

6.2 SUMMARY OF EVENTS AND INCIDENTS 2019

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	627	181	26	3	0

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/2019-incidents/>

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Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
<p>15 January 2019</p> <p>For 6 weeks</p> <p>Classification: Significant</p>	<p>Rhenigidale WTW, Harris, North Region</p>	<p>20</p>	<p>Trihalomethane (THM) failure</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by a shared outlet pipe from the clear water tank and the run to waste pipe from other parts of the WTW being blocked, allowing reject water to enter the clear water tank (CWT). • Cleaning of the CWT may have contributed to the blockage in the outlet pipe. • As there had been low chlorine levels alarms from the CWT, chlorine was added in the CWT. This caused the formation of THMs when the chlorine reacted with organic compounds from the blockage debris. • Recommended identifying all WTWs with combined scours and overflows. • Recommended separating all combined scours and overflows. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Separated the CWT scour and WTW reject pipes. • Cleaned the clear water tank. • Identified all combined scours and overflows in WTWs in Harris. • Arranged for monthly checks to be added to the task schedule for Rhenigidale WTW.
<p>11 February 2019</p> <p>For over 2 months</p> <p>Classification: Serious</p>	<p>Turret B RSZ, Perthshire, East Region</p>	<p>10,401</p>	<p>Mains repair sampling procedure failure – detection of coliforms and <i>Clostridium perfringens</i></p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was declared due to there being a serious failure of operations procedures and application of the Hygiene Code of Practice following repairs to a water main. • The taking of a mains repair sample was deferred, only being taken 2 days following the repair work. The sample failed microbiological standards for Coliform and Clostridium and the resample to confirm the water was wholesome again was not taken for another two months. • Water samples were not taken in a timely way that would have provided the best information about likely causes of failures. This includes the significant delay in taking a resample following the initial microbiological failure. • NHS Tayside confirmed there were no cases of illness in the community attributable to water. • Failure to record chlorine levels in microbiological samples means vital information is missing.

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				<ul style="list-style-type: none"> • Recommended ensuring that managers and team leaders appreciate the need to take timely mains repair samples, assigning appropriate priority and resource. • Recommended ensuring an alert or escalation within procedures for failures to take timely resample assigning responsibility to expedite the process through to the conclusion. • Recommended developing a process or system to enforce taking and recording chlorine residuals in all microbiological sampling. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Held internal performance review with Risk Technicians, Field Response Network Services Operator (NSO) and agreed improvement actions. • Disseminated summary of incident and raised awareness of the resampling process and new escalation process. • Stakeholder group reviewed Distribution Operation and Maintenance Strategy (DOMS) procedure "High level response to water quality sample failures".
<p>3 March 2019</p> <p>For 4 days</p> <p>Classification: Significant</p>	<p>Sandy Loch WTW, Shetland Islands, East Region</p>	<p>13,807</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 loss of control over the disinfection process. • Different strengths of hypochlorite dose and variable volumes and flows through the contact tank meant chlorine was not given adequate contact time (Ct) to properly disinfect the water. • The dual use of the chlorine contact tank as a reservoir for the filter backwash water made it difficult to dose the correct amount of chlorine. • Recommended all water quality event investigations comply with the timescale set out by DWQR in Information Letter 3/2012 (30 days). • Recommended reviewing the risks to achieving disinfection through the dual use of the contact tank for inclusion in the SW investment plan. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Upgraded chlorine dosing control. • Upgraded OSEC (sodium hypochlorite generator) unit.

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<p>6 February 2019</p> <p>For 10 days</p> <p>Classification: Significant</p>	<p>Mannofield East RSZ, Aberdeen Harbour, East Region</p>	<p>971</p>	<p>Network failure – accidental contamination of the mains water supply</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a ship discharging water into the drinking water main by accident. • Affected premises were given bottled water and instructions not to use the mains water supply. • Scottish Water investigated quickly and isolated the affected part of the network. • The water was found to contain hydrocarbons and barium. • Stanchion hydrants were unsecured and did not have non-return valves to prevent water entering the clean drinking water mains. This was recognised as a severe risk by the Water Regulations Advisory Scheme (WRAS) in 2006. • Recommended a full review of all drinking water safety plans where they cover harbour or marinas to ensure risks of access to hydrants by third parties are clearly identified and mitigation measures are set out. • Recommended a review of policies for identification and assessment of backflow risks from distribution system apparatus. • Recommended SW put in place a communication plan on backflow protection guidance for high risk activities and premises. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Installed a non-return valve on the water main entering the harbour. • Cut and capped fire hydrants with no non-return protection in the harbour. • Checked all quays in the harbour for additional stanchion hydrants. • Reviewed the Quality Management Plan including Standard Operating Procedure, Risk Assessment, Method Statement and monitoring controls. • SW Byelaws team issued an instruction to Aberdeen Harbour property owners to adhere to Byelaws regulations. • Ensured all ports and harbours are on the High Risk Inspection Program.

