Ventura Countywide Stormwater Quality Management Program

# Stormwater Program: Water Quality Monitoring Standard Operating Procedures 2009 - 2014


*Revised February 2011*

**Ventura Countywide Stormwater Monitoring Program**
**Standard Operating Procedures – 2009-2014 Stormwater Monitoring**

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# Ventura Countywide Stormwater Monitoring Program
# Standard Operating Procedures – 2009-2014

## 1.0 OVERVIEW

Stormwater monitoring is conducted by the Ventura County Watershed Protection District (VCWPD) to fulfill the requirements of the Ventura Countywide Stormwater National Pollutant Discharge Elimination System (NPDES) Permit, Order No. R4-2010-0108. The primary objectives of the Monitoring Program are the assessment and evaluation of the chemical, physical, and biological impacts of municipal stormwater sewer system discharges on receiving waters; the overall health and long-term trends in receiving water quality; and the compliance with Total Maximum Daily Load (TMDL) targets and water quality objectives (WQOs).

### 1.1 Permit Requirements

Wet-season (October 1st to April 15th) monitoring is required to occur four times per year at mass emission and major outfall stations throughout Ventura County. Three of the events are to be wet-weather events with a quantitative precipitation forecast (QPF) of 0.25 inch or greater. Events forecast to be 0.25 inch or greater that produce only 0.15 – 0.25 inches of rainfall may be sampled. The fourth event is to occur during dry weather. All events are to occur when there has been at least 7 days of dry weather (<0.1 inch rainfall) prior to the monitoring event. Distinguishing between and sampling both wet and dry weather during the wet-season provides water quality information during various weather conditions. Grab and composite samples will be collected and will be analyzed for multiple water quality parameters including indicator bacteria, chemical, and toxicity analyses (see Table 2 for a list of analytes, analytical methods, holding times, and laboratories). Field measurements will also be taken.

Dry-season monitoring (May 1st – September 30th) is required to occur at least once per year at each major outfall station, if flowing. If a site is dry, one of the four backup locations listed for that Co-Permittee (Appendix G will be sampled instead. Grab samples will be collected and will be analyzed for the water quality parameters listed in Table 8. Field observations and measurements will also be taken.

### 1.2 Monitoring Sites – Mass Emission Stations

Three sites will be monitored to estimate and assess the mass emission contributions of the Municipal Separate Storm Sewer System (MS4) to the watershed. Mass emission monitoring can identify trends in the mass emissions over time, and determine if the MS4 is contributing to exceedances of the water quality objectives (WQOs) established in the Los Angeles Region Water Quality Control Plan (Basin Plan) and the California Toxics Rule (CTR). The three mass emission monitoring stations represent Ventura County's three main watersheds: Ventura River, Calleguas Creek, and Santa Clara River. Ventura River and Calleguas Creek have been monitored since the 2000-2001 monitoring season. Santa Clara River has been monitored since the 2001-2002 monitoring season.

The three mass emission monitoring stations are described below. Directions to the sites are located in Appendix A.

Calleguas Creek – California State University Channel Islands (CSUCI)

The Calleguas Creek monitoring site (ME-CC) is located on the north side of Hueneme Road, just east of Lewis Road at the old Camarillo State Hospital Bridge (now the entrance to the California State University Channel Islands campus). The Calleguas Creek monitoring site is positioned at the lower end of the watershed and receives runoff from an estimated 251 square mile drainage area (160,640 acres) of mixed land use (open space, urban, and agricultural).

Ventura River – Ojai Valley Sanitary District

The Ventura River monitoring site (ME-VR2) is located northwest of the junction of State Highway 33 and Canada Larga Road, on the western perimeter of the Ojai Valley Sanitary District Wastewater Treatment Plant. The site was moved from the original Foster Park location (ME-VR) in 2005 due to mudslide activity in the Foster Park area resulting from unstable hillsides and heavy rain. The new site is approximately one mile downstream from the original site. The Ventura River monitoring site is located low in the watershed and receives runoff from an estimated 187 square mile drainage area (119,680 acres) of primarily open space.

Santa Clara River – Freeman Diversion

The Santa Clara River monitoring site (ME-SCR) is located on the east side of the river, north of State Highway 118 at the Freeman diversion dam. The Santa Clara River monitoring site is located low in the watershed and receives runoff from an estimated 1,568 square mile drainage area (1,003,520 acres) of primarily open space.

## 1.3 Monitoring Sites – Major Outfall Stations.

Eleven sites have been established on major storm drain outfalls and monitored to estimate the event mean concentration and annual pollutant load of the cumulative discharges to waters of the State and waters of the United States, assess trends in the major outfalls over time, and determine if the MS4 is contributing to exceedances of the water quality objectives (WQOs) established in the Los Angeles Region Water Quality Control Plan (Basin Plan) and the California Toxics Rule (CTR). One station is located within the boundaries of each of the eleven Co-Permittees participating in the Program (County of Ventura, cities of Camarillo, Fillmore, Moorpark, Ojai, Oxnard, Port Hueneme, San Buenaventura (Ventura), Santa Paula, Simi Valley and Thousand Oaks). Sites were selected to be representative of the land use for each Co-Permittee. Four major outfall stations (Camarillo, Meiners Oaks (County), Ojai, and Ventura) were established and monitored beginning with the 2009-2010 monitoring year, and the seven remaining major outfall stations (Fillmore, Moorpark, Oxnard, Port Hueneme, Santa Paula, Simi Valley, and Thousand Oaks) were established and monitored beginning with the 2010-2011 monitoring year. Monitoring will continue at all eleven sites for the duration of the Order.

The eleven major outfall monitoring stations are described below. Site selection for the major outfall sites targeted outfalls that were representative of the land use within the Co-permittee's boundaries, with allowances made for accessibility, likelihood of measurable flow, and safety. As a result, the proportion of land use types within the outfall's subwatershed will be similar to but not necessarily an exact match for the city or county unincorporated area that it represents. Directions to the sites are located in Appendix A.

Camarillo – Camarillo Hills Drain

The Camarillo monitoring site (MO-CAM) is located north of the 101 Freeway and east of Las Posas Road on the Camarillo Hills Drain at the northeast corner of the Daily Road overcrossing. The Camarillo monitoring site receives runoff from an estimated 4.34- square mile drainage area (2779.1 acres) of primarily residential land use.

Meiners Oaks – Happy Valley Drain

The Meiners Oaks monitoring site (MO-MEI) is located on the southeast side of Rice Road, southwest of the intersection of Rice Road and W Lomita Avenue, on the Happy Valley Drain. The Meiners Oaks monitoring site receives runoff from an estimated 1.60- square mile drainage area (1025.9 acres) of mixed land use (primarily open space, residential, and agricultural).

Ojai – Fox Canyon Barranca

The Ojai monitoring site (MO-OJA) is located on the Fox Canyon Drain (referred to as Fox Canyon Barranca in Permit), east of Fox Street, south of Highway 150 (E Ojai Avenue), near the Ojai Valley Athletic Club. The Ojai monitoring site receives runoff from an estimated 1.17-square mile drainage area (748.6 acres) of mixed land use (primarily open space, residential, and agricultural).

Ventura – Moon Ditch

The Ventura monitoring site (MO-VEN) is located on Moon Ditch, between Leland Street and the 101 Freeway, west of the Johnson Drive undercrossing. The Ventura monitoring site receives runoff from an estimated 1.11 square mile drainage area (707.1 acres) of mixed land use (primarily residential and commercial).

Fillmore – North Fillmore Drain

The Fillmore monitoring site (MO-FIL) is located on the North Fillmore drain, near where it enters Sespe Creek. The site is adjacent to the western boundary of Shiell Park and approximately 75 yards southwest of Telegraph Rd. The Fillmore monitoring site receives runoff from an estimated 1.19 square mile drainage area (761.7 acres) of mixed land use (primarily residential, open space, and agricultural).

Moorpark – Gabbert Canyon Drain

The Moorpark monitoring site (MO-MPK) is located on the Gabbert Canyon drain near the southwestern corner of the Southern California Edison substation, north of Los Angeles Avenue and between North Buttercreek Rd. and Mira Sol Dr. The Moorpark monitoring site receives runoff from an estimated 2.84 square mile drainage area (1816.2 acres) of mixed land use (primarily open space and agricultural).

Oxnard – El Rio Drain

The Oxnard monitoring site (MO-OXN) is located on a VCWPD access bridge across El Rio Drain, southwest of where Oxnard Blvd crosses the 101 freeway, and is accessed from the corner of Buckaroo Avenue and Winchester Drive. The Oxnard monitoring site receives runoff from an

estimated 2.03 square mile drainage area (1298.2 acres) of mixed land use (primarily residential and commercial).

Port Hueneme – Hueneme Drain

The Port Hueneme monitoring site (MO-HUE) is located at the VCWPD pump station on Hueneme Drain, at the intersection with J Street Drain, south of Hueneme Road and southeast of Bubbling Springs Park. The site is accessed through the eastern parking lot of Port Hueneme Beach Park, at the end of Ocean View Drive. The Port Hueneme monitoring site receives runoff from an estimated 0.92 square mile drainage area (589.4 acres) of mixed land use (primarily residential and commercial).

Santa Paula – 11th Street Drain

The Santa Paula monitoring site (MO-SPA) is located on the 11th Street Drain where it enters the Santa Clara River, south of the 126 freeway on the eastern side of the Santa Paula airport. The site is accessed through a gate at the end of Corto Street. The Santa Paula monitoring site receives runoff from an estimated 0.100 square mile drainage area (64.0 acres) of mixed land use (primarily residential and commercial).

Simi Valley – Bus Canyon Drain

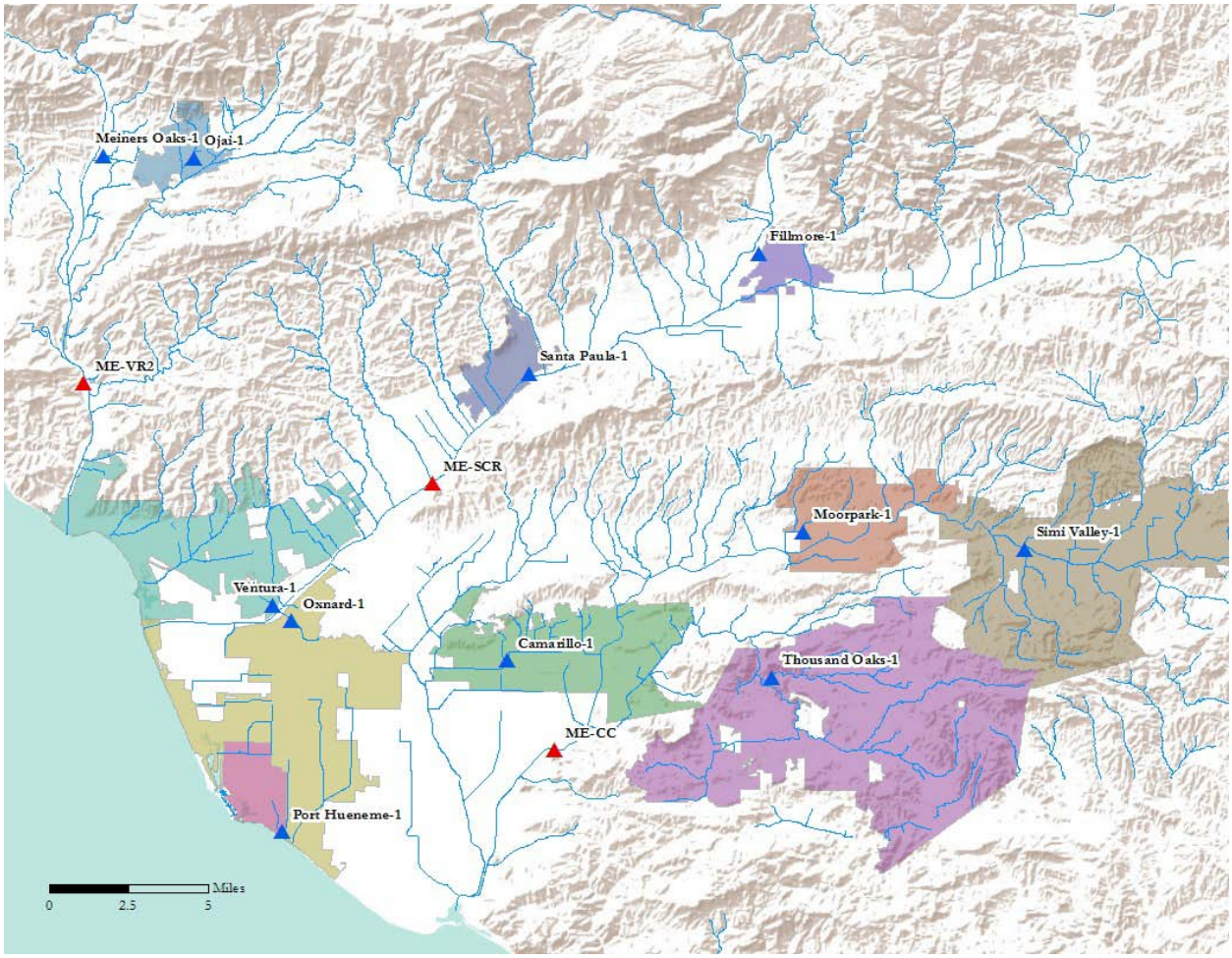
The Simi Valley monitoring site (MO-SIM) is located on Bus Canyon Drain near its connection with the Arroyo Simi. The site is north of the intersection of 5th Street and Los Angeles Avenue. The Simi Valley monitoring site receives runoff from an estimated 5.20 square mile drainage area (3320.7 acres) of mixed land use (primarily open space and residential).

Thousand Oaks – Hill Canyon WWTP

The Thousand Oaks monitoring site (MO-THO) is located on the North Fork Arroyo Conejo in the Hill Canyon WWTP, at the end of Hill Canyon Fire Road, northwest of the city of Thousand Oaks. The Thousand Oaks monitoring site receives runoff from an estimated 8.09 square mile drainage area (5179.3 acres) of mixed land use (primarily residential and open space).

A map showing the location of the three mass emission monitoring sites and eleven major outfall sites is presented as Figure 1.

**Figure 1. Monitoring Station Location**




## 1.4 Safety Considerations

Safety is a primary concern. Sampling crews should always consist of a minimum of two people. During grab sample collection, be sure of your footing prior to sample collection. If for any reason grab sample collection appears to be unsafe, do not attempt to sample. In general, be aware of your surroundings (high flows, spiders, cars, snakes, slippery or loose surfaces, people etc.). Wear a reflective safety vest in high-traffic areas. Use equipment properly. Keep fingers away from peristaltic pump components. Wear gloves when handling samples and sampling equipment, and ensure sample preservatives do not come into contact with skin or clothing.

## 1.5 Standard Monitoring Provisions

Monitoring requirements are based on the requirements of the Ventura Countywide Stormwater National Pollutant Discharge Elimination System (NPDES) Permit number CAS004002, Order No. R4-2010-0108. Monitoring requirements related to collection, documentation, preservation, and analysis of samples are outlined as follows:

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
2. The Ventura County Watershed Protection District shall retain records of all monitoring information, including all calibration and maintenance of monitoring instrumentation, copies of all reports required by the NPDES permit, and records of all monitoring data used to complete the Report of Waste Discharge and application for the NPDES permit, for a period of at least five (5) years (seven years for grant-funded records) from the date of the sample, measurement, report, or application. This period may be extended by request of the Regional Water Quality Control Board or EPA at any time and shall be extended during the course of any unresolved litigation regarding the County's discharge.
3. Records of monitoring information shall include: (1) the date, exact place and time of sampling or measurements; (2) the individual(s) who performed the sampling or measurements; (3) the date(s) analyses were performed; (4) the individual(s) who performed the analyses; (5) the analytical techniques or methods used; and, (6) the results of such analyses.
4. All sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in Order R4-2010-0108 or approved by the Regional Board Executive Officer.
5. All chemical, bacteriological, and bioassay analyses shall be conducted at a laboratory certified for such analyses by an appropriate governmental regulatory agency. The laboratory shall have participated in the Intercalibration Studies organized by the Stormwater Monitoring Coalition (SMC), where applicable.
6. If no flow occurred during the reporting period, the monitoring report shall so state.
7. For any analyses performed for which no procedure is specified in the EPA guidelines or in this Monitoring and Reporting Program, the constituent or parameter analyzed and the method or procedure used must be specified in the monitoring report.
8. Whenever feasible, the minimum detection levels from the California State Implementation Plan will be used. If this is not feasible, the County of Ventura shall use analytical methods with the lowest MDL.
9. The Regional Water Quality Control Board Executive Officer or the Regional Water Quality Control Board, consistent with 40 CFR 122.41, may approve changes to the Monitoring and Reporting Program, after providing the opportunity for public comment, either:
    - By petition of the Ventura County Watershed Protection District or by petition of interested parties after the submittal of the Annual Monitoring Program Report. Such petition shall be filed not later than 60 days after the Annual Monitoring Program Report submittal date, or
    - As deemed necessary by the Regional Water Quality Control Board Executive Officer following notice to the Ventura County Watershed Protection District.

All reports shall be signed by a responsible officer or duly authorized representative (as specified in 40 CFR Section 122.22) of the Ventura County Watershed Protection District and submitted under penalty of perjury.

### 1.6 Wet-Season Monitoring Requirements

A summary of monitoring requirements per wet-season season is presented in Table 1. See Table 2 for a list of required mass emission and major outfall monitoring constituents, analytical methods, reporting limits, and hold times. Field measurements of pH, dissolved oxygen, electrical conductivity, salinity, and water temperature will be taken.

**Table 1. Wet-Season Stormwater Monitoring Program Requirements**

| **2009-10 Wet-Season Requirements** | |
|---|---|
| **Sites** | ME-CC, ME-VR2, ME-SCR, MO-CAM, MO-MEI, MO-OJA, MO-VEN |
| **Number of Events** | Three wet events and one dry event |
| **Sample Type** | Grab samples, automated composite samples, field measurements |
| **Constituents[1]** | Conventionals, Metals, Organics, Inorganics, Microbiological, Pesticides, Herbicides, Toxicity[2] and TIEs[3] |

| **2010-11 Wet-Season Requirements** | |
|---|---|
| **Sites** | ME-CC, ME-VR2, ME-SCR, MO-CAM, MO-MEI, MO-OJA, MO-VEN, MO-FIL, MO-MPK, MO-OXN, MO-HUE, MO-SPA, MO-SIM, MO-THO |
| **Number of Events** | Sites from 2009-10: Three wet events and one dry event<br>Sites new to 2010-11: Two wet events |
| **Sample Type** | Grab samples, automated composite samples, field measurements |
| **Constituents[1]** | Conventionals, Metals, Organics, Inorganics, Microbiological, Pesticides, Herbicides, Toxicity[2] and TIEs[3] |

| **2011-2014 Wet-Season Requirements** | |
|---|---|
| **Sites** | ME-CC, ME-VR2, ME-SCR, MO-CAM, MO-MEI, MO-OJA, MO-VEN, MO-FIL, MO-MPK, MO-OXN, MO-HUE, MO-SPA, MO-SIM, MO-THO |
| **Number of Events** | All sites: Three wet events and one dry event |
| **Sample Type** | Grab samples, automated composite samples, field measurements |
| **Constituents[1]** | Conventionals, Metals, Organics, Inorganics, Microbiological, Pesticides, Herbicides, Toxicity[2] and TIEs[3] |

1. The list of specific constituents, analytical methods, detection limits, and holding times is included in Table 2.
2. The first sampleable storm of the wet season and one additional storm for the first year using three test species per site per storm, and the first storm of the wet season in following years using the most sensitive species determined in the first year.
3. A Toxicity Identification Evaluation (TIE) shall be performed when chronic toxicity is observed.

## Table 2. Analytes, Methods, Limits, Holding Times, and Laboratories

| Constituent | Method | MDL | Hold Time (days) | Lab. |
|---|---|---|---|---|
| **FIELD MEASUREMENTS** | | | | |
| pH | Beckman 255 | | ASAP | District |
| Temperature | YSI 85 | | ASAP | District |
| Dissolved Oxygen | YSI 85 | | ASAP | District |
| Conductivity | YSI 85 | | ASAP | District |
| Salinity | YSI 85 | | ASAP | District |
| **GRABS** | | | | |
| **Chemical analyses (units = mg/L unless specified)** | | | | |
| Cyanide | EPA 335.4 | 0.0027 | 14 | Weck |
| Mercury (units = ug/L) | EPA 245.1 | 0.0039 | 28 | Weck |
| Oil and Grease | EPA 1664A | 2.0 | 28 | Weck |
| Total Petroleum Hydrocarbon | EPA 1664A_NP | 1.9 | 28 | Weck |
| MTBE and 2-Cleve (units = ug/L) | EPA 524.2 | 1.1 | 14 | Weck |
| MTBE and 2-Cleve_Travel Blank (units = ug/L) | EPA 524.2 | 1.1 | 14 | Weck |
| **Microbiological (units = MPN/100ml)** | | | | |
| Total coliform (25 Tube Method - MPNX) | SM 9221 B | 10 | 0.25 | VCPHL[1] |
| Fecal coliform (25 Tube Method - MPNX) | SM 9221 C,E | 2 | 0.25 | VCPHL |
| Enterococcus (Tray Method - WQ IDEXX) | SM 9223 | 10 | 0.25 | VCPHL |
| Total coliform (Tray Method - WQ IDEXX) | SM 9223 | 10 | 0.25 | VCPHL |
| E. coli (Tray Method - WQ IDEXX) | SM 9223 | 10 | 0.25 | VCPHL |
| **Toxicity** | | | | |
| **Marine water (mass emission stations)** | (EPA/600/R-95/136, 1995) | | | |
| *Atherinops affinis* (Larval Survival and Growth) | Test Method 1006.01 | n/a | 1.5 | ABC[2] |
| *Menidia beryllina* (Larval Survival and Growth) | Test Method 1006.0 | n/a | 1.5 | ABC |
| *Macrocystis pyrifera* (Germination and Growth) | Test Method 1009.0 | n/a | 1.5 | ABC |
| *Strongylocentrotus purpuratus* (Fertilization) | Test Method 1008.0 | n/a | 1.5 | ABC |
| **Freshwater (major outfall stations)** | **(**EPA/821/R-02/013, 2002; Table IA, 40 CFR Part 136) | | | |
| *Pimephales promelas* (Larval Survival and Growth) | Test Method 1000.0 | n/a | 1.5 | ABC |
| *Ceriodaphnia dubia* (Survival and Reproduction) | Test Method 1002.0 | n/a | 1.5 | ABC |
| *Selenastrum capricornutum* (also named *Raphidocelis subcapitata*) (Growth) | Test Method 1003.0 | n/a | 1.5 | ABC |
| **AUTOMATED COMPOSITES** | | | | |
| **General** | **(units = mg/L unless specified)** | | | |
| Dissolved Phosphorus (units = ug/L) | EPA 365.1 | 1.4 | 28 | Weck |
| Total Phosphorus (units = ug/L) | EPA 365.1 | 1.4 | 28 | Weck |
| Turbidity (units = NTU) | EPA 180.1 | 0.040 | 2 | Weck |
| TSS | SM2540D | 5.0 | 7 | Weck |
| TDS | SM2540C | 4.0 | 7 | Weck |

[1] Ventura County Public Health Laboratory
[2] Aquatic Bioassay & Consulting Laboratories, Inc.

| | | | | |
|---|---|---|---|---|
| TVSS | EPA 160.4 | n/a | 7 | Weck |
| Phenolics | EPA 420.4 | 0.0016 | 28 | Weck |
| TOC | SM5310C | 0.032 | 28 | Weck |
| BOD | SM 5210 B | 0.10 | 2 | Weck |
| COD | EPA 410.4 | 1.8 | 28 | Weck |
| Residual Chlorine[1] | SM 4500 Cl G | 0.0016 | 0.01 | Weck |
| Nitrate-Nitrogen[2] | EPA 353.2 | 0.022 | 2 | Weck |
| Ammonia-Nitrogen | EPA 350.1 | 0.048 | 28 | Weck |
| TKN | EPA 351.2 | 0.074 | 28 | Weck |
| Nitrate-Nitrite | EPA 353.2 | 33 | 28 | Weck |
| Alkalinity | SM 2320B | n/a | 14 | Weck |
| Conductivity (units = umhos/cm) | SM2510B | 0.23 | 28 | Weck |
| Hardness | EPA 200.7 | n/a | 180 | Weck |
| MBAs | SM 5540 C | 0.019 | 2 | Weck |
| Chloride | EPA 300.0 | 0.079 | 28 | Weck |
| Fluoride | EPA 300.0 | 0.013 | 28 | Weck |
| Perchlorate (units = ug/L) | EPA 314.0 | 0.82 | 28 | Weck |
| **Metals (Dissolved & Total)** | | **(units = ug/L)** | | |
| Mercury | EPA 245.1 | 0.0039 | 28 | Weck |
| Aluminum | EPA 200.8 | 0.19 | 180 | Weck |
| Antimony | EPA 200.8 | 0.0080 | 180 | Weck |
| Arsenic | EPA 200.8 | 0.014 | 180 | Weck |
| Beryllium | EPA 200.8 | 0.022 | 180 | Weck |
| Cadmium | EPA 200.8 | 0.013 | 180 | Weck |
| Chromium (total) | EPA 200.8 | 0.012 | 180 | Weck |
| Copper | EPA 200.8 | 0.022 | 180 | Weck |
| Iron | EPA 200.8 | 0.60 | 180 | Weck |
| Lead | EPA 200.8 | 0.017 | 180 | Weck |
| Nickel | EPA 200.8 | 0.011 | 180 | Weck |
| Selenium | EPA 200.8 | 0.017 | 180 | Weck |
| Silver | EPA 200.8 | 0.0080 | 180 | Weck |
| Thallium | EPA 200.8 | 0.020 | 180 | Weck |
| Zinc | EPA 200.8 | 0.30 | 180 | Weck |
| Barium, Total[3] | EPA 200.8 | 0.024 | 180 | Weck |
| Hex. Chromium, Dissolved | EPA 218.6 | 0.038 | 1 | Weck |
| **Semi-volatile Acids - Acids** | | **(units = ug/L)** | | |
| 2-Chlorophenol | EPA 8270SIM-Phenols | 0.65 | 7 | Weck |
| 4-Chloro-3-methylphenol | EPA 8270SIM-Phenols | 0.37 | 7 | Weck |

[1] Residual Chlorine is a pollutant of concern (POC) for the Calleguas Creek watershed. As such, it is only included in the analyses for ME-CC.

[2] Nitrate-nitrogen is a POC for the Calleguas Creek watershed and is being studied in the Ventura River Watershed. As such, it is only included in the analyses for ME-CC for the full term of the permit, and ME-VR2, MO-MEI, and MO-OJA for 2009-2011.

