8. SURFACE WATER QUALITY

Issues raised by submitters in relation to the EIS relate to the following topics:

- legislative framework;
- water quality monitoring data;
- water quality impacts of construction;
- water quality monitoring;
- risk of contamination; and
- dam management.

8.1. Legislative Framework

A submitter requested that reference to out-dated legislation and guidelines be updated in the Supplementary Report.

Reference is made in the EIS in Section 7.2.2 to outdated legislative documents, namely the Australian Drinking Water Guidelines (2004), *Environmental Protection Policy (Water) Policy 1997* and the Queensland Water Quality Guidelines (2006). New versions of these documents are available:

- Australian Drinking Water Guidelines (ADWG) (NHMRC/NRMRC, 2011);
- *Environmental Protection Policy (Water) Policy 2009* (EPP (Water)); and
- Queensland Water Quality Guidelines (DEHP, 2009).

The 2011 edition of the ADWG supersedes the 2004 Guidelines, as amended in 2006. Major differences between the current ADWG and the 2004 edition include revisions to the monitoring chapters together with the information sheets on sampling and statistics, to achieve closer alignment with the Framework for Management of Drinking Water Quality. There are no identifiable changes in this updated version that influences the original EIS's consideration of the Emu Swamp Dam.

The EPP (Water) commenced on 28 August 2009 and replaces the original policy first released in 1997. The Severn River and its tributaries remain unlisted under Schedule 1 of the EPP (Water), though a program for scheduling EVs and WQOs in other waters references the Queensland Murray-Darling and Bulloo basins as being in an advanced stage with expected completion in 2013/2014. Reference is made to the Queensland Murray-Darling Committee as responsible for developing Healthy Waters Management Plans for the Border Rivers, which includes the Severn River, and a Draft Environmental Values and Community Consultation Report is available that identify the values communities want protected into the future.

The 2013 edition of the Queensland Water Quality Guidelines (DEHP, 2009) includes updates and additional information, including a set of local water quality guidelines for the Mackay-Whitsunday region, which were developed by the region's NRM body. This version also provides linkages between the Queensland guidelines and the Great Barrier Reef Water Quality Guidelines recently drafted by the Great Barrier Reef Marine Park Authority. There remains insufficient data for derivation of guideline values for the Murray Darling Region, and the recommendation is to default to the ANZECC/ARMCANZ (2000) Guidelines for Fresh and Marine Water Quality.

8.2. Existing Water Quality Monitoring Program

8.2.1. Sampling Methodology

A submitter commented that insufficient information was provided on the sampling methodology for herbicide concentrations in the waters of the Emu Swamp Dam catchment, including the rationale for including these particular herbicides and excluding other pesticides.

The EIS provides the results for particular herbicide concentrations in the waters of the Emu Swamp Dam catchment. This has been addressed in the Supplementary Report through provision of a more comprehensive dataset including a wider diversity of herbicide and insecticide results (Desethyl Atrazine, Prometryn, Bromacil, Simazine, Metolachlor, Dimethoate (insecticide)) for the Emu Swamp Dam catchment over an extended period of time (up to 2010). These data are presented in Section 8.2.2.

All samples were collected on the first week of every second month [even] by trained volunteers from the Stanthorpe Water Assessment and Monitoring Project (SWAMP). SWAMP represents a collaborative effort to monitor the condition and trend of stream water quality in the Severn River and Pikes Creek catchments and involves many stakeholders including: Growcom, Granite Borders Landcare, Stanthorpe community members, Granite Belt Irrigators Association, Traprock Wool Association, Border Landcare Organic Group, SDRC (and the former Stanthorpe Shire Council), Queensland Murray Darling Committee in association with the Border Rivers Catchment Management Association, and the Queensland Government through Natural Resources and Water, and Department of Primary Industries. All samples were collected in suitable containers, handled and transported as per laboratory instructions (ALS Australia).

Water quality monitoring locations are represented in Figure 8-1 to facilitate interpretation of the results.

