Fairfax County 2024 MS4 Program Plan and Annual Report

Appendix P9

Standard Operating Procedures for the MS4 Wet Weather Screening Program

VSMP Permit Number VA0088587
9-30-2024

Department of Public Works and Environmental Services
POLICIES AND PROCEDURES Memorandum No.: SWPD16-01

SUBJECT: Standard Operating Procedures for the MS4 Wet Weather Screening Program

Effective: 01/29/2016 Revised: 12/21/2020 Approval:

I. Purpose

Under the MS4 permit, Fairfax County is required to investigate and address areas that are suspected to be contributing excess levels of pollutants to the MS4 by conducting wet weather screening. Sampling stormwater runoff from areas that may be contributing excess pollution is a method used as a first step to locate, isolate, and remediate areas that may be responsible for polluted stormwater discharges that may ultimately impact the quality of receiving waters. This SOP describes Fairfax County's program for wet weather screening.

Fairfax County's 2015 Virginia Stormwater Management Program (VSMP) Municipal Separate Storm Sewer System (MS4) permit includes the following provisions for wet weather screening (Part I, Section B.2.l.2):

Wet Weather Screening Program: *In addition to the monitoring required in Part I.C., the permittee shall continue to investigate, and address areas within their jurisdiction that are suspected to be contributing excessive levels of pollutants to the MS4. No later than 12 months after the effective date of this permit, the permittee shall develop written procedures for a wet weather screening program which shall include standard operating procedure to be used for initial screening and follow-up purposes. The written procedures shall be incorporated as part of the MS4 Program Plan.*

SPECIFIC REPORTING REQUIREMENTS:

- *No later than 12 months after the effective date of the state permit, the permittee shall submit to the Department the written procedures for wet weather screening.*
- *Beginning with the annual report due October 1, 2017, each annual report shall include a list of locations upon which wet weather screening was conducted, the results, weather conditions at the time sample was collected to include date and approximate time of most recent storm event preceding sample collection, long term trends analyses, and any follow-up actions including maintenance and/or repair of infrastructure or outfalls performed as a result of the wet weather screening.*

This Wet Weather Screening Program Standard Operating Procedure (SOP) describes Fairfax County's site selection, field reconnaissance, and wet weather screening protocols for evaluating areas that may be contributing stormwater pollution to the County's MS4 and provides a framework for full compliance with the above MS4 permit requirements.

This document contains the following:

- Site Selection and Priority Determination
- Field Protocol for Wet Weather Outfall Screening
- Data Management/Quality Control
- Notification/Follow-Up Procedures
- Monitoring Reports
- References.

II. Site Selection and Priority Determination

a. General Factors for Identifying Candidate Sites

Fairfax County seeks to identify and monitor the most likely sources of excessive levels of pollutants entering the MS4 system. The County uses available data to target appropriate sites for investigation and possible wet weather screening. Categories of criteria that are used to identify suitable areas for wet weather screening during the desktop GIS analysis are described below.

i. MS4 Service Area

The County focuses wet weather screening activities on those areas that are regulated under its VSMP MS4 discharge permit. The County's MS4 service area consists of those drainage areas that discharge to an MS4 outfall that is owned or operated by Fairfax County. An MS4 outfall is defined as a point of discharge from a man-made channel or conveyance to surface waters of the State.

ii. Categorization of Parcels using Land Use

One key factor in selecting candidate areas for monitoring is land use, as represented by the County's land use codes for parcels. These codes are assigned when individual parcels are created. Each code has been assigned an index value ranging from 1 to 4 (Versar 2006) that represents the relative potential for parcels with that code to discharge pollutants during wet weather (Appendix A). A brief description of the index appears in Table 1. Index values have been assigned based on general expectations for a land use class, to provide a practical means for targeting field investigations to areas of greatest concentrations of land use classes that are most likely to be sources of pollution via runoff. This has been done to facilitate a countywide approach to priority service area selection using GIS. For example, in general, an automotive repair facility (Index Value 3) would be a more likely source of runoff pollution than a single-family residence (Index Value 1).

Land uses are organized into index values according to the predominant activities occurring on the parcel that consist of (a) transferring, storing, or employing hazardous materials in an industrial, manufacturing, or treatment process (Index Value 4), (b) occurrences of drips, spills, or deposits of petroleum or commercial products on impervious areas that are exposed to precipitation and can be subsequently carried to the MS4 (Index Value 3), c) permanent storage of retail inventory or commercial waste in centralized, exposed areas and which may leach onto impervious surfaces (Index Value 2), and d) occasional exterior use and storage of household chemicals and waste (Index Value 1).

Examples of sites that could contribute polluted runoff to a given service area include carwashes, gas stations, other automotive repair facilities, scrap yards, truck stops, shopping centers, restaurants, golf courses, home improvement retailers, plant nurseries and garden centers, research and testing facilities, industrial parks, mass transit terminals and maintenance facilities, pipeline rights-of-way and pressure control stations, and

manufacturers. Information to identify such sites within the county's jurisdiction is available from several sources.

Table 1: General index of potential for pollutant discharge during wet weather based on land use

Index Value	Description
1	No or insignificant potential (e.g., residences, schools, offices)
2	Slight risk (e.g., department stores, supermarkets, and other retail outlets with no obvious potential to pollute)
3	Moderate risk (e.g., warehouses, mass transit rights-of-way and terminals, restaurants, golf courses, and gasoline stations)
4	High risk (e.g., manufacturing, industry, waste treatment and disposal, utility rights-of-way)

iii. Easement

Maintenance and repair easements are required to allow the County to legally enter the storm drain network for the purpose of conducting monitoring of runoff. The easements allow the County and its agents to access portions of the MS4 on private property for the purposes of this work.

iv. Industrial and Commercial Facilities

The County has identified industrial and commercial facilities (ICFs) that operate within its boundaries. When businesses are established, they are assigned a standard industrial classification (SIC) code that describes the nature of the business. As part of this site selection methodology, certain SIC codes have been identified that have an elevated potential for discharge of polluted stormwater runoff from the premises. Examples of businesses that have the SIC codes of elevated concern are: automobile service and repair, recreation, wholesale chemicals and cleaning, retail shopping centers, industrial processes, and appliance repair. The list of SIC codes that occur within the Fairfax County MS4 service areas and have been included in the wet weather site selection process can be found in Appendix B.

b. Site Selection Protocol

The wet weather screening program employs a multi-factored scoring procedure to identify specific MS4 drainage areas that have the greatest potential for contributing polluted runoff. The method uses a variety of GIS data and supplemental information to rank parcels. Table 2 lists Fairfax County's GIS data relevant to this effort.

i. Site Selection Metrics

Table 2: GIS layers and data to be used to select and prioritize industrial/ commercial parcels for monitoring

Description	Dataset Name
MS4 service area	MS4_Service_Area
Industrial and commercial facilities	STWMGR_IHRR_FACILITIES_SITES
Orthophotography	2017_orthophoto_1ft.sid
Fairfax hydrography layer	StormNet
Current land use	IPLS_IPLS_GENER_EXIST_LAND_USE
Landcover	landcover_2015_fairfaxcounty.tif
Easements	StormNet
Stormwater network - arcs	StormNet
Stormwater network - point features	StormNet
VPDES industrial permitted facilities	VPDES_parcels
Major transportation areas (% Roadways)	Roadways__Bridges
Minor transportation areas (% Roadways)	Driveways__Parking_Lots

The goal of the site selection process is to target areas that have the greatest potential for discharging excessive levels of pollutants to the MS4. Incorporating a systematic strategy in the selection process increases the likelihood of finding possible pollution sources while reducing the amount of staff time spent at unlikely sites. Four distinct metrics were selected to prioritize potentially problematic MS4 drainage areas:

a. ICF Points – Industrial and commercial facilities represent a broad class of businesses and land uses with the potential to pollute stormwater.

b. Index Value Parcels –Index values ranging from 1 to 4 were assigned to each parcel in an extensive review of land use codes (LUC) – with Value 4 parcels having the greatest potential to contribute pollution to the MS4 (Table 3). While LUCs should be updated based on the most up-to-date data, the original LUC value assignment determinations conducted by Versar and the County in 2006 remains applicable for this site selection process.

c. Impervious and Turf– Imperviousness is a well-established metric for measuring the impact of land use changes on aquatic systems. Areas of turf and grass can also exhibit high concentrations of pollutants such as pesticides and nutrients. Combining these two land coverage types creates a metric focused on evaluating the scale of land use changes within each drainage area.

d. Roadways - Percentage of major and minor roadways and parking lots within each drainage area. This variable serves as a proxy for vehicle use and storage, as well salt application and storage, as elevated conductivity levels in local streams has been found to be linked to high road density.

Table 3: Index value 4 land uses within Fairfax County MS4 service areas

Land Use Code	Description
111	Planned industrial park
112	Industrial conglomeration
121	Durable manufacturing
131	Nondurable manufacturing
135	Printing and publishing
140	Research and test, where not in office building or office park
160	Contract construction
190	Other industrial NEC
221	Electric, including transmission rights-of-way, generation plants, regulating
222	Gas, including pipeline rights-of-way, treatment plants, storage, irrigation distributional channels, pressure control stations, etc.
223	Water, including pipeline rights-of-way, treatment plants, storage, irrigation distributional channels, pressure control stations, etc.
224	Sewage, including treatment plants, pressure control stations, etc.
226	Pipeline rights-of-way and pressure control stations, NEC (such as petroleum)

ii. Site Selection Prioritization Process

The site selection procedure is detailed below. This procedure may be modified over time as additional data are gathered or as the needs of Fairfax County's program change. A graphical illustration of the site selection process is provided in Appendix C.

Part 1: Calculate selection metric values.

1. Overlay MS4 drainage areas with metrics:
   a. **ICF Points**
   b. **Index Value Parcels**
   c. **Impervious and Turf**
   d. **Major and Minor Roadways**
2. Conduct a spatial join with the ICF Points (metric **a**). Count the points within each drainage area and divide the count by the acreage to calculate a metric density for each drainage area.

   Result: ICF Density
3. Conduct a spatial join for the Index Values Parcels (metric **b**). Count the number of each Index Value (1-4) within each drainage area. To prioritize higher pollution potential parcels, create a weighted sum of the parcels in each drainage area, using the following weights for each index value, and divide the count by the acreage to calculate a metric density for each drainage area:
   i. Value 4 weight – 1.00
   ii. Value 3 weight – 0.50
   iii. Value 2 weight – 0.25
   iv. Value 1 weight – 0.00

   Result: Weighted Index Value Density

4. Conduct a spatial join with the Impervious and Turf and Major and Minor Roadways land use and land cover layers (metric **c** & **d**). Estimate the acreage within each drainage and divide by the total area to calculate the percent of the total drainage composed by metric.

   Result: Percent Impervious and Turf; Percent Roadway

Part 2: Metric value scaling.

Scaling each metric so that it ranges from 0-1 allows each of the four metrics to be compared with each other directly by looking at their values relative to their range. From Part 1, for values in each metric, subtract the minimum value of the metric and then divide by the difference between the maximum and minimum of the metric. When the minimum value of a metric is 0, this simplifies to dividing each value by the maximum value of the metric.

Part 3: Assign weighted values to each metric.
Assign weights to each of the four metric values calculated in Part 2. Weights allow for different scenarios that highlight sites more suitable to monitor for different pollutants. Weights for each metric must be between 0 and 1.0, and sum to 1.0. Even weights of 0.25 for each metric were chosen for site selection.

Part 4: Calculate the final suitability score.
The sum of the four weighted metric scores represents the final suitability score that is used to evaluate the results of the desktop selection process.

