GUAM WATERWORKS AUTHORITY	STANDARD OPERATING PROCEDURE	No.	SOP-1500-WWC-003
	Method for Sanitary Sewer Overflow Spill Calculation	Effective Date	6/6/2025
		Final Approver	Miguel C. Bordallo, P.E. General Manager
		Revision Letter	A

1.0 Purpose

This Standard Operating Procedure (SOP) establishes guidelines for accurately estimating the volume of a Sanitary Sewer Overflow (SSO) discharged from the Guam Waterworks Authority's (GWA) sewer systems (e.g., manhole, clean out, wet pit, etc.) and treatment plants. It outlines different methods and data used for calculating the volume of SSOs.

2.0 Scope

This SOP applies to all GWA employees under the Wastewater Collection and Wastewater Treatment divisions who respond to SSOs.

3.0 Policy

GWA is required to report all SSO data, regardless of size, to the United States Environmental Protection Agency's (USEPA) Enforcement Section following the procedures outlined in Section 6.14 of the *SSO Response* SOP.

These overflows are also recorded to gain insight into the network facilities during SSO occurrences and to determine if any area should be considered as a Hot Spot[1].

4.0 Definition

4.1. **Bypass:** The intentional diversion of waste streams from any portion of a treatment facility.

4.2. **Discharge Spill:** The release of treated or untreated wastewater into any area not normally a part of the GWA wastewater management system.

4.3. **Discharge to Waters of the US:** The release of treated or untreated wastewater into any natural water body in the US not governed by a National Pollutant Discharge Elimination System (NPDES) permit.

4.4. **Flow Rate:** The volume of flow per unit that is escaping from the GWA's wastewater treatment facility or collection system.

4.5. **Hot Spot:** A Hot Spot refers to a designated segment of sewer pipe identified to be prone to recurring SSOs due to blockages caused by Fats, Oils, and Grease (FOG), grit, debris, or structural defects. These areas are added to the Hot Spot list when SSOs occur at least twice in a twelve (12) month period, not related to rainfall, inflow, or infiltration.

4.6. **Inflow and Infiltration (I/I):** Inflow of rainwater entering the sewer system through improper connections (e.g., downspouts or drainage system). Infiltration is groundwater entering the sewer system through holes in the sewers or unsealed manholes.

[1] For detailed information, refer to GWA's Hot Spot Cleaning Plan.

4.7. **Pumping Station Operator (Operator):** The Employees under the Wastewater Collection section are responsible for operating and maintaining GWA's sewer pump stations as well as responding to and mitigating emergency call-outs such as SSOs.

4.8. **Sanitary Sewer Overflow (SSO):** Any overflow, spill, release, or diversion of wastewater from a sanitary sewer collection system that occurs before a treatment plant. Sanitary sewer overflows include a) overflows or releases of wastewater that reach waters of the US, b) overflows or releases of wastewater that do not reach waters of the US, and c) wastewater backups into buildings or private property that are caused by blockages or flow conditions in a sanitary sewer system or building sewer lateral. SSOs are also caused by high volumes of I/I pipe blockages, pipe breaks, power failure, and insufficient system capacity.

4.9. **Sanitary Sewers:** A sewer that carries sewage and to which storm, surface, and ground waters are not permitted to be admitted.

4.10. **Sewer Manhole (SMH):** The surface-level access point for a below-ground sewer piping system. Designed for the entry of cleaning equipment and personnel to conduct sewer maintenance on underground sewer piping.

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.	Operations & Maintenance (O&M) Manager, Wastewater Collection & Treatment	Provides oversight and guidance to their respective employees/contractors to ensure full compliance with this SOP. Reviews this SOP annually and makes necessary changes to be presented to the AGM-O for consideration. Ensures that proper training and/or training guidelines are provided to the affected employees to ensure proper compliance with this SOP.
5.4.	Supervisors, Operations & Maintenance	Monitor personnel to ensure compliance with this SOP and provide guidance if needed.
5.5.	Operators	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, administrator's, or supervisor's assistance.

6.0 Procedure Description

6.1. **Documentation:** All data must be recorded in the notes section of the Work Order and in the "Spill Details" section of the Incident Report[2].

6.2. **Methods for Calculation:** Obtaining an accurate estimate of SSO volume is critical, but may be difficult due to unpredictable factors like heavy rainfall and water breaks. Each SSO is unique and may require a different calculation method to determine the volume accurately. Therefore, Operators should apply their best judgment to determine the most appropriate method to use for each SSO.

