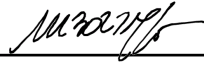


	STANDARD OPERATING PROCEDURE	No.	SOP-1500-WD-004
	Water Line Leak Repair	Effective Date	11/20/2025
		Final Approver	 Miguel C. Bordallo, P.E. General Manager
		Revision Letter	A

1.0 Purpose

This Standard Operating Procedure (SOP) establishes guidelines for detecting and repairing water line leaks within the Guam Waterworks Authority's (GWA) water distribution system.

2.0 Scope

This SOP applies to Guam Waterworks Authority (GWA) personnel who are involved in detecting and repairing water line leaks.

3.0 Policy

Ensure prompt and efficient repair of water leaks to minimize water loss, prevent potential damage to GWA's infrastructure, maintain water quality, and ensure uninterrupted service. All repairs will be conducted in accordance with the American Water Works Association (AWWA) Standard C651-23, *Disinfecting Water Mains* and M-36, *Water Audits and Loss Control Programs*. Adherence to these and other applicable AWWA standards ensures safety, regulatory compliance, and best practices throughout the repair process.

4.0 Definitions

- 4.1. **American Water Works Association (AWWA)**: An international, nonprofit, scientific, and educational society accredited by the American National Standards Institute, dedicated to ensuring safe and reliable water. It sets standards and best practices for water quality, treatment, and distribution.
- 4.2. **Dispatcher**: Employees under the Water Wastewater System Control Center (SCC) in charge of sending emails and text messages to the public and/or media concerning emergency and scheduled water and/or wastewater service interruptions or road closures to perform infrastructure repair and maintenance.
- 4.3. **Geographic Information Systems (GIS)**: A system used to create, manage, analyze, and map all types of spatial data.
- 4.4. **Handheld GPS Device**: A device GWA personnel use in the field to collect accurate spatial data in real-time.
- 4.5. **JD Edwards EnterpriseOne Capital Asset Management (CAM)**: A tool used to manage GWA's Operation and Maintenance Program. CAM tracks the full lifecycle of assets—from acquisition to retirement—including asset performance, and schedules both preventive and corrective maintenance activities.¹
- 4.6. **JD Edwards EnterpriseOne System (E1)**: An Enterprise Resource Planning (ERP) system used to generate, track, and manage work order requests, ensuring accurate assignment, scheduling, and documentation of operational activities.

¹ [JD Edwards EnterpriseOne Capital Asset Management Data Sheet \(oracle.com\)](https://oracle.com)

Water Line Leak Repair

- 4.7. **Pipe Invert:** The bottom interior surface of the pipe.
- 4.8. **Portable Dewatering Pump:** A portable pump used to remove excess water or other liquids.
- 4.9. **Pumper Truck:** A vacuum tank truck designed to remove liquids and debris.
- 4.10. **Repair Crew:** A team of Operators from the Leak Detection (LD) or Pressure Line Unit (PLU) that responds to and repairs water leaks.
- 4.11. **Rover:** An informal term used within the Water Distribution division to refer to Water Distribution Operators who perform daily maintenance and inspections. While not an official GWA position title, it remains in use and on internal documents and forms for consistency.
- 4.12. **Trouble Dispatch Center (Dispatch):** The GWA 24/7 customer complaint response center. The Trouble Dispatch Center is responsible for receiving customer complaints and generating and assigning Work Order (WO) requests.
- 4.13. **Water Hammer:** A hydraulic shock or surge occurs due to a sudden change in the pipeline's flow direction, causing noise, vibration, and potential pipe damage.
- 4.14. **Water / Wastewater System Control Center (SCC):** GWA's primary control/communications hub connecting field personnel and system operators with Operations Supervisors or Managers and executive management. SCC Dispatchers send and receive data to and from field personnel/operators providing critical asset information, additional support, or equipment needed. SCC is also responsible for documenting all transactions between SCC, the relevant Operations Supervisor or Manager, and the responding field personnel/operators.