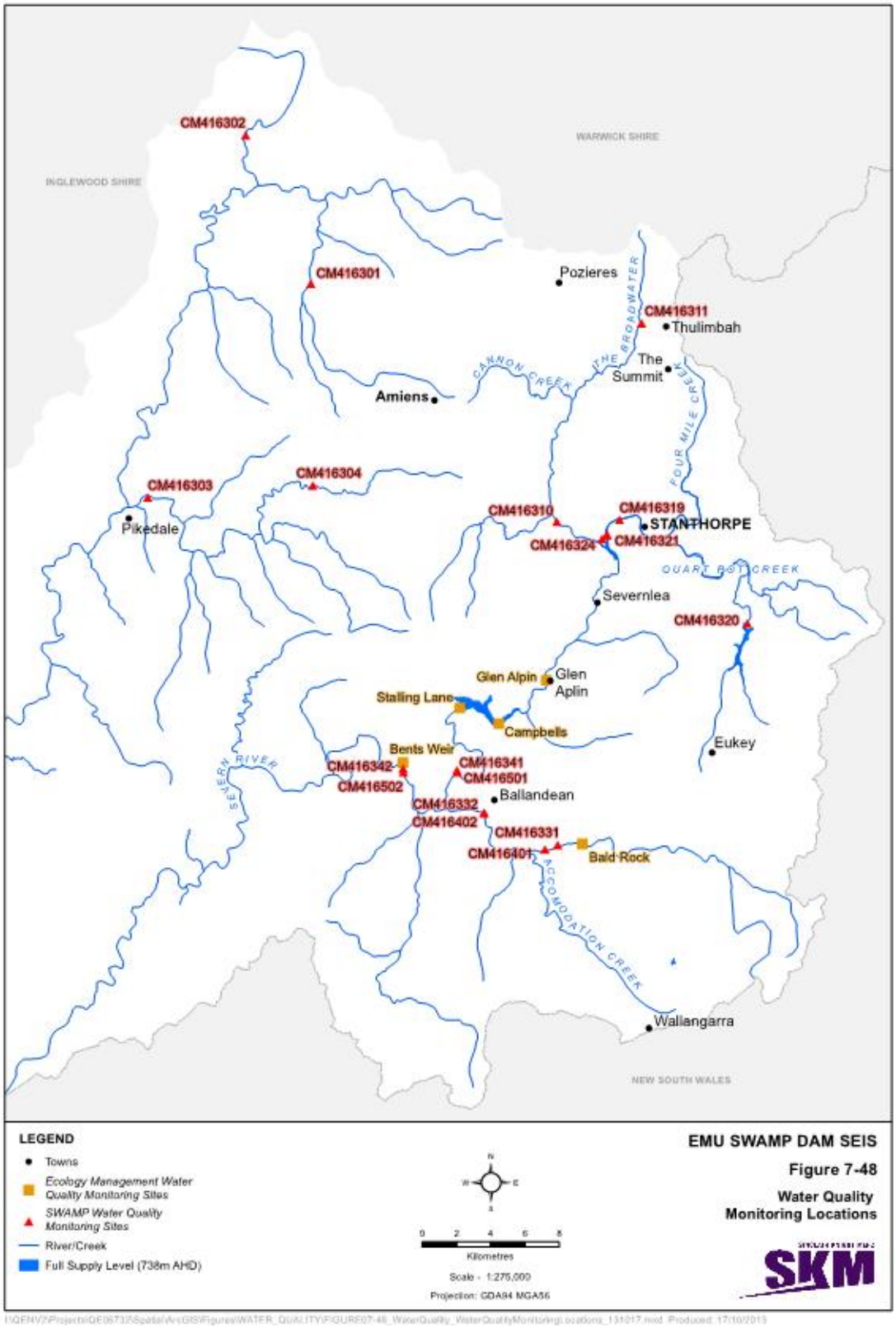

Figure 8-1 SWAMP water quality monitoring locations identified by the prefix CM416.