[3] Barium, total is a pollutant of concern (POC) for the Calleguas Creek and Santa Clara River watersheds. As such, it is only included in the analyses for ME-CC and ME-SCR.

| | | | | |
|---|---|---|---|---|
| 2,4-Dichlorophenol | EPA 8270SIM-Phenols | 0.51 | 7 | Weck |
| 2,4-Dimethylphenol | EPA 8270SIM-Phenols | 1.0 | 7 | Weck |
| 2,4-Dinitrophenol | EPA 8270SIM-Phenols | 1.0 | 7 | Weck |
| 2-Nitrophenol | EPA 8270SIM-Phenols | 0.71 | 7 | Weck |
| 4-Nitrophenol | EPA 8270SIM-Phenols | 1.0 | 7 | Weck |
| Pentachlorophenol | EPA 8270SIM-Phenols | 0.15 | 7 | Weck |
| Phenol | EPA 8270SIM-Phenols | 0.35 | 7 | Weck |
| 2,4,6-Trichlorophenol | EPA 8270SIM-Phenols | 0.30 | 7 | Weck |
| **Semi-volatile Acids - Base/Neutral** | | **(units = ug/L)** | | |
| 1,2,4-Trichlorobenzene | EPA 625 | 0.26 | 7 | Weck |
| 1,2-Dichlorobenzene | EPA 625 | 0.30 | 7 | Weck |
| 1,2-Diphenylhydrazine | EPA 625 | 0.35 | 7 | Weck |
| 1,3-Dichlorobenzene | EPA 625 | 0.36 | 7 | Weck |
| 1,4-Dichlorobenzene | EPA 625 | 0.32 | 7 | Weck |
| 2,4-Dinitrotoluene | EPA 625 | 0.40 | 7 | Weck |
| 2,6-Dinitrotoluene | EPA 625 | 0.24 | 7 | Weck |
| 2-Chloronaphthalene | EPA 625 | 0.26 | 7 | Weck |
| 3,3-Dichlorobenzidine | EPA 625 | 0.30 | 7 | Weck |
| 4,6 Dinitro-2-methylphenol | EPA 625 | 0.33 | 7 | Weck |
| 4-Bromophenyl phenyl ether | EPA 625 | 0.23 | 7 | Weck |
| 4-Chlorophenyl phenyl ether | EPA 625 | 0.24 | 7 | Weck |
| Benzidine | EPA 625 | 0.70 | 7 | Weck |
| Bis(2-Chloroethoxy) methane | EPA 625 | 0.40 | 7 | Weck |
| Bis(2-Chloroethyl) ether | EPA 625 | 0.46 | 7 | Weck |
| Bis(2-Chloroisopropyl) ether | EPA 625 | 0.48 | 7 | Weck |
| Bis(2-Ethylhexl) phthalate | EPA 625 | 2.6 | 7 | Weck |
| Butyl benzyl phthalate | EPA 625 | 1.0 | 7 | Weck |
| Diethyl phthalate | EPA 625 | 0.23 | 7 | Weck |
| Dimethyl phthalate | EPA 625 | 0.26 | 7 | Weck |
| di-n-Butyl phthalate | EPA 625 | 0.53 | 7 | Weck |
| di-n-Octyl phthalate | EPA 625 | 0.28 | 7 | Weck |
| Hexachlorobenzene | EPA 625 | 0.15 | 7 | Weck |
| Hexachlorobutadiene | EPA 625 | 0.41 | 7 | Weck |
| Hexachloro-cyclopentadiene | EPA 625 | 5.0 | 7 | Weck |
| Hexachloroethane | EPA 625 | 0.36 | 7 | Weck |
| Isophorone | EPA 625 | 0.33 | 7 | Weck |
| Nitrobenzene | EPA 625 | 0.37 | 7 | Weck |
| N-Nitroso-dimethyl amine | EPA 625 | 0.36 | 7 | Weck |
| N-Nitroso-di-n-propyl amine | EPA 625 | 0.41 | 7 | Weck |
| N-Nitroso-diphenyl amine | EPA 625 | 0.23 | 7 | Weck |
| 1,2 Benzanthracene [benzo(a) anthracene] | EPA 8270SIM-PAH | 0.28 | 7 | Weck |
| 3,4 Benzofluoranthene [Benzo(b)fluoranthene] | EPA 8270SIM-PAH | 0.15 | 7 | Weck |
| Acenaphthene | EPA 8270SIM-PAH | 0.12 | 7 | Weck |
| Acenaphthylene | EPA 8270SIM-PAH | 0.13 | 7 | Weck |
| Anthracene | EPA 8270SIM-PAH | 0.12 | 7 | Weck |
| Benzo(a)pyrene | EPA 8270SIM-PAH | 0.36 | 7 | Weck |

| | | | | |
|---|---|---|---|---|
| Benzo(g,h,i)perylene | EPA 8270SIM-PAH | 0.13 | 7 | Weck |
| Benzo(k)fluoranthene | EPA 8270SIM-PAH | 0.12 | 7 | Weck |
| Chrysene | EPA 8270SIM-PAH | 0.090 | 7 | Weck |
| Dibenzo(a,h)anthracene | EPA 8270SIM-PAH | 0.13 | 7 | Weck |
| Fluoranthene | EPA 8270SIM-PAH | 0.20 | 7 | Weck |
| Fluorene | EPA 8270SIM-PAH | 0.15 | 7 | Weck |
| Indeno(1,2,3-cd)pyrene | EPA 8270SIM-PAH | 0.10 | 7 | Weck |
| Naphthalene | EPA 8270SIM-PAH | 0.11 | 7 | Weck |
| Phenanthrene | EPA 8270SIM-PAH | 0.11 | 7 | Weck |
| Pyrene | EPA 8270SIM-PAH | 0.21 | 7 | Weck |
| **Chlorinated Pesticides** | | **(units = ug/L)** | | |
| Aldrin | EPA 608 | 0.0015 | 7 | Weck |
| alpha-BHC | EPA 608 | 0.0018 | 7 | Weck |
| beta-BHC | EPA 608 | 0.0031 | 7 | Weck |
| delta-BHC | EPA 608 | 0.0025 | 7 | Weck |
| gamma-BHC (lindane) | EPA 608 | 0.0021 | 7 | Weck |
| alpha-chlordane | EPA 608 | 0.0043 | 7 | Weck |
| gamma-chlordane | EPA 608 | 0.0040 | 7 | Weck |
| 4,4'-DDD | EPA 608 | 0.0030 | 7 | Weck |
| 4,4'-DDE | EPA 608 | 0.0025 | 7 | Weck |
| 4,4'-DDT | EPA 608 | 0.0031 | 7 | Weck |
| Dieldrin | EPA 608 | 0.0021 | 7 | Weck |
| alpha-Endosulfan | EPA 608 | 0.0017 | 7 | Weck |
| beta-Endosulfan | EPA 608 | 0.0019 | 7 | Weck |
| Endosulfan sulfate | EPA 608 | 0.0080 | 7 | Weck |
| Endrin | EPA 608 | 0.0028 | 7 | Weck |
| Endrin aldehyde | EPA 608 | 0.0030 | 7 | Weck |
| Heptachlor | EPA 608 | 0.0017 | 7 | Weck |
| Heptachlor Epoxide | EPA 608 | 0.0019 | 7 | Weck |
| Toxaphene | EPA 608 | 0.12 | 7 | Weck |
| **Polychlorinated Biphenyls (PCBs)** | | **(units = ug/L)** | | |
| Aroclor-1016 | EPA 608 | 0.050 | 7 | Weck |
| Aroclor-1221 | EPA 608 | 0.060 | 7 | Weck |
| Aroclor-1232 | EPA 608 | 0.15 | 7 | Weck |
| Aroclor-1242 | EPA 608 | 0.070 | 7 | Weck |
| Aroclor-1248 | EPA 608 | 0.060 | 7 | Weck |
| Aroclor-1254 | EPA 608 | 0.040 | 7 | Weck |
| Aroclor-1260 | EPA 608 | 0.040 | 7 | Weck |
| **Organophosphate Pesticides** | | **(units = ug/L)** | | |
| Atrazine | EPA 525.2 | 0.047 | 14 | Weck |
| Bis(2-Ethylhexl) phthalate | EPA 525.2 | 1.1 | 14 | Weck |
| Benzo(a)pyrene | EPA 525.2 | 0.073 | 14 | Weck |
| Cyanazine | EPA 525.2 | 0.020 | 14 | Weck |
| Prometryn | EPA 525.2 | 0.074 | 14 | Weck |
| Simazine | EPA 525.2 | 0.083 | 14 | Weck |
| Chlorpyrifos | EPA 525.2-LL | 0.0069 | 14 | Weck |

| | | | | |
|---|---|---|---|---|
| Diazinon | EPA 525.2-LL | 0.0052 | 14 | Weck |
| Malathion | EPA 525.2-LL | 0.0076 | 14 | Weck |
| **Herbicides** | | **(units = ug/L)** | | |
| 2,4,5-TP-SILVEX | EPA 515.3 | 0.020 | 14 | Weck |
| 2,4-D | EPA 515.3 | 0.050 | 14 | Weck |
| Pentachlorophenol | EPA 515.3 | 0.020 | 14 | Weck |
| Glyphosate | EPA 547 | 1.8 | 14 | Weck |

Wet Events – Toxicity Testing

Chronic toxicity testing will be conducted at both the mass emission and major outfall stations to assess stormwater impacts on marine and freshwater environments and determine if storm water (wet weather) discharges are causing or contributing to chronic toxic impacts on aquatic life. For the first year of the Order for which the monitoring station is operational, samples for chronic toxicity testing were collected at each site during two wet weather events (the first significant storm and one other event) and analyzed using three test species. For the remaining years of the Order, samples for chronic toxicity testing will be collected annually at each monitoring site during the first significant wet weather event and analyzed using the most sensitive species determined from the first year of analysis. The three species to be used for the mass emission stations are the marine species: *Atherinops affinis* (topsmelt), *Macrocystis pyrifera* (giant kelp), and *Strongylocentrotus purpuratus* (purple sea urchin). The three species to be used for the major outfall stations are the freshwater species: *Pimephales promelas* (fathead minnow), *Ceriodaphnia dubia* (daphnid – water flea), and *Selenastrum capricornutum* (green alga also named *Raphidocelis subcapitata*). The most sensitive species determined for each site are given below:

**Table 3. Toxicity Testing - Most Sensitive Species**

| **Site** | **Most Sensitive Species** |
|---|---|
| ME-CC | Topsmelt (*Atherinops affinis*) |
| ME-SCR | Purple sea urchin (*Strongylocentrotus purpuratus*) |
| ME-VR2 | Topsmelt (*Atherinops affinis*) |
| MO-CAM | Fathead minnow (*Pimephales promelas*) |
| MO-MEI | Fathead minnow (*Pimephales promelas*) |
| MO-OJA | Fathead minnow (*Pimephales promelas*) |
| MO-VEN | Daphnid – water flea (*Ceriodaphnia dubia*) |
| MO-FIL | Daphnid – water flea (*Ceriodaphnia dubia*) |
| MO-HUE | Daphnid – water flea (*Ceriodaphnia dubia*) |
| MO-MPK | Green alga (*Selenastrum capricornutum* also named *Raphidocelis subcapitata*) |
| MO-OXN | Fathead minnow (*Pimephales promelas*) |
| MO-SPA | Fathead minnow (*Pimephales promelas*) |
| MO-SIM | Daphnid – water flea (*Ceriodaphnia dubia*) |

| | |
|---|---|
| MO-THO | Daphnid – water flea (*Ceriodaphnia dubia*) |

Toxic samples shall be immediately subjected to Toxicity Identification Evaluation (TIE) procedures to identify the toxic chemical(s) if toxicity is demonstrated by the standard t-test. Chronic Phase I (Toxicity Characterization Procedures) shall be completed for all sites showing significant toxicity (≥50% mortality).

### 1.7 Dry-Season Monitoring Requirements

Dry-season monitoring events will occur at least once per year (between May 1st and September 30th) at each major outfall station, if flowing. If a site is dry, one of the four backup locations (Appendix G) listed for that Co-Permittee will be sampled instead. Grab samples will be collected and analyzed for total hardness, total organic carbon, lead (dissolved), zinc (dissolved), copper (dissolved), total coliform bacteria, and *E. coli* bacteria. The type of sample container, preservative, and volume of sample required can be found in Table 8. Field measurements will be taken for turbidity, pH, dissolved oxygen, electrical conductivity, salinity, water temperature, and ambient temperature. Field observations will include flow estimation, odor, color, floatables, staining, algal growth, and the spatial extent, amount, and types of trash present (see field sheet in Appendix D).

## 2.0 MONITORING STATION EQUIPMENT

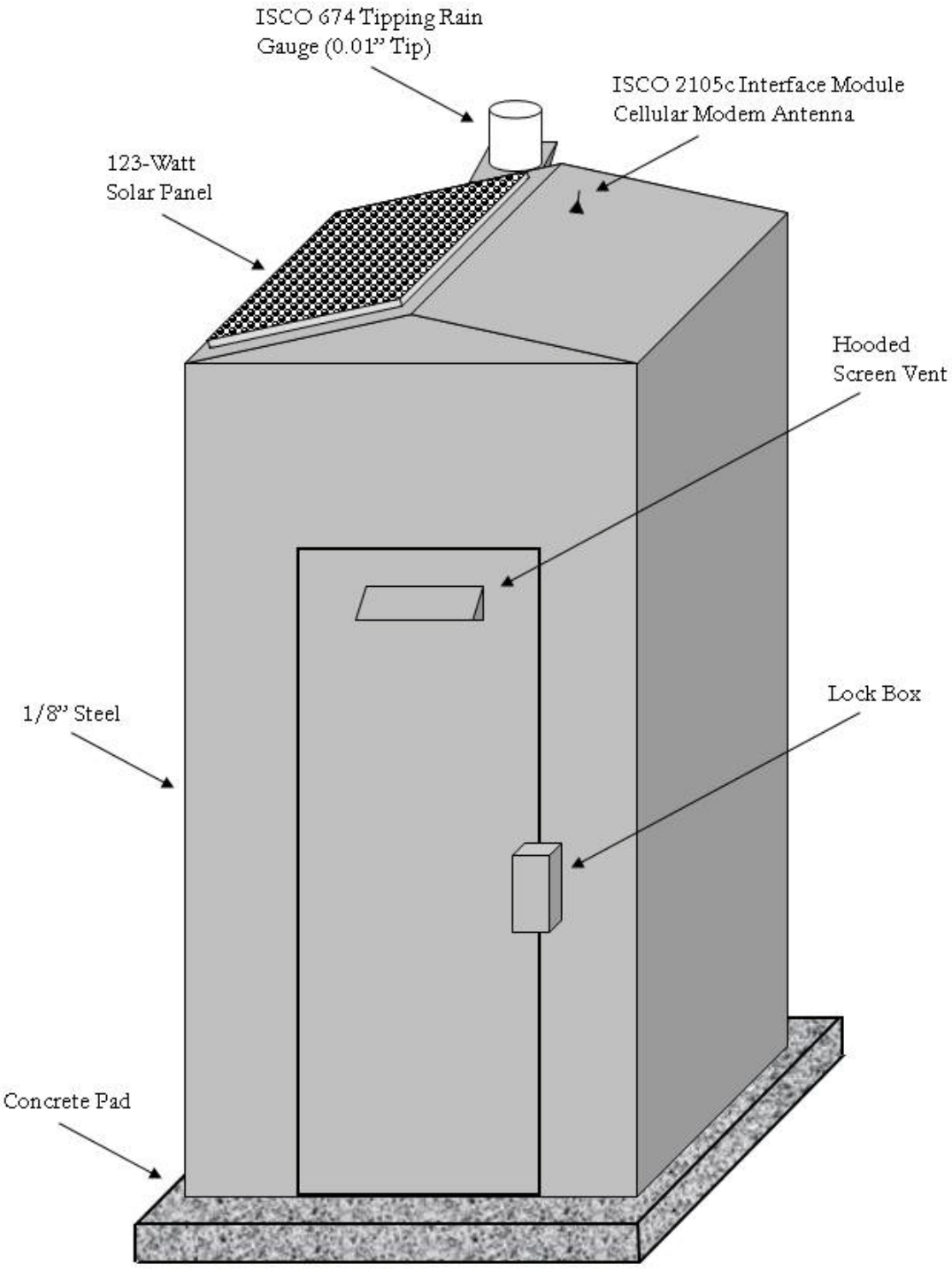
Monitoring equipment is housed in a locked security enclosure (steel or fiberglass) at each monitoring station. Each enclosure contains an ISCO 6712 automated sampler (peristaltic pump sampler head with data logging capabilities), a refrigerator for the composite sample container, AC or DC power and battery backups. Sites may also have an integrated ISCO flow meter, ISCO 674 electronic tipping bucket rain gauge, and ISCO 2105c interface module, depending on the requirements of the location. All sites and equipment have been designed to reduce the potential for vandalism and non-authorized interference. Sites with a higher level of vandalism potential have additional protective features.

### 2.1 Equipment Description

Steel Enclosures

The steel enclosures are made from ten gauge (1/8") steel, and have a tamper-resistant lock box which is locked with a padlock coded for the NPDES key.

**Figure 2. Steel Enclosure**



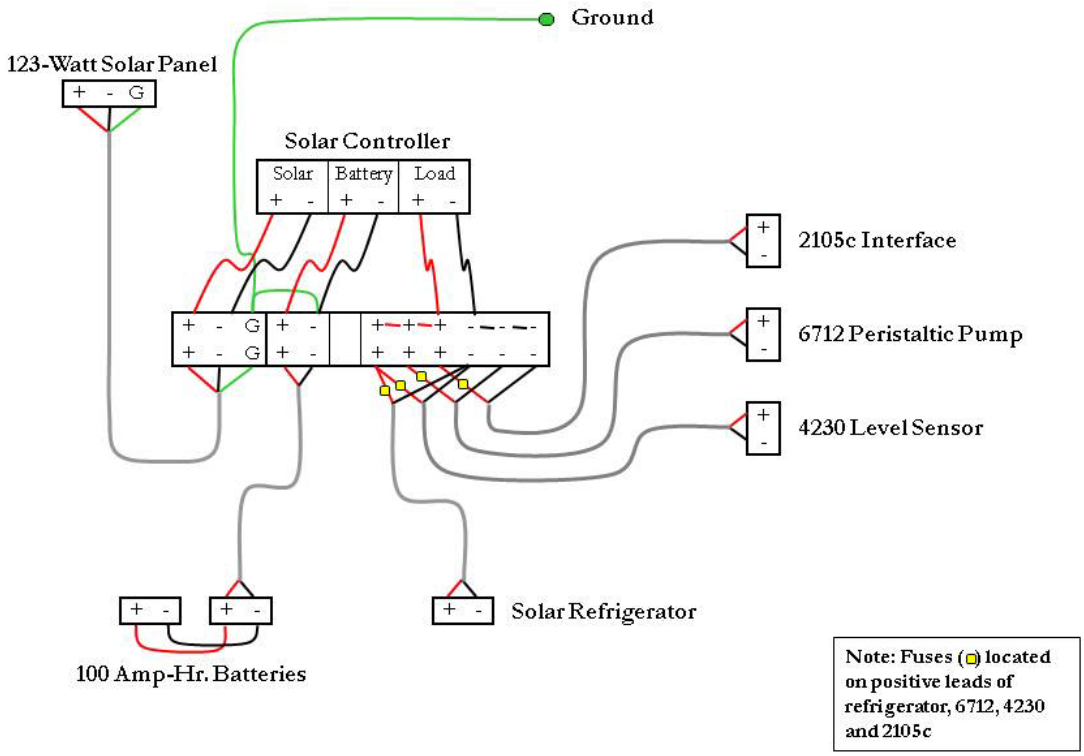

Fiberglass Enclosures

The fiberglass enclosures are made from 0.25 inch thick fire-retardant fiberglass with a UV stabilized Gelcoat, stainless steel fittings, and are locked with a padlock coded for the NPDES key. Fiberglass enclosures are installed at major outfall stations with reduced vandalism potential.

Power supply

Electricity is provided at each site by either AC or solar power. Sites with AC power have one AGM (absorbed glass mat) battery connected in series to a float charger in case of a power failure during a monitoring event. Solar power is utilized at sites where the use of AC electricity is impractical due to location and/or cost factors. Solar panels are connected to the roofs of the steel enclosures and are wired to two 12-volt (100 amp-hour) AGM batteries. Calleguas Creek has two 12-volt solar panels; all other sites have one 12-volt solar panel. Solar panels are 100 to 150 watts. Solar panels at locations with a high potential for vandalism are covered with a protective layer of Lexan. The panels are bolted to the roof and the bolts can only be accessed from within the steel enclosure. A diagram of the electrical wiring is shown in Figure 3.

**Figure 3. Wiring Schematic**




Rain Gauges

There are three types of rain gauges used by the Program. Sites that have overhead interference and/or nearby USGS or VCWPD Automated Local Evaluation in Real-Time (ALERT) system rain gauges do not have rain gauges installed on-site and rainfall is measured using either the Hydrolynx 5050P or the Hydrological Services TB3 electronic tipping buckets that are part of the ALERT system. Sites without overhead interference and/or nearby ALERT system rain gauges have either ISCO 674 or Hydrological Services TB3 electronic tipping buckets installed on-site. The Hydrolynx 5050P sends a pulse for every 0.04 inches of rainfall, and the Hydrological Services TB3 and ISCO 674 send a pulse for every 0.01 inch of rain that is collected.

Rainfall is measured for each site and rainfall quantities measured at on-site rain gauges may be used to automatically enable sampling programs. The pulse is sent to the 2105c interface module which records it and can use the information to actuate the 6712 automated sampler. Sites without rain gauges installed on-site cannot be enabled remotely based on rainfall. [Note: most sites are enabled based on stage (water level); there are only two sites that are enabled based on rainfall.] Rainfall at all sites can be monitored through the VCWPD ALERT system by VCWPD stormwater staff to determine when to remotely enable a site, as necessary.

A list of commonly used rain gauge sites is shown in Table 5.

Flow Meters

There are three types of ISCO flow meters used in the Program: 4230 bubbler, 4210 ultrasonic, and 4250 area-velocity flow meters. Table 4 shows the type of meter installed at each site. [Note: ME-SCR has a 4210 ultrasonic flow meter installed at the Freeman Diversion dam; however it is not used by the Program as the width of the dam and different diversion scenarios make it difficult to accurately measure the volume of flow.] The ISCO flow meters measure river stage and extrapolate a flow value from rating curves specific to each monitoring site. The flow sensor is securely fastened in the flow stream near the sample intake strainer. Flow sensor cables run through protective conduit into the monitoring equipment enclosure where the cable plugs into the ISCO 2105c interface module that is connected to the ISCO 6712 sampler/controller. Flow data is transmitted to the ISCO 2105c interface module during monitoring events for the purpose of collecting representative flow weighted composite samples. The flow meters send water level and flow rate data to the ISCO 2105c interface module at pre-programmed intervals. Flow data is also used in the estimation of event and annual mass emissions.

Automated Composite Sampling Equipment

Composite samples are collected using an ISCO 6712 automated sampler (peristaltic pump sampler head with data logging capabilities), flexible silicon tubing in the pump head, an intake line, an 18.5 L borosilicate-glass composite sample bottle, and a refrigerator. The samplers are configured to collect aliquots after a pre-programmed volume of flow has passed the flow monitoring point (flow-paced) or at given intervals (time-paced). The size and number of samples and the trigger-volume of flow are determined prior to each monitoring event, based on expected storm event flow and duration.

The Teflon sample intake line, housed in protective conduit, is attached to a stainless steel intake strainer which is anchored in the flow stream and also attached to the flexible pump tubing at the sampler. The flexible pump tubing runs through the 6712 automated sampler's peristaltic pump into the composite sample bottle. The sample bottle is housed in the refrigerated unit where it is stored at a constant temperature of 4° C. Refrigerators at AC powered sites are ISCO 6712 FR units. Refrigerators at solar powered sites are DC powered SunDanzer™ refrigerators. A portable ISCO 6712 sampler is used when the refrigerated samplers are offline and ice must then be applied during monitoring events.

Interface Module

All sites (except Thousand Oaks*) have an ISCO 2105c interface module which is equipped with an internal cell phone modem. The 2105c collects data from the rainfall and flow gauges (where applicable), which are connected directly to the 2105c interface module, to which they send their

data at preprogrammed intervals. The 2105c interface module manages the data and uses it to send pulses to the 6712 automated sampler to trigger it to collect the next sample based on preprogrammed parameters. The 2105c interface module pushes rainfall, water level and flow, battery voltage, and sample count data through its modem to the Flowlink® database, which is stored on a dedicated section of the County of Ventura's SQL server. Information in the Flowlink database is available for near real-time remote viewing by VCWPD staff on its password protected website. The 2105c interface module allows remote programming including sampling program initiation and changes to sampling frequency as rainfall conditions evolve before and throughout the storm.

* The Thousand Oaks site will either have a 2105c interface module or it will not have an interface module and will be connected via the Hill Canyon Ethernet. Currently, the Thousand Oaks site requires manual data download and sampling program updates.

Data Management

ISCO Flowlink Pro® software for Windows allows VCWPD staff to remotely track the status of equipment and the conditions at the monitoring station, eliminating the need to be onsite to obtain water level and flow, battery voltage, sample count, and rainfall information. Near-real-time data can be graphed during monitoring events. The ALERT system is used to track rainfall from precipitation gauges county-wide. A Microsoft Access database with reporting and QA/QC features is used to store and manage the water quality analytical data.

## 2.2 Flow Monitoring

Accurate flow measurement is essential during NPDES monitoring for two reasons. 1) For the collection of representative flow weighted composite samples and 2) in order to accurately calculate monitoring event and annual mass emissions using flow data and constituent concentrations. Flow monitoring equipment and methods are described below.

Staff Gauge

Each of the monitoring stations is equipped with a staff gauge for the purpose of visually determining river depth. The staff gauge depth readings can then be related to river flows using flow rating curves that have been developed with multiple historical manual flow measurements or by theoretical hydraulic analysis. The staff gauge reading should be recorded at each visit to the site and compared with the reading on the ISCO flow meter. When flow is measured manually, it is important to record the staff gauge reading at the beginning and end of each station visit to ensure that flow has not changed during the course of the measurement.

VCWPD/USGS Station

The USGS maintains stream gauges at the Calleguas Creek site and at the Foster Park Bridge, near the old Ventura River site (ME-VR). The VCWPD hydrology section also maintains a stream gauge at the Foster Park Bridge, as well as at the Meiners Oaks site. Depth readings are continuously recorded and related to river flow data using flow rating curves developed and maintained by USGS and/or VCWPD staff. The stations are used as part of the flood warning system (not Meiners Oaks) and can provide verification for the flow data recorded at the associated mass emission or major outfall stations as needed.

ISCO Flow meters

There are three types of ISCO flow meters used in the Program: 4230 bubbler, 4210 ultrasonic, and 4250 area-velocity flow meters. ISCO 4230 bubbler flow meters use an internal air compressor to force a metered amount of air through a bubble line submerged in the flow channel. Flow level is determined by measuring the pressure needed to force air bubbles out of the line. Measurement accuracy of the 4230 is not affected by wind, steam, foam, turbulence, suspended solids, or rapidly changing head heights. ISCO 4210 ultrasonic flow meters provide non-contact sensing of flow over a weir or in a flume. The ultrasonic sensor is mounted above the flow stream and transmits a sound pulse that is reflected by the surface of the flow. The elapsed time between sending a pulse and receiving an echo determines the level in the channel. The sensor does not contact the liquid so the 4210 provides long-term dependability with no scheduled maintenance. The ISCO 4210 automatically compensates for air temperature, and is not affected by chemicals or high concentrations of grease, suspended solids or silt in the flow. ISCO 4250 area-velocity meters use Doppler technology to directly measure average velocity in the flow stream, while the integral pressure transducer measures liquid depth to determine flow area. The 4250 then calculates flow rate by multiplying the area of the flow stream by its average velocity. The 4250 is best for applications where weirs or flumes are not practical, or where submerged, full pipe, surcharged, and reverse flow conditions may occur. It does not require an estimate of the slope or roughness of the channel.

Rainfall/Runoff/Pacing Tables and Graphs

Trigger tables for the purpose of estimating monitoring event runoff flow volumes for a given quantity of precipitation forecast at the mass emission stations are located in Appendix E. These tables will be used to program the pacing at the flow-paced mass emission stations (ME-CC and ME-VR2) for flow-weighted composite sample collection and are based on historical event data starting in the early 1970's.

Rating curves for the conversion of rainfall in inches to sampler pacing in cubic feet per second at the flow-paced major outfall stations are located in Appendix E. Both predicted and observed values are shown.

The tables and graphs continue to be updated and refined as more monitoring data is collected and analyzed to define volumetric flows associated with years of low, moderate and high precipitation events, and varying levels of antecedent moisture.

## 2.3 Monitoring Sites – Equipment Summary

The equipment for the three mass emission and eleven major outfall monitoring stations is summarized below. All sites are equipped with a refrigerator, electricity source, and automated ISCO monitoring equipment that includes a 6712 automated sampler, integrated flow meter, data logger, and 2105c interface module. An electronic precipitation gauge is associated with each site.

**Table 4. Monitoring Equipment at Each Site (part one)**

| | Flow Meters | | | Pacing | | Refrigerator | | Power Source | | Intake Line[1] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Site** | **4210** | **4230** | **4250** | **Time** | **Flow** | **6712** | **DC** | **AC** | **DC** | **S.S.[2]** | **Tef[3]** |
| ME-CC | | X | | | X | | X | | X | | X |
| ME-SCR | X | | | X | | X | | X | | X | |
| ME-VR2 | | X | | | X | X | | X | | | X |
| MO-CAM | | X | | | X | | X | | X | X | |
| MO-MEI | | X | | | X | | X | | X | X | |
| MO-OJA | | X | | | X | X | | X | | X | |
| MO-VEN | | X | | | X | | X | | X[4] | X | |
| MO-FIL | | | X | X | | | X | | X[4] | X | |
| MO-MPK | | X | | | X | | X | | X[4] | X | |
| MO-OXN | | X | | | X | | X | | X[4] | X | |
| MO-HUE | | N/A | | X | | X | | X | | X | |
| MO-SPA | | | X | | X | | X | | X[4] | | X |
| MO-SIM | | X | | | X | | X | | X[4] | X | |
| MO-THO | | X | | | X | X | | X | | | X |

[1] Predominate material used in intake line
[2] Stainless Steel
[3] Teflon
[4] Solar panels with a protective Lexan layer to reduce the potential for vandalism.

**Table 5. Monitoring Equipment at Each Site (part two)**

| | Rain Gauge | | | Interface Module | | Enclosure | |
|---|---|---|---|---|---|---|---|
| **Site** | **On-site** | **Alternate Rain Gauge Hydstra ID - Location** | | **2105c** | **Ethernet** | **Steel** | **Fiber-glass** |
| ME-CC | | 505 | Calleguas Creek @ CSUCI | X | | X | |
| ME-SCR | 674 | 175 | Saticoy Yard | X | | X | |
| ME-VR2 | 674 | | | X | | X | |
| MO-CAM | 674 | 509 | LasPosas Res/Spanish Hills | X | | X | |
| MO-MEI | 674 | 218 | Meiners Oaks Fire Station | X | | X | |
| MO-OJA | | 165 | Stewart Canyon | X | | X | |
| MO-VEN | 674 | 222 | County Government Center | X | | X | |
| MO-FIL | | 199 | Fillmore Sanitation | X | | X | |
| MO-MPK | | 126 | Moorpark – County Yard | X | | X | |
| MO-OXN | | MO-VEN | | X | | X | |
| MO-HUE | TB3 | 403 | Silverstrand | X | | | X |
| MO-SPA | | 245 | Santa Paula – Wilson Ranch | X | | X | |
| MO-SIM | | 246 | Simi Sanitation | X | | X | |
| MO-THO | | 128 | Thousand Oaks | | X | | X |

## 2.4 Monitoring Sites – Equipment Description

Calleguas Creek – California State University Channel Islands (CSUCI)

The battery powered refrigerator and ISCO 6712 sampler head were installed prior to the 2010-11 monitoring year, replacing the portable ISCO sampler that had been used for previous monitoring events. The flow rating table is maintained by the United States Geological Survey (USGS). Rainfall information for this site is obtained from the nearby ALERT system rain gauge, Calleguas Creek @ CSUCI (Hydstra ID 505). The intake and bubbler lines are housed in PVC pipe that leads from the enclosure to the water, and is attached to the bridge for stability and support.

Ventura River – Ojai Valley Sanitary District

This vertical distance between the sampler intake and the monitoring enclosure is too large to use the peristaltic pump in the 6712 automated sampler. A remote auxiliary peristaltic pump is used instead, and is located at the midway point between the water and the monitoring enclosure. The flow rating table is maintained by the United States Geological Survey (USGS) and VCWPD stormwater staff. Rainfall amounts measured by the 674 electronic tipping bucket can be compared with the nearby VCWPD ALERT system gauges, Casitas Dam (Hydstra ID 004) and Canada Larga (Hydstra ID 085) through the VCWPD ALERT system (real-time data) and Hydstra (total rainfall). The intake and bubbler lines are housed in metal pipe that is secured to the rip rap that leads from the enclosure to the water.

Santa Clara River – Freeman Diversion

Unlike the other Mass Emission sites (and most other Major Outfall sites), it is not possible to accurately calculate flow at this site due to water diversion activities at the diversion structure. For this reason, samples are collected on a time-paced basis, as approved by the LARWQCB. The ISCO 4210 Ultrasonic Transducer flow meter provides data when water crests the dam, but is not used for sampler pacing. Rainfall amounts measured by the 674 electronic tipping bucket are used to enable the 6712 automated sampler and can be compared with the nearby VCWPD ALERT system gauge, Saticoy Yard (Hydstra ID 175) through the VCWPD ALERT system (real-time data) and Hydstra (total rainfall). Sample lines are attached to the channel wall and lead from the sampling equipment in the enclosures down to below the water level in the channel so as to catch low flows, while minimizing the potential for the intake line to become clogged with sediment. There are two separate intake lines currently installed at this site to allow for the different flow patterns that occur as a result of turnouts at the diversion canal.

Camarillo – Camarillo Hills Drain

The flow rating table is maintained by VCWPD stormwater staff. Rainfall amounts measured by the 674 electronic tipping bucket can be compared with the nearby VCWPD ALERT system gauge, Las Posas Reservoir/Spanish Hills (Hydstra ID 509) through the VCWPD ALERT system (real-time data) and Hydstra (total rainfall). The intake and bubbler lines are housed in stainless steel pipe that is attached to the channel wall and leads from the sampling equipment in the enclosure down to the toe of the channel so as to catch low flows, while minimizing the potential for the intake line to become clogged with sediment.