5.0 Roles and Responsibilities

5.1.	General Manager	Approves this SOP and all its subsequent changes.
5.2.	Assistant General Manager for Operations (AGM-O)	Oversees the development, revision, and implementation of this SOP as the Policy Owner.
5.3.	Assistant General Manager for Compliance and Safety (AGM-C&S)	Reviews chlorine residual reports. Determines and advises the General Manager (GM) of the need to issue a Precautionary Boil Water Notice.
5.4.	Operations & Maintenance (O&M) Manager, Water Distribution	Reviews chlorine residual reports from the PLU Supervisor for breaks lasting more than 12 hours. Consults with the AGM-C&S to determine if a Precautionary Boil Water Notice is required. Reviews GIS data submissions when assigned and reports repeated late or missing submissions to the AGM-O. Reviews this SOP annually and makes necessary changes to be presented to the AGM-O for consideration.

Water Line Leak Repair

		Ensures that proper training and/or training guidelines are provided to the affected employees to ensure proper compliance with this SOP.
5.5.	Leak Detection Supervisor, Operation & Maintenance (O&M)	Monitors personnel to ensure compliance with this SOP and provides guidance if needed. Creates and assigns WOs to the LD. Assigns WOs to the PLU Supervisor if additional resources are needed. Reviews WO for completeness. Closes out completed WOs. Submits field data via WO or handheld GPS devices to the GIS manager or analyst.
5.6.	Pressure Line Unit Supervisor, Operation & Maintenance (O&M)	Monitors personnel to ensure compliance with this SOP and provides guidance if needed. Reviews and assigns WOs to the repair crew for an initial leak assessment. Determines personnel, equipment, and supplies needed for the repair. Contacts SCC to request leak detection assistance when needed. Notifies the Department of Public Works (DPW) before the start of excavation. Notifies Dispatch 48 hours before planned water outages, road closures, and excavation. Reviews WO for completeness. Closes out completed WOs. Submits field data via WO or handheld GPS devices to the GIS manager or analyst.
5.7.	Dispatchers	Receive reports, complaints, or inquiries from GWA customers or the public and relay it to SCC for necessary action. Give customers or the public feedback on their reports, complaints, or inquiries. Prepare and send out water outage/road closure notices to the public. Generate and route WOs to the PLU Supervisor.

Water Line Leak Repair

		Coordinate utility clearances for excavations when needed. Create permanent road repair WOs ensuring the original leak repair WO is referenced.
5.8.	Water / Wastewater System Control Center (SCC)	Receives critical reports or information from GWA field personnel about the operation of GWA facilities. Relays the report or information received and ensures all communications are updated and in the SCC records for its reference.
5.9.	Management Analyst	Reviews GIS data submissions when assigned and reports repeated late or missing submissions to the AGM-O.
5.10.	Personnel Services Administrator (PSA)	Works with the Policy Owner and Authors to establish a training module and track compliance of employees involved in the activities of this SOP.
5.11.	All Employees	Strictly abide by the contents of this SOP and conduct activities accordingly. When confronted by a situation not covered by this SOP or requiring clarification, seek the Manager's or Supervisor's assistance.

6.0 Procedure Description

- 6.1. **Safety Considerations:** Adhere to all safety protocols. Safety briefings are held weekly to discuss these protocols. Use appropriate personal protective equipment (PPE) needed to perform the required work.
- 6.2. **Detection and Notification:** Water leaks are generally identified and reported to GWA's Trouble Dispatch Center (Dispatch) by the Rovers during their daily routine work or by the general public. Water leaks are also identified by Leak Detection (LD) Technicians while performing leak detection surveys and are reported to the LD Supervisor via email or text message.
 - 6.2.1. **Reports Received by Dispatch:** The Trouble Dispatcher will, as best as possible, gather the following information: 1) the name and telephone number of the reporting party, 2) the exact location of the leak, and 3) a brief description of the leak.
 - 6.2.2. **Reports Identified by LD:** The LD Technician will provide the LD Supervisor with the exact location and brief description of the leak.
- 6.3. **Work Order (WO) Assignment:**
 - 6.3.1. The Trouble Dispatcher will generate a WO request in the Capital Asset Management (CAM) system and assign it to the LD Supervisor if field verification is needed or directly to the PLU Supervisor for known leak.
 - 6.3.2. The LD Supervisor will create a WO in CAM for leaks identified and reported during surveys.

