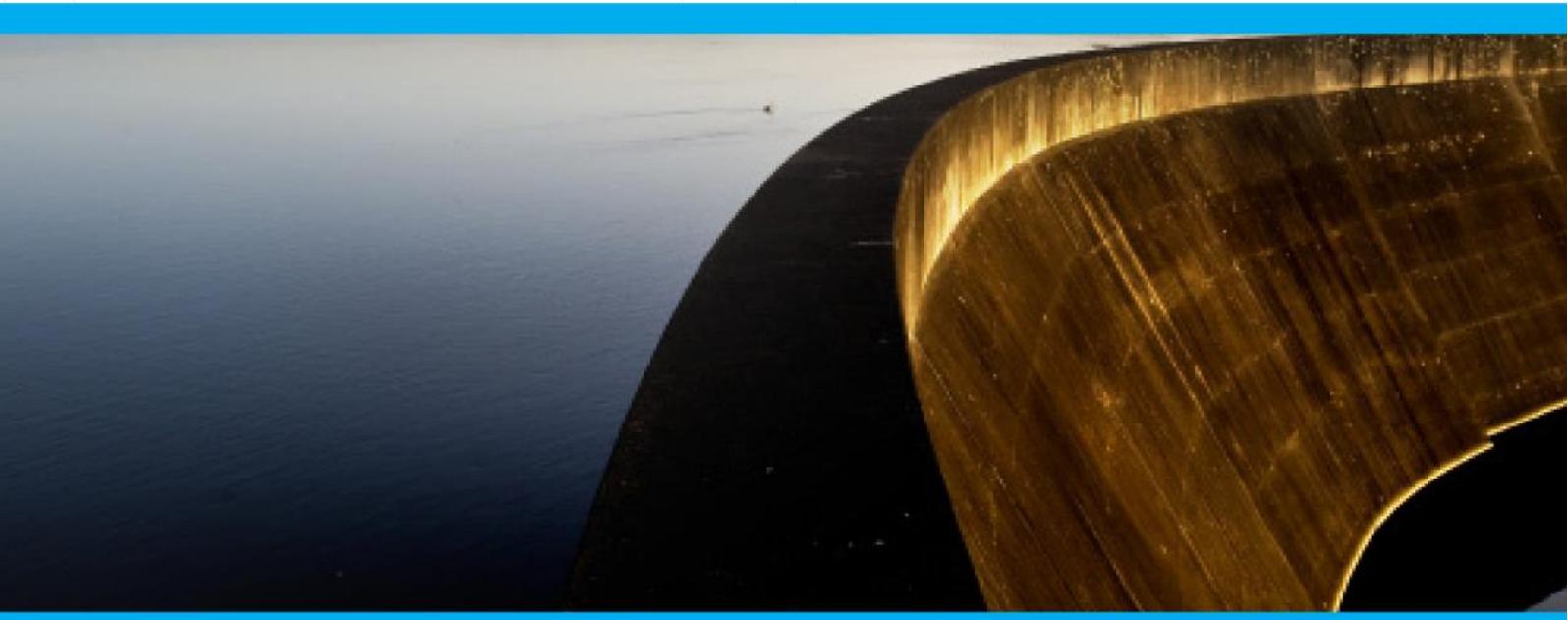


Drinking Water Quality Management Plan Report 2014-15

Seqwater (SP507) Drinking Water Quality Management Plan



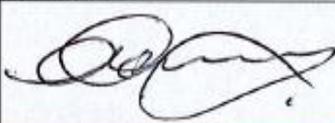
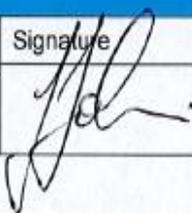
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1. Executive summary

The Queensland Bulk Water Supply Authority, trading as Seqwater (Seqwater), is responsible for Southeast Queensland's bulk water supply arrangements. This includes catchments, storages and water treatment plants and a number of small reticulation systems supplying recreation parks.

This is Seqwater's third annual *Drinking Water Quality Management Plan Report* (DWQMP report). It outlines the activities for the management of water quality risk and issues encountered during the period 1 July 2014 – 30 June 2015. During this reporting period, Seqwater met the approval conditions for its DWQMP.

Seqwater's operational and verification monitoring programs have occurred in accordance with the programs documented in the approved DWQMP. Operational monitoring includes process instrumentation and operator testing designed to assess the performance of preventive measures identified for particular hazardous events and to prompt requirements for corrective actions. The verification monitoring involves a sampling and analytical testing program which is predominantly undertaken by an external NATA-certified laboratory. Verification monitoring included 7600 source water (raw water) analyses, 47797 treated water analyses, and 39577 Supply System drinking water analyses. Additionally, source water monitoring such as catchment surveys and the use of passive samplers to detect micro-pollutants (for example, pesticides and pharmaceuticals) increased the total source water monitoring to over 40000 analyses.

Water treatment operations recorded four health-related exceedances and 10 aesthetic exceedances against the water quality criteria identified in the DWQMP, for the reporting period. In the Supply System, there were three health-related exceedances and no aesthetic exceedances. This represents an ongoing reduction in the number of exceedances compared with previous years. This result reflects the achievements made through the continuous improvement of Seqwater's drinking water quality management system.

Two of the health-related exceedances (*E.coli*) were most likely related to sampling contamination and are unlikely to be an indication of process failure against the DWQMP. The other health exceedances (a THM, bromate and three chlorate exceedances) were the result of disinfection byproduct issues. This includes the formation of THMs or bromate due to a reaction between precursor chemicals present in the source water and the disinfectant (sodium hypochlorite or ozone); and the formation of chlorate due to the degradation of the disinfectant (sodium hypochlorite) during manufacture, transport and on-site storage. Aesthetic exceedances continue to relate to source water conditions in certain catchments that contribute to elevated hardness or asset related issues that cause elevated turbidity in Seqwater's small-scale reticulation systems within its recreation parks. Seqwater continues to improve its systems and processes to prevent further exceedances.

Seqwater reported all incidents concerning health related guideline values to the regulator within the required timeframes. Additionally, one operational event was reported which related to operational fluoride monitoring at Molendinar WTP, where despite the shutdown of the dosing facility due to a fault during interlock testing, the fluoride concentration was observed in operational monitoring to be marginally above

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the ADWG value (of 1.5 mg/L) for a short duration. Grab sample monitoring confirmed that fluoride levels in the receiving distribution system remained within specification.

Drinking water quality management system improvement activities completed during the reporting year included 12 risk assessment reviews, 21 HACCP team meetings, 20 internal audits of treatment plants and supply system sites, and seven external (SAI Global™) audits for ISO 22000:2005 certification. These reviews and audits are part of a schedule that covers all of Seqwater’s treatment plants and supply system sites. The long-term improvement initiatives identified through these assessments and reviews have been captured in a consolidated Drinking Water Quality Improvement Plan.

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2. Introduction

2.1 Purpose

This annual report has been prepared in accordance with section 142 of the *Water Supply (Safety and Reliability) Act 2008* (refer to the Table below). The purpose of this annual report is to provide the Water Supply Regulator (WSR or the regulator) with information on the overall performance of the DWQMP for the period 1 July 2014 to 30 June 2015.

