

Drinking Water Quality Management Plan (DWQMP) report

2016/2017

FLINDERS SHIRE COUNCIL

SPID: 51

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Glossary of terms

ADWG 2004	Australian Drinking Water Guidelines (2004). Published by the National Health and Medical Research Council of Australia
ADWG 2011	Australian Drinking Water Guidelines (2011). Published by the National Health and Medical Research Council of Australia
<i>E. coli</i>	<i>Escherichia coli</i> , a bacterium which is considered to indicate the presence of faecal contamination and therefore potential health risk
HACCP	Hazard Analysis and Critical Control Points certification for protecting drinking water quality
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
MPN/100mL	Most probable number per 100 millilitres
CFU/100mL	Colony forming units per 100 millilitres
<	Less than
>	Greater than

1. Introduction

This report documents the performance of Flinders Shire Council's drinking water service with respect to water quality and performance in implementing the actions detailed in the drinking water quality management plan (DWQMP) as required under the *Water Supply (Safety and Reliability) Act 2008* (the Act).

The report assists the Regulator to determine whether the approved DWQMP and any approval conditions have been complied with and provides a mechanism for providers to report publicly on their performance in managing drinking water quality.

This template has been prepared in accordance with the *Water Industry Regulatory Reform – drinking water quality management plan report factsheet* published by the Department of Energy and Water Supply, Queensland, accessible at www.dews.qld.gov.au.

2. Actions taken to implement the DWQMP

Implementation of the DWQMP carried on throughout the 2016/2017 financial year.

Progress in implementing the risk management improvement program

Flinders Shire Council's DWQMP includes a Risk Management Improvement Program (RMIP) which aims to manage any unacceptable residual risks identified by the hazard/risk assessment and improve parts of the Plan where deficiencies in information did not allow the criteria to be completely and accurately addressed.

The RMIP identifies areas where Council could implement changes to manage hazards/risks and uncertainties. The program outlines interim, short-term and long-term actions for Council to implement in order to manage the identified hazards/risks and uncertainties.

Appendix B contains an excerpt from the RMIP table in Council's DWQMP and addresses the actions in the DWQMP that have been completed, currently in progress or have been deferred.¹

Revisions made to the operational monitoring program to assist in maintaining the compliance with water quality criteria² in verification monitoring.

No revisions have been made to the operational monitoring program.³

3. Compliance with water quality criteria for drinking water

The water quality criteria mean health guideline values in the most current Australian Drinking Water Guidelines, as well as the standards in the Public Health Regulation 2005.

4. Notifications to the Regulator under sections 102 and 102A of the Act

This financial year there was one instance where the Regulator was notified under sections 102 or 102A of the Act. The notification involved the detection of *E. coli* – an organism that may not directly represent a hazard to human health, but indicates the presence of recent faecal contamination.

¹The RMIP has recently been amended and submitted to the Department of Energy and Water Supply for approval. This excerpt is from the current RMIP, not the amended RMIP.

² Refer to *Water Quality and Reporting Guideline for a Drinking Water Service for the water quality criteria for drinking water*.

³ Revisions have been made to the amended Plan that has been submitted to the Regulator.

Non-compliances with the water quality criteria and corrective and preventive actions undertaken

Incident Description: The non-compliance was a detection of *E.coli* from a routine sample taken on the 23/11/2016 at an outside tap located on the Western side of the Helicopter pad. 7.5 mpn *E.coli* organisms were detected, with a disinfection level of 0mg/L.

Corrective and Preventative Actions: The non-compliance was reported to the regulators, Qld Health and the DON. The Reservoir was dosed again and follow samples were taken. Dosing in Hughenden was increased to 3 times a week. The Hospital now has their own disinfection system to ensure they maintain chlorine residuals in excess of 0.5mg/L

5. Customer complaints related to water quality

Flinders Shire Council is required to report on the number of complaints, general details of complaints, and the responses undertaken.

Throughout the year the following complaints about water quality were received:

Table 1 - complaints about water quality.

	Suspected Illness	Discoloured water	Taste and odour	Total
Hughenden	0	0	1	1
Prairie	0	0	0	0
Torrens Creek	0	0	0	0

Suspected Illness

During 2015/2016 there were no complaints regarding illness arising from the water supply system..

Taste and Odour

One complaint was received in relation to the water smelling and tasting of chlorine. Tests within the reticulation network returned well under the health guideline values and the customers were advised of the reasons Council chlorinates the water supply.

6. Findings and recommendations of the DWQMP auditor

Flinders Shire Council arranged for Sean Hinton from Bligh Tanner to conduct a regular audit of the DWQMP during 3-4 April 2017 covering the time period from 11 April 2016 to 3 April 2017. The purpose of the audit was to verify the accuracy of the monitoring and performance data provided to the Regulator; assess compliance with the DWQMP; and to assess the relevance of the DWQMP in relation to the service provided.

The assessment of the compliance with the DWQMP was undertaken by determining whether the ADWG requirements as stated in the DWQMP have been met. Where ADWG best practice is stated and met in the plan, these criteria are assessed as compliant (C). In instances where the ADWG best practice guidance was not met, but the ADWG component or element is not required under the Act, this was assessed as either N/A or as an opportunity for improvement (OFI). Improvement opportunities are identified based on the auditors knowledge of water treatment processes and practices and reflects his opinion.

Items that are specifically stated in the DWQMP that were not (fully) implemented were assessed as non-conformances (NC).

Table 2: Compliance Summary

Compliance Codes		Number of Findings
Compliant		55
Non-compliance		3
Opportunity for Improvement		16

Non-conformances that were identified included:

- Preventive measures - the specific non-conformance related to the gaps observed at all bore heads in all schemes (refer to photos later in this report). The DWQMP risk assessment states that gaps in bore heads are sealed with an expanding foam sealant, and uses this as a preventive measure against contamination of bores with run-off which has been assessed as an extreme unmitigated risk (before the application of preventive measures). Given that there is a history of E. coli incidents, and that low levels of residual chlorine are maintained in all three schemes, this should be rectified as soon as possible. It was also noted that several of the other preventive measures could not be verified due to the absence of any records. **Improvements:** Update DWQMP preventive measures to remove

outdated items (e.g. tablet dosing at Prairie) and to reflect current circumstances. **Actions undertaken:** Council staff immediately inspected all bores and re-sealed all gaps. The RMIP has also been updated to reflect the need to document inspections undertaken on the bores (amended RMIP has been submitted to DEWS for approval).

- Operational monitoring - no chlorine results were available for Hughenden Reservoir during July 2016. The DWQMP states that monitoring is undertaken fortnightly. It was communicated to the auditor that this was due to the Water Officer being on leave at that time, and the Environmental Health Officer was covering the testing schedule among her other commitments. Due to time constraints, the frequency of chlorine monitoring was reduced and focused on end of line areas within the scheme. **Actions Undertaken:** The DWQMP has been amended to include in plan a reduced monitoring program that would occur in times of low staff levels, limited access due to construction etc. – state that the minimum requirements for E.coli as stated in the Public Health Act will still be met. In times of staff leave, a risk based monitoring program shall be put in place.
- Operational monitoring - Table 12.1 of the DWQMP states that, for all schemes, a target range of 0.5-1.5mg/L chlorine applies. The table provides response measures in the event that the target range is not met, for example, “operator adjustment” and “increase dose in the event of low level of chlorine”. Operational monitoring results for all schemes were reviewed and results were almost always below the lower boundary of the target range. From discussions with Council staff, it was communicated that corrective actions are not undertaken as the community is not willing to accept higher levels of chlorine. **Recommendations:** It was advised that this has been discussed with Queensland Health. It is recommended that this issue is elevated to the CEO and Council with a view to gradually increasing chlorine levels to provide protection against water contamination. The issue could potentially be discussed at one of Council's community forums. **Actions:** Chlorine Residuals at Torrens Creek and Prairie have been increased, residuals in Hughenden re harder to increase while the reservoir is still being hand-dosed. Residuals will be increased once the New Sodium Hypochlorite dosing system is installed.

The Flinders Shire Council DWQMP requires review in light of the non-conformances identified as well as a number of improvement opportunities that were identified relating to updating information in the plan.