Water Line Leak Repair

- 6.3.2.1. If the leak can be repaired by the LD, the WO is assigned to the Leak Detection Technician.
- 6.3.2.2. If additional resources are needed (heavy equipment, traffic control, additional manpower, etc.), the LD Supervisor will assign the WO to the PLU Supervisor and notify him/her of the assignment via email or text message.
- 6.3.3. The PLU Supervisor will review the WO and assign it to the PLU repair crew for an initial leak assessment.
- 6.4. **Documentation:** Details of the repair process must be documented in the Work Order and CAM using the Rinami tablet. These details include, but are not limited to:
 - 6.4.1. Before and after photos of the repair.
 - 6.4.2. Field Conditions: Paved/unpaved, traffic conditions, type of soil, side of street, weather conditions, etc.
 - 6.4.3. Type of Break: Circumferential, longitudinal, both, shear, hole, split, blowout, joint, sleeve, etc.
 - 6.4.4. Cause of Break: Water hammer, defective pipe, corrosion, deterioration, improper bedding, operating pressure, improper installation, etc.
 - 6.4.5. Pipe Data: Type of main, class, length, diameter, etc.
 - 6.4.6. Type of repair and materials used.
 - 6.4.7. Potential contamination issues (e.g., muddy trench water flowing into a broken pipe, leaking sewer pipe in the trench, etc.).
 - 6.4.8. Water quality test results.
 - 6.4.9. Field observations, including inoperable valves or hydrants or incorrect locations of mains, valves, hydrants, underground utility locations, service connections, etc.
- 6.5. **Initial Response Procedures:**
 - 6.5.1. The assigned repair crew (LD or PLU) will review the details of the information or complaint in the WO.
 - 6.5.1.1. **Customer Communication Requirement:** If the WO includes a customer contact number, the repair crew must:
 - a. Confirm the leak location directly with the customer before proceeding with the assessment.
 - b. After completing the repair, a member of the PLU team must contact the customer to inform them that the leak has been repaired.
 - 6.5.2. Assess the leak to confirm if it falls within GWA's jurisdiction and determine if excavation is needed.
 - 6.5.2.1. If the WO is assigned to the LD, repairs are performed in accordance with Section 6.6.

Water Line Leak Repair

- 6.5.2.2. If the WO is assigned to the PLU, the repair crew will proceed with the assessment and report their findings to the PLU Supervisor via phone call or text message.
- 6.5.3. Based on the findings of the repair crew, the PLU Supervisor will determine the personnel, equipment, and materials needed. If needed, the PLU Supervisor will initiate the following actions:
 - 6.5.3.1. Contact SCC to request assistance from the leak detection crew if assistance is needed to pinpoint the leak using sounding equipment.
 - 6.5.3.2. If a backhoe is required, contact Dispatch to request utility clearances for marking utility lines in the area to avoid any damage during the repair work.
 - 6.5.3.3. If excavation is required, provide sufficient notice to the Department of Public Works (DPW) before the start of excavation².
 - 6.5.3.4. If required, notify Dispatch via email or text message to issue a service interruption and/or road closure using the Water Outage & Road Closure Notice Request³.
 - 6.5.3.5. For breaks lasting more than twelve (12) hours, monitor and report the chlorine residuals upstream and downstream of the repair via email, phone, or WhatsApp to the O&M Manager and AGM-C&S. The AGM-C&S will evaluate the report and advise the GM if a Precautionary Boil Water Notice is required⁴.
- 6.6. **Leak Repair Procedures:** The repair crew should document the repair with before and after photos and attach them to the WO in the CAM.
 - 6.6.1. Upon arrival at the site, open the WO and begin the start.
 - 6.6.2. Establish traffic control measures around the area and set up visible street signs to ensure a safe working area.
 - 6.6.3. If applicable, identify the leak detection technician's marking to locate the leak.
 - 6.6.4. If applicable, mark the area to be excavated. Begin excavation around the leak and avoid damage to other utilities⁵.
 - 6.6.4.1. Excavate the break. Provide the necessary benching, sloping, and/or shoring depending on the depth in accordance with the Occupational Safety and Health Administration (OSHA) standards for trenching and excavation⁶. Use portable dewatering pumps or pumper trucks to keep water levels at least one foot below the pipe invert during the repair.
 - 6.6.5. Inspect the affected pipe to assess the severity of the leak and the type of break (e.g., circular break, hole, or rectangular break).

