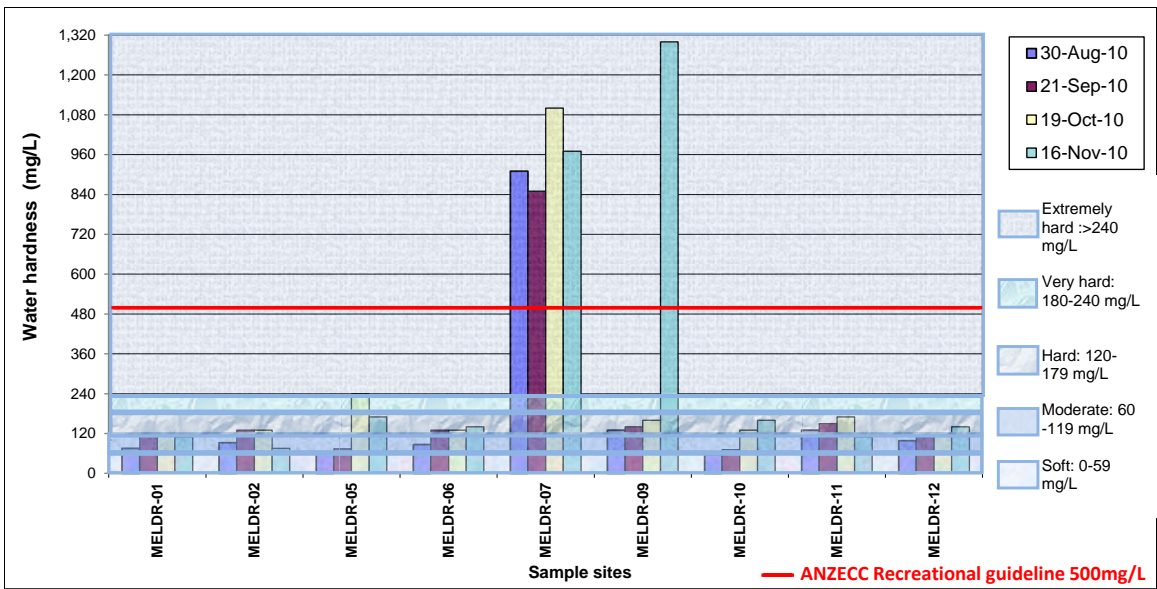


Figure 20: Water Hardness in the surface waters of the Bull Creek catchment.

## **Metals in water**

Metals are derived from a variety of sources such as motor vehicles, tyres, rubber, industrial waste, fertilisers and pesticides, refuse leachate and corrosion of pipes and roofs. Some of these metals are toxic to aquatic organisms at varying concentrations and may accumulate in animals and in the human body (IEA 2003).

Metal concentrations in the waters of the Bull Creek catchment varied. All arsenic, cadmium chromium and nickel samples were below the specific ANZECC trigger value. All samples recorded mercury concentrations below the limit of reporting. However, aluminium, copper, iron, lead and zinc concentrations were above the specific trigger values on some occasions. For all graphs, a value equal to half the limit of reporting was substituted for those occasions where concentrations were recorded as 'below the laboratory limit of reporting' to allow these 'unknown' values to be represented graphically.

Table 9 shows the sites that have recorded metals concentrations above the trigger value for the whole sampling period (2007-2010).

### **Aluminium**

Aluminium (Al) is toxic to aquatic organisms and its toxicity increases as pH decreases (Australian Government 2006). Aluminium may be present in water through natural leaching from soil and rock, and is increased in soluble groundwater concentrations under acidic conditions and therefore it is commonly linked to Acid Sulphate Soils activity (ASS).

The ANZECC trigger value for aluminium is 0.055 mg/L but is only applicable when the pH is greater than 6.5. The concentration of aluminium in the surface waters of the Bull Creek was elevated across the catchment, with 24 out of 36 samples exceeding the ANZECC trigger value (0.055 mg/L) but only 19 of them recorded a pH above 6.5 when the trigger value is applicable (see figure 21).

As in the previous three years of sampling, the highest Al concentrations have been recorded at sites 1, 2, 5 and 6 (Bull Creek MD – PSDTBCMD, Brockman Park, John Creaney Park and Bateman Park respectively). The reason for this elevated concentrations focused on those sites of the catchment is unknown and requires further investigation.

The highest concentration was in October recorded at site 6 (0.85 mg/L) and the lowest in August at site 7 (0.022 mg/L).

**Table 9:** Record of metals concentrations in water above the specific trigger values in the Bull Creek Catchment 2002 – 2010

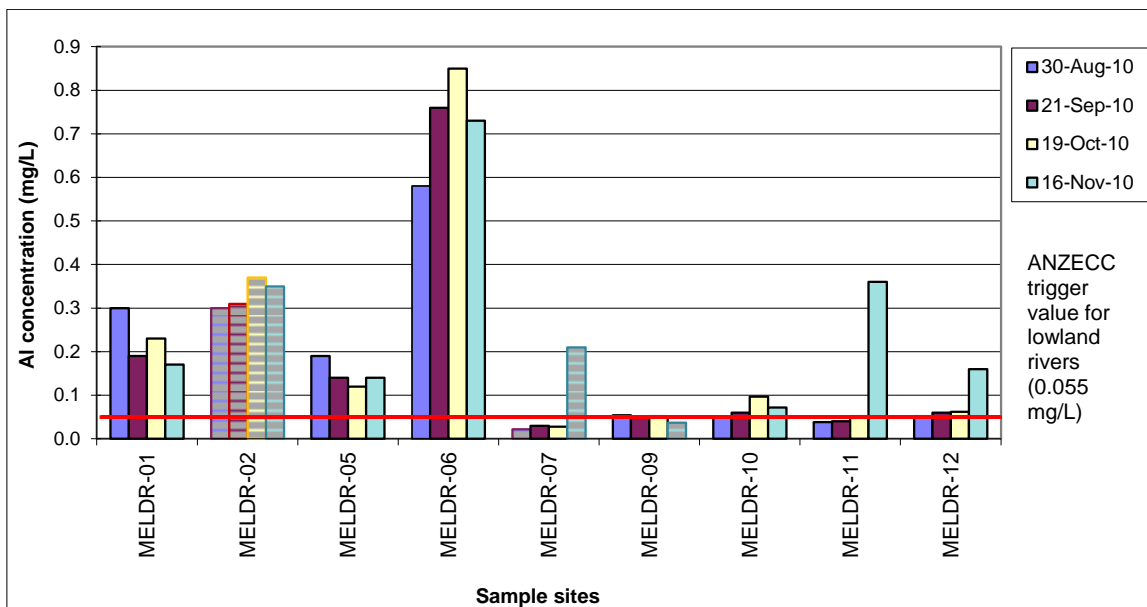
Site	Metal	2010				2009/2010				2008/2009				2007/2008				
		Aug	Sep	Oct	Nov	Sep	Nov	Jan	Mar	Sep	Nov	Jan	Mar	Jul	Oct	Jan	Apr	
PSDTBCMD	Al	0.3	0.19	0.23	0.17	0.21	0.3	3.2	NO pH reading	0.29	0.17	0.2	0.22	0.29	0.17	NA	0.21	
	Cr	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.004	NO	
	Cu	0.004	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	Fe	1.2	0.68	0.78	0.58	0.79	0.64	0.85	0.88	1.6	0.6	0.88	0.97	0.76	1	13	0.68	
MELDR-02	Al	NA	NA	NA	NA	NA	0.39	NA	0.31	NA	0.9	NA	NA	NA	NA	NA	NA	
	Fe	1.1	1.3	1.1	1.3	1.4	1.2	1.5	15	1.6	1.2	1.2	1.2	1.1	2	1.2	1.1	
MELDR-05	Al	0.19	0.14	0.12	0.14	0.065	0.24	NS	NS	NA	0.13	0.084	NS	0.22	0.095	NS	NS	
	Cu	0.008	NO	NO	NO	NO	NO	NS	NS	NO	NO	NO	NS	0.003	NO	NS	NS	
	Fe	0.71	2	1	1.1	1.8	0.93	NS	NS	1.9	1.3	0.51	NS	1.2	2.7	NS	NS	
	Pb	NO	NO	NO	NO	NO	NO	NS	NS	NO	NO	NO	NS	0.004	NO	NS	NS	
MELDR-06	Zn	0.054	NO	NO	NO	NO	NO	NO	NS	NO	NO	NS	NS	NO	NO	NS	NS	
	Al	0.58	0.76	0.85	0.73	3.6	3.2	0.3	2.6	NA	1.5	1.4	1.3	NA	1.1	0.97	NA	
	Cr	NO	NO	NO	NO	NO	NO	NO	NO	0.004	NO	NO	NO	0.006	0.005	NO	NO	
	Fe	2.8	4.5	4.5	5.1	4.3	4.9	6.2	5.6	8.3	6.6	7	6.4	16	12	1.4	12	
MELDR-07	Zn	0.021	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
	Al	NO	NO	NO	NA	NA	0.058	NS	NS	NO	0.066	0.16	NS	NA	NO	NS	NS	
	Fe	4.8	6.3	4.5	19	5.4	6.9	NS	NS	9.5	7.3	16	NS	3.9	15	NS	NS	
MELDR-08	Zn	NO	NO	NO	NO	NO	NO	NS	NS	NO	NO	NO	NS	1.2	NO	NS	NS	
	Al	NS	NS	NS	NS	NA	0.29	NS	NS	NA	0.13	NS	NS	NA	NS	NS	NS	
	Fe	NS	NS	NS	NS	0.63	NS	NS	NS	0.99	0.41	NS	NS	0.95	5.6	NS	NS	
MELDR-09	Zn	NS	NS	NS	NS	0.031	NS	NS	NS	0.024	NO	NS	NS	0.13	0.026	NS	NS	
	Al	NO	NO	NO	NO	0.058	0.17	NS	NS	0.28	NO	0.1	0.11	0.27	0.086	NO	NS	
MELDR-10	Fe	NO	NO	NO	NO	NO	NO	NO	NO	0.45	NO	NO	NO	0.82	0.61	NS	NS	
	Al	NO	0.06	0.097	0.072	0.079	0.065	NS	NS	NO	NO	NO	0.056	0.055	NO	NO	NS	
	Cu	0.002	NO	NO	NO	NO	NO	NO	NS	NO	NO	NO	NO	NO	NO	NS	NS	
MELDR-11	Fe	NO	NO	0.9	1.1	0.14	0.34	2.7	NS	0.7	0.31	1.1	1.8	0.39	0.34	NS	NS	
	Al	NO	NO	NO	0.36	0.067	0.032	NS	NS	NO	NO	NO	0.16	0.056	NO	0.11	0.089	
	Fe	0.43	0.37	0.4	2	0.32	0.99	1.7	1.8	0.53	0.7	0.91	1.6	0.39	0.59	NS	NS	
MELDR-12	Pb	NO	NO	NO	0.014	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NS	NS	
	Al	NO	0.06	0.062	0.16	0.22	0.062	NS	NS	0.058	NO	NO	NS	NA	NO	0.2	NS	
	Cr	NO	NO	NO	NO	NO	NO	NO	NS	NO	NO	NO	NS	NO	0.003	NS	NS	
	Fe	1.4	1.2	0.69	0.55	1.6	0.58	0.68	NS	2.5	1.1	0.61	NS	1.4	3.7	NS	NS	
MELDR-12	Zn	NO	NO	NO	NO	NO	NO	NO	NS	NO	NO	NO	NS	0.19	NO	NS	NS	

Trigger Values: Al 0.055mg/L if pH is>6.5; Cr 0.001mg/L; Cu 0.0014mg/L; Fe 0.3mg/L; Pb 0.0034mg/L; Zn 0.008mg/L

NO = metal was not above the trigger value

NS = No sample was taken

NA= Al trigger value no applicable because pH was <6.5



**Figure 21: Aluminium concentrations in the surface waters of the Bull Creek catchment.**

Sites 1, 2 and 6 exceeded the trigger value on all four sampling events. Site 2 also recorded concentrations above the trigger value on all four sampling occasions but the recorded pHs were below 6.5, therefore the trigger value cannot be applied. Sites 10, 11 and 12 (Frederick Baldwin, Marmion Reserve and Blue Gum Lake outlet respectively) recorded concentrations above the trigger value and pHs above 6.5 on at least one sampling occasion. Site 9 (Quenda Lake outlet) was the only site that recorded concentrations below the trigger value on all four sampling events.

