

AUSTIN WATER
WINTER STORM URI
**AFTER ACTION
REPORT**



November 3, 2021





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EXECUTIVE SUMMARY



Winter Storm Uri brought extreme cold, ice and snow, coupled with widespread power outages and significant disruption to water service throughout Texas. Despite the best efforts of Austin Water (AW) staff, the winter storm ultimately resulted in widespread water outages, and all customers experienced a Boil Water Notice. After the storm subsided, AW began conducting extensive internal reviews to investigate what went right, what went wrong, and what actions need to be taken to prevent a future failure.

This After Action Report documents the findings of the internal reviews of AW's emergency management, communications, infrastructure and service to wholesale customers during Winter Storm Uri. This report also details the short-term corrective actions that have already been completed to enhance AW's winter weather preparedness as well as a comprehensive improvement plan for longer-term recommendations. Members of the Water and Wastewater Commission participated in a Winter Storm Working Group, which provided guidance and discussion throughout the review process, and provided input into the prioritization of infrastructure improvements.

AW has also fully participated in the citywide review process sponsored by the City's Homeland Security and Emergency Management (HSEM) department. The HSEM after action review investigated the storm response across the entire City of Austin and community stakeholders. Because that after action review is better positioned to investigate cross-departmental collaborations, such as emergency water distribution efforts and impacts to the City's inbound call system, that information is not included in this report. Relevant findings and recommendations from the HSEM report will be incorporated into AW's ongoing improvement plans.

Incident Management Team Review

AW's review of emergency management procedures followed a FEMA framework for documenting emergency activations, and similar reviews have been conducted for previous emergency incidents within AW. The review found the Incident Management Team (IMT) was effective in achieving its objectives, enhanced by familiarity with remote work after nearly a year of COVID-19 protocols. However, some staff had not participated in Incident Command System (ICS) training and a lack of familiarity with emergency protocols hindered the overall function of the IMT. Recommendations include conducting annual emergency response trainings, increasing depth of IMT staffing for each identified position, and increasing accountability protocols to achieve compliance with training requirements.

Communications Review

The main finding of the communications review was that while AW disseminated accurate information, the rapidly evolving nature of the storm and its impacts to water distribution infrastructure caused some communications to become quickly out of date, which created the perception that communications were intentionally misleading. In addition, the communications function would benefit from having a more central role and decision-making authority within the overall IMT structure. In response to another recommendation, AW has adjusted its proactive winter preparedness messaging to customers to increase awareness of best practices for emergency preparation.

EXECUTIVE SUMMARY CONT.



Technical Review

The technical review documents storm-related impacts to AW infrastructure and operational responses, determines the root causes of system failures, presents enhanced infrastructure performance goals, and recommends infrastructure improvements. Overall, significantly increased water usage, coupled with reduced water production, were the main contributing factors to the widespread water outages and Boil Water Notice experienced by AW customers. A suite of recommended actions has been proposed to address the identified root causes of system shortcomings, and will support meeting the requirements of Senate Bill 3, as further detailed on page 9 of this report.

Wholesale Customer Review

A review of service to wholesale customers was completed by AW staff through a questionnaire to wholesale customers. Customers indicated AW should provide improved communication about issuing and lifting Boil Water Notices, and improved coordination of emergency water connections. Recommendations include designating a single point of contact for wholesale customers, as well as conducting annual valve exercises between AW and wholesale customers.

Recommended Actions Already Completed

Many recommended actions have been completed that will increase overall utility resiliency and winter storm response capabilities. The improvements have occurred in six main areas: treatment plants, wastewater lift stations, public communications, winter emergency preparedness, community response, and wholesale customer service. A full list of completed recommended actions is included in this report.

Comprehensive Improvement Plan

Each of the recommendations that have not already been completed are compiled in a comprehensive improvement plan. Most of the technical recommendations will be incorporated into AW's ongoing Capital Planning process for development and implementation of specific projects, while others will be incorporated into ongoing operations and maintenance activities.

INCIDENT OVERVIEW



The period of extreme cold temperatures between February 12 and February 19, 2021, known as Winter Storm Uri, caused extensive damage and disruption to Austin and communities across the State of Texas. During this event, temperatures at Austin Bergstrom International Airport remained below freezing for 164 consecutive hours (nearly seven days) and 144 consecutive hours at Camp Mabry. These are the longest periods on record, and the minimum recorded temperature was six degrees Fahrenheit. Austin also experienced significant snow and ice cover, with six inches of snow recorded between February 14 and 15.

AW initiated operational changes to plant operations, public messaging, and emergency operations status to prepare for winter weather between February 9 through 15. At each of the three water treatment plants, supplies of chemicals and fuel were replenished, sludge was hauled offsite, and deicing fluid was placed in critical locations. Preparations were also made for plant operators and other critical staff to shelter-in-place for the duration of the cold weather. Communications were disseminated to the public to advise on freezing weather preparedness, such as dripping faucets to prevent frozen pipes, and turning off outdoor irrigation systems. Beginning on February 10, the AW Incident Management Team (IMT) was placed on stand-by, and AW Emergency Management staff closely monitored conditions in anticipation of the activation of emergency protocols. Contact was made between AW, Austin Energy (AE), and the Lower Colorado River Authority (LCRA) regarding the availability of electricity and operation of Longhorn Dam.

A break occurred in the 48-inch Lakewood drinking water transmission main on February 10. AW maintained adequate drinking water storage and pressure levels, despite considerable water loss due to the main break. Subsequently, a local power outage at the Texas Plume Lift Station caused a sanitary sewer overflow on February 12.

Weather conditions continued to deteriorate between February 12 and 15, significantly impairing natural gas production and electricity generation capacity throughout the State of Texas. In order to maintain electric grid stability, the Electric Reliability Council of Texas (ERCOT) ordered AE to shed electric load beginning in the early morning of February 15. Major AW assets on AE's list of critical infrastructure were unaffected by the load shedding, but 48 sanitary sewer lift stations lost electricity. To avoid sanitary sewer overflows at lift stations without restored electricity, AW utilized generators to supply auxiliary electricity, and hauled sewage out of the lift stations using tanker trucks. Through the extraordinary efforts of AW staff, only nine sanitary sewer overflows (SSOs) occurred between February 12 through 24. When conditions allowed, SSO sites were inspected for potential environmental damage and remediation was conducted to recover spilled sewage.

On February 15 and 16, freezing temperatures continued to affect public infrastructure and private buildings and AW began to receive reports of pipe breaks. Water demand across the AW service area increased from approximately 150 million gallons per day (MGD) on February 15 to a peak hourly demand of 260 MGD on in the evening of February 16. Storage levels began to deplete in Southwest Austin, although there was no indication of loss of service system-wide at that time. Public messaging was disseminated to reassure AW customers there were no planned water outages and unlike nearby water utilities, AW customers were not under a Boil Water Notice.