Part 5: Refine MS4 drainage area selection layer.
Smaller drainage areas generate less flow during storm events which makes these outfalls difficult to monitor. Because of this, MS4 outfalls with drainage areas under 10 acres are removed from prioritization.

c. Field Reconnaissance Protocol

The top fifteen sites identified as candidates for screening according to the site selection protocol are visited to determine suitability for monitoring and ease of access. Information gained from field reconnaissance is used to select priority sites for wet weather screening. This work may occur in and/or around confined spaces. Staff shall be trained in confined space awareness and identification per OSHA guidelines. For work that involves entry into a confined space, the County (or an approved contractor) will mobilize a (minimum) two-person, permit-required, confined space certified crew with appropriate equipment to the site, and enter the facility adhering to applicable OSHA requirements for confined space entry. Standard operating procedures relevant to safety and health considerations for these monitoring activities are maintained under separate cover in the Fairfax County Stormwater Safety Manual.

Field maps prepared for reconnaissance include streams, watersheds, outfalls, the storm sewer network, and major and minor roads. The candidate sites are photographed. All observations will be recorded on the Wet Weather Monitoring Site Evaluation Form (Appendix E). The field reconnaissance protocol consists of the following steps:

1. Location and Land Use Characterization: Gather data from site selection process (Section II.b) including drainage basin size, land use, and percent impervious drainage area for each candidate site. Have this information on hand during the field reconnaissance.
2. Pollution Potential: In the field, evaluate the subbasin visually for the presence of trash, poor maintenance practices, suspicious spills or stains, and the presence (or absence) and condition of secondary controls (USEPA 2005).
3. Safety: Assess safety concerns at the site including security, proximity to traffic, biological hazards, and confined space entry concerns. Determine if there is a need for personnel trained and certified to work in confined spaces.
4. Infrastructure Configuration: Document information on the infrastructure configuration. Locate outfall(s) and verify orifice diameter to enable calculation of flow rate (discharge) using appropriate Manning's coefficients.
5. Access: Evaluate site accessibility including property ownership, easements, terrain, vegetation, and setup accessibility. If access to the outfall is impeded by dangerous terrain or fences, or it is not visible due to immersion in receiving waters or blocked by sediment, then a manhole up-network from the outfall can be considered as an alternative sampling point. The location of non-outfall monitoring locations should be within County easements. Traffic control authorization and training may be required.
6. Equipment Setup: Open manholes and determine the suitability of placing a compact automated sampler within the manhole or at-grade adjacent to the manhole. Identify any required inserts for monitoring equipment (spring ring, scissors ring, or weir).

The results of the field reconnaissance are reviewed to determine the best sites for monitoring. Factors considered in Steps 2 through 6 of the Field Reconnaissance Protocol could hinder monitoring or eliminate a site from consideration (e.g., inaccessibility, relative lack of security). Two sites will be selected for each five-year MS4 permit term. The County may have to obtain permission from the landowner to access selected monitoring sites. The selected wet weather screening sites will be revisited and prepared for monitoring according to procedures outlined in Section III and Appendix F. Selected monitoring sites and alternate sites are reviewed below.

d. Monitoring Sites

i. Fairfax Water, Chantilly Location; STMN0442033318

This outfall drains to the recently restored reach of Flatlick Branch adjacent to Fairfax Water's property yard. The highest ranked site, this outfall drains an area that is greater than 20 acres and about 75% impervious. This outfall drains several parking lots and various commercial facilities. It is also adjacent to a large landscaping materials yard. Some businesses included within the drainage area to this outfall include auto repair and detailing shops, a fleet fueling station, and a restaurant. The land use and drainage area contributing to this outfall increases the potential for actionable follow-up in the event of exceedances.

ii. Bren Marr Park, near I-395; STMN0811453764

This outfall drains over 76 acres to Backlick Run and is located near both Edsall Road and I-395. This outfall drains numerous industrial and commercial facilities. Some businesses included within the drainage area to this outfall include concrete and construction materials suppliers (Vulcan Materials), auto repair, tiling, electrical work, and construction. A portion of I-395 also drains to this outfall.

e. Alternate Monitoring Sites

i. Hill Park Dr, Lorton; STMN0992487877

This outfall drains to Long Branch adjacent to Fairfax Water's property yard. This outfall drains over 28 acres. It is located adjacent to another highly ranked outfall (STMN0992487937), however this outfall is much better situated for equipment deployment. This outfall drains large institutional and commercial facilities. Some businesses included within the drainage area are auto repair, tiling, landscaping and outdoor materials storage, and food distribution. It also drains residential areas and roadways.

ii. Towerview Rd, Herndon; STMN0242014003

This outfall drains to Horsepen Creek. The upstream drainage network drains parking lots for six commercial buildings, as well as street drainage from Park Center Road, Redskin Drive, and Towerview Road. The outfall receives approximately 15 acres of drainage, made up of over 75% impervious surface coverage. This site ranked within the top ten on the list of prioritized outfalls, and the land use and small drainage area to this outfall would increase the potential for actionable follow-up to exceedances. Some businesses located within the drainage area to this outfall include an equipment rental yard, truck rental and towing, glass product manufacturer, screen printing, and construction materials warehouses.

iii. Cinderbed Rd. and Hill Park Dr, Newington; STMN0992487937

This outfall is within 100 yards of another recommended monitoring site (STMN0992487877) and also drains to Long Branch. It receives drainage from primarily commercial sites but does not receive any residential drainage (unlike the neighboring monitoring site). The drainage area is comprised of 75% impervious surfaces, consisting of a smaller drainage network. The outfall is positioned in an entrenched orientation within the spillway, which would require greater length of suction line for monitoring installations.

iv. Terminal Rd, Lorton; STMN0993495633

This outfall drains a parking area serving a number of ICFs and drains to a ditch alongside a railroad tracks. The drainage area is 15.6 acres (consisting of 85% impervious area), with a singular pipe network contributing to most drainage. The parking areas were mostly full, with employee vehicles as well as customer vehicles awaiting repairs. Additionally, there were many trash receptacles stored near inlets and drains within the parking area. Sediment accumulation within the spillway downstream of the outfall has caused a pool of standing water to form. This could present a challenge during sampling events.

III. Field Protocol for Wet Weather Outfall Screening

This section provides details of the protocols to be followed during wet weather monitoring deployments and includes descriptions of sampling equipment, analytes, sampling frequency, and antecedent condition requirements. Specific instructions for sampling procedures are provided in Appendix F.

a. Sampling Methods

The preferred sampling method is an electronic, automated sampler, which collects discrete samples of runoff at specific intervals throughout a storm. The County uses automated samplers and electronic flow logging techniques to sample runoff from potentially high-polluting areas that may adversely impact waters of the State. Stenstrom and Lee (2005) emphasize that monitoring runoff throughout an entire storm with automated sampling is preferable because pollutant concentrations may vary over time based on the rate and duration of rainfall. This approach also allows for unattended monitoring which is useful when storms occur overnight (Harmel et al. 2006). Automated sampling and associated continuous flow-logging also enable researchers to calculate pollutant loads.

Field technicians sample storm runoff flows by attaching automated samplers to MS4 outfalls located within or terminating a target service area. Flow rates are logged at all sampling points to enable flow-weighted compositing of samples. A flow-weighted composite sample provides an accurate representation of the overall concentration of a given analyte in the runoff. The flow-logging apparatus is secured (e.g., with a scissors ring) within the pipe for the duration of each storm event. When flow levels exceed a trigger point, the sampler will initiate the collection of the first flush. This requires the collection of 5 liters of flow. The sampler will then proceed with the total storm collection, collecting at fixed time intervals for the remainder of the forecast storm period. The sample interval can be calculated by multiplying the total sum of expected rainfall accumulation by trailing limb allowance (in hours). This time interval may vary depending on the goals of the sampling or the expected duration of the storm. Seasonality will also factor into the expected rainfall accumulation, and anticipated storm event hydrograph. Individual samples from the total storm collection will be combined into a discharge volume-weighted composite sample. One composite sample and one first flush sample will be obtained at each sampling point and transported to an approved analytical laboratory to be tested for the analytes listed in Table 4. Field technicians measure pH and specific conductance in the first flush and composite samples before delivering samples to the laboratory.

b. Analytes

Categories of pollutants to be tested are nutrients, metals, and sediment. Each category consists of specific pollutants that provide information about suspended material transport, contamination of impervious surfaces from heavy metals, and deposition and mobilization of nutrients commonly used in detergents and fertilizers. This analyte suite consists of pollutants shown to be commonly found in urban runoff and has been refined through experience with sampling wet weather runoff from these kinds of areas within Fairfax County. Water hardness (as mg/L CaCO3) is monitored so that analytical results can be directly compared to Virginia surface water criteria. Monitoring will be conducted according to procedures approved under 40 CFR Part 136 or alternate methods approved by the U.S. Environmental Protection Agency. Samples must be analyzed at a certified non-commercial (e.g., in accordance with 1VAC30-45) or accredited commercial laboratory (e.g., in accordance with 1VAC30-46).

Table 4: Laboratory analytes, detection limits, and current analytical methods for Fairfax County's wet weather screening program.

Parameter	Detection Limit	Method
Ammonia	0.01 mg/L	EPA 350.1
Cadmium	2.0 µg/L	EPA 200.8
Calcium	2.0 µg/L	EPA 200.8
Chemical Oxygen Demand (COD)	10 mg/L	SM 5220 D
Chloride	0.02 mg/L	EPA 300
Chromium (Total)	2.0 µg/L	EPA 200.8
Copper	2.0 µg/L	EPA 200.8
Fluoride	0.01 mg/L	EPA 300
Iron	2.0 µg/L	EPA 200.8
Lead	2.0 µg/L	EPA 200.8
Magnesium	2.0 µg/L	EPA 200.8
Manganese	2.0 µg/L	EPA 200.8
Nickel	2.0 µg/L	EPA 200.8
Nitrate + Nitrite	0.02 mg/L	EPA 353.2
Orthophosphate	0.01 mg/L	EPA 365.1
pH		SM 4500
Phosphorus (Total)	0.01 mg/L	EPA 365.1
Potassium	0.3 mg/L	EPA 200. 8
Silica	2.0 µg/L	EPA 200. 8
Sodium	2.0 µg/L	EPA 200. 8
Specific Conductance		EPA 120.1
Sulfate	0.02 mg/L	EPA 300
Total Dissolved Solids	10 mg/L	SM 2540 C
Total Kjeldahl Nitrogen	0.5 mg/L	EPA 351.2
Total Suspended Solids	1.0 mg/L	SM 2540 D
Total Water Hardness	1.0 mg/L	SM 2340
Zinc	0.02 mg/L	EPA 200.8

c. Correcting for baseflow

The monitoring sites at Bren Mar Park and Fairfax Water, Chantilly may experience continuous or intermittent baseflow. Up to four baseflow samples will be collected at these sites to quantify baseflow rates and the pollutant load contributions during periods of dry weather, with an antecedent dry period of at least 48 hours, or immediately prior to forecasted storm events. This will allow for accurate characterization of pollutant loads above baseline levels during storm events.

d. Sampling Frequency

The County's 2015 MS4 permit does not specify a sampling frequency or duration for areas of interest. Wet weather sampling of MS4 service areas is intended to support the County in identifying and addressing sources of water quality pollution.