During the four year sampling period sites 1, 5 and 6 have recorded concentrations above the trigger value and pHs above 6.5 on most of the sampling occasions (see table 9 for details).

Given the toxicity of aluminium to aquatic organisms; this widespread Al contamination in the catchment, particularly at site 6, is very concerning and further investigation is warranted, perhaps looking into the concentrations of soluble Al through the catchment. The Al concentration records exceeding the ANZECC trigger value and with pHs greater than 6.5, have been: 15 out of 36 samples in 2010, 16 out of 24 samples in 2009/2010, 19 out of 34 samples in 2008/2009 and 12 out of 26 samples in 2007/2008. Site 6 has recorded very high concentrations of Al during the four year sampling period and pHs greater than 6.5 on almost all occasions.

## Arsenic

Arsenic (As) is a naturally occurring mineral that is widely distributed throughout the world's soils. Arsenic is highly toxic to aquatic life and bio-accumulates in some animals. Arsenic is very persistent in the environment and can inhibit plant growth. Sources of arsenic include the combustion of fossil fuels, primary production of iron, steel, copper, nickel and zinc, use of pesticides, weed killers and fungicides, wood treatment products and burning of treated wood (Australian Government 2006). High arsenic concentrations can also be caused from acidic groundwater.

Arsenic concentrations in the Bull Creek catchment were below the ANZECC trigger value for lowland rivers (0.024 mg/L) at all sites. As in 2009, site 11 (Marmion Reserve) recorded the highest concentration (0.01 mg/L) during the November sampling occasion. At sites 1, 2 and 9 (Bull Creek Park, Brockman Park and Quenda Lake outlet) the recorded concentrations were below the limit of reporting (0.001 mg/L) every time they were sampled.

During the four year sampling period arsenic concentrations have been always below the trigger value. Sites 1 and 2 have recorded concentrations below the limit of reporting on almost all occasions. Sites 10 and 11 have recorded the highest concentrations during the four year sampling period.

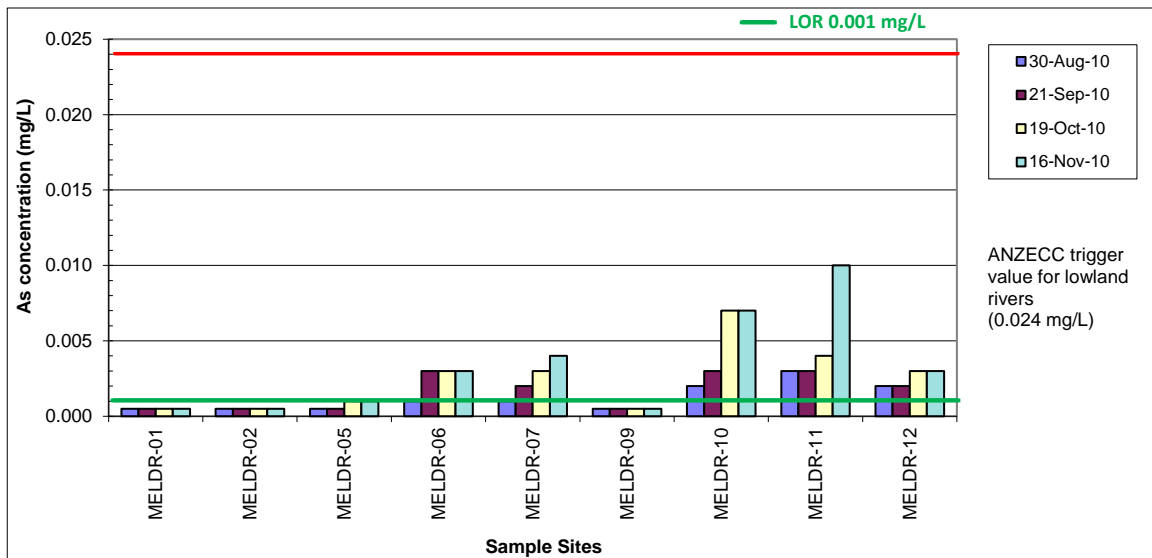


Figure 22: Arsenic concentrations in the surface waters of the Bull Creek catchment.

## Cadmium

Cadmium (Cd) is highly toxic and accumulates in the liver and kidneys of animals, and is a known carcinogen (World Health Organisation 1984). Sources of cadmium include combustion, wear of tyres and brake pads, possible combustion of lubricating oils, industrial emissions, agricultural use of sewage

sludge, fertilisers and pesticides, corrosion of galvanized metals and landfill leachate (presumably contaminated by discarded rechargeable batteries) (IEA 2003).

The trigger values for cadmium are affected by water hardness. Therefore, the trigger values shown on the graph vary, dependant on the water hardness recorded at each site. The concentrations at all sites were below the limit of reporting (0.0001 mg/L) and as in 2009 all sites recorded a concentration below the hardness adjusted ANZECC trigger.

During the four year sampling period the cadmium concentrations in all samples has been below the limit of reporting (with the exception of the 2007/2008 sampling when concentrations of 0.0015, 0.00012 and 0.0001 mg/L were recorded in July at sites 7, 8 and 12 respectively) and below the adjusted trigger values.

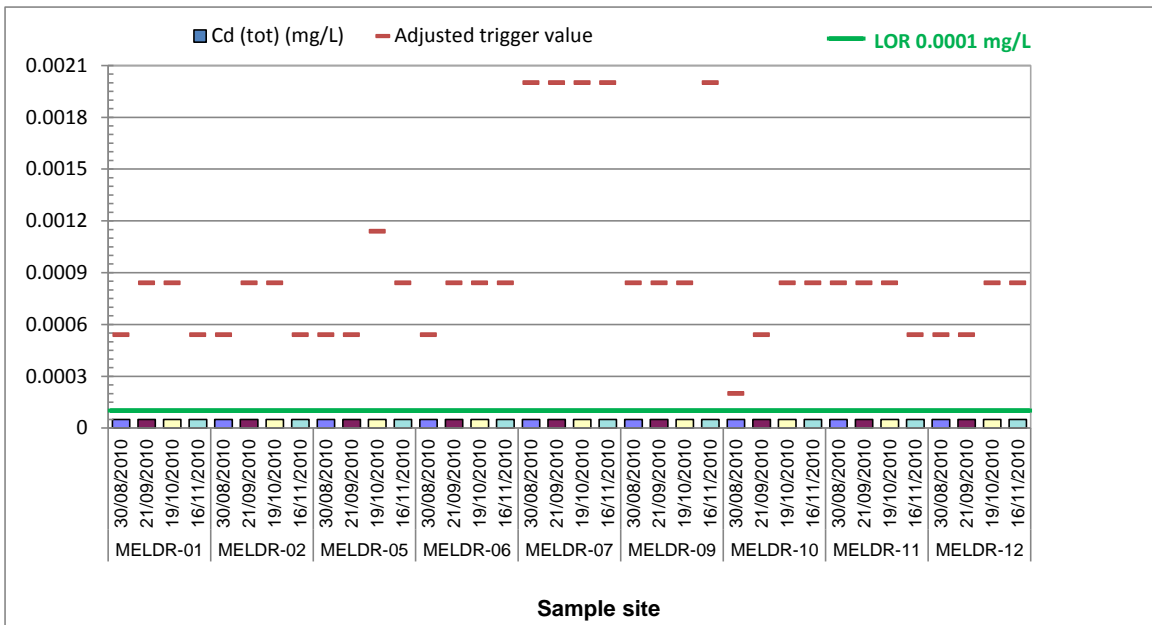


Figure 23: Cadmium concentrations in the surface waters of the Bull Creek catchment.

## Chromium

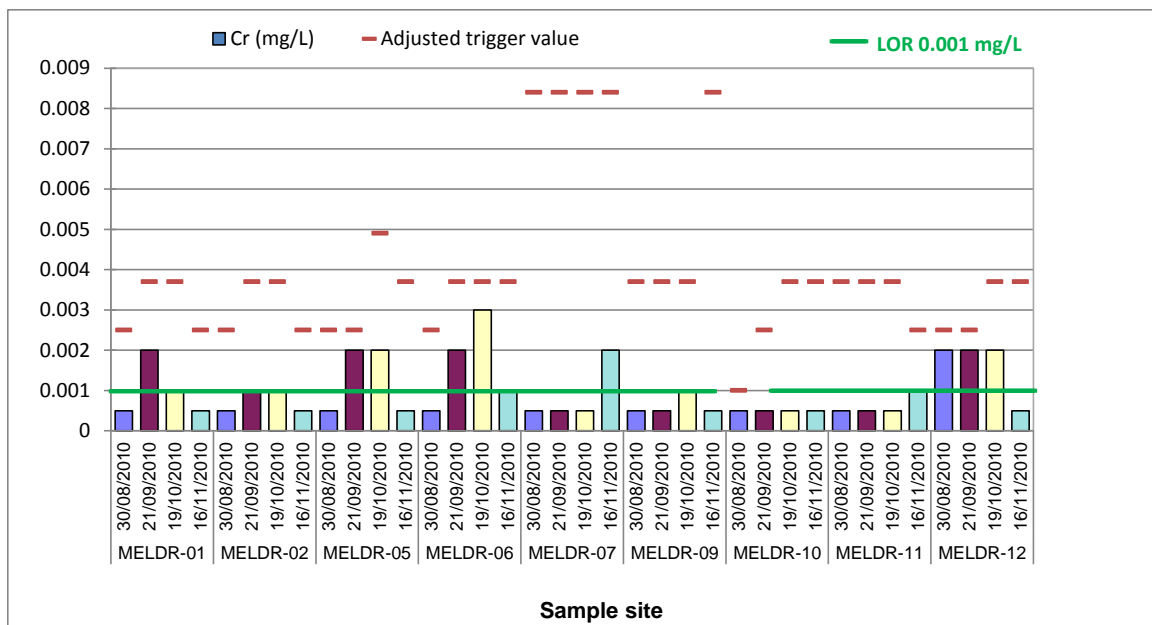
Chromium (Cr) occurs in both trivalent and hexavalent forms. Trivalent chromium is considered to be practically non-toxic. In chlorinated or aerated water, hexavalent chromium is the predominant form and is toxic to aquatic organisms and a carcinogen to animals and humans. Chromium in storm water is mostly associated with suspended solids (IEA 2003).