INCIDENT OVERVIEW CONT.



Conditions rapidly changed during the overnight hours of February 16 and continuing into the next day. On the morning of February 17, AW's IMT was activated and staff shifted into 24-hour emergency operations to respond to the water outage in Southwest Austin. A Boil Water Notice was issued for Southwest Austin and the Lost Creek neighborhood on the morning of February 17, because pressure in that portion of the distribution system dropped below regulatory requirements. Water usage continued to rise to a peak hourly demand of 330 MGD, more than double the levels observed in February 2020. In the early afternoon, the Ullrich Water Treatment Plant (WTP) experienced a disruption to both electric feeds to the plant. The power outage was restored and plant systems were systematically restarted, restoring treatment capacity within approximately 11 hours. With the temporary reduction in water production, coupled with the extremely high water demands, system-wide storage was depleted resulting in widespread water outages. Because pressure in the distribution system dropped below the regulatory requirement, a Boil Water Notice was issued for all AW customers during the evening of February 17.

System recovery efforts were focused on reducing water consumption and repairing leaks to replenish storage capacity and re-pressurize the distribution system. Efforts prioritized restoring water to hospitals and other critical customers by isolating key transmission mains. Crews operated continuously, 24-hours a day, to shut off water at private residences experiencing pipe breaks and repair broken water mains. Although not typically part of AW's responsibilities, multiple AW staff consulted with private plumbers and building managers to support their repairs of leaks within private plumbing systems. Public messaging urged conservation to allow system storage to be refilled and to boil water before consumption. Beginning on February 19, system status updates were published every 12 hours to notify customers of current system storage levels and to provide updates on progress towards system recovery. Pressure was gradually restored to the distribution system, and the Boil Water Notice was lifted in phases throughout February 22 and 23. Once water pressure was restored and the Boil Water Notice was lifted, the Incident Management Team ceased 24-hour operations and shifted to overnight "on-call" status in the evening of February 23.

Throughout the event, multiple communication channels were utilized to keep the public aware of important status updates. Using Capital Area Council of Governments' Warn Central Texas Emergency alert system, 1.1 million contacts were made to notify customers of the Boil Water Notice onset and expiration. Though still in the pilot phase, the My ATX Water Customer Portal was used to send nearly 950,000 email and text messages, and customers with new Advanced Metering Infrastructure were notified of probable water leaks on their property. In addition, AW posted updates to its website and social media channels, with documents translated into Spanish, Vietnamese, Chinese, Korean and Arabic. When the Boil Water Notice was lifted sequentially for each pressure zone, AW launched a web map to help customers identify the pressure zone for their residence. This website was visited over 1 million times and high web traffic caused the site to malfunction. After the initial technical issue, the map was restored and remained operational for the duration of the event. Due to extremely high inbound call volumes to AW's dispatch line, the majority of customer calls were not received between February 17 to 19. Power outages during this period also contributed to the City of Austin's phone service disruptions. AW initiated an online customer intake form and received nearly 30,000 service requests over four days.

AW also collaborated with HSEM and community organizations to support community response efforts. AW provided staffing at bottled water pickup sites between February 20 through 23. Although water service was fully restored in the distribution system by February 23, many customers were still experiencing private plumbing issues and water was not available at some properties. AW connected fire hydrant adapters at 65 locations and deployed 60 portable 275-gallon tanks to enable residents to fill vessels with potable water at apartment complexes where private plumbing issues persisted. AW also located a 5,500-gallon water tanker truck at the Austin Community College Northridge campus to support water distribution efforts. Direct involvement from AW staff in community recovery efforts continued until March 5.

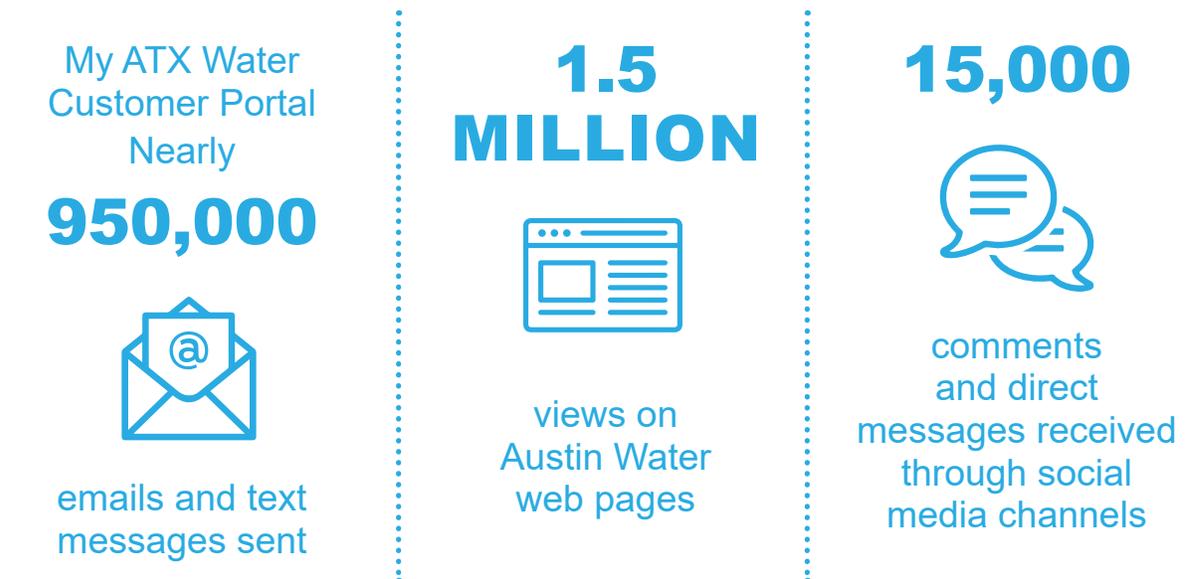


KEY METRICS

Infrastructure impacts



Communications activities



KEY METRICS CONT.