6.2.1. **Eyeball Estimation:** This method is commonly used by the Wastewater Collection section for contained spills. To estimate the total volume using this method, follow these steps:

6.2.1.1. Consider the amount of water it would take to fill a standard 5-gallon bucket.

6.2.1.2. Estimate the time, in minutes, it would take to fill the 5-gallon bucket.

6.2.1.3. Determine the flow rate in gallons per minute (GPM) by dividing the bucket volume by the time required to fill it.

6.2.1.4. Calculate the total duration of the spill, from the time the overflow was reported until the time it stopped[3].

6.2.1.5. Multiply the estimated flow rate by the duration of the spill to obtain the total estimated spill volume.

6.2.2. **Bucket Method:** This method is commonly used by the Wastewater Treatment section if the entire flow stream can be captured in a bucket. To calculate the total estimated spill volume using this method, follow these steps:

6.2.2.1. Place a standard 5-gallon bucket under the flow stream.

6.2.2.2. Record the time in minutes it takes for the bucket to fill up. To convert seconds into minutes, divide the number of seconds by 60 (round to 2 decimal places).

6.2.2.3. Determine the flow rate in GPM by dividing the bucket volume by the time required to fill it.

6.2.2.4. Multiply the estimated flow rate and the duration of the spill to get the total estimated spill volume.

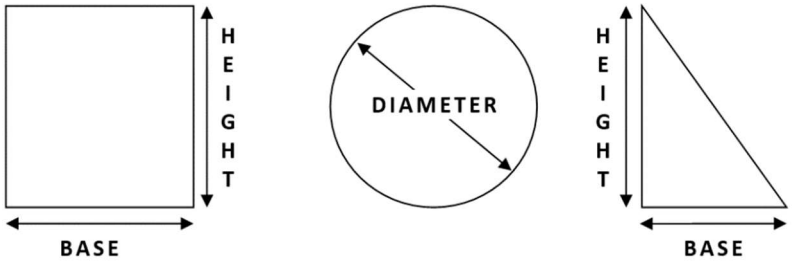
6.2.3. **Duration and Flow Rate (SD Chart):** This method utilizes the *San Diego Manhole Overflow Flow Rate Guide* **(Attachment 1)** to measure the area and depth of spills flowing from manhole covers at various flow rates.

6.2.4. **Measured Volume:** This method is used when the overflow is discovered after the fact and there is no way to determine the duration of the overflow. The wetted area, which is known as the affected area, may be used to calculate the overflow. The

[2] Refer to the *Sanitary Sewer Overflow Response* SOP (draft).
[3] Amended Stipulated Order (Civil Case No. 02-00035), subparagraph 31.b.(3).

following is a simplified way to use shape and dimension to calculate the area of the spills and the depth to calculate the volume.

6.2.4.1. Simplify the wetted area into three (3) regular shapes: rectangle, triangle, or circle.



6.2.4.2. Sketch the shape of the wetted area.

6.2.4.3. Measure the base and the height when measuring a rectangle or triangle and the diameter when measuring a circle.

6.2.4.4. Measure the depth (D) of the wetted area.

6.2.4.5. Convert all units to feet.

6.2.4.6. Calculate the area:

a. Rectangle: Area A = base x height.
b. Triangle: Area A = base x height divided by 2.
c. Circle: Area A = 3.1416 x d x d divided by 4.

6.2.4.7. The volume of overflow is the product of depth (D) and the area (A).

6.2.4.8. Convert the computed volume from cubic feet to gallons by multiplying by 7.48.

6.3. **Incident Report Submission:** Incident Reports must be completed and submitted following the procedures outlined in Section 6.13 of the *SSO Response* SOP.

6.4. **Regulatory Reporting Requirements:** Spill data and calculations must be reported following the procedures outlined in Section 6.14 of the *SSO Response* SOP.

6.5. **Training:** The O&M Managers should conduct training on SSO Spill Calculation when needed. All new or applicable employees must receive training and sign the *Employee's Acknowledgment Receipt* **(Attachment 2)** to confirm their understanding and compliance with the procedures outlined in this SOP.

6.6. **Non-Compliance with this SOP:**

6.6.1. **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).

6.6.2. **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	O&M Manager, Wastewater Collection Legal Secretary III	Jason Tudela 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 were 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 Revision

All suggestions for improvement shall be directed to the Policy Owner indicated below. The Policy Owner will consider the 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 approved by the GM.