Sources of chromium include the chemical manufacturing industry (e.g. dyes for paints, rubber and plastic products), the metal finishing industry (e.g. chrome plating), manufacturers of pharmaceuticals, wood, stone, clay and glass products, electrical and aircraft manufacturers, steam and air conditioning supply

services, cement producing plants (cement contains chromium), incineration of refuse and sewage sludge, combustions of oil and coal (Australian Government 2005).

The trigger values for chromium are affected by water hardness, therefore the trigger values shown on the graph vary depending on the water hardness recorded at each site.

As in 2009, Cr concentrations in the Bull Creek catchment were below the site specific trigger value at all sites sampled. 21 out of 36 samples recorded concentrations below the limit of reporting (0.001 mg/L).



**Figure 24: Chromium concentrations in the surface waters of the Bull Creek catchment.**

During the four year sampling period Cr concentrations above the specific trigger value have been recorded sporadically at sites 1, 6 and 12 during the 2007/2008 and 2008/2009 sampling (see table 9 for details).

**Copper**

Copper (Cu) is commonly found as the Cu<sup>2+</sup> ion in natural waters, and this ion is potentially very toxic to aquatic life, both acutely and chronically (Australian Government 2006), and is quickly accumulated in both plants and animals (IEA 2003). The toxicity of copper greatly increases with decreasing water hardness and dissolved oxygen concentrations (Australian Government 2006). Sources of copper include wear of vehicle tyres and brake pads, metal industry and domestic products, corrosion of brass and copper pipes, sewage treatment plant

effluent, electroplating wastes, pesticides, fungicides, algacides and brake lining.

The trigger values for copper are affected by water hardness. Therefore the trigger values shown on the graph vary, depending on the water hardness concentration recorded at each site.

The concentration of copper in the surface waters of the Bull Creek catchment was generally low, 26 out of 36 samples recorded concentrations equal to or below the limit of reporting (0.001 mg/L). Samples collected during August at sites 1, 5 and 10 (Bull Creek MD, John Creaney Park and Frederick Baldwin) recorded concentrations exceeding the specific adjusted trigger value (0.004, 0.008 and 0.002 mg/L respectively).

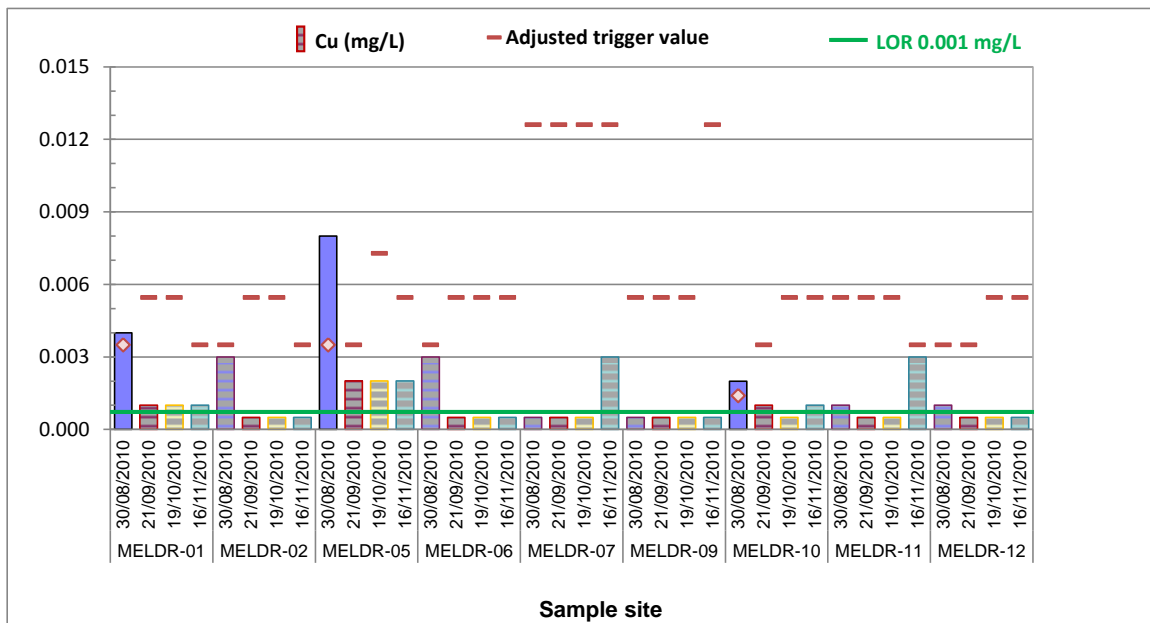


Figure 25: Copper concentrations in the surface waters of the Bull Creek catchment.

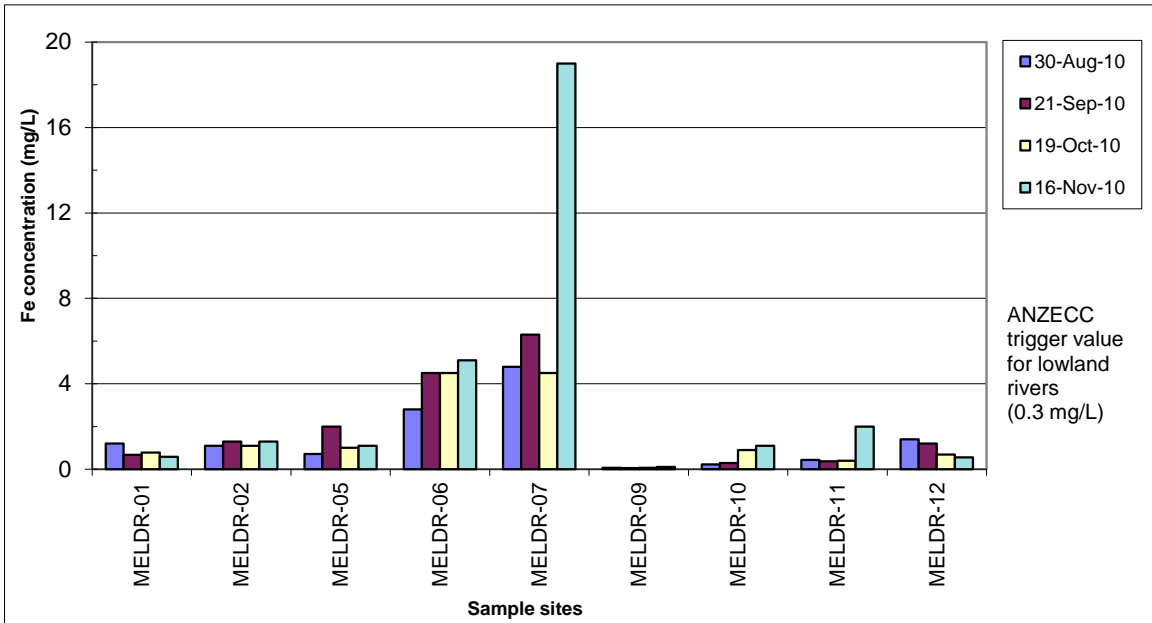
Site 5 is the only site that has recorded Cu concentrations exceeding the specific adjusted trigger before 2010; in 2007/2008 a concentration of 0.003 mg/L was recorded in July (see table 9 for details).

## Iron

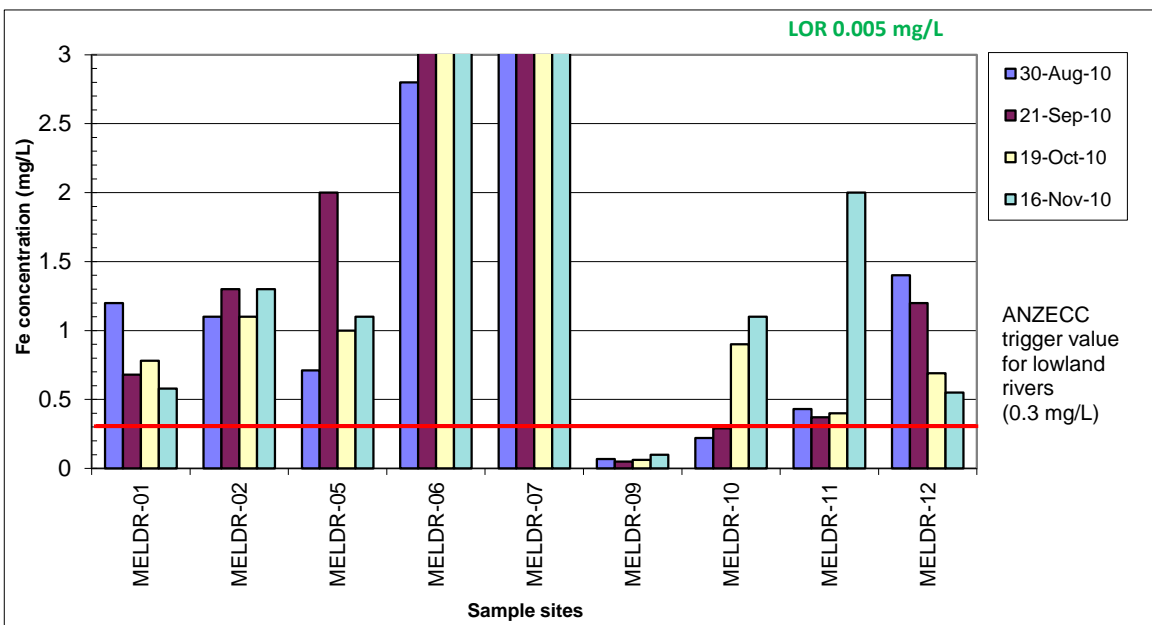
Iron (Fe) may be present in natural waters in varying quantities depending upon the geology of the area and the chemical components of the waterway (ANZECC & ARMCANZ 2000). Iron is generally present in the ferrous ( $Fe^{2+}$ ) or ferric ( $Fe^{3+}$ ) states. In surface waters iron is generally present in the ferric state, in reducing waters the ferrous form can persist (ANZECC & ARMCANZ 2000). In the presence of oxygen, iron is often found as colloidal suspensions of ferric hydroxide, which may remain suspended in water or settle onto sediments and

aquatic plants, which can cause problems with turbidity, decreased light penetration and smothering of benthic organisms (ANZECC & ARMCANZ 2000).

The ANZECC recreational guideline for iron is 0.3 mg/L in lowland rivers. Iron concentrations in the Bull Creek catchment were elevated, 30 out of 36 samples exceeded the trigger value. The highest and lowest concentrations were recorded at site 7 (Booragoon Lake) in November 19 mg/L and in September 0.05 mg/L at site 9 (Quenda Lake outlet)



**Figure 26: Iron concentrations in the surface waters of the Bull Creek catchment.**



**Figure 27: Iron concentrations in the surface waters of the Bull Creek catchment (zoom in\*).**

\*Please note this graph scale stops at 3 mg/L

Similarly to the 2009/2010 and 2008/2009 sampling, site 9 (Quenda Lake outlet) was the only site that recorded concentrations below the trigger value on all the sampling occasions.