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<p>3 March 2019</p> <p>For 2 weeks (intermittent)</p> <p>Classification: Significant</p>	<p>Skerries WTW, Shetland Islands, East Region</p>	<p>75</p>	<p>Treatment failure – loss of control of treatment process</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by the new reverse osmosis (RO) unit being incorrectly set at maximum, causing pressure surges that damaged the nanofiltration membranes. • There were alarms for low chlorine in the final water, increased levels of trihalomethanes (THMs) but no breach of the regulatory standard, and a failing sample for iron and turbidity in the final water at the work during the incident. No samples at consumers’ taps failed. • Recommended a review of the impact assessment and sign off arrangements to ensure risks are properly identified and mitigated for intervention work and continuation of phased work. • Recommended SW to consider provision of additional combined permeate monitoring point for the nanofiltration stage to assist in fault finding or else to review the fault finding protocols for situations where a single CP point covers both stages of membrane filtration. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Replaced nanofiltration unit and reverse osmosis unit. • Installed second RO unit. • Review treat water online monitoring requirements.
<p>11 March 2019</p> <p>For 1 hour</p> <p>Classification: Significant</p>	<p>Glenlatterach WTW, Moray, East Region</p>	<p>41,792</p>	<p>Treatment failure – disinfection failure</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by operators failing to follow standard operating procedure during a changeover in chlorine gas cylinders. Valves that should have been reopened after changeover had been left shut. This left the pumps unable to dose chlorine to disinfect water. • There were no microbiological or chlorine residual failures at consumer taps. • Glenlatterach WTW switched over from a gas to a liquid chlorine dosing system later in 2019. • Recommended finding a way of checking or visibly marking outlet valves to ensure all chlorine gas bottles are able to operate as expected at all sites using this means of disinfection. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Ensured chlorine gas changeover procedures and record keeping protocol is discussed as part of a ‘tool box’ session.

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14 April 2019 For 8 days Classification: Serious	Bradan WSZ, Ayrshire, West Region	214,314	Treatment failure – Taste and odour complaints	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a wildfire in the water supply catchment causing organoleptic compounds (taste and odour causing chemicals) into the lochs supplying the WTW. • A total of 231 consumers in the Bradan Water Supply Zone (WSZ) contacted Scottish Water about taste and odour problems in their water. • Scottish Water responded swiftly and worked well with other agencies during this unforeseen incident. • However, the response in terms of sampling could have been more timely and contact with public health teams and agencies should have been quicker. • Recommended SW prepare appropriate documentation for its response to catchment fires and deliver appropriate training. • Recommended a review of communications between Operations and Public Health staff outwith normal working hours. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Took and analysed further phenol samples from the raw and final Bradan WTW waters. • Liaised with Scottish Fire & Rescue Service on firefighting within Scottish Water catchments.

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25 May 2019 For 2 weeks Classification: Significant	Tullich WTW, Oban, North Region	15,976	Treatment failure – geosmin taste and odour	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The incident was caused by elevated levels of geosmin (taste and odour causing compounds from algae) in the raw water source. • 39 consumer contacts about taste and odour were received. • Scottish Water reacted appropriately to the discovery of the geosmin but could have scoured and flushed the Service Reservoirs. The geosmin history of the catchment was unknown as the previous WTW at Tullich had different treatment. • SW delivered information to DWQR late in breach of Information Letter 3/2012. DWQR subsequently audited SW’s Public Health Team. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Completed design and costing for the additional Powdered Activated Carbon (PAC) treatment process. • Complete PAC installation and commissioning. • Reinforced to staff the importance of SR scouring and network flushing in response to WQ issues. • Included Tullich in the ‘At Risk’ raw water geosmin/algae sampling programme. • Developed an operational response plan for PAC dosing at Tullich WTW for taste and odour treatment. • Reviewed possible sources of the geosmin in the raw water source. • Identified actions to reduce the frequency and duration of any future events.

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<p>6 June 2019</p> <p>For 2 days</p> <p>Classification: Significant</p>	<p>Roberton WTW, Hawick, South Region</p>	<p>41,007</p>	<p>Treatment failure – ammonium failure</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a period of not using chloramination allowing ammonium sulphate to crystallise in the non-return valve in an injector. This allowed the ammonium to continue dosing beyond the set dose. • A lack of telemetry alarms for high ammonium and a lack of training in identifying the possible faults slowed the response. • Recommended developing a Treatment Operations and Maintenance Strategy (TOMS) procedure for reintroduction of ammonium after the chlorination of a chloraminated system with training for relevant operations staff. • Recommended a review of TOMS procedures to ensure the risk of siphoning from dosing lines is fully addressed. • Recommended providing DWQR with the programme of works for replacement of the Supervisory Control and Data Acquisition (SCADA) and Programmable Logic Controllers (PLCs). <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Cleaned injectors and non-return valves. • Fitted new loading valves on ammonium dosing. • Added high alarm to dosing flow. • Checked and set alarms on final ammonium monitor.