² 21 GCA §71104, *Notice of Intent to Excavate or Demolish*.

³ See SOP-1500-WP-001, *Water Outage & Road Closure Notifications to the Media/Public*.

⁴ See SOP on *Issuance of Precautionary Boil Water Notice* (draft).

⁵ See SOP T.101, *Trenching, Excavation and Shoring*.

⁶ 29 CFR 1926 Subpart P.

Water Line Leak Repair

- 6.6.6. Measure and record the size of the pipe and break (in inches) in the WO and *Water Loss Form (Attachment 1)*.
 - 6.6.6.1. Circular breaks: Measure the diameter of the pipe and the width of the break.
 - 6.6.6.2. Hole in pipes: Measure the diameter of the hole.
 - 6.6.6.3. Rectangular break: Measure the width and length of the break.
- 6.6.7. Install a pressure gauge to the fire hydrant, hose bib, or meter assembly to measure and record the system pressure (which should be within a minimum of 20 pounds per square inch (psi) to a maximum of 90 psi⁷) in the “Water Loss Details” section under “Pressure Before Repair (psi)” of **Attachment 1**.
- 6.6.8. Record the estimated time the leak has been active in the *Water Loss Form* and WO.
- 6.6.9. Begin repairs according to the procedures outlined in **Attachment 2**. Consider the following to ensure effective and efficient repairs:
 - 6.6.9.1. Confirm and document if positive pressure is maintained above 20 psi near the break site by visually observing water flow from the pipe or checking a hose bib or hydrant at a higher elevation⁸.
 - a. If the pipe cannot be repaired under pressure, do not depressurize it until it is exposed. Isolate the leak area or pipe section to minimize water loss and disruption to surrounding areas.
 - 6.6.9.2. Maintain a dewatered trench at least one foot below the pipe invert.
 - 6.6.9.3. Inspect the interior and exterior of all new materials (pipes, fittings, valves, etc.) to ensure no visible damage, debris, or contamination.
 - 6.6.9.4. Remove any visible debris from exposed areas of the existing pipe.
 - 6.6.9.5. Keep all repair parts, tools, and materials clean and sanitized. Inspect, clean, and disinfect new piping before installation.
 - 6.6.9.6. Maintain pipe caps, plugs, or other protective coatings until materials are ready to be installed.
 - 6.6.9.7. Complete installation of all pipe and fitting joints in the trench before stopping work.
- 6.6.10. Isolating the leak area/pipe section may be necessary to minimize water loss and disruption to surrounding areas. If isolation is required, the O&M Manager will dispatch Rovers to the site to conduct flushing and obtain a chlorine residual.
- 6.6.11. If necessary, disinfect the pipe using the spray method in accordance with AWWA Standard C652. For disinfection of repaired mains, the spray method may be used, which involves a 30-minute exposure to free chlorine at not less than 200 mg/L⁹.

⁷ 28 GAR §2103 (l), *Minimum Water Delivery Pressure*.

⁸ Positive pressure is maintained to prevent contamination from backflow into the pipe.