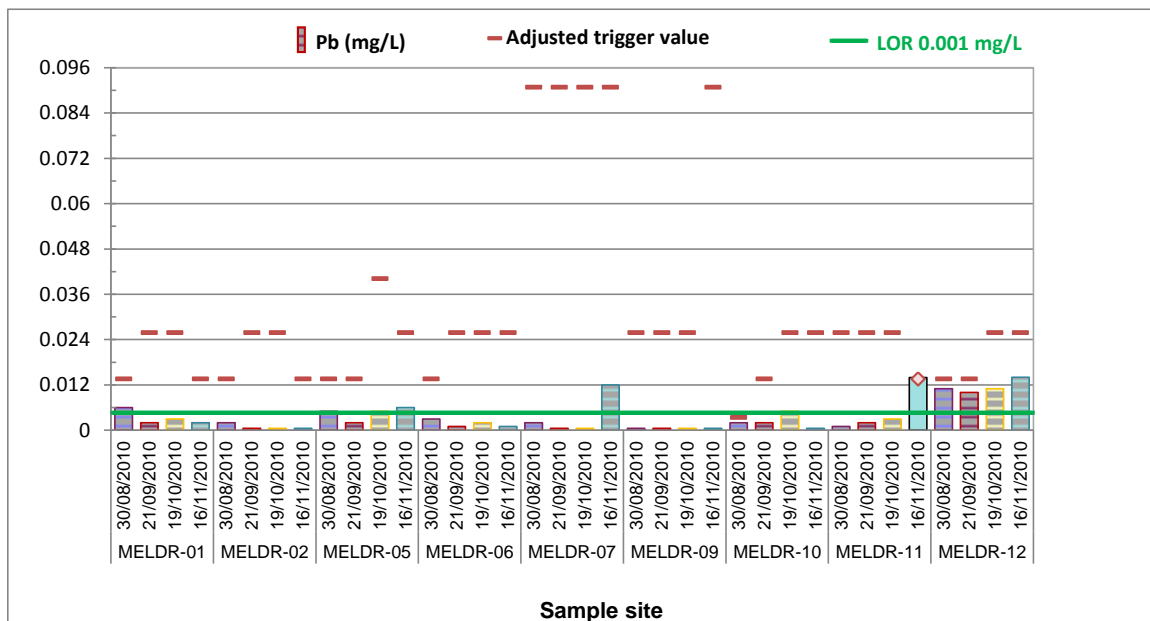
During the four year sampling period sites 1, 2, 5, 6, 7, 11 and 12 (Bull Creek MD, Brockman Park, John Creaney Park, Bateman Park, Booragoon Lake outlet, Marmion Reserve and Blue Gum Lake outlet) have recorded iron concentrations above the trigger value when samples have been taken (see table 9 for details).

## Lead

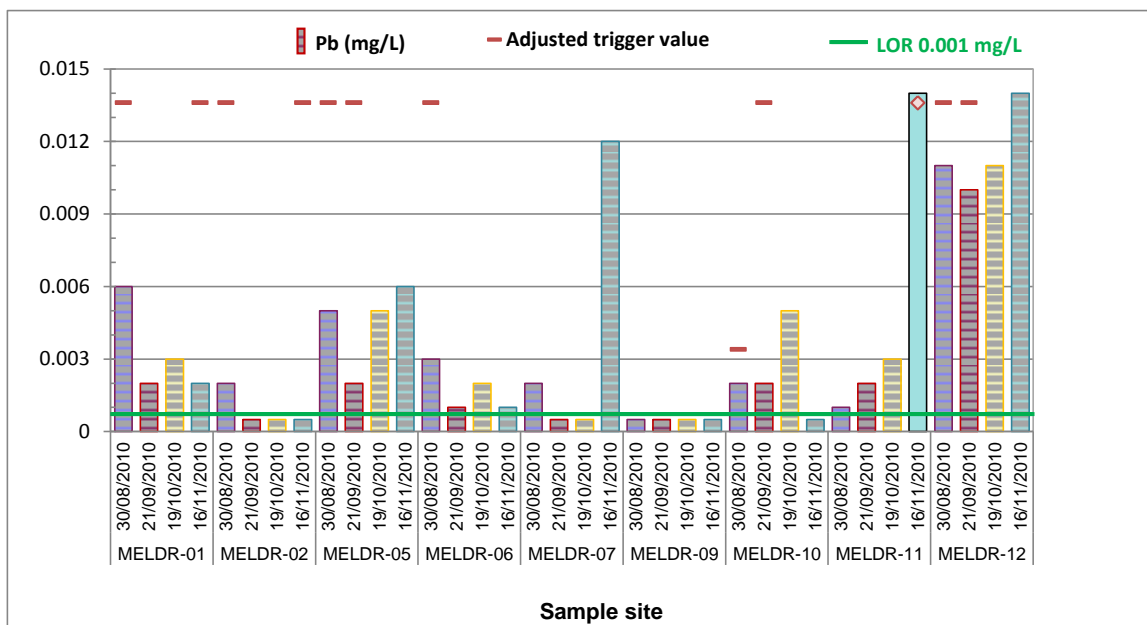
Lead (Pb) is a cumulative, general metabolic poison which bio-accumulates in animals, plants and bacteria and is highly poisonous to both plants and animals. Lead persists in the environment for long periods and does not readily breakdown (Australian Government 2006). The main source of lead in urban runoff is from petrol additives. Other sources include tyres, industrial and mining emissions, manufacturing and smelting industries, lead water pipes and soldered joints, burning of fossil fuels, plastic pipes and guttering, and paints (IEA 2003).

The trigger values for lead are affected by water hardness. Therefore the trigger values shown on the graph are variable, dependent on the water hardness concentration recorded at each site.

Lead concentrations in the Bull Creek catchment were below the site specific trigger values for all of the samples collected with the exception of site 11 (Marmion Reserve) where a concentration of 0.014 mg/L was recorded on the November sampling occasion. 10 out of 36 samples recorded Pb concentrations below the limit of reporting (0.001 mg/L).



**Figure 28: Lead concentrations in the surface waters of the Bull Creek catchment.**

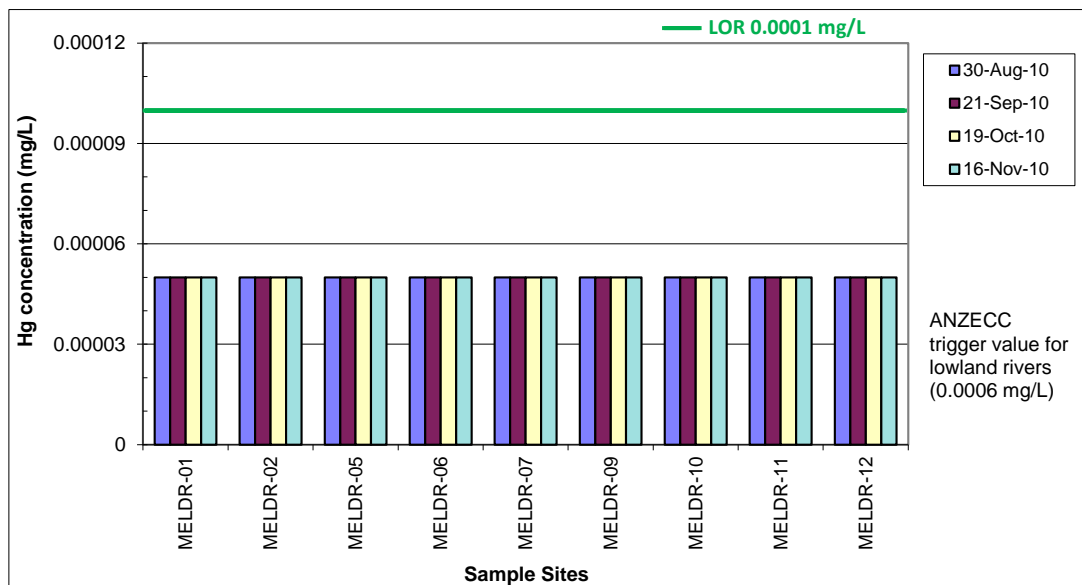


**Figure 29: Lead concentrations in the surface waters of the Bull Creek catchment (zoom in\*).**

\*Please note this graph scale stops at 0.015 mg/L

**Mercury**

Mercury (Hg) is a naturally occurring element that is found in rocks and ores. Burning of fossil fuels (coal, oil, petrol, asphalt, etc.) and disposal of batteries, thermometers and other mercury containing products as well as photographic processing facilities may be sources of mercury to the environment. Both mercury and its compounds have high acute (short-term) and have high chronic (long-term) toxicity on aquatic life. Mercury and its compounds are highly persistent in water and the environment and will bio-accumulate or concentrate in the tissues of fish (Australian Government 2006).



**Figure 30: Mercury concentrations in the surface waters of the Bull Creek catchment.**

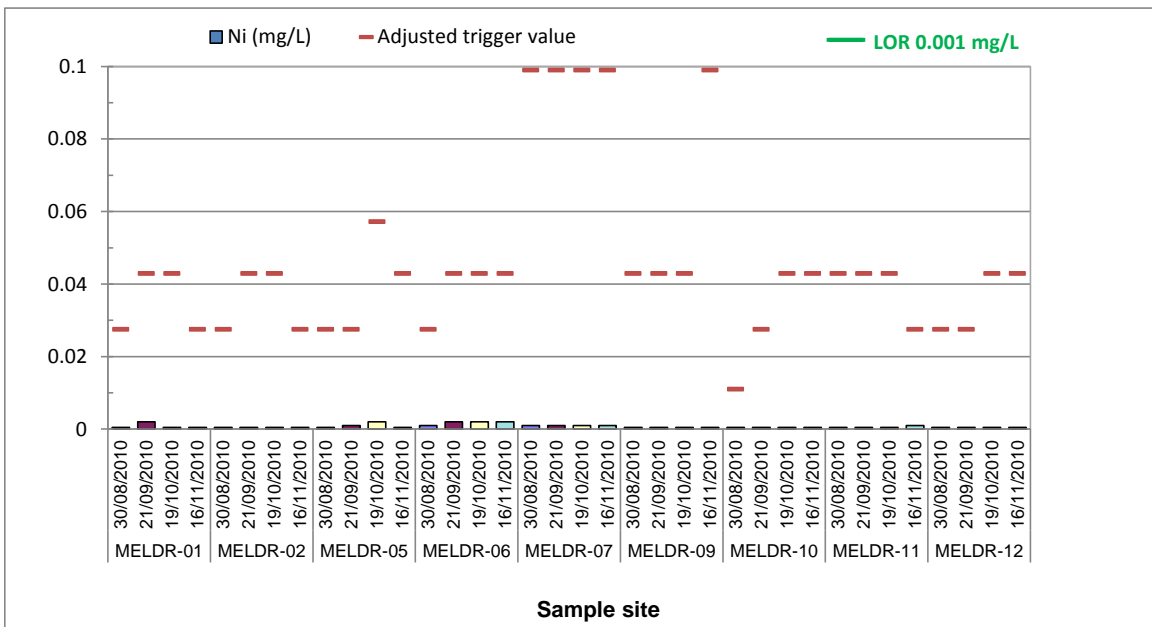
As in the previous years of monitoring, mercury concentrations in the Bull Creek catchment have been below the limit of reporting (0.0001 mg/L) at all sites.