8.2.2. Monitoring Results

A submitter commented that the SWAMP water quality data presented in the EIS may not be representative of runoff quality over a wider range of climate conditions because it was mainly collected during a period of below average rainfall. Specifically, they commented that consideration should be given to the impacts of drought conditions on the 2006-07 data (SWAMP). Poor weather conditions could result in lower crop production, less fertilizer use, less runoff and therefore less nutrient loss to water courses i.e. "normal" conditions may result in higher nutrient concentrations in the streams

Consideration has been given to the impacts of drought conditions on water quality experienced during the period of presented data in the EIS (i.e. 2006-2007). As such, additional water quality data for the region, where and when available, has been sourced for certain sites which provides further information on the effect of environmental variability on water quality. Nutrient data was available between 2008 and 2012 in Quart Pot Creek upstream, and downstream of Stanthorpe (upstream of Emu Swamp Dam), and represents an area subject to increased runoff and crop production upstream of the dam in wet weather conditions.

Nutrient concentrations measured over this period do not show a clear relationship with daily flow conditions in Quart Pot Creek (Figure 8-2), though overall nutrient concentrations post 2007 do appear to be elevated above concentrations observed during 2006. This additional data has been included in the calculation of water quality objectives for monitoring water quality during operation of the dam (see Section 8.3.1).

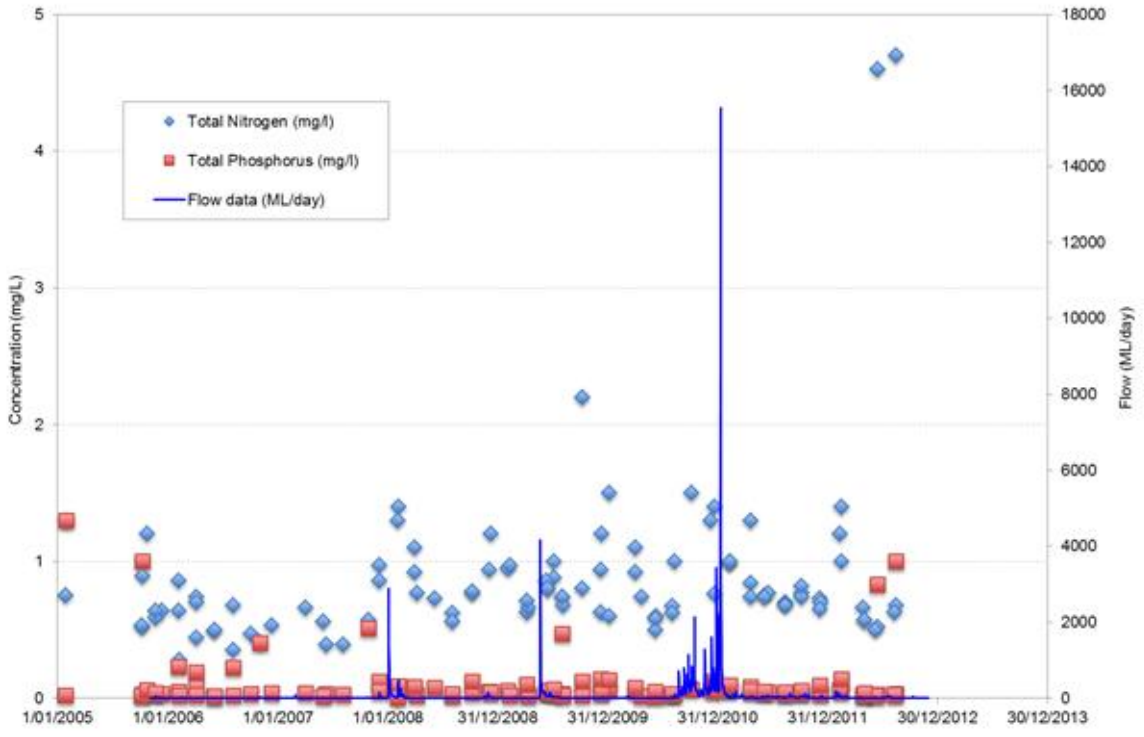

Figure 8-2 Total nitrogen and total phosphorus in Quart Pot Creek (source SWAMP data)

In addition to supplemental nutrient results, and as outlined in Section 8.2.1, additional herbicide and insecticide data for the region has been sourced for certain sites and provides further information on the effect of environmental variability on water quality (Table 8-1). Additional herbicide and insecticide data was collected between 2008 and 2010 in Quart Pot Creek (CM416319, CM416321 and CM416324), upstream and downstream of Stanthorpe, and represents an area upstream of the dam during a period of increased runoff. Similar to nutrients, pesticide concentrations also did not show a positive relationship with flow (as a proxy for runoff). Pesticide monitoring results from sites CM416319, CM416321 and CM416324 in Quart Pot Creek are presented in Figure 8-3.

