# Stormwater Quality Manuals
## Field Guide for Illicit Discharge Detection and Elimination

March 2016



Nevada Department of Transportation

# NDOT's Field Guide for the Detection and Elimination of Illicit Discharges

## Notice

Comments and questions relating to the NDOT's Illicit Discharge Detection and Elimination and the Department's Stormwater Management Program should be directed to:

James Murphy – Program Manager
Nevada Department of Transportation
Stormwater Division
1263 South Stewart Street
Carson City, Nevada 89712

Telephone: 775-888-7889 or 775-888-7771
Email: jmurphy@dot.state.nv.us
Website: www.Nevadadot.com/stormwater

Stantec

6995 Sierra Center Parkway, # 200
Reno, NV 89511 | Phone: (775) 850-0777


Nevada Department
of Transportation

# Table of Contents

## Recognizing and Reporting Illicit Discharges

# Acronyms

| | |
|---|---|
| BMP | Best Management Practices |
| CFR | Code of Federal Regulations |
| IDDE | Illicit Discharge Detection and Elimination |
| MS4 | Municipal Separate Storm Sewer System |
| NDEP | Nevada Division of Environmental Protection |
| NDOT | Nevada Department of Transportation |
| NPDES | National Pollutant Discharge Elimination System |
| USEPA | United States Environmental Protection Agency |

# Recognizing and Reporting Illicit Discharges

## 1.0 Introduction

The purpose of this document is to educate and inform NDOT employees of what an "Illicit Discharge" is and what to do if one is observed. Whether you are an administrator at Headquarters or on a maintenance crew in the field, this handbook was developed to help you spot an "illicit discharge", or anything that is not supposed to be going into the NDOT's Municipal Separate Storm Sewer System (MS4), and what you should do when you see one. The information and activities described in this document are intended to preserve and protect water quality in the State of Nevada.

## 1.1 Organization of This Field Guide

This field guide provides guidance to all NDOT employees on how to recognize illicit discharges and what actions to take.

## 1.2 What is an Illicit Discharge?

The federal government defines an illicit discharge (40 CFR 122.26(b)(2)) as "Any discharge to a municipal separate storm sewer that is not composed entirely of stormwater, except discharges pursuant to a National Pollutant Discharge Elimination System (NPDES) permit (other than the NPDES permit for discharges from the MS4) and discharges resulting from firefighting activities".

As examples, the following would be considered illicit discharges into NDOT's MS4:

- Discharges from sanitary sewer lines
- Automobile and household chemicals (pesticides, paint, oil, antifreeze, etc.)
- Discharges from dry cleaners, laundromats, and municipal car washes
- Discharges from equipment wash pads
- Sediments from unstabilized slopes
- Septic tank waste
- Industrial wastewaters
- Chlorinated pool water

An illicit discharge could originate:

- On the ground surface and within the NDOT right-of-way
- In facilities connected to the NDOT MS4

- In an adjacent or locally owned MS4
- On the ground surface and outside the NDOT right-of-way and flowing into the NDOT right-of-way

By NDOT's statewide stormwater MS4 Permit, specific non-stormwater discharges are allowed provided NDOT does not determine the discharge to be a significant pollutant source. The following are some allowable non-stormwater discharges into NDOT's MS4:

- Water pipe flushing during fire hydrant testing
- Diverted stream flows
- Water from springs or rising ground waters
- Uncontaminated groundwater
- Discharges from potable water sources not requiring a separate permit
- Residential foundation and/or footing drains
- Air conditioning condensate
- Irrigation water from lawns and landscaping
- Water from residential crawl space pumps
- Flows from natural habitats and wetlands
- De-chlorinated swimming pool discharges
- Individual residential car washing
- Water incidental to street sweeping that is not associated with construction activities
- Discharges or flows from firefighting activities
- Dewatering activities not requiring a separate permit

## 1.3 Illicit Discharges - What to Look for, Observe or Note

NDOT's MS4 system (e.g. storm drains, outfalls and conveyance channels) are located in areas ranging from rural to highly urbanized. Illicit discharges are sometimes easily spotted because of the presence of flow during dry weather, dumped materials, unusual or strong odors, excess sediments, trash, oil sheens, or unusual colors. Other times, there are only telltale clues leading to a suspicion of past illicit discharges (for example, the staining of concrete pipes or dead vegetation). Some things to look for and think about are presented below.