### **Nickel**

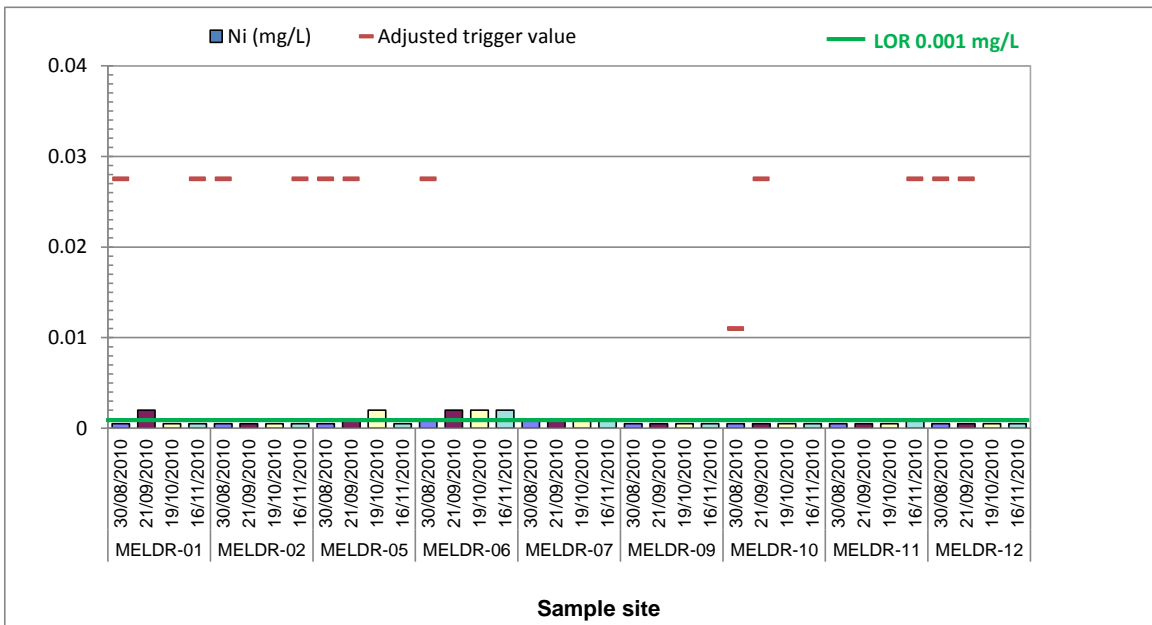
Nickel is relatively non-toxic and there is little evidence of bio-accumulation. Nickel in storm water is usually associated with suspended solids and organic matter. Sources of nickel include corrosion of welded metal plating, wear of moving parts in engines, electroplating and alloy manufacture, and food production equipment (IEA 2003).

The trigger values for nickel are affected by water hardness. Therefore the trigger values shown on the graph are varied, dependent on the water hardness concentration recorded at each site.

Nickel (Ni) concentrations in the Bull Creek catchment were below the site specific trigger value at all sites. Similar results have been found during the four year sampling period; nickel concentrations have never exceeded the specific trigger value at any site. In 2010 31 out of 36 samples collected recorded nickel concentrations equal to or below the limit of reporting (0.001 mg/L).



**Figure 31: Nickel concentrations in the surface waters of the Bull Creek catchment.**



**Figure 32: Nickel concentrations in the surface waters of the Bull Creek catchment (zoom in\*).**

\*Please note this graph scale stops at 0.05mg/L

## Zinc

Zinc bio-accumulates easily in plants and animals and is mostly associated with dissolved solids, although it will absorb to suspended particles. Sources of zinc in stormwater include wear from tyres and brake pads, combustion of lubricating oils, and corrosion of galvanized roofs, pipes and other metal objects (IEA 2003).

The trigger values for zinc are affected by water hardness. Therefore the trigger values shown on the graph are variable, dependent on the water hardness concentration recorded at each site.

Zinc (Zn) concentrations were below the site specific trigger value for each site; with the exception of samples taken at sites 5 and 6 (John Creaney Park and Bateman Park) during the August sampling occasion which recorded the highest concentrations (0.054 and 0.021 mg/L respectively) and exceeded the specific trigger value of 0.02 mg/L.

During the four year sampling period zinc concentrations exceeding the specific trigger value have been recorded sporadically at some sites. Site 8 (Piney Lakes outlet) is the only site that has recorded zinc concentrations exceeding the trigger value on more than one occasion (see table 9 for details).

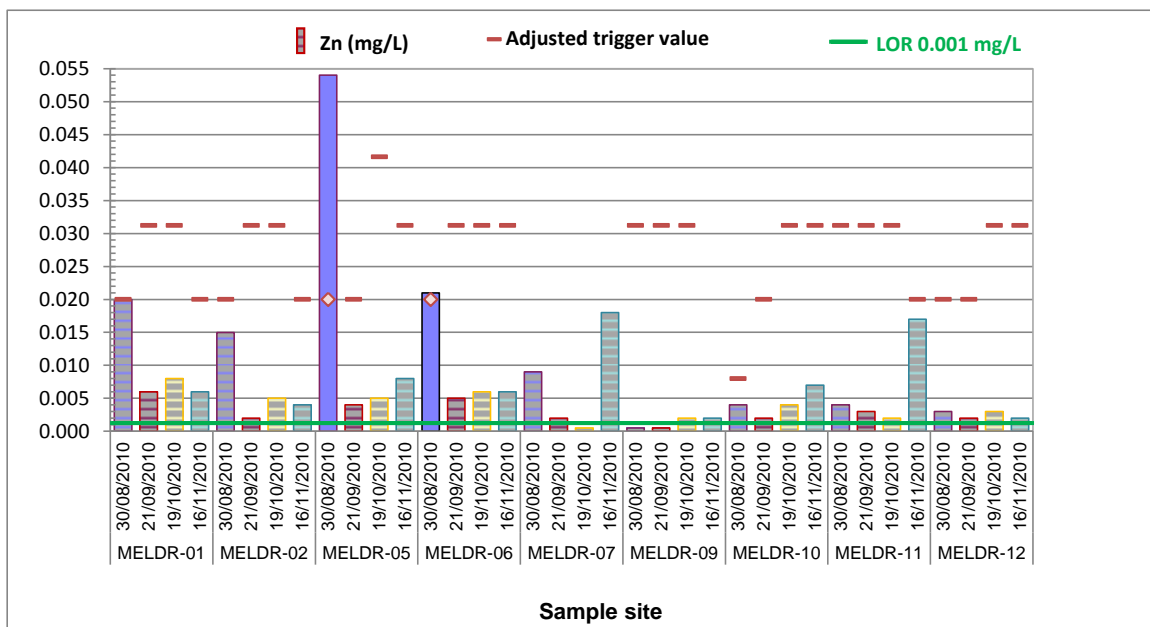


Figure 33: Zinc concentrations in the surface waters of the Bull Creek catchment.

## Recommendations

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The improvement of water quality in Bull Creek catchment involves a wide range of management issues regarding the environmental problems at each specific site. However there are some general recommendations, which are listed below:

- Continue monitoring the water quality in the catchment to detect changes in the concentrations of nutrients and metals maintaining or increasing the frequency of sampling to generate more data about the condition of the catchment and to interpret trends and changes that are happening over time.
- Prepare an analysis of the findings for the four year water quality monitoring program to understand better patterns and develop 'hot spots' rankings for the different sites and align those rankings to specific management actions aimed at improving the water quality in the catchment.
- Exceedance of a trigger value, for any parameter, indicates that there is the potential for an impact to occur, management responses should be oriented to minimise or alleviate those impacts before water flows to the Canning River.
- The high concentrations of metals and nutrients recorded at some sites are of concern and warrants further investigation.
- Undertake additional sampling during major rainfall events to assess their effects on water quality.
- Implement nutrient stripping strategies to improve the water quality of the Bull Creek catchment and the quality of the water which is discharged to the Canning River.
- Investigation into the catchment-scale elevated aluminium concentrations.
- Considering that mercury and nickel have not recorded concentrations above the specific trigger value during the four year sampling period, it would be advisable to drop these parameters in future monitoring programs to decrease the costs of laboratory analysis.

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## **Appendix A – Glossary**

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Aesthetic	Aspects of water that are perceived by the senses.
ANZECC	Australian and New Zealand Environment and Conservation Council.
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand.
Catchment	Area of land which intercepts rainfall and contributes the collected water to surface water (streams, drains, rivers, wetlands) or groundwater.
Limit of reporting	Lowest level of detection achievable amongst laboratories; the level that another laboratory should reach given the same instrument, method and sample matrices.
NHMRC	National Health and Medical Research Council.

## Appendix B – Water Quality Results

### (a) Physical parameters results

pH		ANZECC trigger value for lowland rivers of SW Australia 6.5 - 8.0; for wetlands 7.0 - 8.5				
		Max (red) 9.44	Min (blue) 5.6	Comparison to ANZECC trigger value		
Site Context	Site Name	Site Number	Collect Date	pH (no units)	pH lower limit 6.5/7	pH upper limit 8/8.5
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	6.92	Acceptable	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	6.24	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	6.93	Acceptable	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	6.98	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	6.23	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	7.5	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	7.55	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	7.34	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	7.17	Acceptable	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	7.29	Acceptable	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	6.34	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	6.91	Acceptable	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	6.94	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	6.55	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	7.53	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	7.51	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	7.52	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	7.61	Acceptable	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	7.51	Acceptable	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	6.28	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	7.1	Acceptable	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	7.26	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	6.88	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	7.26	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	7.32	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	7.87	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	9.44	Acceptable	Does not meet guidelines
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	7.49	Acceptable	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	6.37	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	7.31	Acceptable	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	6.87	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	5.6	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	7.55	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	9.08	Acceptable	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	8.57	Acceptable	Does not meet guidelines

**Dissolved oxygen (DO)**

ANZECC trigger value 80-120% saturation for lowland rivers, 90-120% for wetlands

Max (red) 160.4 Min (blue) 12.1

**Comparison to ANZECC trigger value**

Site Context	Site Name	Site Number	Collect Date	DO (%)	DO lower limit 80/90	DO upper limit 120
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	65.3	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	54.8	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	74.3	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	75.7	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	61.2	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	101.2	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	82.8	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	48.5	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	90	Acceptable	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	57.9	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	47.2	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	26.2	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	74.9	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	12.1	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	89.9	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	67.5	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	54.8	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	95.6	Acceptable	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	55	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	40.2	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	14.6	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	72.3	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	91.4	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	80.4	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	23.7	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	103.7	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	160.4	Acceptable	Does not meet guidelines
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	51.6	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	41.1	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	12.7	Does not meet guidelines	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	79.8	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	78.6	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	45.8	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	134.1	Acceptable	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	125.5	Acceptable	Does not meet guidelines