The program is designed for monitoring two areas concurrently four times a year, approximately quarterly, for five years to capture seasonal and interannual variation in pollution concentrations. This sampling frequency results in 8 first flush and 8 composite storm samples per MS4 reporting year, assuming external factors that reduce the availability of predictable, qualifying events (e.g., extended dry periods, scattered thunderstorms) or equipment failure do not prevent sample collection. Any samples missed throughout the year will be re-collected as soon as practically possible. Collections from these storm events may be supplemented with baseflow sampling at the Bren Mar Park and Fairfax Water, Chantilly sites, as mentioned in Section III c.

e. Antecedent Dry Period and Rainfall Criteria

Sampling after a dry period is beneficial because it reduces the possibility of sampling immediately after surfaces have been washed relatively clean by a prior storm. Antecedent dry periods required by discharge permits typically range from 48 hours for BMP effectiveness studies to 72 hours for standard discharge permit monitoring programs (USEPA 1992). Experience has shown that attempting to wait for a 72-hour antecedent dry period may preclude timely storm sampling, especially during periods of frequent storms (i.e., daily, generally in summer months). A 48-hour antecedent dry period is required for wet-weather monitoring (USEPA 2002) and will be observed in Fairfax County's screening program. The weather conditions at the time of sample collection are recorded as well as the date and approximate time of the most recent storm event preceding the sample collection. This information can be gathered from meteorological databases such as Weather Underground.

Storms that are forecast to deliver 0.3 inches or more of rain within 24 hours are eligible for monitoring. A rainfall depth of 0.3 in. represents a moderate quantity that should produce sufficient runoff to allow automated sampling. The minimum rainfall depth may be revised if it provides insufficient runoff for automated sampling or during extended dry periods.

Eligible storms are identified by field staff that monitor the National Weather Service forecast for storms expected to deliver at least 0.3 in. of rainfall at a targeted service area monitoring location. Rainfall depth delivered by a given storm is estimated from regional rainfall accumulation as determined by Doppler radar or from a local rain gauges in the County.

f. Health and Safety

Ensuring the health and safety of field personnel is the responsibility of every member of the staff for the project. The collective effort of all staff members in providing a healthy and safe work environment helps to minimize or eliminate the potential for accidents. This work may occur in and/or around confined spaces. Staff shall be trained in confined space awareness and identification per OSHA guidelines. For work that involves entry into a confined space, the County (or an approved contractor) will mobilize a (minimum) two-person, permit-required, confined space certified crew with appropriate equipment to the site, and enter the facility adhering to applicable OSHA requirements for confined space entry. Standard operating

procedures relevant to safety and health considerations for these monitoring activities are maintained under separate cover in the Fairfax County Stormwater Safety Manual.

The following procedures from the Safety Manual are highlighted for field staff:

- Perform field work in teams of at least two.
- Bring mobile phone and first aid kit on all field site visits.
- Exercise caution when encountering any wildlife and hazardous plants. In addition, many outfalls are located in remote areas that may be near gathering places for homeless or transient individuals. Do not enter a potentially hostile area.
- Use common sense during electrical storms and/or when severe conditions (e.g., high wind, hail) develop. The safety of field staff overrides all other considerations.
- Storm sewers contain a variety of water-borne bacteria and other harmful chemicals. Wash hands or use anti-bacterial wipes or hand gels liberally, especially prior to lunch breaks, etc.

IV. Quality Control

a. Documentation of Field Monitoring

Documentation of the wet weather screening effort includes the following:

- results of field reconnaissance in preparation for the wet weather screening
- construction, orientation, and size of the MS4 conduit that is the sampling point for the site of interest
- the unique ID and physical location of the outfall or manhole being accessed (if any)
- GPS coordinates of the outfall or manhole being accessed if it is not on Fairfax County's stormwater infrastructure GIS layer
- description of hardware inserted into the pipe at sampling point

For storm events, a dedicated data sheet (Appendix G) is used to document sample location, rainfall depth, date of sampling initiation, serial numbers of automated sampler and flow module, names of field crew, discrete sample interval, discharge volume represented by each discrete sample, proportional aliquot of discrete sample used in compositing, and date and time of sample composite.

b. Chain of Custody

Chain of custody (COC) forms, used for all samples, are a permanent record of transfer of sample custody. Custom COC forms for this project are preprinted with the analytes and partial laboratory numbers particular to the activity at hand (e.g., composite; Appendix H). Field staff need only to complete the laboratory numbers, complete the columns designated for other information, line out any samples that will not be submitted, and sign the form. When picking up the samples for delivery to the laboratory, the laboratory courier signs and dates the COC form in the "Received By" box and leaves a photocopy for project records. Copies of the COC form are provided with certificates of analysis from the laboratory.

c. ISCO Model 6712 Portable Automated Sampler

The sampler assembly consists of a keypad, pump, tubing, and sample bottle container which holds 24 plastic bottles. The first five bottles in the series will be used for a first flush analysis, and the remaining 19 are used to contain the discrete samples collected at intervals throughout the storm. Required maintenance involves checking the integrity of the suction tubing, checking to see that suction tubing is securely attached to the pump tubing (when sampler is attached), making sure that pump tubing is properly threaded through the distributor arm, running the internal electronic maintenance cycle (includes electronic tests of RAM and ROM, mechanical tests of sample pump and distributor arm), and making sure the knurled knob that holds the distributor arm to the frame is tight. Quarterly maintenance consists of running the sample pump to check for suction line integrity. The suction line at a sampling point is replaced when the apparatus is moved to a new site upon completion of sampling. The pump tubing is replaced annually. A step is included in the automated sampler program to rinse the suction tubing with sample water prior to sampling.

V. Notification/Follow-Up Procedures

Standard laboratory analysis reporting time is two weeks; the field staff forward all monitoring results by email to the Wet Weather program manager within three business days of results receipt with a notification of results that exceed the criteria in Table 5. The Wet Weather program manager reviews the results and coordinates with the Stormwater Pollution Inspections Section to determine appropriate follow-up actions in accordance with the "Standard Operating Procedures for Industrial High Risk Runoff Program MS4 Point of Connection and Facility Inspections". The Stormwater Pollution Inspections section ensures that any discharges or findings of non-compliance that meet the conditions specified in Part II.G, H or I of the MS4 permit are reported to DEQ and notifies any other county agencies, as necessary. The County's water quality Stormwater "Who to Call List" outlines the appropriate individuals and agencies to be notified for various water quality incidents and concerns and is utilized in this process.

Note: If a hazardous material spill is suspected, field staff will immediately call the county's Fire and Rescue Hazardous Material Investigative Service (703-246-2300) and the appropriate staff (referenced above) in the County Stormwater Planning Division.

Table 5: Laboratory analytes and detection limits for Fairfax County's wet weather screening and industrial/high risk runoff programs

Parameter	Detection Limit	Exceedance Criterion
Ammonia[a]	0.01 mg/L	10 mg/L
Cadmium[b] [c]	2.0 µg/L	2.1 µg/L
Calcium	2.0 µg/L	N.A.
Chemical Oxygen Demand (COD)[b]	10 mg/L	120 mg/L
Chloride[d]	0.02 mg/L	860 mg/L
Chromium (Total) [b]	2.0 µg/L	1.1 mg/L
Copper[b] [c]	2.0 µg/L	18 µg/L
Fluoride[a]	0.01 mg/L	75 mg/L
Iron[b]	2.0 µg/L	1.0 mg/L
Lead[b] [c]	2.0 µg/L	120 µg/L
Magnesium[b]	2.0 µg/L	64 µg/L
Manganese[e]	2.0 µg/L	50 µg/L
Nickel[b] [c]	2.0 µg/L	470 µg/L
Nitrate + Nitrite[f]	0.02 mg/L	1.85 mg/L
Orthophosphate	0.01 mg/L	N.A.
pH[d]		< 6.0, > 9.0
Phosphorus (Total)	0.01 mg/L	2 mg/L
Potassium[g]	0.3 mg/L	20 mg/L
Silica	2.0 µg/L	N.A.
Sodium	2.0 µg/L	N.A.
Specific Conductance[g]		2,000 µS/cm
Sulfate	0.02 mg/L	N.A.
Total Dissolved Solids[d]	10 mg/L	500 mg/L
Total Kjeldahl Nitrogen[b]	0.5 mg/L	1.5 mg/L
Total Suspended Solids[b]	1.0 mg/L	100 mg/L
Total Water Hardness[g]	1.0 mg/L	< 10 mg/L, > 2,000 mg/L
Zinc[a] [c]	0.02 mg/L	0.2 mg/L

(a) Virginia Pollutant Discharge Elimination System (VPDES) industrial general permit numeric effluent limit
(b) Virginia Pollutant Discharge Elimination System (VPDES) industrial general permit benchmark concentration
(c) Acute water quality criterion for metals is hardness-dependent. Values above reflect hardness standardized to 100 mg/L as CaCO3. See Virginia Water Quality Standard 9VAC25-260-140 for explanation of factors used to adjust acute criterion based on hardness for specific metals.
(d) Virginia Water Quality Standards for surface water 9VAC25-260-140.
(e) EPA secondary drinking water standards
(f) Municipal Action Levels from waste discharge requirements for Los Angeles County MS4 (Order No. R4-2012-0175, as amended by Order WQ 2015-0075)
(g) Benchmark concentration from Illicit Discharge Detection and Elimination, A Guidance Manual for Program Development and Technical Assessments
N.A. = No EPA or Virginia acute standard available

VI. Monitoring Reports

For the Wet Weather Screening Program, Fairfax County produces individual storm reports and permit yearly reports (for all activities within an annual MS4 reporting cycle) to document permit compliance data collection efforts.

a. Event Monitoring Report

For each storm event monitored, an event monitoring report is created for all sites monitored during that event. A data table is prepared that includes the following information:

- Site evaluation and reconnaissance data;
- Site setup and antecedent rainfall information;
- Storm setup and sample collection information;
- Sample analysis results;
- Continuous flow rate and rainfall data (in 10-minute intervals);
- Discrete volume worksheet;
- Pass/fail screening status; and
- Reference values for exceedance criteria.

The event monitoring report also includes a PDF of the laboratory certificate of analysis. The laboratory provides analytical results within two weeks.

b. Monitoring Yearly Report

At the end of each MS4 reporting year (July 1 – June 30), a report on wet weather screening of potential pollution runoff areas is prepared for use in the development of the County's annual MS4 report to VA DEQ. The report contains narratives of each area screened and briefly describes results. The yearly report includes the following:

- locations where wet weather screening was conducted;
- weather conditions at the time each sample was collected including the date and approximate time of the most recent storm event preceding sample collection,
- compilation of analytical results, flow, and rainfall data for each site;
- narratives of each site screened and brief descriptions of results;
- statement addressing permit requirement regarding long term trend analysis of the results;
- follow-up actions performed as a result of the wet weather screening; and
- summary spreadsheet containing analytical results (identifying any exceedances), flow, and rainfall data (see example spreadsheet format in Appendix J)

Year 2 through Year 5 reports include comparisons to prior years monitoring efforts and results. The Year 5 report will also include an overall summary of the five years of monitoring and recommendations for future wet weather screening efforts.

VII. References

Harmel, R., K. King, B. Haggard, D. Wren, and J. Sheridan. 2006. Practical Guidance For Discharge And Water Quality Data Collection On Small Watersheds. Transactions of the American Society of Agricultural and Biological Engineers, Vol. 49, p. 4.

Stenstrom, M. K. and H. Lee. 2005. Industrial Storm Water Monitoring Program: Existing Statewide Permit Utility and Proposed Modifications. January.

USEPA. 2005. Unified Subwatershed And Site Reconnaissance: A User's Manual, Version 2.0, Prepared for Office of Water Management, U.S. Environmental Protection Agency by Center for Watershed Protection, Ellicott City, MD.