### Dry Weather Flows

Water in the MS4 should only consist of stormwater, resulting from a recent rainfall or snowmelt event. Flowing water in stormwater outfalls, pipes or ditches during dry weather periods is one potential indicator of an illicit discharge. When flow is observed during dry weather, it should be treated as suspicious and reported and investigated.

### Nature of Illicit Discharges

The mode of entry to NDOT's MS4 tells a lot about the illicit discharge and where it is coming from. Does the event come and go? Does it flow into the MS4 or is it hard piped directly into the system?

Most Illicit Discharge Detection and Elimination (IDDE) Programs categorize illicit discharges as ***Direct*** **or** ***Indirect*** in their mode of entry to the stormwater conveyance system and may be ***Continuous, Intermittent*** **or** ***Transient*** in nature.

**Direct** – meaning the illicit discharge is a result of piping plumbed directly into the MS4.

**Indirect** – meaning the illicit discharge enters the system via inlets or infiltration.

**Continuous** – Discharges that are on-going and un-interrupted.

**Intermittent** – These discharges occur over a shorter period of time (e.g., a few hours per day or a few days per year). Intermittent discharges come and go on an irregular basis.

**Transient** – Transient discharges are short in duration or temporary. These events are usually in response to a singular event such as an overturned tanker truck, industrial spill, illegal dumping, etc.

Examples of a ***Direct*** mode of entry of an illicit discharge include:

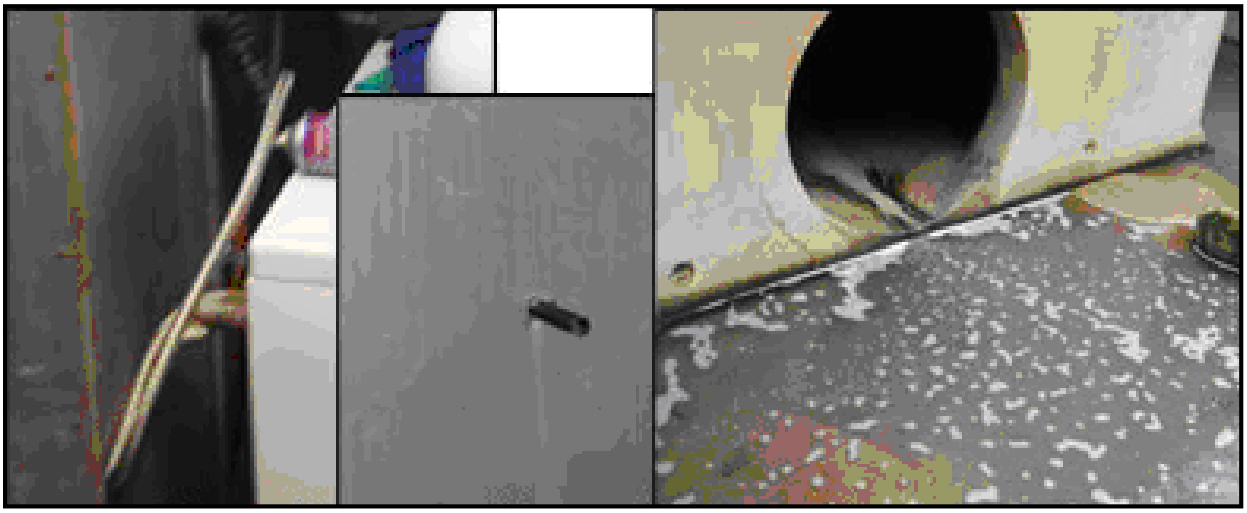

**Figure 1-1. In this case, the mode of entry to the MS4 was a "direct" connection; a washing machine was mistakenly connected to the MS4 instead of the sanitary sewer. It is a "intermittent" discharge in that it only flows when the washer is in operation and discharging. (Photo from University of North Carolina – Environmental Health and Safety)**