**Electrical Conductivity (EC)** ANZECC trigger value 0.12-0.3 mS/cm for lowland rivers; 0.3 - 1.5 mS/cm for wetlands

Max (red) 4.76

Min (blue) 0.181

**Comparison to ANZECC trigger value**

Site Context	Site Name	Site Number	Collect Date	EC (mS/cm)	lower limit 0.12/0.3	upper limit 0.3/1.5
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	0.415	Acceptable	Does not meet guidelines
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.568	Acceptable	Does not meet guidelines
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.289	Acceptable	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.415	Acceptable	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	2.65	Acceptable	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.717	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.181	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.297	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.714	Acceptable	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	0.72	Acceptable	Does not meet guidelines
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	0.79	Acceptable	Does not meet guidelines
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	0.9	Acceptable	Does not meet guidelines
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	0.604	Acceptable	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	2.51	Acceptable	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	0.748	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	0.23	Does not meet guidelines	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	0.35	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	0.809	Acceptable	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	0.738	Acceptable	Does not meet guidelines
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	0.805	Acceptable	Does not meet guidelines
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	1.036	Acceptable	Does not meet guidelines
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	0.624	Acceptable	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	3.4	Acceptable	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	0.889	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	0.452	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	0.483	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	1.003	Acceptable	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	0.726	Acceptable	Does not meet guidelines
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	0.809	Acceptable	Does not meet guidelines
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	0.738	Acceptable	Does not meet guidelines
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	0.632	Acceptable	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	4.76	Acceptable	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	0.547	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	0.409	Acceptable	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	1.196	Acceptable	Acceptable

**Total Suspended Solids (TSS)**

DoW interim guideline 6 mg/L

Max (red) 184

Min (blue) 0.5

All data in blue were <1 (LOR)

Site Context	Site Name	Site Number	Collect Date	TSS (mg/L)	DoW interim guideline
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	8	Does not meet guidelines
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	1	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	8	Does not meet guidelines
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	14	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	32	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	2	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	1	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	1	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	1	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	3	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	2	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	7	Does not meet guidelines
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	9	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	11	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	0.5	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	1	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	3	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	0.5	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	4	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	1	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	12	Does not meet guidelines
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	13	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	11	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	1	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	4	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	3	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	0.5	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	2	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	3	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	6	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	10	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	184	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	1	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	3	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	50	Does not meet guidelines
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	3	Acceptable

**Temperature (°C)**

Max (red) 27.91

Min (blue) 14.49

Site Context	Site Name	Site Number	Collect Date	Temp (deg C)
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	16.88
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	18.46
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	15.81
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	17.39
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	18.15
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	14.49
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	18
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	17.39
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	20.24
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	16.05
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	19.65
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	15.77
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	16.73
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	16.48
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	15.25
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	16.78
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	18.06
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	19.23
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	17.62
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	20.13
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	19.23
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	19.22
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	22.42
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	19.59
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	19.6
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	22.35
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	23.47
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	17.96
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	20.47
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	19.1
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	19.49
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	25.12
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	18.54
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	23.45
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	27.91

**(b) Nutrients results**

<b>Total nitrogen (TN) (mg/L)</b>		<b>N (tot) {TN, pTN} (mg/L)</b>			
ANZECC trigger value for lowland rivers (1.2 mg/L); for wetlands (1.5 mg/L)		<b>Max (red)</b> 20	<b>Min (blue)</b> 0.29		
Site Context	Site Name	Site Number	Collect Date	TN	Comparison to ANZECC trigger value
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	1.7	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	3.9	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	1.4	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.75	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	2.7	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.49	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.33	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	1	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	1.3	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	3	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	6	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	1.3	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	0.6	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	6.1	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	0.54	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	0.29	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	0.6	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	1	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	3.9	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	6.8	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	2.1	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	0.6	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	16	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	0.6	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	0.65	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	0.63	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	1.2	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	3.9	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	7.8	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	2.5	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	0.64	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	20	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	0.95	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	0.77	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	1.2	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	1.7	Guideline exceeded

**Total Oxidised Nitrogen (NOx) (mg/L) N (sum sol ox) {NOx-N, TON} (mg/L)** All data in blue were <0.01 (LOR)

ANZECC trigger value: 0.15mg/L for lowland rivers; 0.10 mg/L for wetlands

Max (red) 2.8

Min (blue) 0.005

Site Context	Site Name	Site Number	Collect Date	NOx	Comparison to ANZECC trigger value
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	0.95	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.18	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.21	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.22	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.016	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.16	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.005	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	2.3	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	0.082	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	0.023	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	0.15	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	0.01	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	0.086	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	0.005	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	2.8	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	0.068	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	0.025	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	0.11	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	0.11	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	0.017	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	0.005	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	2.7	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	0.16	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	0.005	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	0.093	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	0.19	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	0.019	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	0.005	Acceptable

**Dissolver Organic Nitrogen (DON) (mg/L)**      N (sum sol ox) {NOx-N, TON} (mg/L)      All data in blue were <0.025(LOR)

ANZECC trigger value: ND

Max (red) 3.5

Min (blue) 0.0125

Site Context	Site Name	Site Number	Collect Date	DON
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	0.32
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.0125
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.42
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.24
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	1.5
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.44
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.16
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.22
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.82
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	0.19
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	0.0125
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	0.57
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	0.22
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	2.7
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	0.5
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	0.21
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	0.27
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	0.89
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	0.45
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	0.0125
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	1.1
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	0.22
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	3.5
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	0.55
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	0.41
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	0.43
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	1.1
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	0.89
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	0.43
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	1
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	0.28
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	1.2
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	0.89
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	0.41
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	0.67
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	1.4

Nitrogen as Ammonia (NH <sub>3</sub> ) (mg/L)		NH <sub>3</sub> -N/NH <sub>4</sub> -N (sol) (mg/L)		All data in blue were <0.01 (LOR)	
ANZECC trigger value: 0.9mg/l		Max (red) 14		Min (blue) 0.005	
Site Context	Site Name	Site Number	Collect Date	NH <sub>3</sub> -N/ NH <sub>4</sub> -N	Comparison to ANZECC trigger value
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	0.27	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	3.3	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.15	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.18	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.041	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.54	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.051	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	0.48	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	5.6	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	0.44	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	0.2	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	3.4	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	0.01	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	0.013	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	0.15	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	0.056	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	0.54	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	6.2	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	0.1	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	0.2	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	12	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	0.013	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	0.21	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	0.026	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	0.031	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	0.26	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	7	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	1.3	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	0.26	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	14	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	0.018	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	0.26	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	0.043	Acceptable

<b>Total Phosphorus (TP) (mg/L)</b>		<b>P (tot) {TP, pTP} (mg/L)</b>			
ANZECC trigger value: 0.065mg/L for lowland rivers; 0.06 mg/L for wetlands		Max (red) 3.9		Min (blue) 0.01	
Site Context	Site Name	Site Number	Collect Date	TP	Comparison to ANZECC trigger value
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	0.039	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.028	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.095	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.03	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	1	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.012	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.025	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.042	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.12	Guideline exceeded
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	0.014	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	0.01	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	0.059	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	0.012	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	1.5	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	0.015	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	0.022	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	0.034	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	0.076	Guideline exceeded
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	0.02	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	0.011	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	0.17	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	0.016	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	0.95	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	0.02	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	0.042	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	0.049	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	0.073	Guideline exceeded
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	0.015	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	0.017	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	0.16	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	0.021	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	3.9	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	0.028	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	0.045	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	0.089	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	0.14	Guideline exceeded

**Soluble Reactive Phosphorus (SRP) (mg/L)** PO4-P (sol react) {SRP, FRP} (mg/L) All data in blue were <0.005 (LOR)  
 ANZECC trigger value: 0.04mg/L for lowland rivers and 0.03 mg/L for wetland **Max (red)** 0.46 **Min (blue)** 0.0025

Site Context	Site Name	Site Number	Collect Date	SRP	Comparison to ANZECC trigger value
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	0.008	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.012	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.021	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.007	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	0.056	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.0025	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.0025	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.01	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.042	Guideline exceeded
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	0.0025	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	0.0025	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	0.0025	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	0.0025	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	0.46	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	0.006	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	0.0025	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	0.0025	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	0.033	Guideline exceeded
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	0.0025	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	0.0025	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	0.0025	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	0.0025	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	0.21	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	0.0025	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	0.0025	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	0.0025	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	0.018	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	0.009	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	0.008	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	0.066	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	0.009	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	0.083	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	0.01	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	0.005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	0.01	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	0.081	Guideline exceeded

**(C) Metals results**

<b>Aluminium (Al)</b>		<b>(mg/L)</b>	<b>(Note: ANZECC guideline only applicable if pH&gt;6.5)</b>		
<b>ANZECC trigger value: 0.055mg/L</b>			<b>Max (red) 0.85</b>	<b>Min (blue) 0.022</b>	
<b>Site Context</b>	<b>Site Name</b>	<b>Site Number</b>	<b>Collect Date</b>	<b>Al (tot) (mg/L)</b>	<b>Comparison to ANZECC trigger value</b>
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	0.3	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.3	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.19	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.58	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	0.022	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.054	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.048	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.038	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.052	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	0.19	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	0.31	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	0.14	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	0.76	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	0.03	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	0.05	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	0.06	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	0.04	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	0.06	Guideline exceeded
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	0.23	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	0.37	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	0.12	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	0.85	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	0.028	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	0.052	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	0.097	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	0.052	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	0.062	Guideline exceeded
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	0.17	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	0.35	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	0.14	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	0.73	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	0.21	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	0.037	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	0.072	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	0.36	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	0.16	Guideline exceeded

<b>Arsenic (As)</b> (mg/L)				All data in blue were <0.001 (LOR)	
ANZECC trigger value: 0.024mg/L		Max (red) 0.01		Min (blue) 0.0005	
Site Context	Site Name	Site Number	Collect Date	As	Comparison to ANZECC trigger value
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	0.0005	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.0005	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.0005	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	0.001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.0005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.002	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.003	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.002	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	0.0005	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	0.0005	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	0.0005	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	0.003	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	0.002	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	0.0005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	0.003	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	0.003	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	0.002	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	0.0005	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	0.0005	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	0.001	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	0.003	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	0.003	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	0.0005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	0.007	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	0.004	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	0.003	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	0.0005	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	0.0005	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	0.001	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	0.003	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	0.004	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	0.0005	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	0.007	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	0.01	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	0.003	Acceptable

<b>Iron (Fe)</b> (mg/L)					
<b>ANZECC trigger value: 0.3 mg/L</b>		<b>Max (red) 19</b>	<b>Min (blue) 0.05</b>		
Site Context	Site Name	Site Number	Collect Date	Fe	Comparison to ANZECC trigger value
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	1.2	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	1.1	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.71	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	2.8	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	4.8	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.069	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.22	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.43	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	1.4	Guideline exceeded
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	0.68	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	1.3	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	2	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	4.5	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	6.3	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	0.05	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	0.29	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	0.37	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	1.2	Guideline exceeded
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	0.78	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	1.1	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	1	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	4.5	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	4.5	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	0.062	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	0.9	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	0.4	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	0.69	Guideline exceeded
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	0.58	Guideline exceeded
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	1.3	Guideline exceeded
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	1.1	Guideline exceeded
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	5.1	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	19	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	0.1	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	1.1	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	2	Guideline exceeded
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	0.55	Guideline exceeded