Diuron, the highest concentration herbicide identified in the EIS, shows a decline over time due to either changes in land management practices or potentially dilution with the onset of increased flows in the region (Figure 8-3).

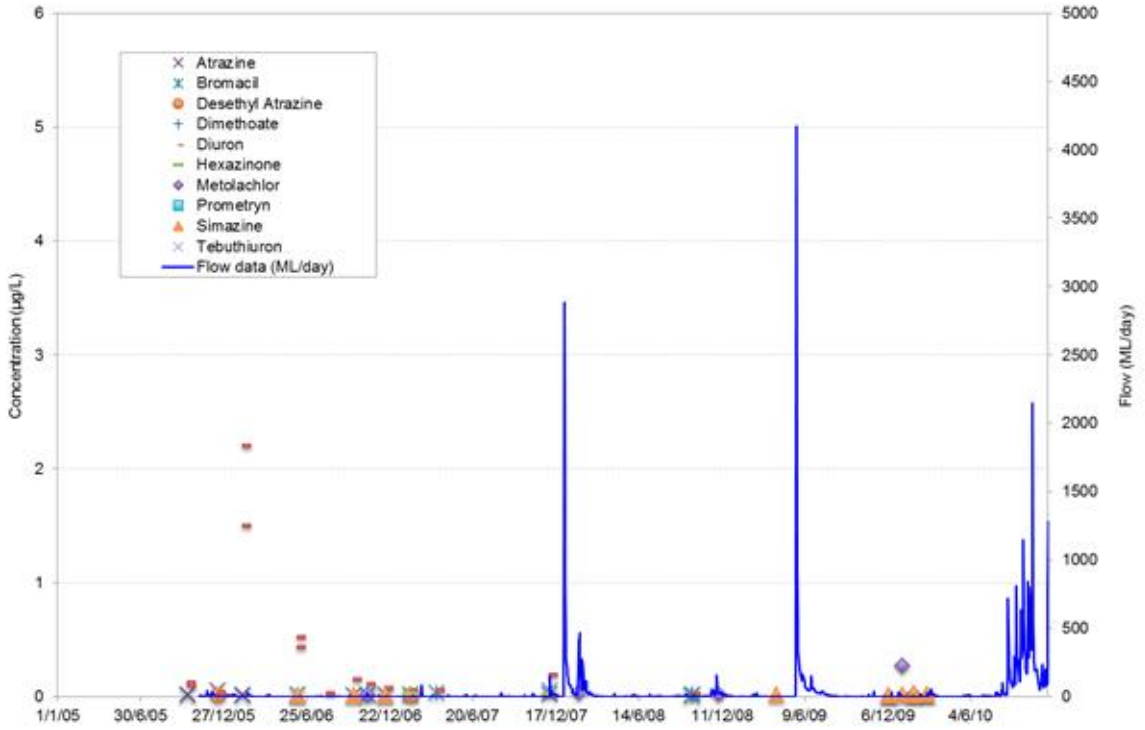

Figure 8-3 Pesticide monitoring results from sites CM416319, CM416321 and CM416324 in Quart Pot Creek (source SWAMP data)

Figure 8-4 presents the same pesticide data with diuron removed so trends in the lower concentration herbicides could be observed. Concentrations for most herbicides remain stable over time, except for Metolachlor, which does show a spike in January 2010, but is not temporally aligned with a spike in flow.

