

SUMMARY OF EVENTS AND INCIDENTS 2018

Scottish Water is required to tell the Drinking Water Quality Regulator for Scotland (DWQR) about events that could affect water quality. DWQR assesses all events and categorises them in consideration of their impact on public confidence in the water supply. There are five categories used with the three most severe declared by DWQR to be incidents.

Category	Not Significant	Minor	Significant	Serious	Major
No. of Events	728	130	18	4	1

The following tables detail the significant, serious and major events declared as incidents. Each individual incident assessment can be viewed on the DWQR website: <http://dwqr.scot/regulator-activity/water-quality-incidents/2018-incidents/>

© Crown copyright 2019

Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings.

Published for the Drinking Water Quality Regulator for Scotland, August 2019.

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
2 March 2018 For 17 hours Classification: Significant	Castle Moffat WTW, East Lothian, South Region	52,792	Treatment failure – aluminium	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> The incident was caused by a burst on the service water line due to extreme weather conditions. This reduced polyelectrolyte dosing, severely affecting the coagulation process. The affected service water line is located well inside a building and thus its freezing could not have reasonably been anticipated. Scottish water took all possible actions to minimise the extent of the incident. The lack of ability to run filtered water to waste greatly exacerbated the duration and severity of the incident. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Installed heat tracing to the service water pipe work & investigated rationalising this pipe work To consider fitting a run to waste facility on the filtered water To consider installing an auto shutdown facility on the inlet to the treatment works in the event of further polyelectrolyte dosing and coagulation failures
3 April 2018 For 2 days Classification: Significant	Herricks WTW, Aberdeenshire, East Region	5834	Treatment failure – detection of <i>Cryptosporidium</i>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> The incident was caused by problems with controlling water flows across the filters, creating water quality issues whenever a filter was removed for backwash. Additionally, an erratic flow pattern through the clarifier process during desludging of the units caused an increase in turbidity of the water passing forward onto the filters. DWQR declared this event due to concerns over conflicting information from instrumentation and the potential impact on raw water quality from a period of intense rainfall combining with activity to clean intake screens. Recommended increasing monitoring for <i>Cryptosporidium</i> in the final water leaving the treatment works pending provision and verification of an effective UV stage. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Investigated the performance of all turbidity instruments and coagulation pH instruments Investigated DAF (dissolved air flotation) and filter flow control improvement opportunities. Install UV treatment at the treatment works. Investigated and reported on filter back wash control and improvement opportunities for this. Instructed Scottish Water's Control Centre to call out all combined filtered alarms to the Water Operations Team until the monitor issues were resolved. Provided DWQR with a Letter of Commitment regarding improvements to treatment processes

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
<p>May 2018</p> <p>For 6 days followed by a second 6 day period</p> <p>Classification: Significant</p>	<p>Lismore Primary WTW, Argyll, North Region</p>	<p>10</p>	<p>Treatment failure – loss of disinfection</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a series of systematic failures. A fault with the dosed chlorine flow meter caused it to fail to send a signal to start chlorine dosing when the works started up. Additionally, due to alarm set-up and monitor labelling issues, the autosutdown of the works (programmed to initiate when chlorine drops below a certain level) failed to activate and the dosed chlorine alarm and the final water chlorine alarm both failed to generate. • Had there been adequate alarm visibility, the issue with the flow meter would have been detected and the incident would not have occurred. • When the second flow meter fault was noted, the Scottish Water operator correctly escalated the issue to the Public Health Team to take further samples and investigate the incident. However, the series of alarm failures meant the incident went unnoticed for two weeks. DWQR is concerned that no investigation was undertaken following the first failure. A review of telemetry at this time (even if only to identify when the flow meter had faulted) would have identified that dosing had ceased and that the alarm settings were wrong. • Recommended reviewing critical telemetry alarms on other remote treatment works. • Recommended investigating the time lag for alarms at other treatment works having short run times. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Changed the telemetry flag so that the alarm was assigned to the correct alarm group. • Agreed and disseminated a procedure for contacting Lismore Primary School in the event of a disinfection failure. • Communicated to the Operational Team Leader the need to escalate all instances of chlorine dosing failures and breaches of emergency action levels to the Public Health Team. • Reviewed and optimised the current water treatment works operation so that it runs for a longer period. • Ensured the Drinking Water Safety Plan risk assessment process for all WTW systems includes a consideration of generic risks from flow meter failure where this is critical to dosing control. • Revised the task schedule to include flow meter operation checks. • Reviewed the performance of Lismore Primary WTW with regard to its fitness for purpose.