⁹ Refer to chlorination method 2 in AWWA Standard C652, *Disinfection of Water Storage Facilities*.

Water Line Leak Repair

- 6.6.12. Install a new section of pipe, ensuring proper sizing and alignment with existing connections.
- 6.6.13. Secure the new pipe in place with fittings and clamps, ensuring a watertight seal.
- 6.6.14. Re-install the pressure gauge and take another reading to ensure the system has returned to normal operating condition and there are no additional leaks. Measure and record the system pressure in the WO and **Attachment 1** under "Pressure After Repair (psi)."
- 6.6.15. Using the handheld GPS device, record the exact location of the repaired pipe, including the latitude and longitude coordinates, in the notes section of the WO and the *Water Loss Form*.
- 6.6.16. Flush fire hydrants to remove air from the system to ensure water quality.
- 6.6.17. After flushing and disinfection are complete, return the main to service by opening any closed valves, using a sequence that avoids low or negative pressures. Be sure to monitor the repaired section closely for any signs of reoccurring leaks or issues.
- 6.6.18. If excavation was done, begin temporary road repairs¹⁰.
 - 6.6.18.1. Notify the Permits office to request a permit inspector conduct an on-site inspection before backfilling and compacting. The inspector will verify proper compaction before laying cold mix/asphalt.
 - 6.6.18.2. If permanent road repairs are necessary, initiate steps for permanent road repairs.
- 6.7. **Flow Rate and Water Loss:** Accurate recording of water loss is essential for water management. The repair crew will use one of the following methods to estimate the flow rate and water loss:
 - 6.7.1. **Missouri Rural Water Association (MRWA):** The MRWA website provides three (3) types of pipe break loss calculators for circular breaks (**Attachment 3**), hole breaks (**Attachment 4**), and rectangular breaks (**Attachment 5**).
 - 6.7.1.1. Open the MRWA Pipe Break Loss Calculator¹¹.
 - 6.7.1.2. Enter the details of the break:
 - a. Type of Break: Select the shape of the break (circular, hole, or rectangular).
 - b. Pipe and Break Size: Input the diameter, width, or length of the pipe or break as appropriate.
 - c. Pressure: Enter the system pressure.
 - 6.7.1.3. Enter the estimated duration of the leak time in hours.
 - 6.7.1.4. Record the calculated water loss results in the WO and *Water Loss Form*.

¹⁰ See SOP on *Roadway Restoration Post-Leak Repairs* (draft) for detailed steps on temporary and permanent road repairs.

¹¹ [MrwaPwa\(moruralwater.org\)](http://MrwaPwa(moruralwater.org)).

Water Line Leak Repair

6.7.2. **Eyeball Estimation:** To estimate the total volume using this method, follow these steps:

6.7.2.1. Imagine the amount of water that would fill a standard 5-gallon bucket.

6.7.2.2. Estimate the time (in minutes) it would take to fill the 5-gallon bucket.

6.7.2.3. Divide the volume of the bucket by the time taken to fill it to calculate the flow rate in gallons per minute (gpm).

6.7.2.4. Calculate the total duration of the leak, from the time it was reported until the time it stopped.

6.7.2.5. Multiply the estimated flow rate and duration of the leak to get the total estimated water loss.

6.8. Work Order Closure:

6.8.1. The LD or PLU Supervisor or Leader must review all WOs before closing them out to ensure all required fields are filled out and photos are attached.

6.8.1.1. A WO that includes a customer contact number must not be closed unless the customer has been contacted to verify the leak location and the communication details, including the date, time, and outcome, are documented.

6.8.2. Once the WO has been reviewed and deemed complete, the LD or PLU Supervisor or Leader will proceed to close out the WO.

6.9. **Data Submission:** Field data, including any new pipe material, location, and field observations, must be submitted to the GIS section via WO or handheld GPS device¹².

6.9.1. Submission Timeline:

6.9.1.1. **Work Orders:** At the end of each shift, the LD or PLU Supervisor will email a list of completed WO numbers for that day to the GIS section using the established email distribution list (**Attachment 6**).

