SSO Estimation

Dustin Tripp

City of Raleigh

Public Utilities Department

Table of Contents

- Responsibilities
- SSO Events
- Reporting Requirements
- DEQ
- How to Determine SSO Volume
- Examples

ORC RESPONSIBILITIES

- Visit the system as often as is necessary to insure the proper operation of the system but in no case less frequently than specified in the following schedule, unless otherwise specified in permit;

- Collection Systems:
  - within 24 hours of knowledge of a bypass, spill, or overflow of wastewater from the system unless visited by a collection system Back-up Operator in Responsible Charge;

An SSO is occurring…

…what do you do?

DON'T PANIC

Oh crap...

SSO Events

- Arrive onsite (within two hours of verification)
- Assist crews in stopping the overflow
- Minimize environmental damage
- Assess amount of spill
- Begin clean-up
- Report SSO to DEQ (if necessary)

When to Report an SSO

- When any amount hits a Surface Water of the State – (USGS Blue-line)
- When the amount is over 999 gallons, regardless of surface water
- Press Release (24 hours)
- BIMS Report (5 Days)
- Newspaper Ad (10 Days)

SSOs 999 gallons or less

- No press release required
- If reaches surface water:
  - Within 24 Hours
    - Notify DEQ
  - Within 5 Days
    - BIMS Report Due

SSOs 1000 gallons or more

- Within 24 Hours
  - Notify DEQ
  - Issue Press Release
- Within 5 Days
  - BIMS Report Due

SSOs 15,000 gallons or more

- Within 24 Hours
  - Notify DEQ
  - Issue Press Release
- Within 5 Days
  - BIMS Report Due
- Within 10 Days
  - Publish Newspaper Ad

Newspaper Ad

NOTICE OF DISCHARGE OF UNTREATED WASTE

City of Raleigh
Public Utilities Department

The City of Raleigh Public Utilities Department staff found a sanitary sewer overflow at 3201 Walnut Creek Pkwy S.in Raleigh, NC on Friday July 7, 2017. The North Carolina Department of Environmental Quality, Division of Water Resources was notified of the overflow.

City Staff were notified of a sanitary sewer overflow via a customer call at 8:00AM on Friday July 7, 2017. Crews were able to stop the overflow by 9:30AM on Friday July 7, 2017. Cleanup related to the spill was completed by 3:00PM on Saturday July 8, 2017. It is estimated that the overflow occurred for approximately 2 days, with an overflow volume of 360,000 gallons which reached an unnamed tributary to Walnut Creek. No fish kill has occurred from this overflow as of the time of this press release. The overflow was the result of shop rags.

The City of Raleigh has an aggressive education and enforcement program to prevent the discharge of grease, debris, and other improper materials in the sewer system and to take enforcement action where appropriate. Only water, human waste, and toilet tissue are permitted to be discharged into the sewer system.

This news release is required by NCGS Article 21, Chapter 143.215.C For more information, contact Public Utilities Director Robert Massengill or Assistant Public Utilities Director T.J. Lynch at 919-996-4540.

N&O: July 12, 2017

Talking to DEQ

Before calling:

- Address of spill
- Manhole Facility ID – Ex. SMH147103
- Time SSO began (estimate)
- Time SSO stopped (actual)
- Cause (roots, debris, grease, disposable wipes, paper products, contractor damage, vandalism)
- SSO Volume
- Estimated time of cleanup completion
- USGS Blueline Stream name (if applicable)
  - Could be an unnamed tributary
  - PUMA – Show Additional Layers; Environmental

Talking to DEQ

During the call:
- Write down
  - Name of staff member
  - Time of Call

Clean-Up: No Surface Water

- Remove solids and liquids
    - Pump to closest manhole or use combo trucks
- Restore area
    - Apply powdered limestone
        - not near surface waters
    - Seed and straw

Clean-Up: Surface Water

- Block area downstream
  - To prevent further migration of material
- Set-up pumps to nearest manholes
  - Multiple pumps may be needed
- Remove any solids/paper/etc.
- Use combination trucks (or hydrant with dechlorinator) to wash down surface water
  - Move contaminated water towards pumps

How to Determine SSO Volume

$2 > -3$

$0.999... = 1$

∞

$+$

$-$

$\times$

$\div$

$\pi \approx 3.14$

5^2

$\sqrt{2}$

$1 + 2 \cdot 3$

$(1 - 2) + 3$

$5(2 + 2)$

$101_2 = 5_{10}$

Orange County, CA Estimation Guide

Methods

- Pictorial Reference Flow Rate
  - Visual
  - Vent or Pick Holes
- Measured Volume
- Manhole
  - MH Ring
  - Partially Covered MH
  - Open MH
- Combo/Vacuum Truck Recovery