Event Date, Duration & Classification	Area	Estimate of population affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
16 May 2018 For 12 days Classification: Serious	Craighead WTW, Aberdeenshire, East Region	5374	Treatment failure – manganese	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a pump failure that led to loss of flotation within the DAF (Dissolved Air Flotation) system. This problem was further exacerbated by the incapability of the treatment works to remove soluble manganese present within the raw water supply. • Although the situation was resolved within four hours, there is no facility to run the works to waste, thus poor quality water was passed forward to the filters and on through the works. • DWQR is content that staff took the necessary measures to resolve the immediate DAF process issue and monitor the effect on the supply by taking samples at consumers' taps. • Although the raw water reservoir aeration system is primarily in place to combat the algal issues in the reservoir that supplies Craighead WTW, it is believed to have benefits in the management of manganese levels. However, it had been allowed to remain unavailable for operation due to the need for maintenance and replacement pumps. It is unacceptable for key treatment or mitigation measures to be unavailable for activation to address these risks. • DWQR is concerned that the introduction of elevated levels of manganese into distribution systems increases the risk of discolouration of the water supply and future breaches of the standard at consumers' taps. • Recommended reviewing business processes to ensure works orders for maintenance of key treatment elements and equipment remain visible to senior operators and managers to ensure their timeous completion. • Recommended providing a quarterly report on progress with the construction of a new water treatment works. • Recommended commencing enhanced monitoring of raw water sources including the River Deveron for total and soluble manganese. • Recommended providing a report to DWQR on raw water manganese levels after one year of enhanced monitoring. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Repaired the faulty pump • Reviewed whether the pump failure can be incorporated in the shutdown sequence • Investigated and reported on what is required to reconfigure clear water pumps to duty / standby operation • Developed a raw water management process to minimise the risk of overloading the WTW • Assessed the benefits of the reservoir aeration system for managing manganese levels

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
29 May 2018 For 6 hours Classification: Significant	Rawburn WTW, Scottish Borders, South Region	18,867	Treatment failure – iron	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a fault with the pressure relief valve that controls the ferric coagulant dosing. This led to a loss of optimal coagulation, resulting in water with elevated iron levels and turbidity passing forward into the treatment process and ultimately into supply. • Scottish Water's Control Centre and operational staff reacted promptly and appropriately to the incident. • Sampling was undertaken over the following three days in distribution to assess the effect on consumers. However, due to a misunderstanding, the samples were not taken from a spread of properties and were all located in one street on the first day of sampling. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Replaced the faulty pressure relief valve. • Reviewed the alarm levels for ferric dosing flow. • Created a Maintenance Scheduled Task to check the operation of pressure relief valves on an annual basis and replace these as required. • Contacted sampling team leaders to ensure that distribution samples requested as part of the water quality event are spread across the distribution system unless otherwise directed by the Public Health Team.
31 May 2018 For 10 hours Classification: Significant	Carron Valley A Zone, Falkirk and West Lothian, West Region	4687	Network failure – turbidity, iron, manganese and aluminium	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by disturbance of deposits in the water main which was caused by a burst of a 9 inch main. The cause of the burst was likely due to ground movement following variations in ground temperature. • Scottish Water staff responded rapidly to the incident and generally managed it in a well co-ordinated manner. Efficient team working, both within Scottish Water and with external contractors, minimised disruption to consumers. • However, recovery was hampered by a seized geared valve on a main, and also by valves being inaccessible due to valve covers being tarred over. • It is disappointing and unacceptable that appropriate sampling was not carried out to determine the extent and duration of this incident. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Uncovered and surveyed the strategic geared valves and made these operable where possible • Reinforced Scottish Water's sampling process for Incident Working to all West region and customer NSOs (Network Service Operators).