DWQMP Report Condition	Seqwater Compliance
<p>142 Drinking water quality management plan reports</p> <p>(1) This section applies for each financial year after a financial year in which a relevant service provider's drinking water quality management plan has been approved.</p> <p>(2) The provider must, unless the provider has a reasonable excuse—</p> <p>(a) prepare a report (a drinking water quality management plan report) for the financial year complying with this section and, if section 142C(2) applies to the provider, that subsection; and</p> <p>(b) give the regulator a copy of the report within 120 business days after the financial year ends.</p>	<p>The current report meets these requirements. It is required to be submitted 120 business days following the end of the 2014–15 financial year. Accordingly, submission for the current report is due by 17 December 2015.</p> <p>The current report has been prepared in accordance with the approval conditions of the DWQMP and the Regulator's guidance at https://www.dews.qld.gov.au/water-supply-regulations/service-providers/regulatory-reform/dwqmp-report.</p> <p>Section 142C(2) is not applicable.</p>
<p>142(3) The report must state or include all of the following—</p> <p>(a) the information required under the latest report requirement given to the provider;</p>	<p>This report provides an update on the implementation of the DWQMP in accordance with the approval conditions of its DWQMP and the above Regulatory guidance. Seqwater has not received any additional report requirements.</p> <p>Refer to Section 3 of this report.</p> <p>Refer to Section 7 of this report. A Review of the DWQMP was not required to be completed during the 2014-2015 year.</p> <p>Refer to Section 6 of this report. A Regular audit was not required to be undertaken during the 2014-2015 year.</p> <p>Refer to Section 5 of this report for details of incident/event reporting during the 2014-2015 year.</p>
<p>(b) the actions the provider took to implement the plan;</p>	
<p>(c) the outcome of any review of the plan in the financial year and how the provider has addressed matters raised in the review;</p>	
<p>(d) if a drinking water quality management plan audit report has been prepared for the financial year—a summary of its findings and any recommendations;</p>	
<p>(e) details of any information the provider gave the regulator under sections 102 and 102A in the financial year;</p>	

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DWQMP Report Condition	Seqwater Compliance
(f) details of the provider’s compliance with water quality criteria for drinking water;	Refer to Sections 3 and 5 of this report. Enclosure 1 provides the 2014-15 Water Quality Data report. This report also includes aesthetic criteria.
(g) if the provider supplies drinking water to customers—details of any complaints to the provider about the provider’s drinking water service.	Consumer complaints are managed by the downstream distribution and retail entities, with the exception of the small recreation park systems operated by Seqwater where there have been no recorded complaints. Accordingly, complaints are not detailed in this report.

2.2 Plan overview

Seqwater must comply with the Seqwater (SP507) Drinking Water Quality Management Plan (DWQMP) approved by the Regulator. The Seqwater DWQMP was developed under Chapter 2, Part 4, Division 1 of the Act. The DWQMP forms part of the corporate drinking water quality management system that Seqwater has implemented to cover all of its drinking water assets and activities that are captured by the Act. The Seqwater water quality management system has been developed to be consistent with the *Drinking Water Quality Management Plan Guideline (2010)* issued under the Act as well as the Framework for the Management of Drinking Water Quality within the *Australian Drinking Water Guidelines (ADWG, 2011)*. Accordingly, Seqwater adopts the multi-barrier approach for drinking water quality management.

Seqwater currently has responsibilities across all of these barriers, which include:

- Catchments
- Storages and dams
- Water treatment
- Disinfection
- Supply systems
- Distribution systems in recreation areas.

The Seqwater (SP507) DWQMP covers the drinking water quality management activities of Seqwater for all drinking water treatment plants and the bulk water supply systems managed by Seqwater. Accordingly, the plan applies to barriers including selective abstraction of the raw water to the management of bulk water supply assets and small distribution networks in Seqwater’s recreation areas.

The final barriers in the distribution system are predominantly managed by downstream Water Service Providers who provide distribution and connections with consumers in all systems except for Seqwater’s recreation area systems.

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3. Implementation of the DWQMP

Seqwater’s amended DWQMP received final approval from the Regulator on 18 March 2014. Amendments were made as part of the Review of the DWQMP, site-based HACCP plans (sub-plans) and Risk Assessments and these are detailed in section 6 of this report. Seqwater’s compliance with the conditions in the ‘Information Notice’ for its approved DWQMP is detailed in section 3.1. The risk assessment reviews completed during the 2014-2015 year are detailed in section 3.2.

Seqwater maintains an operational monitoring program which supports the multiple barrier approach to effectively manage drinking water quality as described in section 3.3. This includes the operational monitoring performed by the operators of the Water Treatment Plants. This monitoring is used to verify the operation of the plant and the accuracy of any online instrumentation available, the various Supervisory Control and Data Acquisition (SCADA) tools available at the Water Treatment Plants, and the Internal Process Laboratory results of key operational parameters. There have been no significant revisions to the operational monitoring program during the 2014-2015 year.

Seqwater’s verification monitoring plan covers a wide range of parameters that have been determined using a risk based approach and have been detailed in the DWQMP. The results of Seqwater’s verification monitoring during the 2014-2015 year are described in section 3.4 and a detailed data report in the format prescribed by the Regulator is provided in the spreadsheets at Enclosure 1. Verification monitoring, including sampling and analysis, is undertaken by an external NATA accredited laboratory and the results are recorded in the Seqwater’s Laboratory Information Management System (LIMS). There have been no variations to the verification monitoring program detailed in the approved DWQMP.

Seqwater has continuously sought improvement opportunities for drinking water quality management and the implementation of the actions in the risk management improvement program (known as the Drinking Water Quality Improvement Plan) during 2014-2015 as described in section 4.

3.1 Approval conditions

Seqwater was given final conditional approval of its amended DWQMP on the 18 March 2014 under sections 99(1)(b) and 100(3) of the Act. A summary of the approval conditions, and Seqwater’s compliance with them, is provided in the following table.

Condition	Compliance
No. 1. Water Quality Criteria	
Water quality criteria for drinking water including: <ul style="list-style-type: none"> i. The standards for drinking water quality prescribed in a regulation under the Public Health Act. ii. The criteria in any guideline, if any, made by the regulator about the quality of drinking 	Compliant. Seqwater has reported all non-compliance with relevant criteria including health guideline values in the ADWG and standards in the <i>Public Health Act</i> as identified through its verification monitoring program.

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Condition	Compliance
<p>water.</p> <p>iii. The criteria for drinking water made in a condition applicable to the DWQMP.</p> <p>For the purpose of (iii), the following applies:</p> <p>All parameters that have health guideline values in the ADWG are deemed to be water quality criteria. Aesthetic guideline values are not considered to be water quality criteria and are not required to be reported.</p> <p>Seqwater is required to implement the verification monitoring program in the approved DWQMP and report any non-compliance with the water quality criteria for the parameters monitored. Additionally, Seqwater must report any non-compliance with a health guideline value through monitoring or other activity that is not part of this program.</p>	<p>A review of the verification monitoring data report (Enclosure 1) found that all such non-compliances were covered by formal reports to the Regulator using the prescribed form.</p> <p>Seqwater has fully implemented its verification monitoring program.</p> <p>Seqwater is not aware of any non-compliance with the health guideline values in the ADWG that could have been identified through other monitoring including research activities.</p>
<p>No. 2. Additional Reporting requirements; (a) events and (b) where a parameter has no water quality criteria</p>	
<p>Additional reporting requirements include:</p> <p>(a) An event including anything that has happened to Seqwater's service which has escalated beyond its ability to control, and Seqwater believes, or is concerned, that public health may be impacted as a result.</p> <p>(b) Where a parameter has no water quality criteria which Seqwater believes cannot be managed under its DWQMP and Seqwater believes, or is concerned, that public health may be impacted.</p> <p>These reporting requirements must be reported to the regulator immediately and followed up in writing using the prescribed form within 24 hours.</p>	<p>Compliant.</p> <p>Seqwater has actively reported all events relating to its treatment operations which could have had the potential to impact on public health. Incident reports have included events where there was an increased risk profile.</p> <p>Seqwater routinely reports parameters which have no water quality criteria such as bromide, a potential contaminant resulting from the desalination treatment process.</p> <p>Reporting requirements are compliant.</p>
<p>No. 3. Research projects and additional reporting requirements</p>	
<p>If Seqwater becomes involved in any research activities and becomes aware of a detection that must be reported as:</p> <ul style="list-style-type: none"> Non-compliance with water quality criteria 	<p>Seqwater is not aware of any non-compliance with the health guideline values in the ADWG, events that could impact on public health, or detections of parameters without water quality criteria</p>