Meiners Oaks – Happy Valley Drain

The flow rating table is maintained by VCWPD stormwater staff. Rainfall amounts measured by the 674 electronic tipping bucket can be compared with the nearby VCWPD ALERT system gauge, Meiners Oaks Fire Station (Hydstra ID 218) through the VCWPD ALERT system (real-time data) and Hydstra (total rainfall). The intake and bubbler lines are housed in stainless steel pipe that is attached to the channel wall and leads from the sampling equipment in the enclosure down to the toe of the channel so as to catch low flows, while minimizing the potential for the intake line to become clogged with sediment.

Ojai – Fox Canyon Barranca

The flow rating table is maintained by VCWPD stormwater staff. Rainfall information for this site is obtained from the nearby ALERT system rain gauge, Stewart Canyon (Hydstra ID 165).

The intake and bubbler lines are housed in stainless steel pipe that is attached to the channel wall and leads from the sampling equipment in the enclosure down to the toe of the channel so as to catch low flows, while minimizing the potential for the intake line to become clogged with sediment.

Ventura – Moon Ditch

Due to a higher vandalism potential, the solar panel is covered with a protective layer of Lexan. The flow rating table is maintained by VCWPD stormwater staff. Rainfall amounts measured by the 674 electronic tipping bucket can be compared with the nearby VCWPD ALERT system gauge, County Government Center (Hydstra ID 222) through the VCWPD ALERT system (real-time data) and Hydstra (total rainfall). The intake and bubbler lines are housed in stainless steel pipe that is attached to the channel wall and leads from the sampling equipment in the enclosure down to the toe of the channel so as to catch low flows, while minimizing the potential for the intake line to become clogged with sediment.

Fillmore – North Fillmore Drain

Due to a higher vandalism potential, the solar panel is covered with a protective layer of Lexan. The flow rating table is maintained by VCWPD stormwater staff. This site is subject to backwater effects, so time-paced samples are collected once the 6712 automated sampler is enabled based on stage height. Rainfall information for this site is obtained from the nearby ALERT system rain gauge, Fillmore Sanitation (Hydstra ID 199). The intake and signal lines are housed in PVC pipe that is secured to the rip rap that leads from the sampling equipment in the enclosure to the water.

Moorpark – Gabbert Canyon Drain

Due to a higher vandalism potential, the solar panel is covered with a protective layer of Lexan. The flow rating table is maintained by VCWPD stormwater staff. Rainfall information for this site is obtained from the nearby ALERT system rain gauge, Moorpark – County Yard (Hydstra ID 126). The intake and bubbler lines are housed in stainless steel pipe that is attached to the channel wall and leads from the sampling equipment in the enclosure down to the toe of the channel so as to catch low flows, while minimizing the potential for the intake line to become clogged with sediment.

Oxnard – El Rio Drain

Due to a higher vandalism potential, the solar panel is covered with a protective layer of Lexan. The flow rating table is maintained by VCWPD stormwater staff. Rainfall information for this site is obtained from the nearby MO-VEN major outfall rain gauge. The intake and bubbler lines are housed in stainless steel pipe that is attached to the channel wall and leads from the sampling equipment in the enclosure down to the toe of the channel so as to catch low flows, while minimizing the potential for the intake line to become clogged with sediment.

Port Hueneme – Hueneme Drain

The vandalism potential at this site is low so the monitoring enclosure is fiberglass rather than steel. This site is subject to backwater effects, so time-paced samples are collected. Rainfall amounts measured by the TB3 electronic tipping bucket are used to enable the 6712 automated sampler and can be compared with the nearby VCWPD ALERT system gauge, Silverstrand

(Hydstra ID 403) through the VCWPD ALERT system (real-time data) and Hydstra (total rainfall). The intake line is housed in stainless steel pipe that is attached to the channel wall and leads from the sampling equipment in the enclosure down to the water.

Santa Paula – 11th Street Drain

Due to a higher vandalism potential, the solar panel is covered with a protective layer of Lexan. The flow rating table is maintained by VCWPD stormwater staff. Rainfall information for this site is obtained from the nearby ALERT system rain gauge, Santa Paula – Wilson Ranch (Hydstra ID 245). The intake and area velocity meter signal lines are housed in PVC pipe that leads from the sampling equipment in the enclosure down the rip-rap to a scissor ring within the 48 inch reinforced concrete outfall pipe.

Simi Valley – Bus Canyon Drain

Due to a higher vandalism potential, the solar panel is covered with a protective layer of Lexan. The flow rating table is maintained by VCWPD stormwater staff. Rainfall information for this site is obtained from the nearby ALERT system rain gauge, Simi Sanitation (Hydstra ID 246). The intake and bubbler lines are housed in stainless steel pipe that is attached to the channel wall and leads from the sampling equipment in the enclosure down to the toe of the channel so as to catch low flows, while minimizing the potential for the intake line to become clogged with sediment.

Thousand Oaks – Hill Canyon WWTP

The vandalism potential at this site is low so the monitoring enclosure is fiberglass rather than steel. The flow rating table is maintained by VCWPD stormwater staff. This site is currently being evaluated to determine whether a 2105c interface module or the Hill Canyon Ethernet should be used for remote communication with this site. ISCO data (stage, flow, sample times, etc.) is currently recorded on site and must be downloaded following every event, or every thirty days, whichever comes first. Once the Ethernet or 2105c interface module is functional, data will be recorded and automatically sent to the Flowlink database. Remote programming will also be possible once this occurs. Rainfall information for this site is obtained from the nearby ALERT system rain gauge, Thousand Oaks (Hydstra ID 128). The intake and bubbler lines are housed in stainless steel pipe that is secured to the rip rap that leads from the sampling equipment in the enclosure to the water.

## 3.0 FIELD MONITORING EQUIPMENT

The following equipment preparation and maintenance activities are performed in preparation for monitoring.

### 3.1 Field Crew Equipment

Prior to the first monitored event of the season and immediately after each of the subsequent monitoring events, the field crew takes inventory of all field equipment (see Table 6 for monitoring equipment checklist) and replaces items as necessary.

## 3.2 Field Meters

Meters must be inspected prior to each monitoring event to ensure operation. Meters should be calibrated and maintained as described in their operations manual.

Currently, the Program uses a YSI 85 meter for dissolved oxygen (concentration and percentage), electrical conductivity, specific conductance, salinity, and temperature. The probe must be turned on 20 minutes prior to use, and calibrated in the field for dissolved oxygen at the altitude of the monitoring site before measurements are taken. Valid dissolved oxygen readings require that the probe be placed in running water or moved within water at a speed of at least 1 ft/sec for the dissolved oxygen measurements.

A Beckman 255 pH/mV meter is used for pH and temperature measurements and a two-point calibration must be performed in the laboratory on the day before or day of sampling. Calibration should be performed at 7.0 and 10.01, rather than at 4.0 to more closely simulate expected environmental conditions.

## 3.3 Vehicles

Two designated 4WD vehicles equipped for water quality monitoring are permanently assigned to monitoring field crews for use during monitoring events.

## 3.4 Communication

Each field crew member has a cellular phone for remote communication. This is important for safety as well as for coordinating between sampling crews and receiving direction from Storm Control or the Stormwater Monitoring Program Manager.

## 3.5 Field Logbooks

All visits to the sampling stations should be recorded in the site-specific logbook (yellow books). Logbooks are 4 ¾" x 7 ½" Rite-in-the-Rain bound journals, No. 390F. Logbook entries should include: date and time of visit, flow, gage height, personnel, and tasks performed while on site including sampling times and locations, if applicable. Field measurement information will be recorded in the field notebook and on the chain of custody forms, as applicable.

## 3.6 Sampling Poles

Sampling poles are available for grab sample collection. Poles must be Teflon-coated to reduce the chance for sample contamination. The poles are extendable and have Velcro straps for securing the sample bottle to the end of the pole. Each sampling crew should be equipped with a sampling pole.

## 3.7 Dry Event – Damming Equipment

Two-inch diameter or greater thin-wall silicon tubing filed with sand and sealed at both ends, and secured with sand bags (which do not come into contact with the water), is used to "dam" the major outfall channels for low-flow sample events such as the "dry" wet-season event and the dry-season event. The tubing allows sufficient water to accumulate for samples to be collected.

**Table 6. Monitoring Equipment Checklist**

| | |
|---|---|
| ☐ | Log books and/or field sheets |
| ☐ | Chain-of-Custody forms |
| ☐ | Grab sample bottles and 5 gallon bucket for transportation |
| ☐ | Lab water for field blanks, if needed |
| ☐ | Grab poles |
| ☐ | Multi-meter |
| ☐ | Powder-free nitrile gloves |
| ☐ | Coolers and ice |
| ☐ | Ice scooper |
| ☐ | Spare sample bottle labels |
| ☐ | D.I. water and squirt bottles |
| ☐ | Paper towels, antibacterial hand cleaner |
| ☐ | Keys: enclosures (NPDES), gates (2503), and Hydro/USGS enclosures (2151, 2640) |
| ☐ | Cellular phone |
| ☐ | Digital camera (charged) |
| ☐ | Flashlights and headlamps (each crewmember) |
| ☐ | Tools: diagonal clippers, utility knife, screw drivers, |
| ☐ | Electrical tape and cable ties (assorted sizes) |
| ☐ | Batteries: spare alkaline AAA, AA, C and D cell; 6 volt alkaline lantern type |
| ☐ | Pencils, waterproof markers & paper |
| ☐ | Ziplock bags (assorted sizes) |
| ☐ | Rubber bands |
| ☐ | First aid kit |
| ☐ | Rubber boots, short/hip/chest waders |
| ☐ | Safety gear: traffic cones, signing, etc. |
| ☐ | Rope |
| ☐ | Calibrated pH meter (Beckman 255 pH/mV/temp ISE meter or similar) |
| ☐ | Calibrated DO/EC/salinity meter (YSI 85 or similar) |
| ☐ | Five gallon bucket for transporting meters and distilled water squirt bottle for cleaning between sites |
| ADDITIONAL ITEMS FOR DRY EVENTS | |
| ☐ | Large diameter (>2.0”) sand filled thin-wall silicon tubing for damming low-flow major outfall discharge |
| ADDITIONAL ITEMS FOR WET-SEASON EVENTS | |
| ☐ | SOP and sampler programming log |
| ☐ | Laptop computer with Flowlink, 2105c interface module communication cable, 4200/6712 communication cable, and air card for remote viewing of real-time data<br>Multimeter |
| ☐ | 5 gal. buckets for toxicity samples |
| ☐ | Replacement composite bottles (with mesh carriers and 18.5 L bottles) |

## 4.0 SAMPLE CONTAINERS

Sample containers must be labeled prior to the collection of each sample. Following collection of each sample, the chain-of-custody form must be filled out and the sample delivered/shipped to the appropriate laboratory. These actions are described below

### 4.1 Chain-of-Custody Forms

Chain-of-custody (COC) forms should be filled out for all samples submitted to each laboratory and should include the monitoring station name, date and time of sample collection, sampling personnel, number of sample bottles, analyses requested, and type of sample (grab or composite). See Appendix D for example COC forms. Analytical methods, detection limits, and holding times for each parameter monitored are presented in Table 2. The following special notes should be added to COC forms when applicable.

- Filter for dissolved metals immediately.
- Perform bacteriological analyses within 6 hours of sample collection time.
- Perform conductivity analyses immediately.
- Perform TIE analysis if toxicity mortality exceeds 50%.
- Specify site to receive MS/MSD, laboratory duplicates, field blanks or field duplicates as required (Table 11).

### 4.2 Labels/Station Codes

Collected samples are designated by the names and site codes listed in Table 7. Quality control samples submitted "blind" to the laboratory are designated by the fictitious names and site codes listed below. Label bottles with site codes as shown in Table 7 below.

**Table 7. Bottle Label Site Codes**

| **Mass Emission Stations** | | | |
|---|---|---|---|
| **Installed** | **Site Code** | **Site** | **Site Description** |
| 2000 | ME-CC | Calleguas Creek | California State University Channel Islands |
| 2005[1] | ME-VR2 | Ventura River | Ojai Valley Sanitary District |
| 2000 | ME-SCR | Santa Clara River | Freeman Diversion |
| **Major Outfall Stations** | | | |
| **Installed** | **Site Code** | **Site** | **Site Description** |
| 2009 | MO-CAM | Camarillo-1 | Camarillo Hills Drain |
| 2009 | MO-MEI | Meiners Oaks-1 | Happy Valley Drain |
| 2009 | MO-OJA | Ojai-1 | Fox Canyon Barranca |

[1] ME-VR2 was installed in 2005 to replace site ME-VR, which was deemed unsafe in January 2005.

| | | | |
|---|---|---|---|
| 2009 | MO-VEN | Ventura-1 | Moon Ditch |
| 2010 | MO-FIL | Fillmore-1 | North Fillmore Drain |
| 2010 | MO-HUE | Port Hueneme-1 | Hueneme Drain |
| 2010 | MO-MPK | Moorpark-1 | Gabbert Canyon Drain |
| 2010 | MO-OXN | Oxnard-1 | El Rio Drain |
| 2010 | MO-SPA | Santa Paula-1 | 11th Street Drain |
| 2010 | MO-SIM | Simi Valley-1 | Bus Canyon Drain |
| 2010 | MO-THO | Thousand Oaks-1 | Hill Canyon WWTP |
| **"Blind Samples" for Quality Assurance** | | | |
| **Installed** | **Site Code** | **Site** | **QC Sample** |
| N/A | "MB-1" | "Bean Road" | Field Blank |
| N/A | "MD-1" | "Dillon Street" | Field Duplicate |

### 4.3 Sample ID Conventions

Sample bottle labels are prepared and applied to sample bottles prior to each monitoring event. Sample bottles submitted to laboratories for analysis shall be labeled with the sampling site code, and the date and time of sample collection.

### 4.4 Sampling Containers Order

Inventory of sampling containers should be taken prior to each event and additional orders placed with the appropriate laboratory (Weck Laboratories Inc., Ventura County Public Health Laboratory, and Aquatic Bioassay & Consulting Laboratories, Inc.) via telephone or e-mail. Sample containers are to be picked up and/or delivered prior to the monitoring event by the monitoring crew, UPS, FedEx, or courier. Chain-of-custody forms (Appendix D) are customized for the monitoring program and are provided by the monitoring crew. Sampling container orders include the following:

- Automated sampler composite bottles, cleaned (Weck Laboratories Inc.)
- Grab sample bottles (Weck Laboratories Inc.)
- Bacteria sample bottles (Ventura County Public Health Laboratory)
- Toxicity buckets (Aquatic Bioassay & Consulting Laboratories, Inc.)
- Trip, field, and equipment blanks (Weck Laboratories Inc.)
- Blank water (Weck Laboratories Inc. and/or VCPHL)
- Ice chests (Weck Laboratories Inc, and/or VCWPD)

### 4.5 Dry-Season Sampling Containers

Dry-season sampling containers are listed in Table 8.

**Table 8. Dry-Season Sampling Containers**

| Constituent | Container | Preservative |
|---|---|---|
| Total Coliform & *E. coli* bacteria | 125 ml sterile polyethylene | 4°C & $Na_2S_2O_3$ |
| Total Hardness | 250 ml polyethylene | 4°C & $HNO_3$ |
| Total Organic Carbon | 500 ml polyethylene | 4°C & $H_2SO_4$ |
| Dissolved Metals (Lead, Zinc, Copper) | 250 ml polyethylene | 4°C & $HNO_3$ |

## 4.6 Wet-Season Sampling Containers

Wet-Season sampling containers are listed in Table 9 below. Grab samples are collected in pre-preserved bottles by stormwater staff. Composite samples are collected in 18.5 L glass bottles and sent to the lab where they are split into the containers listed in Table 10.

**Table 9. Wet-Season Sampling Containers**

| Constituent | Container | Preservative |
|---|---|---|
| Composite (see Table 10) | 18.5 liter glass | 4°C |
| Total and Fecal Coliform<br>*E. coli*<br>Enterococcus (ME sites only) | 125 ml sterile polyethylene | 4°C & $Na_2S_2O_3$ |
| Cyanide | 500 ml polyethylene | 4°C & NaOH |
| Oil & Grease<br>Petroleum hydrocarbons (TPH) | 3 x 1 liter glass | 4°C & acid to pH <2 |
| MTBE and 2-chloroethyl vinyl ether | 3 x 40 ml vials | 4°C & acid to pH <2 |
| Mercury, dissolved & total recoverable | 250 ml polyethylene | 4°C & $HNO_3$ |
| Chronic Toxicity with TIE (1st year at site) | 2 x 5 gal. plastic buckets | Cool to 4°C |
| Chronic Toxicity with TIE (after 1st year at site – depends on test species) | 1-2 x 5 gal. plastic bucket | Cool to 4°C |

Toxicity testing requires the filling of the following sample containers for each monitoring station: First year of operation under Order No. R4-2010-0108: two 5-gallon plastic buckets (10 gallons total). Remaining years of Order No. R4-2010-0108: two 5-gallon buckets, except for those sites where *S. purpuratus* and *C. dubia* are the most sensitive species, in which case only one 5-gallon bucket is needed per site. Where these samples cannot be collected by direct submersion, the ISCO peristaltic pump (6712 automated sampler or portable ISCO sampler) should be used. See Peristaltic Grab Pump Technique below for toxicity sample collection method.

## Table 10. Wet-Season Composite Split-Sample Containers – Split at Laboratory

| PARAMETER | Method | Volume needed (ml) | No. Bottles | Bottle Type | Preservative | Hold time (days) |
|---|---|---|---|---|---|---|
| **COMPOSITES-CONVENTIONAL** | | | | | | |
| Turbidity | EPA 180.1 | 2,000 | varies | volume varies - poly | <6°C | 2 |
| TSS | SM2540D | | | | | 7 |
| TDS | SM2540C | | | | | 7 |
| TVSS | EPA 160.4 | | | | | 7 |
| BOD | SM 5210 B | | | | | 2 |
| Alkalinity | SM 2320B | | | | | 14 |
| Conductivity | SM2510B | | | | | 28 |
| MBAs | SM 5540 C | | | | | 2 |
| Chloride | EPA 300.0 | | | | | 28 |
| Fluoride | EPA 300.0 | | | | | 28 |
| Perchlorate | EPA 314.0 | | | | | 28 |
| Nitrate-Nitrogen | EPA 353.2 | | | | | 2 |
| Dissolved Phosphorus | EPA 365.1 | 500 | 1 | 500 ml - poly | <6°C, H2SO4 | 28 |
| Total Phosphorus | EPA 365.1 | | | | | 28 |
| Phenolics | EPA 420.4 | | | | | 28 |
| COD | EPA 410.4 | | | | | 28 |
| Ammonia-Nitrogen | EPA 350.1 | | | | | 28 |
| TKN | EPA 351.2 | | | | | 28 |
| Nitrate-Nitrite | EPA 353.2 | | | | | 28 |
| TOC | SM5310C | 250 | 1 | 250 ml - amber glass | <6°C, H3PO4 | 28 |
| **METALS (Dissolved & Total)** | **Method** | | | | | |
| Hardness (total) | EPA 200.7 (Ca+Mg) | 250 | 1 | 250ml - poly | <6°C, HNO3 | 180 |
| Aluminum (total) | EPA 200.8 | | | | | |
| Antimony (total) | EPA 200.8 | | | | | |
| Arsenic (total) | EPA 200.8 | | | | | |
| Beryllium (total) | EPA 200.8 | | | | | |
| Cadmium (total) | EPA 200.8 | | | | | |
| Chromium (total) | EPA 200.8 | | | | | |
| Copper (total) | EPA 200.8 | | | | | |

| PARAMETER | Method | Volume needed (ml) | No. Bottles | Bottle Type | Preservative | Hold time (days) |
|---|---|---|---|---|---|---|
| Iron (total) | EPA 200.8 | | | | | |
| Lead (total) | EPA 200.8 | | | | | |
| Nickel (total) | EPA 200.8 | | | | | |
| Selenium (total) | EPA 200.8 | | | | | |
| Silver (total) | EPA 200.8 | | | | | |
| Thallium (total) | EPA 200.8 | | | | | |
| Zinc (total) | EPA 200.8 | | | | | |
| Mercury (total) | EPA 245.1 | | | | | |
| Aluminum (dissolved) | EPA 200.8 | 250 | 1 | 250 ml - poly | <6°C, HNO3 | 180 |
| Antimony (dissolved) | EPA 200.8 | | | | | |
| Arsenic (dissolved) | EPA 200.8 | | | | | |
| Beryllium (dissolved) | EPA 200.8 | | | | | |
| Cadmium (dissolved) | EPA 200.8 | | | | | |
| Chromium (dissolved) | EPA 200.8 | | | | | |
| Copper (dissolved) | EPA 200.8 | | | | | |
| Iron (dissolved) | EPA 200.8 | | | | | |
| Lead (dissolved) | EPA 200.8 | | | | | |
| Nickel (dissolved) | EPA 200.8 | | | | | |
| Selenium (dissolved) | EPA 200.8 | | | | | |
| Silver (dissolved) | EPA 200.8 | | | | | |
| Thallium (dissolved) | EPA 200.8 | | | | | |
| Zinc (dissolved) | EPA 200.8 | | | | | |
| Mercury (dissolved) | EPA 245.1 | | | | | |
| Hex. Chromium | EPA 218.6 | 250 | 1 | 250 ml - poly | (NH4)2SO4 buffer, pH 9.3-9.7 | 1 |
| **SEMI-VOLATILE ORGANICS** | **Method** | | | | | |
| 1,2,4-Trichlorobenzene | EPA 625 | 2,000 | 2 | 1L - amber glass | <6°C, Na2S2O3 (if chlorinated) | 7 |
| 1,2-Dichlorobenzene | EPA 625 | | | | | |
| 1,2-Diphenylhydrazine | EPA 625 | | | | | |
| 1,3-Dichlorobenzene | EPA 625 | | | | | |
| 1,4-Dichlorobenzene | EPA 625 | | | | | |
| 2,4-Dinitrotoluene | EPA 625 | | | | | |
| 2,6-Dinitrotoluene | EPA 625 | | | | | |

| PARAMETER | Method | Volume needed (ml) | No. Bottles | Bottle Type | Preservative | Hold time (days) |
|---|---|---|---|---|---|---|
| 2-Chloronaphthalene | EPA 625 | | | | | |
| 3,3-Dichlorobenzidine | EPA 625 | | | | | |
| 4-Bromophenyl phenyl ether | EPA 625 | | | | | |
| 4-Chlorophenyl phenyl ether | EPA 625 | | | | | |
| Benzidine | EPA 625 | | | | | |
| Bis(2-Chloroethoxy) methane | EPA 625 | | | | | |
| Bis(2-Chloroethyl) ether | EPA 625 | | | | | |
| Bis(2-Chloroisopropyl) ether | EPA 625 | | | | | |
| Butyl benzyl phthalate | EPA 625 | | | | | |
| Diethyl phthalate | EPA 625 | | | | | |
| Dimethyl phthalate | EPA 625 | | | | | |
| di-n-Butyl phthalate | EPA 625 | | | | | |
| di-n-Octyl phthalate | EPA 625 | | | | | |
| Hexachlorobenzene | EPA 625 | | | | | |
| Hexachlorobutadiene | EPA 625 | | | | | |
| Hexachloro-cyclopentadiene | EPA 625 | | | | | |
| Hexachloroethane | EPA 625 | | | | | |
| Isophorone | EPA 625 | | | | | |
| Nitrobenzene | EPA 625 | | | | | |
| N-Nitroso-dimethyl amine | EPA 625 | | | | | |
| N-Nitroso-di-n-propyl amine | EPA 625 | | | | | |
| N-Nitroso-diphenyl amine | EPA 625 | | | | | |
| 2-Chlorophenol | EPA 8270C | Included with EPA 625 | | | | |
| 4-Chloro-3-methylphenol | EPA 8270C | | | | | |
| 2,4-Dichlorophenol | EPA 8270C | | | | | |
| 2,4-Dimethylphenol | EPA 8270C | | | | | |
| 2,4-Dinitrophenol | EPA 8270C | | | | | |
| 2-Nitrophenol | EPA 8270C | | | | | |
| 4-Nitrophenol | EPA 8270C | | | | | |
| 4,6 Dinitro-2-methylphenol | EPA 8270C | | | | | |
| Phenol | EPA 8270C | | | | | |
| 2,4,6-Trichlorophenol | EPA 8270C | | | | | |

| PARAMETER | Method | Volume needed (ml) | No. Bottles | Bottle Type | Preservative | Hold time (days) |
|---|---|---|---|---|---|---|
| 1,2 Benzanthracene [benzo(a) anthracene] | EPA 8270C | | | | | |
| 3,4 Benzofluoranthene [Benzo(b)fluoranthene] | EPA 8270C | | | | | |
| Acenaphthene | EPA 8270C | | | | | |
| Acenaphthylene | EPA 8270C | | | | | |
| Anthracene | EPA 8270C | | | | | |
| Benzo(g,h,i)perylene | EPA 8270C | | | | | |
| Benzo(k)fluoranthene | EPA 8270C | | | | | |
| Chrysene | EPA 8270C | | | | | |
| Dibenzo(a,h)anthracene | EPA 8270C | | | | | |
| Fluoranthene | EPA 8270C | | | | | |
| Fluorene | EPA 8270C | | | | | |
| Indeno(1,2,3-cd)pyrene | EPA 8270C | | | | | |
| Naphthalene | EPA 8270C | | | | | |
| Phenanthrene | EPA 8270C | | | | | |
| Pyrene | EPA 8270C | | | | | |
| **CHLORINATED PESTICIDES/PCBs** | **Method** | | | | | |
| Aldrin | EPA 608 | 2,000 | 2 | 1L - amber glass | <6°C, Na2S2O3 (if chlorinated) | 7 |
| alpha-BHC | EPA 608 | | | | | |
| beta-BHC | EPA 608 | | | | | |
| delta-BHC | EPA 608 | | | | | |
| gamma-BHC (lindane) | EPA 608 | | | | | |
| alpha-chlordane | EPA 608 | | | | | |
| gamma-chlordane | EPA 608 | | | | | |
| 4,4'-DDD | EPA 608 | | | | | |
| 4,4'-DDE | EPA 608 | | | | | |
| 4,4'-DDT | EPA 608 | | | | | |
| Dieldrin | EPA 608 | | | | | |
| alpha-Endosulfan | EPA 608 | | | | | |
| beta-Endosulfan | EPA 608 | | | | | |
| Endosulfan sulfate | EPA 608 | | | | | |
| Endrin | EPA 608 | | | | | |
| Endrin aldehyde | EPA 608 | | | | | |

| PARAMETER | Method | Volume needed (ml) | No. Bottles | Bottle Type | Preservative | Hold time (days) |
|---|---|---|---|---|---|---|
| Heptachlor | EPA 608 | | | | | |
| Heptachlor Epoxide | EPA 608 | | | | | |
| Toxaphene | EPA 608 | | | | | |
| Aroclor-1016 | EPA 608 | | | | | |
| Aroclor-1221 | EPA 608 | | | | | |
| Aroclor-1232 | EPA 608 | | | | | |
| Aroclor-1242 | EPA 608 | | | | | |
| Aroclor-1248 | EPA 608 | | | | | |
| Aroclor-1254 | EPA 608 | | | | | |
| Aroclor-1260 | EPA 608 | | | | | |
| **ORGANOPHOSPHATE PESTICIDES** | **Method** | | | | | |
| Atrazine | EPA 525.2 | 2,000 | 2 | 1L - amber glass | <6°C, HCl, sulfite (if chlorinated) | 14 |
| Benzo(a)pyrene | EPA 525.2 | | | | | |
| Bis(2-Ethylhexl) phthalate | EPA 525.2 | | | | | |
| Cyanazine | EPA 525.2 | | | | | |
| Prometryn | EPA 525.2 | | | | | |
| Simazine | EPA 525.2 | | | | | |
| Chlorpyrifos | EPA 525.2-LL | | | | | |
| Diazinon | EPA 525.2-LL | | | | | |
| Malathion | EPA 525.2-LL | | | | | |
| **HERBICIDES** | **Method** | | | | | |
| 2,4,5-TP-SILVEX | EPA 515.3 | 250 | 1 | 250ml - amber glass | <6°C, Na2S2O3 (if chlorinated) | 14 |
| 2,4-D | EPA 515.3 | | | | | |
| Pentachlorophenol | EPA 515.3 | | | | | |
| Glyphosate | EPA 547 | 40 | 1 | 40ml - amber VOA | <6°C, Na2S2O3 (if chlorinated) | 14 |

Note: Each sample bottle and preservative entry includes the parameters listed below it. Hold times may differ.

## 5.0 QA/QC – QUALITY CONTROL SAMPLES

### 5.1 Analytical Laboratory Quality Control Samples

Matrix Spike/Matrix Spike Duplicates (MS/MSD)

MS/MSD samples are performed by the laboratory at a minimum of once per analytical batch or every 20 samples, whichever is more frequent. MS/MSD analyses should be conducted on VCWPD grab samples listed in Table 2 and for VCWPD composite samples when sufficient volume is available after samples are split. The Chain-of-Custody should contain the language "Lab to select samples for MS/MSD where extra volume permits (all test methods)." Double the normal composite sample volume is required for these samples (see Table 12 for sample volumes).

Laboratory Blanks and Laboratory Duplicates

Laboratory blanks and laboratory duplicates are method-specific and are the responsibility of the laboratory. Laboratory blanks are conducted at a minimum of once per analytical batch or every 20 samples, whichever is more frequent. Laboratory duplicates are utilized if an MS/MSD analysis is not conducted.

Analytical (Laboratory) Quality Control-Relevant Methods

- Matrix Spike/Matrix Spike Duplicates (total recoverable metals, total recoverable mercury, EPA 8270SIM-PAH and -Phenols, EPA 625, EPA 608, EPA 525.2, and EPA 515.3 analyses only)
- Laboratory Control Sample Duplicates (all methods) – only completed for batches with insufficient sample for MS/MSD analysis.
- Laboratory Blanks (all methods)

### 5.2 Wet-Season Program Generated Quality Control Samples

Quality control samples should be collected prior to the first monitoring event of each monitoring season and during each event according to the schedule presented in Table 12. Quality control sample results are used for data evaluation and interpretation. Field-generated quality control samples (field duplicates and field blanks) should be submitted "blind" to the laboratory. Blind samples are disguised by the use of bogus site names (see Table 7). Composite and grab quality control samples should be collected according to the schedule shown in Table 11.