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
1 Jun 2018 For 2 days Classification: Significant	Dufftown SR, Moray, East Region	2003	Network failure – turbidity, iron, manganese and aluminium	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> The incident was primarily caused by the drain down of the main and re-establishment of flow causing the disturbance of deposits in the supply main. A remotely operated vehicle float had been left in the reservoir following planned maintenance and had been drawn into the outlet pipe from the reservoir as the water level dropped within the SR (service reservoir) and was subsequently transported within the water mains to the meter point. Whilst Scottish Water’s response to the reduction in water pressure experienced by consumers was appropriate, there was inadequate consideration given to the potential for disturbance of water mains deposits on restoration of flows in the pipe to the reservoir. The effects of discoloration and the failures of standards could have been mitigated by more thorough flushing of the mains prior to activating the inlet to the SR. DWQR is particularly concerned at the inadequacy of the safeguards in place with contractors which permit equipment to be left within the reservoir after cleaning operations. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Investigated employing UPS (uninterruptible power supply) protection for telemetry. Reviewed the procedure for SR cleaning and added robot cleaning to this.
15 Jun 2018 For 5 days Classification: Significant	Lawton SR, Dundee, East Region	12,263	Storage point failure – microbiology	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> The incident was likely caused by a number of issues with the structural integrity of the service reservoir which permitted routes of ingress of surface water into the storage space from which contamination can arise. Scottish Water took the necessary actions to respond to this event, isolating the SR (service reservoir) and taking samples to verify there were no continuing issues for consumers. However, the incident could have been avoided. An investigation in response to similar microbiological failures in September 2016 identified actions to remove the tank from service for cleaning and investigation but this had not been carried out due to risks at the time to the security of supply from other utility works being carried out in close proximity to strategic water supply mains in the area. Had this been achieved, the defects would have been identified and the required repairs scheduled. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Completed remedial repairs to the SR. Relocated the secondary chlorine dosing to the inlet to the SR to improve mixing. Scottish Water will install a new bypass arrangement for the SR to make it easier to isolate the SR in the future.

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
27 Jun 2018 For 3 days Classification: Significant	Bonnycraig WTW, Scottish Borders, South Region	10,577	Treatment failure – detection of <i>Cryptosporidium</i>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> The incident was caused by faulty UV (ultra violet) sensors which caused the UV control to switch over from the duty to the standby reactor. Each of the faults then cleared and the duty reactor took over again after a three minute warm-up period. This changeover and back again caused UV intensity to drop below the required level to inactivate <i>Cryptosporidium</i> oocysts. Recommended updating the Treatment Operation and Maintenance Strategy procedure for UV systems installed for <i>Cryptosporidium</i> inactivation to reflect issues identified by the incident. DWQR has served an Enforcement Notice on Scottish Water for improvements at this site <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Ensured that spare UV sensors are stored on site. Added weekly tasks to work task scheduling to check filter outlet flow trends and complete required UV tasks and checked and reviewed common alarm functionality for the UV system. Investigated installing a combined filtered water turbidity monitor linked to telemetry. Modified the UV system software to prevent change-over after reactor faults clearing quickly. Agreed to review filtered water turbidity trends regularly and escalate individual filters with trends that are a cause for concern or are different from those of the other filters. Used the learning on filter flows and turbidity trends from this incident to produce and disseminate a report to the water operator team leaders and process scientists.
8 July 2018 For 9 days Classification: Significant	Tighnabruaich WTW, Argyll, West Region	1306	Treatment failure – turbidity and manganese	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> The incident was caused by disturbance of the manganese deposits from the limestone contactor. Low reservoir levels caused air to be drawn into the raw water main; the first open point for air to be dispersed at the WTW is the limestone contactor, so pockets of air in the system agitated manganese precipitates on the limestone. Since 2013 there have been eight events involving air ingress when reservoir levels were low which resulted in elevated manganese levels. However, the Drinking Water Safety Plan (DWSP) for Tighnabruaich WTW assessed the risk of such events as ‘unlikely’. Recommended that, following Scottish Water’s review of their Asset Capability study, Scottish Water report on the actions they will take to prevent further manganese events at the WTW. Required a review of the DWSP risk assessment for Tighnabruaich WTW to adequately reflect the risk from manganese and incorporate the findings of the Asset Capability study. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Scottish Water has identified a number of actions from its Asset Capability study which it is currently reviewing.