6.9.1.2. **Handheld GPS Device:** If handheld GPS devices are used, they will be physically submitted to the GIS section every Friday morning for data downloading. The devices will then be retrieved on the following Monday morning or once the downloads are complete.

6.10. Reporting:

6.10.1. Upon the request of the AGM-O, the O&M Manager or Management Analyst will review data submissions for the specified timeframe to ensure compliance with the submission requirements outlined in Section 6.9.

6.10.2. The review will compare completed WOs against the GIS section's confirmation of received submissions to determine whether filed data and updated coordinates were submitted in a timely manner¹³.

¹² See SOP-1000-AM-002, *GIS Mapping Post Leak Repairs*.

¹³ GIS confirmation of received submissions is based on existing email submission history and GPS download confirmations.

Water Line Leak Repair

6.10.3. Any instances of repeated late or missing submissions will be documented and reported to the AGM-O for further review and potential corrective action.

6.11. **Training:** The O&M Managers should conduct training on water line leak repair when needed. All new or applicable employees must receive training and sign the *Employee's Acknowledgment Receipt (Attachment 7)* to confirm their understanding and compliance with the procedures outlined in this SOP.

6.11.1. The Personnel Services Administrator (PSA) will work with the Policy Owner and Authors to establish a training module and track compliance of employees involved in the activities of this SOP.

6.12. Non-Compliance with this SOP:

6.12.1. **Employee:** Failure of the employee to adhere and comply with any of the guidelines, policies, and procedures stated herein may result in progressive or adverse disciplinary action, including but not limited to suspension, demotion, or termination of employment as provided by GWA Personnel Rules and Regulations (PR&R).

6.12.2. **Supervisors and Managers:** Failure of the Manager or Supervisor to report and enforce all the guidelines, policies, and procedures stated herein may result in progressive or adverse disciplinary action, including but not limited to suspension, demotion, or termination of employment as provided by GWA PR&R.

7.0 Document Approvals

Role	Position	Name of Approver	Approval Signature	Date Approved
Authors	Leak Detection Technician Supervisor Management Analyst II	Raymond Asuncion Antonette Dione Gutierrez	Approval on File	On File
Policy Owner	Assistant General Manager for Operations (AGM-O)	Thomas A. Cruz, P.E.	Approval on File	On File
Final Approver	General Manager	Miguel C. Bordallo, P.E.	Page 1	Page 1

By existing Guam and Federal laws, the contents of this SOP were reviewed thoroughly by its Policy Owner and was found to be:

☒ appropriate for publication on the GWA website without compromising the security of GWA's system or the public's health and safety.

☐ not appropriate for publication on the GWA website because it might jeopardize the security of GWA's system or the public's health and safety.

8.0 Records of Revisions

All suggestions for improvement shall be directed to the Policy Owner indicated below. The Policy Owner will consider input received, develop recommendations on how to address the suggestions and obtain authorization to make the recommended changes. Updates, revisions, corrections and waivers to this SOP shall be made in writing and be approved by the GM.

8.1. Policy Owner: Assistant General Manager for Operations

8.2. Authorization: General Manager

Water Line Leak Repair

Effective Date	Revision Letter	Document Authors	Description of Change
Page 1	A	Raymond Asuncion Antonette Dione Gutierrez	Initial Release of SOP