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Condition	Compliance
<ul style="list-style-type: none"> • An event • A parameter with no water quality criteria <p>The detection must be reported to the regulator immediately and followed up in writing using the prescribed form within 24 hours.</p>	that is identifiable from research activities.
No. 4. Financial outlays	
The State accepts no liability for any financial outlay incurred by Seqwater in complying with the drinking water quality management plan and the conditions in this approval	-

3.2 Risk assessment

Seqwater completed 12 risk assessment reviews for its drinking water quality management plans during the reporting year and these included Image Flat, Noosa, Landers Shute, Dayboro, Petrie, Molendinar, Mudgeeraba, Hinze, North Stradbroke Island, Kalbar, Kooralbyn and Rathdowney WTPs.

Seqwater’s remaining water treatment operations and the supply system are being reviewed in accordance with Seqwater’s schedule during the 2015-2016 year.

The findings from the recent risk assessment reviews are consistent with those reported in the 2014-2015 Report, i.e. the main risks identified did not significantly change, and in most cases pathogens are the predominant limiting hazard. The following presents a summary of the significant risk management improvements that have been identified from these recent reviews:

- In some cases the residual (mitigated) risks have been further reduced by capital upgrades as part of the regular asset management process.
- Process instrumentation and a SCADA upgrade have been completed at nearly all of Seqwater’s WTPs improving monitoring and alarming, and therefore reducing the risk of non-compliant water leaving the WTP. The new instruments have typically included:
 - Raw water turbidity alarms (if not already installed)
 - Settled water turbidity alarms
 - Pre and Post Clear water reservoir instruments for pH, free chlorine and turbidity.
- Improvements that have been identified through the risk assessment review process include increasing the interlocks between these instruments and plant operation. There are also a number of WTPs that are yet to have SCADA upgrades and are currently reliant on existing PLC and RAD-TEL systems.

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- Improvements that have been identified through incident management processes include protection from lightning strikes and power interruptions on control systems.

Seqwater is continuing to monitor its progress in these areas through its capital works and renewals programs and the implementation of its *Monitoring and Control System* project.

3.3 Operational monitoring

Water Treatment Plant operational monitoring

Operational monitoring in water treatment operations includes real-time monitoring through process instrumentation, operator grab sample tests and observations, and analytical laboratory testing undertaken by Seqwater’s process laboratories. Operational monitoring programs for each Water Treatment Plant (WTP) are designed to assess the performance of preventive measures identified for particular hazardous events and to prompt requirements for corrective actions.

Following the recommendations in the ADWG with regards to the reliance on operational monitoring, the site specific Hazard Analysis and Critical Control Point (HACCP) plans generally specify online monitoring as the Critical Limit monitoring. All potential exceedances are first verified, to rule out instrumentation measurement errors, and upon verification, are reported to the Drinking Water Quality team within a specified timeframe.

The main preventive measures are well established across all WTPs, with critical control points monitored by online instrumentation clearly identified in the process flow diagrams in each site-based HACCP Plan. Where possible, multiple levels of alarms for each online instrument through the SCADA system provide early warning of process control issues and early intervention by Operations staff. Additionally, some alarm set points are interlocked to shut the WTP down before Critical Limits are exceeded. The Critical Control Point (CCP) procedures have documented Action Limits, Critical Limits and key corrective actions including clear instructions for Operations staff and their supervisors on when the process is to be rated down or shut down as well as reporting requirements. Across Seqwater’s treatment operations, the operational monitoring system has worked successfully throughout the year with many improvements implemented.

Internal auditing (section 5) reviews the effectiveness of operational monitoring, alarm set points and the compliance with the CCP procedures. The main preventive measures typical of most WTPs are listed below with an update of the status of the preventive measures and operational monitoring.

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Preventive Measure	Related Hazardous Events	Operational Monitoring	Status
Coagulation	<ul style="list-style-type: none"> Raw water exceeds treatment capability Coagulant dosing failures Low alkalinity Poor pH control Poor or excessive mixing Incorrect dose rates Inadequate coagulation aids 	<ul style="list-style-type: none"> Dose water pH Chemical dosing alarms Observation checks of flocculation and sedimentation 	<p>Instrumentation for dosed water pH including alarming is established at all sites using alum as the coagulant and where pH regulation of the dosed water is in place. Additionally, the instrumentation and SCADA upgrade is providing settled water turbidity analysers and alarming across all of Seqwater's sites that have a clarification or Dissolved Air Flotation (DAF) process. Operator grab sample monitoring has been compliant with the WTP's HACCP plan which documents operational monitoring.</p>
Filtration	<ul style="list-style-type: none"> Raw water exceeds treatment capability Coagulation failure Solids carryover Poor backwashing Filtration break-through 	<ul style="list-style-type: none"> Online turbidity for each cell/filter outlet SCADA tools such as headloss, runtime / production 	<p>The instrumentation and SCADA upgrade is providing filtered water turbidity alarming across Seqwater's sites which consist of an interlock to plant operation or activate back washing, and dial-out to the on-call operator's mobile. Operator grab sample monitoring has been compliant with the WTP's HACCP plan which documents operational monitoring.</p>

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Preventive Measure	Related Hazardous Events	Operational Monitoring	Status
Disinfection (by Ultraviolet irradiation)	<ul style="list-style-type: none"> UV dosing failure Raw water exceeds treatment capability Coagulation failure Filter break-through causing shielding 	<ul style="list-style-type: none"> Online monitoring for UV intensity and flow UV transmittance (online or grab sample) monitoring Observation checks of the UV system status 	This is only applicable to sites that have insufficient pathogen treatment barriers for their catchments. This includes Kilcoy, Beaudesert and Kalbar WTPs where UV disinfection has worked effectively without significant issues/excursions. Projects are in place to install UV systems as part of upgrades at Capalaba, Dayboro and Kenilworth WTPs.
Disinfection (by chlorination)	<ul style="list-style-type: none"> Chlorine dosing failures Incorrect dose rates Poor pH control High flows – low contact time Low reservoir levels Contamination to reservoir Filter break-through causing shielding 	<ul style="list-style-type: none"> Online free chlorine after dosing and after contact time Online pH and turbidity after contact time Reservoir levels and flows Chemical dosing alarms 	The instrumentation and SCADA upgrade is providing filtered water turbidity alarming across Seqwater's sites which consist of an interlock to plant operation or activate back washing, and dial-out to the on-call operator's mobile. Operator grab sample monitoring has been compliant with the WTP's HACCP plan which documents operational monitoring.
Fluoridation	<ul style="list-style-type: none"> Overdosing fluoridation chemical 	<ul style="list-style-type: none"> Online fluoride monitoring pre and post on-site reservoir Operator fluoride monitoring – concentration by lab testing Operator monitoring – daily calculated fluoride dose using product weights and flow meter data. Chemical dosing alarms 	The fluoride dosing monitoring arrangements are fully established and documented. Operator testing and checks of the online monitoring system are performed at least daily. Queensland Health periodically audit fluoridation of the water supply at all Seqwater sites with fluoridation systems.