USEPA. 2002. Urban Stormwater BMP Performance Monitoring: Guidance Manual for Meeting the National Stormwater BMP Database Requirements. EPA-821-B-02-001. U.S. Environmental Protection Agency, Office of Water, Washington D.C. April.

USEPA. 1992. NPDES Storm Water Sampling Guidance Document. EPA 833-B-92-001. U.S. Environmental Protection Agency, Office of Water, Washington D.C. July.

Versar, Inc. 2006. Fairfax County Wet Weather Screening and Industrial/High Risk Monitoring Program: 2006 Site Selection and Screening Plan. Prepared for Fairfax County Department of Public Works and Environmental Services by Versar, Inc., Springfield, VA. December.

Virginia State Water Control Board. 2009. General VPDES Permit for Industrial Activity Storm Water Discharges, Permit No. VAR05 Fact Sheet. Virginia Department of Environmental Quality, Richmond, VA. April.

Virginia State Water Control Board. 2011. 9VAC25-260 Virginia Water Quality Standards, With Amendments Effective January 6, 2011. Virginia Department of Environmental Quality, Richmond, VA. January.

VIII. Administrator of the SOP

This SOP document is administered by the Stream Monitoring Section within the Stormwater Planning Division. For more information about this document, please call the Stormwater Planning Division at (703) 324-5500.

IX. Appendices

A. Land Use Codes and Index Values for Wet Weather Pollutant Discharge Potential

B. Selected SIC Codes that Occur Within Fairfax County MS4 Service Areas

C. Graphical representation of site selection process

D. Maps and Photos of Selected and Alternative MS4 Service Areas

E. Wet Weather Monitoring Site Evaluation Form

F. Equipment Installation, Operation and Sampling Procedures

G. Example Wet Weather Screening Field Data Sheet

H. Chain of Custody Form

Appendix A: Land Use Codes and Index Values for Wet Weather Pollutant Discharge Potential

Land uses and attached index of potential wet weather pollution discharge (1=least, 4=most risk for contributing excess pollutants via wet weather discharge) for parcels in Fairfax County, Virginia. Note that codes were established only for three-digit land use codes. Land use codes were obtained from Fairfax County Department of Tax Administration.

Land Use Code	Description	Index
0	Residential	
3	Retail Trade	1
1	Single-family, Detached or Semidetached	
11	Single-family, detached	1
12	Single-family, semidetached or garden court	1
13	Two or more single-family, detached on single parcel (including guest house or unit in detached auxiliary building)	1
14	Single-family structure NEC	1
15	Single-family residences located in an area where value may be influenced by commercial or industrial properties.	1
2	Two-family	
21	Duplex, either vertical or horizontal	1
29	Two-family NEC	1
3	Townhouse or Multiplex	
31	Townhouse, in ownership development	1
32	Townhouse, in condominium development	1
33	Townhouse, in rental development	1
34	Multiplex (except duplex) in ownership development	1
35	Multiplex (except duplex) in condominium development	1
36	Multiplex (except duplex) in rental development	1
37	Combination of structure types, predominantly townhouses and/or multiplexes	1
39	Townhouse or multiplex structures NEC, including cooperatives	1
4	Apartments	
40	Garden apartments, rental (up to and including 4 stories)	1
41	Garden apartments, condominium (up to and including 4 stories)	1
42	Medium rise apartments, rental (5 to 8 stories)	1
43	Medium rise apartments, condominium (5 to 8 stories)	1
44	High rise apartments, rental, without commercial/professional (9 or more stories)	1
45	High rise apartments, condominium, without commercial/ professional (9 or more stories)	1
46	High rise apartments, rental, with commercial/professional (9 or more stories)	1

Land Use Code	Description	Index
47	High rise apartments, condominium, without commercial/ professional (9 or more stories)	1
48	Combination of structure types, predominantly apartments	1
49	Apartments, NEC, including cooperatives	1
5	Mobile Homes	
51	Mobile homes in park or court	1
52	Mobile homes not in park or court	1
6	Residential Structures (originally designed for hotels and motels but now primarily used as dwelling units)	
60	Residential hotels and motels	1
7	Group Quarters	
71	Rooming and boarding houses	1
72	Membership lodgings	1
73	Residence halls and dormitories	1
74	Retirement homes and orphanages	1
75	Religious quarters	1
76	Nursing homes	1
79	Other group quarters NEC (except military and correctional)	1
8	Transient Lodging	
81	Motel without restaurant and/or other commercial amenities	1
82	Motel with restaurant and/or other commercial amenities	1
83	Hotel without restaurant and/or other commercial amenities	1
84	Hotel with restaurant and/or other commercial amenities	1
85	Tourist Home	1
89	Other transient lodging NEC	1
9	Other Residential	
91	Garage, barn, outhouse, shed, etc., on separate but adjacent parcel from unit	4
92	Private open space, swimming pool, tennis courts, private roads, parking areas,	2
93	Private open space, swimming pool, tennis courts, private roads, parking areas,	2
99	Other residential NEC	1
1	Industrial	
11	Industrial Park or Conglomeration	
111	Planned industrial park	4
112	Industrial conglomeration	4
12	Durable Manufacturing, where not in industrial parks	
121	Durable manufacturing	4
126	Durable manufacturing (where in a condominium development)	4
127	Durable manufacturing (where in a cluster development)	4
13	Nondurable Manufacturing, where not in industrial parks	

Land Use Code	Description	Index
131	Nondurable manufacturing	4
135	Printing and publishing	4
136	Nondurable manufacturing (where in a condominium development)	4
137	Nondurable manufacturing (where in a cluster development)	4
14	Research and Testing, where not in industrial parks	
140	Research and test, where not in office building or office park	4
146	Research and testing (where in a condominium development)	4
147	Research and testing (where in a cluster development)	4
15	Wholesale, Warehousing and Storage, where not in industrial parks	
150	Wholesale, warehousing and storage	3
151	Mini-warehouses	3
156	Wholesale, warehousing and storage (where in a condominium development)	3
157	Wholesale, warehousing and storage (where in a cluster development)	3
16	Contract Construction, where not in industrial parks	
160	Contract construction	4
166	Contract construction (where in a condominium development)	4
167	Contract construction (where in a cluster development)	4
19	Other Industrial NEC	
190	Other industrial NEC	4
2	Transportation, Utilities, Communications (operating facilities not including offices)	
21	Transportation	
211	Railroad, including right-of-way, terminals, maintenance	3
212	Rail rapid transit, including right-of-way, terminals, maintenance	3
213	Bus, including terminals, maintenance and special rights-of-way	3
214	Motor freight transportation	3
215	Street and highway right-of-way	3
216	Auto parking	3
217	Air including runways, terminals and maintenance	3
218	Marine terminals	3
219	Other transportation NEC (including freight forwarding services and taxi	3
22	Utilities	
221	Electric, including transmission rights-of-way, generation plants, regulating	4
222	Gas, including pipeline rights-of-way, production plants, storage and distribution	4
223	Water, including pipeline rights-of-way, treatment plants, storage, irrigation	4
224	Sewage, including treatment plants, pressure control stations, etc.	4
225	Solid waste disposal including refuse incineration, garbage grinding stations,	4
226	Pipeline rights-of-way and pressure control stations, NEC (such as petroleum)	4
229	Other utilities, NEC	3

Land Use Code	Description	Index
23	Communications	
231	Telephone and telegraph	3
232	Radio and television	3
239	Other communications, NEC 3 Retail Trade	3
31	Shopping Centers (a group of commercial establishments with on-site parking which are planned, developed, owned and managed as a unit, and related in location)	
311	Neighborhood Center	2
312	Specialty Center - consists of numerous small tenants with no anchor tenant.	2
313	Community Center	2
314	Regional Center	2
315	Super Regional Center	2
316	Promotional Center	2
317	Town Center	2
318	Condo Center	2
32	Building Materials, Hardware, Farm Equipment (where not included in shopping centers)	
320	Building materials, hardware, farm equipment	3
33	General Merchandise, Apparel, Home Furnishings, Drugs (where not included in shopping centers)	
331	Department stores	2
332	Discount stores	2
333	Variety or junior department stores	2
334	Apparel and accessories	2
335	Furniture, house furnishings	2
336	Drug stores	2
337	Condo Retail - Specialty type store located in a predominantly office or	2
34	Food Stores (where not included in shopping centers)	
341	Supermarket	2
342	Supermarket plus general merchandise	2
343	Convenience grocery	2
349	Other food NEC (including fruit, meat, fish, etc.)	2
35	Eating and Drinking (where not included in shopping centers)	
351	Restaurant with alcohol	3
352	Restaurant without alcohol	3
353	Carry-out Kitchen	3
354	Carry-out with seating	3
36	Automotive, Marine, Aircraft and Accessories (where not included in shopping centers)	
361	Motor vehicle sales (new and used)	2

Land Use Code	Description	Index
362	Gasoline and Service Station	3
363	Gasoline Sale Only	3
364	Gasoline Sales and Car Wash	3
365	Service Station out of operation, but not yet converted to another use. Service	2
369	Other automotive, marine, aircraft and accessories NEC	3
39	Other Retail NEC (where not included in shopping centers)	
390	Other retail NEC	2
4	Office Buildings and Office Parks	
41	Office Park	
410	Office Park	1
42	Low Rise Office (up to and including 4 stories)	
421	General low rise office	1
422	Medical and/or dental low rise office	1
423	Government leased low rise office (90% or more floor area leased to	1
424	Government owned low rise office	1
425	Condominium Office (General, Low Rise)	1
426	Condominium Office (Medical and/or Dental, Low Rise)	1
427	Cluster Office (General, Low Rise)	1
428	Cluster Office (Medical and/or Dental, Low Rise)	1
429	Converted Residential Office (ex-dwellings which have been totally converted	1
43	Medium and High Rise Offices (5 or more stories)	
431	General medium or high rise office	1
432	Medical and/or dental medium high rise office	1
433	Government leased medium or high rise office (90% or more floor area leased to	1
434	Government owned medium or high rise office	1
435	Condominium Office (General, Medium or High Rise)	1
436	Condominium Office (Medical and/or Dental, Medium or High Rise)	1
49	Other Office NEC	
490	Other office NEC	1
5	Consumer and Business Service land uses (where not included in office buildings or shopping centers; usually in converted houses or converted stores)	
510	Finance, insurance, real estate and professional services	1
520	Personal services including laundry, photo, beauty, barber, funeral, apparel,	1
530	Motor vehicle repair when provided separately from motor vehicle sales dealers and gasoline stations.	3
540	Other repair services NEC	1
550	Veterinary hospitals	1
590	Other consumer and business service land uses NEC	1