**Mercury (Hg)**

(mg/L)

ANZECC trigger value: 0.0006mg/L

Site Context	Site Name	Site Number	Collect Date	Hg	Comparison to ANZECC trigger value(0.0006mg/L)
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	<0.0001	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	<0.0001	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	<0.0001	Acceptable
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	<0.0001	Acceptable
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	<0.0001	Acceptable
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	<0.0001	Acceptable

**Water Hardness**

(CaCO<sub>3</sub>) {Ca+Mg} (mg/L)

Max (red) 1300

Min (blue) 56

Site Context	Site Name	Site Number	Collect Date	Total Water Hardness
BULL CREEK	BULL CREEK MD	PSDTBCMD	30/08/2010	75
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	92
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	63
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	87
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	910
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	130
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	56
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	130
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	98
BULL CREEK	BULL CREEK MD	PSDTBCMD	21/09/2010	120
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	21/09/2010	130
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	21/09/2010	74
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	21/09/2010	130
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	21/09/2010	850
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	21/09/2010	140
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	21/09/2010	71
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	21/09/2010	150
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	21/09/2010	110
BULL CREEK	BULL CREEK MD	PSDTBCMD	19/10/2010	120
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	19/10/2010	130
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	19/10/2010	240
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	19/10/2010	130
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	19/10/2010	1100
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	19/10/2010	160
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	19/10/2010	130
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	19/10/2010	170
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	19/10/2010	120
BULL CREEK	BULL CREEK MD	PSDTBCMD	16/11/2010	110
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	16/11/2010	75
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	16/11/2010	170
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	16/11/2010	140
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	16/11/2010	970
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	16/11/2010	1300
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	16/11/2010	160
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	16/11/2010	110
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	16/11/2010	140

**Cadmium (Cd)**

All data in blue were <0.0001 (LOR)

Site Context	Site Name	Site Number	Collect Date	Cd (tot) (mg/L)	Water Hardness (mg/L)	Adjust factor	Adjusted trigger value	Comparison to ANZECC trigger ADJUSTED value	Hardness (mg/L)	Cd	ANZECC trigger value*
BULL CREEK	BULL CREEK MD	MELDR-01	30/08/2010	0.00005	75	2.7	0.00054	Acceptable	0-59	1	0.0002
			21/09/2010	0.00005	120	4.2	0.00084	Acceptable	60-119	2.7	
			19/10/2010	0.00005	120	4.2	0.00084	Acceptable	120-179	4.2	
			16/11/2010	0.00005	110	2.7	0.00054	Acceptable	180-240	5.7	
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.00005	92	2.7	0.00054	Acceptable	400	10	
			21/09/2010	0.00005	130	4.2	0.00084	Acceptable			
			19/10/2010	0.00005	130	4.2	0.00084	Acceptable			
			16/11/2010	0.00005	75	2.7	0.00054	Acceptable			
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.00005	63	2.7	0.00054	Acceptable			
			21/09/2010	0.00005	74	2.7	0.00054	Acceptable			
			19/10/2010	0.00005	240	5.7	0.00114	Acceptable			
			16/11/2010	0.00005	170	4.2	0.00084	Acceptable			
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.00005	87	2.7	0.00054	Acceptable			
			21/09/2010	0.00005	130	4.2	0.00084	Acceptable			
			19/10/2010	0.00005	130	4.2	0.00084	Acceptable			
			16/11/2010	0.00005	140	4.2	0.00084	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	0.00005	910	10	0.002	Acceptable			
			21/09/2010	0.00005	850	10	0.002	Acceptable			
			19/10/2010	0.00005	1100	10	0.002	Acceptable			
			16/11/2010	0.00005	970	10	0.002	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.00005	130	4.2	0.00084	Acceptable			
			21/09/2010	0.00005	140	4.2	0.00084	Acceptable			
			19/10/2010	0.00005	160	4.2	0.00084	Acceptable			
			16/11/2010	0.00005	1300	10	0.002	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.00005	56	1	0.0002	Acceptable			
			21/09/2010	0.00005	71	2.7	0.00054	Acceptable			
			19/10/2010	0.00005	130	4.2	0.00084	Acceptable			
			16/11/2010	0.00005	160	4.2	0.00084	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.00005	130	4.2	0.00084	Acceptable			
			21/09/2010	0.00005	150	4.2	0.00084	Acceptable			
			19/10/2010	0.00005	170	4.2	0.00084	Acceptable			
			16/11/2010	0.00005	110	2.7	0.00054	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.00005	98	2.7	0.00054	Acceptable			
			21/09/2010	0.00005	110	2.7	0.00054	Acceptable			
			19/10/2010	0.00005	120	4.2	0.00084	Acceptable			
			16/11/2010	0.00005	140	4.2	0.00084	Acceptable			

**Chromium (Cr)**

All data in blue were <0.001 (LOR)

Site Context	Site Name	Site Number	Collect Date	Cr (mg/L)	Water Hardness (mg/L)	Adjust factor	Adjusted trigger value	Comparison to ANZECC trigger ADJUSTED value	Hardness (mg/L)	Cr	ANZECC trigger value*
BULL CREEK	BULL CREEK MD	MELDR-01	30/08/2010	0.0005	75	2.5	0.0025	Acceptable	0-59	1	0.001
			21/09/2010	0.002	120	3.7	0.0037	Acceptable	60-119	2.5	
			19/10/2010	0.001	120	3.7	0.0037	Acceptable	120-179	3.7	
			16/11/2010	0.0005	110	2.5	0.0025	Acceptable	180-240	4.9	
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.0005	92	2.5	0.0025	Acceptable	400	8.4	
			21/09/2010	0.001	130	3.7	0.0037	Acceptable			
			19/10/2010	0.001	130	3.7	0.0037	Acceptable			
			16/11/2010	0.0005	75	2.5	0.0025	Acceptable			
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.0005	63	2.5	0.0025	Acceptable			
			21/09/2010	0.002	74	2.5	0.0025	Acceptable			
			19/10/2010	0.002	240	4.9	0.0049	Acceptable			
			16/11/2010	0.0005	170	3.7	0.0037	Acceptable			
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.0005	87	2.5	0.0025	Acceptable			
			21/09/2010	0.002	130	3.7	0.0037	Acceptable			
			19/10/2010	0.003	130	3.7	0.0037	Acceptable			
			16/11/2010	0.001	140	3.7	0.0037	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	0.0005	910	8.4	0.0084	Acceptable			
			21/09/2010	0.0005	850	8.4	0.0084	Acceptable			
			19/10/2010	0.0005	1100	8.4	0.0084	Acceptable			
			16/11/2010	0.002	970	8.4	0.0084	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.0005	130	3.7	0.0037	Acceptable			
			21/09/2010	0.0005	140	3.7	0.0037	Acceptable			
			19/10/2010	0.001	160	3.7	0.0037	Acceptable			
			16/11/2010	0.0005	1300	8.4	0.0084	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.0005	56	1	0.001	Acceptable			
			21/09/2010	0.0005	71	2.5	0.0025	Acceptable			
			19/10/2010	0.0005	130	3.7	0.0037	Acceptable			
			16/11/2010	0.0005	160	3.7	0.0037	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.0005	130	3.7	0.0037	Acceptable			
			21/09/2010	0.0005	150	3.7	0.0037	Acceptable			
			19/10/2010	0.0005	170	3.7	0.0037	Acceptable			
			16/11/2010	0.001	110	2.5	0.0025	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.002	98	2.5	0.0025	Acceptable			
			21/09/2010	0.002	110	2.5	0.0025	Acceptable			
			19/10/2010	0.002	120	3.7	0.0037	Acceptable			
			16/11/2010	0.0005	140	3.7	0.0037	Acceptable			

**Copper (Cu)**

All data in blue were <0.001 (LOR)

Site Context	Site Name	Site Number	Collect Date	Cu (mg/L)	Water Hardness (mg/L)	Adjust factor	Adjusted trigger value	Comparison to ANZECC trigger ADJUSTED value	Hardness (mg/L)	Cu	ANZECC trigger value*
BULL CREEK	BULL CREEK MD	MELDR-01	30/08/2010	0.004	75	2.5	0.0035	Guideline exceeded	0-59	1	0.0014
			21/09/2010	0.001	120	3.9	0.00546	Acceptable	60-119	2.5	
			19/10/2010	0.001	120	3.9	0.00546	Acceptable	120-179	3.9	
			16/11/2010	0.001	110	2.5	0.0035	Acceptable	180-240	5.2	
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.003	92	2.5	0.0035	Acceptable	400	9	
			21/09/2010	0.0005	130	3.9	0.00546	Acceptable			
			19/10/2010	0.0005	130	3.9	0.00546	Acceptable			
			16/11/2010	0.0005	75	2.5	0.0035	Acceptable			
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.008	63	2.5	0.0035	Guideline exceeded			
			21/09/2010	0.002	74	2.5	0.0035	Acceptable			
			19/10/2010	0.002	240	5.2	0.00728	Acceptable			
			16/11/2010	0.002	170	3.9	0.00546	Acceptable			
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.003	87	2.5	0.0035	Acceptable			
			21/09/2010	0.0005	130	3.9	0.00546	Acceptable			
			19/10/2010	0.0005	130	3.9	0.00546	Acceptable			
			16/11/2010	0.0005	140	3.9	0.00546	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	0.0005	910	9	0.0126	Acceptable			
			21/09/2010	0.0005	850	9	0.0126	Acceptable			
			19/10/2010	0.0005	1100	9	0.0126	Acceptable			
			16/11/2010	0.003	970	9	0.0126	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.0005	130	3.9	0.00546	Acceptable			
			21/09/2010	0.0005	140	3.9	0.00546	Acceptable			
			19/10/2010	0.0005	160	3.9	0.00546	Acceptable			
			16/11/2010	0.0005	1300	9	0.0126	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.002	56	1	0.0014	Guideline exceeded			
			21/09/2010	0.001	71	2.5	0.0035	Acceptable			
			19/10/2010	0.0005	130	3.9	0.00546	Acceptable			
			16/11/2010	0.001	160	3.9	0.00546	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.001	130	3.9	0.00546	Acceptable			
			21/09/2010	0.0005	150	3.9	0.00546	Acceptable			
			19/10/2010	0.0005	170	3.9	0.00546	Acceptable			
			16/11/2010	0.003	110	2.5	0.0035	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.001	98	2.5	0.0035	Acceptable			
			21/09/2010	0.0005	110	2.5	0.0035	Acceptable			
			19/10/2010	0.0005	120	3.9	0.00546	Acceptable			
			16/11/2010	0.0005	140	3.9	0.00546	Acceptable			

**Lead (Pb)**

All data in blue were <0.001 (LOR)