8.1. Policy Owner: Assistant General Manager of Operations (AGM-O)

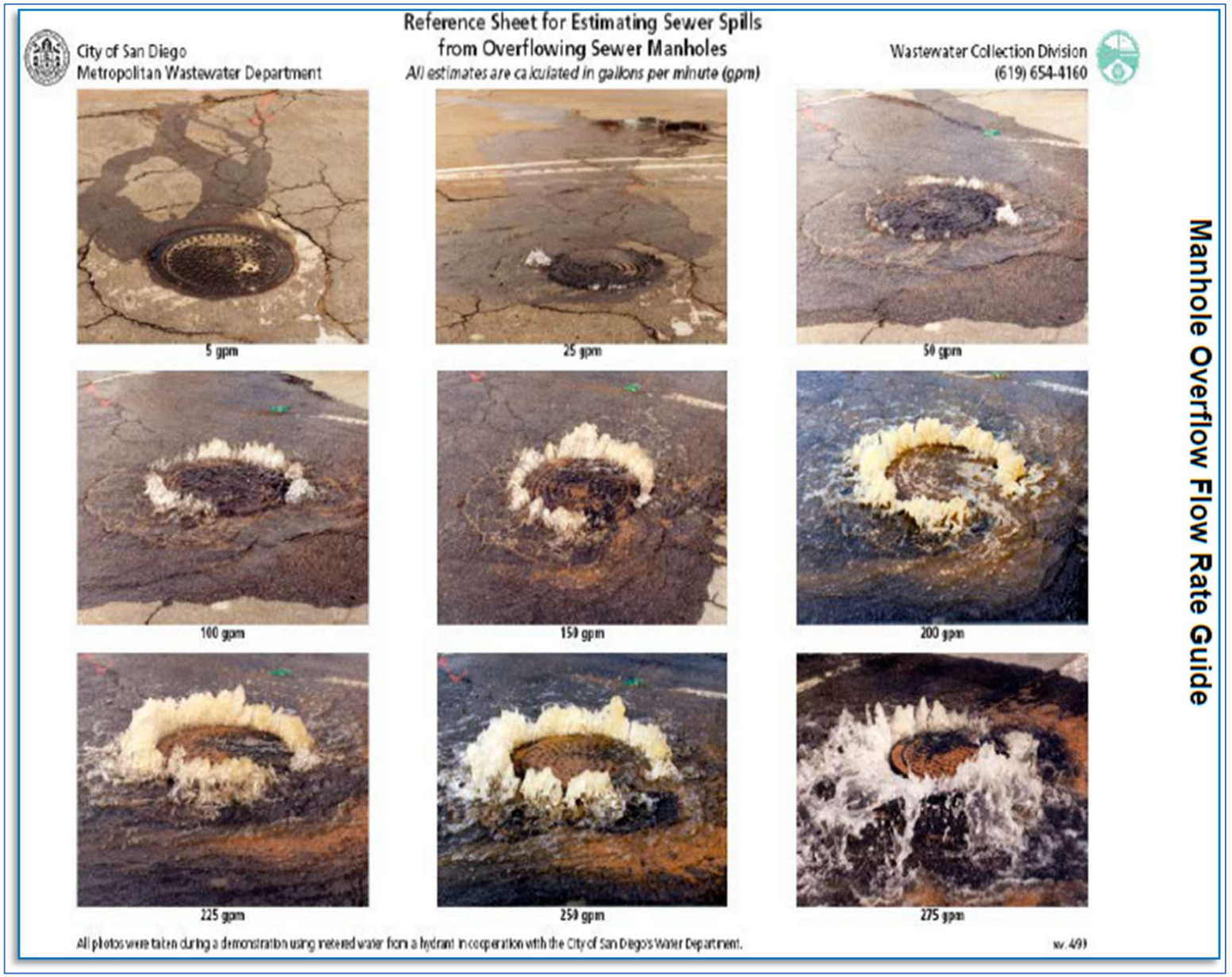
8.2. Authorization: General Manager

Effective Date	Revision Letter	Document Authors	Description of Change
Page 1	A	Jason Tudela Antonette Dione Gutierrez	Initial Release of Policy/Procedure

9.0 References

9.1. SOP on *Sanitary Sewer Overflow Response* (draft).

Attachment 1: San Diego Manhole Overflow Flow Rate Guide



Attachment 2: Employee's Acknowledgement Receipt

GUAM WATERWORKS AUTHORITY

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Mangilao, Guam 96913
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METHOD FOR SANITARY SEWER OVERFLOW SPILL CALCULATION
EMPLOYEE'S ACKNOWLEDGMENT RECEIPT

I, the undersigned, an employee of the Guam Waterworks Authority, hereby acknowledge receipt of SOP-1500-WWC-003 entitled "*Method for Sanitary Sewer Overflow Spill Calculation*" this _____ day of _____, 20____.

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

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