9.0 References

- 9.1. AWWA Standard C651-23, *Disinfecting Water Mains*.
- 9.2. M-36, *Water Audits and Loss Control Programs*.
- 9.3. Guam Code Annotated, Title 21, § 71104, *Notice of Intent to Excavate or Demolish*.
- 9.4. SOP-1500-WP-001, *Water Outage & Road Closure Notifications to the Media/Public*.
- 9.5. SOP on *Issuance of Precautionary Boil Water Notice* (Draft).
- 9.6. SOP T.101, *Trenching, Excavation and Shoring*.
- 9.7. Occupational Safety and Health Administration (OSHA), 29 CFR 1926 Subpart P (Excavations).
- 9.8. 28 GAR §2103 (I), *Minimum Water Delivery Pressure*.
- 9.9. SOP on *Roadway Restoration Post-Leak Repairs* (Draft).
- 9.10. MRWA Pipe Break Loss Calculator. [MrwaPwa \(moruralwater.org\)](http://MrwaPwa.moruralwater.org).
- 9.11. Appendix B - Procedures for Managing an ArcSDE Enterprise Geodatabase.
- 9.12. [JD Edwards EnterpriseOne Capital Asset Management Data Sheet \(oracle.com\)](http://JD Edwards EnterpriseOne Capital Asset Management Data Sheet (oracle.com))
- 9.13. AWWA Standard C652, *Disinfection of Water Storage Facilities*.
- 9.14. SOP-1000-AM-002, *GIS Mapping Post Leak Repairs*.

Water Line Leak Repair

Attachment 1: Water Loss Form



Gloria B. Nelson Public Service Building
688 Route 15
Mangilao, Guam 96913
raymond@guamwaterworks.org

WATER LINE LEAK REPAIR
WATER LOSS FORM

Water Loss

Work Order No.	Failure Description
Division	Description & Unit Number
	Start Date

Water Loss Details

Order Number (Loss Number)	Creation Date	Creation Time
Start Date	Start Time	Completion Date *
Age Of Leak (days before call)	Pipe Type *	
Leak Location *	Material Type *	
Cause of Rupture		
Pipe Diameter (in)*	Cover Depth (in)*	
Pressure Before Repair (psi)	Pressure After Repair (psi)	
Pipe Repaired (feet)		

Water Volume Calculation

Magnitude of Leak *	Method of Leak Rate *
Gallons Per Minute *	Gallons Per Day
Days Duration	Rate / Kgal
Village of Leak *	



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Water Line Leak Repair

Attachment 2: Main Break Types and Repair Response Procedures

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WATER LINE LEAK REPAIR
MAIN BREAK TYPES AND REPAIR
RESPONSE PROCEDURES

Main Break Type	Type 1	Type 2	Type 3	Type 4
Description				
Description	Controlled pipe repair without depressurization	Controlled pipe repair with depressurization after shutdown	Uncontrolled pipe break with possible water contamination or loss of sanitary conditions during repair	Uncontrolled pipe break with a likelihood of water contamination or loss of sanitary conditions during repair
Pressure Conditions	Positive pressure maintained during break and repair	Pressure maintained during break and excavation, followed by controlled shutdown for repair	Loss of pressure at break site / possible local depressurization (less than 20 psi) adjacent to the break (e.g., severe erosion requires pressure to be reduced prior to exposing the pipe)	Loss of pressure at break site / widespread depressurization (less than 20 psi) in the system (e.g., pipe blowout and loss of pressure prior to shutdown)
Risk of Microbiological Contamination	No signs of contaminant intrusion	No signs of contaminant intrusion	Possible contaminant intrusion	Possible / actual contaminant intrusion
Assess Break				
	Excavate to at least 1' below the pipe invert No shutdown needed; maintain pit water level below break	Excavate to at least 1' below the pipe invert Perform controlled shutdown after pipe is exposed and secured from trench soil/water contamination and maintain pit water level below break	Uncontrolled shutdown Document possible contamination Shut-off customer services in affected area	Immediate or uncontrolled shutdown Document likely contamination Shut-off customer services in affected area
Repair	Repair pipe under positive pressure Disinfect repair parts Swab accessible components with 1% chlorine solution	Repair pipe following controlled shutdown Disinfect repair parts Swab accessible components with 1% chlorine solution	Repair pipe following partial of uncontrolled shutdown Disinfect repair parts Swab accessible components with 1% chlorine solution	Repair pipe following uncontrolled or immediate shutdown Disinfect repair parts Swab accessible components with 1% chlorine solution
Disinfection	Not required	Not required	Conduct slug chlorination (CT_1 of 100 mg/L-min)	Conduct slug chlorination (CT_1 of 100 mg/L-min)
Flushing	Conduct scour flush at 3 fps for a minimum of 3 pipe volumes and confirm water is visually clear Dechlorinate if needed	Conduct scour flush at 3 fps for a minimum of 3 pipe volumes and confirm water is visually clear Dechlorinate if needed	Conduct scour flush at 3 fps for a minimum of 3 pipe volumes and confirm water is visually clear Dechlorinate if needed	Conduct scour flush at 3 fps for a minimum of 3 pipe volumes and confirm water is visually clear Dechlorinate if needed