Site Context	Site Name	Site Number	Collect Date	Pb (mg/L)	Water Hardness (mg/L)	Adjust factor	Adjusted trigger value	Comparison to ANZECC trigger ADJUSTED value	Hardness (mg/L)	Pb	ANZECC trigger value*
BULL CREEK	BULL CREEK MD	MELDR-01	30/08/2010	0.006	75	4	0.0136	Acceptable	0-59	1	0.0034
			21/09/2010	0.002	120	7.6	0.02584	Acceptable	60-119	4	
			19/10/2010	0.003	120	7.6	0.02584	Acceptable	120-179	7.6	
			16/11/2010	0.002	110	4	0.0136	Acceptable	180-240	11.8	
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.002	92	4	0.0136	Acceptable	400	26.7	
			21/09/2010	0.0005	130	7.6	0.02584	Acceptable			
			19/10/2010	0.0005	130	7.6	0.02584	Acceptable			
			16/11/2010	0.0005	75	4	0.0136	Acceptable			
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.005	63	4	0.0136	Acceptable			
			21/09/2010	0.002	74	4	0.0136	Acceptable			
			19/10/2010	0.005	240	11.8	0.04012	Acceptable			
			16/11/2010	0.006	170	7.6	0.02584	Acceptable			
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.003	87	4	0.0136	Acceptable			
			21/09/2010	0.001	130	7.6	0.02584	Acceptable			
			19/10/2010	0.002	130	7.6	0.02584	Acceptable			
			16/11/2010	0.001	140	7.6	0.02584	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	0.002	910	26.7	0.09078	Acceptable			
			21/09/2010	0.0005	850	26.7	0.09078	Acceptable			
			19/10/2010	0.0005	1100	26.7	0.09078	Acceptable			
			16/11/2010	0.012	970	26.7	0.09078	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.0005	130	7.6	0.02584	Acceptable			
			21/09/2010	0.0005	140	7.6	0.02584	Acceptable			
			19/10/2010	0.0005	160	7.6	0.02584	Acceptable			
			16/11/2010	0.0005	1300	26.7	0.09078	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.002	56	1	0.0034	Acceptable			
			21/09/2010	0.002	71	4	0.0136	Acceptable			
			19/10/2010	0.005	130	7.6	0.02584	Acceptable			
			16/11/2010	0.0005	160	7.6	0.02584	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.001	130	7.6	0.02584	Acceptable			
			21/09/2010	0.002	150	7.6	0.02584	Acceptable			
			19/10/2010	0.003	170	7.6	0.02584	Acceptable			
			16/11/2010	0.014	110	4	0.0136	Guideline exceeded			
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.011	98	4	0.0136	Acceptable			
			21/09/2010	0.01	110	4	0.0136	Acceptable			
			19/10/2010	0.011	120	7.6	0.02584	Acceptable			
			16/11/2010	0.014	140	7.6	0.02584	Acceptable			

Nickel (Ni)

All data in blue were <0.001 (LOR)

Site Context	Site Name	Site Number	Collect Date	Ni (mg/L)	Water Hardness (mg/L)	Adjust factor	Adjusted trigger value	Comparison to ANZECC trigger ADJUSTED value	Hardness (mg/L)	Ni	ANZECC trigger value*
BULL CREEK	BULL CREEK MD	MELDR-01	30/08/2010	0.0005	75	2.5	0.0275	Acceptable	0-59	1	0.011
			21/09/2010	0.002	120	3.9	0.0429	Acceptable	60-119	2.5	
			19/10/2010	0.0005	120	3.9	0.0429	Acceptable	120-179	3.9	
			16/11/2010	0.0005	110	2.5	0.0275	Acceptable	180-240	5.2	
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.0005	92	2.5	0.0275	Acceptable	400	9	
			21/09/2010	0.0005	130	3.9	0.0429	Acceptable			
			19/10/2010	0.0005	130	3.9	0.0429	Acceptable			
			16/11/2010	0.0005	75	2.5	0.0275	Acceptable			
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.0005	63	2.5	0.0275	Acceptable			
			21/09/2010	0.001	74	2.5	0.0275	Acceptable			
			19/10/2010	0.002	240	5.2	0.0572	Acceptable			
			16/11/2010	0.0005	170	3.9	0.0429	Acceptable			
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.001	87	2.5	0.0275	Acceptable			
			21/09/2010	0.002	130	3.9	0.0429	Acceptable			
			19/10/2010	0.002	130	3.9	0.0429	Acceptable			
			16/11/2010	0.002	140	3.9	0.0429	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	0.001	910	9	0.099	Acceptable			
			21/09/2010	0.001	850	9	0.099	Acceptable			
			19/10/2010	0.001	1100	9	0.099	Acceptable			
			16/11/2010	0.001	970	9	0.099	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.0005	130	3.9	0.0429	Acceptable			
			21/09/2010	0.0005	140	3.9	0.0429	Acceptable			
			19/10/2010	0.0005	160	3.9	0.0429	Acceptable			
			16/11/2010	0.0005	1300	9	0.099	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.0005	56	1	0.011	Acceptable			
			21/09/2010	0.0005	71	2.5	0.0275	Acceptable			
			19/10/2010	0.0005	130	3.9	0.0429	Acceptable			
			16/11/2010	0.0005	160	3.9	0.0429	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.0005	130	3.9	0.0429	Acceptable			
			21/09/2010	0.0005	150	3.9	0.0429	Acceptable			
			19/10/2010	0.0005	170	3.9	0.0429	Acceptable			
			16/11/2010	0.001	110	2.5	0.0275	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.0005	98	2.5	0.0275	Acceptable			
			21/09/2010	0.0005	110	2.5	0.0275	Acceptable			
			19/10/2010	0.0005	120	3.9	0.0429	Acceptable			
			16/11/2010	0.0005	140	3.9	0.0429	Acceptable			

**Zinc (Zn)**

All data in blue were <0.001 (LOR)

Site Context	Site Name	Site Number	Collect Date	Zn (mg/L)	Water Hardness (mg/L)	Adjust factor	Adjusted trigger value	Comparison to ANZECC trigger ADJUSTED value	Hardness (mg/L)	Zn	ANZECC trigger value*
BULL CREEK	BULL CREEK MD	MELDR-01	30/08/2010	0.02	75	2.5	0.02	Acceptable	0-59	1	0.008
			21/09/2010	0.006	120	3.9	0.0312	Acceptable	60-119	2.5	
			19/10/2010	0.008	120	3.9	0.0312	Acceptable	120-179	3.9	
			16/11/2010	0.006	110	2.5	0.02	Acceptable	180-240	5.2	
BULL CREEK CATCHMENT	BROCKMAN PARK	MELDR-02	30/08/2010	0.015	92	2.5	0.02	Acceptable	400	9	
			21/09/2010	0.002	130	3.9	0.0312	Acceptable			
			19/10/2010	0.005	130	3.9	0.0312	Acceptable			
			16/11/2010	0.004	75	2.5	0.02	Acceptable			
BULL CREEK CATCHMENT	JOHN CREANEY PARK	MELDR-05	30/08/2010	0.054	63	2.5	0.02	Guideline exceeded			
			21/09/2010	0.004	74	2.5	0.02	Acceptable			
			19/10/2010	0.005	240	5.2	0.0416	Acceptable			
			16/11/2010	0.008	170	3.9	0.0312	Acceptable			
BULL CREEK CATCHMENT	BATEMAN PARK	MELDR-06	30/08/2010	0.021	87	2.5	0.02	Guideline exceeded			
			21/09/2010	0.005	130	3.9	0.0312	Acceptable			
			19/10/2010	0.006	130	3.9	0.0312	Acceptable			
			16/11/2010	0.006	140	3.9	0.0312	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	BOORAGOON LAKE OUTLET	MELDR-07	30/08/2010	0.009	910	9	0.072	Acceptable			
			21/09/2010	0.002	850	9	0.072	Acceptable			
			19/10/2010	0.0005	1100	9	0.072	Acceptable			
			16/11/2010	0.018	970	9	0.072	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	QUENDA LAKE OUTLET	MELDR-09	30/08/2010	0.0005	130	3.9	0.0312	Acceptable			
			21/09/2010	0.0005	140	3.9	0.0312	Acceptable			
			19/10/2010	0.002	160	3.9	0.0312	Acceptable			
			16/11/2010	0.002	1300	9	0.072	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	FREDERICK BALDWIN	MELDR-10	30/08/2010	0.004	56	1	0.008	Acceptable			
			21/09/2010	0.002	71	2.5	0.02	Acceptable			
			19/10/2010	0.004	130	3.9	0.0312	Acceptable			
			16/11/2010	0.007	160	3.9	0.0312	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	MARMION RESERVE	MELDR-11	30/08/2010	0.004	130	3.9	0.0312	Acceptable			
			21/09/2010	0.003	150	3.9	0.0312	Acceptable			
			19/10/2010	0.002	170	3.9	0.0312	Acceptable			
			16/11/2010	0.017	110	2.5	0.02	Acceptable			
CITY OF MELVILLE DRAIN NETWORK	BLUE GUM LAKE OUTLET	MELDR-12	30/08/2010	0.003	98	2.5	0.02	Acceptable			
			21/09/2010	0.002	110	2.5	0.02	Acceptable			
			19/10/2010	0.003	120	3.9	0.0312	Acceptable			
			16/11/2010	0.002	140	3.9	0.0312	Acceptable			

## Appendix C – ANZECC Trigger Values and Guidelines

### Trigger values and guidelines for physical properties and nutrient concentrations in lowland rivers and wetlands

Guideline	pH	D0 % Sat	EC (mS/cm)	TSS (mg/L)	TN (mg/L)	NO <sub>x</sub> N (mg/L)	NH <sub>3</sub> -N/NH <sub>4</sub> -N (mg/L)	TP (mg/L)	FRP (mg/L)
ANZECC Water Quality Guideline – Recreational (2000)	6.5-8.5	>80 (>6.5 mg/L)	10	-	-	10	-	-	-
ANZECC Water Quality Trigger Values - lowland river (2000)	6.5-8.0	80-120	0.12-0.3	-	1.2	0.150	0.9	0.065	0.04
ANZECC Water Quality Trigger Values wetland (2000)	7-8.5	>90-120 (>6mg/L)	0.3-1.5	-	1.5	0.10	-	0.06	-
DoW interim guideline	-	-	-	6	-	-	-	-	-
NMI Limit of Reporting	-	-	-	1	0.025	0.01	0.01	0.005	0.005

### ANZECC trigger values and guidelines for metals in freshwater

Guideline	Al (mg/L)	As (mg/L)	Cd* (mg/L)	Cr* (mg/L)	Cu* (mg/L)	Fe (mg/L)	Pb* (mg/L)	Hg (mg/L)	Ni* (mg/L)	Zn* (mg/L)	Hardness (mg/L)
ANZECC Water quality trigger value – Recreational (2000)	0.2	0.05	0.005	0.05	1.0	0.3	0.05	0.001	0.01	5.0	500
ANZECC Water quality trigger value – Freshwater 95% (2000)	0.055	0.024	0.0002	0.001	0.0014	-	0.0034	0.0006	0.011	0.008	-
NMI Limit of Reporting	0.005	0.001	0.0001	0.001	0.001	0.005	0.001	0.0001	0.001	0.001	5

\* Trigger values not adjusted for water hardness