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Preventive Measure	Related Hazardous Events	Operational Monitoring	Status
Reticulation (recreation sites)	<ul style="list-style-type: none"> Ingress or infiltration Corrosion and deterioration of assets 	<ul style="list-style-type: none"> Observation Chlorine residual monitoring Demand monitoring (plant operation hours and reservoir levels) Vermin proofing inspections on reservoirs 	<p>Reticulation systems have been monitored by on-site staff to ensure that there is no ingress from vermin or through loss of positive pressure. This is scheduled through Preventive Maintenance work orders. If leaks occur, they would be detected by these inspections and the draw on the plant's capacity.</p> <p>Chlorine testing on recreation park taps is undertaken and backed up by verification monitoring at the same sample sites.</p>

Supply System operational monitoring

Operational monitoring in the DWQMP includes the planned sequence of measurements and observations to assess and confirm the performance of preventive measures identified for particular hazardous events. Measurements are of operational parameters that will indicate whether processes are functioning effectively. As part of the ADWG Framework, ISO22000 and HACCP standards, these operational measures have been identified and summarised within the Supply System DWQMP as Critical Control Points and Operational Pre-requisite Programs.

The preventive measures are well established within the business, with CCPs monitored by online instrumentation throughout the Supply System. Operation Centre staff are able to react to the Supply System exceedances when notified through the SCADA system. Alarming is programed into the SCADA system at three different incident levels, each defining the severity of the exceedance. Each incident level has documented contingency and escalation procedures for staff to follow. The overall operational monitoring system has worked successfully throughout the year.

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Seqwater monitors the Operational Pre-requisite Programs through internal auditing and compliance spot-checks. The main preventive measures are listed below, including an update of the status of each measure, with the main limiting hazard in most instances being pathogens. Risks requiring further treatment are listed in the improvement plan – refer to section 4.

Preventive Measure	Related Hazardous Events	Operational Monitoring	Status
Monthly Operating Supply Schedule (MOSS)	<ul style="list-style-type: none"> Non-compliant water supplied to the Supply System by Bulk Water Suppliers Deterioration of water quality in service reservoirs due to variable water ages 	This is issued monthly to the Drinking Water Quality team for review and to provide feedback on any foreseen issues arising from different source waters.	This formalised process continues as the Monthly Operating Supply Schedule (MOSS) at Seqwater. Water Quality issues are raised if there are concerns of any localised issues and the MOSS amended accordingly. E.g. Mt Crosby MIB & Geosmin issues.
Maintain Disinfection residual	<ul style="list-style-type: none"> Non-potable water or organic matter entering service reservoir or pipeline Contamination to reservoirs by access by third party Contamination to reservoir by vermin entry 	Chlorine, pH and temperature parameters are measured online at all Key Interface Points which are representative for each water zone. In some locations SUVA instruments are in place to provide further data. These signals are transferred and alarmed at the 24/7hrs attended operations center. Operations center escalation and corrective action procedures are audited routinely. Training is delivered for new operations center staff.	Established SCADA systems and critical limit alarming levels notify the operations center of low chlorine residual. Escalation procedures covering different severities of alarms are well established and are followed by operations center staff. Corrective actions are documented in a procedure and are followed by operations center staff and Supply System operations management. A documented procedure is allocated to maintaining chlorine residual and is used as a guideline for operational staff.
Service Reservoir Inspection Program	<ul style="list-style-type: none"> Ingress of non-potable water to reservoirs Vermin entry to reservoir Corrosion and deterioration of assets 	Service reservoir inspections are carried out monthly by the Service Contractor using a checklist and photo evidence process. These records are audited routinely to identify any deficiencies.	This process and water quality focused culture is now well established within the business. Any issues identified are raised and corrected through the work order system. Checklists and photos are checked monthly by Drinking Water Quality staff.

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Preventive Measure	Related Hazardous Events	Operational Monitoring	Status
Mains Hygiene Procedure	<ul style="list-style-type: none"> Stagnation of reservoirs and pipelines Commissioning new assets and pipelines Maintenance and operational changes 	This formalised procedure provides the process to prevent contamination of pipelines and reservoirs during maintenance activities. It also covers disinfection of assets prior to returning to service. Onsite compliance checks are routinely carried out to identify any deficiencies.	This process and water quality focused culture is now well established within the business. Training is delivered during the induction of new field staff. This process is now 'business as usual'
Locked and Alarmed Hatches on reservoirs	<ul style="list-style-type: none"> Contamination to reservoirs by access by third party 	All reservoirs are locked and alarm systems notify the 24/7hr operations center of any unauthorised access to grid reservoirs. Closed Circuit TV cameras are also in place at some reservoir sites. Security guards routinely patrol the reservoir sites.	The alarming of reservoirs is tested routinely with operations center staff well versed in the procedures if a security breach occurs. Access to these reservoirs is managed by Works Access and permit to work procedures.
Maintaining Positive Pressure	<ul style="list-style-type: none"> Ingress of non-potable water or organic matter to pipelines 	Pressure and flow is monitored online at locations throughout the grid. These are alarmed and notify the 24/7 operations center of any low pressure situations.	The operations center staff are well versed in the procedures to follow in the case that low pressure occurs within the Supply System. Planned and unplanned pipeline isolations are managed by the Mains Hygiene procedure.
Optimisation of re-chlorination through Automated control systems	<ul style="list-style-type: none"> Formation of disinfection by-products 	All chemical dosing facilities are comprehensively equipped with system redundancies including dual online instruments, UPS, multiple chemical dosing pumps, backup telemetries with multi-barrier alarming to the 24/7 operations center.	Control systems are well established and now have proven historical track records. The operations center has comprehensive documentation to assist in the control of these systems and is well versed in the procedures to operate these stations efficiently and effectively.
Pigging or super-chlorination of pipelines	<ul style="list-style-type: none"> High flow or changes in flow rate or direction in pipelines 	Turbidity and conductivity parameters are measured online at all Key Interface Points.	Routine cleaning programs for reservoirs are in place. However, the existing pipelines do not have a pigging program at this point in time. Biofilm testing has proven that biofilms are in low volume and pathogens have not been detected in the samples measured. High flows and direction changes are managed by the control systems and operating manuals by the operations center.

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3.4 Verification monitoring

The results of Seqwater’s verification monitoring during the 2014-2015 year are summarised below. There have been no variations to the approved monitoring programs such as missed sample runs. The detailed data report at Enclosure 1 is in the format prescribed by the Regulator. This program includes:

- the Scheme component (e.g. reticulation, source water)
- parameter
- unit of measure
- total number of samples collected (number of analyses)
- number of samples that did not meet the water quality criteria
- minimum concentration or count
- maximum concentration or count
- average (mean) concentration or count.