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29 May 2019 For 1 month (three separate failed samples) Classification: Significant	Amlaird WTW, East Ayrshire, West Region	34,874	Treatment failure – coliforms	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by three failing coliform samples from Amlaird WTW. This was likely due to water ingress into the clear water tanks. Heavy rainfall likely exacerbated this. • Scottish Water were slow to identify the CWT ingress but acted promptly to take it out of supply once the issue was identified. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Removed CWT Cell 1b from service • Completed internal and external repairs of cell 1b and return to service following successful flood test. • Reviewed SW process to disseminate reservoir cleaning reports to ensure Asset Planner awareness. • Reviewed DOMS “Treated Water Storage Management Procedure” on flood test failure. • Reviewed Treated Water Storage (TWS) hatch sealing and other “quick win” delivery. • Added tank integrity issues to Drinking Water Safety Plan (DWSP). • Issued a reminder to Asset Planner, TWS, Operations, Process Science and other relevant teams to ensure tank cleaning inspection reports are incorporated into DWSP in a timely manner. • Reinforced the importance of early consideration of tank condition following WTW bacteriological failures as part of the PCA and Enhanced Outcome Report (EOR) process. • Discussed the current TWS assessment and risk classification at the February Water Quality Investment Group (Wand determine actions for process improvement.

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<p>12 June 2019</p> <p>For 8 days</p> <p>Classification: Significant</p>	<p>Craighead WTW, Aberdeenshire, East Region</p>	<p>5,374</p>	<p>Treatment failure – manganese failure</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This failure of the manganese standard in the final water at Craighead WTW was caused by the failure of the raw water reservoir aeration system. • Despite shutting down the works and tankering in water from another system there were manganese failures at consumers’ taps. • There is no manganese removal stage in the treatment process at Craighead so the works were unable to respond to rising manganese in the raw water. • Prompt action was taken after the manganese failure but there was no action taken when raw water monitoring samples showed rising levels of manganese prior to the event. • This was the second incident at Craighead concerned with failure of the manganese standard and we retain a concern that the planned replacement treatment works may not adequately provide for dealing with this parameter. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Repaired reservoir aeration system. • Investigated catchment area. • Reviewed the inclusion of soluble manganese removal treatment stage in new works design. • Investigated potential for installation of manganese three stream monitoring with telemetry connectivity. • Investigated potential for installation of raw water dissolved oxygen monitoring with telemetry connectivity. • Investigated potential for transferring raw water aeration system fault visual alarm to telemetry. • Amended task schedule to include improvements of manganese bench analysis to include raw water soluble testing. • Adopted raw water apparatus status log sheet. • Made amendments to open ended pumped inlet main to allow safe sampling.

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<p>13 June 2019</p> <p>For 2 days</p> <p>Classification: Significant</p>	<p>Castle Moffat WTW, East Lothian, South Region</p>	<p>63,938</p>	<p>Treatment failure – aluminium and turbidity failure</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by heavy rain which caused a sudden deterioration in the raw water quality and inability of the treatment works to respond quickly to such changes. This was exacerbated by an absence of early water quality monitoring due to monitors being out of service or operating incorrectly. • Scottish Water’s Intelligent Control Centre (ICC) initially suppressed the remote alarms from the site. This is in contradiction to normal procedure. • The works has no run to waste facility. A lack of resilience at the works meant consequences were more severe and prolonged than they should have been. This allowed water with high aluminium content to pass into the supply. Subsequent sampling at consumers’ taps showed minimal impact on water quality. • Recommended a review of the provision of raw water quality monitoring on site with a view to providing multiple means of early detection of changing quality. • Recommended promoting the site for consideration of installation of a run to waste facility via the Investment Planning and Prioritisation Framework (IPPF) investment process. • Recommended investigating and resolving any issues with inappropriate truncation of water quality monitoring SCADA signals at the site. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Assessed feasibility of changing filter alum and turbidity ‘do not defer’ signals to ensure prompt response in the event of filters being compromised. • Installed new raw water turbidity meter. • Updated task schedule to include weekly flushing of turbidity meter. • Reviewed feasibility of installing raw instrumentation at raw water pumping station. • Reviewed procedure for draining a tank to waste if required during an event.