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
5 Jul 2018 For 8 hours Classification: Significant	Lochinvar WTW, Dumfries and Galloway, South Region	12,343	Treatment failure – loss of disinfection (chlorine)	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> The incident was caused by a mains power dip which caused the coagulation dosing pump to stop. A range of faults with the monitors and alarms at Lochinvar WTW meant that Scottish Water's Control Centre remained unaware of the problem until the final chlorine alarmed 7 hours later. DWQR's investigation has established that disinfection, although compromised, was still sufficient to achieve a compliant contact time. Recommended reviewing the Maintenance Scheduled Task procedure to ensure that all sites have regular end to end alarm testing. Recommended reviewing and updating the Drinking Water Safety Plan in the light of root causes and conclusions. Recommended circulating a copy of the incident report to all relevant business managers. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Reinforced the procedure for attending to Coagulation pH alarms to the South treatment teams Reviewed Lochinvar WTW's telemetry alarms and ensured that their settings are appropriate, Replaced the clarified water turbidity meter. Tested the alarms to check they are working and changed the clarified water pH alarm priority. Reviewed the coagulation pH Emergency Activation Level.
17 Jul 2018 For 5 days Classification: Significant	Iona New SR, Argyll, North Region	300	Storage point failure – microbiology	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> No definitive cause was found for this incident. No issues were uncovered with the sample handling, examination procedure, equipment or personnel. The water supplied from the SR (service reservoir) was found to be satisfactory, giving no cause for concern regarding ingress. The sample point was not enclosed within a stock-proof fence and the SR roof was covered in grass which may allow water pooling or conceal points of ingress, both of which could allow contamination to occur. Chlorine levels for Buinessan WTW and all associated service reservoirs were stable prior to and during the incident. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Arranged for Iona SR to be cleaned and investigated the removal of grass and earth from the roof of the SR subject to local planning restrictions. Ensured the sample tap and feed pipework are compliant with current Scottish Water specification requirements. Reviewed the sample failure investigation process to support improved root cause investigation

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
April 2018 Ongoing Classification: Serious	Bradan Zones, South and North Ayrshire, West Region	214,314	Network failure – iron	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • It is likely that elevated iron, turbidity, and discolouration of the supply were due to the introduction of the chloramination process at Bradan water treatment works. The change in the chemistry of the supply, along with the greater persistence of monochloramine, can increase corrosion, thereby increasing the leaching of metals from pipework and destabilising biofilms and entrapped pipe material deposits. Increased and variable flows through the network due to higher seasonal demand in the summer are likely to have caused a hydraulic disturbance, exacerbating the situation. An increase in water temperature, which will have increased chemical reactivity and microbiological activity was potentially an additional contributing factor. • Scottish Water quickly became aware of increased consumer contacts and iron and turbidity sample failures in the Bradan network and responded promptly. DWQR is satisfied that Scottish Water's initial targeted flushing of the system was a logical attempt to deal with discoloured water in the network. When this flushing did not improve the situation, Scottish Water drew on expertise from Sheffield University; advice given on low velocity flushing was followed, with equipment designed to strictly control flow to prevent further stripping of biofilm from pipework. This low velocity flushing is ongoing and the trend for consumer contacts and iron failures currently appears to be reducing. DWQR is content that Scottish Water is continuing to monitor and resource the situation. • Scottish Water set up a Focus Group to manage this ongoing incident and it is recommended that it regularly convenes until Scottish Water is satisfied that the incident is over, with updates to DWQR on a monthly basis to allow DWQR to continue to monitor the situation. • Lessons learned from this incident must be used to update Scottish Water's operational procedure for the implementation of chloramination into a chlorinated supply. • Examination of sample results show that the primary aim of the switch from chlorination to chloramination in the Bradan system in April 2018 has been successful, in that there has been a substantial reduction in the concentration of THMs (trihalomethanes) at consumers' taps, with little increase in THM levels in the distribution system. • Recommended Scottish Water report monthly to DWQR, until further notice is given, on progress with investigations and remedial works to reduce iron and turbidity sample failures and discoloured water consumer contacts in the Bradan network. • Recommended that Scottish Water provide DWQR with a sampling plan, which sets out the locations of on-line turbidity monitors in the Bradan network along with a schedule of parameters to be analysed and frequency of analysis that Scottish Water intends to follow over the course of 2019.

