Dry Weather Field Screening Methods And Resources Needed

Green Country Stormwater Alliance

Nienhuis Park Community Center

Broken Arrow

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INCOG

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GiveCleanWateraHelpingHand

Define "Dry Weather"

You might say:

- Dry weather begins after a period of 72 hours with less than 0.10 inches of rain.
- Dry weather begins 48 to 72 hours after rainfall events that produce runoff.
- Dry weather begins 72 hours after the last precipitation or snow melt runoff.

Define "Dry Weather"

Problem is:

- Clay soils may require more than 72 hours and sandy soils considerably less time for precipitation to dissipate.
- Depending upon soil type, land use and the "spotty" nature of rainfall events, one part of your MS4 may be experiencing wet weather while another part is having dry weather.

MS4 = Municipal Separate Storm Sewer System

Why Do We Do This?

The point of dry weather field screening is to determine if the dry weather flows are due to natural occurrences or illicit (illegal) discharges.

Play Detective

- Is the bacteria coming from birds? Confined animals nearby? Septic systems? Sanitary sewer overflows or leaking pipes?

- Is the turbidity coming from a nearby construction site? A parking lot or road? An industrial discharge?

- What about nutrients, chemicals, etc.?

Where Do I Monitor?

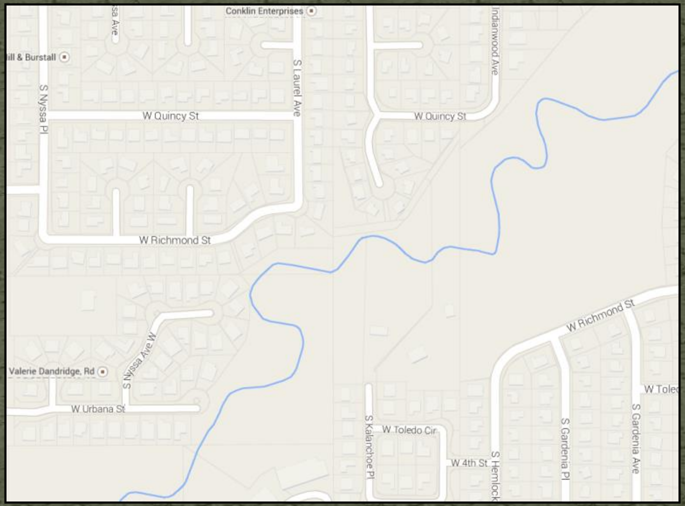
- Monitoring sites are typically outfalls within your MS4 and where water from your MS4 collection system discharges into a "waters of the state."
- To find these use a combination of maps, aerials, information from others and walking the receiving waters in and near your MS4.

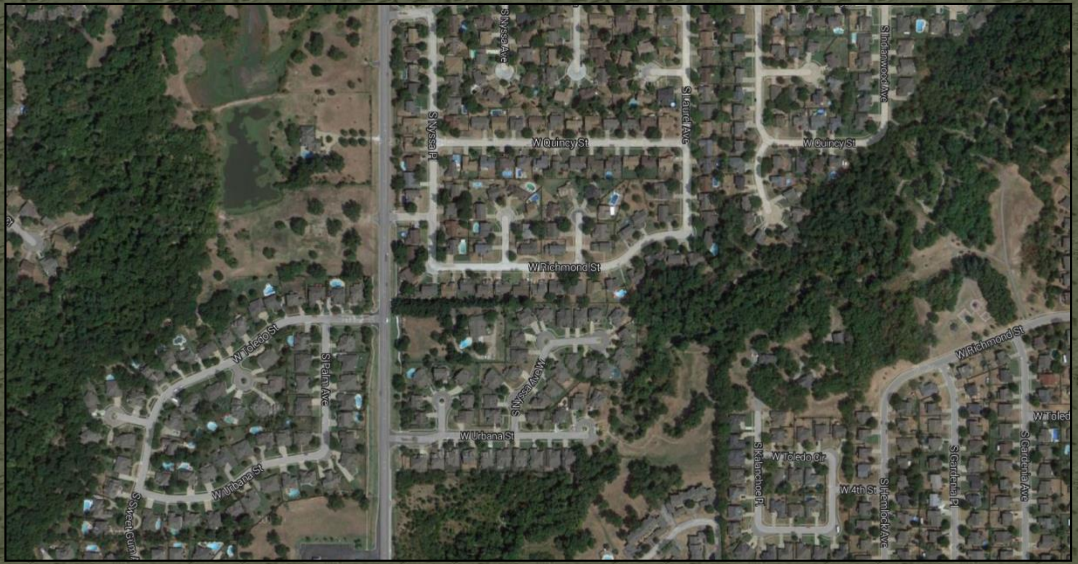
Site Location

- Before you do any field work, formulate a plan.
- Look at a map and determine where your outfalls are and which ones you will try to monitor. Will you divide your MS4 into sections or watersheds?
- Print a map and make a reconnaissance run to see which sites you can get to without undue risk or crossing private property unless you have permission.

Site Location

Once you have located your sites on a map, find the physical location. To aid in this, use a GPS (global positioning system), aerial photos, tape measure, distance measuring wheel, pacing or a visual description.





Avoiding Future Problems

- File this information for future reference.
- If this site is going to be used frequently, assign a number to it and mark it on a permanent surface so it can be readily identified.
- Photos allow you to compare the current site conditions with past conditions.

  Is the site changing?

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Now which one of these outfalls did Joe sample last time?