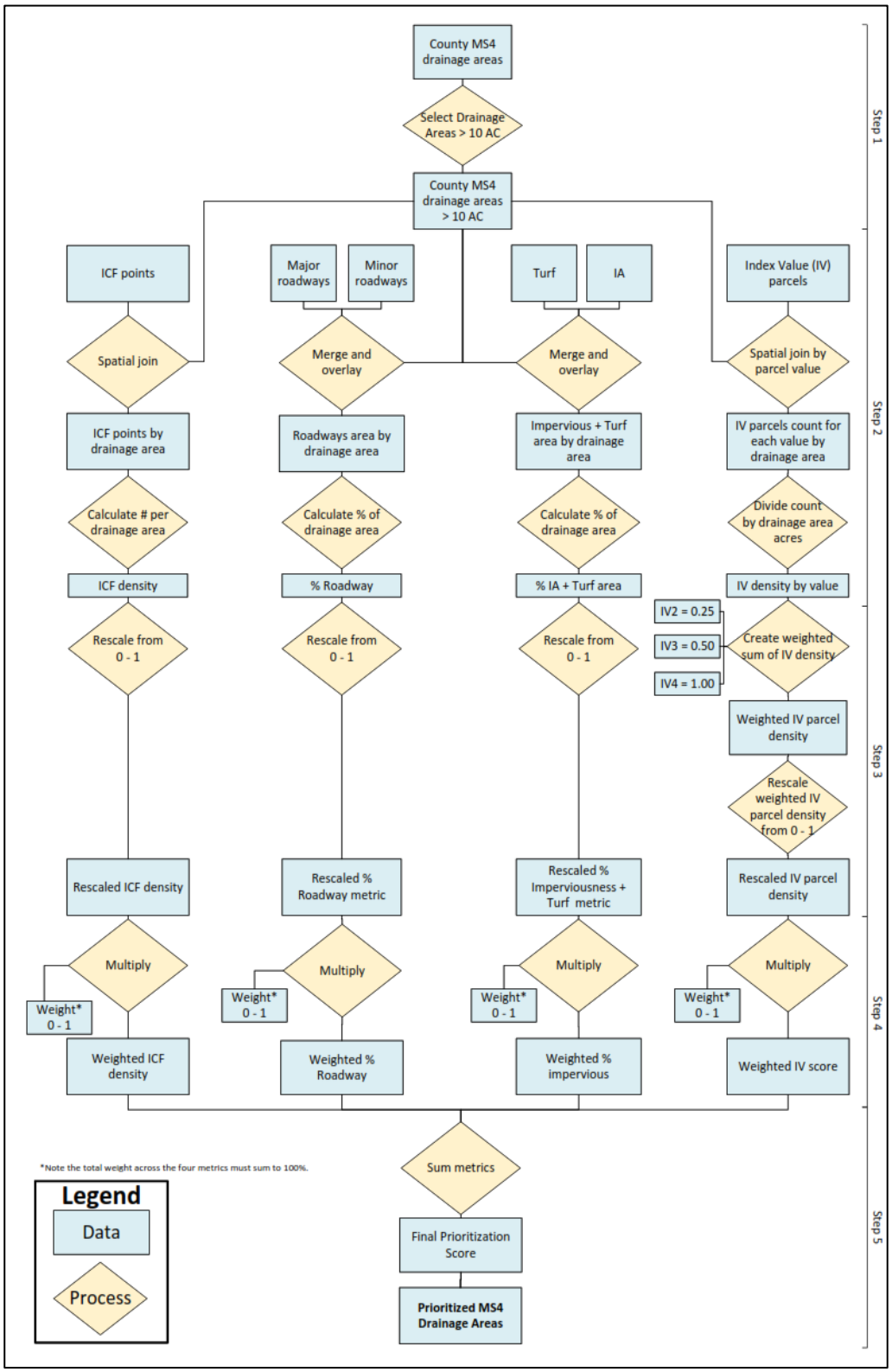
Land Use Code	Description	Index
6	Public and Quasi Public Service land uses (where not included in office buildings or shopping centers)	
610	Cemeteries	1
620	Hospital and health facilities (except nursing homes)	1
630	Post offices	1
640	Police stations	1
650	Fire and rescue stations	1
660	Correctional institutions	1
670	Military institutions	1
680	Welfare and charitable services	1
690	Other public and quasi public service land uses NEC	1
7	Cultural, Educational and Entertainment Service	
71	Churches, Synagogues	
710	Churches, synagogues	1
72	Civic, Social, Fraternal, Professional, Business Associations	
720	Civic, social, fraternal, professional, business associations	1
73	Libraries	
730	Libraries	1
74	Permanent Exhibition	
740	Permanent exhibitions including museums, art galleries, monuments, planetaria,	1
75	Education	
751	Nursery schools (may include kindergarten)	1
752	Public elementary, intermediate, secondary, high and special class schools	1
753	Private schools; kindergarten through 12 or combination of these grades; may	1
754	College, universities, including junior colleges and professional schools (law,	
755	Special training schools including vocational and trade schools, business,	1
759	Other educational services NEC	1
76	Public Assembly, Both Indoor and Outdoor	
760	Places of public assembly including theaters, stadiums, auditoriums, exhibition	1
79	Other Cultural and Entertainment Service land uses NEC	
790	Other cultural and entertainment service land uses NEC	1
8	Recreation	
81	Recreation Facilities and Parks - Outdoor (except golf courses and except swimming pools not in public parks)	
811	Private (except for homeowner association facilities)	1
812	Commercial - open to public	1
813	Government-owned - open to public with or without fee	1
82	Recreation Facilities - Indoor (except swimming pool)	
821	Private	1

Land Use Code	Description	Index
822	Commercial - open to public	1
823	Government-owned - open to public with or without fee	1
83	Golf Courses	
831	Private	3
832	Commercial	3
833	Government-owned	3
84	Swimming Pools (except homeowners association pools).	
841	Swimming pools - outdoor	3
842	Swimming pools - indoor	3
85	Boat Slips	
850	Boating Marinas - public and private	2
851	Condominium Boat Slips - private for sale	2
9	Resource Uses and Undeveloped Areas	
91	Agricultural Activities	
910	Agricultural activities and related services	3
92	Forestry Activities and Related Services	
920	Forestry activities and related services	3
93	Horticulture Activities	
930	Horticulture activities and related services	3
94	Resource Production and Extraction	
941	Sand and gravel quarrying	3
949	Other resource production and extraction	3
95	Permanent Conservation Areas	
950	Permanent conservation areas, including wildlife preserves	1
96	Water Areas	
960	Water areas	1
97	Vacant Land	
971	Vacant land	1
972	Improved land with dilapidated structure of no visible use, incidental shed, etc.	1
99	Other Resource Uses and Undeveloped Area NEC	
990	Other resource uses and undeveloped area NEC	1

Appendix B: Selected SIC Codes that within Fairfax County MS4 Service Areas

SIC	Description
241	Dairy Farms
751	Livestock Grooming
752	Dog Training/Pet Boarding Sitting & Kennels/Pet Services/Pet Funeral Servies/Pet Training/Pet Washing & Grooming
1311	Oil & Gas Producers
1611	Paving Contractors
2752	Printers (Mfrs)
2841	Soaps, Detergents, and Cleaning Preparations
2851	Paint Removers-Manufacturers
2911	Oil Refiners (Mfrs)/Petroleum Products-Manufacturers
2951	Asphalt Paving Mixtures and Blocks
4119	Limousine Service
4212	Hauling Debris Removal
4953	Garbage Collections/Junk Removal/Landfills- Sanitary/Pet Waste Removal/Refuse Systems/Waste Disposal-Hazardous/Medical
5015	Automobile Wrecking (Whls)
5084	Printer Cartridges (Whls)
5093	Recycling Centers (Whls)/Scrap Metals & Iron (Whls)
5169	Chemicals (Whls)/Chemicals-Storage & Handling (Whls)/Cleaning Compounds/Lubricants-Synthetic (Whls)/ Sealers-Asphalt, Concrete, Etc (Whls)
5171	Petroleum Bulk stations and Terminals
5172	Oils-Lubricating-Wholesale/Oils-Petroleum (Whls)
5191	Animal Health Products (Whls)/ Feed-Dealers (Whls)/Fertilizers (Whls)
5211	Building Materials
5261	Garden Centers/Mulches/Nurserymen
5511	Automobile Dealers-New Cars/Used Cars/ Limousine-Dealers
5541	Oils-Lubricating-Retail/Service Stations-Gasoline & Oil
5571	Mopeds/Motorcycles & Motor Scooters-Accessories/Dealers/Supplies
5999	Pet Supplies & Foods-Retail
6512	Shopping Centers & Malls
7342	Deodorizing & Disinfecting/Pest Control
7349	Janitor Service
7359	Carpet Rug & Cleaning Equipment-Rental/Contractors-Equipments Supls-Renting
7514	Automobile Renting
7532	Automobile Body-Repairing & Painting/Automobile Customizing
7533	Mufflers & Exhaust Systems-Engine
7536	Glass Coating and Tinting
7537	Transmissions-Automobile
7538	Automobile Repairing & Servicing/Automobile Machine Shop Service/Truck Repairing & Service
7539	Automobile Radiator Repair/Automotive Repair Shops/Brake Service/Carburetors
7542	Automobile Detail & Clean-Up Service/Car Washing & Polishing
7549	Automobile Lubrication Service/Automobile Inspection Stations New/Used/Wrecker Service
7623	Refrigerating Equip-Commercial-Service/Refrigerators & Freezers-Service/Repair
7933	Bowling Centers
7992	Golf Courses
7997	Swimming Pools-Private
7999	Golf Courses-Miniature/Golf Instruction/Golf Practice Ranges/7999 – Swimming Pools-Public

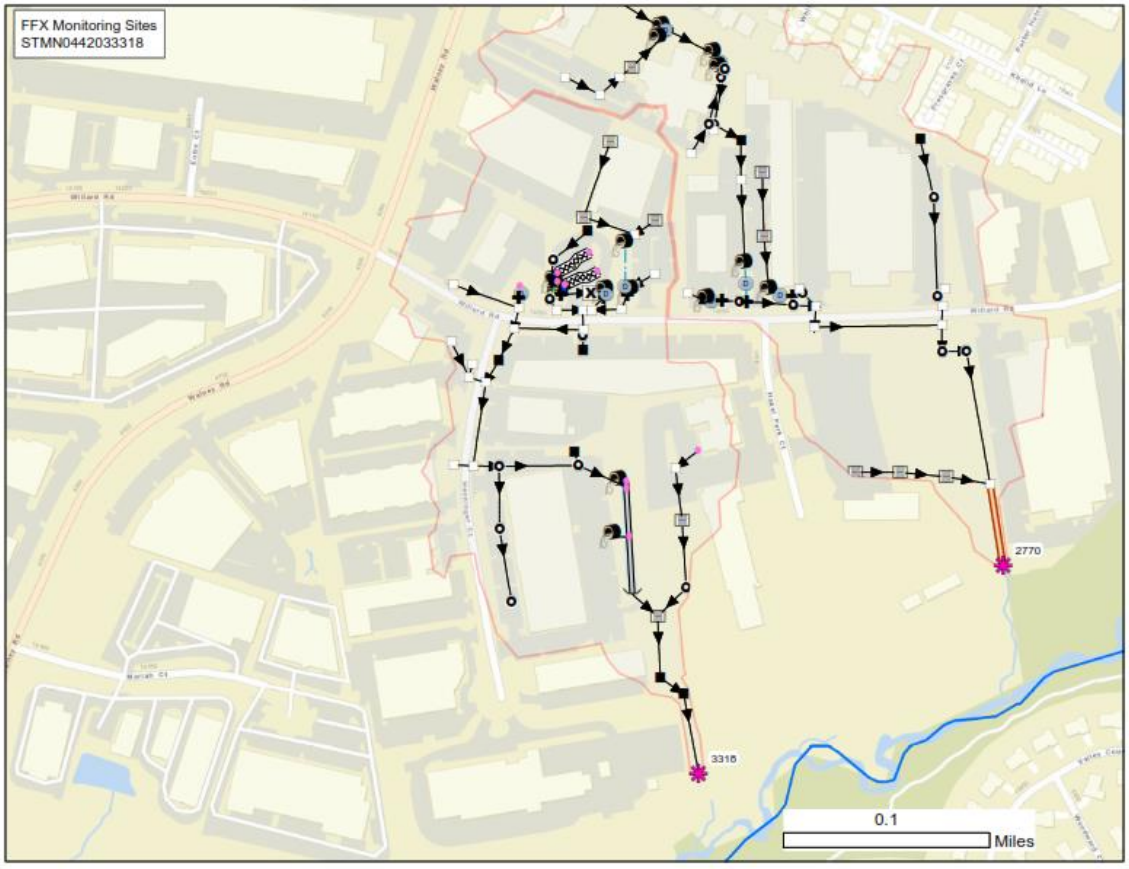
APPENDIX C: Graphical representation of site selection process