**Table 11. Wet-Season Monitoring Event QA/QC Schedule**

| 2009-2010 (number of sites per event) | | | | | |
|---|---|---|---|---|---|
| **QC Sample Type** | **Event #0 (Pre-storm)** | **Event #1 (Wet)** | **Event #2 (Wet)** | **Event #3 (Wet)** | **Event #4 (Dry)** |
| Equipment Blank | 1 | - | - | - | - |

| | | | | | |
|---|---|---|---|---|---|
| MS/MSD | - | X[1] | X[1] | X[1] | X[1] |
| Field Blank | - | - | - | 1 | - |
| Field Duplicate[2] | - | - | 1 | 1 | - |
| **2010-2015 (number of sites per event) (repeat requirements for 2010-2011, 2011-2012, 2012-2013, and 2013-2014 monitoring seasons)** | | | | | |
| **QC Sample Type** | **Event #0 (Pre-storm)** | **Event #1 (Wet)** | **Event #2 (Wet)** | **Event #3 (Wet)** | **Event #4 (Dry)** |
| Equipment Blank | 1 | - | - | - | - |
| MS/MSD | - | X[1] | X[1] | X[1] | X[1] |
| Field Blank | - | - | - | 1 | 1 |
| Field Duplicate[2] | - | 1 | 1 | - | - |

Table 11 Notes:

1. X: Matrix Spike/Matrix Spike Duplicates (MS/MSD) are performed by the laboratory at a minimum of once per analytical batch or every 20 samples, whichever is more frequent. VCWPD composite samples are to be used for MS/MSD when sufficient volume is available after samples are split.
2. Laboratory blanks and laboratory duplicates are method-specific and are the responsibility of the laboratory. Laboratory blanks are conducted at a minimum of once per analytical batch or every 20 samples, whichever is more frequent. Laboratory duplicates are utilized if an MS/MSD analysis is not conducted.

### 5.3 Field QA/QC Descriptions

Bottles and equipment are checked for potential contaminants through analysis of equipment, stationary, field, and travel blanks prepared as described below.

Equipment Blanks

Prior to the first monitoring event of each wet-season (and between the first and second storm of the 2010-11 season, once the equipment has been cleaned), an equipment blank (blank water run through the cleaned tubing installed in the auto sampler) should be collected from one site, and analyzed for total recoverable metals (EPA 200.8), nitrate-nitrite (EPA 353.2) and Semi- and Non-Volatile Organics (EPA 625). See Appendix C for blank sample collection procedures.

[1] "X": The laboratory is to preferentially select VCWPD samples for MS/MSD analysis when sufficient sample volume is available after samples are split.
[2] Field duplicates are grab samples only.

This is done to ensure that equipment is cleaned correctly. Any indication of contamination will result in source investigation, identification, and correction and the equipment will be cleaned and tested again, if deemed necessary by stormwater staff.

Blanks Stationary

Prior to the first monitoring event of each wet-season, the lab should collect one composite bottle blank and analyze it for total recoverable metals (EPA 200.8), nitrate-nitrite (EPA 353.2), and Semi- and Non-Volatile Organics (EPA 625). See Appendix C for blank sample collection procedures.

Sampling (Field) Quality Control

- Field Blanks (bacteriologicals and total recoverable mercury)
- Field Duplicates (grab samples only)
- Travel Blanks (EPA 524.2 only)

## 5.4 Collection Methods

Specific collection methods for each type of quality control sample type are described below.

Field Blank

- Grab sample field blanks should be collected immediately prior to the collection of normal grab samples. The field crew will use the blank water provided and will fill each grab sample container according to standard procedures.
- Field blanks should be submitted "blind" to the laboratory (see Table 7 for bogus sample names).

Field Duplicate

- Grab sample field duplicates should be collected for the sites and events specified in Table 11.
- Grab sample field duplicates should be collected immediately following the collection of normal grab samples.
- Field duplicates should be submitted "blind" to the laboratory (see Table 7 for bogus site names).

## 5.5 Wet-Season QA/QC Required Sample Volumes

**Table 12. QA/QC Sample Volumes**

| **Constituent** | **Sample (mLs)** | **MS/MSD (mLs)** | **Field Dup (mLs)** | **Type** |
|---|---|---|---|---|
| **GRAB SAMPLES** | | | | |
| **Poly bottle, ≤ 4°C, NaOH**<br>Total Cyanide (EPA 335.4) | 500 | From existing | 500 | grab |

| | | | | |
|---|---|---|---|---|
| **Poly bottle, ≤ 4°C, HCl**<br>Oil & Grease(EPA 1664A)<br>TPH (EPA 1664A_NP) | 3000 | From existing | 3000 | grab |
| **Amber glass VOA, ≤ 4°C, HCl**<br>Volatile Organics (EPA 524.2) | 120 | 80 | 120 | grab |
| **Poly bottle, ≤ 4°C, $HNO_3$**<br>Mercury (EPA 245.1) | 250 | 250 | 250 | grab |
| **Sterile poly bottle, ≤ 4°C, $Na_2S_2O_3$**<br>Total & Fecal coliform, *E. coli* (all sites)<br>Enterococcus (ME sites only) | 100 | - | 100 | grab |
| **COMPOSITE SAMPLES** | | | | |
| **Poly bottle, ≤ 4°C, filtered, $HNO_3$**<br>Dissolved Metals (Ag, Al, As, Be, Cd, Cr, Cu, Fe, Ni, Pb, Se, Sb, T1, Zn, Hg), | 250 | 250 | - | composite |
| **Poly bottle, ≤ 4°C, $HNO_3$**<br>Total Metals (Ag, Al, As, Ba[1], Be, Cd, Cr, Cu, Fe, Ni, Pb, Se, Sb, T1, Zn, Hg), hardness | 250 | 250 | - | composite |
| **Poly bottle, ≤ 4°C**<br>Turbidity, conductivity, TSS, TVSS, TDS, BOD, alkalinity, MBAs, chloride, fluoride, perchlorate, nitrate-nitrogen[2], residual chlorine[3] | 2000 | 2000 | - | composite |
| **Poly bottle, ≤ 4°C, $(NH_4)_2SO_4$ buffer, pH 9.3-9.7**<br>Hexavalent Chromium (Cr VI) | 250 | 250 | - | composite |
| **Poly bottle, ≤ 4°C, $H_2SO_4$**<br>Phosphorous (total and dissolved), phenolics, COD, ammonia-nitrogen, TKN, nitrate+nitrite | 500 | 500 | - | composite |
| **Amber glass bottle, ≤ 6°C, $H_3PO_4$**<br>TOC (SM5310C) | 250 | 250 | - | composite |
| **Amber glass bottle, ≤ 6°C, $Na_2S_2O_3$**<br>Semi-volatile Organics (EPA 625, EPA 8270SIM-Phenols, EPA 8270SIM-PAHS) | 2000 | 2000 | - | composite |

[1] Total barium is a pollutant of concern (POC) for the Calleguas Creek and Santa Clara River watersheds. As such, it is only included in the analyses for ME-CC and ME-SCR.

[2] Nitrate-nitrogen is a POC for the Calleguas Creek watershed and is being studied in the Ventura River Watershed. As such, it is only included in the analyses for ME-CC for the full term of the permit, and ME-VR2, MO-MEI, and MO-OJA for 2009-2011.

[3] Residual chlorine is a POC for the Calleguas Creek watershed. As such, it is only included in the analyses for ME-CC.

| | | | | |
|---|---|---|---|---|
| **Amber glass bottle, ≤ 6°C, $Na_2S_2O_3$**<br>OC-Pesticides and PCBs (EPA 608) | 2000 | 2000 | - | composite |
| **Amber glass bottle, ≤ 6°C, HCl**<br>OP-Pesticides (EPA 525.2 and 525.2LL) | 2000 | 2000 | - | composite |
| **Amber glass bottle, ≤ 6°C, $Na_2S_2O_3$**<br>Cl-Herbicides (EPA 515.3) | 250 | 500 | - | composite |
| **Amber glass VOA, ≤ 6°C, $Na_2S_2O_3$**<br>Glyphosate (EPA 547) | 40 | 40 | - | composite |
| **Total Composite Volumes** | **11790** | **11940*** | **0** | composite |

**** Conduct analysis on original sample volume***

## 6.0 WET-SEASON MONITORING EVENT PREPARATION

The following monitoring preparation activities are performed prior to each monitoring event.

### 6.1 Decision to Monitor a Storm Event

The decision to sample a storm event is made by the Stormwater Monitoring Program Manager or designee in consultation with weather forecasting information services. The decision is made once a minimum quantitative precipitation forecast (QPF) of 0.25 inches has been determined. (Note: A QPF of 0.25 inches is required to initiate sampling but monitoring can proceed if less rain falls than predicted, provided it is greater than 0.15 inches.

### 6.2 Field Crews

Field crews are designated for each event as needed by the Stormwater Monitoring Program Manager or designee. When field crews are notified regarding monitoring status (including notifications to begin sampling) the phone tree is utilized (Appendix B). For each monitoring event it is the responsibility of the monitoring manager or designee to contact personnel participating as members of the monitoring crew.

### 6.3 Event Requirements Summary

The sample volume and preservative requirements (Table 9) and monitoring equipment checklist (Table 6) should be reviewed prior to each monitoring event. For wet-season events, the monitoring event QA/QC schedule (Table 11) should also be reviewed. These tables show sampling requirements for each monitoring event, including sample volume, grab sample bottle and QA/QC requirements. These tables will serve as a guide to help field crews prepare for and monitor storm events.

### 6.4 Pre-Season Maintenance

Prior to the beginning of the monitoring season the following routine maintenance is performed on each of the monitoring sites:

- Check battery connections.
- Clean solar panels (DC sites)
- Inspect/calibrate ISCO equipment, including rainfall gauges

- Inspect/clean/install sample tubing
- Collect equipment blanks
- Clean/install composite sample bottles
- Inspect/clean flow sensor
- General maintenance

See ISCO instruction manual for detailed information regarding maintenance and servicing information for the above-listed equipment.

### 6.5 Composite Equipment Cleaning and Maintenance Procedures

See Appendix C for detailed bottle and equipment cleaning procedures.

All sample bottles, lids, tubing, and strainers should be rigorously cleaned prior to use. Composite sample bottles, lids, and guidance caps will be cleaned at the laboratory after each storm using laboratory soap (Alconox or similar) and nitric acid treatments, interspersed with DI water rinses. For the 2010-2011 monitoring season, composite bottles for MO-MEI and MO-OJA (grant-funded) will be given a final rinse with solvent (methanol) and allowed to air dry without a DI rinse to prevent organics (including phthalates) contamination. Composite sample bottles will be stored between events with their lids on and upper portion covered with clean plastic bags. Guidance caps will be stored in clean plastic bags.

Composite sampling equipment (pump tubing, sampling lines) at all sites (except MO-MEI and MO-OJA during 2010-2011) will be inspected and flushed with distilled water prior to the first sampling event of the monitoring season and between each event by VCWPD water quality personnel.

For the 2010-2011 monitoring season, MO-MEI and MO-OJA composite sampling equipment (pump tubing, sampling lines) will be inspected and cleaned in situ with 5 % nitric acid, distilled water, and solvent (methanol) by VCWPD water quality personnel before the first and second sampling events of the season. Composite equipment will be flushed with distilled water between events three and four.

Pump tubing will be replaced when the pump counts approach 1,000,000 revolutions or when inspections show evidence of wear, whichever occurs first.

### 6.6 Monitoring Event – Station Preparation

When a monitoring event becomes imminent, the field crews perform the following activities at each of the monitoring stations.

1. Site inspection
2. Check electrical and sample tubing connections
3. Check that tubing and intakes are clean
4. Check battery levels (all sites)
5. Check refrigerator temperature
6. Check desiccant
7. Check that clean composite sample bottles are labeled and installed

8. Clean solar panels (DC sites)
9. Record information in field logbook
10. Get ice from Water Quality ice machine at the Saticoy Operations Yard
11. Ice down portable composite sampler(s), if used
12. Gather, inspect, and label all grab sample bottles.
13. Deliver grab sample bottles and composite bottles to each monitoring site.

When the decision is made to monitor an event, the Field Crews should perform the following activities on each of the monitoring stations.

1. Calculate "Volume to Sample" values based on anticipated river flows and quantity of precipitation forecast (see Appendix E).
2. Record details of each site visit and the upcoming storm in the log book for each site. Include information about sample collection pacing threshold in cf, sample collection volume in ml, and number of samples to be collected (Appendix D).
3. Program volume-to-sample or rainfall-to-runoff values into ISCO units at each monitoring station. See ISCO equipment manuals for specific programming steps.
4. For wet weather monitoring, set flow thresholds for sample collection initiation and termination thresholds. Thresholds should be set so that sample collection will begin when river flows exceed 120% of typical baseline flows, and sample collection ends when river flows drop below 120% of typical baseline flows, or 24 hours of monitoring has been conducted. These flow thresholds may be revised after the first few monitoring events.

### 6.7 Composite Sampling Equipment Programming

See Appendix F or manufacturer's handbook for programming instructions.

## 7.0 WET-SEASON MONITORING EVENT IMPLEMENTATION

Each of the mass emission and major outfall stations will be monitored for water quality parameters at the frequency shown previously in Table 1. Field measurements of pH, dissolved oxygen, conductivity, specific conductance, salinity, and temperature will be taken using meters that have been calibrated according to manufacturer's specifications. Grab and composite samples will be collected and analyzed from each site for the water quality constituents shown in Table 2. See Table 9 for containers and preservatives required for grab samples. The following section describes the monitoring and field activities required to successfully collect specified grab and composite samples. If automated composite sample collection equipment is not operational, composite samples may be collected using the back-up manual method described in Section 7.6.

### 7.1 All Site Visits

The following activities should be conducted during all monitoring site visits (and recorded in the site-specific field notebook):

- Check weather and flow conditions, including verification of stage on flow meter with outside staff.
- Open enclosure and check ISCO display.
- Check sample volume collected agrees with number of samples shown taken by 6712 display.
- Fill out log sheet parameters.
- Check battery level.

## 7.2 Monitoring Activities – Wet Events

The status of all monitoring stations should be checked periodically, using Flowlink®, during each monitoring event. The modem connection in the interface module is designed to be used to initiate sampling, estimate the time until each composite bottle fills, monitor the storm hydrograph, select a time for grab sample collection, and to terminate sampling, as necessary.

Initiating Sampling

To initiate sampling the following steps should be taken for each site:

1. Review Fox Weather and National Weather Service quantitative precipitation forecasts (QPF) and determine expected rainfall.
2. Use volume-to-sample or rainfall-to-runoff tables to estimate runoff based on QPF and antecedent weather and ground saturation conditions.
3. Review and update sampler program as necessary due to anticipated changes in storm conditions.
4. Confirm that automated samplers are armed and ready to begin sample collection when thresholds are met.

Monitoring Flow

The Flowlink database is used to periodically monitor the flow rates and storm hydrograph for each site during each monitored event. Adjustments are made to sampler programming as necessary. The data from any sites that were unable to connect and/or upload their data to the Flowlink database during the event will be manually downloaded from the site following each monitored event.

## 7.3 Monitoring Activities – Dry Events

The status of all monitoring stations should be checked periodically, using Flowlink®, during each monitoring event. The modem connection in the interface module is designed to be used to initiate sampling, monitor sample punches, and to terminate sampling, as necessary.

Initiating Sampling

To initiate sampling the following steps should be taken for each site:

1. Program all composite samplers for time-paced samples, 35 samples of 500 mL per sample.

2. Set up damming equipment at major outfall stations with insufficient flow. Attach Teflon sampling line to the end of the sampler intake and weight it in the deepest part of the channel. Make sure sandbags, or other items used to supplement weighted silicone line, are not in contact with water to be sampled.
3. Run sample program.

## 7.4 Sample Splitting/Analytical Priorities

After one composite bottle has been generated for each sampling site, samples will be poured into individual sample containers at Weck Laboratories, Inc. for specific types of analysis.

Prior to splitting samples, sample volumes must be evaluated to determine whether enough sample volume has been collected for all analyses and QA/QC samples. If inadequate volume has been collected, use the following steps to maximize the use of the samples collected.

1. If a site that requires MS/MSD or duplicate analyses is short of composite volume, and another site has surplus volume, the QA/QC schedule should be modified so that the site with surplus volume receives the QA/QC analyses.
2. If multiple sites are short of composite volume, QA/QC samples should be reduced. MS/MSD is the most important type of QA/QC analysis, and should be the last to be eliminated. However, if sample volume is limited, even the MS/MSD analyses should be eliminated. If limited volume is available for minimal QA/QC analyses, use the priorities shown in #3 below.
3. If sample volume is inadequate to perform required analyses, even after QA/QC analyses have been eliminated, the following priority list should be implemented: metals (total and dissolved) are most important, then pesticides (organophosphate (OP), chlorinated (OC), herbicides), organics (PCBs, acids, base/neutrals), nutrients, anions, then conventionals. These priorities also apply to QA/QC analyses when limited additional QA/QC sample volume is available.

## 7.5 Terminating Sampling

<u>Terminating Sampling</u>

When it has been determined that the monitoring event is over, field personnel will terminate sampling at any monitoring site that has not reached the end of its program.

Sample collection will be terminated when the river stage drops below the programmed flow threshold or after 24 hours of monitoring has been conducted. Monitoring stations should be visited at the end of each sampled event to pick up composite bottle(s) and deliver them to the appropriate laboratory(s). Activities to be performed during a station shut down visit are listed below.

- Terminate sampling
- Download the data stored in the ISCO control unit (only required if data was unable to be automatically uploaded to Flowlink®)
- Check batteries
- Fill out log sheet

## 7.6 Temporary Composite Sample Collection Method

If automatic composite sampling equipment is not working, portable ISCO 6712 composite samplers may be used to collect samples. If flow measuring equipment is available, then the portable sampler will be connected and flow-paced samples will be collected. If flow measuring equipment is unavailable, then the portable sampler will be set to collect time-paced samples. Grab samples will be collected one time during the monitoring event following typical grab sample collection methods.

Additional Equipment Required for Temporary Composite Sample Collection

- Portable ISCO 6712 composite sampler with charged battery
- Extra charged battery
- Clean Teflon tubing, flexible pump tubing, and intake strainer for each station
- Clean 18.5 L wide-mouth borosilicate glass bottle with Teflon-lined lid.
- Black mesh bag
- Ice to ice down sample bottle in portable sampler

Temporary Composite Sample Collection Steps

Portable ISCO 6712 composite samplers can be programmed the same as the 6712 sampler heads. Each sample aliquot will be collected as follows.

1. Upon arrival, record the time and river flow/stage in the field notes, if possible.
2. Determine the safest and most representative location to collect composite sample aliquots. Typically, the most representative location is that which has consistent moderate positive flow.
3. Place a clean 18.5 L wide-mouth borosilicate glass sample bottle into the mesh bag and set it in the sampler.
4. Fill the sampler with ice, taking care to keep ice away from the bottle opening
5. Using clean techniques, remove the lid from the borosilicate glass bottle, and close and secure the sampler.
6. Wipe down and install clean tubing in the pump head. Take care not to allow the ends of the tubing to contact any unclean surface.
7. Attach the clean intake strainer to the intake end of the clean tubing and lower into the flow stream.
8. At the end of the event, turn off the portable pump, replace the bottle lid, and place the sample on ice.
9. Prior to departure from the site, record flow/stage again in the field notes.

See Section 9.0 for details on sample compositing, splitting, and shipment to laboratories.

Safety is a primary concern during sample collection. Samples should be collected from a stable structure, out of the traffic lane and behind the railing. If at any time during sample collection, conditions appear unsafe or cause the monitoring field crew to have concern for personal safety,

monitoring efforts should cease immediately and field personnel should report to the project Monitoring Manager or designee.

### 7.7 Downloading Monitoring Event Data

The ISCO interface modules are designed to automatically push monitoring data to the Flowlink database on the County of Ventura's SQL server from static IP addresses programmed by field personnel. The data is available for remote viewing through a password-protected website. Monitoring event data can also be downloaded on-site if there is a problem with the automatic upload. If a manual download is required, it must be completed immediately following each monitoring event. Monitoring data is downloaded onto a laptop computer using the ISCO Flowlink software and then uploaded to the Flowlink database on the County of Ventura's SQL server.

## 8.0 MONITORING ACTIVITIES – GENERAL

### 8.1 Monitoring Activities – Storm Control

One stormwater staff member should remotely monitor the progress of the storm and equipment during the storm event. The staff member should act to update equipment programming as necessary, either remotely through Flowlink or by coordinating with field crews for onsite programming requirements.

### 8.2 Monitoring Activities – Field Measurements

Field Measurements

Field measurements should be taken at the same time as grab samples, on the rising limb of the hydrograph, and recorded in the site-specific notebook.

### 8.3 Monitoring Activities – Grab Samples

Selecting Time for Grab Samples

To the greatest extent possible, grab samples should be collected mid-depth at a location where significant positive flow is present, during peak stormwater runoff flow conditions. During dry weather events, grab samples should be collected at the approximate midpoint of the event when there is sufficient flow.

Grab samples are ideally collected during peak flow. However, because it is difficult to predict the time of peak flow, timing grab sampling to coincide with the hydrographic peak may not be possible. Therefore, to the greatest extent possible, grab samples should be collected on the rising limb of the hydrograph, during the early to middle portion of the monitoring event, at a time when flow rates are increasing and precipitation rates are decreasing.

Field personnel should monitor weather reports and site hydrographs at each sampling location to determine appropriate times for grab sample collection.

### 8.4 On-Site Activities

Once monitoring is underway, monitoring sites may be visited by the field crews for five reasons: 1) To check on progress of equipment; 2) to perform station maintenance and/or troubleshooting; 3) to collect grab samples and make field measurements; 4) to terminate a monitoring event; or 5) to collect a full composite bottle. Clean sample handling techniques, site visit activities, grab sample collection methods, field measurement methods, composite bottle procedures, and sampling termination activities are presented below.

## 9.0 SAMPLE HANDLING

### 9.1 Clean Sample Handling

"Clean sampling" techniques are required to collect and handle water samples in a way that does not result in contamination, loss, or change in the chemical form of the analytes of interest. Samples are collected using the protocols summarized below:

- Samples are collected only into rigorously pre-cleaned sample bottles.
- At least two persons, wearing clean, powder-free nitrile gloves at all times, are required on a sampling crew.
- After a grab sample is collected, or when a clean item must be re-bagged, it is done in the opposite order from which it was removed.
- Clean, powder-free nitrile gloves are changed whenever something not known to be clean has been touched.
- For this program, clean techniques must be employed whenever handling the composite bottles, Teflon lids, suction tubing, strainers, or grab sample bottles for metals, organics or bacteriological samples.
- To reduce potential contamination, sample collection personnel must adhere to the following rules while collecting stormwater samples:
    1. No smoking.
    2. Never sample near a running vehicle. Do not park vehicles in immediate sample collection area (even non-running vehicles).
    3. Avoid allowing rain water to drip from rain gear or any other surface into sample bottles.
    4. Do not eat or drink during sample collection.
    5. Do not breathe, sneeze or cough in the direction of an open sample bottle.

### 9.2 Composite Sample-Splitting Procedures

Composite samples are split at the laboratory. It is important that each bottle be correctly labeled prior to pouring off samples to ensure the correct identification of each sample. Composite samples should be split using the following procedures.

1. Wear clean gloves when handling bottles and lids;

2. Thoroughly agitate the sample to be poured until well mixed, using a compositing device if available;
3. Remove the lid from final composite and cap from bottle to be filled;
4. Pour composite sample into individual analysis bottle and replace both lids;
5. Place individual analysis bottles in an ice chest with ice for lab shipment, or into refrigerator if split at laboratory;
6. Repeat steps 1 through 5 for each individual analysis bottle to be filled;
7. Generate lab duplicate samples, if required (see Table 11), by alternating the pouring off of normal with lab duplicate samples;
8. Fill out COC forms and deliver samples to laboratories specified below.

### 9.3 Grab Sample Collection

The preferred method for grab sample collection is direct submersion of sample bottles at mid-stream and mid-depth. However, due to monitoring site configurations and safety concerns, direct filling of sample bottles is not always feasible. Monitoring site configuration and the type of grab sample will dictate grab sample collection technique. The following constituents have specific sample collection requirements:

- Bacteriological samples may **NOT** be pumped. Sample bottles are filled by direct submersion, or with the use of a sterile intermediate container, such as a Teflon bailer. **These samples have a 6-hour hold time from collection to analysis.** Therefore, prompt delivery to the lab after collection is essential.
- Oil and grease and TPH samples may **NOT** be pumped or collected using an intermediate container, as these constituents tend to adhere to tubing and containers. Therefore, sample bottles must be filled by direct submersion. Wide mouth bottles should be requested for these samples.
- Samples for mercury analysis may **NOT** contact any container that has not been rigorously cleaned. Therefore, samples should be collected by direct submersion.
- Samples for MTBE and 2-chloroethyl vinyl ether must be collected with zero headspace, therefore samples should be collected by direct submersion until the vial is almost full, after which additional sample should be added using the Teflon lid.
- Toxicity grab samples may be collected by direct submersion, using a clean intermediate container, or by pumping.
- Grab samples should be collected using one or more of the five grab sample collection techniques presented below. Always use clean sample handling techniques as described above.

<u>Direct Submersion: Hand Technique</u>

Where practical, all grab samples may be collected by direct submersion to mid-stream, mid-depth using the following procedures.

1. Wear clean gloves when handling bottles and caps;

2. Pre-label sample containers (site code, location, date, time, analysis) except mercury sample bottles;
3. Do **NOT** label mercury bottles! Simply record mercury bottle number and collection information in field notes and on chain-of-custody (label may be placed on outer bag only);
4. Submerge bottle to mid-stream/mid-depth, remove lid, let bottle fill, and replace lid;
5. Place sample on ice, fill out COC form, and deliver to lab;
6. Collect duplicate samples if needed using the same protocols described above.

Direct Submersion: Grab Pole Technique

Certain samples (oil & grease and TPH) are required to be collected without the use of an intermediate container. Where site access is difficult or unsafe, sample bottles may be submerged directly by attaching sample bottle to a grab pole using a Velcro strap or cable ties as follows.

1. Wear clean gloves when handling bottles and caps;
2. Pre-label sample containers (site code, location, date, time, analysis) except mercury sample bottles;
3. Do **NOT** label mercury bottles! Simply record mercury bottle number and collection information in field notes and on chain-of-custody (label may be placed on outer bag only);
4. Attach sample bottle to grab pole using a Velcro strap;
5. Remove bottle lid, lower bottle into stream, submerge bottle to approximately mid-stream/ mid-depth, fill bottle, raise to surface and replace lid;
6. Place sample on ice and fill out COC form;
7. Collect duplicate samples if needed using the same protocols described above.

Intermediate Container Technique

Samples collected from an open channel for which the introduction of a secondary container is acceptable may be collected with the use of a specially cleaned intermediate container (see cleaning procedure listed below). This technique is not suitable for bacteriological, mercury, oil & grease, or TPH samples.

1. Wear clean gloves when handling bottles and caps;
2. Pre-label sample containers (site code, location, date, time, analysis);
3. Attach specially cleaned borosilicate glass intermediate container to the grab pole using a Velcro strap or plastic cable ties;
4. Submerge intermediate container to mid-stream/mid-depth, let bottle fill, and pour off into individual sample bottles;
5. Place sample on ice, fill out COC form, and deliver to lab;
6. Collect duplicate samples if needed using the same protocols described above.

Peristaltic Pump Grab Technique

Samples for which collection by pumping is acceptable (toxicity) may be collected as follows.

1. Wear clean gloves when handling tubing, bottles, and caps;

2. Pre-label sample containers (site code, location, date, time, analysis);
3. Check ISCO sampler controller countdown display prior to sample collection, so as not to interfere with composite sample collection;
4. Remove the sample tubing from composite bottle and pump sufficient sample through the ISCO sampler to fill sample bottles. This is done by pressing "STOP" on the ISCO sampler, pressing "PUMP FORWARD" to fill the container, and pressing "RESUME SAMPLING" to return to automated compositing. Clean handling techniques must be used when removing the sampling tube from the composite jug, filling the mercury containers, and replacing the tube in the composite jug;
5. Collect duplicate samples if needed using the same protocols described above.

### 9.4 Prior to Leaving the Site

- Add ice to all collected sample coolers
- Conduct general physical inspection of site
- Note reading on outside staff
- Fill out log sheet
- Secure the site

## 10.0 LABORATORIES

### 10.1 Laboratory Coordination

Laboratory staff should be given as much notice as possible of the Program's intent to sample.

### 10.2 Transport to Laboratory

All samples should be kept on ice from the time of sample collection until delivery to the laboratory. Samples must be delivered to the lab well within holding times. See Table 2 for analytical methods, constituent holding times, and laboratory to perform analyses. Delivery/shipping instructions for individual laboratories are listed below

Aquatic Bioassay & Consulting Laboratories, Inc.

Toxicity/TIE samples are to be delivered to Aquatic Bioassay & Consulting Laboratories, Inc. at 29 North Olive Street in Ventura. Keep samples on ice during delivery (coolers supplied by VCWPD).

Contact: Michael Machuzak (805) 643-5621 office or (805) 216-3262 cell

Ventura County HCA Public Health Department Laboratory

Samples to be analyzed for the following constituents are delivered to the Ventura County Public Health Department Laboratory at 3147 Loma Vista Road in Ventura:

Total and fecal coliform, *E. coli* and *Enterococcus* bacteria analyses

Keep samples in ice chests on ice for delivery within 6 hour holding time.

Contact: Susan Benavides (805) 981-5131 office

Weck Laboratories, Inc.

All other samples to be analyzed (all chemical analyses for grab and composite samples) are picked up by courier and delivered to Weck Laboratories, Inc. at 14859 East Clark Avenue in City of Industry.

- Generals (including conventionals, metals, nutrients, anions, oil & grease, TPH, TOC)
- Organics (volatiles, semi-volatiles)
- Pesticides (OC, OP, PCBs, herbicides)

Keep samples in ice chests and on ice for delivery (coolers supplied by Weck).

Contact: Hai Van Nguyen (626) 336-2139 office

## 11.0 DATA MANAGEMENT

### 11.1 Field Data

Wet-Season

Field data from wet-season monitoring events will be recorded into site-specific field notebooks and transferred into an electronic event summary which will be stored on the VCWPD network drive. Information from the event summaries will be compiled in the annual report, which will be submitted to the Regional Board Executive Officer and stored on the VCWPD network drive. Rainfall, stream height, stream flow, and sample time data will be recorded electronically in the controller, rain gauge, sampler head, or ALERT system depending on operational setup. This data will be automatically pushed to a network server when possible, and downloaded onto laptop computers after each event when the automatic pushing feature is unavailable. ISCO data will be uploaded (automatically when possible and manually when not) and stored in the Flowlink® database for at least five years following data generation. Information relevant to the Project will be incorporated into the annual report. VCWPD will retain sampling information for at least five years – seven years for grant funded results – following Project completion.