Workforce demands

AW Incident Management Team

staffed

300 HOURS

of emergency operations
(25 12-hour Operational Periods)



Inbound Call Volume

more than

10,000

calls per day



Online Service Request Form in multiple languages

30,000

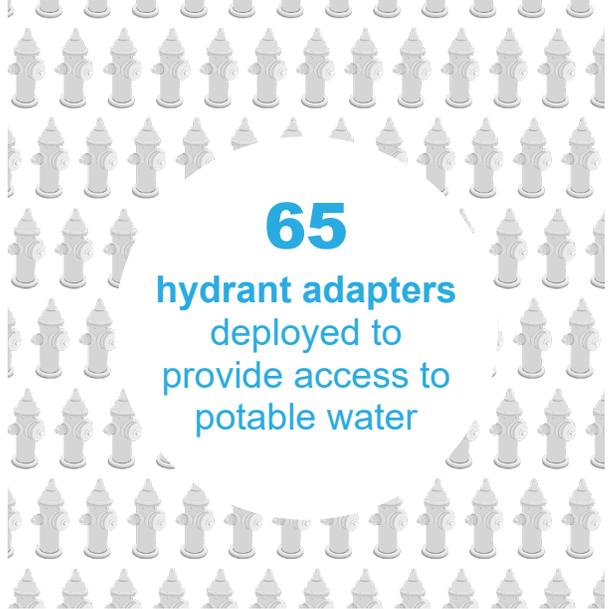
requests received
over 4 days



Community recovery efforts

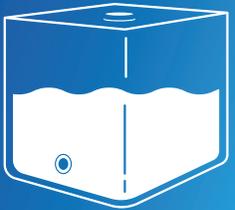
65

hydrant adapters
deployed to
provide access to
potable water



60

275-gallon
water tanks
purchased
for bulk water
distribution



52,148
gallons of
drinking water
distributed in
bulk to the
community

ONGOING IMPLEMENTATION OF SENATE BILL 3



On June 8, 2021, the Governor signed Senate Bill 3 (SB 3) to address preparing for and responding to the issues that arose during the winter storm. The new law creates Section 13.1394 of the Texas Water Code which expands the definition of an “affected utility,” to include every water utility in Texas. “Affected Utilities” must meet requirements for the emergency operation of a water system during an extended power outage.

This section also requires that an affected water utility adopt and submit an emergency preparedness plan to the Texas Commission on Environmental Quality (TCEQ) for approval. The emergency preparedness plan must be submitted by March 1, 2022; implementation of emergency plans must begin by July 1, 2022, or upon final approval by the TCEQ. TCEQ guidance on SB 3 indicates that an affected water utility may request an extension of up to 90 days to these deadlines.

The TCEQ released an emergency preparedness plan template in August 2021 containing the options allowable under SB 3 for providing emergency operations during an extended power outage. However, there is indication this template may be modified to clarify specific requirements for compliance with SB 3. Guidance from the TCEQ is still evolving, and Austin Water staff are closely monitoring for any additional information.

The emergency preparedness plan and the options chosen for its implementation must be approved by the TCEQ. While multiple options are available for implementation of the plan, the TCEQ will determine if the options selected are acceptable and it is possible that on-site power generation at water treatment plants and other critical facilities may be required for final approval of the plan. AW will utilize the tools developed for the emergency preparedness plan to mitigate risk, including water storage, back-up power, electrical hardening, and emergency water demand rules. In addition, AW’s long-term plan for improving system resilience includes construction of additional transmission mains, pump stations, and storage.

AW staff will continue working to implement SB 3 requirements and anticipates meeting all submittal deadlines. Implementation of the Technical Review recommendations in this report will support meeting the requirements of SB 3.



METHODOLOGY

Each analysis section within this report provides a summary of the observations and recommendations that resulted from an in-depth after action review conducted in some instances by AW staff and in others by third-party independent consultants. The methods to conduct each review are detailed below.

Incident Management Team Review

The review of AW's Incident Management Team (IMT) during Winter Storm Uri was conducted by AW emergency management staff. The review was prepared following the guidance of FEMA's Homeland Security and Exercise Evaluation Program, which provides a framework for conducting after action evaluations of emergency operation activations. It is common practice for AW to conduct similar reviews following an emergency event or activation of the IMT. AW staff who conducted the evaluation and prepared the report have extensive training and background in emergency management and response.

Communications Review

The review of AW's communication efforts during Winter Storm Uri was conducted by WaterPIO, a consulting firm specializing in communications for water utilities. WaterPIO has conducted a wide spectrum of communications services for municipal utility clients across the United States, providing strategies for customer and stakeholder engagement, crisis planning, and emergency response. WaterPIO evaluated AW's public communications during Winter Storm Uri across all communications platforms and made recommendations for improvements. WaterPIO conducted interviews with AW staff serving in a broad range of roles throughout the event; reviewed media coverage, press conference recordings, and briefings to Council; and compared responses of other Texas water utilities.

Technical Review

Freese and Nichols (FNI), a regional water and wastewater infrastructure consulting firm, conducted the technical review of infrastructure impacts in collaboration with AW planning, engineering and operations staff. FNI was selected for this review based on their experience with municipal water and wastewater planning, design and operation, as well as in preparing similar after action reports. The primary goal of the technical review process was to summarize the impacts to AW infrastructure, determine the root causes of system failures, and recommend future actions to mitigate risk that could result from future extreme cold weather.

Wholesale Customer Review

The review of service to wholesale customers was conducted by AW staff. The review consisted of a questionnaire distributed to each wholesale customer to solicit feedback about the service provided by AW during the storm. The survey asked wholesale customers about AW's responsiveness, professionalism, communications and technical support during the winter storm. A completed survey was received from 20% of AW's wholesale customers.

INCIDENT MANAGEMENT TEAM REVIEW



Overview

During a critical incident, AW activates its Incident Management Team (IMT) and Department Operations Center (DOC) to facilitate an appropriate response, following the principles of the FEMA's National Incident Management System (NIMS) and Incident Command System (ICS). NIMS and ICS help responders coordinate complex responses to critical incidents by providing standardized organizational configurations, planning principles, and documentation processes. AW has adopted Standard Operating Procedures that define activation of the IMT and establish training requirements for IMT members.

AW's IMT was placed on stand-by beginning February 10, 2021. Following activation of the Austin/Travis County Emergency Operations Center (EOC), AW activated a virtual EOC Responder on February 12, 2021. AW's IMT and DOC activated virtually at 7:00 a.m. on February 17, 2021. Inability of staff to travel safely to the DOC, along with COVID-19 pandemic safety considerations, contributed to the need to activate virtually. Incident Command established twelve-hour operational periods, utilizing Microsoft Teams to conduct briefings and meetings. The IMT operated continuously for six days, moving overnight shifts to an on-call status on February 23, 2021 at 7:00 p.m. The IMT was demobilized at 7:00 p.m. on March 5, 2021. In all, the IMT conducted 25 12-hour operational periods, or 300 hours of emergency activation, between February 17 and March 5, 2021.

A summary of strengths, observations and recommendations are provided below.

Strengths

The AW Emergency Management Team's assessment of the IMT and DOC activation noted the following strengths:

Strength: AW's remote work processes established during the COVID-19 pandemic response worked well.

Strength: Microsoft Teams allowed remote meetings and information sharing.

Strength: Staff commitment to the response and willingness to serve during exigent circumstances were critical.

Strength: The interface between the AW DOC and the City of Austin EOC contributed to a coordinated response.

Strength: The use of the ICS format enhanced shift planning and hand-offs.

Strength: Having pre-identified team members with experience in past activations and table-top exercises participate in IMT roles helped streamline response efforts.