7. Outcome of the review of the DWQMP and how issues raised have been addressed

Following the first audit of the DWQMP, a review was conducted by Council's Environmental Health Officer, Melissa Keating. The review was conducted before the 9th May 2017. The purpose of the review was to ensure that the DWQMP remains relevant, having regard to the operation of the drinking water service and to implement recommendations and actions arising from the audit of the plan.

Amendments made to the DWQMP

The following items of Flinders Drinking Water Quality Management Plan were amended after a review of the plan.

- Add staff responsibilities in section 1 (i.e., 1.4 Staff responsibilities).
- Update Population, Demographics, Economics, and Industry in order to reflect 2016 Census data.
- Update Scheme descriptions and schematics to reflect current infrastructure – namely Torrens Creek.
- Correct terminology used in Prairie Schematics in order to ensure common terminology is used.
- Take out Water Quality data from main document and add it as an appendix – this will ensure that the main document can be emailed (currently too large to email).
- Update Preventive measures in Risk Assessment in order to remove outdated items and to reflect current circumstances. Also ensure that RMIP IP's match IP's stated in Risk assessment.

- Update Section 8 to reflect current Operation and Procedure documentation.
- Update Emergency Contact details to reflect staff changes.
- Update table 9.3 to reflect staff changes.
- Include in plan a reduced monitoring program that would occur in times of low staff levels, limited access due to construction etc – state that the minimum requirements for E.coli as stated in the Public Health Act will still be met. In times of staff leave, a risk based monitoring program shall be put in place.
- Response to Customer complaints – take out sentence that says it is in the Customer Service Standards, replace with ‘located in Drinking Water Incident Response Manual’.
- Section 12.2 in DWQMP - elaborate on the E.coli sampling regime – stipulate that not all sites are tested each week.
- Update RMIP to reflect current progress and changes to implementation dates if required.
- Update Verification monitoring sites to ensure they reflect changes in schematics (take out Hughenden Hospital).
- Update table 12.4 – sampling procedures.

The following additional amendments were made following an Information requirement Notice from the Department of Energy and Water Supply:

- Inclusion of service provider name and contact details, as well as operator name(s) and contact details.
- Inclusion of a separate schematic of the Hughenden Fluoride Plant.
- Clarification of the disinfection chemical used at the Prairie and Torrens Creek Scheme.
- Clarification on disinfection location in all schemes.
- Photos of ORP System at Prairie and Torrens Creek.
- Update of Water Quality Assessment to include water quality data from 2014 to 2017.
- Update of Table 7.6 Hazard Identification and Risk Assessment Team.
- Update of Table 7.7 to include Turbidity and separate chemical under-dosing and over-dosing. Inclusion of hazardous events and hazardous associated with equipment trips/failures.
- Update RMIP to include additional actions:
 - Development of Monitoring Program for inspection of temporary foam sealant and slab condition of all bores.
 - Water Mains Replacement Program.
 - Upgrade of ORP system at Torrens Creek.
 - Plumbers to inform EHO of Water Mains Breaks so that Water Sample can be taken.
 - Turbidity monitoring in Torrens Creek.
 - Water & Sewerage SOPs.
 - Plumber’s Logbook.
- Review and Update Table 8.1 Operational and Maintenance Procedures.
- Inclusion of Drinking Water Incident Manual and Hughenden Water Treatment Plant Emergency Response Plan.
- Add link to incident reporting forms.
- Update Section 12.2 Verification Monitoring and Table 12.5 Verification Monitoring for E.coli (all schemes) to include external E.coli testing from a NATA accredited lab to establish QA/QC and to verify in-house (E.coli) Colilert testing.
- Update Section 12 Operational and Verification Monitoring Programs to include turbidity monitoring for Source water and reticulation.
- Inclusion of Critical and Alarm Limits and appropriate responses in Table 12.1 Operational Monitoring.

Appendix A – Summary of compliance with water quality criteria

The results from the verification monitoring program have been compared against the levels of the water quality criteria specified by the Regulator in the *Water Quality and Reporting Guideline for a Drinking Water Service*.

Table 3 - Verification monitoring results – Hughenden Source Water (raw water)

Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of reporting	Laboratory name
Aluminium	mg/L	Quarterly	16	5	0	<0.003	0.034	0.0051875	0.003	FSS Health Support Qld
Antimony	mg/L	Quarterly	16	1	1 ⁴	<0.0001	0.0086	0.00063125	0.0001	FSS Health Support Qld
Arsenic	mg/L	Quarterly	16	1	0	<0.0001	0.0003	0.0001125	0.0001	FSS Health Support Qld
Barium	mg/L	Quarterly	16	16	0	0.024	0.093	0.055375	0.0001	FSS Health Support Qld
Beryllium	mg/L	Quarterly	16	0	0	<0.0001	<0.0001	0.0001	0.0001	FSS Health Support Qld
Bismuth	mg/L	Quarterly	3	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Boron	mg/L	Quarterly	16	16	0	0.066	0.73	0.1145625	0.0001	FSS Health Support Qld
Cadmium	mg/L	Quarterly	16	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Chromium	mg/L	Quarterly	16	2	0	<0.0001	0.0071	0.00054375	0.0001	FSS Health Support Qld
Cobalt	mg/L	Quarterly	16	1	0	<0.0001	0.0008	0.00014375	0.0001	FSS Health Support Qld
Copper	mg/L	Quarterly	16	4	0	<0.001	0.018	0.00325	0.001	FSS Health Support Qld
Iron	mg/L	Quarterly	16	16	0	0.005	5.6	0.380625	0.005	FSS Health

⁴ Bore 2 returned a reading of 0.0086 mg/L. All remaining bores and reticulation samples returned readings of <0.0001mg/L. After discussing exceedance with Council's designated regulator contact it was determined that the exceedance was not reportable as it had diluted before it reached the reticulation.

										Support Qld
Lead	mg/L	Quarterly	16	2	0	<0.0001	0.0063	0.0005125	0.0001	FSS Health Support Qld
Mercury	mg/L	Quarterly	16	0	0	<0.0001	<0.0001	<0.0001	0.001	FSS Health Support Qld
Manganese	mg/L	Quarterly	16	16	0	0.0043	0.26	0.04135	0.0001	FSS Health Support Qld
Molybdenum	mg/L	Quarterly	16	11	0	<0.0001	0.0003	0.000175	0.0001	FSS Health Support Qld
Nickel	mg/L	Quarterly	16	2	0	<0.0001	0.0082	0.00063125	0.0001	FSS Health Support Qld & In-house
Selenium	mg/L	Quarterly	16	3	0	<0.0001	0.001	0.00084375	0.0001	FSS Health Support Qld
Silver	mg/L	Quarterly	16	0	0	<0.001	<0.001	<0.001	0.001	
Strontium	mg/L	Quarterly	16	16		0.011	0.16	0.079125	0.0001	
Thallium	mg/L	Quarterly	16	0	0	<0.0001	<0.0001	0.0001	0.0001	
Tin	mg/L	Quarterly	16	2		<0.0001	0.0003	0.00013125	0.0001	
Titanium	mg/L	Quarterly	16	0	0	<0.001	<0.001	0.001	0.001	
Uranium	mg/L	Quarterly	16	0	0	<0.0001	<0.0001	<0.0001	0.0001	
Vanadium	mg/L	Quarterly	16	1	0	<0.0001	0.0002	0.00010625	0.0001	
Zinc	mg/L	Quarterly	16	16	0	0.001	0.092	0.0079375	0.001	
Conductivity	mg/L	Quarterly	16	16	0	825	1170	957.875		
pH		Quarterly	16	16	0	7.99	8.47	8.26875		
Total Hardness	mg/L	Quarterly	16	16	0	8.1	27	14.84375		
Temporary Hardness	mg/L	Quarterly	16	16	0	8.1	27	14.84375		
Alkalinity	mg/L	Quarterly	16	16	0	190	224	207		
Residual Alkalinity	mg/L	Quarterly	16	16	0	3.3	4.1	3.84375		
Silica	mg/L	Quarterly	16	16	0	16	18	16.4375		
TDI	mg/L	Quarterly	16	16	0	582	809	668.1875		
TDS	mg/L	Quarterly	16	16	0	481	698	560.125		
True Colour	Hazen	Quarterly	16	16	0	1	15	2.125		
Turbidity	NTU	Quarterly	16	16	0	1	5	1.5		
Sodium	mg/L	Quarterly	16	16	0	180	260	205		
Potassium	mg/L	Quarterly	16	16	0	1.7	3.1	2.1625		
Calcium	mg/L	Quarterly	16	16	0	2.5	7.7	4.38125		
Magnesium	mg/L	Quarterly	16	16	0	0.07	1.9	0.891875		
Hydrogen	mg/L	Quarterly	16	16	0	0	0	0		