Reference Sheet for Estimating Sewer Spills from Overflowing Sewer Manholes
All estimates are calculated in gallons per minute (gpm)

City of San Diego Metropolitan Wastewater Department

Wastewater Collection Division (619) 654-4160

5 gpm | 25 gpm | 50 gpm
100 gpm | 150 gpm | 200 gpm
225 gpm | 250 gpm | 275 gpm

All photos were taken during a demonstration using metered water from a hydrant in cooperation with the City of San Diego's Water Department.

DISCLAIMER: This overflow simulation may appear differently from those in other systems because of the manhole lid pick hole configuration. Manhole lids with single or multiple pick holes may appear differently during overflow conditions. However, the volume of exfiltration and the footprint of the wet area should appear relatively the same under similar slope conditions.

| 5 gpm | 25 gpm | 50 gpm | 100 gpm |
| 150 gpm | 200 gpm | 300 gpm | 400 gpm |

DISCLAIMER: This overflow simulation may appear differently from those in other systems because of the manhole lid pick hole configuration. Manhole lids with single or multiple pick holes may appear differently during similar overflow conditions. However, the volume of exfiltration and the footprint of the wet area should appear relatively the same under similar slope conditions.

Vent Hole Method

To estimate an SSO occurring from the manhole pick and vent holes:

- Measure the height of the wastewater plume exiting the holes.
- Find that height and hole diameter on the manhole pick or vent hole chart to determine the flow rate escaping the pick/vent hole.
- Multiply the flow rate times the number of holes that are discharging wastewater.
- Once the total volume (gpm) has been determined, multiply the gpm by the duration of the SSO in minutes.

This will result in the total estimated gallons of the SSO.

Vent Hole Method

Hole Dia. inches	Area sq. ft.	Coeff.of Vel. Cv	Coeff. Of Cont. Cc	C Cv x Cc	Water Ht inches	Water Ht inches	Water Ht feet	Q cfs	Q gpm	Q gph
	Formula: =0.785*Ax*Ax/144			Formula: =Ix*449			Formula: =Gx/12	Formula: =Ex*Bx*(SQRT(2*32.2*Hx))	Formula: =Ix*449	Formula: =Jx*60
Vent Hole										
0.50	0.00136	0.945	0.70	0.662	1/16 th	0.063	0.005	0.0005	0.23	14
0.50	0.00136	0.945	0.70	0.662	1/8 th	0.125	0.010	0.0007	0.33	20
0.50	0.00136	0.945	0.70	0.662	1/4 th	0.250	0.021	0.0010	0.47	28
0.50	0.00136	0.945	0.70	0.662	one half	0.500	0.042	0.0015	0.66	40
0.50	0.00136	0.945	0.70	0.662	3/4 ths	0.750	0.063	0.0018	0.81	49
0.50	0.00136	0.945	0.70	0.662	1 inch	1.000	0.083	0.0021	0.94	56
0.50	0.00136	0.945	0.70	0.662	1 1/4 "	1.250	0.104	0.0023	1.05	63
0.50	0.00136	0.945	0.70	0.662	1 3/8"	1.375	0.115	0.0024	1.10	66
0.50	0.00136	0.945	0.70	0.662	1 1/2"	1.500	0.125	0.0026	1.15	69
0.50	0.00136	0.945	0.70	0.662	1 5/8"	1.625	0.135	0.0027	1.20	72
0.50	0.00136	0.945	0.70	0.662	1 3/4"	1.750	0.146	0.0028	1.24	74
0.50	0.00136	0.945	0.70	0.662	2 inches	2.000	0.167	0.0030	1.33	80
0.50	0.00136	0.945	0.70	0.662	2 1/4"	2.250	0.188	0.0031	1.41	84
0.50	0.00136	0.945	0.70	0.662	2 1/2"	2.500	0.208	0.0033	1.48	89
0.50	0.00136	0.945	0.70	0.662	2 3/4"	2.750	0.229	0.0035	1.56	93
0.50	0.00136	0.945	0.70	0.662	3 inches	3.000	0.250	0.0036	1.62	97
0.50	0.00136	0.945	0.70	0.662	3 1/4"	3.250	0.271	0.0038	1.69	101
0.50	0.00136	0.945	0.70	0.662	3 1/2"	3.500	0.292	0.0039	1.75	105
0.50	0.00136	0.945	0.70	0.662	3 3/4"	3.750	0.313	0.0040	1.82	109
0.50	0.00136	0.945	0.70	0.662	4.000	4.000	0.333	0.0042	1.88	113