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Water Line Leak Repair

Attachment 3: Circular Break

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**WATER LINE LEAK REPAIR
CIRCULAR BREAK**



**MISSOURI RURAL WATER
ASSOCIATION**

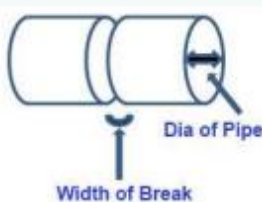
Pipe Break Loss
Estimate water flow and loss from a pipe break.

Break Type
Circular

Type of break in the pipe

Diameter
Diameter of pipe in inches

Pressure
Water pressure in the pipe (psi)



Width
Width of break in inches

Time
Leak time in hours

CLEAR

Page 1 of 1

Water Line Leak Repair

Attachment 4: Hole Break

GUAM
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AUTHORITY

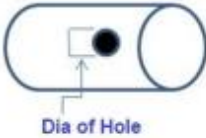
Gloria B. Nelson Public Service Building
688 Route 15
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raymond@guamwaterworks.org

WATER LINE LEAK REPAIR
HOLE BREAK



Pipe Break Loss
Estimate water flow and loss from a pipe break

Break Type
Hole
Type of break in the pipe


Dia of Hole

Diameter
Diameter of hole in inches

Pressure
Water pressure in the pipe (psi)

Time
Leak time in hours

CLEAR

Page 1 of 1

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WATER LINE LEAK REPAIR RECTANGULAR BREAK



Estimate water flow and loss from a pipe break.

Rectangular

Width of break in inches

Length of break in inches

Water pressure in the pipe [pa]

Leak time in hours

CLEAR

Water Line Leak Repair

Attachment 6: GIS Email Distribution List

Gloria B. Nelson Public Service Building
688 Route 15
Mangilao, Guam 96913
vincep@quamwaterworks.org

**WATER LINE LEAK REPAIR
GIS EMAIL DISTRIBUTION LIST**

Name	Position	Email
Rodney Toves	GIS Manager	rtoves@quamwaterworks.org
Roque Rosario	GIS Analyst	roquer@quamwaterworks.org
Raymond Asuncion	Leak Detection Technician Supervisor	raymond@quamwaterworks.org
Benny Chargualaf	Leak Detection Technician Leader	bcharqualaf@quamwaterworks.org
Luther Meno	Water Sewer Worker Leader	lmemo@quamwaterworks.org
Vincent Pangelinan	O&M Manager for Water Distribution	vincep@quamwaterworks.org
Thomas F. Cruz, P.E.	Assistant General Manager for Operations	thomas@quamwaterworks.org
Antonette Dione Gutierrez	Management Analyst II	agutierrez@quamwaterworks.org

Water Line Leak Repair

Attachment 7: Employee’s Acknowledgment Receipt



Gloria B. Nelson Public Service Building
688 Route 15
Mangilao, Guam 96913
raymond@guamwaterworks.org

WATER LINE LEAK REPAIR
EMPLOYEE'S ACKNOWLEDGMENT
RECEIPT

I, the undersigned, an employee of the Guam Waterworks Authority, hereby acknowledge receipt of SOP-1500-WD-004 entitled "Water Line Leak Repair" this _____ day of _____, 20____.

Employee's Name/Badge No.:	Employee's Signature:	Date:

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