Bicarbonate	mg/L	Quarterly	16	16	0	227	268	246		
Carbonate	mg/L	Quarterly	16	16	0	1.7	4.9	3.16875		
Hydroxide	mg/L	Quarterly	16	16	0	0	0.1	0.0125		
Chloride	mg/L	Quarterly	16	16	0	91	130	104.625		
Fluoride	mg/L	Quarterly	16	16	0	0.05	0.13	0.096875		
Nitrate	mg/L	Quarterly	16	16	0	0.05	1	0.5125		
Sulphate	mg/L	Quarterly	16	16	0	63	160	102.375		
Gross Alpha Activity	Bq/L	6 monthly	8	8	0	<0.04	0.09+/- 0.08	0.0575 +/- 0.080	-	FSS Health Support Qld
K40 Corrected Beta Activity	Bq/L	6 monthly	8	4	0	<0.08	<0.1	<0.0900	-	FSS Health Support Qld

Table 4: Verification Monitoring for Pesticides - Hughenden Source water (raw water)

ParameterER	Units	Frequency of Sampling	Total No. Samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Mean	Limit of reporting	Laboratory name
Aldrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Dieldrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Aldrin & Dieldrin ⁵	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Chlordane cis	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Chlordane trans	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Chlordane	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
DDD (pp)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld

⁵ Reporting limits are based not on instrument sensitivities, but on sample reproducibility. In the presence of potential interferences etc. which occur in natural waters we set reporting limits where we are confident in the reproducibility of the reported value - the instrument detection limit is often a factor of 10 or more lower.

For the organochlorine pesticides, they have been banned for a number of decades and we do not often see any such residues in the environment. If any such residues were detected we would confirm their presence and quantification via an alternative detection method. Whilst we are reporting a value of < 0.4 µg/L for Total Aldrin & Dieldrin and for Total Heptachlor, the individual components are reported at a lower level, and we can detect their presence well below the guideline values.

If any residues were detected we can confirm down to 0.06 µg/L for each of these total values.

DDE (pp)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
DDT(op)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
DDT (pp)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total DDT	µg/L	Quarterly	16	0	0	<0.8	<0.8	<0.8	0.4	FSS Health Support Qld
Dicofol	µg/L	Quarterly	16	0	0	<2.9	<2.9	<2.9	1.5	FSS Health Support Qld
a-Endosulfan	µg/L	Quarterly	16	0	0	<1	<1	<1	0.2	FSS Health Support Qld
b-Endosulfan	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.2	FSS Health Support Qld
Endosulfan Sulfate	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Endosulfan	µg/L	Quarterly	16	0	0	<1.4	<1.4	<1.4	0.6	FSS Health Support Qld
Heptachlor	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Heptachlor Epoxide	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Heptachlor ⁶	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Lindane (g-HCH)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Methoxychlor	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Oxychlorthane	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Azinphos-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Bromophos-ethyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Carbophenothion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Chlorfenvinphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Chlorpyrifos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Diazinon	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Dichlorvos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Dimethoate	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld

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For the organochlorine pesticides, they have been banned for a number of decades and we do not often see any such residues in the environment. If any such residues were detected we would confirm their presence and quantification via an alternative detection method. Whilst we are reporting a value of < 0.4 ug/L for Total Aldrin & Dieldrin and for Total Heptachlor, the individual components are reported at a lower level, and we can detect their presence well below the guideline values.

If any residues were detected we can confirm down to 0.06 ug/L for each of these total values.

Omethoate	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Total Dimethoate	µg/L	Quarterly	16	0	0	<0.6	<0.6	<0.6	0.3	FSS Health Support Qld
Disulfoton	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Ethion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Ethoprophos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenamiphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenchlorphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenitrothion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenthion (methyl)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Malathion (Maldison)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Methidathion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Mevinphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Monocrotophos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Parathion (ethyl)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Parathion-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pirimiphos-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Profenofos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pyrazophos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Sulprofos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Temephos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Terbufos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Tetrachlorvinphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Ametryn	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Atrazine	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Bromacil	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Diuron	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Fluometuron	µg/L	Quarterly	16	0	0	<0.04	<0.04	<0.04	0.02	FSS Health Support Qld
Hexazinone	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Metolachlor	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Simazine	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Terbutryn	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Amitraz	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld

Diclofop-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Haloxypop-2-etotyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Haloxypop-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Metribuzin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Molinate	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pendimethalin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Propanil	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Propazine	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Terbuthylazine	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Trifluralin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Captan	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Carbaryl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fipronil	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Piperonyl Butoxide	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pirimicarb	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Propargite	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Propiconazole	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Triadimefon	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Triadimefon	µg/L	Quarterly	16	0	0	<0.6	<0.6	<0.6	0.3	FSS Health Support Qld
Bioresmethrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Cyfluthrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Cypermethrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.5	FSS Health Support Qld
Deltamethrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenvalerate	µg/L	Quarterly				<0.2	<0.2	<0.2	0.1	
Permethrin	µg/L	Quarterly				<0.2	<0.2	<0.2	0.1	

Table 5: Verification monitoring and operational results - Hughenden Reticulation

Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of reporting	Laboratory name
Aluminium	mg/L	Quarterly	33	1	0	<0.0030	0.0040	0.0030	0.003	FSS Health Support Qld
Antimony	mg/L	Quarterly	33	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Arsenic	mg/L	Quarterly	33	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Barium	mg/L	Quarterly	33	16	0	0.0360	0.0640	0.0508	0.0001	FSS Health Support Qld
Beryllium	mg/L	Quarterly	33	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Bismuth	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Boron	mg/L	Quarterly	33	33	0	0.0690	0.0770	0.0739	0.0001	FSS Health Support Qld
Cadmium	mg/L	Quarterly	33	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Chromium	mg/L	Quarterly	33	1	0	0.0001	0.0002	0.0001	0.0001	FSS Health Support Qld
Cobalt	mg/L	Quarterly	33	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Copper	mg/L	Quarterly	33	4	0	0.0010	0.0480	0.0061	0.001	FSS Health Support Qld
Iron	mg/L	Quarterly	33	33	0	0.0040	0.2300	0.0423	0.005	FSS Health Support Qld
Lead	mg/L	Quarterly	33	13	0	<0.0001	0.0014	0.0003	0.0001	FSS Health Support Qld
Mercury	mg/L	Quarterly	33	0	0	<0.0001	<0.0001	<0.0001	0.001	FSS Health Support Qld
Manganese	mg/L	Quarterly	33	32	0	<0.0001	0.1600	0.0200	0.0001	FSS Health Support Qld
Molybdenum	mg/L	Quarterly	33	15	0	<0.0001	0.0002	0.0001	0.0001	FSS Health Support Qld
Nickel	mg/L	Quarterly	33	5	0	<0.0001	0.0010	0.0002	0.0001	FSS Health Support Qld & In-house