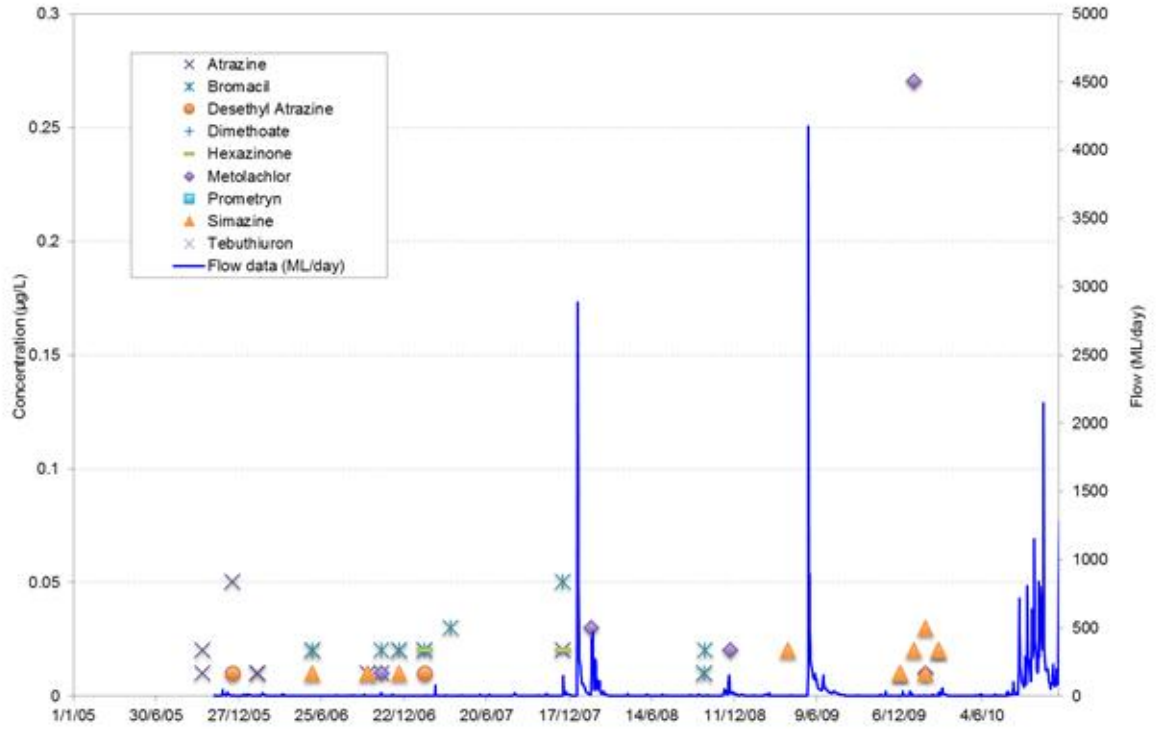

Figure 8-4 Pesticide monitoring results (except diuron) from sites CM416319, CM416321 and CM416324 in Quart Pot Creek (source: SWAMP data)

Table 8-1 Herbicide and insecticide concentrations (µg/L) sourced from the region (shaded values indicate exceedance of guideline value).

Sub-catchment	Site ID	Date	Atrazine (µg/L)	Desethyl Atrazine (µg/L)	Diuron (µg/L)	Hexazinone (µg/L)	Tebuthiuron (µg/L)	Prometryn (µg/L)	Bromacil (µg/L)	Simazine (µg/L)	Metolachlor (µg/L)	Dimethoate (µg/L)
ANZECC 95% Level of Protection			13	NG	0.2*	75*	2.2	NG	180*	3.2	0.02*	0.15*
ADWG 2011			20	20	20	400	NG	NG	400	20	300	7
Pine Creek	CM416301	21-Oct-05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		07-Feb-06	<0.01	<0.01	<0.01	0.6	<0.01	0.44	<0.01	<0.01	<0.01	<0.01
		06-Apr-06	<0.01	<0.01	<0.01	0.06	<0.01	0.04	<0.01	<0.01	<0.01	<0.01
		14-Jun-06	<0.01	<0.01	<0.01	0.07	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
	CM416302	18-Oct-05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		07-Feb-06	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		06-Apr-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	CM416303	10-Feb-06	<0.01	<0.01	<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	CM416304	10-Feb-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		02-May-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	CM416306	05-Feb-08	<0.01	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Broadwater Creek	CM416310	24-Oct-05	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		24-Feb-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		06-Feb-08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
	CM416311	17-Oct-05	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		24-Oct-05	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		24-Feb-06	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Quart Pot Creek	CM416319	10-Oct-05	0.02	<0.01	0.12	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		15-Dec-05	0.05	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		08-Feb-06	0.01	<0.01	1.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		06-Apr-06	<0.01	<0.01	4.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		06-Jun-06	<0.01	<0.01	0.43	<0.01	<0.01	<0.01	0.02	0.01	<0.01	<0.01