Dry-Season

Information from the field sheets will be compiled in the annual report, which will be submitted to the Regional Board Executive Officer and stored on the VCWPD network drive.

### 11.2 Laboratory Data

Laboratory data will undergo QA procedures at the laboratory as described in their QA manual and SOPs. Results will include sample ID, date and time of collection, date sample received, date of analysis, analytical method, and where applicable, date of sample preparation, method detection limit and reporting limit. Relevant QA/QC data shall also be provided with results, including any blanks, duplicates, spikes, and reference materials. The toxicity laboratory will provide their results in PDF format, with hard copy available on request. The chemistry laboratory shall provide VCWPD with sample results and analytical data in PDF format and SWAMP-comparable electronic data deliverables (EDDs). The bacteriological laboratory will fax their results and mail a hard copy to VCWPD.

## 11.3 Laboratory Data Review

When the laboratory reports are received following each monitored storm event, and after the pre-season QA/QC sampling, it is important to check the reported data as soon as possible to identify gross errors that may have been committed in the sampling, analysis, or reporting process. This means that the laboratory must first report results in a timely fashion (within three weeks of sample delivery) and then the results must be reviewed immediately upon receipt to allow for re-analysis of questionable (out-of-range) results within the prescribed holding time. The initial screening includes the following checks:

√ Completeness. All laboratory analyses specified in the sampling plan should be requested on the COC forms. All laboratory analyses should likewise be performed as specified in the COC forms. QA/QC analyses should also be checked for completeness. A review of COC forms is necessary to check that this documentation was properly filled out by the field crew and the laboratory check-in attendant.

√ Holding Time. All analyses should be performed within the prescribed holding time.

√ Detection Limits. Detection limits should meet or be lower than the levels agreed upon prior to laboratory submission.

√ Reporting Errors. On occasion laboratories commit typographical errors or send incomplete results. Reported concentrations that appear out of range or inconsistent are indicators of laboratory reporting problems that should be investigated when detected. Examples of this would be a dissolved concentration greater than the corresponding total recoverable concentration, or a constituent concentration that is orders of magnitude different than the same constituent for other events.

Irregularities found in the initial screening process should be immediately reported to the laboratory for clarification or correction. The initial screening process can identify and correct errors that would otherwise cause problems further along in the data evaluation process, or later if the data are used for higher-level analysis. Moreover, re-analysis of out-of-range values can increase confidence in the integrity of questionable data.

## 11.4 Database

Data received from the bacteriological and chemistry laboratories will be inspected for transcription errors and for completeness by VCWPD staff before and during entry into the temporary side of the VCWPD water quality database, where it will undergo further QA analysis by built-in functions within the data base. After the final QA checks for errors are completed, the data will be transferred to the permanent side of the database. Summary tables can be generated from this database for inclusion in the annual report and for upload to CEDEN (California Environmental Data Exchange Network). The database is currently unable to accept toxicity data so toxicity data will be stored on the VCWPD network drive. Each laboratory will retain their data for a period of at least five years from the date of generation. VCWPD will retain all analytical data for an indefinite period of time (a minimum of five years – seven years for grant funded results – following Project completion).

## 11.5 Annual Report

Information from the event summaries and field sheets will be compiled in the annual report, which will be submitted to the Regional Board Executive Officer and stored on the VCWPD network drive for at least seven years – thirty-five years for grant funded results – from the date of generation. The annual report is due on December 15th, each year.

# APPENDIX A

# EMERGENCY PROCEDURES

# HOSPITAL DIRECTIONS

# MONITORING SITE DIRECTIONS

## EMERGENCY PROCEDURES

In the event of a minor injury requiring medical attention, inform the Task Manager and drive to the nearest hospital. The following hospitals are in Ventura County.

**VENTURA**
Community Memorial Hospital
Loma Vista at Brent Street
147 N. Brent Street
Ventura
(805) 652-5018 or 652-5011

Ventura County Medical Center (VCMC)
3291 Loma Vista Road
Ventura
(805) 652-6000

**OJAI**
Ojai Valley Community Hospital
1306 Maricopa Hwy.
Ojai, CA 93023
(805) 646-1401

**THOUSAND OAKS**
Los Robles Hospital & Medical Center
215 West Janss Road
Thousand Oaks, CA 91360
(805) 497-2727

**SANTA PAULA**
VCMC Santa Paula Hospital
825 N 10th Street
Santa Paula, CA 93060-1399
(805) 525-7171

**SIMI VALLEY**
Simi Valley Hospital
2975 North Sycamore Drive
Simi Valley, CA 93065
(805) 955-6000

**OXNARD**
St. John's Regional Medical Center
1600 North Rose Avenue
Oxnard, CA 93030
(805) 988-2500

**CAMARILLO**
St. John's Pleasant Valley Hospital
2309 Antonio Avenue
Camarillo, CA 93010
(805) 389-5800

**CLOSEST HOSPITALS**

ME-CC: St. John's (Oxnard), St. John's (Camarillo)
ME-SCR: St. John's (Oxnard), VCMC Ventura
ME-VR2: VCMC Ventura, Community Memorial Ventura
MO-CAM: St. John's (Camarillo)
MO-FIL: VCMC Santa Paula
MO-HUE: St. John's (Oxnard)
MO-MEI: Ojai Valley Community
MO-MPK: Los Robles (Thousand Oaks), St. John's (Camarillo)
MO-OJA: Ojai Valley Community
MO-OXN: St. John's (Oxnard)
MO-SIM: Simi Valley
MO-SPA: VCMC Santa Paula
MO-THO: Los Robles (Thousand Oaks), St. John's (Camarillo)
MO-VEN: VCMC Ventura, Community Memorial Ventura, St. John's (Oxnard)

## EMERGENCY FACILITY DRIVING DIRECTIONS

In the event of a minor injury requiring medical attention, inform the Task Manager and drive to the nearest hospital. Use the following directions to get to the nearest hospital:

Directions to Ojai Valley Community Hospital (805) 646-1401
The hospital is on the Maricopa Hwy (CA-33)
From the south/east: the hospital is ~ 0.2 miles west of the intersection of CA-33 and W Ojai Avenue. The hospital is on the right.
From the northwest: the hospital is ~ 0.6 miles southeast of the intersection of CA-33 and El Roblar Drive. Make a U-turn at Valle Rio Rd. The hospital will be approximately 200 feet on the right.

Directions to Community Memorial Hospital Ventura (805) 652-5018
US-101. Exit Main Street, go west. After intersection with Telegraph Road, go 0.2 mile.
Turn right on Cabrillo Drive. Hospital will be ~ 0.1 mile on left.

Directions to Ventura County Medical Center Ventura (805) 652-6000
US-101. Exit Main Street, go west.
Right on S Mills St. Go ~ 0.8 mile.
Left on Loma Vista. Hospital will be ~ 0.2 mile on right.

Directions to VCMC Santa Paula Hospital (805) 525-7171
CA-126. Exit CA-150/10th Street. Go north ~ 0.5 mile.
Slight left at N 10th Street. Hospital will be ~0.6 mile on left.

Directions to St. John's Regional Medical Center Oxnard (805) 988-2500
US-101. Exit Rose Avenue. Go south ~ 0.7 mile.
U-turn at Tiesa Lane. Hospital will be ~ 0.1 mile on right.

Directions to Simi Valley Hospital (805) 955-6000
CA-118. Exit Sycamore Drive. Go north ~ 0.6 mile.
Hospital will be on the left.

Directions to St. John's Pleasant Valley Hospital Camarillo (805) 389-5800
CA-118 to CA-34W/Somis Road. Go south ~ 1.8 mile.
Right on Las Posas. Go ~ 0.5 mile.
Right on Antonio Drive ~ 0.2 miles. Hospital will be on the left.

US-101. Exit N Lewis Rd. Go north ~ 2.2 miles.
Left on Las Posas Rd. Go ~ 0.6 mile.
Right on Antonio Drive ~ 0.2 miles. Hospital will be on the left.

Directions to Los Robles Hospital & Medical Center Thousand Oaks (805) 497-2727
CA-23 S. Exit Janss Road. Go west ~ 1.6 miles. Hospital will be on the right.

US-101. Exit Lynn Rd. Go north ~ 1.8 miles.
Right on Janss Road. Go ~ 0.2 mile. Hospital will be on the left.

## SITE-SPECIFIC INFORMATION: MAPS AND DRIVING DIRECTIONS
## Directions from the Saticoy Operations Yard

ME-CC: Calleguas Creek – California State University Channel Islands (CSUCI)
Wells Road/Los Angeles Avenue southeast;
Right on E Vineyard Ave, head southwest;
Left on Central Avenue, head east;
U.S. Highway 101 south;
CA-34/Lewis Road exit;
Left on E Ventura Blvd., head east;
Right on Lewis Road, head south;
Left on University Drive;
Site is on the right after the Calleguas Creek bridge.

ME-VR2: Ventura River – Ojai Valley Sanitary District
Wells Road/Los Angeles Avenue northwest;
CA-126 west;
US-101 north;
CA-33 north,
Exit Canada Larga Road;
Left under the CA-33, head west;
Right on N Ventura Ave, head north;
Left into the Ojai Valley Sanitary District Wastewater Treatment Plant (use caution when crossing bike trail);
Enter WWTP (gate codes located in yellow book for two external gates)
Turn right after entering WWTP and follow road anti-clockwise around perimeter of WWTP (through gate, key to be kept in each VCWPD sampling vehicle) to sampling station.
The site is on the right. [Note: Continue driving around perimeter to exit]

ME-SCR: Santa Clara River – Freeman Diversion
Wells Road/Los Angeles Avenue southeast;
Left on N. Pacific Milling Road (just after Vineyard Avenue);
Enter through the United Water Conservation District gate; Combo number in yellow book;
The site is at the end of the road at the diversion dam (climb stairs and proceed northeast).

MO-CAM: Camarillo – Camarillo Hills Drain
Wells Road/Los Angeles Avenue southeast;
Right on E Vineyard Ave, head southwest;
Left on Central Avenue, head east;
U.S. Highway 101 south;
Exit Las Posas Rd, turn left (head north);
Right on E Daily Drive, head east, keep right at the stop sign;
Site is on the left on the east side of Camarillo Hills Drain, next to the auto dealer.

MO-MEI: Meiners Oaks – Happy Valley Drain

Wells Road/Los Angeles Avenue northwest;
CA-126 west;
US-101 north;
CA-33 north,
Left on CA-150/Baldwin Rd, head west;
Right on Rice Rd, head northeast;
Site is on right, before Lomita Ave.

MO-OJA: Ojai – Fox Canyon Barranca
Wells Road/Los Angeles Avenue northwest;
CA-126 west;
US-101 north;
CA-33 north;
Stay straight onto CA-150/Ojai Avenue.
Right on Fox St, head south;
Park at turning circle before entrance to Ojai Valley Athletic Club (OVAC);
Cross bridge (on foot) and follow channel to the right, site is near the OVAC.

MO-VEN: Ventura – Moon Ditch
Wells Road/Los Angeles Avenue southeast;
Right on E Vineyard Ave, head southwest;
US-101 north;
Exit Johnson, merge onto Northbank Drive;
Right on Johnson Dr, head southeast under US-101;
Road will turn sharply to right and become Leland Dr;
Enter VCWPD flood control gates on right hand side.

MO-FIL: Fillmore – North Fillmore Drain
Wells Road/Los Angeles Avenue northwest;
CA-126 E;
Left on Old Telegraph Rd, head northeast;
Right onto VCWPD access road (keep right) after crossing Santa Clara River, before Shiell Park;
Site is on the left.

MO-MPK: Moorpark – Gabbert Canyon Drain
Wells Road/Los Angeles Avenue/CA-118 southeast;
Turn left to stay on CA-118 E;
Site is on left after N Buttercreek Rd, near the southwestern corner of the Southern California Edison electricity facility.

MO-OXN: Oxnard – El Rio Drain
Wells Road/Los Angeles Avenue southeast;
Right on E Vineyard Ave, head southwest;
Right on N Oxnard Blvd, head north;
Left on Cross Avenue, head west, Cross turns to the right and becomes Saddle Avenue;
Left on Winchester Drive, head west, Winchester turns to the right and becomes Buckaroo Ave.

Site is southwest of the corner of Winchester and Buckaroo, across the railroad tracks and on the southwestern side of El Rio Drain.

MO-HUE: Port Hueneme – Hueneme Drain
Wells Road/Los Angeles Avenue southeast;
Right on E Vineyard Ave, head southwest;
Left on Oxnard Blvd, head south;
Continue onto Saviers Rd, head south;
Right on Hueneme Rd, head west;
Left on Surfside Dr, head south;
Left on Oceanview Dr, head east;
Drive through parking lot and proceed northeast to VCWPD treatment facility. Site is located inside gate.

MO-SPA: Santa Paula – 11th Street Drain
Wells Road/Los Angeles Avenue/CA-118 W northwest;
CA-126 E;
Exit CA-150/Santa Paula/10th Street, turn left under CA-126;
Right on E Harbor Blvd, head northeast;
Right on 12th Street/ South Mountain Rd, head south;
Right on E Santa Maria St;
Left on Corto St;
Enter through gate and proceed southwest to monitoring site.

MO-SIM: Simi Valley – Bus Canyon Drain
Wells Road/Los Angeles Avenue/CA-118 E southeast;
Turn left to stay on CA-118 E;
Right to merge onto CA-118 E;
Exit First street, turn right, head south;
Right on Los Angeles Ave, head west;
Right at 5th St, park in parking lot;
Site is west of the parking lot.

MO-THO: Thousand Oaks – Hill Canyon WWTP
Wells Road/Los Angeles Avenue/CA-118 E southeast;
Turn left to stay on CA-118 E;
Right on CA-34/Somis Rd, head south;
Left at Upland Rd, head east;
Left at Santa Rosa Rd, head east;
Right onto Hill Canyon Fire Rd, head south;
Enter WWTP, take road to right past the drying beds, turn left, follow road down to grey monitoring station house on left (near secondary clarifiers).

# APPENDIX B

# STORMWATER MONITORING PROGRAM

# PHONE TREE

# APPENDIX C

# QUALITY ASSURANCE /QUALITY CONTROL
# SAMPLE CONTAINER PROCEDURES

# COMPOSITE BOTTLE COLLECTION

Exercise caution!

- Wear clean latex gloves and avoid all contaminated surfaces!
- Keep extra gloves within easy reach.

Composite bottle replacement is carried out as follows:

1. Check status of sampler.
2. If the bottle is full the ISCO sampler should read “Done.”
3. If the bottle is not full (as at the end of a storm) the ISCO will read “Sample XX of XX after X pulses.” (Press STOP on the ISCO to avoid accidental sampling.)
4. Open the refrigerator and remove the hole-containing Teflon lid from the bottle.
5. Place a hole-less Teflon lid onto the filled bottle and secure it (wide mouth composite bottles are screw tops, narrow neck bottles must be clamped down).
6. Ensure that the bottle is in a mesh carrier bag.
7. Remove the full sample bottle from the refrigerator and place it in a blue cube cooler.
8. Check that the site label is still attached to the bottle.
9. Fill out the appropriate information on the COC.
10. Ice the full sample bottle in the cube cooler. Secure the bottle inside the vehicle.

# BOTTLE AND EQUIPMENT CLEANING PROCEDURES

## 18.5 L Composite Bottles (carboys)

All sample bottles, lids, tubing, and strainers should be rigorously cleaned prior to use.

Composite sample bottles, lids, and guidance caps will be cleaned at the laboratory after the samples have been poured off. The cleaning process includes laboratory soap (alconox or similar) and nitric acid treatments, interspersed with DI water rinses. [Note: A final treatment with solvent (methanol) will be conducted and bottles will be set to air dry without a DI rinse to prevent organics contamination (including phthalates) for composite bottles to be used at MO-MEI and MO-OJA during Proposition 50 V-1 grant funding (2009/10 – 2010/11 monitoring years)]. Composite sample bottles will be stored between events with their lids on and upper portion covered with clean plastic bags. Guidance caps will be stored in clean plastic bags.

### Tubing, Lids and Strainers

Composite sampling equipment (pump tubing, sampling lines) will be inspected and flushed with 2 liters of distilled water at the completion of each monitoring event and prior to the next monitoring event. [Note: As part of Proposition 50 V-1, MO-MEI and MO-OJA will also be cleaned in situ with 5% nitric acid, deionized water, and solvent (methanol) by VCWPD water quality personnel before the first and second sampling events]. Pump tubing will be replaced when the pump counts approach 1,000,000 revolutions or when inspections show evidence of wear, whichever occurs first.

### Cleaning Solutions

Laboratory soap = 200 ml concentrated Contrad or Alconox per full 10L bottle

1 + 1 $HNO_3$ Acid = 1 part $HNO_3$ acid (16N) to 1 part deionized water.

Methanol = 100% methanol

### Equipment and handling

1. Safety Precautions - All of the appropriate safety equipment must be worn by personnel involved in the cleaning of the bottles due to the corrosive nature of the chemicals being used to clean the bottles and tubing. This safety equipment must include protective gloves, lab coats, chemically resistant aprons, goggles with side shields and respirators. All MSDS must be read and signed off by personnel.
2. Cleaning of equipment must be recorded in the site-specific field notebook, including the day cleaned and procedures used.
3. Powder-free nitrile gloves must be worn while cleaning and handling bottles and equipment. Care must be taken at all times to avoid introduction of contamination from any source.

## BLANK PREPARATION AND COLLECTION SOPS

Note that different types of blank water are used by different labs. Each lab should provide blank water for specified blank samples.

For the following procedures, use gloves and standard "clean" glassware handling procedures. All blank containers should be appropriately labeled. A chain of custody form, including sample date and time, and requested analyses, should be completed for all samples to be analyzed. Blanks should be stored at 4˚C until extraction and analysis.

Tubing and equipment blanks should be analyzed for organics (EPA 625), nitrate + nitrite (EPA 353.2), and total recoverable metals (EPA 200.8).

### Tubing Blanks – Distilled Water Cleaning (Standard)

Tubing blanks are collected prior to the start of the sampling season and after the equipment has been cleaned at one sampling site. Tubing blanks are subjected to analysis for semi- and non-volatile organics (EPA 625), nitrate-nitrite (EPA 353.2) and total recoverable trace metals (EPA 200.8).

The following procedures should be followed for collection of tubing blanks:

1. Label the containers
2. Pump reverse 2 liters of distilled water through the tubing and discard the water.
3. Pump reverse 1 liter of organic-free blank water through the tubing and discard the blank water.
4. Pump 5.5 liters of organic-free blank water into four unpreserved 1-liter amber glass containers for EPA 625 analysis, two 250 ml poly bottles with $HNO_3$ for EPA 200.8 total recoverable metals analysis, and two 500 ml poly bottle with $H_2SO_4$ for EPA 353.2 nitrate + nitrite analysis.
5. Samples must be immediately placed on ice and delivered to the laboratory for analysis (including MS/MSD) within 24 hours of collection.

### Tubing Blanks – Proposition 50 V-1 Cleaning (2010-11 season only)

Tubing blanks are to be collected prior to the start of the sampling season and between the first and second storms after the equipment has been cleaned at one sampling site. Tubing blanks are subjected to analysis for semi- and non-volatile organics (EPA 625), nitrate-nitrite (EPA 353.2) and total recoverable trace metals (EPA 200.8).

The following procedures should be followed for collection of tubing blanks:

1. Attach the calibration line to the sample intake using the 5/8 inch inner-diameter reinforced silicone tubing and hose clamps.
2. Label the containers

3. Pump reverse one liter of distilled water through the system to check for blockages and flush out any large contaminants.
4. Pump reverse one liter of 1% nitric acid through the closed loop for one minute. Collect waste.
5. Flush two liters of high purity deionized water through the system for one minute. Collect rinsate.
6. Pump reverse one liter of methanol through the closed loop for one minute. Collect waste.
7. Pump 5.5 liters of organic-free blank water into four unpreserved 1-liter amber glass containers for EPA 625 analysis, two 250 ml poly bottles with $HNO_3$ for EPA 200.8 total recoverable metals analysis, and two 500 ml poly bottle with $H_2SO_4$ for EPA 353.2 nitrate + nitrite analysis.
8. Samples must be immediately placed on ice and delivered to the laboratory for analysis (including MS/MSD) within 24 hours of collection. Waste nitric, methanol, and rinsate must be returned to the laboratory for disposal.

**Composite Bottle Blanks**

The following procedures describe preparation of composite bottle blanks for analysis of trace metals.

Composite bottle blanks to be analyzed for trace metals use blank water, provided by the lab. To perform a composite bottle blank (cleaning check) of the 18.5 L composite bottles, perform the following steps with a pre-cleaned composite bottle:

1. Fill composite bottle with approximately 7 liters of organic-free blank water.
2. Cap composite bottle with Teflon lid cleaned as specified above, and transfer composite bottle to 4˚C refrigerator, or place in cube cooler with ice, for 24 hours.
3. Label the bottles as directed. Record the sample dates and times on the chain-of-custody form.
4. After the 24 hours have passed, transfer four liters of organic-free blank water into four unpreserved 1-liter amber glass containers for EPA 625 analysis, two 250 ml poly bottles with $HNO_3$ for EPA 200.8 total recoverable metals analysis, and two 500 ml poly bottles with $H_2SO_4$ for EPA 353.2 nitrate + nitrite analysis. Alternatively, the composite bottle may be sent to the laboratory for sample splitting.
5. Samples must be immediately placed on ice and delivered to the laboratory for analysis (including MS/MSD) within 24 hours of collection.

# APPENDIX D

# FIELD LOGS

# CHAIN OF CUSTODY FORMS

**Field Logs**

The field logs are written in “Rite in the Rain”, All-Weather, Horizontal Line, No. 390F, log books. There is a separate book for each station.

The following information should be noted in the entry book:

- Date
- Time of day in military time including PST or PDT designation (Note: ISCO equipment will always be in PST, watches and cell phones may be in PDT or PST, depending on time of year).
- Weather condition:
    - Raining, Sprinkling, Cloudy, Sunny
    - Santa Ana Winds, Windy, Breezy, Calm
    - Cold, Warm, Hot
- Water condition
    - Color, Odor, Debris
    - Erosion/Silting at site
- Persons on site, include other agency personnel if present
- Monitoring Event Number (1 thru 4)
- Instrument Readings
    - Date/Time
    - ISCO 4230 Flowmeter: Level & Flow
    - ISCO 6712 Sampler: Sample number
    - Staff Gage Reading
- Description of activities being performed:
    - Site inspection
    - Programming monitoring equipment
    - Sample Collection
    - Composite bottle(s) volume/quantity verification during monitoring event
    - Terminating sampling (volume collected)
    - Interrogate Instruments
    - Equipment Maintenance

# Wet Season: Yellow Book Templates

## FLOW-PACED SITE TEMPLATES

EVENT SET UP TEMPLATE

10/5/2010 4230 13:00 PST, 1.349', 23 cfs
14:00 PDT o/s = 1.34'
KH, TL, WBC Storm specifications: 1.0" forecast rainfall; 440,000 cf
pacing (include any calculations or relevant notes)
2105c Pulse = 1,000 cf
6712 "Program flow-paced: ME-CC" Flow paced; 1, 18.5 liter bottle; every 440 pulses, no sample at start, 35 samples, 500 ml/sample. Enable: none programmed, repeatable enable, no sample at disable, sample at enable, countdown stopped while disabled, 0 pause and resumes, no delay to start, 24 hour run time. Run Program. "Program disabled 13:00 (PST) Tu 5-OCT" Installed one 18.5 L bottle, lid off, fridge at 4° C.

Battery voltage = 12.4 V

EVENT SET UP TEMPLATE

10/5/2010 4230 13:00 PST, 1.349', 23 cfs
14:00 PDT o/s = 1.34'
KH, TL, WBC Storm specifications: 1.0" forecast rainfall; 440,000 cf
pacing (include any calculations or relevant notes)
2105c Default (note any changes)
6712 "Program flow-paced: ME-CC"
Run default program, 440 pulses
(use checklist and note any differences).
"Program disabled 13:00 (PST) Tu 5-OCT" Installed one 18.5 L bottle, lid off, fridge at 4° C.

Battery voltage = 12.4 V

EVENT VISIT TEMPLATE - GRABS

10/5/2010 4230 21:00 PST, 2.444', 540 cfs
22:00 PDT o/s = 2.44'
KH, TL, WBC 6712 "Sample 10 after 130 pulses" Bottle ~ 5 L, volume good.
Grabs taken at 22:10 PDT pH = 7.86
DO = 68.9 % EC = 1553 uS Sal = 0.9 ppt
DO = 6.31 mg/l $EC_{sp}$ = 1742 uS Temp = 19.3°C
(Note any changes made, any communications with storm control about this site, any special conditions onsite, any issues requiring fixing etc.)
Battery voltage = 12.4 V

EVENT VISIT TEMPLATE - COMPOSITES

10/6/2010 4230 09:00 PST, 1.900', 50 cfs
10:00 PDT o/s = 1.90'
KH, TL, WBC 6712 "Program flow paced is done - Errors have occurred" Sample 21 "No liquid detected"
Composite collected at 10:00 PDT. Bottle ~ 17.5 L
(Note any changes made, any communications with storm control about this site, any special conditions onsite, any issues requiring fixing etc.)
Battery voltage = 12.4 V

6712 Program Checklist:

Flow paced; 1, 18.5 liter bottle; every 440 pulses, no sample at start, 35 samples, 500 ml/sample. Enable: none programmed, repeatable enable, no sample at disable, sample at enable, countdown stopped while disabled, 0 pause and resumes, no delay to start, 24 hour run time.

## TIME-PACED SITE TEMPLATES

EVENT SET UP TEMPLATE

10/5/2010 4230 13:00 PST, 1.349', 23 cfs
14:00 PDT o/s = 1.34'
KH, TL, WBC Storm specifications: 1.0" forecast rainfall; 440,000 cf
pacing (include any calculations or relevant notes)
2105c Default
6712 "Program time-paced: ME-SCR" Time paced; 1, 18.5 liter bottle; every 41 minutes, 35 samples, 500 ml/sample. Enable: none programmed, repeatable enable, no sample at disable, sample at enable, countdown stopped while disabled, 0 pause and resumes, no delay to start, 24 hour run time. Run Program. "Program disabled 13:00 (PST) Tu 5-OCT" Installed one 18.5 L bottle, lid off, fridge at 4° C.

Battery voltage = 12.4 V

EVENT SET UP TEMPLATE

10/5/2010 4230 13:00 PST, 1.349', 23 cfs
14:00 PDT o/s = 1.34'
KH, TL, WBC Storm specifications: 1.0" forecast rainfall; 440,000 cf
pacing (include any calculations or relevant notes)
2105c Default (note any changes)
6712 "Program flow-paced: ME-SCR"
Run default program
(use checklist and note any differences).
"Program disabled 13:00 (PST) Tu 5-OCT" Installed one 18.5 L bottle, lid off, fridge at 4° C.

Battery voltage = 12.4 V

EVENT VISIT TEMPLATE - GRABS

10/5/2010 4230 21:00 PST, 2.444', 540 cfs
22:00 PDT o/s = 2.44'
KH, TL, WBC 6712 "Sample 7 in 00:27:30" Bottle ~ 3.5 L, volume good.
Grabs taken at 22:10 PDT pH = 7.86
DO = 68.9 % EC = 1553 uS Sal = 0.9 ppt
DO = 6.31 mg/l $EC_{sp}$ = 1742 uS Temp = 19.3°C
(Note any changes made, any communications with storm control about this site, any special conditions onsite, any issues requiring fixing etc.)
Battery voltage = 12.4 V

EVENT VISIT TEMPLATE - COMPOSITES

10/6/2010 4230 09:00 PST, 1.900', 50 cfs
10:00 PDT o/s = 1.90'
KH, TL, WBC 6712 "Program time paced is done - Errors have occurred" Sample 21 "No liquid detected"
Composite collected at 10:00 PDT. Bottle ~ 17.5 L
(Note any changes made, any communications with storm control about this site, any special conditions onsite, any issues requiring fixing etc.)
Battery voltage = 12.4 V

6712 Program Checklist:

Time paced; 1, 18.5 liter bottle; every 41 minutes, 35 samples, 500 ml/sample. Enable: none programmed, repeatable enable, no sample at disable, sample at enable, countdown stopped while disabled, 0 pause and resumes, no delay to start, 24 hour run time.