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<p>11 July 2019</p> <p>For 3 hours</p> <p>Classification: Significant</p>	<p>Assynt WTW, Dingwall, North Region</p>	<p>39,188</p>	<p>Treatment failure – disinfection failure</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Extremely heavy rainfall in the catchment caused high colour in the raw water. • The coagulation dosing and control system was unable to react to this high level of colour because the dosing pump was capped. The ultrafiltration membranes were also unable to remove this level of colour. • This meant that inadequately treated water passed on to the disinfection stage. The initial alarm at the works was for low final water chlorine, which shut the works. • Scottish Water acted too quickly to restore the supply of water without appreciating issues with the water quality and lack of disinfection. • Recommended ensuring TOMS procedures give clear guidance on escalation procedures. • Recommended providing refresher training on escalation procedures in TOMS. • Recommended investigating adding colour monitors to telemetry. • Recommended ensuring Polyaluminium Chloride (PACL) dosing is correctly configured to prevent overdosing. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Compiled PACL dose/raw water colour lookup tables for site use. • Investigated feasibility and options for process run to waste. • Removed cap on PACL dose pump. • Reviewed and adjusted shutdown level on permeate colour. • Reviewed Emergency Action Levels (EALs).. • Adjusted mask time on chlorine low level shut down. • Investigated raw water Dissolved Organic Carbon (DOC) monitor installation. • Provided refresher training for Assynt operations team on disinfection strategy. • New clear water tank progressed to increase storage. • Arranged catchment inspection and report.

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25 July 2019 For 4 hours Classification: Significant	Rosebery WTW, Midlothian and East Lothian, South Region	137,167	Treatment failure – power failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The works was being run on its standby generator due to bad weather forecast in the area. The generator failed but no alarms were raised as there was no uninterrupted power supply (UPS). • Water continued flowing through the works with no chemical dosing and no outbound telemetry signals. A telemetry check had been done just before the power failure. • Operators attended site after some consumers from direct-fed properties complained about no water. The operator then dosed the final water with chlorine. There were no failures of regulatory standards but no trihalomethane (THM) samples were taken. • The two main inadequacies at the works were a lack of backup power supply and the lack of a process to safely restart the works without putting untreated water into supply. • In addition to this incident, a further three water quality events from Rosebery WTW in 2019 were for power failures or generator issues. • Recommended investigating and implementing a means of alerting the control centre to “flatlining” critical alarms on an ongoing basis over and above 4-hourly polling of telemetry stations. • Recommended producing or reviewing the procedure to enable operators to safely return the works to service where untreated water is present in the clear water tank and inter-stage following an incident. Ensure the procedure is rolled out across all WTW. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Installed uninterrupted power supply (UPS) battery backup for PLCs, inlet valves and filter valves. • Power monitoring to take place when generator is on. • Checked South region sites with raw inlet valve for auto-shutdown capability and that UPS is installed and working. • Checked WTW telemetry for last alarmed time stamp and investigated any anomalies indicating possible telemetry backup battery faults at other sites.

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<p>18 July 2019</p> <p>For 6 weeks</p> <p>Classification: Significant</p>	<p>Carron Valley WTW, Falkirk, West Region</p>	<p>210,091</p>	<p>Treatment failure – geosmin taste and odour</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by an increase in geosmin in the raw water source and lack of adequate treatment processes to remove it. • Carron Valley WTW has a history of geosmin (algal breakdown products) taste and odour. 185 consumer contacts reporting taste and odour were received between 29 July and 28 September. • Operators increased the PAC dose, the network was rezoned to reduce flow through the works, the Dissolved Air Flotation (DAF) units were cleaned and desludged, and filter performance was checked. • The supernatant return to the head of the works was done after securing consent from SEPA to run to waste into a nearby burn. • Scottish Water issued a Letter of Commitment to the DWQR to assure that it will investigate options for improving the supply. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Installed an air curtain at the reservoir inlet. • Reviewed catchment sampling programme and determined continuation into 2020. • Ensured recently installed raw water sampling point is operational. • Determined suitable options for PAC dosing and reported findings to DWQR. • Depth sampling and centre of reservoir sampling was arranged. • Carried out a detailed investigation into PAC optimisation and philosophy. • Reviewed and updated the Carron Valley Operational Response Plan. • Permanent supernatant run to waste facility was investigated.