Sub-catchment	Site ID	Date	Atrazine (µg/L)	Desethyl Atrazine (µg/L)	Diuron (µg/L)	Hexazinone (µg/L)	Tebuthiuron (µg/L)	Prometryn (µg/L)	Bromacil (µg/L)	Simazine (µg/L)	Metolachlor (µg/L)	Dimethoate (µg/L)
ANZECC 95% Level of Protection			13	NG	0.2*	75*	2.2	NG	180*	3.2	0.02*	0.15*
ADWG 2011			20	20	20	400	NG	NG	400	20	300	7
		08-Aug-06	<0.01	<0.01	0.023	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		05-Oct-06	0.01	<0.01	0.15	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
		04-Nov-06	0.01	<0.01	0.11	<0.01	<0.01	<0.01	0.02	<0.01	0.01	<0.01
		12-Dec-06	0.02	<0.01	0.07	<0.01	<0.01	<0.01	0.02	0.01	<0.01	<0.01
		06-Feb-07	0.02	0.01	0.04	0.02	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
		04-Apr-07	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
		05-Dec-07	0.02	<0.01	0.19	0.02	<0.01	<0.01	0.05	<0.01	<0.01	<0.01
		05-Feb-08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01
		08-Oct-08	0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
		04-Dec-08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01
		04-Feb-09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		08-Apr-09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
		08-Dec-09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
		07-Jan-10	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
		01-Feb-10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
		02-Mar-10	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
	CM416320	06-Feb-06	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		07-Apr-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		07-Jan-10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		01-Feb-10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		02-Mar-10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	CM416321	07-Oct-05	0.02	<0.01	0.4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		06-Apr-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	CM416324	10-Oct-05	0.01	<0.01	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Sub-catchment	Site ID	Date	Atrazine (µg/L)	Desethyl Atrazine (µg/L)	Diuron (µg/L)	Hexazinone (µg/L)	Tebuthiuron (µg/L)	Prometryn (µg/L)	Bromacil (µg/L)	Simazine (µg/L)	Metolachlor (µg/L)	Dimethoate (µg/L)
ANZECC 95% Level of Protection			13	NG	0.2*	75*	2.2	NG	180*	3.2	0.02*	0.15*
ADWG 2011			20	20	20	400	NG	NG	400	20	300	7
		08-Feb-06	<0.01	<0.01	2.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		07-Apr-06	<0.01	<0.01	4.8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		06-Jun-06	<0.01	<0.01	0.52	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
		09-Oct-08	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
		08-Apr-09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		08-Dec-09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
		07-Jan-10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.27	<0.01
		01-Feb-10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.01	<0.01
		02-Mar-10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
UNKNOWN LOCATION	CM416325	07-Jan-10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.13	0.3
		01-Feb-10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	<0.01
		02-Mar-10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01
Accommodation Creek	CM416331	07-Nov-05	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		10-Feb-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		05-Apr-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	CM416332	07-Nov-05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		10-Feb-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
		05-Apr-06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Severn River	CM416341	10-Mar-06	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01
		02-May-06	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01
		25-Jun-06	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01
		17-Oct-06	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	0.02	<0.01	<0.01
	CM416342	10-Mar-06	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01

The same submitter requested that the Supplementary Report revisit the original major ions data and report the correct numbers for copper and zinc and that the original data for aluminium and manganese were below detection limits.

Reporting of metals in the EIS did not correctly identify values that were below laboratory reporting limits (LoR) in Tables 7-35, 7-37 or 7-39. This has been amended and correctly reported in Section 21 of the Supplementary Report. This has not resulted in any changes in the interpretation of results nor the conclusions made in the original EIS.