Selenium	mg/L	Quarterly	33	0	0	<0.0010	<0.0010	<0.0010	0.0001	FSS Health Support Qld
Silver	mg/L	Quarterly	33	0	0	<0.0010	<0.0010	<0.0010	0.001	
Strontium	mg/L	Quarterly	33	16	0	0.0290	0.1200	0.0909	0.0001	
Thallium	mg/L	Quarterly	33	0	0	<0.0001	<0.0001	<0.0001	0.0001	
Tin	mg/L	Quarterly	33	3	0	<0.0001	0.0004	0.0001	0.0001	
Titanium	mg/L	Quarterly	33	0	0	<0.0010	<0.0010	<0.0010	0.001	
Uranium	mg/L	Quarterly	33	1	0	<0.0001	0.0002	0.0001	0.0001	
Vanadium	mg/L	Quarterly	33	0	0	<0.0001	<0.0001	<0.0001	0.0001	
Zinc	mg/L	Quarterly	33	33	0	0.0007	0.0660	0.0097	0.001	
Conductivity	mg/L	Quarterly	31	31	0	886.0000	1202.0000	982.0645		
pH		Quarterly	31	31	0	7.9400	832.0000	34.7587		
Total Hardness	mg/L	Quarterly	31	31	0	12.0000	18.0000	14.0000		
Temporary Hardness	mg/L	Quarterly	31	31	0	12.0000	18.0000	14.0000		
Alkalinity	mg/L	Quarterly	31	31	0	205.0000	212.0000	208.6774		
Residual Alkalinity	mg/L	Quarterly	31	31	0	3.8000	4.0000	3.9032		
Silica	mg/L	Quarterly	31	31	0	16.0000	17.0000	16.2258		
TDI	mg/L	Quarterly	31	31	0	631.0000	729.0000	684.9355		
TDS	mg/L	Quarterly	31	31	0	520.0000	618.0000	574.6452		
True Colour	Hazen	Quarterly	31	31	0	<1.0000	<2.0000	<1.0645		
Turbidity	NTU	Quarterly	31	31	0	<1.0000	<2.0000	<1.0323		
Sodium	mg/L	Quarterly	31	31	0	193.0000	230.0000	210.8710		
Potassium	mg/L	Quarterly	31	31	0	1.9000	202.0000	8.5419		
Calcium	mg/L	Quarterly	31	31	0	3.5000	5.3000	4.2226		
Magnesium	mg/L	Quarterly	31	31	0	0.6000	1.6000	0.8484		
Hydrogen	mg/L	Quarterly	31	31	0	0.0000	0.0000	0.0000		
Bicarbonate	mg/L	Quarterly	31	31	0	244.0000	254.0000	249.0968		
Carbonate	mg/L	Quarterly	31	31	0	1.4000	3.5000	2.6194		
Hydroxide	mg/L	Quarterly	31	31	0	0.0000	0.0000	0.0000		
Chloride	mg/L	Quarterly	31	31	0	11.0000	110.0000	103.2903		
Fluoride	mg/L	Quarterly	31	31	0	0.0110	0.1200	0.0949		
Nitrate	mg/L	Quarterly	31	31	0	<0.5000	1.4000	0.8677		
Sulphate	mg/L	Quarterly	31	31	0	82.0000	130.0000	107.9032		
Chlorine (operational)	mg/L	weekly	275			0	0.65	0.0873		

Table 6: Verification Monitoring Results - Prairie Source

Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of reporting	Laboratory name
Aluminium	mg/L	Quarterly	8	1	0	<0.003	0.004	0.003125	0.003	FSS Health Support Qld
Antimony	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Arsenic	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Barium	mg/L	Quarterly	8	8	0	0.067	0.094	0.077625	0.0001	FSS Health Support Qld
Beryllium	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Bismuth	mg/L	Quarterly	1	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Boron	mg/L	Quarterly	8	8	0	0.2	0.37	0.25375	0.0001	FSS Health Support Qld
Cadmium	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Chromium	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Cobalt	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Copper	mg/L	Quarterly	8	8	0	0.001	0.004	0.002125	0.001	FSS Health Support Qld
Iron	mg/L	Quarterly	8	8	0	0.031	0.34	0.123375	0.005	FSS Health Support Qld
Lead	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Mercury	mg/L	Quarterly	8	2	0	<0.0001	0.0002	0.000125	0.001	FSS Health Support Qld
Manganese	mg/L	Quarterly	8	8	0	0.026	0.039	0.0305	0.0001	FSS Health Support Qld
Molybdenum	mg/L	Quarterly	8	3	0	<0.001	0.0011	0.0010375	0.0001	FSS Health Support Qld
Nickel	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health

										Support Qld & In-house
Selenium	mg/L	Quarterly	8	0	0	<0.001	<0.001	<0.001	0.0001	FSS Health Support Qld
Silver	mg/L	Quarterly	8	0	0	<0.001	<0.001	<0.001	0.001	
Strontium	mg/L	Quarterly	8	8	0	0.064	0.69	0.5905	0.0001	
Thallium	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	
Tin	mg/L	Quarterly	8	2	0	<0.0001	0.0004	0.0001625	0.0001	
Titanium	mg/L	Quarterly	8	0	0	<0.001	<0.001	<0.001	0.001	
Uranium	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	
Vanadium	mg/L	Quarterly	8	0	0	<0.0001	<0.0001	<0.0001	0.0001	
Zinc	mg/L	Quarterly	8	6	6	<0.001	0.056	0.0095	0.001	
Conductivity	mg/L	Quarterly	8	8	0	1200	1670	1347.5		
pH		Quarterly	8	8	0	8	8.32	8.17		
Total Hardness	mg/L	Quarterly	8	8	0	73	93	85.875		
Temporary Hardness	mg/L	Quarterly	8	8	0	73	93	85.875		
Alkalinity	mg/L	Quarterly	8	8	0	94	152	134.75		
Residual Alkalinity	mg/L	Quarterly	8	8	0	0.2	1.6	0.975		
Silica	mg/L	Quarterly	8	8	0	14	20	17.625		
TDI	mg/L	Quarterly	8	8	0	727	918	796.125		
TDS	mg/L	Quarterly	8	8	0	658	876	732		
True Colour	Hazen	Quarterly	8	8	0	<1	<1	<1		
Turbidity	NTU	Quarterly	8	8	0	<1	<1	<1		
Sodium	mg/L	Quarterly	8	8	0	210	300	244.375		
Potassium	mg/L	Quarterly	8	8	0	5.5	6.2	5.85		
Calcium	mg/L	Quarterly	8	8	0	20	25	23.25		
Magnesium	mg/L	Quarterly	8	8	0	5.7	7.4	6.7		
Hydrogen	mg/L	Quarterly	8	8	0	0	0	0		
Bicarbonate	mg/L	Quarterly	8	8	0	112	179	160.875		
Carbonate	mg/L	Quarterly	8	8	0	1.2	2.6	1.625		
Hydroxide	mg/L	Quarterly	8	8	0	0	0	0		
Chloride	mg/L	Quarterly	8	8	0	230	450	296.25		
Fluoride	mg/L	Quarterly	8	8	0	0.1	0.25	0.15		
Nitrate	mg/L	Quarterly	8	8	0	<1	2.5	1.375		
Sulphate	mg/L	Quarterly	8	8	0	0.7	77	49.8375		
Gross Alpha Activity	Bq/L	6 monthly	4	4	0	<0.040	<0.0700	<0.0550	-	FSS Health Support Qld
K40 Corrected	Bq/L	6 monthly	4	4	0	<0.080	<0.100	<0.0925	-	FSS Health

Beta Activity										Support Qld
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Table 7: Verification Monitoring results Pesticides - Prairie Source

ParameterER	Units	Frequency of Sampling	Total No. Samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Mean	Limit of reporting	Laboratory name
Aldrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Dieldrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Aldrin & Dieldrin ⁷	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Chlordane cis	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Chlordane trans	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Chlordane	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
DDD (pp)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
DDE (pp)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
DDT(op)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
DDT (pp)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total DDT	µg/L	Quarterly	16	0	0	<0.8	<0.8	<0.8	0.4	FSS Health Support Qld
Dicofol	µg/L	Quarterly	16	0	0	<2.9	<2.9	<2.9	1.5	FSS Health Support Qld
a-Endosulfan	µg/L	Quarterly	16	0	0	<1	<1	<1	0.2	FSS Health Support Qld
b-Endosulfan	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.2	FSS Health Support Qld
Endosulfan Sulfate	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Endosulfan	µg/L	Quarterly	16	0	0	<1.4	<1.4	<1.4	0.6	FSS Health Support Qld

⁷ Reporting limits are based not on instrument sensitivities, but on sample reproducibility. In the presence of potential interferences etc. which occur in natural waters we set reporting limits where we are confident in the reproducibility of the reported value - the instrument detection limit is often a factor of 10 or more lower.