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<p>3 August 2019</p> <p>For 6 days</p> <p>Classification: Significant</p>	<p>Glenfarg WTW, Fife and Perth and Kinross, East Region</p>	<p>172,151</p>	<p>Treatment failure – disinfection failure</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a defective flow control valve at the primary distribution system Service Reservoir, in turn caused by a power blip during a thunderstorm. There is also the issue of widely varying flows through the works exacerbated by an inadequately sized clear water tank. • Initially issues with coagulation pH alerted the operators to investigate. • One sample failed for microbiology, indicating inadequate disinfection. All resamples and wider system sampling showed no other failures of water quality standards. • Scottish Water is reviewing investment needs at the works and has provided a letter of commitment to DWQR for this site <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Installed and commissioned new PLC and Human Machine Interface to control flow into Finmont SR. • Repaired latch on CWT inlet lid. • Reviewed EAL sheet to ensure alarm set points are appropriate.

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3 August 2019 For 10 hours Classification: Significant	Stenhousemuir South DMA, Carron Valley WSZ, Central Scotland, West Region	3,991	Network failure – iron, manganese, aluminium and turbidity failures	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by disturbance of sediment in the main caused by an unexplained increase in flow throughout the system. Investigation could not uncover a reason for the sudden increase in flows. • An incident team responded to consumer contacts about discoloured water. SW investigated for pipe bursts or fire service use of hydrants. Low velocity flushing was carried out during the incident. • Network cleanliness is a concern, given the metals and turbidity failures recorded during this incident. • A total of forty-six consumer contacts were made. There were five failures of the iron standard, seven for manganese and one for aluminium. Two samples exceeded the turbidity standard. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Investigated feasibility of cleanliness index sampling programme. • Investigated feasibility of flushing the Stenhousemuir South DMA.
5 August 2019 For 2 days Classification: Significant	Kaim WTW, Glasgow, Renfrewshire and Inverclyde, West Region	7,569	Treatment failure – manganese failures	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a lack of manganese removal at the works. With a sudden change in raw water manganese levels, there was fairly little that could be done at the works to remove it from the water. • An alternative water source was considered but had too high levels of organic compounds to be suitable. • DWQR noted that Kaim WTW is due to be mained out (replaced by another WTW) but was disappointed that this work had been delayed for over two years. DWQR will be monitoring this work. • There were 32 consumer contacts between 16 and 26 June 2019. This includes failures of the manganese standard at consumers' taps. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Considered the need for a TOMS procedure in response to significantly changing raw water manganese concentrations where there is no manganese removal stage.

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<p>10 August 2019</p> <p>For 5 days</p> <p>Classification: Significant</p>	<p>Herricks WTW, Moray, East Region</p>	<p>5,834</p>	<p>Treatment failure – coagulation failure</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by the works lacking the appropriate processes to respond to and effectively treat poor quality water from the raw water reservoirs. This was exacerbated by carrying out planned maintenance works during a period of heavy rainfall. • Low water level alarm from the reservoir showed that the raw water main had air-locked following the planned maintenance and a poorer quality water source was used to replenish the reservoir. There was a subsequent low water level alarm in the clear water tank requiring increased production through the works. • Aluminium dosing did not respond to changing raw water conditions for adequate coagulation. Reactive sampling showed failure of the aluminium standard and detection of <i>Cryptosporidium</i> oocysts in the final water. There was one failure of the aluminium standard in a consumer tap sample. • DWQR had previously received a Letter of Commitment from Scottish Water detailing how the capability at the works would be improved. DWQR has been monitoring this work closely. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Completed software modifications for coagulant pump flow proportional control. • Replaced Aztec Colour Predictor with DOC monitor. • Created procedure for Raw Water Management. • Issued a reminder that raw water maintenance tasks should be presented to treatment control. • Treatment control form was updated with maximum raw water quality envelope. • Reviewed and improved coagulation pH control capability. • Investigated maximum scale of filtered aluminium monitor on telemetry. • Investigated the presence of coagulation dosing pump limiter on all coagulated WTW.

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26 August 2019 For 2 days Classification: Significant	Glendevon WTW, Fife, East Region	149,853	Treatment failure – coagulation failure	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by the inability of the works to adjust to changing raw water conditions. Forestry and heavy rainfall may have contributed to this. • It is unprecedented for the deterioration in quality experienced in this incident to arise from the catchment providing the principal source of raw water to the works. • Coagulation processes require the right pH to work effectively. The difficulty in controlling this in the raw water led to under-dosing of aluminium sulphate. • Investigation found the pipeline feeding an emergency dosing pump was using carrier water rather than undiluted chemical. Once this was rectified water quality improved. • Two samples of final water at the works breached the aluminium standard but no reactive samples from consumers’ taps showed any breaches. • The works uses a blended source but it is not currently possible to sample the blended raw water to accurately assess quality. • Recommended ensuring the investment needs for the works is fully reviewed and reflects the incapacibilities previously identified in studies and demonstrated in this incident. Identified needs should be considered for inclusion in the investment programme at the earliest opportunity. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Installed emergency alum dosing pump and line. • Investigated options for obtaining representative raw water sample for monitoring. • Extended lookup table to include raw water extremes. • Created a site specific procedure in response to deteriorating raw water quality. • Carried out catchment survey.