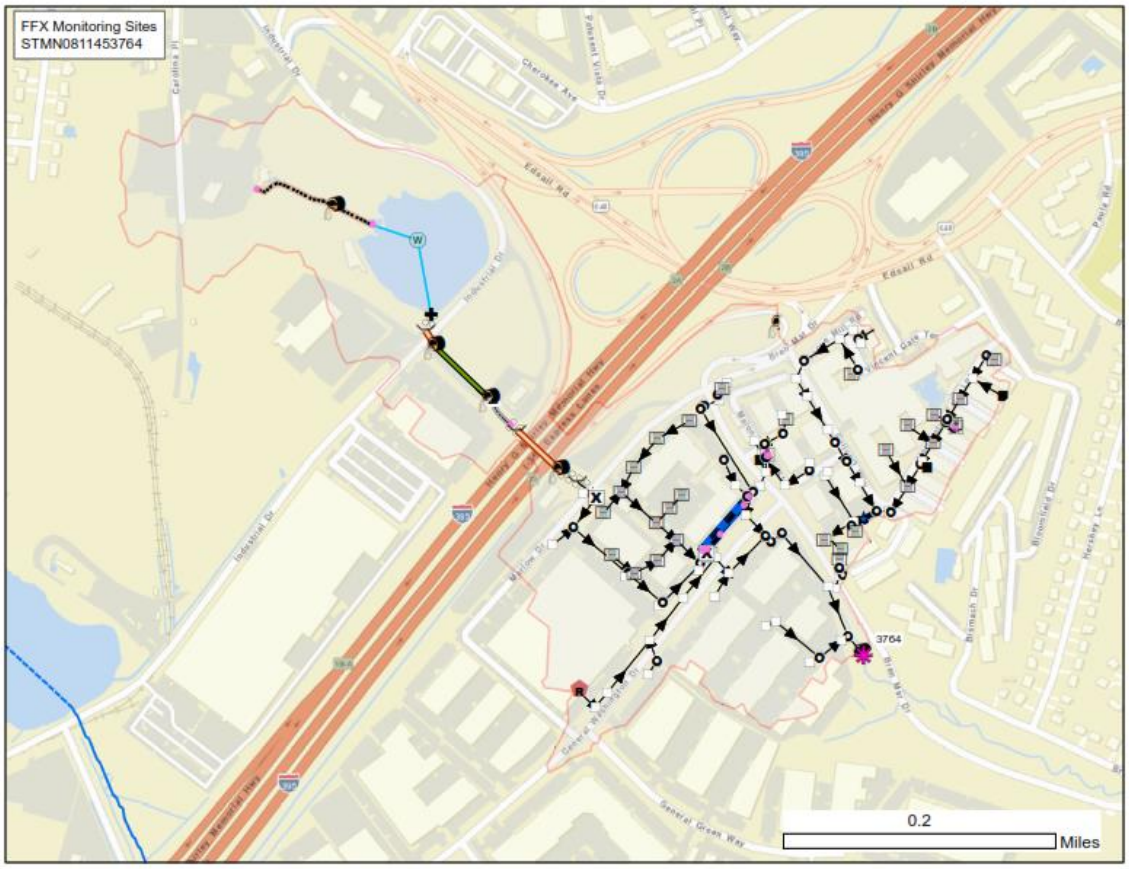
APPENDIX D: Maps and Photos of Selected and Alternative MS4 Service Areas