				<ul style="list-style-type: none"> • Recommended that Scottish Water review its procedure for the introduction of chloramination to ensure that supplies at risk from increased iron and turbidity failures from the network are adequately conditioned. • Recommended that Scottish Water investigate high free chlorine readings in the chloraminated Bradan zones and investigate the suitability of use of DPD (N,N-diethyl-p-phenylenediamine) for measuring free chlorine in chloraminated supplies and the potential for false positives. • Recommended Scottish Water make suitable methods available for the measurement of iron concentrations for field and bench testing equipment which give comparable results to laboratory analysis. • Recommended that Scottish Water carry out further investigation into the effectiveness of the disinfection of the Bradan supply, including the use of tracers, to confirm appropriate mixing and residence time in the clear water tank prior to the dosing of ammonium sulphate. • Recommended Scottish Water use flow cytometry data to better understand the Bradan network at different times of the year and under different hydraulic conditions and temperatures. • Recommended Scottish Water investigate the reasons for the change in cell counts in the final and distribution water as measured by flow cytometry from the months immediately prior to, during and after the introduction of chloramination to the Bradan supply and report conclusions to DWQR. • Recommended that Scottish Water consider the use of the measurement of soluble and insoluble iron concentrations in samples taken in the Bradan network. • Recommended Scottish Water carry out research or a literature review to determine the potential for increased corrosion of lead pipework in chloraminated water when compared to chlorinated supplies. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Reviewed water quality and network performance across the Bradan Supply Zone to establish whether a trunk main investigation is required and the size and timescale to undertake this. • Reviewed the actions arising from a meeting with experts at Sheffield University. • Reviewed flow meter operation within the Bradan network. • Initiated a soft flushing programme within the Bradan network. • Investigated the feasibility of carrying out flow cytometry sampling within the network. • Reviewed 'chlorine to chloramination' procedure in light of lessons learned from this incident • Reviewed and updated the drinking water safety plan in the light of the incident root causes and conclusions. • Circulated a copy of the incident report to all relevant business managers, including all Water Operations Managers, for information.
--	--	--	--	---

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
Summer 2018 For over 3 months Classification: Significant	Rosebery WTW and Zone, Midlothian, South Region	155,426	Treatment failure – taste and odour (algal breakdown products)	DWQR comments and findings: <ul style="list-style-type: none"> The incident was caused by the release of MIB (2-methylisoborneol) by algae in the raw water at Gladhouse reservoir. This was exacerbated by the structural condition of the reservoir which meant it was kept at a level of one meter below the spill level. The shallow reservoir and the hot weather experienced in summer 2018 produced optimal conditions for algal growth. There are no specific treatment options at Rosebery to remove MIB and Scottish Water took practical steps by changing the raw water blend, removing the supernatant return and rezoning the network to mitigate the impact of the taste and odour on consumers. The weather event was unprecedented. However, given that the Drinking Water Safety Plan for Rosebery lists the likelihood of geosmin and MIB as “almost certain”, acknowledges that current treatment processes will not remove them, and that a similar incident occurred at Carron Valley the previous year; it is disappointing that no previous planning had been done to prepare for such an event. Scottish Water actions: <ul style="list-style-type: none"> Set a raw water MIB trigger level for changing the raw water blend. Considered installation of an air curtain at the intake from Gladhouse reservoir. Considered the potential of other treatment options for reducing final MIB concentrations. Considered installation of a permanent supernatant run to waste facility.
13 Aug 2018 For approx. 3 months Classification: Major	Turriff Zone, Aberdeenshire, East Region	68,025	Treatment failure – taste and odour (algal breakdown products)	DWQR comments and findings: <ul style="list-style-type: none"> The incident was caused by the presence of high levels of MIB (2-methylisoborneol), a substance produced by the decomposition of microorganisms, in the raw water and this is most likely due to the increased abstraction of water from the River Deveron. There are no specific treatment operations at Turriff WTW to remove MIB. Although Scottish water took practical steps to try to enhance the process to mitigate the impact of the taste and odour on consumers, ultimately these could not be sustained. Scottish Water responded appropriately to the potential for algal growth in the raw water supply by increasing monitoring for the key algal species. With awareness of the emerging consumer concern, appropriate sampling was carried out in the distribution system & at consumers’ taps. Recommended investigating options for the use of PAC (powdered activated carbon) dosing or other additional emergency package filter plant to address future algal issues. Scottish Water actions: <ul style="list-style-type: none"> Reviewed the algae risk in the reservoir supplying Turriff WTW. Reviewed the future algae sampling programme.