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<p>20 September 2019</p> <p>For 2 days</p> <p>Classification: Significant</p>	<p>Clatto WTW, Dundee, East Region</p>	<p>28,711</p>	<p>Treatment failure – burst raw water main</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a burst raw water main affecting the power supply and control instrumentation within the works. • During a routine inspection the operators discovered ingress of water into the motor control room. Water was leaking from the chemical dosing connection point on the raw water inlet pipe. The subsequent flooding caused a power failure and shut down of the works. • A total of 195 consumer contacts were received over the course of the event with the majority of those being for discoloured water. Consumer tap samples identified one microbiology breach and four metals breaches (iron, manganese and/or aluminium). • Metals in water at consumers’ taps was attributed to change in direction and velocity of flows in the distribution network. • NHS Tayside raised concerns around the risk assessment made before reintroducing production in the works and in the delay in notification to them. • Recommended a review of escalation procedures to Public Health Team to ensure timely notification and engagement of external stakeholders. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Permanently repaired burst raw water main. • Assessed condition of other connections to the raw water main. • Reviewed options to reduce flooding risk to Motor Control Center (MCC) (including reviewing sump pump capability). • Reviewed generator capability.

Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
<p>2 October 2019</p> <p>For 2 days</p> <p>Classification: Significant</p>	<p>Port Charlotte WTW, Islay, North Region</p>	<p>809</p>	<p>Treatment failure – loss of coagulation</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a blockage of crystallised chemical in the soda dosing lines. This was caused by taking the trace heating thermostat offline. A second aluminium breach was caused by the clarifier desludge being left in manual after the recovery of operations. • Several aluminium failures were recorded in the interstage filtered aluminium monitor, at service reservoirs and consumers’ taps. • The incident was prolonged due to lack of understanding the severity of the incident and consideration of the impact on final water quality for consumers. Loss of appropriate pH for effective coagulation had been a cause of previous water quality incidents and SW had previously committed to improve training and awareness of this. • In spite of recording aluminium levels above the Short-term Health Recommended Action Value (SHRAV), this was not reported to health stakeholders until two days later. • There were fewer samples taken from consumers’ taps than would have been appropriate, meaning the scale of the incident cannot be fully assessed. A miscommunication meant operators took samples for bench analysis rather than for laboratory analysis. • Twelve direct-fed properties were not protected or alerted to the poor quality of the water. • Recommended a review of the actions required when a SHRAV is breached by an interstage sample point where there is no final water monitor to demonstrate that water quality has not been compromised. • Recommended preparing a contingency plan for the contact of direct fed consumers to alert of poor water quality when resource is limited. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Identified key run to waste points in the process and introduced formal procedures to be used by operators and examined what mitigation could be put in place to protect the 12 direct-fed properties in future. • Team Leader treatment knowledge improved to ensure full understanding of site specific process units. • Introduced a cleaning and maintenance schedule to formally record cleaning tasks carried out on soda tanks, pipework and pumps.

Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
				<ul style="list-style-type: none"> • Amended sodium carbonate solution preparation procedure to reduce chemical strength from 15% to 10%. • Investigated installation of an additional sample line from the final water to the existing interstage aluminium monitor and link up with telemetry. • Promoted replacement of combined clarified turbidity monitor. • Reviewed and clarified with Public Health Team minimum sampling requirements during events. • Reinforced to all North region Water Operations that isolation of controlling thermostats is forbidden. • Created procedure for requesting samples where island operators have to carry out sampling as part of their role. • Reviewed all North WTW to identify risks with unfamiliar naming conventions and/or run to waste facilities. • Reinforced EAL breach procedure to operators on Islay. • Investigated the installation of a warning system in the event that the clarifier desludge process is left in manual.

Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
<p>9 October 2019</p> <p>For 2 hours</p> <p>Classification: Significant</p>	<p>Papa Stour WTW, Shetland Islands, East Region</p>	<p>31</p>	<p>Treatment failure – disinfection failure</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The cause of this incident was the use of over-diluted sodium hypochlorite in the disinfection process. • After a planned shutdown to repair a leaking pipe below the disinfection chemical day tank and restart of the works, a low chlorine alarm prompted a manual shutdown and investigation of the cause. • The decanted sodium hypochlorite solution had been restored to the tank but it was not until this had been replaced by fresh solution that the disinfection process was restored • The chemical drums holding the decanted solution were unlabelled, making it unclear what strength of chemical was being dosed. Due to a lack of communication in the team, an untrained staff member had diluted an already diluted solution when restoring it to the tank. • Reactive sampling at the works and consumers’ taps showed no breach of microbiological standards. • Recommended ensuring there is a clear understanding between team members of actions taken, actions to be taken and their extent and the responsibilities of various team members in completion of tasks. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Reinforced requirement to present impact assessment form to treatment control to be reinforced to all East Water Operations team leaders. • Reinforced that only adequately trained staff are permitted to carry out WTW tasks. • Reviewed existing or created TOMS procedure for chemical make-up and include step for use of hydrometer to check strength.

Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
<p>11 November 2019</p> <p>For 3 days</p> <p>Classification: Significant</p>	<p>Roberton WTW, Hawick, South Region</p>	<p>37,874</p>	<p>Treatment failure – coagulation failure and <i>Cryptosporidium</i> detections</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • The two related events in this incident were caused by a sludge blanket from Clarifier 2 rising and carrying over to the filters after Clarifier 1 was taken out of service. Dormant crystallised coagulant blocked the coagulant dosing line causing the pump to burst. • Clarifier 1 was taken out of service for modification. Modifications were made to adjust for the increased pressure on Clarifier 2. Turbidity started to rise, so operators desludged the clarifier and this rectified the problem. When turbidity and aluminium alarms were raised, desludging was carried out again. Chlorine contact time was maintained throughout but the final aluminium standard was breached for around 15 minutes. • A coagulant dosing low flow alarm was not passed out by the ICC; the operator noticed it when logged into telemetry from home. A lack of appropriate alarms on SCADA and no alarm callout from the ICC exacerbated the response to the second part of the incident. • The site has been operating with obsolete equipment. SW’s capital investment plans will be reviewed by DWQR. • Recommended ensuring that the need for additional <i>Cryptosporidium</i> analysis is discussed routinely at treatment control meeting where operations involve clarifiers or filters. • Recommended providing a report on investment plans for capital maintenance during the current period including timescales for delivery. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Provided a documented procedure for clarifier cleaning at Roberton. • Investigated feasibility of installing flow meter to clarifier inlets. • Reviewed method of measuring sludge volumes on site. • Promoted upgrade to Alba dosing pumps to allow suitable failure safeguards. • Issued a briefing note to all staff reminding them of the Standard Operating Procedure (SOP). • Considered installing a combined filtered aluminium sample. • Checked response from coagulation pH meter and alarms are suitable.

Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
<p>10 November 2019</p> <p>For 1 day</p> <p>Classification: Significant</p>	<p>Amlaird RSZ, North and East Ayrshire, West Region</p>	<p>7,217</p>	<p>Network failure – burst water mains</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a burst four inch main followed by a burst ten inch main. • The bursts were particularly difficult to repair due to the complexity of the network, need for traffic management, and difficulty in accessing equipment in a timely manner. • A total of 88 consumer contacts were received for water quality (not including sufficiency i.e. “no water”/“low pressure”). One sample failed regulatory standards for manganese and iron. Bottled water was offered to affected consumers on request. • Sampling at the time of the burst was difficult due to the time of day. Alternative sample points such as hydrants should have been used to accurately assess water quality at the time of the burst. • The structural integrity and condition of the network contributed to the bursts. A condition assessment was made and will be reviewed by DWQR. • The network condition had changed due to taking Hillfarm SR out of service following a microbiological sample failure. This was necessary to protect water quality but changing water pressure may have contributed to the bursts. • Scottish Water submitted the incident report three months late. This was the subject of Information Letter 2/2020 published on the DWQR website. • Recommended Scottish Water review procedures for sampling in networks when staff cannot gain access to consumers’ properties. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Carried out condition assessment on 10 inch main, concluded remedial action. • Considered mains rehabilitation/flushing within Newmilns and Galston DMAs. • Completed repairs on Hillfarm SR and put it back into service. • Issued a statement to GAP/SLD highlighting the importance of critical equipment during network incidents.

Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
22 November 2019 For 10 hours Classification: Significant	Turret WTW, Central Scotland, West Region	178,428	Treatment failure – loss of coagulation	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a failed polyelectrolyte pump and a fouled flow sensor. Numerous alarms were raised from the site systems to the Intelligent Control Centre (ICC) but these were not responded to appropriately. • Some nuisance alarms obscured when alarms were alerting genuine cause for concern. Staff ought to have been investigating these thoroughly. • Trends from chlorine monitoring suggest the chlorine residuals were sufficient and no microbiological failures were recorded. Network samples showed no regulatory failures. • Recommended identifying and remedied nuisance alarms from Turret WTW to the ICC. • Recommended providing awareness sessions to ICC staff involved in this incident regarding Standard Operating Procedures (SOPs) for turbidity alarms, staff changeover and Duty Manager checks as soon as possible. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Replaced or repaired the Polyelectrolyte Dosing Flow Sensors. • Replaced the Polyelectrolyte Dosing Pump. • Formal feedback and awareness sessions provided to ICC staff involved regarding Standard Operating Procedures for turbidity alarms.

Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
27 November 2019 For 3 days Classification: Significant	Balmore C5 Zone, East Dunbartonshire, West Region	8,476	Network failure – discoloured water	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Scottish Water shut down a ten inch water pipe to install a connection to a new housing development and to fit a hydrant. Operators flushed the network until the water ran clear. • Consumers reported discoloured water and further flushing was carried out. Confusion over which water supply area the pipework and valves are in caused delay to understanding the cause of the incident. • The likely cause was operating valves in the incorrect order, causing rapid filling of the pipework and disturbance of the sediment in the main. • There were 14 failures of the iron standard, seven for manganese and one for coliform bacteria. 143 consumer contacts were received in connection with this incident. • DWQR is currently reviewing Scottish Water’s DOMS procedures. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Promoted Water Supply Zone for further investigation to determine whether mains conditioning or flushing required. • Discussed incident at the DOMS working group to consider any lessons to be learned and agree on any changes required to who can operate complex shut – low risk valves. • Ascertain whether a water network model exists for the system and if so determine whether the event can be simulated.

Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
<p>13 December 2019</p> <p>For 4 days</p> <p>Classification: Significant</p>	<p>Laggan Bridge WTW, Highland, North Region</p>	<p>63</p>	<p>Treatment failure – <i>Cryptosporidium</i> detections</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • Following heavy rainfall and recent groundworks near the boreholes, 15 <i>Cryptosporidium</i> oocysts were detected. UV transmissivity and turbidity levels confirmed the oocysts were deactivated. • Newly installed cartridge filters which should be replaced every 6 weeks or where differential pressure (DP) exceeds 1.0 Bar, however filters had not been changed for 14 weeks and DP alarms had been set to 1.4 Bar. • No training was given to operators on changing filters. • One combined turbidity monitor meant it was difficult to assess filtered water quality from the parallel treatment of three different borehole sources. • Neither the installation of individual turbidity monitors nor combatting surface water ingress were included in the capital project to upgrade the WTW. The project did not deliver the necessary requirements identified in recommendations from the Expert Group on <i>Cryptosporidium</i>. • Recommended fitting individual turbidity monitors and repairing boreholes, with regular updates to DWQR on progress. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Ensured replacement of the cartridge filters at procedural frequency. • Reviewed process for projects to provide operator training, updated task schedules and EALs. • Reviewed asset start-ups/Water into Supply documentation for sign off of alarm set points. • Carried out operator training on the cartridge filters. • Increased <i>Cryptosporidium</i> sampling to biweekly and reviewed after three months. • EALs updated for UV, flow, turbidity and differential pressure. • Reviewed DP, flow and turbidity alarm set points once WTW has been optimised. • Reviewed and lowered differential pressure alarm settings if applicable. • Investigated if repairs can be carried out to the top sections of the boreholes (BHs) to remove surface water ingress. • Investigated the start-up of the BH flows – looked to see if a slow ramp rate can be added to the Variable Speed Drives and if the max speed can be capped at design flow.

Event Date, Duration & Classification	Area	Estimate of pop. affected	Nature and cause of the event	Main actions and findings from the DWQR investigation
				<ul style="list-style-type: none"> • Reviewed need for turbidity monitors prior to each UV unit on each BH. • Investigated and provided a solution to the issue of air in the system and pump flow spikes.
<p>23 December 2019</p> <p>For 10 days</p> <p>Classification: Significant</p>	<p>North Hoy WTW, Orkney Islands, East Region</p>	<p>46</p>	<p>Treatment failure – microbiological detection</p>	<p>DWQR comments and findings:</p> <ul style="list-style-type: none"> • This incident was caused by a contaminated sample being taken at the water treatment works failing microbiological standards. The general hygiene condition of the works and poor sampling practice were identified as the likely cause of the initial microbiological failure. • Due to difficulties in taking and transporting further samples over the Christmas period, a Boil Water Notice (BWN) was issued to consumers. • Due to errors in scheduling, a further sample was not taken until 30 December. • Investigation showed there to be no issues with treatment processes and all samples at consumers' taps and in the distribution system were found to be satisfactory. The BWN was lifted on 1 January 2020. <p>Scottish Water actions:</p> <ul style="list-style-type: none"> • Audited sampler and completed required remedial actions. • Reviewed operative water hygiene training and retrained as required (including reminder to record chlorine residuals). • Added North Hoy CWT to cleaning schedule for 2020. • Instructed operator that clothing and boots must be changed prior to entering the WTW. • Completed deep clean of WTW floor and work area.



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