8.3. Construction and Operational Water Quality Monitoring Program

A submitter requested that Total Suspended Solids be measured during the routine and event monitoring proposed during the construction phase and that more detail be provided on how the event sampling will be done e.g. manually or with pump samplers and where will this occur. The submitter has also requested more detail on the fixed site water quality meter with telemetry that is proposed for use in operations.

The same submitter suggested that for the operational phase, monitoring of nutrients, algae and pesticides would be required and that routine water quality monitoring in the dam should be ongoing for the life of the operation not just the first 3 years.

The EIS recommended a "fixed site water quality meter with data logger ….(be installed) … at the outlet pipe, *which is connected to the Urban Pipeline*". In order to determine total suspended solids (TSS) from turbidity data obtained from this automated logger, a site-specific relationship between turbidity and TSS will need to be developed. Insufficient data currently exists to derive this relationship, hence manual collection of TSS and turbidity will be undertaken fortnightly at the site of the logger for the first year following the commencement of construction, inclusive of a variety of weather and runoff conditions (26 data points). Combined monitoring of turbidity and TSS will continue during the first year of operations on a monthly basis to establish change in the relationship during infilling and operation (12 data points). This will allow calibration between the automated and manual instruments and formation of a relationship between turbidity and TSS.

In addition to quarterly water quality monitoring upstream and downstream of the proposed Emu Swamp Dam, the EIS also recommended "*four (4) event based occasions per year, when inflows exceed 30 ML/day, upstream and downstream of the …..(dam)*". This monitoring is proposed to be conducted using an automated pump sampler within the Severn River upstream of the proposed dam. In the event of flow conditions within the river reaching 30 ML/day, samples will be pumped out of the river via fixed pipe system into suitably prepared containers for storage until collection by a field technician if conditions are deemed safe. A number of pre-identified personnel will be alerted to the event via email and text message notifying them of collection of the sample and the requirement for recovery of the samples for suitable storage and preservation prior to analysis by a NATA certified laboratory for the suite routine indicators measured on a quarterly basis.

8.3.1. Water Quality Objectives

A submitter stated that section 7.2.6 and the EMP in Chapter 20 of the EIS suggested water quality parameters to be monitored, but do not develop water quality objectives or performance criteria that would, for example, trigger corrective action. The submitter has requested that the development of water quality objectives and performance criteria is a necessary part of the EIS.

Construction and operational trigger values have been established based on available water quality data. Water quality trigger values are based on water quality data described in the EIS and the Supplementary Report (Table 8-2).

Two sets of water quality objectives have been determined from available datasets outlined in the EIS (inclusive of additional data described in the Supplementary Report) (Table 8-2).

Objectives for physico-chemical parameters and nutrients have been determined for construction (as 5th and or 95th percentiles of available historical data) and operation (as 20th and 80th percentiles of available historical data).

Objectives for toxicants (i.e. pesticides and metals) default to the ANZECC/ARMCANZ 2000 trigger values for 95th percentile protection and pertain to filtered samples for metals to represent the more bioavailable fraction of metals.

The following trigger value definitions are applied to the the surface water quality monitoring sites proposed within and downstream of Emu Swamp Dam.

The construction period for water quality monitoring is considered the period during construction and for 12 months post-construction. During dam construction an "exceedance" of the construction trigger value is when the monthly median value for one parameter exceeds the relevant guideline (termed a "trigger event") for 3 consecutive months. The median values for each indicator should not exceed:

- below the 5th percentile and/or above the 95th percentile (where relevant) calculated for that indicator, or
- above ANZECC/ARMCANZ 2000 trigger value for three consecutive months.

The operational period for water quality monitoring is considered the period following 1 year of operation. During dam operation an "exceedance" of the operation trigger value is when the 12-month rolling median value for one parameter exceeds the relevant guideline (termed a "trigger event") for any month. The 12-month rolling median for each indicator should not exceed:

- below the 20th percentile and/or above 80th percentile (where relevant) calculated for that indicator, or
- above the ANZECC/ARMCANZ 2000 trigger value for three consecutive months.