For the organochlorine pesticides, they have been banned for a number of decades and we do not often see any such residues in the environment. If any such residues were detected we would confirm their presence and quantification via an alternative detection method. Whilst we are reporting a value of < 0.4 ug/L for Total Aldrin & Dieldrin and for Total Heptachlor, the individual components are reported at a lower level, and we can detect their presence well below the guideline values.

If any residues were detected we can confirm down to 0.06 ug/L for each of these total values.

Heptachlor	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Heptachlor Epoxide	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Heptachlor ⁸	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Lindane (g-HCH)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Methoxychlor	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Oxychlorthane	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Azinphos-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Bromophos-ethyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Carbophenothion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Chlorfenvinphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Chlorpyrifos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Diazinon	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Dichlorvos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Dimethoate	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Omethoate	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Total Dimethoate	µg/L	Quarterly	16	0	0	<0.6	<0.6	<0.6	0.3	FSS Health Support Qld
Disulfoton	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Ethion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Ethoprophos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenamiphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenchlorphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenitrothion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenthion (methyl)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld

⁸ Reporting limits are based not on instrument sensitivities, but on sample reproducibility. In the presence of potential interferences etc. which occur in natural waters we set reporting limits where we are confident in the reproducibility of the reported value - the instrument detection limit is often a factor of 10 or more lower.

For the organochlorine pesticides, they have been banned for a number of decades and we do not often see any such residues in the environment. If any such residues were detected we would confirm their presence and quantification via an alternative detection method. Whilst we are reporting a value of < 0.4 ug/L for Total Aldrin & Dieldrin and for Total Heptachlor, the individual components are reported at a lower level, and we can detect their presence well below the guideline values.

If any residues were detected we can confirm down to 0.06 ug/L for each of these total values.

Malathion (Maldison)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Methidathion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Mevinphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Monocrotophos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Parathion (ethyl)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Parathion-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pirimiphos-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Profenofos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pyrazophos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Sulprofos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Temephos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Terbufos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Tetrachlorvinphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Ametryn	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Atrazine	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Bromacil	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Diuron	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Fluometuron	µg/L	Quarterly	16	0	0	<0.04	<0.04	<0.04	0.02	FSS Health Support Qld
Hexazinone	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Metolachlor	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Simazine	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Terbutryn	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Amitraz	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Diclofop-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Haloxyfop-2-etotyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Haloxyfop-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Metribuzin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Molinate	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pendimethalin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Propanil	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Propazine	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Terbuthylazine	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld

Trifluralin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Captan	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Carbaryl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fipronil	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Piperonyl Butoxide	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pirimicarb	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Propargite	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Propiconazole	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Triadimefon	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Triadimefon	µg/L	Quarterly	16	0	0	<0.6	<0.6	<0.6	0.3	FSS Health Support Qld
Bioresmethrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Cyfluthrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Cypermethrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.5	FSS Health Support Qld
Deltamethrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenvalerate	µg/L	Quarterly				<0.2	<0.2	<0.2	0.1	
Permethrin	µg/L	Quarterly				<0.2	<0.2	<0.2	0.1	

Table 8: Verification and operational results - Prairie reticulation

Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of reporting	Laboratory name
Aluminium	mg/L	Quarterly	12	2	0	<0.003	0.02	0.0045	0.003	FSS Health Support Qld
Antimony	mg/L	Quarterly	12	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Arsenic	mg/L	Quarterly	12	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Barium	mg/L	Quarterly	12	12	0	0.01	0.19	0.074	0.0001	FSS Health Support Qld
Beryllium	mg/L	Quarterly	12	1	0	<0.0001	0.0003	0.000116667	0.0001	FSS Health Support Qld
Bismuth	mg/L	Quarterly	3	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Boron	mg/L	Quarterly	12	12	0	0.023	0.26	0.2025	0.0001	FSS Health Support Qld
Cadmium	mg/L	Quarterly	12	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Chromium	mg/L	Quarterly	12	1	0	<0.0001	0.0002	0.000108333	0.0001	FSS Health Support Qld
Cobalt	mg/L	Quarterly	12	1	0	<0.0001	0.0003	0.000116667	0.0001	FSS Health Support Qld
Copper	mg/L	Quarterly	12	8	0	<0.001	0.031	0.008416667	0.001	FSS Health Support Qld
Iron	mg/L	Quarterly	12	12	0	0.013	1.2	0.140083333	0.005	FSS Health Support Qld
Lead	mg/L	Quarterly	12	7	0	<0.0001	0.0032	0.0005	0.0001	FSS Health Support Qld
Mercury	mg/L	Quarterly	12	0	0	<0.0001	<0.0001	<0.0001	0.001	FSS Health Support Qld
Manganese	mg/L	Quarterly	12	12	0	0.007	0.29	0.048175	0.0001	FSS Health Support Qld
Molybdenum	mg/L	Quarterly	12	7	0	<0.0001	0.0011	0.000991667	0.0001	FSS Health Support Qld
Nickel	mg/L	Quarterly	12	10	0	<0.0001	0.0036	0.000466667	0.0001	FSS Health Support Qld &

										In-house
Selenium	mg/L	Quarterly	12	0	0	<0.0010	<0.0010	<0.0010	0.0001	FSS Health Support Qld
Silver	mg/L	Quarterly	12	0	0	<0.001	<0.001	<0.001	0.001	
Strontium	mg/L	Quarterly	12	12	0	0.023	0.69	0.614416667	0.0001	
Thallium	mg/L	Quarterly	12	1	0	<0.0001	0.0002	0.000108333	0.0001	
Tin	mg/L	Quarterly	12	4		0.0001	0.0004	0.000175	0.0001	
Titanium	mg/L	Quarterly	12	0	0	0.001	0.001	0.001	0.001	
Uranium	mg/L	Quarterly	12	1	0	<0.0001	0.0003	0.000116667	0.0001	
Vanadium	mg/L	Quarterly	12	1	0	0.0001	0.0002	0.000108333	0.0001	
Zinc	mg/L	Quarterly	12	12	0	0.002	0.021	0.006593667	0.001	
Conductivity	mg/L	Quarterly	12	12	0	1200.0000	1250.0000	1219.166667		
pH		Quarterly	12	12	0	8.1200	8.3700	8.199166667		
Total Hardness	mg/L	Quarterly	12	12	0	90.0000	93.0000	91.08333333		
Temporary Hardness	mg/L	Quarterly	12	12	0	90.0000	93.0000	91.08333333		
Alkalinity	mg/L	Quarterly	12	12	0	144.0000	149.0000	146.25		
Residual Alkalinity	mg/L	Quarterly	12	12	0	1.1000	1.2000	1.108333333		
Silica	mg/L	Quarterly	12	12	0	19.0000	20.0000	19.25		
TDI	mg/L	Quarterly	12	12	0	728.0000	767.0000	745.1666667		
TDS	mg/L	Quarterly	12	12	0	659.0000	969.0000	698.4166667		
True Colour	Hazen	Quarterly	12	12	0	<1.0000	<1.0000	<1		
Turbidity	NTU	Quarterly	12	12	0	<1.0000	4.0000	1.416666667		
Sodium	mg/L	Quarterly	12	12	0	210.0000	230.0000	216.8333333		
Potassium	mg/L	Quarterly	12	12	0	5.8000	6.0000	5.875		
Calcium	mg/L	Quarterly	12	12	0	24.0000	28.0000	24.91666667		
Magnesium	mg/L	Quarterly	12	12	0	4.9000	7.3000	6.95		
Hydrogen	mg/L	Quarterly	12	12	0	0.0000	0.0000	0		
Bicarbonate	mg/L	Quarterly	12	12	0	172.0000	178.0000	174.4166667		
Carbonate	mg/L	Quarterly	12	12	0	1.5000	2.9000	1.941666667		
Hydroxide	mg/L	Quarterly	12	12	0	0.0000	0.0000	0		
Chloride	mg/L	Quarterly	12	12	0	240.0000	250.0000	245		
Fluoride	mg/L	Quarterly	12	12	0	0.1000	0.1600	0.113333333		
Nitrate	mg/L	Quarterly	12	12	0	1.0000	1.0000	1		
Sulphate	mg/L	Quarterly	12	12	0	69.0000	70.0000	69.41666667		
Chlorine (operational)	mg/L	3 times a week	184			0	1.57	0.253		