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
September 2018 For 2 months Classification: Significant	Glenfarg WTW and zones, Perth and Kinross, East Region	170,000	Treatment failure – taste and odour (algal bloom breakdown products)	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> The incident was caused by the inability of the treatment works to satisfactorily deal with the changing quality of the raw water supply resulting from an algal bloom within the reservoir that serves Glenfarg WTW. DWQR is satisfied that the investigations and measures taken by Scottish Water to address the challenges placed on treatment process by the algal bloom were appropriate. This, however, is a known issue at this works and DWQR considers more should be done to ensure the readiness of the works to meet the treatment needs presented by the particular algal species found in these source waters. Recommended putting in place the necessary changes identified in capability studies to bring effective coagulation control, optimised clarifier performance and filter performance to address the algal challenge at this treatment works. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Reviewed and updated the drinking water safety plan in the light of the incident root causes and conclusions. Refurbished two rapid gravity filters and considered refurbishing the others. Agreed with DWQR the capability issues to be addressed and brought forward investment to progress these. Provided DWQR with a Letter of Commitment regarding investment at the site
19 Sep 2018 For 8 hours Classification: Serious	Perth WTW, Perth and Kinross, East Region	50,997	Treatment failure – aluminium	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> The incident was primarily caused by the actions taken by the operator to maintain production in the face of significant changes to the raw water quality. Scottish Water's investigation found errors in the adjustment of the aluminium sulphate dose and in restarting the plant at production flows instead of the minimum flow as stipulated in the operational procedure. It is clear that these were the key factors in the loss of control over the coagulation process. Recommended reiterating the need for early escalation of events at treatment works to team leaders and managers to allow timely support and resources to be arranged <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Re-emphasised the Treatment Operation and Maintenance Strategy procedure for dealing with loss of coagulation. Investigated pH correction improvements and reviewed & considered replacing the pH monitor. Reviewed the auto shutdown control parameters on coagulation pH levels. Reviewed the run to waste options at Perth WTW.

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
3 Oct 2018 For 18 hours Classification: Significant	Glassford SR, South Lanarkshire, South Region	8,601	Treatment failure – taste and odour (elevated chlorine levels)	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> The incident was caused by a loss of signal to the chlorine monitor's control unit. The resultant zero reading caused the secondary chlorine dosing to dose at its maximum. The Operator who attended the SR (service reservoir) did not understand the consequence of the lost signal and did not notice the increase in dosing by the pump. Recommended ensuring that Scottish Water's Control Centre's despatch tools highlight all SRs with secondary dosing. Recommended reviewing the need for Operators to attend SRs with secondary dosing at other sites and/or review Operator training for attending SRs with secondary dosing. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Repaired the SR outlet chlorine monitor. Investigated resizing the dosing pumps to a more appropriate size and whether to introduce dilution as an alternative. Added an Asset Note that highlights on the Scottish Water Control Centre dispatch tool that the site has secondary dosing controlled by the site residual which must be attended by ops. Ensured Treatment Operations carry out weekly checks of the secondary disinfection system due to its complexity.
1 Oct 2018 For 28 days Classification: Significant	Savalbeg WTW, Highland, West Region	923	Treatment failure – aluminium	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> The incident was caused by a combination of issues with the airlift pump and the condition of the media in the Dynasand filters. The resultant build-up of aluminium deposits was then displaced during a tankering operation and flushed into supply. DWQR is disappointed that recommendations made following a DWQR audit in 2017 were not implemented by the time of the incident as these may have resulted in earlier intervention. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> Removed and cleaned the sand from Dynasand 2 and replaced the Dynasand air lift pump. Reviewed the Dynasand filter sand speed measurements and recording. Cleaned the clear water tank and chlorine contact tank. Carried out remedial work on the pre-chlorine contact tank turbidity and aluminium monitors Installed a final aluminium monitor with a connection to telemetry. Updated the task schedule to include recording bench readings for final aluminium. Reviewed the procedure for tankering to the clear water tank with low water levels to minimise disturbance of any sediment.