Strength: Data analysis performed by the Systems Planning/Situation Unit staff was critical for system recovery.

Strength: The shift of the DOC mission from system recovery to community recovery was instrumental in providing alternate source potable water for customers with private plumbing failures.

INCIDENT MANAGEMENT TEAM REVIEW CONT.



Areas for Improvement

Observation: Due to COVID-19 restrictions, instructor-led in-person ICS classes had not been held since 2019. Over the course of the response, IMT staffing was insufficient and required adding team members. Many of the added personnel were untrained in the application of ICS and had not previously served in incident response, resulting in inconsistent application of the principles of ICS.

- **Recommendation:** Conduct in-house training annually to meet department training requirements and track conducted training.
- **Recommendation:** Develop IMT depth to a minimum of three members for each identified position. Review IMT depth annually and expand as necessary.
- **Recommendation:** Implement annual reporting and accountability to ensure full compliance with AW training and response requirements.

Observation: Many AW staff were unable to report for work assignments due to poor road conditions. AW does not have a ready fleet of vehicles capable of operating in extreme inclement conditions, nor staff readily available to provide transportation services. Ad hoc ride services were eventually provided through coordination of the IMT.

- **Recommendation:** Evaluate options for developing fleet assets that enhance response capabilities during emergency conditions.

COMMUNICATIONS REVIEW



Overview

AW's Communications Division provided information to customers before, during and after Winter Storm Uri using all available platforms – social media, media releases, press conferences, website, an online service request form, an online outage map, and emergency alerts via emails, texts and phone calls.

Communications began with a media release and social media posts about how to prepare for freezing weather on February 10. As Winter Storm Uri impacted water distribution infrastructure, AW provided operational updates daily via a dedicated web page and social media. During the event, AW received about 15,000 comments and direct message questions through social media channels.

AW used the Warn Central Texas Emergency alert system to notify customers when the citywide Boil Water Notice was issued and when the notice was rescinded. In addition, email and text messages were sent to customers through the new My ATX Water Customer Portal. This was the first time this portal was used to provide citywide emergency notifications and the messages were well received by customers.

Additions to AW's website during the event included an online service request intake form, online outage map, a list of frequently asked questions, and priority placement of updates related to the incident. The intake forms and responses to Frequently Asked Questions were provided in five languages other than English: Spanish, Korean, Arabic, Vietnamese and Chinese.

AW established an outbound call center with more than 80 AW and City volunteer staff members to follow up on service requests and contact apartment complexes during the community recovery phase of the incident.

AW communication efforts experienced numerous challenges that impacted customers, including City of Austin website outages, call volumes exceeding available staffing, City of Austin phone system malfunctions, and the online map crashing due to the high volume of page views. Through the After Action Review process, AW is working to overcome these challenges and prepare staffing and resources to improve communications and processes in future emergencies.

A summary of strengths, observations and recommendations are provided below.

Strengths

WaterPIO's assessment of AW's communications activities noted the following strengths:

Strength: Proactive winter weather communications were appropriate for the typical freezes that Austin has experienced.

Strength: AW's Director served as an effective spokesperson during press conferences.

Strength: Notifications sent through AW's new My ATX Water Customer Portal were well received by customers.

Strength: Communications with critical customers, including hospitals and healthcare providers, were effective.

Strength: The AW website provided Winter Storm information in a prominent location.

Strength: Information was clearly and frequently relayed on social media during the storm.

COMMUNICATIONS REVIEW CONT.



Areas for Improvement

Observation: AW's current emergency management structure does not elevate the communications role to one with decision making authority. AW's Communications Division does not have adequate staffing to serve multiple shifts during extended emergency activations, or to provide staff at the City of Austin's Joint Information Center (JIC).

- **Recommendation:** Clarify the Public Information Officer role within the Incident Management Team to include strategic decisions on communications messaging.
- **Recommendation:** Conduct emergency response plan-related exercises that incorporate the ICS structure and use scenarios to test the communications area of the response in ways that are not easily anticipated.
- **Recommendation:** Provide AW Communications staff at the City's JIC during emergency activations to help close information gaps and coordinate communications.
- **Recommendation:** Identify roles for current Communications staff to serve during emergency activations, and because of current staffing levels, identify additional AW staff who can support communication activities.

Observation: Public communications were focused on system infrastructure status and were disseminated only after final verification from operations personnel, resulting in delays in a rapidly changing environment. There was not a consistent media spokesperson within AW.

- **Recommendation:** Set the schedule for updates during an emergency, based on a "planned transparency" approach to releasing information to media and the public, synchronized with the news cycle.
- **Recommendation:** Include the Public Information Officer in IMT command meetings to develop updates which reflect potential uncertainty in future developments to accelerate communication releases.
- **Recommendation:** Create a real time outage map on the AW website that displays water outages during normal operations and emergency conditions.
- **Recommendation:** Conduct media training for staff who will represent AW in media interviews, press conferences, public meetings, or similar roles during an emergency.

COMMUNICATIONS REVIEW CONT.



Observation: AW used the Warn Central Texas notification system to notify customers about the onset and rescinding of the Boil Water Notice. In addition, AW used the My ATX Water Customer Portal to send emergency notifications about the Boil Water Notice throughout the event. This was the first time that the portal had been used for this type of notification and no protocols were in place for its use. However, this notification method proved successful and was received positively by customers.

- **Recommendation:** Develop standard operating procedures for using the Warn Central Texas notification system, notifications through the My ATX Water Customer Portal, and HESM's Integrated Public Alert & Warning System (IPAWS).
- **Recommendation:** Incorporate Warn Central Texas notifications into AW's communications tactics, including use during all water, wastewater and employee safety-related emergencies.
- **Recommendation:** Increase use of the My ATX Water Customer Portal during future emergencies.
- **Recommendation:** Complete training of AW Communications staff to be familiar with the use of the IPAWS emergency alert system.

Observation: AW provided proactive winter weather communications that were appropriate for the typical freezes that Austin has experienced. However, the messaging placed heavy emphasis on protecting pipes by dripping. During prolonged freezing temperatures and power outages resulting from the winter storm, this messaging required adjustments to adapt to rapidly changing conditions in water system infrastructure. The switch from "drip your pipes," to water conservation messaging, followed by a Boil Water Notice damaged AW's credibility and was confusing for customers.

- **Recommendation:** Adjust winter weather messaging to incorporate a variety of winter weather preparation tips for customers based on lessons learned from Winter Storm Uri.
- **Recommendation:** Enhance outreach prior to Winter 2021-2022 to demonstrate lessons learned during Winter Storm Uri.
- **Recommendation:** Elevate visibility of winter weather prep information on the AW website.

Observation: AW was not able to communicate directly with tenants who do not have direct billing accounts with AW. Tenants did not receive notifications through the My ATX Water Customer Portal and were less likely to be following updates on the AW website and social media channels since they are not account holders with the utility.