Authorized Non-Stormwater Discharges*

Water line flushing	Fire hydrant flushing
Landscape irrigation	Diverted stream flows
Rising ground water	Foundation/footing drains
Residential building wash (no detergent)	Individual residential car washing
Discharges from riparian areas and wetlands	De-chlorinated swimming pool discharges
Street wash water	Air conditioning condensate
Irrigation water	Lawn watering
Springs	Other permitted discharges
Pumped ground water (uncontaminated)	Ground water infiltration (Uncontaminated)
Non-commercial or charity car washes	Discharges from potable water sources
Gray water from municipal splash pads	Emergency firefighting activities

As long as the discharge is not a substantial contributor to pollution.

Non-Authorized Stormwater Discharges

- Discharges mixed with non-stormwater
- Stormwater discharges associated with industrial activity unless covered under an OKRO5 permit.
- Stormwater discharges associated with construction activity (OKR10 covers this)
- Stormwater discharges currently covered under another permit
- Discharges exceeding water quality standards
- Discharges not consistent with a Total Maximum Daily Load (TMDL)

Permit Requirements

OKRO4 3.b(5) Says

“Educate employees that have been working in the field, such as maintenance workers, building inspectors, etc., to identify and report stormwater illicit discharges.”

Baseline Analytical Data

- Develop baseline analytical data.
- Get this analytical data from your own testing and the records from state agencies (Blue Thumb, Conservation Dept., OWRB, DEQ, etc.), your water plant and wastewater plant.
- Use this data to determine what is typical for surface waters, groundwaters, rain water, wastewater, drinking water, etc. in your area.

Intermittent Flows

- You may get a report of flows, but when you arrive there are only indications of a previous flow.
- If you miss an opportunity to collect a sample, it may be awhile before you get another chance.
- Tracking down the source of an intermittent flow can take time, be patient.
- If intermittent flows are coming from different sources, the data will seem incongruent.

Be Prepared

To minimize problems:

- Have a well thought out plan when you go out the door.
- Carry extra batteries, pencils or pens, field forms, etc.
- Have the right clothing and safety gear.
- Keep your vehicle well maintained.
- Carry a means of communication.

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Sampling and Observations

- While in the field, look around and take good notes when you see something of interest.

- What are you looking for?

  Anything that might provide a clue as to the:

1. Origin of an unusual flow
2. Composition of an unusual flow
3. Frequency of an unusual flow

Estimating Flow

- Averaging multiple width and depth measurements will improve the accuracy of your flow measurement if the width and depth of the flow varies.
- If the water is deep enough and you have a flow meter, that will simplify the process.

Estimating Flow Method "A"

- Determine the velocity along a relatively straight section at least 5 feet long by timing how many minutes (or seconds) it takes a floating object to move from point A to point B.
- The floating object should not drag along the bottom or your flow estimate will be low.

Estimating Flow Method "A"

- If the floating object sticks up much higher than the surface of the water, wind can blow it around resulting in erroneous results.
- In deeper water oranges work well. In shallow water a small stick will work.
- In very shallow water, flow measurement can be even more difficult. You may have to clear a portion of the channel to get accurate readings.

Estimating Flow Method "A"

- Measure width of flow at the surface.
- Measure the depth of the flow.

Estimating Flow Method "A"

- Example 1:
- It took 15 seconds (0.25 min.) to flow 6 feet. The flow width at the surface was 0.5 feet and the flow depth was 2 inches (0.17 Feet).

$$\frac{1 \text{ min.}}{60 \text{ sec.}} \times \frac{15 \text{ sec.}}{1} = 0.25 \text{ min.}$$

$$\frac{1 \text{ foot}}{12 \text{ inches}} \times \frac{2 \text{ inches}}{1} = 0.1667 \text{ feet}$$

Estimating Flow Method "A"

- Example 1:
- Since flow is frequently reported in cubic feet (a volume) per minute (cfm), measure flow in the most accurate units you can and then convert those measurements to feet and minutes before performing the flow calculation.

Estimating Flow Method "A"

Flow rate (cfm) = Velocity (ft/min) x Area (ft^2)

Velocity (V) = $\dfrac{\text{Distance from point "A" to "B"}}{\text{Travel time from point "A" to "B"}}$

Area (A) = Water Depth x Width of Flow

Flow Rate (Q) = (V) x (A)

Estimating Flow Method "A"

$$V = \frac{6 \text{ ft.}}{0.25 \text{ min.}} = 24 \text{ ft/min}$$

$$A = 0.17 \text{ ft.} \times 0.5 \text{ ft.} = 0.085 \text{ ft}^2$$

Q = V x A, therefore

$$Q = 24 \text{ ft./min} \times 0.085 \text{ ft}^2 = 2.0 \text{ cfm}$$

or $$\frac{2.0 \text{ ft}^3}{\text{min.}} \times \frac{1 \text{ min.}}{60 \text{ sec.}} = 0.03 \text{ cfs}$$

Estimating Flow Method "B"

- For this method we need a calibrated container and a stop watch.
- Example 2:
- It took 50 seconds to fill a 2 gallon pail from an outfall.

Estimating Flow Method "B"

$$\text{Flow Rate, } Q(\text{gpm}) = \frac{\text{Vol. in gal.}}{\text{Seconds to fill}} \times \frac{60 \text{ sec.}}{1 \text{ min.}}$$

$$Q(\text{gpm}) = \frac{2 \text{ gal.}}{50 \text{ sec.}} \times \frac{60 \text{ sec.}}{1 \text{ min.}} = \frac{2.4 \text{ gal.}}{\text{min.}} \times \frac{1 \text{ min.}}{60 \text{ sec.}}$$

Flow Rate = 2.4 gpm or 0.04 gps

gpm x 0.1337 ft^3/gal = cfm

2.4 gpm x 0.1337 ft^3/gal = 0.32 cfm

Questions?

A river is the report card for its watershed.
Alan Levere