Selected Monitoring Sites

1. Fairfax Water, Chantilly Location; STMN0442033318

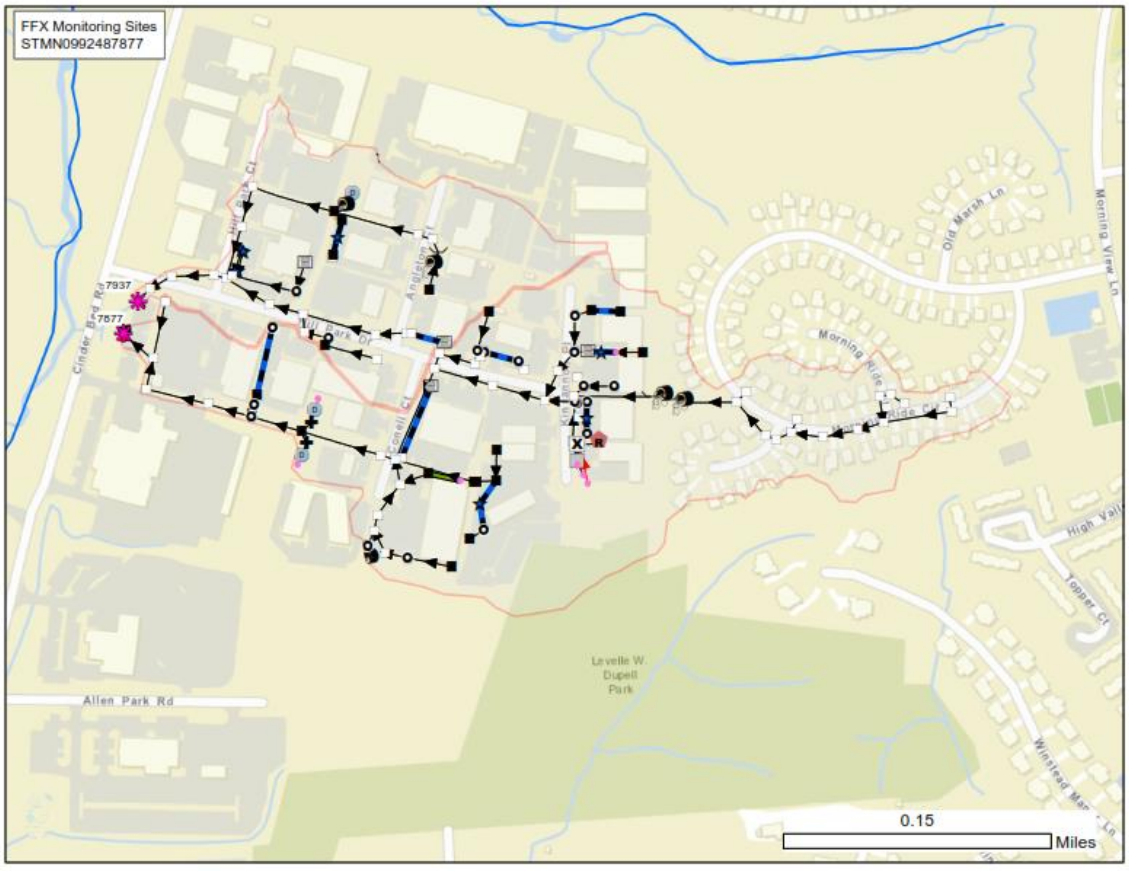


2. Bren Marr Park, near I-395; STMN0811453764

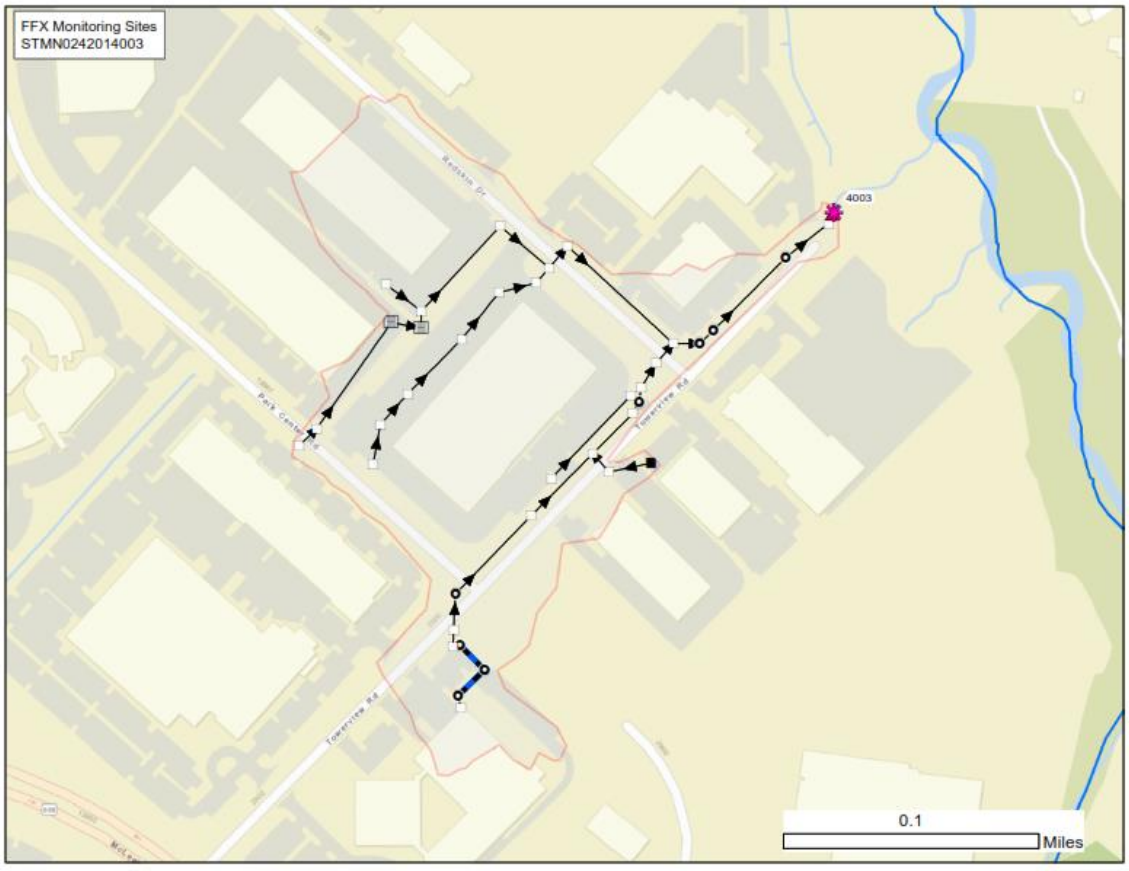


Alternate Monitoring Sites

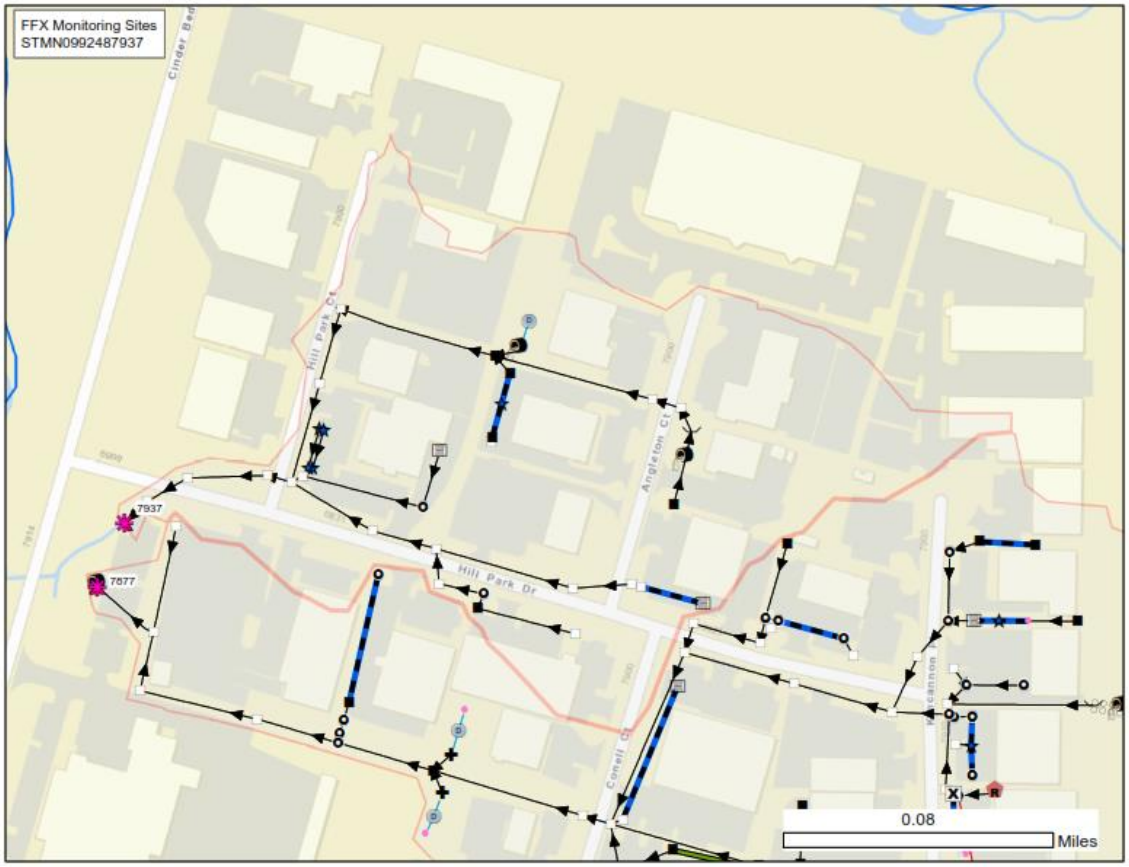
1. **Hill Park Dr, Lorton; STMN0992487877**



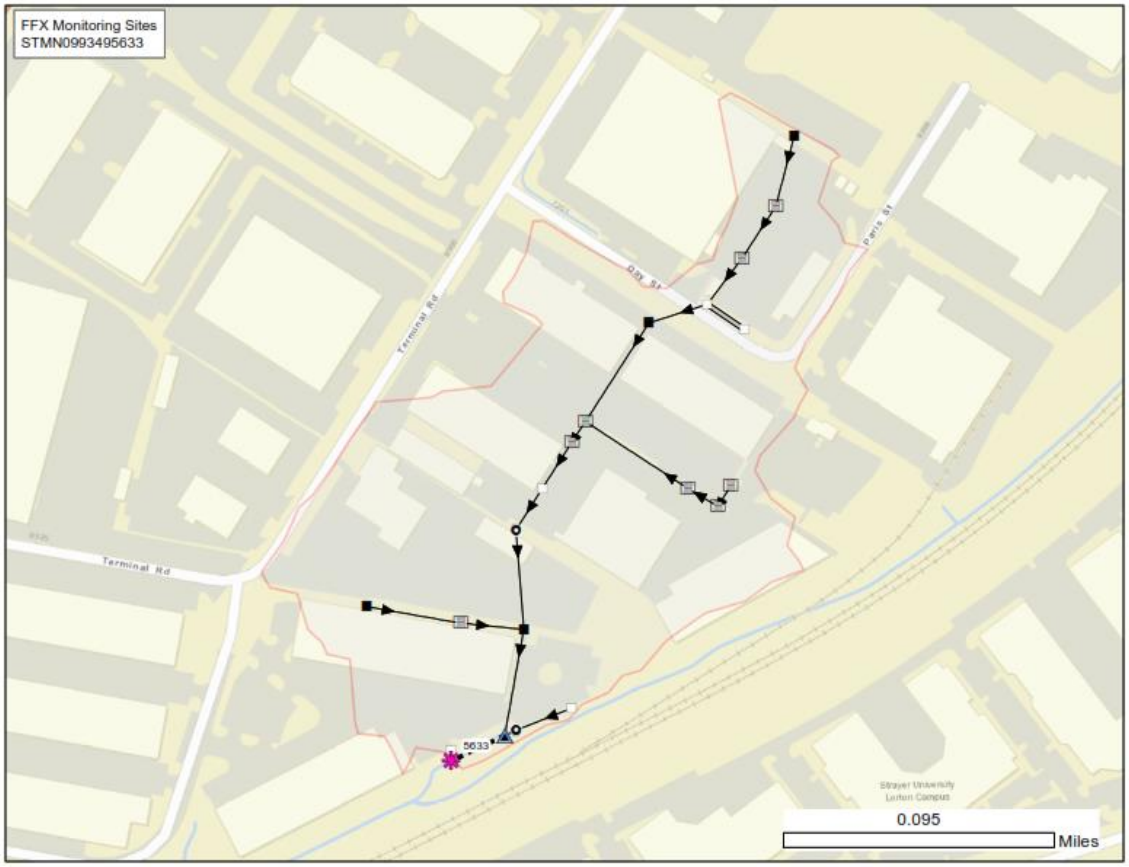
2. Towerview Rd, Herndon; STMN0242014003



3. Cinderbed Rd. and Hill Park Dr, Newington; STMN0992487937



4. Terminal Rd, Lorton; STMN0993495633



Appendix E: Wet Weather Monitoring Site Evaluation Form

WET WEATHER MONITORING SITE EVALUATION	
FIELD DATA COLLECTION FORM	
Date/Time:	**Lat/Long:**
Evaluator Initials:	**Adjacent Cross Streets:**
Outfall ID: STMN_____	**Predominant Land Use:**
LAND USE CHARACTERIZATION	
Percent breakdown of: Residential _____ Commercial _____ Industrial _____ **Institutional** _____	
Businesses/Organizations Nearby:	
POLLUTION POTENTIAL	
Check any that apply: ☐ **Outdoor material storage (uncovered, hazardous, leaking)** ☐ **Waste management (open/leaking dumpster, blowing trash)**	☐ **Parking lot stains** ☐ **Uncovered outdoor vehicle or equipment maintenance** ☐ **Outdoor vehicle fueling** ☐ **Outdoor industrial processes** ☐ **Other**
Description of items selected from above list:	
Description of stormwater controls on site (none, few, pervasive):	
Other:	
SAFETY	
Site Security (personnel and/or equipment):	

WET WEATHER MONITORING SITE EVALUATION			
Proximity to Traffic (traffic control needed?):			
Biological Hazards:			
Confined Space Entry Concerns:			
Other:			
INFRASTRUCTURE CONFIGURATION			
Check any that apply: ☐ **Concrete Ditch** ☐ **Pond/Scour Pool Present?** ☐ **Submerged?** ☐ **Pipe Conduit** ☐ **Pipe Shape** ☐ **Other** ☐ **Natural Channel** ☐ **Irregular Outfall Shape**			
Describe configuration and accessibility of feeder outfalls to natural channel or concrete ditch, if applicable:			
Pipe Diameter/Dimensions (in):			
Pipe Slope (%):			
Pipe Conditions (sediment, organic material):			
Receiving Waterbody:			
ACCESS			
Site located on private property?			
Slope/Terrain/Overgrown Veg:			
Fencing/Security (gate key/combo needed?):			
Travel Time:			
Suitable parking/egress?		**Distance from site to truck parking (approx.):**	

WET WEATHER MONITORING SITE EVALUATION			
Other:			
Sketch property layout:			
EQUIPMENT SETUP			
Access via Outfall or Manhole (if manhole, can tubing be routed with manhole cover in place?):			
Backwater Concerns:		**Proximity to bends/confluences in pipe:**	
Sedimentation concerns:		**Other concerns from flow:**	
Age of Infrastructure/Proximity to new development:			
Public Exposure/Visibility:			
Describe the proposed site layout:			
Other:			
Sketch equipment setup:			

Appendix F: Equipment Installation, Operation and Sampling Procedures

Wet weather screening equipment

The automated sampler to be employed will be an ISCO Model 6712 portable sampler capable of collecting up to 24 1000-mL water samples. The samples are contained in Propak liners constructed of polyethylene which are inserted into plastic frames to provide rigidity. The size of the samples and number of bottles will assure that several bottles will be filled corresponding to all portions of the storm event hydrograph. The automated sampler will be transported to the sampling sites prior to the storm event and removed after event conclusion. During the event, each sampler will be covered by a lid to protect it from the effects of weather. The samplers will be powered by 12 volt 100Ah rechargeable marine batteries. The sampler will be secured against theft when practical using bicycle locks attached to fixed objects such as fence posts.

Should site conditions require, an ISCO Model 6712C compact portable sampler may be used. This sampler is of a size and configuration that will allow it to be inserted and retrieved from a manhole and suspended using a pro-hanger and appropriate harness (for manholes 18 to 24 inches in diameter). Alternatively, the samplers may be secured using rebar loops inserted into the ground and combination bicycle locks to discourage theft.

Automated sampler placed in manhole using hanger and spring ring

AV Module The flow module measures water level within the pipe based on overlying water pressure exerted on bubbles pumped from the module that exit the bubbler tubing at the base of the pipe. Flow rates are calculated from the water level measurements based on Manning's Equation. The bubbler line is mounted to a "spring ring" or "scissors ring" that is secured within the pipe. If backwater conditions

exist at an outfall or within the MS4, an ISCO Model 750 area-velocity flow module and appropriate probe may be substituted in order to accurately determine flow rate.

On-site equipment installation

Materials, Equipment and Supplies:

- Confined Spaces entry apparatus (if necessary) consisting of tripod, winch, lanyard, harness, oxygen meter.
- Scissors ring or spring ring with appropriate extensions, where applicable
- Remote installation tool
- Bubbler line or area-velocity probe
- Suction line and stainless steel low-flow strainer
- Ratchet set, English
- Sensor carrier
- Cable ties
- Batteries and container

This work may occur in and/or around confined spaces. Staff shall be trained in confined space awareness and identification per OSHA guidelines. For work that involves entry into a confined space, the County (or an approved contractor) will mobilize a (minimum) two-person, permit-required, confined space certified crew with appropriate equipment to the site, and enter the facility adhering to applicable OSHA requirements for confined space entry. Standard operating procedures relevant to safety and health considerations for these monitoring activities are maintained under separate cover in the Fairfax County Stormwater Safety Manual. Confined-spaces entry-certified personnel and apparatus are to be used if installation is to be within a pipe inlet to a below-grade junction (pipes greater than > 15" diameter only; for pipes less than 15", see step 3).

1. Measure outfall pipe and assemble scissors ring with designated extensions. Retract brace by rotating nut counter-clockwise with ratchet.

2. Install sensor carrier and attach bubbler line or AV module to sensor carrier. Attach suction line to low-flow strainer and attach strainer to sensor carrier using cable ties. Insert scissors ring in pipe just upstream of outlet orifice; orient scissors ring so that metal bubbler line outlet is in the invert of pipe, pointing downstream.

3. In the case of 15" diameter or less pipes for within-network installations (i.e., not at an outfall), a remote, street-level installation tool can be used. Sensor carrier, strainer, and tubing are to be attached as described above.

4. The tubing can be secured by attaching to fixed objects such as tree roots or fencing to prevent tubing from laying in the waterway where it may become a target of debris snags. For within-network installations, the tubing can be tied off at the upper step of the closed manhole or threaded through manhole cover and secured on nearby brush until such time as storm event is monitored.