Vent Hole Method

Vent Hole										
0.75	0.00307	0.955	0.67	0.640	1/16 th	0.063	0.005	0.0011	0.51	31
0.75	0.00307	0.955	0.67	0.640	1/8 th	0.125	0.010	0.0016	0.72	43
0.75	0.00307	0.955	0.67	0.640	1/4 th	0.250	0.021	0.0023	1.02	61
0.75	0.00307	0.955	0.67	0.640	one half	0.500	0.042	0.0032	1.44	87
0.75	0.00307	0.955	0.67	0.640	3/4 ths	0.750	0.063	0.0039	1.77	106
0.75	0.00307	0.955	0.67	0.640	1 inch	1.000	0.083	0.0045	2.04	122
0.75	0.00307	0.955	0.67	0.640	1 1/4 "	1.250	0.104	0.0051	2.28	137
0.75	0.00307	0.955	0.67	0.640	1 3/8"	1.375	0.115	0.0053	2.39	144
0.75	0.00307	0.955	0.67	0.640	1 1/2"	1.500	0.125	0.0056	2.50	150
0.75	0.00307	0.955	0.67	0.640	1 5/8"	1.625	0.135	0.0058	2.60	156
0.75	0.00307	0.955	0.67	0.640	1 3/4"	1.750	0.146	0.0060	2.70	162
0.75	0.00307	0.955	0.67	0.640	2 inches	2.000	0.167	0.0064	2.89	173
0.75	0.00307	0.955	0.67	0.640	2 1/4"	2.250	0.188	0.0068	3.06	184
0.75	0.00307	0.955	0.67	0.640	2 1/2"	2.500	0.208	0.0072	3.23	194
0.75	0.00307	0.955	0.67	0.640	2 3/4"	2.750	0.229	0.0075	3.38	203
0.75	0.00307	0.955	0.67	0.640	3 inches	3.000	0.250	0.0079	3.53	212
0.75	0.00307	0.955	0.67	0.640	3 1/4"	3.250	0.271	0.0082	3.68	221
0.75	0.00307	0.955	0.67	0.640	3 1/2"	3.500	0.292	0.0085	3.82	229
0.75	0.00307	0.955	0.67	0.640	3 3/4"	3.750	0.313	0.0088	3.95	237
0.75	0.00307	0.955	0.67	0.640	4.000	4.000	0.333	0.0091	4.08	245

Vent Hole Method

Example:

Measured height of plume exiting pick/vent hole is 1 inch from a ½-inch vent hole and there are 4 vent holes. The total volume per minute would be .94 gpm per hole (from attached chart) or 3.76 gpm total (.94 gpm x 4 holes) from the manhole cover. If the SSO lasted one hour, the total wastewater lost would be 226 gallons (3.76 x 60 = 225.6).

- Number of pick holes 4
- Flow from each pick hole .94 gpm
- Duration of SSO 60 minutes
- Total SSO volume (.94 x 4 x 60=225.6) 226 gallons

Measured Volume

1. Sketch the shape of the contained wastewater.

2. Measure or pace off the dimensions.

3. Measure the depth at several locations and select an average.

4. Convert the dimensions, including depth, to feet.

5. Calculate the area:
   - Rectangle: Area = length (feet) x width (feet)
   - Circle: Area = diameter (feet) x diameter (feet) x 3.14 divided by 4
   - Triangle: Area = base (feet) x height (feet) x 0.5

6. Multiply the area (square feet) times the depth (in feet) to obtain the volume in cubic feet.

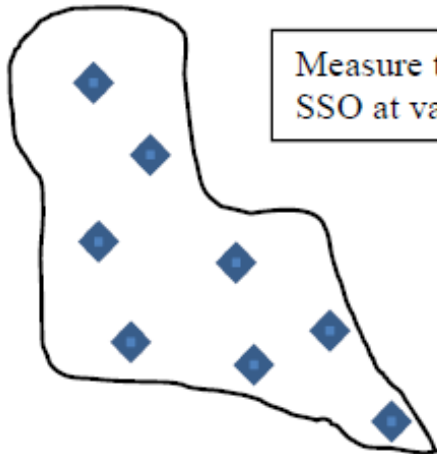7. Multiply the volume in cubic feet by 7.48 to convert to gallons