Analysis of Micro-pollutants using Passive Samplers

The sampling and analysis of micro-pollutants using a ‘passive sampler’ methodology began at the start of 2014-2015 for sites in the catchment where the sampling devices could be deployed. The micro-pollutants analysed included pesticides, pharmaceuticals and personal care products. The ‘passive sampler’ reports for sampling conducted during 2015 are also provided at Enclosure 2. There were no exceedances of the ADWG values for these chemicals observed during 2014-2015 using either grab sampling or passive sampling methodologies.

Compliance with DWQMP and Key Performance Indicators

Drinking Water Quality compliance is measured across supply zones using the methods recommended by the ADWG and the *Public Health Regulation 2005* (Public Health Regulation). A supply zone is defined as a WTP and if relevant, the connected downstream components of the Supply System. For Corporate Key Performance Indicator reporting, the water quality results from routine monitoring in each supply zone are assessed over a 12 month period against the water quality criteria, with the final report being issued in June each year. The methods are briefly described below:

- **Microbiological compliance** - A supply zone is compliant if at least 98% of routinely monitored samples do not exceed the water quality criteria, namely *E.coli* (as per Public Health Regulation).
- **Health related compliance** - For parameters sampled eight or more times during the year, the 95th percentile result of each health related parameter shall be used for assessment against the water quality criteria. For parameters sampled less than eight times per year, the maximum reading should be used for assessment against the water quality criteria. If any value is greater than the water quality criteria, then the whole zone is deemed non-compliant.
- **Aesthetic compliance** - the average of each parameter shall be assessed against the water quality criteria only if there are impacts to downstream users. If any value greater than the water quality criteria, then the whole zone is deemed non-compliant.

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Seqwater was assessed as compliant during the 2014-2015 reporting year for all of its water treatment operations and supply system zones for microbiological, health and aesthetic compliance. This was assessed on 47797 treated water analyses and 39577 supply system water analyses (a total of 87374 bulk water supply test results).

Water Treatment Plant verification monitoring

Verification monitoring occurred in accordance with the Seqwater Water Quality Verification Monitoring Plan. This was undertaken by the contracted NATA certified Laboratory Service Provider at Seqwater's raw water, treated water and recreation park distribution system sample points, covering 56 different parameters at various frequencies. The verification program provides the necessary information to validate that the preventive approach to water quality management is effective.

A summary table of verification monitoring of the treated or supply system (bulk) water from 1 July 2014 to 30 June 2015 is provided below. The statistics from verification monitoring results for all parameters for both source (raw) and treated water at each operational site is provided at Enclosure 1.

Name of scheme component	Number of Analyses Performed	Number of Individual ADWG Aesthetic Exceedances	Number of Individual ADWG/DWQMP Health Exceedances
Amity Point WTP	1150	0	0
Atkinson Dam WTP / Recreation Park	1321	0	0
Beaudesert WTP	1230	3	0
Boonah-Kalbar WTP	1265	3	0
Borumba Dam WTP / Recreation Park	1561	0	0
Canungra WTP	1174	0	0
Capalaba WTP	1422	0	0
Dayboro WTP	956	0	0
Dunwich WTP	1177	0	0
Esk WTP	1341	0	1
Gold Coast Desalination Plant	2096	0	0
Hinze Dam WTP / Recreation Park	1523	0	0
Image Flat WTP	1913	0	0
Jimna WTP	1180	0	0
Kenilworth	764	0	0

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Name of scheme component	Number of Analyses Performed	Number of Individual ADWG Aesthetic Exceedances	Number of Individual ADWG/DWQMP Health Exceedances
WTP			
Kilcoy WTP	1277	0	0
Kirkleagh WTP / Recreation Park	1572	0	0
Kooralbyn WTP	1388	0	0
Landers Shute WTP	1394	0	0
Linville WTP	940	0	0
Lowood WTP	1320	0	0
Maroon Dam WTP / Recreation Park	1439	0	0
Molendinar WTP	1187	0	0
Moogerah Dam WTP / Recreation Park	1471	1	0
Mt Crosby WTP	2410	0	0
Mudgeeraba WTP	1188	0	0
Noosa WTP	1767	0	3
North Pine WTP	1121	0	0
North Stradbroke Island WTP	1695	0	0
Petrie WTP	1288	0	0
Point Lookout WTP	1171	0	0
Rathdowney WTP	1318	0	0
Somerset Dam Township WTP	1694	3	0
Wivenhoe Dam WTP / Recreation Park	2084	0	0
Total	47797	10	4

Notes:

- (1) Ewen Maddock and Banksia Beach WTPs remained offline in 'cold standby' during the 2014-15 year and were not subject to verification monitoring whilst off-line.
- (2) Atkinson Dam and Linville WTPs which supply in stand-alone communities were taken off-line and supply demand was achieved by tankering water

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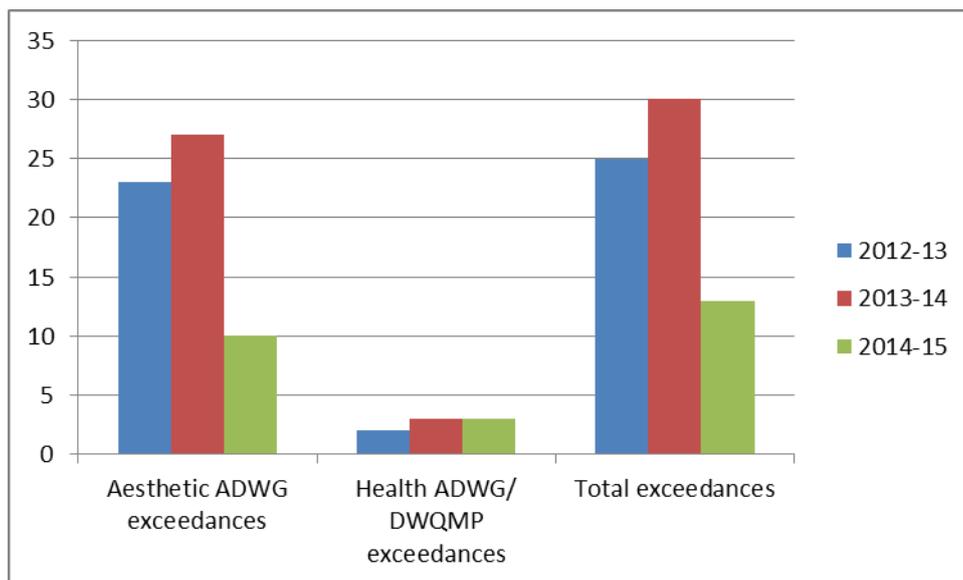
supplies from a nearby scheme; these sites continued to be monitored as treated water.

Analysis of the Water Treatment Plant verification monitoring data

Through an assessment of the water quality data from the verification program (47797 treated water and recreation distribution system drinking water analyses), it was found that the WTPs were compliant against the ADWG health guideline values for drinking water. However, there was an individual detection of *E.coli* at Esk WTP (incident report number: DWI-50700083); and bromate result above the health guideline value and two chlorate results above Seqwater’s drinking water quality criteria at Noosa WTP (incident report numbers: DWI-50700085, 87 & 88).