Preparation for storm event

Materials, Equipment, and Supplies:

- Programmable, automated sampler equipped with flow module
- 24 1,000-mL bottle configuration (or 500 mL, if applicable)
- Pro-hanger and harness for automated sampler, if applicable
- Ice
- Bike locks or chain and padlocks
- 12 volt 100Ah Marine battery

Meteorology

Obtain a storm forecast (e.g., from NOAA, Weather Underground, the Weather Channel, or Dark Skies). The meteorologist should be, beforehand, made aware of antecedent dry-time criteria (48 hours); minimum rainfall depth requirement (0.3 inches); and lead time required to gather sampling equipment, travel to the site, obtain ice, and place and program sampler. Such lead time will vary with distance from equipment storage.

1. Attach bubbler line (or area-velocity probe) and suction tubing to sampler. Attach suction line (other end) to low-flow strainer in pipe (if not already).
2. Make sure sampler is level.
3. Place ice in center of sampler.
4. When putting sampler back on top of bottom, make sure straps are outside, so distributor arm doesn't catch (or slip straps between bottle carrier and sampler bottom)
5. Program sampler to capture entire flow event. Program duration should reflect both the duration of the rain and estimated time allowance for sampling of trailing limb (rule of thumb for highly impervious catchments: 4 hours). To determine sample interval in minutes, multiply sum of the rainfall and trailing limb allowance in hours by 2.5.
6. Secure samplers to fencing or manhole steps using bike lock. Stabilize with line if necessary.
7. Attach sampler cover. Be sure that neither the suction line nor the bubbler tubing is pinched between the cover and sampler body. Also check the lines to be sure there are no holes.
8. If placing sampler in manhole using pro-hanger and harness, replace manhole cover by gently sliding horizontally over the hole. If the angle of the manhole is too great as it nears seating, it may press down on the pro-hanger with enough force to dislodge it and cause the sampler to drop to the bottom of the manhole.

Storm sample compositing

<u>Materials, Equipment, and Supplies:</u>

1. Laptop PC running Flowlink software
2. Discrete sample bottle caps
3. Ice
4. Graduated cylinders (100-mL and 500 mL)
5. Composite container

<u>Methodology:</u>

1. Open sampler body and examine bottles for presence of liquid. Cap each discrete bottle if containing liquid. Replenish with ice if necessary. Close sampler body and transport it to office/laboratory for sample processing.
2. Download sampler data to laptop PC. Create hydrograph of downloaded level data covering the time that the sampler was onsite in the field. Convert continuous level data to flow rate using Manning's equation and input appropriate coefficients for the specific pipe.
3. Export combined level and flow rate data into.csv file (e.g., "sitename levelflow [date of storm].csv").
4. Import level and flow rate data (name of level & flow files will appear as sites).
5. Construct table of discharges in the usual way, using flow rate data just imported and appropriate sample interval.
6. Export table of discharges to another .csv file (e.g., "sitename discharge [date of storm].csv").
7. Open discharge export file in spreadsheet. Copy 1st 24 bottles and times to template file. The template file will automatically calculate discrete volumes (volumes to add to composite bottle) once the formula is corrected to reflect volume at peak discharge [discrete volume = 1,000 mL or 500 mL for compact sampler].
8. Save the discrete volume file just created in Excel as a new file (e.g., "sitename discrete [date of storm].xls"). Print the spreadsheet and refer to it when compositing. Reduce discrete volumes by a proportional amount if the total volume is greater than the capacity of the 4-L bottle.
9. Use graduated cylinders to measure discrete aliquots.
10. After compositing, wash and rinse plastic bottles with phosphate free soap, 10% nitric acid solution, and deionized water.

Note: because of variations in water level in pipe over time, a discrete sample may be low or nonexistent despite a measurable discharge volume represented by the discrete sample as measured by the flowmeter. This is due to the fixed time frame that the sampler takes samples. At the time that the sampler takes the sample, there may be insufficient water in the pipe despite the fact that there was sufficient water at a different time during the interval between discrete samplings.

Appendix G: Example Wet Weather Screening Field Data Sheet

STORM EVENT

FAIRFAX COUNTY WET WEATHER SCREENING FIELD DATA

CREW Setup | Comp. | STATION | SVC AREA ID: _____ | YEAR MONTH DAY

STORM DURATION (hr) | SAMPLE INTERVAL (min) | SAMPLE BEGIN | TIME

TOTAL STORM PRECIP (in) | SAMPLE END

SLOPE:_____ DIAMETER:_____

CONSTRUC. MAT'L:_____ ROUGHNESS:_____

HYDROGRAPH/COMPOSITE INFORMATION:

SAMPLE COLLECTION DATA:

FIRST FLUSH SAMPLES
DATE/TIME OF COLLECTION _____

COMPOSITE SAMPLES
DATE/TIME OF COLLECTION _____

Bottle	Time	Interval discharge (cf)	Discrete vol
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			

F	X				S	T					G	W	Q

INSERT TYPE:_____

MANHOLE ID:_____

LATITUDE:_____

LONGITUDE:_____

SAMPLER SERIAL:_____

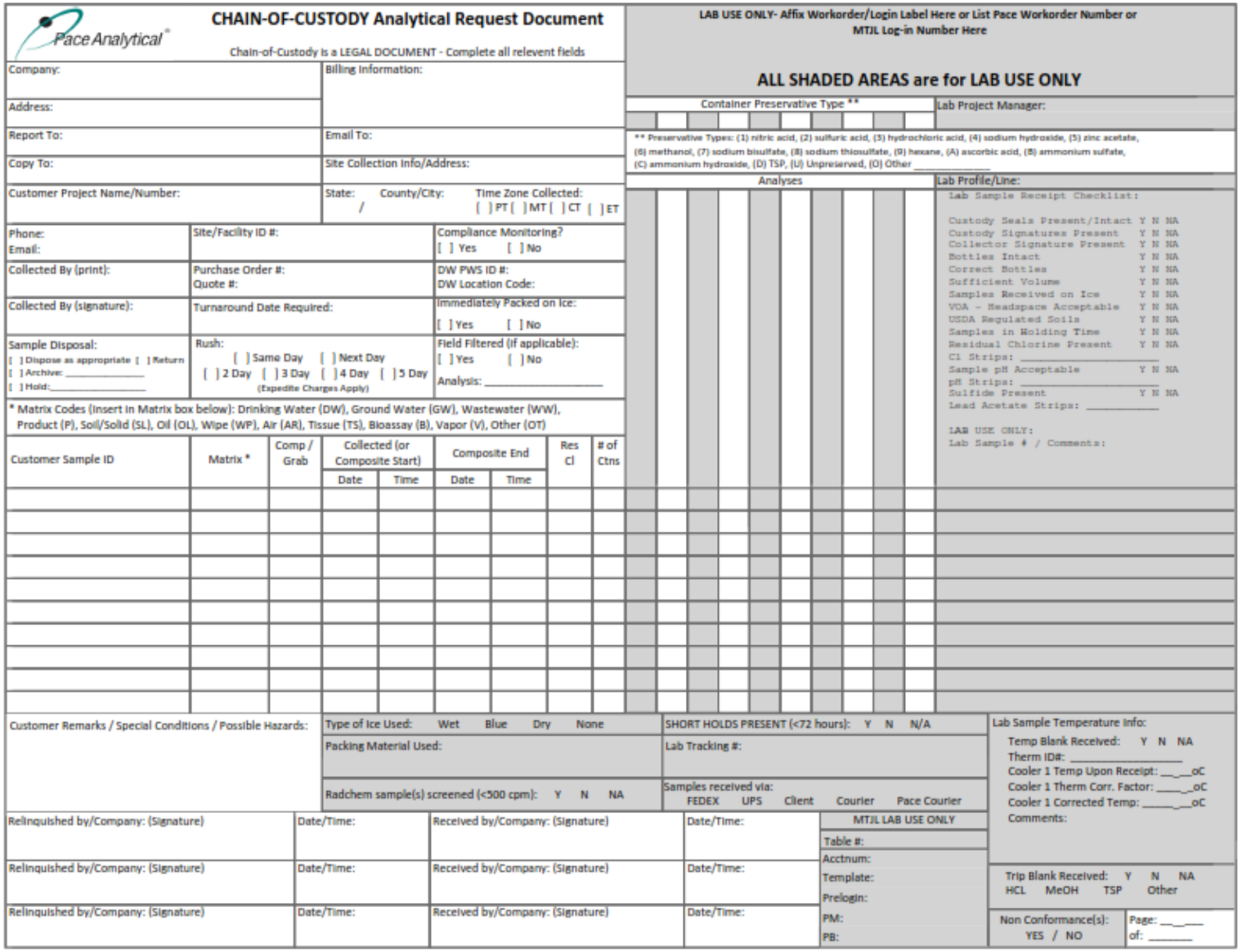
MODULE SERIAL:_____

pH:_____

Sp. Cond.:_____

REVIEWED BY _____ DATE: _____ TSJ 03/14

Appendix H: Chain of Custody Form



Pace Analytical

CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

LAB USE ONLY- Affix Workorder/Login Label Here or List Pace Workorder Number or MTJL Log-in Number Here

ALL SHADED AREAS are for LAB USE ONLY

Company:

Billing Information:

Address:

Report To:

Email To:

Copy To:

Site Collection Info/Address:

Customer Project Name/Number:

State: County/City: Time Zone Collected: [ ] PT [ ] MT [ ] CT [ ] ET

Phone:
Email:

Site/Facility ID #:

Compliance Monitoring? [ ] Yes [ ] No

Collected By (print):

Purchase Order #:
Quote #:

DW PWS ID #:
DW Location Code:

Collected By (signature):

Turnaround Date Required:

Immediately Packed on Ice: [ ] Yes [ ] No

Sample Disposal:
[ ] Dispose as appropriate [ ] Return
[ ] Archive: _____
[ ] Hold: _____

Rush:
[ ] Same Day [ ] Next Day
[ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day
(Expedite Charges Apply)

Field Filtered (if applicable): [ ] Yes [ ] No
Analysis: _____

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Collected (or Composite Start) Time	Composite End Date	Composite End Time	Res Cl	# of Ctns

Container Preservative Type **

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other _____

Lab Project Manager:

Analyses

Lab Profile/Line:

Lab Sample Receipt Checklist:

Custody Seals Present/Intact	Y	N	NA
Custody Signatures Present	Y	N	NA
Collector Signature Present	Y	N	NA
Bottles Intact	Y	N	NA
Correct Bottles	Y	N	NA
Sufficient Volume	Y	N	NA
Samples Received on Ice	Y	N	NA
VOA - Headspace Acceptable	Y	N	NA
USDA Regulated Soils	Y	N	NA
Samples in Holding Time	Y	N	NA
Residual Chlorine Present	Y	N	NA
Cl Strips: _____			
Sample pH Acceptable	Y	N	NA
pH Strips: _____			
Sulfide Present	Y	N	NA
Lead Acetate Strips: _____			

LAB USE ONLY:
Lab Sample # / Comments:

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: Wet Blue Dry None

Packing Material Used:

Radchem sample(s) screened (<500 cpm): Y N NA

SHORT HOLDS PRESENT (<72 hours): Y N N/A

Lab Tracking #:

Samples received via:
FEDEX UPS Client Courier Pace Courier

Lab Sample Temperature Info:
Temp Blank Received: Y N NA
Therm ID#: _____
Cooler 1 Temp Upon Receipt: ___.__oC
Cooler 1 Therm Corr. Factor: ____.__oC
Cooler 1 Corrected Temp: ____.__oC
Comments:

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:

MTJL LAB USE ONLY
Table #:
Acctnum:
Template:
Prelogin:
PM:
PB:

Trip Blank Received: Y N NA
HCL MeOH TSP Other

Non Conformance(s): YES / NO

Page: ___ of: _____