**Figure 1-2. The mode of entry to the MS4 is a "direct" connection of a sanitary sewer line to a storm drain pipe. The flow of sewage into the storm drain was "continuous" in nature since the sewer flowed uninterrupted. (Photo from Marcus de la fleur)**

Examples of ***Indirect*** mode of entry of an illicit discharge include:

**Figure 1-3. Material is being dumped directly into the storm drain but would be considered an "indirect" mode of entry. It is a "transient" situation in that it rarely occurs. (Photo from T. Svetich)**

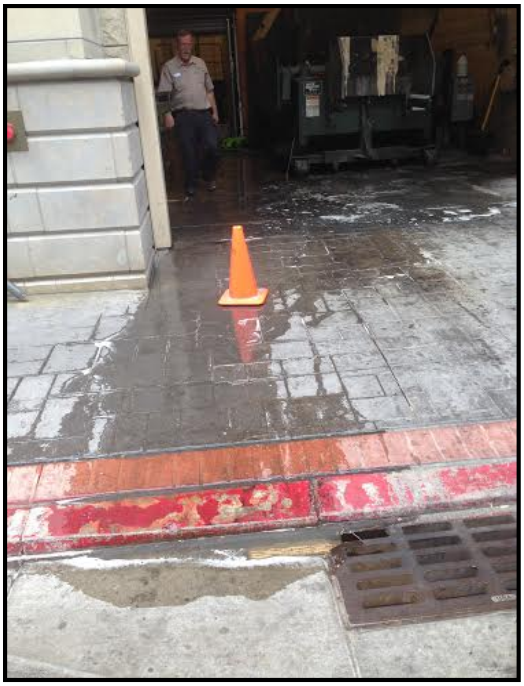

**Figure 1-4. In this situation, a garbage pad area is being washed down with no means of protection or attenuation of pollutants from reaching the MS4. This is regarded as an *indirect* mode of entry and *transient* in that it only periodically discharges to the storm system. If this is their routine maintenance practice, it could be considered an "*intermittent*" discharge. (Photo from T. Svetich)**

**Figure 1-5. A sanitary sewer is surcharging (overflowing) raw sewage as a result of a plugged sewer line. The sewage then flows into the gutter and into a drop inlet. In some cases, if it is not disrupting service, it can be some time before a situation like this is recognized and mitigated. This is an "*indirect*" mode of entry that is most likely a *"transient"* or *"intermittent"* discharge situation. In some cases, sewer overflows can be overlooked for long periods resulting in a "*continuous*" discharge. (Photo from the City of Reno)**

**Figure 1-6. In this situation, sediments were discharged from a construction site and flowed into the storm drain inlet with no BMPs in place. This is regarded as an "*indirect*" mode of entry and would be considered "*transient*". (Photo from NDEP)**

**Figure 1-7. In this situation, a concrete truck is washed onto the ground and not into an approved washout facility. If this material was washed into the MS4, this would be considered an "*indirect*" mode of entry and "*transient*" in frequency. (Photo from NDEP)**

**Figure 1-8. In this "indirect" mode of entry, it appears drainage from a garbage dumpster is draining to a storm drain and could be considered "*transient*" or "*intermittent*" based on staining. (Photo from Coastal Waccamaw Stormwater Education Consortium)**

**Figure 1-9. Sediment discharge into the MS4 from an unstabilized cut slope with no BMPs would be considered "*indirect*" and "*transient*". (Photo from the City of Reno)**

## 1.4 Field Observation of Potential Illicit Discharges

The easiest way to identify an illicit discharge is to use your senses – what do you see and smell? Key indicators we can use to recognize an illicit discharge are:

- Flow
- Odor
- Color
- Turbidity
- Floatables
- Other (fish kills, plant growth, etc.)

### Flow

When flow is observed in the MS4, it should be consistent with the weather conditions. If it has been dry, the MS4 should be dry. This may not always be the case, but any time flow is observed during a dry period, look around and see if there is a reasonable explanation for the flow.