Table 8-2 Water quality objectives for ecosystem protection during and post construction of Emu Swamp Dam

Water Quality Parameter	Water Quality Trigger Values				
	5th Percentile	20th Percentile	80th Percentile	95th Percentile	ANZECC/ARMCANZ 2000 Trigger Value 95th % Protection
Chlorophyll-a (µg/L)	Insufficient data. Percentiles to be calculated following 1 year of monitoring.				
Conductivity at 25 °C (mS/cm)	0.07	0.16	0.32	0.55	
Oxygen per cent saturation (%)					90-110
pH	6.1	6.5	7.4	8.4	
Temperature (°C)	10	12	24	27	
Turbidity (NTU)	9	9	20	58	
TSS	3	9	64	115	
Nitrogen (total) as N (mg/L)			1.18	1.5	
Phosphorus (total) as P (mg/L)			0.91	0.29	
Arsenic (Dissolved) (µg/L)					13
Boron (Dissolved) (µg/L)					370
Cadmium (Dissolved) (µg/L)					0.2
Chromium (Dissolved) (µg/L)					1
Copper (Dissolved) (µg/L)					1.4
Iron (Dissolved) (µg/L)					300
Lead (Dissolved) (µg/L)					3.4
Manganese (Dissolved) (µg/L)					1900
Mercury (Dissolved) (µg/L)					0.6
Zinc (Dissolved) (µg/L)					8
Atrazine (µg/L)					13
Bromacil (µg/L)					180*
Dimethoate (µg/L)					0.15
Diuron (µ/L)					0.2*
Hexazinone (µg/L)					75*
Metolachlor (µg/L)					0.02*
Simazine (µg/L)					3.2
Tebuthiuron (µg/L)					2.2

*Low reliability guideline due to insufficient data

8.4. Water Quality Impacts

8.4.1. Risk of Contamination and Cumulative Impacts

Several submitters raised concerns about the risk of cumulative water quality impacts from increased urban, industrial, other non-residential use and agricultural runoff.

The inclusion of new data outlined in Section 8.2.2, primarily from sites located in close proximity of Stanthorpe in Quart Pot Creek (sites CM416319, CM416320 and CM416321), provides a more robust characterisation of pollution from the township of Stanthorpe.

SDRC will undertake annual assessments of biota and sediments within, and downstream of, Emu Swamp Dam for a standard set of heavy metal (including methyl-mercury) and a broad pesticide screen including herbicides, insecticides, and fungicides for comparison to relevant guideline documents (i.e. ANZECC/ARMCANZ 2000 and QWQG 2009). This approach will determine the occurrence of any contaminant accumulation within the system and allow a more targeted approach for managing responsible sources in the catchment. It is therefore proposed that monitoring of fish, bivalves and sediment at the deepest point within the dam and at one site downstream (<2 km from the dam wall) be undertaken annually for the life of the monitoring program.

8.5. Dam Management

A submitter requested that the dam owner develop and implement strategies to manage the dam's catchment and protect source water, including supporting and, where appropriate, leading changes in farming and land-use planning and practices in the catchment.

Section 5.3.2 identifies water quality protection measures, including application of the Water Resource Catchment Overlay Code of the SDRC Planning Scheme for the protection of water quality within the dam catchment. It is considered that application of these measures is suitable for the protection of water quality in the Emu Swamp Dam.

In Section 3.1.1 of the EIS described a buffer area for the Project of approximately 200 m is proposed surrounding the dam to protect the water quality within the dam and also to maintain ecological connectivity within the region. The buffer area will be revegetated and managed to create vegetated zone around the impoundment for protection of water quality values. The buffer area will act to protect water quality in the inundation area by:

- retarding surface runoff and to acting as a sink for nutrients; and
- minimising potential nutrient and sediment runoff.

It is considered that application of these measures is suitable for the protection of water quality in the Emu Swamp Dam. Another submitter commented that water treatment may be required to ensure water is fit for human consumption.

As discussed in Section 3.4.2 of the EIS, the water in Emu Swamp Dam will be pumped to the existing Mt Marlay Water Treatment Plant, for treatment as potable water. The Mt Marlay water treatment plant treats water from Storm King Dam. Storm King Dam is in the upper parts of the Severn River catchment and has the same raw water quality characteristics. The existing treatment processes are powedered activated carbon, flocculation, coagulation, clarification, filtration and disinfection and these will be suitable for the Emu Swamp Dam water.