Table 9: Verification Monitoring Results - Torrens Creek Source Water

Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of reporting	Laboratory name
Aluminium	mg/L	Quarterly	4	2	0	<0.003	0.008	0.00475	0.003	FSS Health Support Qld
Antimony	mg/L	Quarterly	4	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Arsenic	mg/L	Quarterly	4	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Barium	mg/L	Quarterly	4	4	0	0.19	0.22	0.2025	0.0001	FSS Health Support Qld
Beryllium	mg/L	Quarterly	4	4	0	0.0002	0.0003	0.00025	0.0001	FSS Health Support Qld
Bismuth	mg/L	Quarterly	1	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Boron	mg/L	Quarterly	4	4	0	0.036	0.046	0.04025	0.0001	FSS Health Support Qld
Cadmium	mg/L	Quarterly	4	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Chromium	mg/L	Quarterly	4	0	0	<0.0001	0.0002	0.000125	0.0001	FSS Health Support Qld
Cobalt	mg/L	Quarterly	4	4	0	0.0002	0.0005	0.000375	0.0001	FSS Health Support Qld
Copper	mg/L	Quarterly	4	4	0	0.001	0.005	0.0025	0.001	FSS Health Support Qld
Iron	mg/L	Quarterly	4	4	0	0.005	0.38	0.20725	0.005	FSS Health Support Qld
Lead	mg/L	Quarterly	4	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Mercury	mg/L	Quarterly	4	0	0	<0.0001	<0.0001	<0.0001	0.001	FSS Health Support Qld
Manganese	mg/L	Quarterly	4	4	0	0.023	0.33	0.10075	0.0001	FSS Health Support Qld
Molybdenum	mg/L	Quarterly	4	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld

Nickel	mg/L	Quarterly	4	4	0	0.0032	0.0045	0.0038	0.0001	FSS Health Support Qld & In-house
Selenium	mg/L	Quarterly	4	4	0	0.0003	0.001	0.000825	0.0001	FSS Health Support Qld
Silver	mg/L	Quarterly	4	0	0	<0.001	<0.001	<0.001	0.001	
Strontium	mg/L	Quarterly	4	4		0.023	0.024	0.0235	0.0001	
Thallium	mg/L	Quarterly	4	0	0	0.0002	0.0003	0.000225	0.0001	
Tin	mg/L	Quarterly	4	1	0	<0.0001	0.0003	0.00015	0.0001	
Titanium	mg/L	Quarterly	4	0	0	<0.001	<0.001	<0.001	0.001	
Uranium	mg/L	Quarterly	4	3	0	<0.0001	0.0002	0.000175	0.0001	
Vanadium	mg/L	Quarterly	4	0	0	<0.0001	<0.0001	<0.0001	0.0001	
Zinc	mg/L	Quarterly	4	4	0	0.01	0.018	0.01325	0.001	
Conductivity	mg/L	Quarterly	4	4	0	208	233	218.5		
pH		Quarterly	4	4	0	6.44	6.56	6.5225		
Total Hardness	mg/L	Quarterly	4	4	0	24	27	25.25		
Temporary Hardness	mg/L	Quarterly	4	4	0	24	27	25.25		
Alkalinity	mg/L	Quarterly	4	4	0	32	39	36.75		
Residual Alkalinity	mg/L	Quarterly	4	4	0	0.03	0.3	0.1575		
Silica	mg/L	Quarterly	4	4	0	14	15	14.75		
TDI	mg/L	Quarterly	4	4	0	126	138	132.25		
TDS	mg/L	Quarterly	4	4	0	120	129	123.75		
True Colour	Hazen	Quarterly	4	4	0	1	1	1		
Turbidity	NTU	Quarterly	4	4	0	1	1	1		
Sodium	mg/L	Quarterly	4	4	0	23	26	24.25		
Potassium	mg/L	Quarterly	4	4	0	11	14	12.75		
Calcium	mg/L	Quarterly	4	4	0	1.3	1.5	1.4		
Magnesium	mg/L	Quarterly	4	4	0	5	5.8	5.35		
Hydrogen	mg/L	Quarterly	4	4	0	0	0	0		
Bicarbonate	mg/L	Quarterly	4	4	0	40	48	45		
Carbonate	mg/L	Quarterly	4	4	0	0	0	0		
Hydroxide	mg/L	Quarterly	4	4	0	0	0	0		
Chloride	mg/L	Quarterly	4	4	0	34	45	39		
Fluoride	mg/L	Quarterly	4	4	0	0.05	0.08	0.0575		
Nitrate	mg/L	Quarterly	4	4	0	1.4	1.6	1.5		
Sulphate	mg/L	Quarterly	4	4	0	3.8	4	3.95		
Gross Alpha Activity	Bq/L	6 monthly	2	2	0	<0.040	0.4400±0.0900	0.2400	-	FSS Health Support Qld

K40 Corrected Beta Activity	Bq/L	6 monthly	2	2	0	<0.080	<0.100	<0.0900	-	FSS Health Support Qld
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Table 10: Verification Monitoring pesticides results - Torrens Creek Source Water

ParameterER	Units	Frequency of Sampling	Total No. Samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Mean	Limit of reporting	Laboratory name
Aldrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Dieldrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Aldrin & Dieldrin ⁹	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Chlordane cis	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Chlordane trans	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Chlordane	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
DDD (pp)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
DDE (pp)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
DDT(op)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
DDT (pp)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total DDT	µg/L	Quarterly	16	0	0	<0.8	<0.8	<0.8	0.4	FSS Health Support Qld
Dicofol	µg/L	Quarterly	16	0	0	<2.9	<3	<2.95	1.5	FSS Health Support Qld
a-Endosulfan	µg/L	Quarterly	16	0	0	<1	<1	<1	0.2	FSS Health Support Qld
b-Endosulfan	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.2	FSS Health Support Qld
Endosulfan Sulfate	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld

⁹ Reporting limits are based not on instrument sensitivities, but on sample reproducibility. In the presence of potential interferences etc. which occur in natural waters we set reporting limits where we are confident in the reproducibility of the reported value - the instrument detection limit is often a factor of 10 or more lower.

For the organochlorine pesticides, they have been banned for a number of decades and we do not often see any such residues in the environment. If any such residues were detected we would confirm their presence and quantification via an alternative detection method. Whilst we are reporting a value of < 0.4 µg/L for Total Aldrin & Dieldrin and for Total Heptachlor, the individual components are reported at a lower level, and we can detect their presence well below the guideline values.

If any residues were detected we can confirm down to 0.06 µg/L for each of these total values.

Total Endosulfan	µg/L	Quarterly	16	0	0	<1.4	<1.4	<1.4	0.6	FSS Health Support Qld
Heptachlor	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Heptachlor Epoxide	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Heptachlor ¹⁰	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Lindane (g-HCH)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Methoxychlor	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Oxychlorthane	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Azinphos-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Bromophos-ethyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Carbophenothion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Chlorfenvinphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Chlorpyrifos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Diazinon	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Dichlorvos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Dimethoate	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Omethoate	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Total Dimethoate	µg/L	Quarterly	16	0	0	<0.6	<0.6	<0.6	0.3	FSS Health Support Qld
Disulfoton	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Ethion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Ethoprophos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenamiphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenclorophos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenitrothion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld

¹⁰ Reporting limits are based not on instrument sensitivities, but on sample reproducibility. In the presence of potential interferences etc. which occur in natural waters we set reporting limits where we are confident in the reproducibility of the reported value - the instrument detection limit is often a factor of 10 or more lower.

For the organochlorine pesticides, they have been banned for a number of decades and we do not often see any such residues in the environment. If any such residues were detected we would confirm their presence and quantification via an alternative detection method. Whilst we are reporting a value of < 0.4 ug/L for Total Aldrin & Dieldrin and for Total Heptachlor, the individual components are reported at a lower level, and we can detect their presence well below the guideline values.

If any residues were detected we can confirm down to 0.06 ug/L for each of these total values.