**Figure 1-10. This photo shows a flowing outfall, but there was no recent rain fall (notice the ground is dry). (Photo from the City of Reno)**

**Figure 1-11. The outfalls shown in this photo are flowing strongly after a rain event. (Photo from the Tahoe Environmental Research Center)**

## Odor

An unusual or obvious odor coming from the storm sewer, ditch or an outfall may be an indication of an illicit discharge. Odors are sometimes hard to describe or may be described differently from one person to the next. Sewage is typically recognizable by most people. However, there are some common recognizable odors that most everyone can recognize that may be the result of an illicit discharge. These include:

- Rotten Egg (hydrogen sulfide from decaying organic matter, acid, sulfide release)
- Gasoline/Solvent (fuels, petroleum products, and chemicals)
- Pungent (ammonia, chlorine or other strong chemicals)
- Sour (acids, greases and other putrid substances)
- Floral/Pepperminty (industrial cleaning products, deodorizers, man-made chemicals)
- Sweet (food wastes, cleaning and other chemical products)

If you notice any of these odors, try to pinpoint its origin. When checking for an odor, be sure to note wind direction and speed, as odors sometimes travel long distances and locating the source can be challenging.

## Color

Sometimes, an illicit discharge will have a color, making it easy to recognize. For example, white discharges may be the result of dumped primer (paint) or latex sealants. Because of the added dye, dumped antifreeze/coolant may result in yellow/orange/green colored water. Sediments typically result in turbid brown water. Discharges with a noticeable color should be considered illicit. Figures 1-12 through 1-18 are examples of colored discharges caused by illicit discharges.

**Figure 1-12. A white discharge at an outfall could be the result of paint, glue, sealant or similar paint/latex products. (Photo from Coastal Waccamaw Stormwater Education Consortium)**

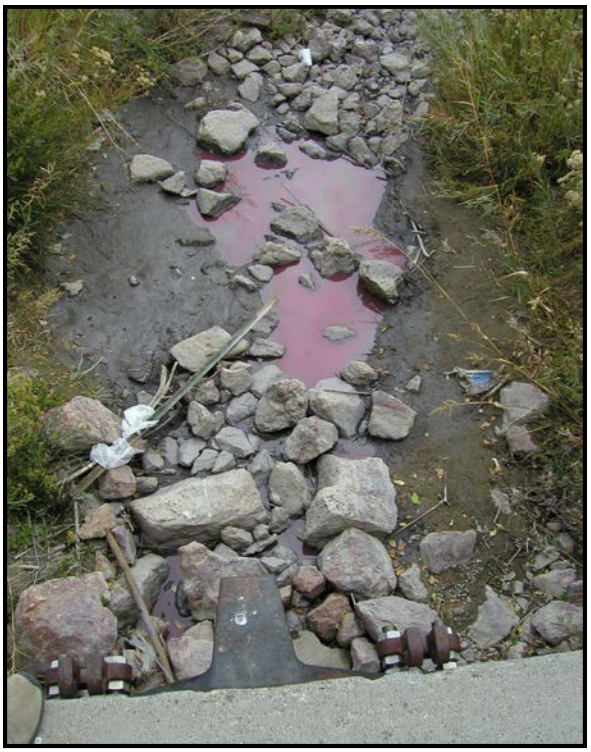

**Figure 1-13. A red discharge lingers below the outfall and may be residual paint or even a diesel fuel spill. (Photo from NDEP)**

**Figure 1-14. This photo shows a gray discharge at an outfall that has the appearance of sewage. (Photo from the Center for Watershed Protection)**

**Figure 1-15. An unusual, black discharge flows to the storm drain. (Photo from the USEPA)**

**Figure 1-16. This photo shows a brown discharge at an outfall that is likely the result of sediments. (Photo from the Washington State Department of Transportation)**

**Figure 1-17. The blue discharge from this outfall does not appear to be a natural condition and is likely a result of a manmade or chemical discharge. (Photo from the Ohio EPA)**

**Figure 1-18. While a green tint in water can be due to algae growth, the tint in this photo was caused by a discharge of anti-freeze. (Photo from NDEP)**

## Turbidity and Sediments

The turbidity of a discharge, which is a measure of its clarity or cloudiness, is another important observation that might indicate an illicit discharge. Turbidity is easy to recognize, especially when held up to the light (Figure 1-19).