- **Recommendation:** Develop an outreach plan and materials for multifamily property management companies, tenant associations, and property managers.

Observation: AW did not provide regular situational updates to AW staff during the event. Employees were dependent on updates from supervisors, the media and social channels. Many felt uninformed and unsure how to respond during the event.

- **Recommendation:** Share more information with employees during emergency operations and include internal communications as part of overall emergency incident activities.
- **Recommendation:** Designate staff to develop internal communications materials during each IMT shift.

TECHNICAL REVIEW



Overview

During the winter storm, AW infrastructure was impacted by freezing temperatures, power outages, supply chain issues, treacherous travel conditions, and pre-storm maintenance. Prior to the onset of freezing temperatures, preparations included readying supplies for staff to shelter-in-place at critical facilities, and replenishing supplies of chemicals used for critical treatment processes.

As temperatures dropped, water usage increased due to private plumbing and water main breaks, as well as due to customers dripping pipes to avoid freezing and breaks. Because water use exceeded production between February 15 and 16, system storage was depleting, resulting in water outages in Southwest Austin in the evening of February 16. Following the temporary loss of production from Ullrich WTP on February 17 as a result of a power outage, system storage continued to deplete. Water pressure within the distribution system fell below the regulatory requirement, triggering a Citywide Boil Water Notice. Between February 18 to 23, system storage was gradually replenished and water pressure was restored, culminating in the Boil Water Notice being lifted on February 23.

The wastewater treatment and collection systems also experienced impacts during the storm. Power was lost to 48 lift stations throughout the wastewater collection system. Generators were effective in maintaining power to a majority of the lift stations, with only nine SSOs. When possible, SSO sites were remediated and inspected for environmental damage. Wastewater treatment plants remained operational throughout the storm, but were impacted by frozen components and were near to exhausting supplies of critical treatment chemicals.

A summary of strengths, observations and recommendations are provided below.

Strengths

Over the course of 19 meetings, interviews, workshops, and site visits with numerous AW staff from multiple work groups, the technical review identified the following strengths:

- Strength:** Pre-storm preparations enabled operations to be maintained throughout the storm and included replenishing chemical storage, reducing chemical dosages, distribution of shelter-in-place supplies, and hauling sludge offsite.
- Strength:** Coordination between systems planning, engineering and operations teams identified issues and facilitated solutions.
- Strength:** Consistent communication between facilities, including daily meetings and hourly text updates, addressed issues in a timely manner.
- Strength:** Availability of food, water and bedding allowed crews to concentrate on operational objectives.
- Strength:** AW's Fleet Services was able to procure a continuous supply of fuel despite statewide diesel shortage.
- Strength:** Generators were reliable due to AW's effective ongoing maintenance program.
- Strength:** Lift station staff transported and installed portable generators at lift stations that lost power, some of them multiple times.
- Strength:** Staff shifts were reorganized to provide 24/7 operational capabilities.

TECHNICAL REVIEW CONT.



Strength: Personnel willingly braved extreme weather and treacherous driving conditions to perform operational duties. There were no serious injuries to AW staff.

Strength: The infrastructure communication system (SCADA) that connects remote facilities and sensors to the enterprise network remained operational throughout the event.

Strength: AW crews performed more than 1,500 emergency water shut-offs for customers and completed 1,200 work orders in a ten day period.

Strength: AW crews developed a hydrant adaptor design, sourced the parts for 65 units, and deployed them to locations near multi-family housing where premise plumbing was out of service.

Strength: Contractors were utilized to assist with repairs at treatment plants and in the water distribution system.

Strength: Water treatment plant staff brought plant capacity that was off-line for routine maintenance into service to boost overall production capacity from 190 MGD prior to the event to approximately 217 MGD.

Strength: Water and wastewater treatment plant staff developed operational strategies to conserve chemical usage. Water treatment plant staff secured a secondary source of lime when the primary supplier grounded their delivery trucks.

Strength: The reclaimed water system remained operational, which is attributed to new construction with high quality materials and construction.

Strength: The Boil Water Notice was lifted in phases to allow utilization of water as quickly as possible for areas that had been restored to normal.

Strength: SSO impacts were mitigated by pumping and hauling sewage from lift stations.

Strength: Cross-work group collaboration was effective in developing and implementing a plan to isolate key water transmission mains to prioritize water service to hospitals.

Areas for Improvement

Observation: Significantly increased water usage due to faucet dripping, private plumbing leaks, and water main breaks contributed to widespread water outages. Within the distribution system, small diameter cast iron pipes experienced the most pipe breaks compared to other pipe sizes and materials.

- **Recommendation:** Continue to focus the Renewing Austin program, AW's water main replacement program, on small diameter cast iron pipes and utilize asset management principles to prioritize poor-performing pipes.
- **Recommendation:** Evaluate Austin Water pipeline design criteria for opportunities to enhance freeze protection requirements.
- **Recommendation:** Replace force main sections with shallow bury depth to prevent freezing.

TECHNICAL REVIEW CONT.



Observation: Many components of the water and wastewater treatment plants and distribution systems froze and became non-operational. Frozen components included: remote sensors, chemical feed systems, valves, small-diameter piping, sludge dewatering systems, and sludge truck hatches.

- **Recommendation:** Winterize components of the water treatment plants.
- **Recommendation:** Winterize components of the wastewater treatment plants.
- **Recommendation:** Implement weatherization enhancements and replacements for instrumentation to prevent issues and failures caused by freezing or power loss.
- **Recommendation:** Evaluate Standard Operating Procedures (SOPs) for severe winter weather for water distribution facilities.
- **Recommendation:** Develop winter storm SOP for all wastewater treatment facilities.
- **Recommendation:** Develop winter storm SOP for wastewater collection system, specifically identifying overflow points and critical lift stations.

Observation: Power losses occurred at remote wastewater treatment plants, wastewater lift stations, an elevated water storage tank, and Ullrich WTP, resulting in SSOs, loss of water storage, and temporary reduction in water production capacity. Portable generators were used to provide power to lift stations, but AW experienced difficulty with transportation of the generators, access to lift station sites, and frozen batteries.

- **Recommendation:** Add backup electric generation capacity at select lift/pump stations and treatment plants based on a criticality assessment.
- **Recommendation:** Conduct improvements to existing electrical resiliency assets.
- **Recommendation:** Collaborate with AE to enable automatic switching capability for the third electric feed at Ullrich WTP.
- **Recommendation:** Collaborate with AE on power resiliency opportunities, such as the cogeneration system at Hornsby Bend Biosolids Management Plant.
- **Recommendation:** Implement maintenance and monitoring protocols for data transmission devices that rely on battery backup systems.
- **Recommendation:** Coordinate with power providers to identify “critical water facilities” in accordance with SB3.