**Dry-Season Data Sheet**

# NPDES Major Outfall Dry Weather Monitoring

## Ventura County Field Data Sheet

Date: _____ At Major Outfall (MO)? YES / NO Site ID: _____

Time: _____ Site Location (if not MO): _____

Sampled By: _____

**Weather Conditions**

- □ Clear
- □ Partly Cloud
- □ Overcast
- □ Showers
- □ Rain
- □ Other
- □ Wind condition _____
- □ Air temp _____ °C / °F

Comments: _____

**Site Description**

- □ Conveyance type _____
- □ Dominant land use _____
- □ Site Elevation _____

**Trash**

General Area:

□ None / Light / Moderate / High

% Organics _____

% Recyclables _____

% Plastics _____

# Large Items _____

# Pieces _____

Stream Banks

□ None / Light / Moderate / High

% Organics _____

% Recyclables _____

% Plastics _____

# Large Items _____

# Pieces _____

**Observations (circle all that apply)**

Water Clarity: Clear / Cloudy / Milky / Muddy / Other

Water Color: Clear / Red / Brown / Yellow / Green / Gray / Other

Odors: None / Sulfur (rotten eggs) / Sewage / Chlorine / Musty / Ammonia / Other _____

Floatables: None/ Sheen/ Oily Sheen/ Garbage/ Sewage/ Other

Foam (color/height/consistency/%coverage): _____

Stains/Deposits: _____

Structural Condition: _____

Vegetation Condition: _____

Biology: _____

Algae: (Color/% Coverage in Stream):

- □ Suspended _____
- □ On Substrate

**Chemistry**

| | | |
|---|---|---|
| Dissolved Oxygen | _____ | % |
| Dissolved Oxygen | _____ | mg/L |
| Conductivity | _____ | µS / mS |
| Specific Conductance | _____ | µS / mS |
| Salinity | _____ | ppt / ppm |
| Water Temperature | _____ | °C |
| pH | _____ | [H+] |

Turbidity: 1 _____

2 _____

3 _____

Average: _____

**Estimated Flow**

□ Flowing / Ponded

- □ Water width _____ ft / m
- □ Water depth _____ ft / m
- □ Flow velocity _____ $fts^{-1}$
- □ Flow rate _____ $cfs^{-1}$

**Laboratory Samples**

- □ Bacteriological (total coliform and E. coli)
- □ Dissolved Metals (lead, zinc, copper)
- □ Total Hardness
- □ Total Organic Carbon (TOC)

**Photos**

- □ Upstream/downstream, general area

# Chain of Custody Record

**Ventura County Watershed Protection District**

**NPDES Stormwater Monitoring Program**

**Grabs - Week Laboratories (SIDE 1 of 2)**

Sampling Date: _____ Sample Event: _____

Sampling Team: _____

| SAMPLE ID | DATE/TIME COLLECTED | Oil & Grease; O&G-NP (EPA 1664A) | Cyanide (EPA 335.4) | MTBE & 2CLEVE (EPA 524.2) | Travel Blanks (EPA 524.2)-only analyze if hits | Mercury (EPA 245.1) | | | | | | | | Number of Bottles | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | Lab to select samples for MS/MSD where extra volume permits (all test methods) excluding travel blanks. |
| ME-CC | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| ME-SCR | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| ME-VR2 | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| MO-CAM | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| MO-OJA | | 3 | 1 | 3 | 1 | 1 | | | | | | | | 9 | |
| MO-MEI | | 3 | 1 | 3 | 1 | 1 | | | | | | | | 9 | |
| MO-VEN | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| MD-1 | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| | | | | | | | | | | | | | | | |

Relinquished Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Received Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Other Notes: Please run 524.2 on travel blanks only if constituents detected in orginal analysis

# Chain of Custody Record

## Ventura County Watershed Protection District

## NPDES Stormwater Monitoring Program

### Grabs - Week Laboratories (SIDE 2 of 2)

Sampling Date: _____ Sample Event: _____

Sampling Team: _____

| SAMPLE ID | DATE/TIME COLLECTED | Oil & Grease; O&G-NP (EPA 1664A) | Cyanide (EPA 335.4) | MTBE & 2CLEVE (EPA 524.2) | Travel Blanks (EPA 524.2)-only analyze if hits | | | | | | | | | Number of Bottles | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | Lab to select samples for MS/MSD where extra volume permits (all test methods) excluding travel blanks. |
| MO-SPA | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| MO-FIL | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| MO-SIM | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| MO-MPK | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| MO-THO | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| MO-OXN | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| MO-HUE | | 3 | 1 | 3 | 1 | | | | | | | | | 8 | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Relinquished Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Received Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Other Notes: Please run 524.2 on travel blanks only if constituents detected in orginal analysis

# Chain of Custody Record

**Ventura County Watershed Protection District**

**NPDES Stormwater Monitoring Program**

**Composites - Week Laboratories (SIDE 1 of 2)**

Sampling Date: _____ Sample Event: _____

Sampling Team: _____

| SAMPLE ID | DATE/TIME COLLECTED | Barium, total | Chlorine Residual | NO3-N | Metals, total & dissolved (+ Hardness) | Cr+6 | BOD, COD, MBAS, TKN, Ammonia, TOC | NO3+NO2 (353.2), Cl, F (300.0), Phenolics | Phosphorus-P Total & Dissolved | 625-CTR, 8270SIM-PAH, 8270SIM-Phenols * | 515.3-Herb 547-Glyphosate, 608-CTR | 525.2 Reg+507, 525-OPP-LL | ALK, CLO4, Turb, TDS, TSS, VSS, Cond | Number of Bottles | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ME-CC | | X | X | X | X | X | X | X | X | X | X | X | X | 1 | |
| ME-SCR | | X | | | X | X | X | X | X | X | X | X | X | 1 | |
| ME-VR2 | | | | X | X | X | X | X | X | X | X | X | X | 1 | |
| MO-CAM | | | | | X | X | X | X | X | X | X | X | X | 1 | |
| MO-OJA | | | | X | X | X | X | X | X | X | X | X | X | 1 | |
| MO-MEI | | | | X | X | X | X | X | X | X | X | X | X | 1 | |
| MO-VEN | | | | | X | X | X | X | X | X | X | X | X | 1 | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Metals by200.8, Total & Dissolved:
Sb, Ag, Al, As, Be, Cd, Cr, Cu, Fe, Ni, Pb, Se, Tl, Zn, Hg

Metals by 200.7, Total (only):
Ca, Mg (for Hardness calc.)

608 include alpha- & gamma-chlordane

* Same extraction with low-level spike for 3 methods: 625CTR, 8270SIM-PAH, & 8270SIM-PHENOLS

Lab to select samples for MS/MSD where extra volume permits (all test methods)

Relinquished Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Received Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Other Notes: Filter for dissolved metals and perform conductivity analyses immediately.

# Chain of Custody Record

## Ventura County Watershed Protection District

## NPDES Stormwater Monitoring Program

## Composites - Week Laboratories (SIDE 2 of 2)

Sampling Date: _____ Sample Event: _____

Sampling Team: _____

| SAMPLE ID | DATE/TIME COLLECTED | | | | Metals, total & dissolved (+ Hardness) | Cr+6 | BOD, COD, MBAS, TKN, Ammonia, TOC | NO3+NO2 (353.2), Cl, F (300.0), Phenolics | Phosphorus-P Total & Dissolved | 625-CTR, 8270SIM-PAH, 8270SIM-Phenols * | 515.3-Herb 547-Glyphosate, 608-CTR | 525.2 Reg+507, 525-OPP-LL | ALK, CLO4, Turb, TDS, TSS, VSS, Cond | Number of Bottles | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MO-SPA | | | | | X | X | X | X | X | X | X | X | X | 1 | |
| MO-FIL | | | | | X | X | X | X | X | X | X | X | X | 1 | |
| MO-SIM | | | | | X | X | X | X | X | X | X | X | X | 1 | |
| MO-MPK | | | | | X | X | X | X | X | X | X | X | X | 1 | |
| MO-THO | | | | | X | X | X | X | X | X | X | X | X | 1 | |
| MO-OXN | | | | | X | X | X | X | X | X | X | X | X | 1 | |
| MO-HUE | | | | | X | X | X | X | X | X | X | X | X | 1 | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Metals by200.8, Total & Dissolved:
Sb, Ag, Al, As, Be, Cd, Cr, Cu, Fe, Ni, Pb, Se, Tl, Zn, Hg

Metals by 200.7, Total (only):
Ca, Mg (for Hardness calc.)

608 include alpha- & gamma-chlordane

* Same extraction with low-level spike for 3 methods: 625CTR, 8270SIM-PAH, & 8270SIM-PHENOLS

Lab to select samples for MS/MSD where extra volume permits (all test methods)

Relinquished Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Received Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Other Notes: Filter for dissolved metals and perform conductivity analyses immediately.

# Chain of Custody Record

## Ventura County Watershed Protection District

## NPDES Stormwater Monitoring Program

### Bacteriological - VCHCA Lab

Sampling Date: _____ Sample Event: _____

Sampling Team: _____

| LAB USE ONLY | SAMPLE ID | DATE/TIME COLLECTED | Total Coliform (25 Tube Method - MPNX) | Fecal Coliform (25 Tube Method - MPNX) | Enterococcus (Tray Method - WQ IDEXX) | *E. coli* (Tray Method - WQ IDEXX) | Total Coliform (Tray Method - WQ IDEXX) | | | Number of Bottles | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ME-CC | | X | X | X | X | X | | | 1 | |
| | ME-SCR | | X | X | X | X | X | | | 1 | |
| | ME-VR2 | | X | X | X | X | X | | | 1 | |
| | MO-CAM | | X | X | | X | X | | | 1 | |
| | MO-OJA | | X | X | | X | X | | | 1 | |
| | MO-MEI | | X | X | | X | X | | | 1 | |
| | MO-VEN | | X | X | | X | X | | | 1 | |
| | MD-1 | | X | X | | X | X | | | 1 | |
| | | | | | | | | | | | |

Relinquished Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Received Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Other Notes: Perform bacteriological analyses within 6 hours of sample collection time

# Chain of Custody Record

## Ventura County Watershed Protection District

## NPDES Stormwater Monitoring Program

### Bacteriological - VCHCA Lab

Sampling Date: _____ Sample Event: _____

Sampling Team: _____

| LAB USE ONLY | SAMPLE ID | DATE/TIME COLLECTED | Total Coliform (25 Tube Method - MPNX) | Fecal Coliform (25 Tube Method - MPNX) | Enterococcus (Tray Method - WQ IDEXX) | *E. coli* (Tray Method - WQ IDEXX) | Total Coliform (Tray Method - WQ IDEXX) | | | Number of Bottles | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MO-SPA | | X | X | | X | X | | | 1 | |
| | MO-FIL | | X | X | | X | X | | | 1 | |
| | MO-SIM | | X | X | | X | X | | | 1 | |
| | MO-MPK | | X | X | | X | X | | | 1 | |
| | MO-THO | | X | X | | X | X | | | 1 | |
| | MO-OXN | | X | X | | X | X | | | 1 | |
| | MO-HUE | | X | X | | X | X | | | 1 | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Relinquished Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Received Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Other Notes: Perform bacteriological analyses within 6 hours of sample collection time

# Chain of Custody Record

**Ventura County Watershed Protection District**
**NPDES Stormwater Monitoring Program**

**Toxicity - ABC Laboratories**

Sampling Date: _____ Sample Event: _____

Sampling Team: _____

| SAMPLE ID | DATE/TIME COLLECTED | Chronic toxicity - topsmelt (*Atherinops affinis*) | Chronic toxicity - inland silverside (*Menidia beryllina*) | Chronic toxicity - giant kelp (*Macrocystis pyrifera*) | Chronic toxicity - purple sea urchin (*Strongylocentrotus purpuratus*) | Chronic toxicity - fathead minnow (*Pimephales promelas*) | Chronic toxicity - daphnid (*Ceriodaphnia dubia*) | Chronic toxicity - green alga (*Raphidocelis subcspitata*) | Number of 5-Gallon Buckets | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| ME-CC | | X | | | | | | | 2 | Note 1, Note 2, Note 3 |
| ME-SCR | | | | | X | | | | 1 | Note 1, Note 2 |
| ME-VR2 | | X | | | | | | | 2 | Note 1, Note 2, Note 3 |
| MO-CAM | | | | | | X | | | 2 | Note 1, Note 2 |
| MO-OJA | | | | | | X | | | 2 | Note 1, Note 2 |
| MO-MEI | | | | | | X | | | 2 | Note 1, Note 2 |
| MO-VEN | | | | | | | X | | 1 | Note 1, Note 2 |
| | | | | | | | | | | |
| | | | | | | | | | | |

Relinquished Printed Name _____

Signature _____

Affiliation _____ Date/Tim _____

Received Printed Name _____

Signature _____

Affiliation _____ Date/Tim _____

Other Notes: Note 1: Dilutions - 6.25%, 12.5%, 25%, 50%, 100% Note 2: Please execute TIE if mortality > 50%

Note 3: Only run toxicity tests if topsmelt is available for side-by-side comparison.

# Chain of Custody Record

**Ventura County Watershed Protection District**
**NPDES Stormwater Monitoring Program**

**Toxicity - ABC Laboratories**

Sampling Date: _____ Sample Event: _____

Sampling Team: _____

| SAMPLE ID | DATE/TIME COLLECTED | Chronic toxicity - topsmelt (*Atherinops affinis*) | Chronic toxicity - inland silverside (*Menidia beryllina*) | Chronic toxicity - giant kelp (*Macrocystis pyrifera*) | Chronic toxicity - purple sea urchin (*Strongylocentrotus purpuratus*) | Chronic toxicity - fathead minnow (*Pimephales promelas*) | Chronic toxicity - daphnid (*Ceriodaphnia dubia*) | Chronic toxicity - green alga (*Raphidocelis subcapitata*) | Number of 5-Gallon Buckets | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| MO-OXN | | | | | | X | X | X | 2 | Note 1, Note 2 |
| MO-HUE | | | | | | X | X | X | 2 | Note 1, Note 2 |
| MO-THO | | | | | | X | X | X | 2 | Note 1, Note 2 |
| MO-MPK | | | | | | X | X | X | 2 | Note 1, Note 2 |
| MO-SIM | | | | | | X | X | X | 2 | Note 1, Note 2 |
| MO-FIL | | | | | | X | X | X | 2 | Note 1, Note 2 |
| MO-SPA | | | | | | X | X | X | 2 | Note 1, Note 2 |
| | | | | | | | | | | |
| | | | | | | | | | | |

Relinquished Printed Name _____

Signature _____

Affiliation _____ Date/Tim _____

Received Printed Name _____

Signature _____

Affiliation _____ Date/Tim _____

Other Notes: Note 1: Dilutions - 6.25%, 12.5%, 25%, 50%, 100%

Note 2: Please execute TIE if mortality > 50%

# Chain of Custody Record

## Ventura County Watershed Protection District

## NPDES Stormwater Monitoring Program

### Equipment - Weck Laboratories

Sampling Date: _____ Sample Event: _____

Sampling Team: _____

| EQUIPMENT | Clean with detergent and HNO3 | Clean with detergent, HNO3, and methanol* | No action required | | NOTES |
|---|---|---|---|---|---|
| 18.5 L carboy and lid | | | | | Please place tape or plastic bag over top and note on wrap if bottle was cleaned with methanol. |
| Blue cube cooler | | | | | |
| Black bags | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Relinquished Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Received Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Other Notes: * Please clean with detergent, nitric, and methanol and **do not** rinse after methanol step (allow to air dry after methanol cleaning to avoid organics contamination). Record which bottles were cleaned with methanol.

# Chain of Custody Record

## Ventura County Watershed Protection District

## NPDES Stormwater Monitoring Program

### Equipment - Weck Laboratories

Sampling Date: _____ Sample Event: _____

Sampling Team: _____

| EQUIPMENT | Clean with detergent and HNO3 | Quantities of Waste for disposal | No action required | | NOTES |
|---|---|---|---|---|---|
| 18.5 L carboy and lid | 1 | | | | Please place tape or plastic bag over top to indicate bottle has been cleaned. |
| 10 L pickle jars and lids | 6 | | | | Please place tape or plastic bag over top to indicate bottle has been cleaned. |
| Blue cube cooler | | | 1 | | |
| Black bags | | | 1 | | |
| Clear plastic storage containers with red lids | | | 2 | | |
| | | | | | |
| Waste methanol | | 2 L | | | |
| Waste 1% nitric acid | | 3 L | | | |
| Waste ultrapure DI water | | 4 L | | | may contain traces of nitric acid |

Relinquished Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Received Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Other Notes: _____

_____

# Chain of Custody Record

## Ventura County Watershed Protection District

## NPDES Stormwater Monitoring Program

### Pre-season - Week Laboratories

Sampling Date: _____ Sample Event: _____

Sampling Team: _____

| SAMPLE ID | DATE/TIME COLLECTED | | 625-CTR* | NO3+NO2 (353.2) | Metals, total | | | Please dispose of contents | | | | | Number of Bottles | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | Metals by200.8, Total: Sb, Ag, Al, As, Be, Cd, Cr, Cu, Fe, Ni, Pb, Se, Tl, Zn, Hg |
| MD-1A (pre) | | | X | | | | | | | | | | 4 | |
| MD-1B (post) | | | X | X | X | | | | | | | | 6 | |
| MD-1C (comp) | | | X | X | X | | | | | | | | 1 | |
| MD-1D (sop) | | | X | X | X | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Waste methanol | | | | | | | | | | | | | | |
| Waste 1% HNO3 | | | | | | | | | | | | | | |
| Waste DI water | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

Relinquished Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Received Printed Name _____

Signature _____

Affiliation _____ Date/Time _____

Other Notes: Please use for MS/MSD analysis when sample volume permits.

# APPENDIX E

# VOLUME TO SAMPLE TABLES

# &

# SAMPLER PACING GRAPHS

# PACING TABLES AND GRAPHS

Volume to sample tables for the mass emission stations and graphs showing sampler pacing as a function of rainfall for each major outfall station are located in this appendix.

## Flow-Paced Mass Emission Stations

### Volume to Sample – Rainfall Runoff Tables

Volume to Sample rainfall runoff tables generated from volume/precipitation linear regression graphs are provided for the purpose of programming automated samplers. The tables have been developed based on historical data and are provided for dry, moderate and wet antecedent conditions. Volumetric values that once programmed into the automated samplers will trigger automated sample collection can be determined based on a forecasted quantity of precipitation and the required sample volume. These tables are to be used as a guide along with best engineering judgment in determining the programming of the automated samplers.

## Flow-Paced Major Outfall Stations

### Sampler Pacing – Rainfall Runoff Graphs

Graphs showing pacing as a function of rainfall and runoff, both predicted and observed, are provided for the purpose of programming automated samplers. The predicted curves were developed by the VCWPD hydrology section based on historical and geological data. The curves will be updated and refined through the collection of observed data for each storm. The aim is to determine volumetric values that can be programmed into the automated samplers to trigger automated sample collection based on a forecasted quantity of precipitation

# 2009-2010 Monitoring Year
# Quick Reference Chart

**ME-CC**

| **Flow Paced Sample Collection** | **0.25** | **0.38** | **0.50** | **0.75** | **1.00** | **1.25** | **1.50** | **FORECAST PRECIPITATION** |
|---|---|---|---|---|---|---|---|---|
| Total VolumeTo Be Collected (ml) | 17,500 | | | | | | | |
| Number of Grab Samples | 35 | | | | | | | |
| Sample Volume/Grab (ml) | 500 | | | | | | | |
| **DRY** | | | | | | | | |
| Grab Flow Rate Trigger/500 ml sample (cf) | 277,778 | 416,666 | 555,555 | 833,333 | 1,111,110 | 1,388,888 | 1,666,665 | |
| **MODERATE** | | | | | | | | |
| Grab Flow Rate Trigger/500 ml sample (cf) | 416,665 | 624,999 | 833,333 | 1,249,998 | 1,666,665 | 2,083,333 | 2,500,000 | |
| **WET** | | | | | | | | |
| Grab Flow Rate Trigger/500 ml sample (cf) | 1,388,888 | 2,083,333 | 2,777,778 | 4,166,665 | 5,555,555 | 6,944,443 | 8,333,333 | |

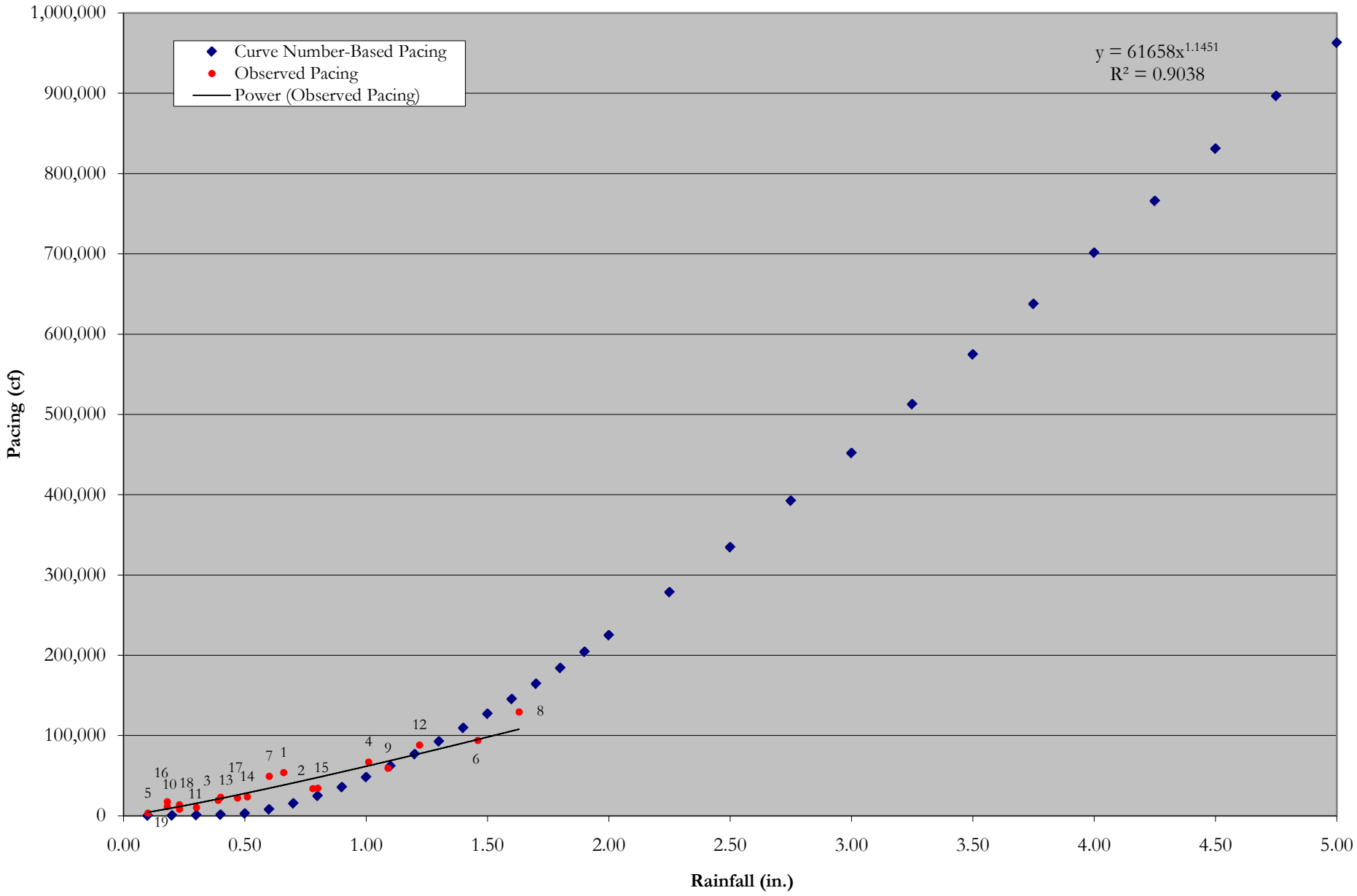
**ME-VR2**

| **Flow Paced Sample Collection** | **0.25** | **0.38** | **0.50** | **0.75** | **1.00** | **1.25** | **1.50** | **FORECAST PRECIPITATION** |
|---|---|---|---|---|---|---|---|---|
| Total VolumeTo Be Collected (ml) | 17,500 | | | | | | | |
| Number of Grab Samples | 35 | | | | | | | |
| Sample Volume/Grab (ml) | 500 | | | | | | | |
| **DRY** | | | | | | | | |
| Grab Flow Rate Trigger/500 ml sample (cf) | 21,428 | 32,142 | 42,857 | 68,067 | 85,713 | 107,142 | 128,571 | 500 mL Grab volume @450 mL due to auxilary pump. |
| **MODERATE** | | | | | | | | |
| Grab Flow Rate Trigger/500 ml sample (cf) | 107,142 | 160,714 | 214,285 | 321,427 | 428,571 | 535,713 | 642,857 | 500 mL Grab volume @450 mL due to auxilary pump. |
| **WET** | | | | | | | | |
| Grab Flow Rate Trigger/500 ml sample (cf) | 1,071,428 | 1,607,142 | 2,142,856 | 3,214,284 | 4,285,714 | 5,357,142 | 6,428,571 | 500 mL Grab volume @450 mL due to auxilary pump. |

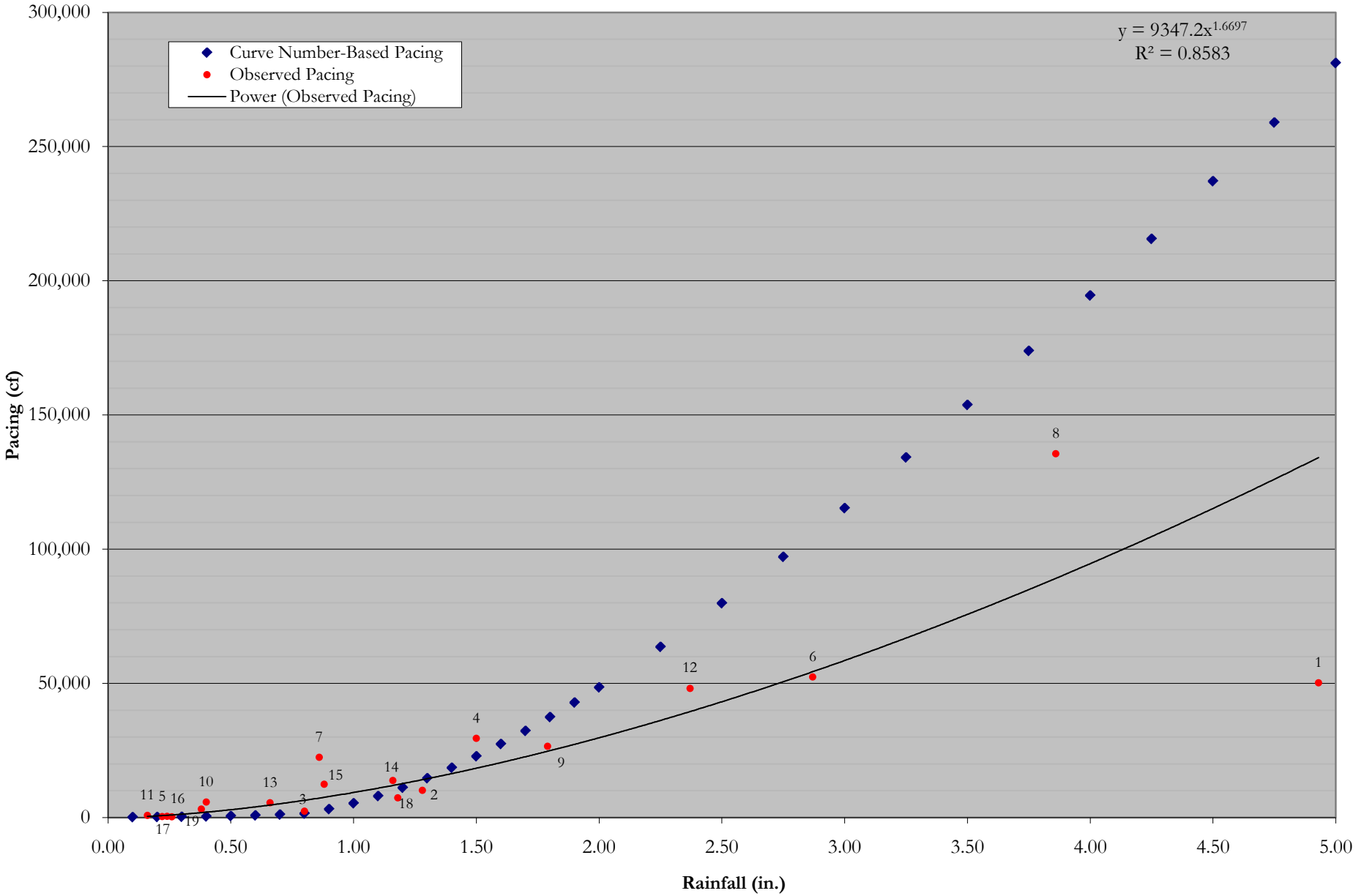
**ME-SCR**

| | **12 hr** | **24 hr** | **36 hr** | **48 hr** | **72 hr** | **96 hr** | |
|---|---|---|---|---|---|---|---|
| **Time Paced Sample Collection** | | | | | | | |
| Total VolumeTo Be Collected (ml) | 17,500 | | | | | | |
| Number of Grab Samples | 35 | | | | | | |
| Sample Volume/Grab (ml) | 500 | | | | | | |
| Grab Sample Time Interval (minutes) | **21** | **41** | **62** | **82** | **123** | **64** | |