**Figure 1-19. A lightly turbid water (left) and highly turbid water (right). (Photo from the City of Reno)**

Turbidity is commonly caused by sediments picked up by stormwater runoff from the roadway, failed or unprotected cut slopes, or unstabilized construction sites. When a highly turbid flow is observed in the MS4, it may be from an illicit discharge. Figures 1-20 through 1-22 are examples of sediment discharges.

**Figure 1-20. Highly turbid water being discharged from an outfall. (Photo from the Wisconsin Department of Natural Resources)**

**Figure 1-21. Highly turbid water from a construction site flowing into the MS4. Note that the inlet protection bags have been pulled to prevent flooding – an approved practice during high volume runoff events (Photo from NDEP)**

**Figure 1-22. This photo shows failed BMPs at a construction site and highly turbid stormwater runoff. (Photo from NDEP)**

## Floatables

Sewage, oil sheen, and foam are all examples of floatable indicators. Trash and debris can also be considered floatables, but are not necessarily an illicit discharge. The following sections provide descriptions and guidance for recognizing the more common types of floatables.

## Sheens (Floatables)

Surface sheens typically have a "rainbow" appearance and will swirl and flow with the water. Sheens are most often caused by petroleum based compounds and may have an odor.

Not all sheens are related to petroleum products. Sometimes they are created by the natural decay of vegetation or algae and not considered illicit discharges. These natural sheens appear quite different from petroleum sheens as they tend to be duller and less colorful and tend to break apart when disturbed. Tossing a rock in the water or stirring with a stick is a good way to test the sheen.

**Figure 1-23. A rainbow sheen caused by a gasoline leak. Note the fluidity of the sheen as it rides the surface of the water. (Photo from the Colorado Department of Transportation)**

**Figure 1-24. This rainbow sheen was caused by leaking motor oil. Notice how it appears a little thicker than the gasoline sheen in Figure 1-23 above. (Photo from the King Co. Stormwater Management)**

**Figure 1-25. This sheen is caused by the natural decay of plant mater and is not associated with an illicit discharge. Note the dullness of the sheen and how it tends to break apart rather than flow. (Photo from the Center for Watershed Protection)**

## Foams and Suds (Floatables)

When observing foam, consider whether it is thick and/or if it holds together for a long time. Foams with structural integrity are more likely to be caused by illicit discharges of soaps, surfactants or other manmade chemicals. Also look to see where the foam is being generated; is it from plunging water? Organic matter such as leaves and decaying materials may cause foams and bubbles in flowing water and on the road surface after a rain event. Typically, foam originating from organic material is short lived and breaks up quickly. See Figures 1-26 through 1-28 for some examples of foam.

**Figure 1-26. The foam on the creek shown in this photo was caused by an illicit discharge. Notice the thickness and persistence of the foam. (Photo from the City of Reno)**


**Figure 1-27. The foam on the parking lot shown here was from car washing activities at a car sales lot. While individual, residential car washing is permissible, commercial car washing is not. (Photo from the Washington State Department of Transportation)**

**Figure 1-28. This photo was taken right after a heavy summer thunderstorm at a small neighborhood park. The foam here was caused naturally from decaying organic matter. (Photo by Stantec)**

## Other Indicators

There are a number of other indicators of illicit discharges that are not readily observable in a discharge; however their impact upon the channel can be seen. For example, nutrients in an illicit discharge are not seen, but they may result in excessive algae or plant growth. Residual stains can be indicative of past illicit discharges. Provided in the sections below are some other ways to spot potential illicit discharges into NDOT's storm sewer system.