Observation: Required maintenance was being performed at treatment plants and water storage facilities, which reduced the capacity to produce and distribute water to customers. Although AW’s production and distribution capacity was more than adequate to meet typical February water usage conditions, reduced capacity was a contributing factor to water outages.

- **Recommendation:** Maintain available water production capacity at WTPs to meet demand planning criteria.
- **Recommendation:** Implement improvements at the WTPs to provide additional flexibility in maintenance scheduling.
- **Recommendation:** Update long-range infrastructure plans utilizing updated demand planning criteria.

TECHNICAL REVIEW CONT.



Observation: Unsafe road conditions resulted in difficulty procuring necessary chemicals and supplies, as well as with the disposal of sludge from water treatment plants. In addition, the statewide natural gas shortage and resulting moratorium prevented lime production, which is used in AW's water treatment process.

- **Recommendation:** Increase chemical storage at treatment plants.
- **Recommendation:** Increase sludge storage and disposal capabilities at treatment plants.
- **Recommendation:** Transition to disinfection processes at wastewater treatment plants which do not require chemicals, eliminating the need for chemical procurement and storage for disinfection.

Observation: Snowy and icy conditions were safety hazards for staff. Specifically, ice buildup on metal grating and walkways at water treatment plants, and slippery driving conditions, presented difficulties.

- **Recommendation:** Store strap-on boot spikes at treatment plants to walk on icy/slippery areas.
- **Recommendation:** Add low level lockouts and remote override at pump stations.
- **Recommendation:** Purchase and utilize tire chains for select AW vehicles, and conduct training for installing tire chains and driving in icy/snowy condition.
- **Recommendation:** Authorize TxTags for high priority fleet vehicles and develop plan for utility-wide implementation.

Observation: Existing transmission capacity constrained the ability to convey water produced at Davis WTP to other areas of the distribution system to compensate for reduced water production at Ullrich WTP. In addition, some areas of the distribution system do not have redundant storage capacity.

- **Recommendation:** Maintain adequate pumping capacity in the distribution system to meet demand planning criteria.
- **Recommendation:** Maintain adequate transmission capacity to meet demand planning criteria.
- **Recommendation:** Increase redundant pumping and transmission capacity from the WTPs to the distribution system.
- **Recommendation:** Maintain adequate distribution system storage capacity to meet demand planning criteria.

Observation: Manual data entry processes resulted in delayed information and decision-making regarding the operational status of the water distribution system. The installed advanced metering infrastructure (AMI) meters provided insight into system operations and customer usage patterns, but the citywide AMI roll out was in its initial phase.

- **Recommendation:** Conduct improvements to the remote data communication (SCADA) system.
- **Recommendation:** Develop analytic capabilities to provide real time water distribution system insight from operational data and AMI meters.
- **Recommendation:** Continue installing AMI meters for entire AW System.

WHOLESALE CUSTOMER REVIEW



Overview

AW's wholesale customers consist of neighboring cities, water supply corporations, utility companies, water control and improvement districts, and municipal utility districts. AW has contracts with fifteen wholesale customers for water and three wholesale customers for emergency connections only. As independent public water systems, wholesale customers are required to initiate a Boil Water Notice to their customers when applicable and report it to the Texas Commission on Environmental Quality. AW staff coordinated frequently with wholesale customers during Winter Storm Uri. Overall, AW staff interacted with wholesale customers through 65 email updates and 50 individual phone calls.

A summary of strengths, observations and recommendations are provided below.

Strengths

Strength: Staff were assigned to the DOC to facilitate communication with wholesale customers and distribute timely information.

Strength: Several wholesale customers expressed appreciation for AW's professionalism and efforts to manage the Winter Storm's impacts.

Areas for Improvement

Observation: Several wholesale customers expressed concerns about communications during Winter Storm Uri. They requested that information about AW's Boil Water Notices (BWN) be provided to them prior to public notification, and they noted confusion with communications regarding lifting the BWNs. Wholesale customers requested better coordination relating to those efforts in the future. During this event, AW coordinated advance notice, and while this notification is not feasible in every circumstance, AW staff will continue working to provide timely communications and coordination for advance notice to wholesale customers.

- **Recommendation:** Improve communications with wholesale customers year-round by maintaining routinely scheduled contact.
- **Recommendation:** Implement a streamlined communications plan during emergencies that emphasizes single points of contact and advances coordinated efforts when practical and possible.

Observation: Some wholesale customer calls were not immediately routed to appropriate contacts resulting in delayed responses to requests for an emergency water connection.

- **Recommendation:** Develop a script for routing wholesale customers calls to appropriate staff.

Observation: During Winter Storm Uri, it was noted that valve crews for both AW and wholesale customers needed to become more familiar with valve locations and operating procedures.

- **Recommendation:** Perform annual valve exercises on emergency interconnect valves, so both crews are familiar with emergency valve operations.

WINTER STORM WORKING GROUP SUMMARY



On April 7, 2021, Austin's Water and Wastewater Commission formed a Winter Storm Working Group to serve as an advisory body to support AW staff in developing a thorough and objective review process. Working Group members provided a unique blend of engineering expertise, knowledge of AW's operations, and customer perspective. The Commission's Vice-Chair Christianne Castleberry served as the Working Group Chair, and Commissioner William Moriarty served as Vice-Chair with Commissioners Grant Fisher, Christy Williams and Jesse Penn as additional members of the working group.

From April through October 2021, the Working Group met monthly for structured discussions with AW staff about the operational challenges faced during Winter Storm Uri, with a focus on drinking water system issues. A list of questions was created to help guide each agenda, and AW staff provided briefing materials in advance. The Working Group held in-depth and challenging discussions with AW executives and managers on the following topics:

- Emergency Communication Strategies
- Impacts to Drinking Water System Storage and Pressure Management
- Impacts to the Drinking Water Distribution System
- Impacts to Drinking Water and Wastewater Treatment Plants
- Enterprise Resiliency and Emergency Planning

In addition, AW staff provided resource materials to the Working Group on Winter Storm communications, City Council briefings, the Citywide After Action Review, and the City Auditor's Disaster Response Audit. Throughout the process, notes and minutes from each Listening Session, as well as the Final Report of the City Council-appointed Winter Storm Review Task Force were provided as additional reference. The Working Group Chair reported the progress of the Working Group to the Water and Wastewater Commission each month.

During the final meeting on October 20, 2021, the Working Group reviewed and provided feedback on a series of recommendations for implementation by AW. First, AW staff presented recommendations already completed or underway related to infrastructure, communications, and incident management. The Working Group concurred with the Improvement Plans for communications and incident management. Next, the Working Group reviewed 22 recommendations related to infrastructure and engaged in a facilitated, prioritization exercise. This exercise produced a consensus priority level assigned to each recommendation.