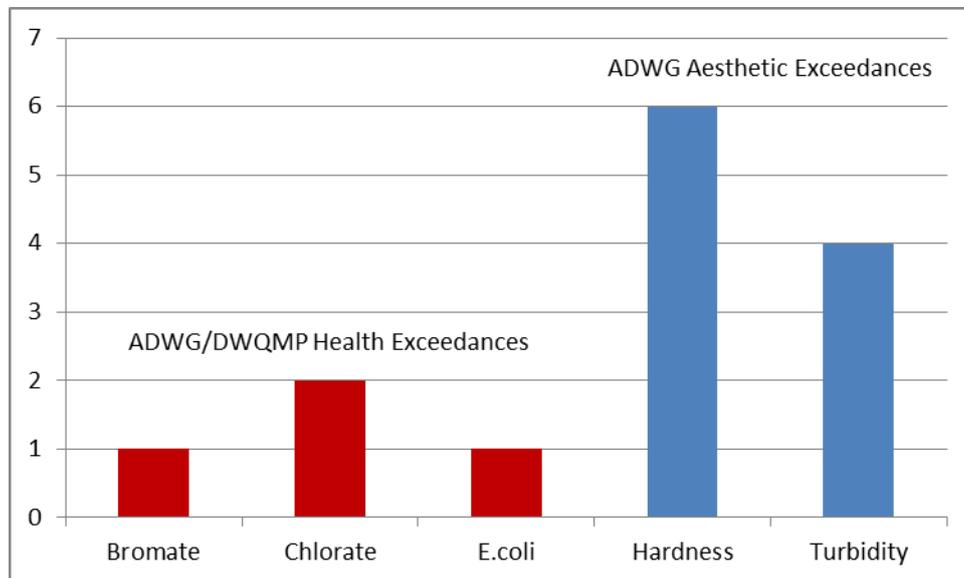
All of the health related exceedances were reported to the Regulator in accordance with section 102 of the Act and the approval conditions of the DWQMP. There was a delay in reporting the bromate exceedance that occurred on 22 December 2014 due to issues with the management of laboratory data. Seqwater receives significant amounts of data from its contracted laboratory and in this instance, both the contracted laboratory and Seqwater’s own Laboratory Information System failed to identify the exceedance. Accordingly, Seqwater only became aware and reported the bromate exceedance on the 28 July 2015. The contracted laboratory and Seqwater have rectified this issue concerning alarming and notifications within their databases.

The following chart shows an ongoing significant reduction in the number of exceedances since the 2012-13 reporting year. Overall, ADWG health related exceedances over the past three years have remained consistently low, between 2 – 4 exceedances per year, which a considerable achievement given the number of diverse schemes and systems. The number of aesthetic exceedances has decreased to 10 exceedances in 2014-2015 compared with 23 aesthetic exceedances observed in the 2012-2013 year and 27 exceedances in the 2013-2014 reporting year. Whilst this reduction reflects good operational practice, it is also related to source water conditions including aesthetic parameters such as hardness which is not treated at Seqwater’s conventional WTPs.



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The following chart details the exceedances according to the parameter and whether they were health or aesthetic based.



The isolated instances of ADWG health exceedances are not believed to be the result of HACCP failures. The *E.coli* detection was in the presence of significant residual chlorine concentrations and no operational disturbances were observed. Subsequent reviews into the external laboratory’s sampling methodology have been completed and the laboratory’s performance continues to be reviewed. Although there is no guideline value for chlorate in the ADWG, chlorate levels above 0.8 mg/L are reported as prescribed in Seqwater’s DWQMP. The chlorate exceedances relate to issues with the sodium hypochlorite chemical supply and onsite management of its storage, which is a supporting program for DWQ management at all sites using this chemical for disinfection. The bromate exceedance relates to elevated bromine in the raw water and its reaction with ozone which is used during the treatment process at some sites as both a disinfectant and to assist the removal of taste and odour compounds during BAC filtration.

The aesthetic exceedances predominantly relate to hardness in treated water produced from sites in the Scenic Rim areas and a small number of turbidity exceedances in two of Seqwater’s recreation park reticulation systems. The underlying cause for the hardness exceedances is associated with the raw water sources from which the WTPs draw and that the treatment process does not have the ability to treat these parameters. The turbidity exceedances observed have been due to stir up of sediment or scouring of biofilm from pipe walls in the reticulation system. Consequently, there have been short periods of time during the year when these individual instances have exceeded the maximum ADWG aesthetic values, while still meeting the compliance targets over the annual period.

Seqwater continues to seek and implement improvements for its treatment processes and preventive measures. With regards to continually improving water quality (for example, in accordance with Element 12 of the Framework for Management of Drinking Water Quality), these exceedances are considered in risk assessments and subsequent risk assessment reviews. Where mitigation of a risk has been

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determined to be inadequate (even for aesthetic parameters), an improvement action is recorded and its progress is regularly reviewed through Seqwater's Drinking Water Quality Improvement Plan.

Supply System verification monitoring

Verification monitoring occurred in accordance with the Supply System Water Quality Monitoring Plan. The monitoring plan was improved during the previous reporting year to adopt a risk-based approach and improve efficiency. Accordingly, the number of analyses for the supply system was reduced from 52257 tests during 2013-14 to 39577 tests during 2014-15.

Sampling and testing was undertaken by a contracted NATA-certified Laboratory Service Provider covering 56 different parameters with weekly and monthly routines scheduled in eight different zones. The verification program provides the necessary information to validate that the preventive approach to water quality management is working effectively.

The Supply System has been assessed as compliant for all eight zones for Microbiological, Health and Aesthetic compliance. Whilst water quality compliance has been achieved based on the assessment of long term trends over a 12 month period, some individual exceedances did occur within the Supply System during the 2014-2015 year and these are shown in the following table.

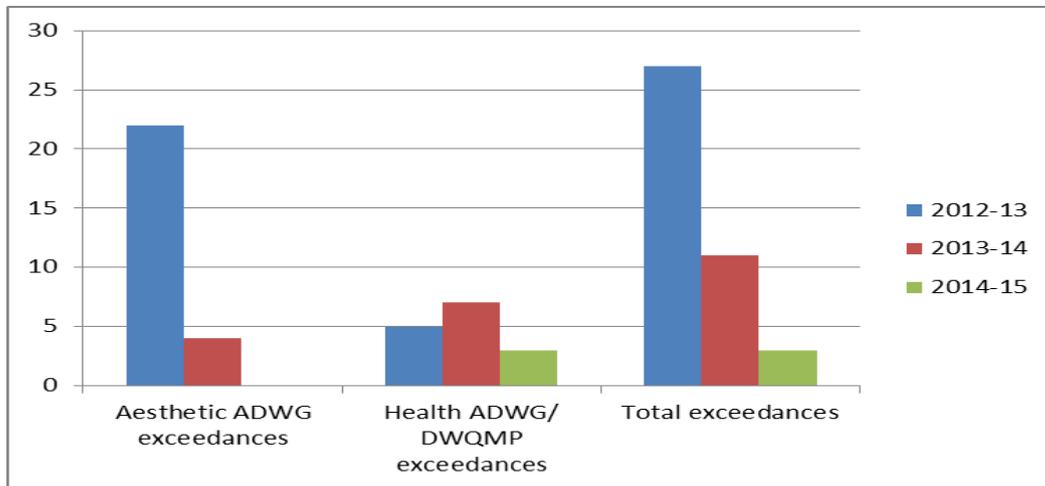
Name of scheme component	Number of Analyses Performed	Number of Individual ADWG Aesthetic Exceedances	Number of Individual ADWG/DWQMP Health Exceedances
Brisbane	12892	0	0
Eastern Pipeline Interconnector (EPI)	1877	0	0
Gold Coast	1243	0	0
Logan	3349	0	0
Network Integration Pipeline (NIP)	1973	0	0
Northern Pipeline Interconnector (NPI)	6570	0	0
Redlands	5639	0	1
Southern Regional Pipeline (SRP)	6034	0	2
Total	39577	0	3

Analysis of the Supply System verification monitoring data

There was a historical low of three ADWG/DWQMP-specified health exceedances and no aesthetic guideline exceedances for the supply system during 2014-15. The

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chart below shows an ongoing significant reduction in the number of exceedances since the 2012-13 reporting year. Although this result is partly supported by a reduction in monitoring to adopt a risk-based approach and improve efficiency, this improvement trend also demonstrates a successful year of operation.