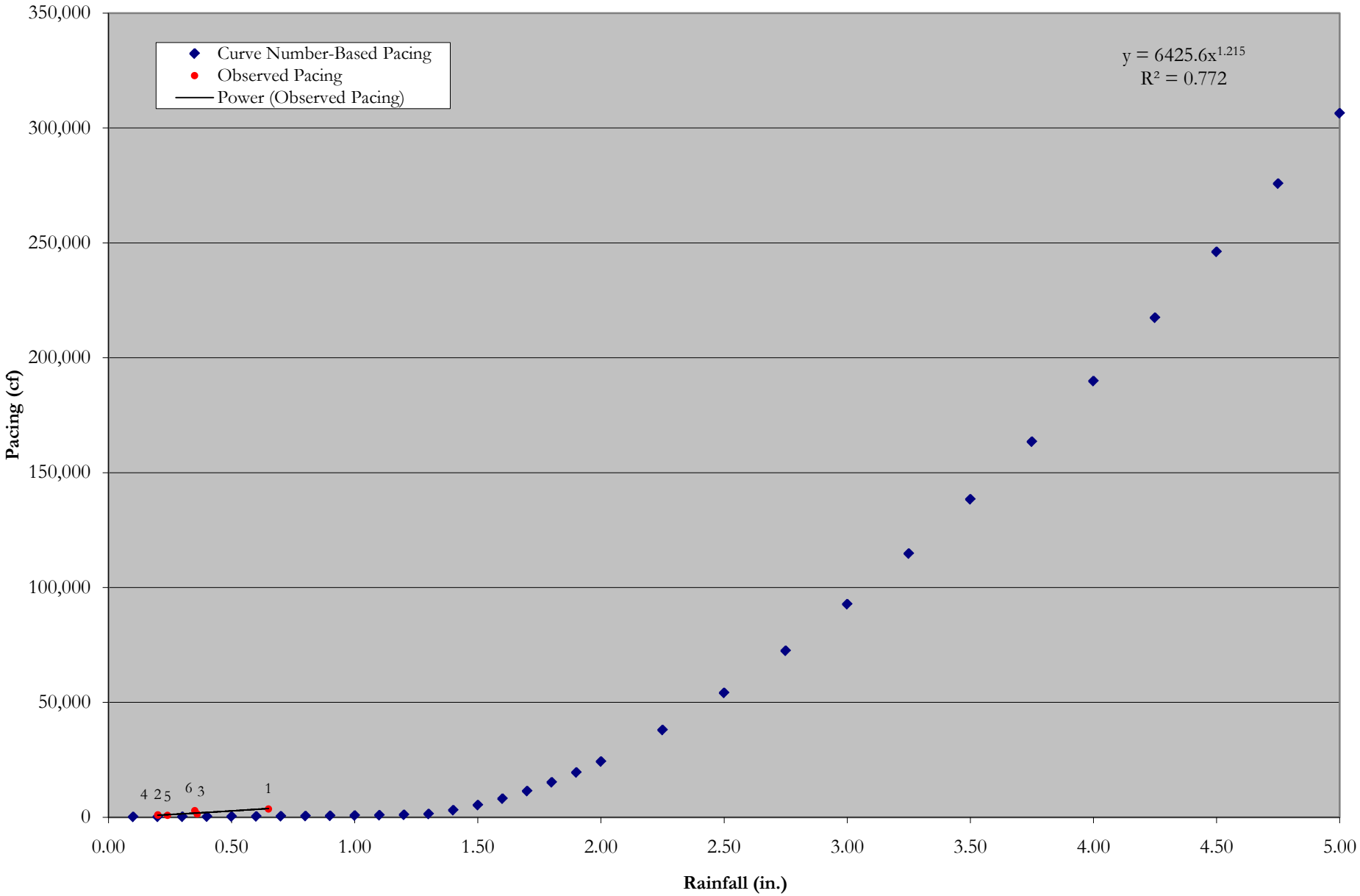
**Rainfall-Runoff**
**Camarillo-1**



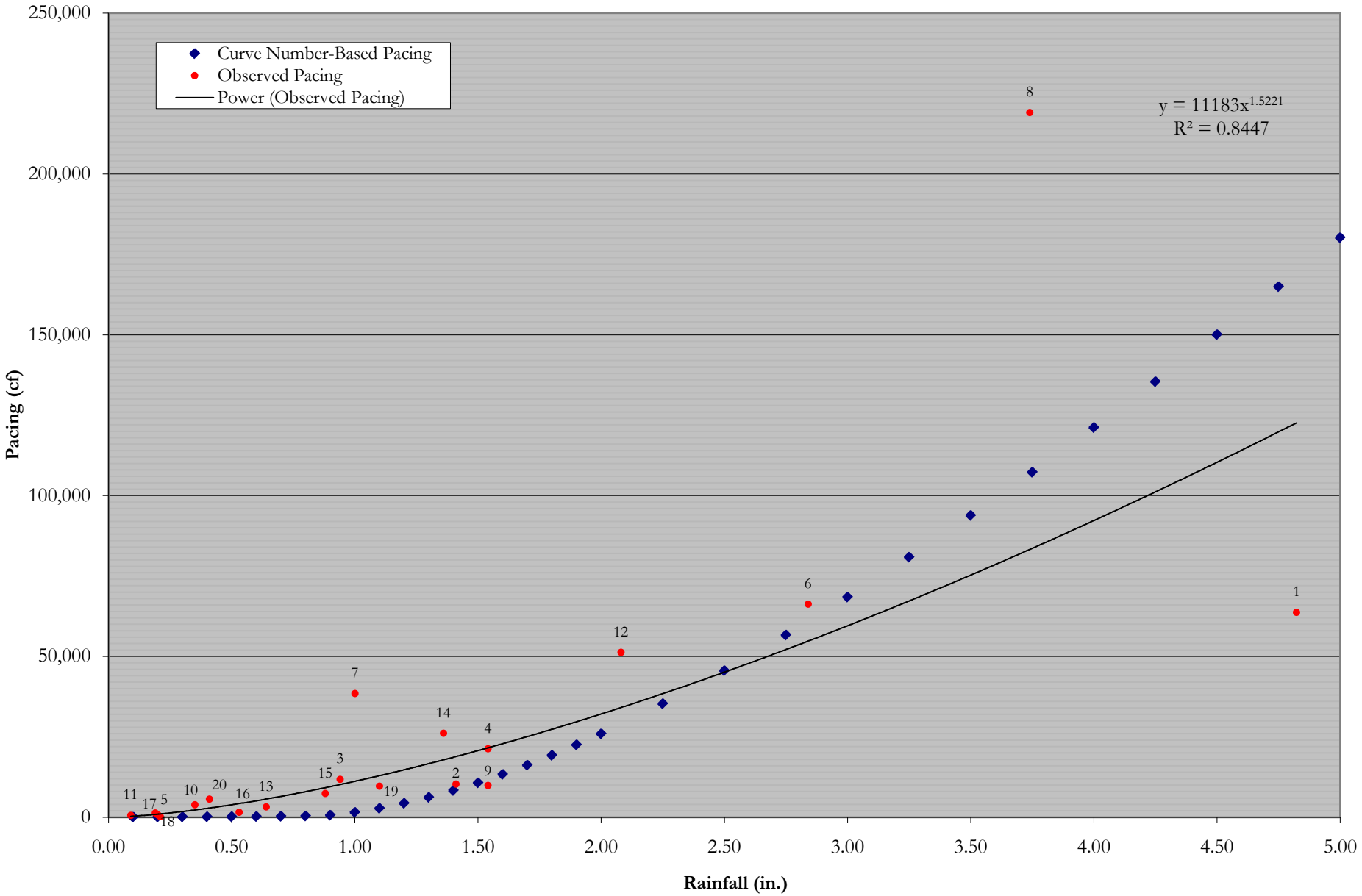
**Rainfall-Runoff**
**Meiners Oaks-1**



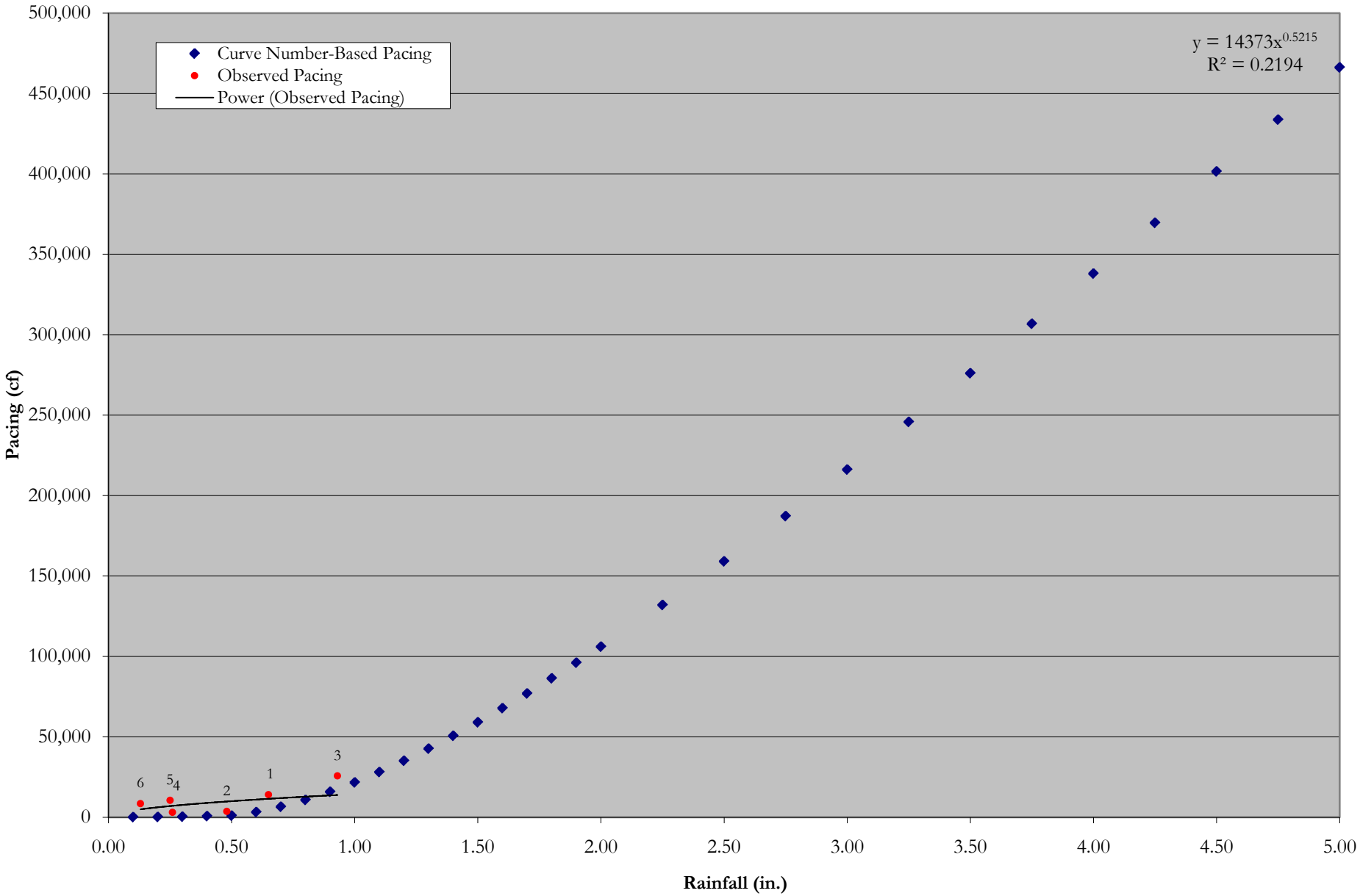
**Rainfall-Runoff**
**Moorpark-1**



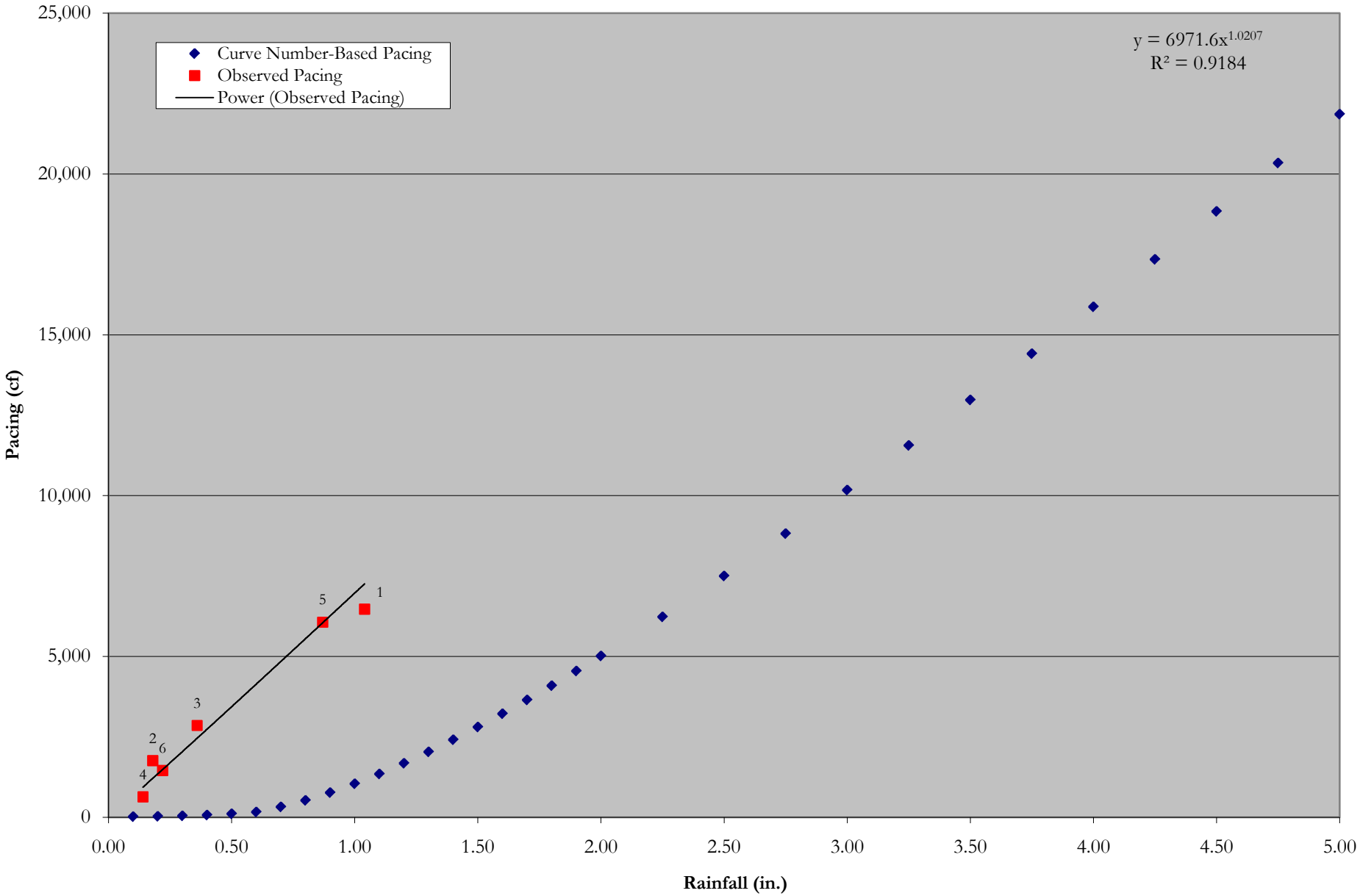
**Rainfall-Runoff**
**Ojai-1**



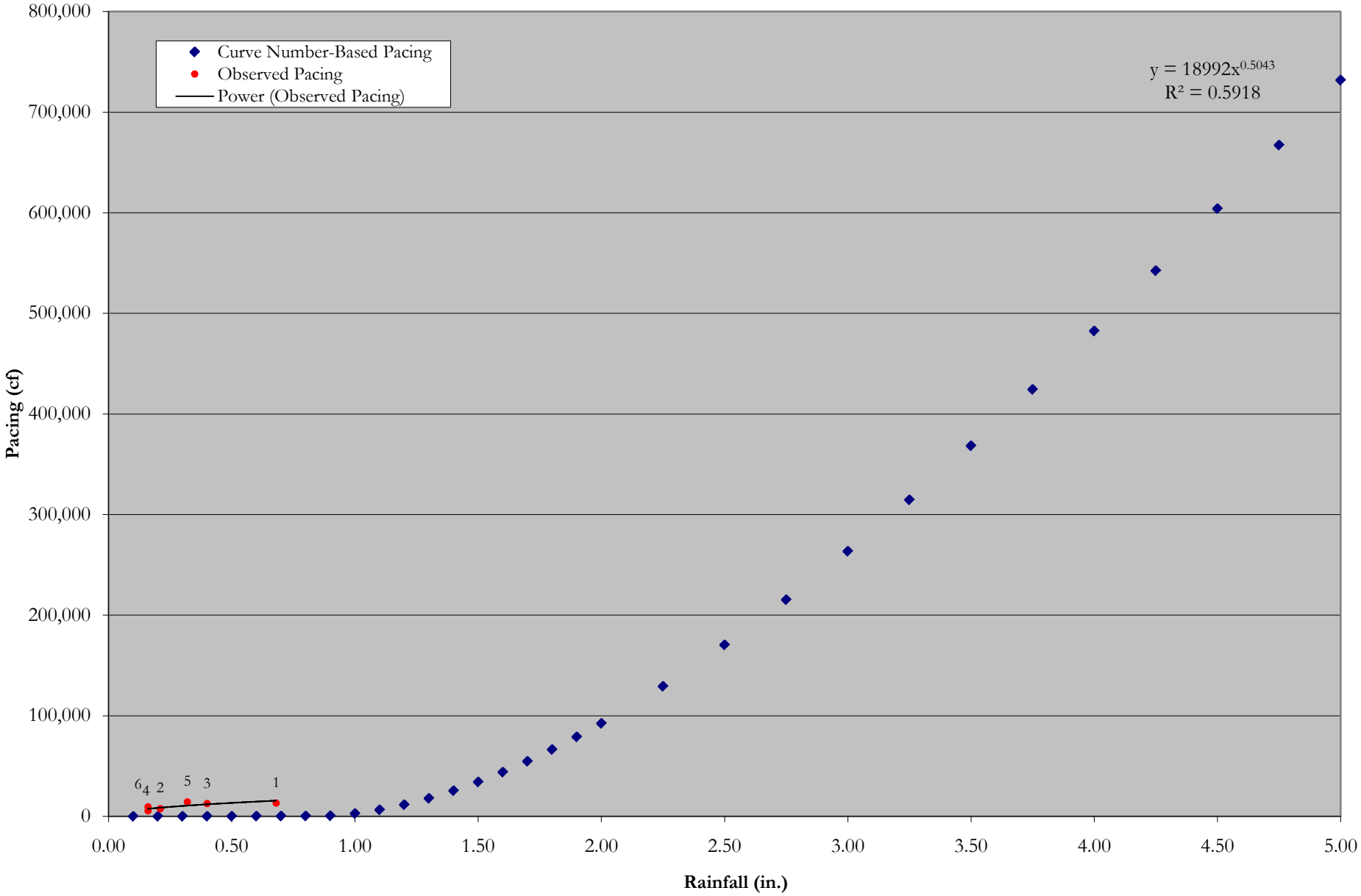
**Rainfall-Runoff**
**Oxnard-1**



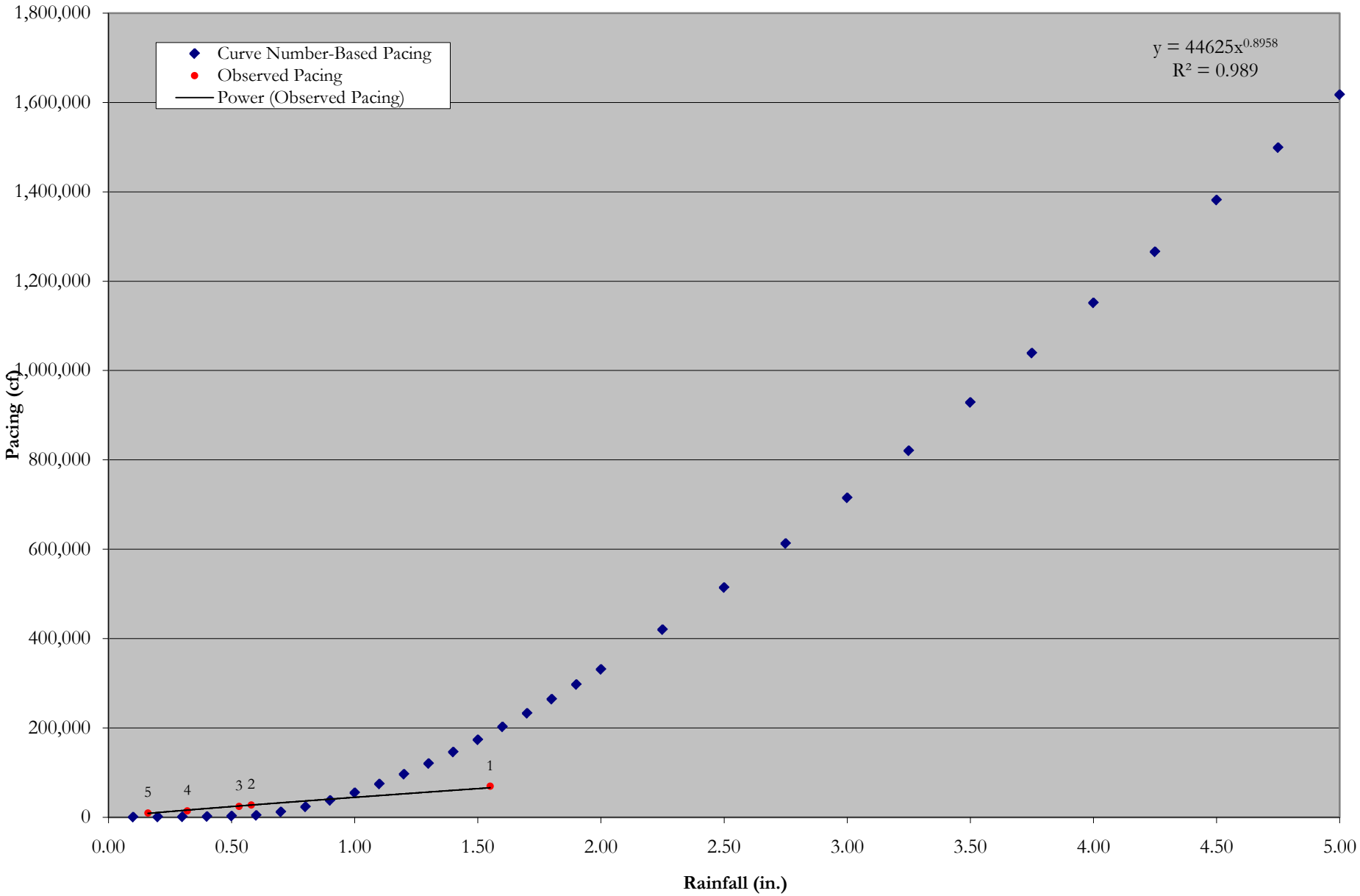
**Rainfall-Runoff**
**Santa Paula-1**



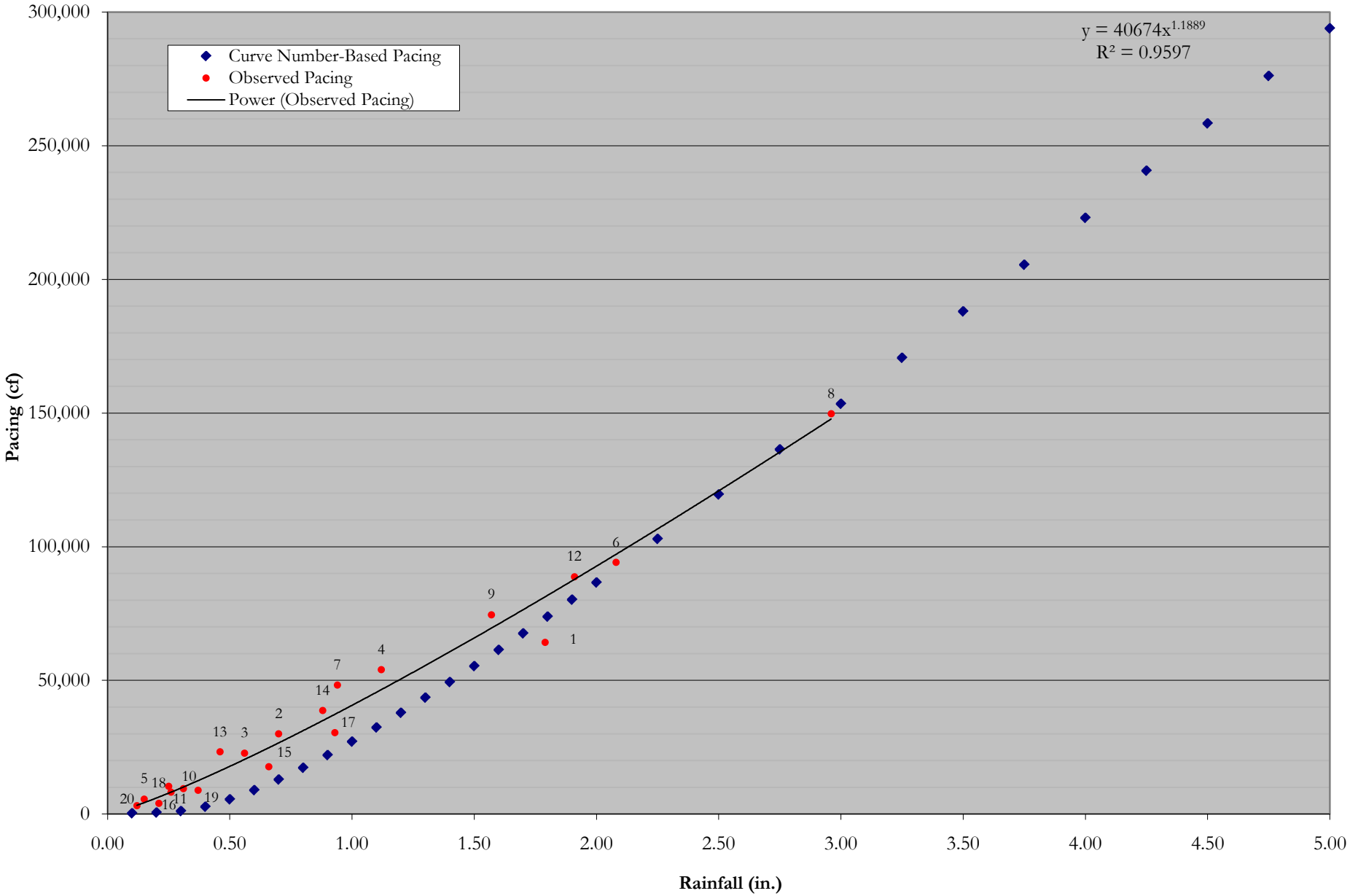
**Rainfall-Runoff**
**Simi Valley-1**



**Rainfall-Runoff**
**Thousand Oaks-1**



**Rainfall-Runoff**
**Ventura-1**



# APPENDIX F

# VCWPD PROGRAMMING INSTRUCTIONS FOR ISCO 2105c INTERFACE MODULE

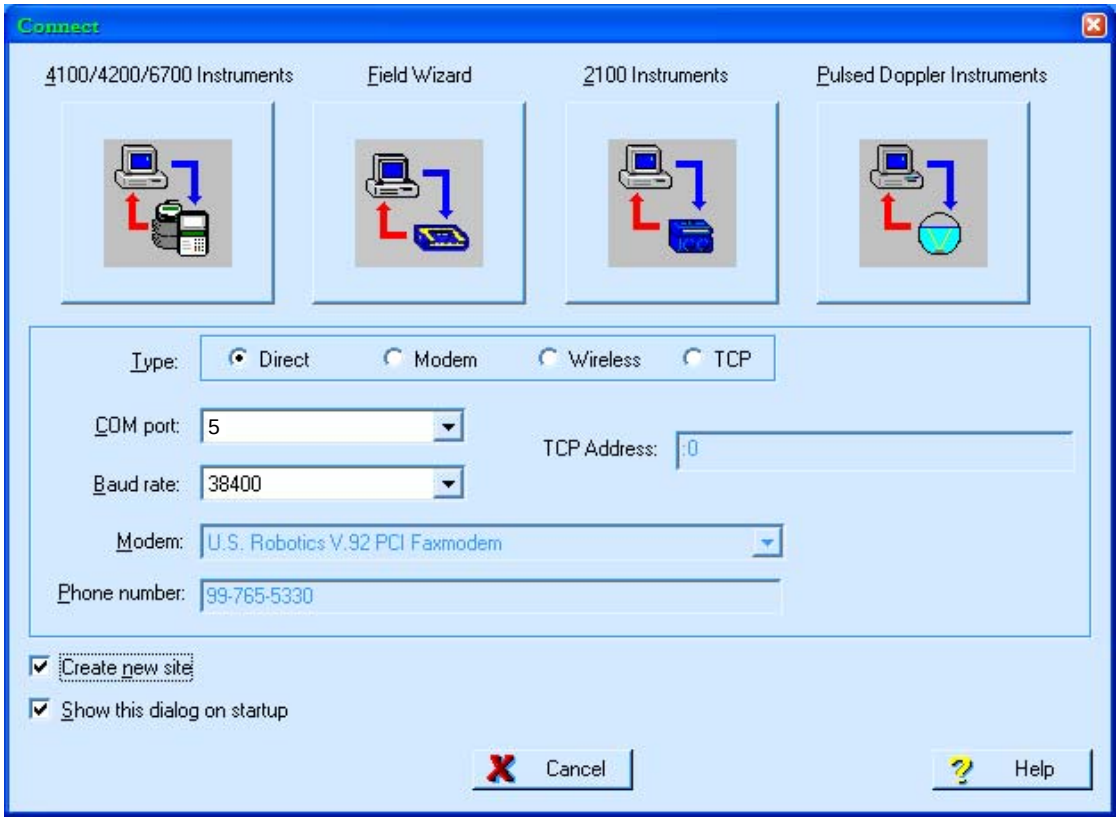
# 2105c Programming Steps

**Document location on network:**

K:\WQ\Water Quality Section\NPDES Monitoring\Equipment\ISCO\Protocols - Setup & Programming\2105c Programming Steps.doc

## Initial Creation of 2105c Site in Flowlink

- Start > Flowlink 5.1
- File > Quick Connect (F11)
- Type: Direct
- COM port: 5
- Baud rate: 38400
- Create new site: checked
-2100 instrument button



**Modbus Tab for 4230 Bubbler**

Protocol setup

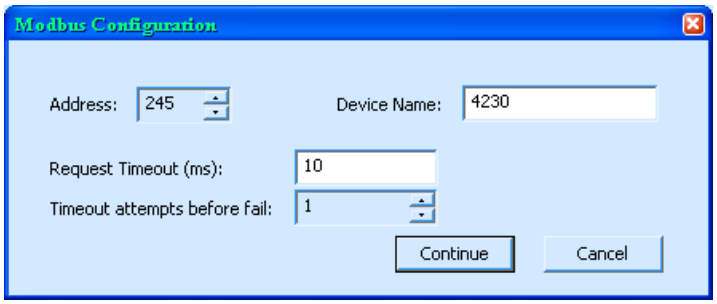
- Protocol Type: ASCII
- Baud rate: 9600
- Bits: 8
- Parity: none
- Stop bits: 1
- New device button

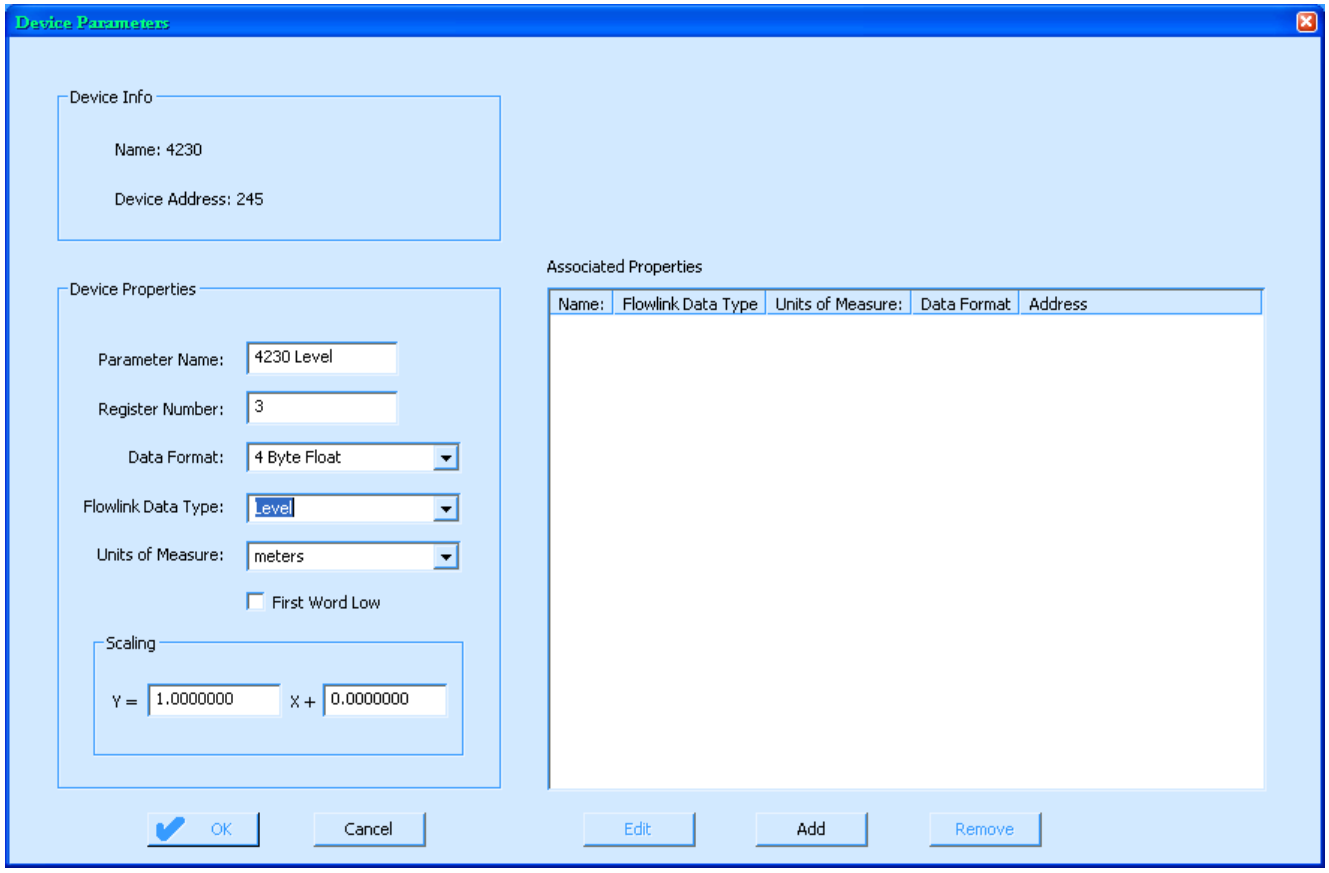
Modbus configuration window

- Address: 245
- Device name: “4230”
- Default timeout settings
- Continue button