The Working Group assigned the highest priority to tackling frozen equipment and components, power resiliency, storage capacity, and real-time information and analytics. The Working Group's consensus priorities are presented in the Improvement Plan section of this report. AW staff affirmed that the Working Group's priorities will be considered as staff carry out these recommendations through operations and maintenance activities and the Capital Improvements Plan. One member noted that AW remains vulnerable to freezing conditions that could significantly impact the system until recommendations of the After Action Review are completed.

In addition, the Working Group members agreed that the Working Group will not be dissolved in October 2021. The Working Group will continue to serve as an advisory body to Austin Water staff and will be convened as needed to guide priorities as Austin Water implements recommendations from the After Action Review.

This summary was reviewed and accepted by all members of the Working Group, and the Working Group Chair transmitted this summary to the Water and Wastewater Commission Chair on October 27, 2021.

CORRECTIVE ACTIONS ALREADY COMPLETED



Multiple short-term corrective actions have been completed as of October 2021. These corrective actions will improve AW's ability to respond to a future winter storm or similar emergency scenario. The improvements that have been completed are categorized as related to treatment plants, public communications, wastewater lift stations, winter emergency preparedness, community response, and wholesale customer service. In addition to the corrective actions listed below, AW has continued progress on exchanges of customer meters to AMI meters, with approximately 10,000 meters exchanged between March 1 and October 1, 2021.

Water and Wastewater Treatment Plant Improvements

- Repairs of all winter storm damage at Ullrich, Davis and Handcox water treatment plants. Examples of repairs include: broken piping, broken valves, cracked basins, and damaged chemical feed systems.
- Repairs of all winter storm damage at South Austin Regional, Walnut Creek and Hornsby Bend wastewater treatment plants.
- The remote wastewater treatment facilities have repaired generators and automatic transfer switches, including staging a portable generator until the permanent generator is installed. Other equipment issues have been addressed through repairs and/or acquiring inventory of replacement parts. Tire chains have been added to the fleet to assist with access issues.
- Heaters, sand and deicing fluid has been procured to assist with future winter storm response.
- Preventative maintenance procedures have been updated to more thoroughly inspect components that were impacted by the winter storm.
- Insulation of all exposed piping is substantially complete, with full completion anticipated by the end of 2021.
- Winter storm standard operating procedures have been updated. Updates include procedures to protect infrastructure from freezing weather and temporarily pause non-critical treatment processes.
- Supplies have been purchased to enhance staff preparedness while sheltering in place at treatment plants during emergencies. Supplies include cots, bedding, hygiene products, potable water and ready-to-eat meals.
- At Ullrich WTP, fully automatic transfer on the AE side requires the replacement of manual transfer switches on two existing primary feeds and one existing backup feed. The work on the backup feed is complete and the work on the two primary feeds will be complete in 2022.
- Electricians are now stationed at Ullrich WTP during normal business hours, and a plan has been developed to station electricians at other treatment plants.

CORRECTIVE ACTIONS ALREADY COMPLETED CONT.



Wastewater Lift Station Improvements

- Automatic power transfer switches have been replaced at Texas Plume and Scotland Wells wastewater lift stations which experienced SSOs as a result of power outages during the storm.
- At Texas Plume and Scotland Wells lift stations, valves were added to lines that drain groundwater that will automatically close when power is lost.
- Repairs of winter storm damage at Cliffs over Lake Austin and Westpark lift stations were completed.
- Tire chains have been added to the fleet to assist with access issues.

Public Communication Improvements

- Updated winter storm preparedness and response messaging has been developed for implementation in future winter storm scenarios.
- Meter box keys and hose bib covers have been received for distribution to community members.
- A public-facing winter weather preparedness guide has been developed and translated into five languages.
- Warn Central Texas notifications have been incorporated into communications tactics, including use during all water, wastewater and employee safety-related emergencies.
- Use of My ATX Water customer portal for emergency notifications has been incorporated into messaging plans.

Winter and Emergency Preparedness Improvements

- AW's Emergency Response Plan has been revised to include an Extreme Cold Weather Plan.
- Additional tire chains have been procured for treatment plant and field service vehicles that would be active in a winter emergency response.
- Three additional FTEs in the Emergency Management Division are included in AW's approved FY 2022 budget to focus on emergency response, preparedness, resiliency and community engagement.
- ICS in-person training sessions are scheduled to resume beginning November 2021.
- New processes to track ICS training and IMT depth have been launched.

CORRECTIVE ACTIONS ALREADY COMPLETED CONT.



Community Response Improvements

- One potable water delivery truck has been delivered and a second truck is pending delivery; both trucks will be commissioned by the end of 2021 to provide bulk water delivery to the community.
- AW maintains an inventory of 275-gallon refillable water totes and fire hydrant adapter kits that can be deployed in case of water outages.
- AW has increased its inventory of bottled water for distribution in case of water outages.
- AW collaborated with City of Austin Purchasing on a solicitation to establish a contract for local bottled drinking water to be used during water emergencies; the contract was executed in October 2021.

Wholesale Customer Service Improvements

- A script has been developed for routing wholesale customer calls to appropriate AW staff and the script has been provided to dispatch staff.
- A schedule for annual valve training exercises on emergency interconnect valves between AW and wholesale customer infrastructure has been established and execution has begun.
- AW has initiated a quarterly newsletter to wholesale customers and holds regularly scheduled phone calls with each wholesale customer.



IMPROVEMENT PLAN

The table below shows the improvement plan for the recommendations that were prioritized by the Winter Storm Working Group. AW intends to implement the recommendations below, and the priorities expressed by the Commissioners will help to guide AW in its allocation of resources. Recommendations within the Capital Planning focus area will be incorporated into the ongoing Capital Planning process which incorporates cost, operational benefit, feasibility and resource requirements to sequence the implementation of proposed Capital Projects.

Recommendations within the Operations and Maintenance focus area are likely to be completed within the next three years. Because projects within the Capital Planning focus area require multiple stages of implementation (planning, design, and construction), full execution of the recommendations will require more than three years. However, initial implementation (i.e. planning and/or design) may initiate in the near term pending the outcome of the Capital Planning process.

Recommendations noted as “1” are designated as the highest priority, “2” as the second highest priority, and “3” as the third highest priority.