Measured Volume

Example:

Basic spill area

Basic spill area divided into 4 geometric sections.
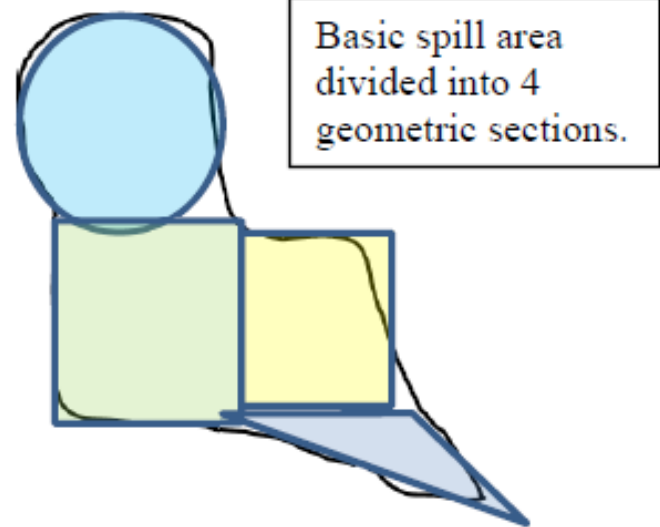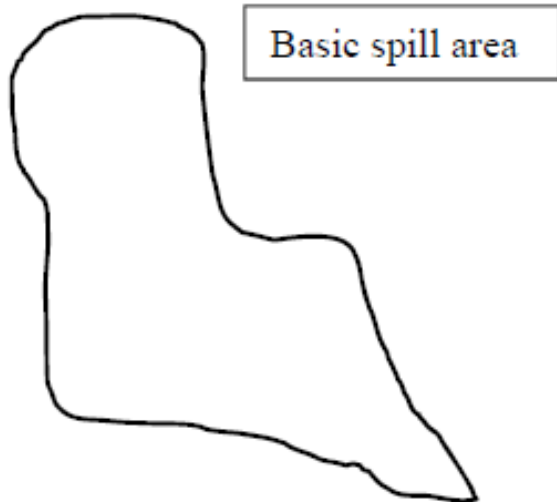
Determine the area of each of the geometric sections adding them all together to determine the total area of the spill.

Measured Volume

Measure the depth of the SSO at various locations.

Where it is difficult to measure wet spots on asphalt, use a depth of 0.0026' or 1/32". For wet spots on concrete use depths of 0.0013' or 1/64" for reasonable estimates.

Sample Calculation:
A 20 ft x 20 ft square wet spot on concrete equals 3.9 gal and for asphalt is 7.8 gal.

Inch to Feet Conversion:		
Inches	to	Feet
1/8"	=	0.01'
1/4"	=	0.02'
3/8"	=	0.03'
1/2"	=	0.04'
5/8"	=	0.05'
3/4"	=	0.06'
7/8"	=	0.07'
1"	=	0.08'
2"	=	0.17'
3"	=	0.25'
4"	=	0.33'
5"	=	0.42'
6"	=	0.50'
7"	=	0.58'
8"	=	0.67'
9"	=	0.75'
10"	=	0.83'
11"	=	0.92'
12"	=	1.00'

Combo Truck Recovery

- When the spill is contained to a specific area and recovered by a combo or vacuum truck, the amount recovered can be used in calculating the amount of the original spill.
- If the spill is contained on a hard surface, estimate the total spill volume by what was captured by the combo or vacuum truck plus the amount that could not be captured.
- To estimate the amount not captured by the combo or vacuum truck, use the Measured Volume Method.
  - For wet spots on concrete, use a depth of 0.0013 ft. or 1/64 inch.
  - For wet stains on asphalt, use a depth of 0.0026 ft. or 1/32 inch.

Conversion Factors

- 1.0 cfs = .6463 mgd
- One cubic foot of water (cf) = 7.48 gallons
- One cubic foot of water per second (cfs) = 448.8 gallons per minute
- A cylinder 1 foot in diameter and one foot deep = 5.87 gallons
- A 1 square foot triangle 1 foot deep = 3.25 gallons
- One inch or 1/12 ft = .083 feet

Shelly Lake Example

- Based on flow monitor data (up and downstream)
- 1.5MGD x 4 days +1 MGD x 0.6076 days

Shelly Lake SSO 04242017.MOV

Pylon Drive Example

Pylon 09232016.MOV

Dustin M. Tripp

Dustin.Tripp@RaleighNC.gov

919-996-2305