Fenthion (methyl)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Malathion (Maldison)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Methidathion	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Mevinphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Monocrotophos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Parathion (ethyl)	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Parathion-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pirimiphos-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Profenofos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pyrazophos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Sulprofos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Temephos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Terbufos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Tetrachlorvinphos	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Ametryn	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Atrazine	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Bromacil	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Diuron	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Fluometuron	µg/L	Quarterly	16	0	0	<0.04	<0.04	<0.04	0.02	FSS Health Support Qld
Hexazinone	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Metolachlor	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Simazine	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Terbutryn	µg/L	Quarterly	16	0	0	<0.02	<0.02	<0.02	0.01	FSS Health Support Qld
Amitraz	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Diclofop-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Haloxyfop-2-etotyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Haloxyfop-methyl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Metribuzin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Molinate	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pendimethalin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Propanil	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Propazine	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld

Terbutylazine	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Trifluralin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Captan	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Carbaryl	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fipronil	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Piperonyl Butoxide	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Pirimicarb	µg/L	Quarterly	16	0	0	<0.4	<0.4	<0.4	0.2	FSS Health Support Qld
Propargite	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Propiconazole	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Triadimefon	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Total Triadimefon	µg/L	Quarterly	16	0	0	<0.6	<0.6	<0.6	0.3	FSS Health Support Qld
Bioresmethrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Cyfluthrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Cypermethrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.5	FSS Health Support Qld
Deltamethrin	µg/L	Quarterly	16	0	0	<0.2	<0.2	<0.2	0.1	FSS Health Support Qld
Fenvalerate	µg/L	Quarterly				<0.2	<0.2	<0.2	0.1	
Permethrin	µg/L	Quarterly				<0.2	<0.2	<0.2	0.1	

Table 11: Verification Monitoring and operational results Torrens Creek reticulation

Parameter	Units	Frequency of sampling	Total No. samples collected	No. of samples in which parameter was detected	No. of samples exceeding water quality criteria	Min	Max	Average (Mean)	Limit of reporting	Laboratory name
Aluminium	mg/L	Quarterly	11	11	0	0.0090	0.0540	0.0237	0.003	FSS Health Support Qld
Antimony	mg/L	Quarterly	11	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Arsenic	mg/L	Quarterly	11	5	0	<0.0001	0.0004	0.0002	0.0001	FSS Health Support Qld
Barium	mg/L	Quarterly	11	11	0	0.0160	0.2200	0.1805	0.0001	FSS Health Support Qld
Beryllium	mg/L	Quarterly	11	0	0	<0.0001	0.0004	0.0003	0.0001	FSS Health Support Qld
Bismuth	mg/L	Quarterly	11	11	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health

										Support Qld
Boron	mg/L	Quarterly	11	11	0	0.0360	0.0470	0.0415	0.0001	FSS Health Support Qld
Cadmium	mg/L	Quarterly	11	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Chromium	mg/L	Quarterly	11	0	0	<0.0001	0.0003	0.0001	0.0001	FSS Health Support Qld
Cobalt	mg/L	Quarterly	11	11	0	0.0002	0.0005	0.0003	0.0001	FSS Health Support Qld
Copper	mg/L	Quarterly	11	11	0	0.0130	0.0440	0.0240	0.001	FSS Health Support Qld
Iron	mg/L	Quarterly	11	11	0	0.3800	2.6000	0.9782	0.005	FSS Health Support Qld
Lead	mg/L	Quarterly	11	11	0	0.0004	0.0034	0.0016	0.0001	FSS Health Support Qld
Mercury	mg/L	Quarterly	11	1	0	<0.0001	0.0002	0.0001	0.001	FSS Health Support Qld
Manganese	mg/L	Quarterly	11	11	0	0.0130	0.1700	0.0382	0.0001	FSS Health Support Qld
Molybdenum	mg/L	Quarterly	11	0	0	<0.0001	<0.0001	<0.0001	0.0001	FSS Health Support Qld
Nickel	mg/L	Quarterly	11	11	0	0.0030	0.0049	0.0037	0.0001	FSS Health Support Qld & In-house
Selenium	mg/L	Quarterly	11	111	0	0.0003	0.0010	0.0008	0.0001	FSS Health Support Qld
Silver	mg/L	Quarterly	11	0	0	<0.0010	<0.0010	<0.0010	0.001	
Strontium	mg/L	Quarterly	11	11	0	0.0220	0.0790	0.0339	0.0001	
Thallium	mg/L	Quarterly	11	0	0	<0.0001	0.0002	0.0001	0.0001	
Tin	mg/L	Quarterly	11	5	0	<0.0001	0.0009	0.0003	0.0001	
Titanium	mg/L	Quarterly	11	0	0	<0.0010	0.0020	0.0011	0.001	
Uranium	mg/L	Quarterly	11	11	0	0.0002	0.0005	0.0003	0.0001	
Vanadium	mg/L	Quarterly	11	3	0	<0.0001	0.0004	0.0002	0.0001	
Zinc	mg/L	Quarterly	11	11	0	0.0190	0.0490	0.0303	0.001	
Conductivity	mg/L	Quarterly	11	11	0	208.0000	245.0000	219.6364		
pH		Quarterly	11	11	0	6.5200	6.9500	6.6900		
Total Hardness	mg/L	Quarterly	11	11	0	12.0000	33.0000	24.9091		
Temporary Hardness	mg/L	Quarterly	11	11	0	12.0000	33.0000	24.9091		

Alkalinity	mg/L	Quarterly	11	11	0	38.0000	47.0000	40.6364		
Residual Alkalinity	mg/L	Quarterly	11	11	0	0.2000	0.3000	0.2909		
Silica	mg/L	Quarterly	11	11	0	14.0000	15.0000	14.6364		
TDI	mg/L	Quarterly	11	11	0	128.0000	151.0000	136.0909		
TDS	mg/L	Quarterly	11	11	0	119.0000	138.0000	125.5455		
True Colour	Hazen	Quarterly	11	11	0	1.0000	1.0000	1.0000		
Turbidity	NTU	Quarterly	11	11	0	2.0000	18.0000	6.2727		
Sodium	mg/L	Quarterly	11	11	0	22.0000	26.0000	23.7273		
Potassium	mg/L	Quarterly	11	11	0	12.0000	14.0000	13.4545		
Calcium	mg/L	Quarterly	11	11	0	1.4000	6.1000	2.3091		
Magnesium	mg/L	Quarterly	11	11	0	4.3000	5.7000	4.9182		
Hydrogen	mg/L	Quarterly	11	11	0	0.0000	0.0000	0.0000		
Bicarbonate	mg/L	Quarterly	11	11	0	46.0000	57.0000	49.4545		
Carbonate	mg/L	Quarterly	11	11	0	0.0000	0.0000	0.0000		
Hydroxide	mg/L	Quarterly	11	11	0	0.0000	0.0000	0.0000		
Chloride	mg/L	Quarterly	11	11	0	34.0000	41.0000	36.5455		
Fluoride	mg/L	Quarterly	11	11	0	0.0500	0.0900	0.0573		
Nitrate	mg/L	Quarterly	11	11	0	1.4000	1.6000	1.4727		
Sulphate	mg/L	Quarterly	11	11	0	4.0000	5.0000	4.1091		
Chlorine (operational)	mg/L	3 times a week	179			0.04	0.86	0.248		

Double click to edit in Excel. Copy and paste table and caption for each scheme. The original Excel tool is accessible at www.dews.qld.gov.au.

Table 12 - Reticulation *E. coli* verification monitoring

Drinking water scheme: Hughenden

Year	2016/2017											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	11	36	27	27	66	23	26	27	35	24	30	21
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	5	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	329	339	335	342	381	369	367	366	366	362	364	353
No. of failures for previous 12 month period	0	0	0	0	5	5	5	5	5	5	5	5
% of samples that comply	100.0%	100.0%	100.0%	100.0%	98.7%	98.6%	98.6%	98.6%	98.6%	98.6%	98.6%	98.6%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2005* (the regulation) requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement comes into effect once you have 12 months data and should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Prairie

Year	2016/2017											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
No. of samples collected	1	3	3	3	3	3	3	3	3	5	5	2
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	42	40	39	37	37	34	34	34	34	36	38	37
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2005* (the regulation) requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement comes into effect once you have 12 months data and should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Drinking water scheme: Torrens Creek

Year	2016/2017											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
No. of samples collected	1	3	3	3	3	3	3	3	3	3	3	2
No. of samples collected in which <i>E. coli</i> is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	37	37	37	37	37	34	34	34	34	34	34	33
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

CALCULATE PERCENTAGE USING A TWELVE (12) MONTH 'ROLLING' ANNUAL VALUE

The *Public Health Regulation 2005* (the regulation) requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

This requirement comes into effect once you have 12 months data and should be assessed every month based on the previous 12 months data (so that it is a 'rolling' assessment).