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
11 Oct 2018 For 3 days Classification: Significant	North Hoy Orkney Zone, Orkney Islands, East Region	79	Treatment failure – trihalomethanes	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by a failure of the membrane plant which allowed unfiltered water to pass through the treatment process, resulting in a sudden increase in chlorine demand. • A failure to recognise the increased risk to health of possible <i>Cryptosporidium</i> oocysts passing through the membrane filters, meant that no monitoring for the parasite was instigated. • The actions to increase chlorine levels created the conditions for the generation of THMs (trihalomethanes) in the water supply as water with high organics content passed forward to react with the abnormally higher levels of chlorine. • The newly installed final chlorine monitor, which should have given an alert to the loss of disinfection, had not been configured to generate any alarms for low chlorine. • Scottish Water's Public Health Team did not generate any event notification to report the failure of filtration and disinfection to external health stakeholders and DWQR. This is a failure of Scottish Water's responsibilities under the Regulations. The process of event notification was not initiated until a failed THM sample on 11 October. However, this was not communicated to DWQR until a monthly summary report of events was issued on 21 December 2018. • Recommended Scottish Water review operational processes and failures of Management Systems to ensure timely notification of Operations events to supporting Scientific and Health Teams and to the required Regulatory and Health bodies. • Recommended Scottish Water ensure treatment staff are aware of the necessity to implement monitoring for <i>Cryptosporidium</i> at times of heightened risk. • Recommended Scottish Water carry out awareness raising sessions on the requirements to escalate Operations events to supporting Scientific and Health Teams. • Recommended Scottish Water carry out awareness raising sessions on the requirements for timely notification and reporting of investigations of Operations events to the required Regulatory and Health bodies. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Commissioned a new nanofiltration transportable treatment unit membrane plant. • Delivered treatment works operator awareness training. • Shared lessons learned with the Public Health Team and ensured teams are aware of the location of disinfection plans so that they can refer to them during disinfection events. • Implemented governance checks to ensure telemetry signals have an appropriate alarm. • Created an Emergency Action Level procedure and rolled this out to all teams. • Reiterated the need for early escalation of WTW events to team leaders and managers to allow timely support and resources to be arranged.

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
29 Oct 2018 For 4 days Classification: Significant	Spey Badentinan WTW, Moray East Region	20,959	Treatment failure – loss of disinfection (chloramination)	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by a failure to ensure the operability of the ammonia dosing pumps following the maintenance of the equipment. • Scottish Water advised that whilst there are reporting and checking procedures where external maintenance contractors carry out work on plant and equipment and checks are carried out, this is not necessarily done when in-house maintenance teams are utilised. This is an unacceptable gap in maintenance procedures that must be addressed. • Ammonia is added to the water after the primary disinfection stage to produce monochloramine as a means of ensuring a persisting disinfection of the supply and to reduce the potential for the formation of THMs (trihalomethanes) throughout the extensive distribution system. • Although routine bench tests showed no change in ammonia level, due to timing, DWQR is concerned that the significant changes shown in the Total Chlorine trend did not generate an alarm, nor prompt any assessment of the ammonia dosing process. • DWQR is satisfied the primary disinfection process was not affected by this incident. Sampling was carried out in the distribution system and at consumers' taps over the following days to monitor the impact of the interruption in the ammonia dosing. The results showed no failures of THM or microbiological standards. • Scottish Water carried out an audit of the chloramination process at this site in July 2017 with the report identifying a number of risks. Had these risks been addressed, it is likely that this event would have been avoided. • Recommended ensuring the risks and issues highlighted in the chloramination audit report are fully addressed. • Recommended implementing a procedure to ensure operability of plant and equipment following all maintenance activity. • Recommended reviewing alarm points on the key process monitors as a failsafe to any future outage/failure of any particular instrument. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Replaced the faulty free chlorine analyser. • Reviewed the dosing control and the visibility of the system. • Recalibrated the dosing pump. • Relocated the ammonium monitor. • Re-emphasised to operators the Treatment Operation and Maintenance Strategy procedure for dealing with a loss of ammonia dosing. • Reviewed the flow switches and the safeguarding of pump systems.

