SOP 13: WATER QUALITY SCREENING IN THE FIELD

Introduction

Outfalls from an engineered storm drain system can be in the form of pipes or ditches. Under current and pending regulations, it is important to inspect and document water quality within the MS4 system under both dry weather and wet weather conditions. SOP 1, “Dry Weather Outfall Inspection” and SOP 2, “Wet Weather Outfall Inspection”, cover the objectives of these activities and how water quality parameters can be collected during both types of inspections. SOP 3, “Catch Basin Inspection and Cleaning”, describes how this operations and maintenance activity can serve as an additional opportunity to collect water quality data.

SOP 2 included detailed information on how to collect discrete analytical samples to be processed by a laboratory. In contrast, this SOP addresses screening-level measurements than can be collected at outfalls, catch basins, receiving waters, or other water bodies. The measurements can be collected with field test kits or with portable meters.

Water quality screening data collected in this manner can feed into an illicit discharge detection and elimination investigation, like the process described in SOP 10, “Locating Illicit Discharges”.

Visual Condition Assessment

SOP 1, SOP 2, and SOP 3 describe a Visual Condition Assessment to collect observations related to the quality of stormwater conveyed by an engineered storm drain system. These observations may include such visual evidence and/or potential pollutants as:

* Foaming (detergents)
* Discoloration
* Evidence of sanitary waste
* Optical enhancers (fluorescent dyes added to laundry detergent); and
* Turbidity

If a Visual Condition Assessment indicates the presence of these pollutants, it may be necessary to quantify the extent of each, and gather data on other parameters that cannot be visually observed but can be measured using field kits or meters. These parameters include:

* Ammonia
* Chloride (present in treated drinking water but not groundwater)
* Conductivity
* Fluoride
* Hardness
* pH
* Potassium

Field Kits and Sampling Methods Available

In recent drafts of new MS4 Permits, U.S. EPA Region 1 has identified several test kits that are acceptable for use in the field, and other regulatory agencies have also completed similar reviews. The following table shows field test kits and portable meters that can be used for screening parameters.

**Table SOP 13-1**

**Field Measurements, Test Kits, and Instrumentation**

|  |  |  |
| --- | --- | --- |
| **Analyte or Parameter** | **Instrumentation**  **(Portable meter)** | **Field Test Kit** |
| Ammonia | CHEMetrics™ V-2000 Colorimeter  Hach™ DR/890 Colorimeter  Hach™ Pocket Colorimeter™ II | CHEMetrics™ K-1410  CHEMetrics™ K-1510 (series)  Hach™ NI-SA  Hach™ Ammonia Test Strips |
| Bacteria | Bacteria field test kits require 24-hour window | |
| Boron | N/A | Hanna™ HI 38074  Taylor™ K-1541 |
| Chloride | CHEMetrics™ V-2000 Colorimeter  Hach™ Pocket Colorimeter™ II  LaMotte™ DC1200 Colorimeter | CHEMetrics™ K-2002 through K-2070  Hach™ CDS-DT  Hach™ Chloride QuanTab® Test Strips |
| Color |  | Hach™ ColorDisc |
| Conductivity | CHEMetrics™ I-1200 | N/A |
| Detergents (Surfactants) | CHEMetrics™ I-2017 | CHEMetrics™ K-9400 and K-9404  Hach™ DE-2 |
| Fluoride | CHEMetrics™ V-2000 Colorimeter  Hach™ Pocket Colorimeter™ II | N/A |
| Hardness | N/A | CHEMetrics™ K-1705 and K-1710  CHEMetrics™ K-4502 through K-4530  Hach™ HA-DT  Hach™ Hardness Test Strips |
| Optical enhancers | Field tests still under development | |
| pH | CHEMetrics™ I-1000 | Hach™ 17J through 17N  Hach™ pH Test Strips |
| Potassium | Horiba™ Cardy C-131 | LaMotte™ 3138 KIW |
| Turbidity | CHEMetrics™ I-1300 | N/A |

Each field test kit will include instructions specific to that test kit, and most kits are available in configurations that detect different ranges of the parameter. For example, the CHEMetrics™ detergents kit K-9400 shown above detects concentrations of 0 to 3 milligrams per liter (mg/L) while the K-9404 kit detects concentrations of 0 to 1,400 mg/L.

The table below shows values identified by the U.S. EPA and the Center for Watershed Protection as typical screening values for select parameters. These represent the typical concentration (or value) of each parameter expected to be found in stormwater. Screening values that exceed these benchmarks may be indicative of pollution and/or illicit discharges.

**Table SOP 13-2**

**Benchmark Field Measurements for Select Parameters**

|  |  |
| --- | --- |
| **Analyte or Parameter** | **Benchmark** |
| Ammonia | >50.0 mg/L |
| Conductivity | >2,000 |
| Detergents (Surfactants) | > 0.25 mg/L |
| Fluoride | >0.25 mg/L |
| pH | <5 |
| Potassium | >20 mg/L |

If and when water quality screening samples, whether using field test kits or portable meters, exceed these benchmark concentrations, the inspector should consider collecting analytical samples for laboratory analysis.

Advantages and Disadvantages of Field Testing

Field test kits can be convenient for use as a screening tool, initial purchase costs are low (typically $0.50 to $5.00 for the kits included in Table SOP 13-1), and the costs are far less than full analyses at a laboratory. However, some disadvantages of this screening method include:

* Limited shelf life
* Labor cost associated with inspector’s time
* Generation of wastes, including glass vials and used reagent
* Steps and processes for each kit can vary widely, resulting in errors
* Trained staff are required in order to effectively utilize kits
* Not all kits are accepted by all regulatory agencies
* Limited useful detection range

Portable instrumentation such as the colorimeters shown in Table SOP 13-1 have the benefit of providing accurate readings, measure to low detection limits, and can be purchased pre-programmed to measure concentrations of most parameters required. Disadvantages of portable instrumentation include:

* High initial purchase cost
* Requirement for ongoing calibration and maintenance
* Individual probes require periodic replacement
* Specific storage requirements to maintain calibration
* Trained staff are required in order to effectively utilize meters

Related Standard Operating Procedures

1. SOP 1, Dry Weather Outfall Inspection
2. SOP 2, Wet Weather Outfall Inspection
3. SOP 3, Catch Basin Cleaning and Inspection
4. SOP 10, Locating Illicit Discharges