The health guideline exceedances included one *E.coli* detection and this represents an ongoing a reduction from the previous reporting years with five *E.coli* detections during 2012-13 and three during 2013-14. The cause for the *E.coli* detections was investigated, and consistent with the detections in the past, there were significant chlorine levels present which indicate potential issues with the sample collection and analysis method.

The other exceedances observed during 2014-15 included Total Trihalomethanes and chlorate, both of which are disinfection byproducts. The cause and improvements to mitigate the chance of recurrence were identified through an investigation using the ICAM™ methodology. Trihalomethane formation was linked to bromide levels in the source water which reacts with sodium hypochlorite, the chemical used for disinfection at Mt Crosby WTP. Although there is no guideline value for chlorate in the ADWG, chlorate levels above 0.8 mg/L are reported in accordance with Seqwater's DWQMP. The elevated chlorate result was observed in the Southern Regional Pipeline (SRP) and found to be related to chemical stock management and the degradation of sodium hypochlorite, the chemical used for boosting chlorine disinfection at this site.

All of these health related exceedances were reported to the Regulator in accordance with section 102 of the Act and the DWQMP approval conditions.

The absence of aesthetic exceedances is supported by improved source water conditions where previous years have been affected by parameters such as hardness which is not amenable to treatment at Seqwater's conventional water treatment plants. The cause of the hardness issue is associated with the Mid-Brisbane river catchment from which Mt Crosby WTP draws water. Because neither of the Mt Crosby WTPs have the ability to reduce hardness levels, there have been short periods of time in the past when these levels have been in excess of the ADWG values in Supply System areas supplied by Mt Crosby including Brisbane, Logan and the SRP.

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4. Improvement plan

Improvements to the Water Treatment Operations and Supply System continue in accordance with the Drinking Water Quality Improvement Plan. These improvements (risk treatments) have been assessed to be necessary during the risk assessment to reduce risks that have been deemed unacceptable, as specified in the risk methodology in the DWQMP.

The progress that has been made during the 2014-2015 reporting year to reduce health related risks and improve reliability in providing safe drinking water supplies is tabled in the spreadsheets at Enclosure 2.

Any improvements which are yet to be implemented will be reassessed and prioritised through the internal audit schedule and the 2015 Risk Assessment reviews.

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5. Drinking water quality incidents

The following section summarises information given to the Regulator detailing:

- Non-compliances with the water quality criteria for drinking water, and the corrective and preventive actions undertaken in response to each non-compliance
- Prescribed incidents reported during the year, including the corrective and preventive actions that have been undertaken
- Comments on the effectiveness of any preventive/control measures.

A summary of incidents at Seqwater’s treatment operations and supply system that are reportable to the Regulator are shown in the following table. All incidents were reported within the required timeframes.

WSR Reference	Incident Location	Report Date	Cause / Corrective and Preventive Actions	Comments
DWI-507-00084	Alexandra Hills Reservoirs (<i>E.coli</i> 1 MPN/100 mL, 08/09/2014)	10/09/2014	Seqwater confirmed that there were no operational issues at Capalaba and NSI WTPs and that disinfection was within specification. Six additional samples taken in the same locality (including these WTPs) on the same day had no detection of <i>E.coli</i> . There was a chlorine residual of 1 mg/L at the time of sampling. Resampling and testing occurred to confirm that there were no issues.	As for the detection of <i>E.coli</i> at Esk WTP (see below), there were no indications that contamination of the water supply had actually occurred. Seqwater continues to work with its contracted laboratory to minimize the risk of sample contamination during sampling and transport of the sample to the laboratory.

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WSR Reference	Incident Location	Report Date	Cause / Corrective and Preventive Actions	Comments
DWI-507-00085	Esk WTP (<i>E.coli</i> 2 MPN/100 mL, 10/09/2014)	11/09/2014	Seqwater confirmed that there were no operational issues at Esk WTP and that disinfection was within specification. There was chlorine residual at the time of sampling of 2.3 mg/L. Resampling and testing occurred to confirm that there were no issues. The downstream distribution entity confirmed that they had no detections and that chlorine residuals were at normal levels in the distribution system.	There were no indications that contamination of the water supply had actually occurred. Seqwater continues to work with its contracted laboratory to minimize the risk of sample contamination during sampling and transport of the sample to the laboratory.
DWI-507-00086	Southern Regional Pipeline (SRP) – Molendinar (Total trihalomethane 0.29 mg/L, 11/02/2015)	20/02/2015	The affected water was from Mt Crosby WTP and had received break point chlorination at the Chambers Flat WQMF. This process combined with relatively long detention times in the SRP resulted in total THM formation above the ADWG limit. Seqwater reviewed the delivery of this water to the remainder of the SRP and the distribution system reservoirs and undertook further testing. The affected water was found to have been sufficiently diluted by blending with water supplied from the Gold Coast's WTPs so that water supplied to the community was below the ADWG limit.	An ICAM™ investigation was completed which identified the main precursors in Mt Crosby's source water for THM formation. It was recommended that a THM management plan be developed for treatment and transport of bulk water supplies to prevent recurrence in both the Seqwater and downstream entity supply systems. At the time of this report, this management plan has been completed and is being implemented.

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WSR Reference	Incident Location	Report Date	Cause / Corrective and Preventive Actions	Comments
DWI-507-00087	Noosa WTP (Chlorate 0.98 mg/L, 13/04/2015; and 1.11 mg/L, 20/04/2015)	22/04/2015	Seqwater confirmed the exceedance by retesting (internal laboratory result 1.11 mg/L, 22/04/2015). The sodium hypochlorite which was held on site was pumped out and replaced with fresh supplies. Seqwater confirmed the effectiveness of replacing the sodium hypochlorite through testing of the chemical and follow up testing of the treated water.	This exceedance is based on health criteria in Seqwater's DWQMP of 0.8 mg/L as no ADWG value exists for chlorate. Seqwater continues to implement and review its management of sodium hypochlorite supplies and on-site storage.
DWI-507-00088	Southern Regional Pipeline (SRP) – Stapylton (Chlorate, 0.99 mg/L, 22/04/2015)	29/04/2015	Seqwater reviewed the delivery of this water to the remainder of the SRP including off-takes to the distribution system reservoirs and undertook further testing. The affected water was found to have been sufficiently diluted by blending with water supplied from the Gold Coast's WTPs so that water supplied to the community was within the criteria in the Seqwater DWQMP.	As above for the chlorate exceedances at Noosa WTP, this is based on health criteria in Seqwater's DWQMP of 0.8 mg/L. Seqwater continues to implement and review its management of sodium hypochlorite supplies and on-site storage.