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
Nov 2018 For 40 days Classification: Serious	Eela Water WTW, Shetland Islands, East Region	5485	Treatment failure – aluminium	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by operational staff trying to maintain an asset that was operating well above its design capacity and has archaic facilities for flow control and monitoring. • A number of factors contributed to this incident including the following: <ul style="list-style-type: none"> ▪ The WTW flows routinely exceeded the design flow meaning that a single flat bed clarifier (FBC) could not handle the total WTW flow to allow for maintenance; ▪ The very basic flow control and lack of flow monitoring meant that there was no control over the flow through the cleaned FBC as it was returned to service; ▪ The treatment control process in the area, designed to ensure routine tasks such as this are properly risk assessed and managed, failed to appreciate the extent of the risk due to the circumstances at this plant; and ▪ Poor escalation during the incident prevented it being monitored and managed properly. • Although there were significant failings with Scottish Water’s approach to managing this incident, DWQR is of the opinion that staff were put in a difficult position by having to maintain and operate an ageing, ill-equipped asset running at well above its design capacity. The specification of this plant falls well short of the standards DWQR expects of a water treatment process in the 21st century. • Recommended undertaking a full assessment of the operability of the works with due regard to maintenance activities and design capacity, define required improvements and measures and carry out an appraisal of the options to reduce risk to water quality. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Completed operator awareness training on the water quality escalation process. • Created an Emergency Action Level breach procedure and rolled this out to all teams. • Reviewed and reinforced the minimum reactive sampling requirements to the Public Health Teams and Sampling Teams (in line with the new Emergency Action Level breach procedure). • Reviewed the clarifier flow control and cleaning regime and identified improvements to these. • Shared the lessons learned from this event at a Water Operations Management Team meeting • Identified other treatment works with clarifier maintenance difficulties and identified improvement actions. • Created a Treatment Operation and Maintenance Strategy procedure to address cleaning and return of a clarifier to service. • Reviewed the treatment control process in the light of the lessons learned from the incident. • Ensured that treatment control includes consideration for proactive sampling. • Progressing investment to improve the treatment processes.

Event Date, Duration & Classification	Area	Estimate of population	Nature and cause of the event	Main actions and findings from the DWQR investigation
15 Dec 2018 For 7 hours Classification: Significant	Glengap WTW WTW, Dumfries & Galloway, South Region	3470	Treatment failure – loss of coagulation but no breach of standards detected	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by the failure of the coagulation pumps due to a power outage and the fact that Scottish Water’s Control Centre was not alerted due to the lack of a dosing pump failure alarm. Poor decision making and lack of communication in responding to the alarms that were received resulted in a prolonged period of time during which the water was inadequately treated. • The standby operator did not attend site after informing Control Centre that he would and did not inform either the Control Centre or the standby team leader of this decision. This led to the Control Centre operator acknowledging subsequent water quality alarms and not passing them out because he believed the standby operator was on site. • It was not until a second Control Centre operator was on shift and further water quality alarms received that the standby operator was informed of the continuing situation and attended site. • Once the operator attended the site, the situation was quickly resolved and escalated appropriately. However, it is a fundamental failing that both the operator and Control Centre staff member did not follow protocol which led to the event becoming an incident. • Recommended ensuring an updated SOP (standard operating procedure) is communicated to the North East and West teams. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Replaced the bench pH monitor electrode. • Considered installing a works shutdown facility on coagulant pump failure and/or deviation in coagulation pH. • Checked the water quality telemetry alarms against Emergency Action Levels as appropriate. • Reviewed the SOP in the light of the root cause and conclusions and rolled out an updated version to the South team.