Appendix B – Implementation of the DWQMP Risk Management Improvement Program

Please note that a new amended RMIP has been submitted to DEWS for review. The RMIP presented below does not reflect the amended version.

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
IP-1	Bore Head improvement program	Mounding of concrete around bore heads, replacement/Maintenance of slabs. Sealing of possible ingress sites. Short-term: Investigation of works required and cost estimates. Long-term: upgrade	Interim: Ongoing inspection and maintenance. Short-term: 30th April 2014 Long-term: Commencing July 2014 – finish 2017.	In Progress	Inspection of the bores occurs on a weekly basis. Any ingress sites are sealed when discovered. This is an ongoing project.
IP-2	Bunding for Fuel & Chlorine storage	Installation of Bunding for Chlorine storage in Torrens Creek. This will occur during the upgrades.	Completed	Completed	

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
IP-3	Investigation of options for improving the integrity of bore casings	Inspection of selected bores with cameras in order to establish what work is required. Options can be explored once Council has up-to-date data.	Completed	Completed	
IP-4	Long-term replacement program for bore casements	Dependent on outcome from IP-3. Once options have been explored Council can develop a long-term replacement program.	Dependent on IP-3	In Progress	
IP-5	Bore Replacement Program	Money is currently put aside each year in order to fund new bores. The need for a new bore/ conditioning of old bores is highly dependent upon the outcome of IP-3.	Ongoing	In Progress	Engineering Department are developing program.

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
IP-6	Chlorination at Hughenden	Installation of Chlorination equipment. Equipment is able to be housed in same facility as Fluoridation equipment. Short-term: Design Criteria and costing Long-term: Installation	Short-term: 30th June 2014 Long-term: 30th June 2018 (fast-tracked if there are ongoing issues).	In Progress	A concept design report has been prepared. Council to go to tender for provision and installation of equipment. GH&D have completed the final design and money has been put aside in the 2017/2018 Budget..
IP-7	Chlorination at Torrens Creek	Installation of ORP system at Torrens Creek. Interim: Currently upgrading water storage and installing Infinity filter for Iron & Manganese. Short-term: Establish tank turn-over (will hand dose with chlorine during this time). Long-term: Chlorination system installed	Completed	Completed	Completed

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
IP-8	Installation of Chlorine dosing pumps in Prairie	Equipment has been purchased for installation of two dosing pumps and one analyser.	Completed	Completed	

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
IP-9	Investigation of Reticulation Network	Investigation into condition of reticulation network and detailed assessment of water demands - Require reliable records for Mains Breaks. The following information is to be gathered each time there is a Mains Break: the pipe material, condition estimate, depth of the pipe and the type of soil. This information is then passed on to the DOE and QA/Asset Manager so that it can be entered into a graphical database (map info). Users will then be able to access a map of the reticulation network with various layers that will include; breaks, repairs, additions, type of pipe and condition. Interim: Ongoing data collection. Short-term: Record collection and set-up of GIS system Long-term: Ongoing data collection and updates of system Network analysis of Hughenden will be undertaken by GHD upon completion up changes to Hughenden's delivery system (Move from Demand-Supply to Supply-Demand).	Interim: Ongoing Short-term: 30th June 2014 Long-term: Ongoing from 30th June 2014	In Progress	

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
IP-10	Air Scouring Program For Flinders.	Investigation into the cost of hiring contractors to undertake work. A program will be developed once costs are established. Interim: Ongoing flushing of Mains. Short-term: Investigation and cost analysis Long-term: Development of program.	Interim: Ongoing Short-term: 30th June 2014 Long-term: 30th June 2016 (Program implemented after this date).	In Progress	Engineering department has recently completed analysis of water and sewerage assets. This data will be utilised or the program.

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
IP-11	Long-term plan for the looping of Mains in Hughenden	Looping of mains in order to avoid dead-ends. Will utilise information gathered during investigation of the reticulation network. Interim: Ongoing flushing of mains. Short-term: Design and Cost analysis. Long-term: Implementation of program (starting from 15/16 financial year).	Interim: Ongoing. Short-term: 30th December 2014 Long-term: 15/16 financial year (start date).	In Progress	
IP-12	Register of Chemical Validation	Develop chemical validation process.	Completed	Completed	

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
IP-13	Investigation of security at Prairie Stock Bore & investigate possibility of increasing volume of water from town bore.	Consult with Rural Lands Officer regarding ability of Council to fence the Stock Bore (currently on a stock route – non Council land). Interim: Investigate Short-term: Obtain approvals and develop cost estimates. Long-term: Installation.	Interim:30th December 2013 Short-term:30th June 2014 Long-term:30th June 2018	In Progress	Council's Rural lands Officer is investigating different fencing options. Project may be pushed back to future budget. Pushed back due to Budget constraints.
IP-14	Upgrade of Fencing at Torrens Creek Bore and Reservoir compound	A new fence will be installed at the Torrens Creek reservoir once the new compound is finished. The fencing of the old bore will also be upgraded. The upgrade is currently occurring.	Reservoir fence completed. Bore fence to bed added to 2017/2018 budget with the aim to complete June 2018.	In Progress	

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
IP-15	Operational and Maintenance Procedures	Update, obtain approval and implement the following procedures: Water & Sewerage quality monitoring (procedures & calibration of equipment) Response to poor bacteriological results Response to customer complaints Imposing water restrictions Equipment/asset failure Mains breaks procedures Develop, obtain approval and implement the following procedures: Drinking Water Quality Incident Response Manual Environmental Incident Plan Operation and Maintenance of pumps Mains flushing and scouring Disconnection and restoration of water supply After hours calls Flow/pressure test Contingency plan – failure of source or Retic Contingency plan – power failure Contingency plan – failure of trunk Mains	Updated by 31st March 2014 Approved by 30th April 2014 Completed Developed by 30th April 2014 Approved by 31st May 2014 Completed	Completed	

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
		Develop, obtain approval and implement the following procedures: Hydrant Maintenance Valve Maintenance Valve repairs Maintenance of switchboards Locating water services	Developed by 30th November 2014 Approved by 31st December 2014 Completed		

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
IP-16	Development of training program for Water officers	Investigation of training requirements for water officers. Develop program and implement program. Fluoridation training provided by supplier of Fluoridation equipment. Interim: Investigation into training required, courses offered and cost. Short-term: Provision of Fluoridation training. Long-term: Cert training for Water Officers.	Interim: Ongoing Short-term: 30th June 2014 Fluoride training: Completed Cert training: Long-term:TBA	In Progress	Plumbers have recently finished Fluoride course. Dependent upon the upgrade to the Hughenden STP and Water Treatment Plant. Officers will undertake training in both areas.
IP-17	Induction program for new water staff	Development of water specific induction training for water officers & 'Take 5's'.	31 st Dec 2017 – needs to be updated to include new STP.	In Progress	

IP item	Action	Description	Target date/s	Status as of December 2016	Details and update
IP-18	Replacement of Lead-jointed concrete pipes	Ongoing replacement of Lead-jointed concrete pipes. Many pipes have been replaced over the past 4 years. Remaining pipes will be replaced. Interim: Ongoing monitoring of water, collection of data for GIS system. Short-term: Identification of pipes as per GIS system/design and costing for replacement of pipes. Long-term: Replacement of pipes in conjunction with road upgrade program.	Interim: Ongoing Short-term: 30th June 2015 Long-term: Ongoing from 30th June 2015.	In Progress	
IP-19	Investigation into connectivity of Torrens Creek bore to the River.	Interim: conduct monitoring of pesticides. Short-term: investigate trends of monitoring results and compare to flows in River. Long-term: dependent upon the results of the investigation.	Interim: Ongoing Short-term: 30th June 2014. Long-term: TBA	In Progress	