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WSR Reference	Incident Location	Report Date	Cause / Corrective and Preventive Actions	Comments
DWI-507-00089	Molendinar WTP Fluoride (Operational monitoring indicating Fluoride 1.5 – 1.7 mg/L for approximately 45 minutes on outlet mains)	26/06/2015	A minor operational overdose occurred during flow meter interlock testing of the fluoridation system before the interlocks on the online fluoride analysers shut down the system. The Fluoridation system was shut down and the treated water was tested by a series of grab samples. This confirmed that no affected water had left site and the on-site storages were not affected due to their large capacity and the short duration of the exceedance. Further sampling and testing in the distribution system confirmed that fluoride concentrations were not affected by the incident.	An ICAM™ investigation was completed which identified a number of recommendations for asset maintenance and project delivery to prevent recurrence. This included improvement of maintenance procedures/jobs plans and site acceptance following project completion.
DWI-507-00090	Noosa WTP (Bromate 0.021 mg/L, 22/12/2014)	28/07/2015	Short duration spike in the bromate concentration due to elevated levels of bromide in the source water which is subsequently oxidized during water treatment by the ozonation process step. A review of results found that this was an isolated occurrence with low bromide/bromate levels (less than the LOR of 0.05 mg/L) in the preceding and following weeks.	The most significant issue in this incident was that the exceedance was not identified by the contracted laboratory or Seqwater's Laboratory Information System (LIMS). This resulted in a delay in notifying the Water Supply Regulator as Seqwater only became aware of the exceedance during a review of its data for the 2014-15 reporting year. Both laboratories have reviewed their processes and LIMS systems to prevent recurrence.

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6. Audit of the plans

6.1 Audit of the DWQMP

Pursuant to section 11.2 of the *Information Notice* for the approval of Seqwater’s DWQMP (2014), an audit (Regular Audit) of the DWQMP is required every 4 years from the date of approval, with the first Regular Audit to be completed prior to 1 March 2016. Accordingly, a Regular Audit was not conducted during the 2014-2015 year. A summary of the findings and any recommendations of the first Regular Audit will be included in the 2015-16 DWQMP report.

6.2 Audits – water treatment and supply system operations

Internal audits – HACCP and Integrated Management System audits

Internal audits have been conducted throughout the year, in accordance with Seqwater’s HACCP and Integrated Management System audit schedules. The scope of the internal audits includes the site’s HACCP plan, Summary wall-chart, Critical Control Point procedures, Operational monitoring plan, and operator and maintenance records. It includes verification of the HACCP flow diagram and process flow diagram by the HACCP Team Leader and available operational staff from the HACCP team.

Internal audits have been conducted at 20 WTP and supply system sites and the Supply System Control Room. Seqwater’s remaining operational sites are scheduled for internal audits during the second half of the next reporting year (2015-2016) as part of a 2-yearly cycle.

All non-conformances, areas of concern and opportunities for improvement are delivered through engagement with operations staff and the use of Seqwater’s electronic document and record management systems and the Drinking Water Quality Improvement Plan processes.

In addition to these internal audits, Deloitte was commissioned by Seqwater to audit its systems including its DWQMP and confirm that all governance and formal obligations are achieved. The audit found that Seqwater was fully compliant against its water quality management obligations. The auditors only recommended opportunities for improving efficiency in how key performance data is collected.

External audits – ISO 22000 Certification and Surveillance audits

Seqwater has integrated the ISO22000:2005 Food Safety Management Systems standard into the DWQMP, as many of the requirements of the standard are consistent with or similar to the elements in the DWQMP which is based on the ADWG Framework. This standard promotes greater commitment from all parts of the business during DWQMP implementation and ensures the DWQMP becomes part of the Integrated Management System (IMS).

Seqwater has maintained ISO 22000 certification for the Supply System which was accredited to ex-LinkWater in June 2012. As part of the certification, the business is

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obligated to conduct surveillance audits. The first of the surveillance audits was conducted in May 2013 by SAI Global.

During May 2015, Seqwater successfully increased the scope of accreditation to include the amended DWQMP (overarching plan), the Supply System and additional sites including Molendinar, Mudgeeraba, Landers Shute, North Pine, Noosa and Image Flat WTPs. The audit findings found no Non-Conformance Reports (NCR) with the recommendation that the certification shall be awarded.

Seqwater is committed to the staged implementation of the ISO22000 standard and certification across the remainder of its main operational sites.

6.3 Aquality assessments

Seqwater has scheduled an Aquality assessment of its Drinking Water Quality Management System on a 2-yearly basis. Aquality is an assessment tool designed by Water Services Association of Australia (WSAA) to allow water service providers to go through every aspect of the Australian Drinking Water Guidelines Framework and measure how well it is understood, documented and implemented across their organisation. The assessment has been conducted internally at Seqwater through a series of targeted workshops involving staff representing management, operations, maintenance, incident management, training, community engagement, documentation, record keeping, audit and review.

The next Aquality assessment was completed in November 2015 and the results are expected to be provided in the 2015-16 DWQMP report.

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7. Regular review of the Plans

Pursuant to section 11.1 of the *Information Notice* for the approval of Seqwater's DWQMP (2014), Seqwater needs to complete a review of its Drinking Water Quality Management Plan (DWQMP) before 1 July 2016.

Seqwater expects to complete this review during early 2016. The outcome of the review and how any matters raised in the review have been addressed will be included in the 2015-16 DWQMP report.

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8. Glossary

ADWG	<i>Australian Drinking Water Guidelines 2011</i> , National Health and Medical Research Council, Commonwealth Government of Australia, Canberra
Aquality	An assessment tool developed by WSAA used for assessing the effectiveness of implementation of the DWQ Management system, based on the 12 elements of the ADWG 'Framework'.
COP	Code of Practice
CCP	Critical Control Point
DWQ	Drinking Water Quality
DWQMP	Drinking Water Quality Management Plan
EPI	Eastern Pipeline Inter-connector
HACCP	Hazard Analysis Critical Control Point. A food safety management system based on a set of guiding principles, known as HACCP Principles or Codex alimentarius.
ISO 22000	<i>ISO 22000:2005 Food Safety Management Systems</i> . International standard for food safety.
LIMS	Laboratory Information Management System
NIP	Network Integration Pipeline
NPI	Northern Pipeline Inter-connector
SCADA	Supervisory Communication and Data Acquisition (SCADA) system. Human to Process software interface.
SRP	Southern Regional Pipeline

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Supply System	Previously named the Bulk Distribution Network and formerly operated by LinkWater.
SUVA	Specific UltraViolet Absorbance
The Act	<i>Water Supply (Safety and Reliability) Act 2008</i>
The regulator	Water Supply Regulator
WSAA	Water Services Association of Australia
WSR	Water Supply Regulator
WTP	Water Treatment Plant

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9. Enclosures

- 1 – Verification monitoring 2014-15 Water Quality data report (TRIM ID: D15/180427)
- 2.1 - Catchment and Drinking Water Quality Micropollutant Monitoring Program – Entox Passive Sampling Winter 2014 Report (TRIM ID: D15/199448)
- 2.2 - Catchment and Drinking Water Quality Micropollutant Monitoring Program – Entox Passive Sampling Summer 2014-2015 Report (TRIM ID: D15/199449)
- 3 - Register of changes to DWQMP, HACCP plans and procedures - 2014-2015 (TRIM ID: D15/199453)
- 4 – Drinking Water Quality Improvement Plan – Progress with health-related risk improvements (TRIM ID: D15/198762)

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