## Temperature (Steam)

The temperature of the discharge can be an important key to spotting an illicit discharge. Overly hot or warm flows can be an indication of an illicit discharge, such as sewage. On very cold days, warm water entering the MS4 can result in steam rising from inlets, ditches, and outfalls. Similarly, during very cold periods when water in the MS4 would normally freeze, free flowing water or melted ice might suggest an illicit discharge. But, be aware that groundwater or other allowable flows entering the storm sewer system may be warm enough to cause steam or to melt ice. Your past experience and observations at a location can help you decide whether or not steam or lack of ice is due to an illicit discharge.

## Plant Growth

Many chemical compounds are not visible in stormwater runoff. Some of these compounds, however, could affect plant growth. For example, illicit discharges high in nutrients may act as a fertilizer and cause excessive plant and algae growth in the channel. Others are toxic to plants and wildlife, causing a "dead zone" (or an area void of aquatic life) in the outfall area.

**Figure 1-29. This excessive algae growth suggests a discharge high in nutrients that may or may not be illicit. (Photo from the Chesapeake Stormwater Network)**

**Figure 1-30. This photo shows a "dead zone" at the outfall due to the possible discharge of a toxic chemical. (Photo from GUBICO)**

## Fish Kills

Fish kills can be sudden and alarming. The causes for fish kills can range from natural conditions to releases of toxic chemicals. In any case, when a fish kill is observed, the possibility of an illicit discharge should be considered. Sometimes only fish will die off, which suggest it might be due to a lack of oxygen, possibly caused by excessive nutrients or organic matter. Other times, aquatic insects, frogs, and birds will also die, suggesting more strongly the presence of a toxin.

**Figure 1-31. Fish kills can be due to natural conditions or toxic chemicals in an illicit discharge. (Photo from the Oregon Department of Fish and Wildlife)**

**Figure 1-32. When large and otherwise healthy looking fish die off, it may be due to an illicit discharge or low oxygen conditions. (Photo from the Reno Gazette Journal)**

## Stains

There may be times when there is no flow in the MS4 or from an outfall, but visible evidence of a past illicit discharge will remain behind. Some chemicals will stain concrete and other surfaces, leaving a noticeable color or residue. The more common stains are oil and petroleum related (usually darkening the surface) and iron staining (rust colored), which could be a result of a chemical condition (low pH and changing oxidation states causing the precipitation of iron).

**Figure 1-33. While no active leaks are occurring, evidence of past hydraulic fluid discharges are evident. (Photo by Stantec)**

**Figure 1-34. Residual foam and dampness around an inlet suggests potential illicit dumping. (Photo by T. Svetich)**

**Figure 1-35. Obvious staining can be seen at two of the three outfalls. The rust red color indicates iron staining and may be due to an illicit discharge. (Photo from the City of Fort Worth, Texas)**

## 1.5 Reporting a Suspected Illicit Discharge

When you suspect an illicit discharge, contact (by phone or email) a representative of NDOT's Stormwater Division and report your observations. Contact information is provided in the table below.

| District | Stormwater Division Districts | Stormwater Division Headquarters |
|---|---|---|
| 1 | (702) 385-6500 | (775) 888-7771 or (775) 888-7757 |
| 2 | (775) 834-8300 | |
| 3 | (775) 777-2700 | |
| Illicit discharges can also be reported by sending an email to: **stormwater@dot.state.nv.us** | | |

NDOT's Stormwater Division will initiate an illicit discharge investigation within 24 hours of the incident being reported.

## 1.6 How to Report an Illicit Discharge

When you call to report an illicit discharge, the following are typical of the questions you will be asked:

1. What is the location of the discharge? (The more detail the better, i.e. roadway number, milepost, intersection, etc.)
2. What is the description of the discharge? (Dumped solids, a dry weather flow, odor, color, foam, etc.)
3. What is the discharge frequency? (One time dump or an on-going issue)
4. What is the source of the discharge? (Do you have an idea of where the potential illicit discharge may be coming from?)
5. Is the illicit substance in, or discharging to, a waterway or the storm sewer system?

Your information will be used to document and initiate the investigation. All illicit discharges entering NDOT's MS4 that discharge into a waters of the U.S. must be reported to NDEP via the Spill Reporting Hotline listed below.

**NDEP Spill Reporting Hotline (1-888-331-6337)**