ID#	Recommendation	Focus Area	Commission Consensus Priority
CP-1	Continue to focus the Renewing Austin program, AW's water main replacement program, on small diameter cast iron pipes and utilize asset management principles to prioritize poor-performing pipes.	Capital Planning	2
OM-1	Winterize components of the water treatment plants.	Operations and Maintenance	1
OM-2	Winterize components of the wastewater treatment plants.	Operations and Maintenance	1
OM-3	Evaluate Austin Water pipeline design criteria for opportunities to enhance freeze protection requirements.	Operations and Maintenance	3
OM-4	Replace force main sections with shallow bury depth to prevent freezing.	Operations and Maintenance	2
CP-2	Implement weatherization enhancements and replacements for instrumentation to prevent issues and failures caused by freezing or power loss.	Capital Planning	1
CP-3	Add electric generation capacity at select lift/pump stations and treatment plants based on a criticality assessment.	Capital Planning	1
OM-5	Conduct improvements to existing electrical resiliency assets.	Operations and Maintenance	1
CP-4	Collaborate with AE on power resiliency opportunities, such as the cogeneration system at Hornsby Bend Biosolids Management Plant.	Capital Planning	2
OM-6	Implement maintenance and monitoring protocols for data transmission devices that rely on battery backup systems.	Operations and Maintenance	2
OM-7	Update long-range infrastructure plans utilizing updated demand planning criteria.	Operations and Maintenance	3
CP-5	Maintain available water production capacity at WTPs to meet demand planning criteria.	Capital Planning	2
CP-6	Implement improvements at the WTPs to provide additional flexibility in maintenance scheduling.	Capital Planning	3
CP-7	Increase chemical storage capacity at treatment plants.	Capital Planning	2
CP-8	Increase sludge storage and disposal capabilities at treatment plants.	Capital Planning	2
CP-9	Transition to disinfection processes at wastewater treatment plants that do not require chemicals, eliminating the need for chemical procurement and storage for disinfection.	Capital Planning	3
CP-10	Maintain adequate pumping capacity in the distribution system to meet demand planning criteria.	Capital Planning	2
CP-11	Maintain adequate transmission capacity to meet demand planning criteria.	Capital Planning	2
CP-12	Increase redundant pumping and transmission capacity from the WTPs to the distribution system.	Capital Planning	3
CP-13	Maintain adequate distribution system storage capacity to meet demand planning criteria.	Capital Planning	1
OM-8	Conduct improvements to the remote data communication (SCADA) system.	Operations and Maintenance	1
OM-9	Develop analytic capabilities to provide real-time water distribution insights from operational data and AMI meters.	Operations and Maintenance	1

IMPROVEMENT PLAN CONT.



The following table shows additional recommendations with expected completion dates.

ID#	Recommendation	Focus Area	Expected Completion Date
OM-10	Evaluate Standard Operating Procedures for severe winter weather for distribution facilities.	Operations and Maintenance	12/31/2021
OM-11	Develop winter storm SOP for all wastewater treatment facilities.	Operations and Maintenance	12/31/2021
OM-12	Develop winter storm SOP for wastewater collection system, specifically identifying overflow points and critical lift stations.	Operations and Maintenance	12/31/2021
OM-13	Coordinate with power providers to identify "critical water facilities" in accordance with SB3.	Operations and Maintenance	3/1/2022
OM-14	Collaborate with AE to add third electric feed to Ullrich WTP and enable automatic switching capability.	Operations and Maintenance	10/1/2022
OM-15	Store strap-on boot spikes at treatment plants to walk on icy/slippery areas.	Operations and Maintenance	12/31/2021
OM-16	Add low level lockouts and remote override at pump stations.	Operations and Maintenance	12/31/2021
OM-17	Purchase and utilize tire chains for select AW vehicles and conduct training for installing tire chains and driving in icy/snowy conditions.	Operations and Maintenance	12/31/2021
OM-18	Authorize TxTags for high priority fleet vehicles and develop plan for utility-wide implementation.	Operations and Maintenance	12/31/2021
OM-19	Continue installing Advanced Metering Infrastructure (AMI) meters for entire AW System.	Operations and Maintenance	12/31/2025
IM-1	Conduct in-house training annually to meet department training requirements, and track conducted training.	Incident Management Team	11/30/2021
IM-2	Develop IMT depth to a minimum of three members at each identified position. Review IMT depth annually and expand as needed.	Incident Management Team	11/30/2021
IM-3	Implement reporting and accountability process annually to ensure full compliance with AW training and response requirements.	Incident Management Team	3/31/2022
IM-4	Evaluate options for developing fleet assets that enhance response capabilities during emergency conditions.	Incident Management Team	12/31/2021
IM-5	Clarify the Public Information Officer role within the Incident Management Team, which includes strategic decisions on communications messaging.	Incident Management Team	12/31/2021
IM-6	Conduct emergency response plan-related exercises that incorporate the ICS structure and use scenarios to test the communications area of the response in ways that are not easily anticipated.	Incident Management Team	12/31/2021
IM-7	Provide AW Communications staff at the City of Austin's Joint Information Center during emergency operations to help close information gaps and coordinate communications.	Incident Management Team	3/31/2023
IM-8	Identify Communications staff to serve multiple shifts during emergency activations and additional Austin Water staff who can support communication activities during emergency activations.	Incident Management Team	12/31/2021
IM-9	Include the Public Information Officer in IMT command meetings to develop updates which reflect potential uncertainty in future developments to accelerate communication releases.	Incident Management Team	12/31/2021
PI-1	Set the schedule for updates during an emergency based on a "planned transparency" approach to releasing information to media and the public that is synchronized with the news cycle.	Public Information Office	12/31/2021
PI-2	Create a real time outage map on the AW website which displays water outages during normal operations and emergency conditions.	Public Information Office	12/31/2021
PI-3	Conduct media training for staff who will represent AW in media interviews, press conferences, public meetings or similar roles during an emergency.	Public Information Office	3/31/2022
PI-4	Develop standard operating procedures for using the Warn Central Texas notification system, notifications through the My ATX Water customer portal, and the Department of Homeland Security's Integrated Public Alert & Warning System (IPAWS).	Public Information Office	6/30/2022
PI-5	Complete training of AW Communications staff to be familiar with the use of the IPAWS emergency alert system.	Public Information Office	6/30/2022
PI-6	Enhance outreach prior to Winter 2021-2022 to demonstrate lessons learned during Winter Storm Uri.	Public Information Office	2/28/2022
PI-7	Elevate visibility of winter weather prep information on the AW website.	Public Information Office	11/1/2021
PI-8	Develop an outreach plan and materials for multifamily property management companies, tenant associations, and property managers.	Public Information Office	12/31/2021
PI-9	Share more information with employees during emergency operations and include internal communications as part of overall emergency incident activities.	Public Information Office	12/31/2021
PI-10	Designate staff to develop internal communications materials during each IMT shift.	Public Information Office	12/31/2021
WH-1	Implement a streamlined communications plan during emergencies that emphasizes single points of contact and advanced coordinated efforts when practical and possible.	Wholesale	12/31/2021

LINKS TO SUPPORTING DOCUMENTS



[Read Austin Water's Incident Management Team Review here](#)

[Read WaterPIO's Communications Review here](#)

[Read Freese and Nichols Technical Review here](#)

AUSTIN WATER
WINTER STORM URI
**AFTER ACTION
REPORT**



November 3, 2021