Device parameters window

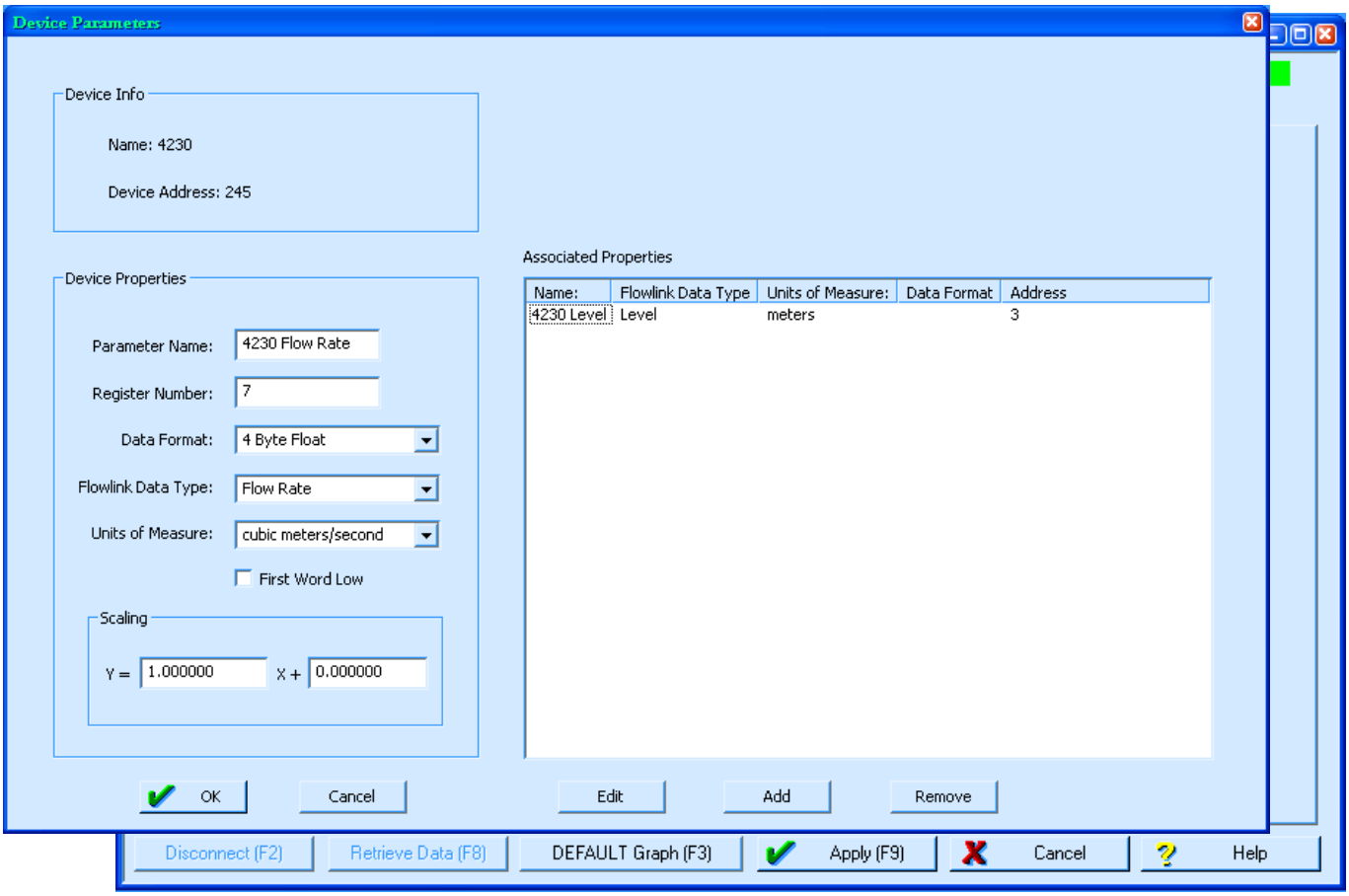
- Parameter name: “4230 Level”
- Register number: 3
- Data format: 4 byte float
- Flowlink data type: level
- Unit of measure: meters[1]
- First word low: unchecked
- Scaling: Y = 1.000000X + 0.00000
- Add button




[1] Modbus only works with metric units. Conversion to standard units (e.g., cubic feet per second) takes place within 2105c and can be displayed by customizing other tabs.

- Parameter name: “4230 Flow Rate”
- Register number: 7
- Data format: 4 byte float
- Flowlink data type: flow rate
- Unit of measure: cubic meters per second[1]
- First word low: unchecked
- Scaling: Y = 1.000000X + 0.00000
- Add button




- OK button
- Apply button

**Modbus Tab for 4250 Area-Velocity**

Protocol setup

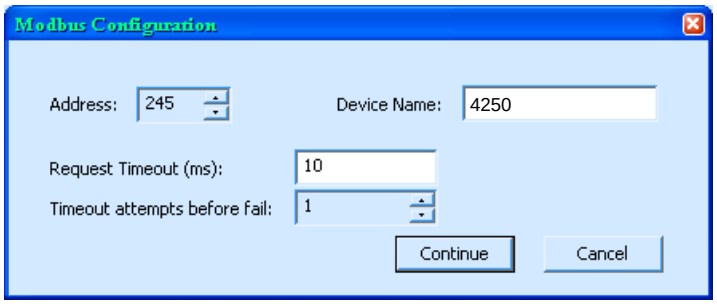
- Protocol Type: ASCII
- Baud rate: 9600
- Bits: 8
- Parity: none
- Stop bits: 1
- New device button

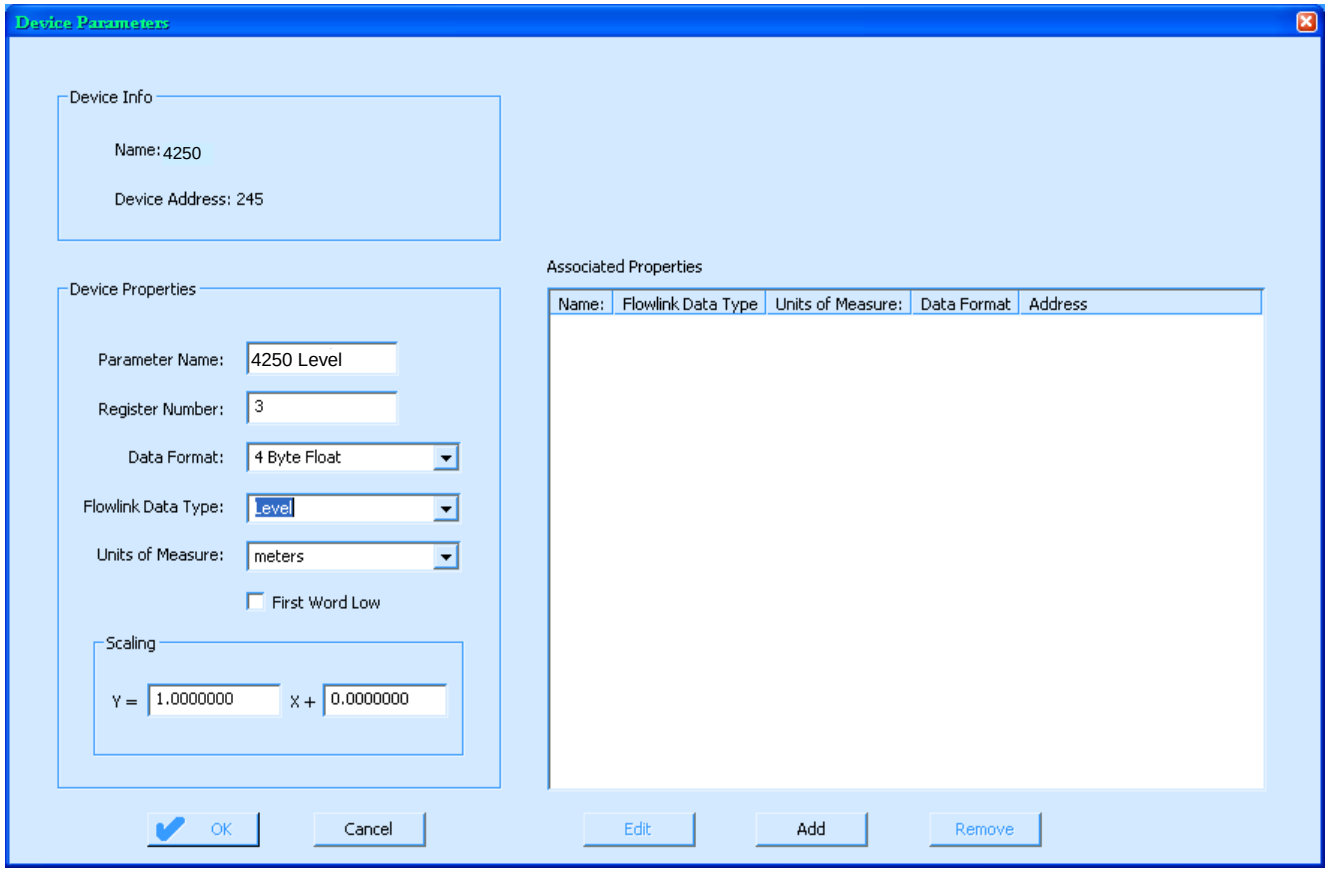
Modbus configuration window

- Address: 245
- Device name: “4250”
- Default timeout settings
- Continue button

Device parameters window

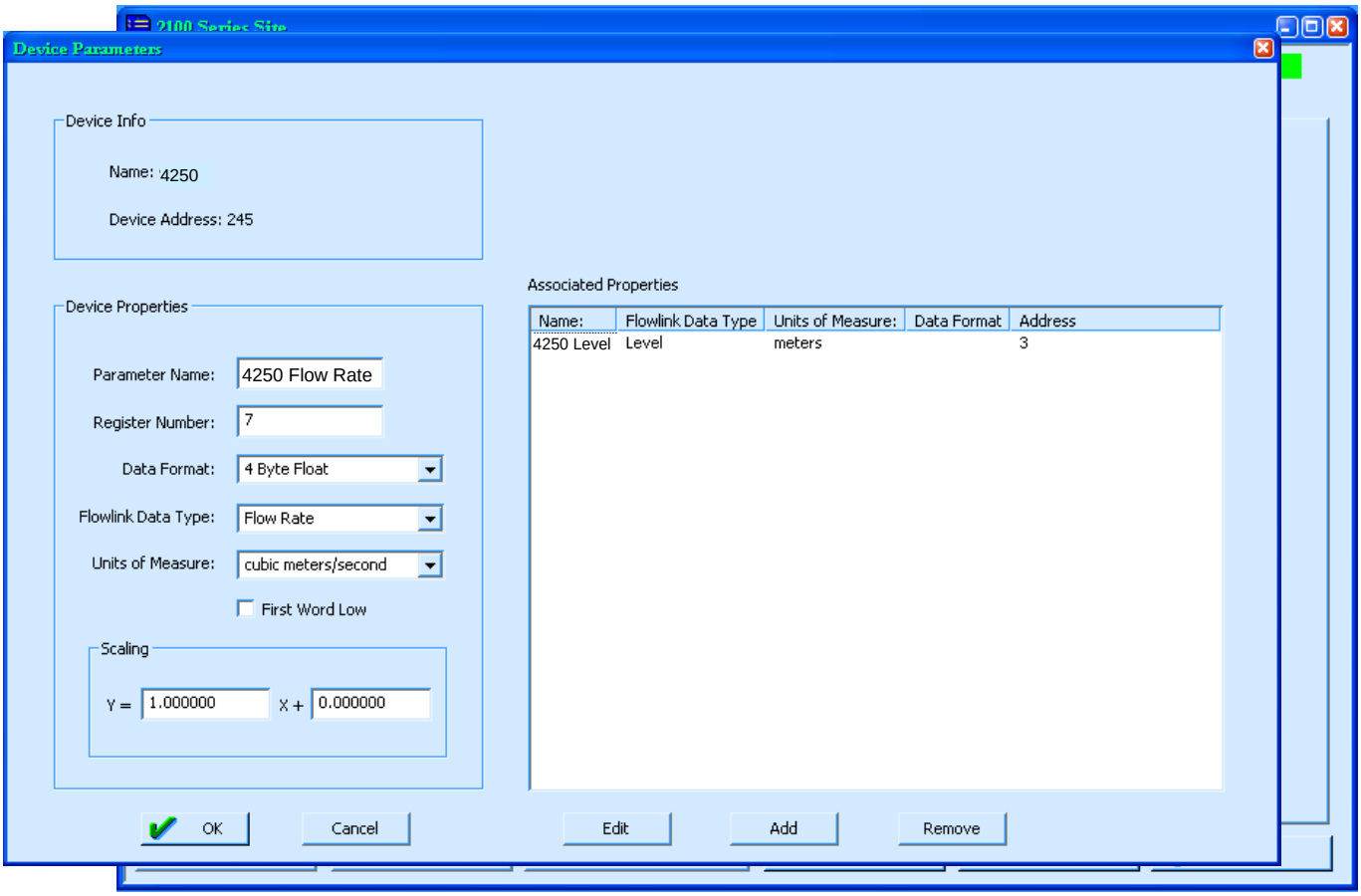
- Parameter name: “4250 Level”
- Register number: 3
- Data format: 4 byte float
- Flowlink data type: level
- Unit of measure: meters[2]
- First word low: unchecked
- Scaling: Y = 1.000000X + 0.00000
- Add button



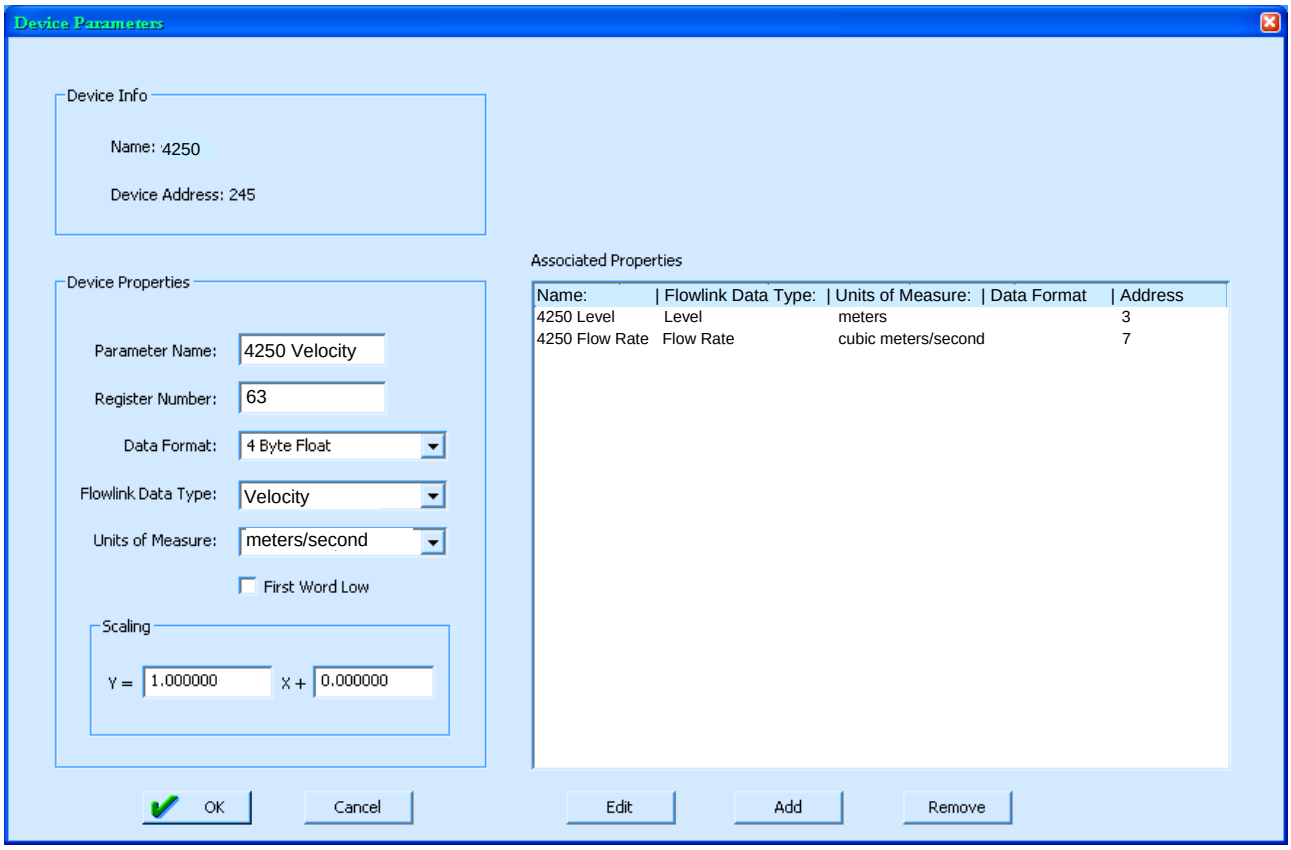

[2] Modbus only works with metric units. Conversion to standard units (e.g., cubic feet per second) takes place within 2105c and can be displayed by customizing other tabs.

- Parameter name: “4250 Flow Rate”
- Register number: 7
- Data format: 4 byte float
- Flowlink data type: flow rate
- Unit of measure: cubic meters per second[3]
- First word low: unchecked
- Scaling: Y = 1.000000X + 0.00000
- Add button




[3] Modbus only works with metric units. Conversion to standard units (e.g., cubic feet per second) takes place within 2105c and can be displayed by customizing other tabs

- Parameter name: “4250 Velocity”
- Register number: 63
- Data format: 4 byte float
- Flowlink data type: velocity
- Unit of measure: meters per second[4]
- First word low: unchecked
- Scaling: Y = 1.000000X + 0.00000
- Add button

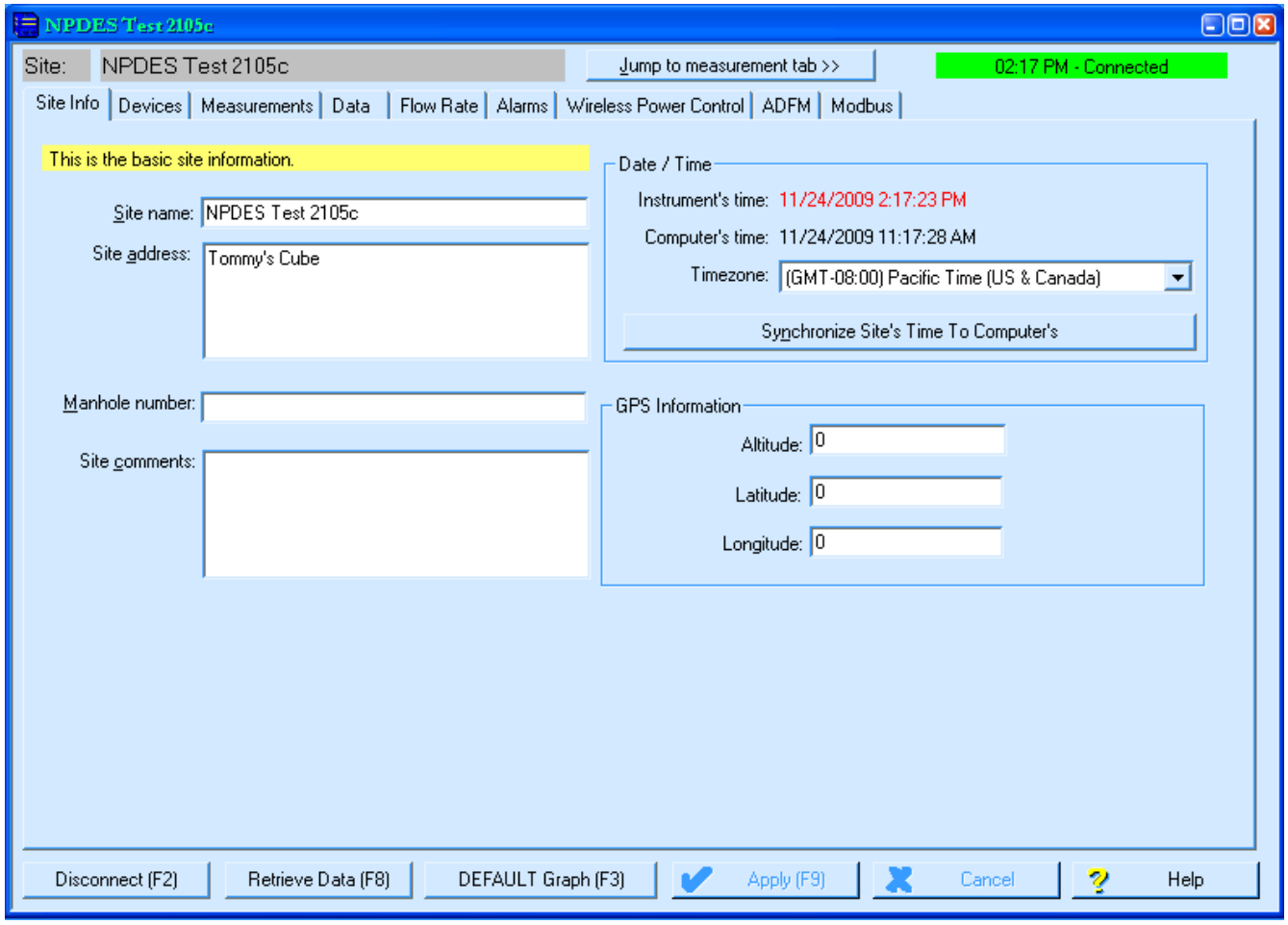



- OK button
- Apply button

[4] Modbus only works with metric units. Conversion to standard units (e.g., cubic feet per second) takes place within 2105c and can be displayed by customizing other tabs

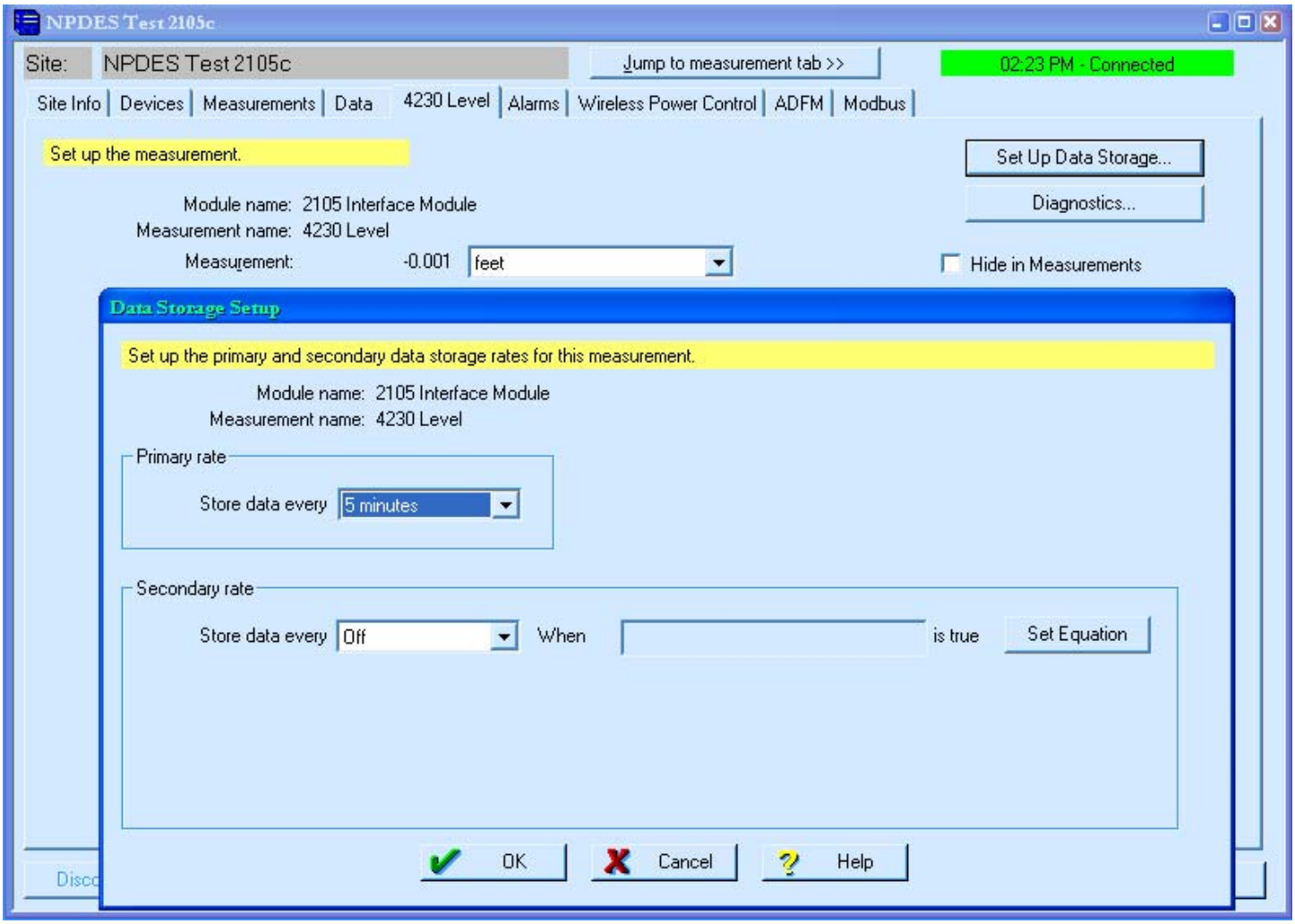
**Site Info Tab**

- Site name: “[site ID from NPDES permit]”
- Site address: “[waterbody name]”
- Apply button

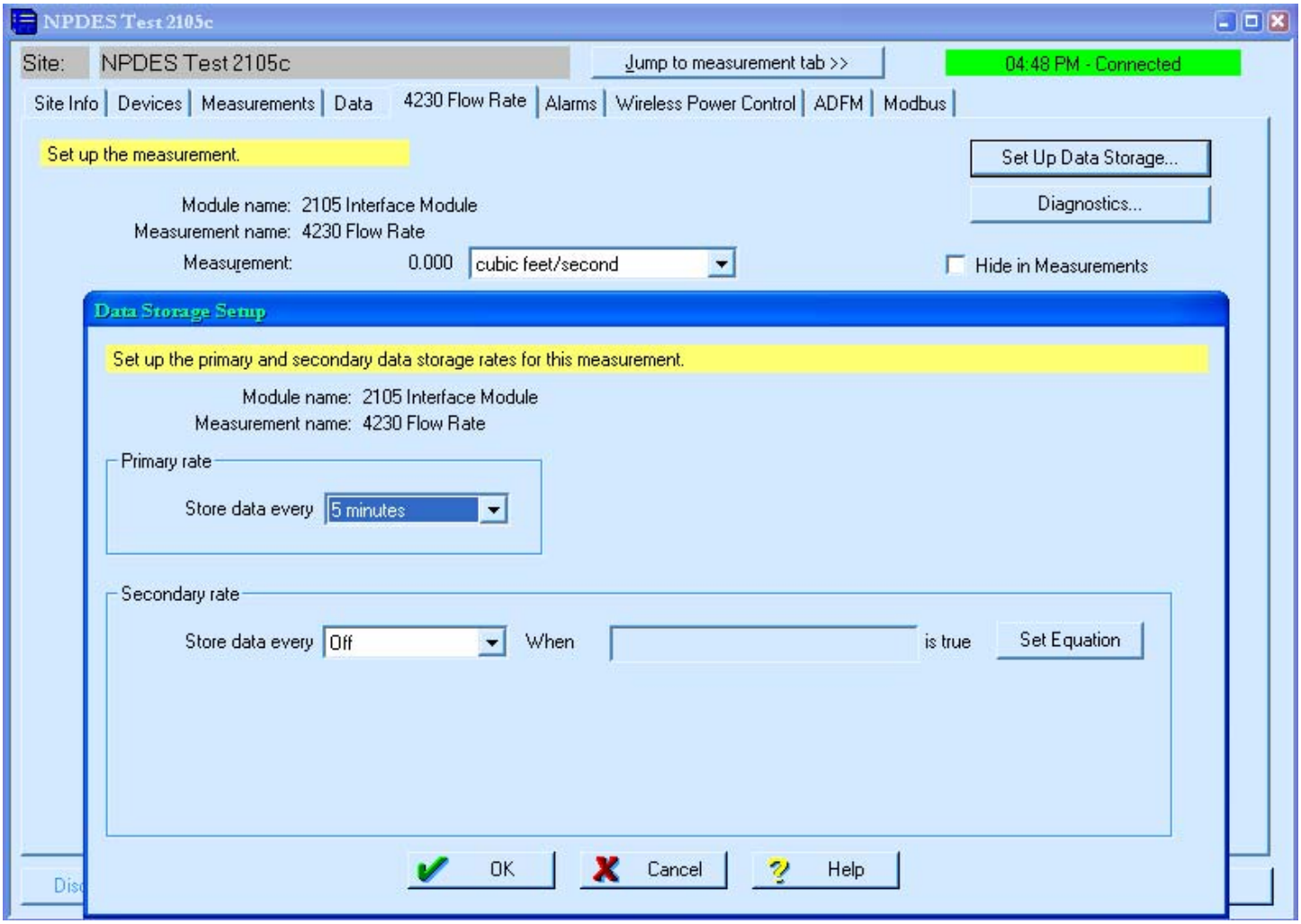


**Jump to Measurements Tab for 4230 Bubbler**

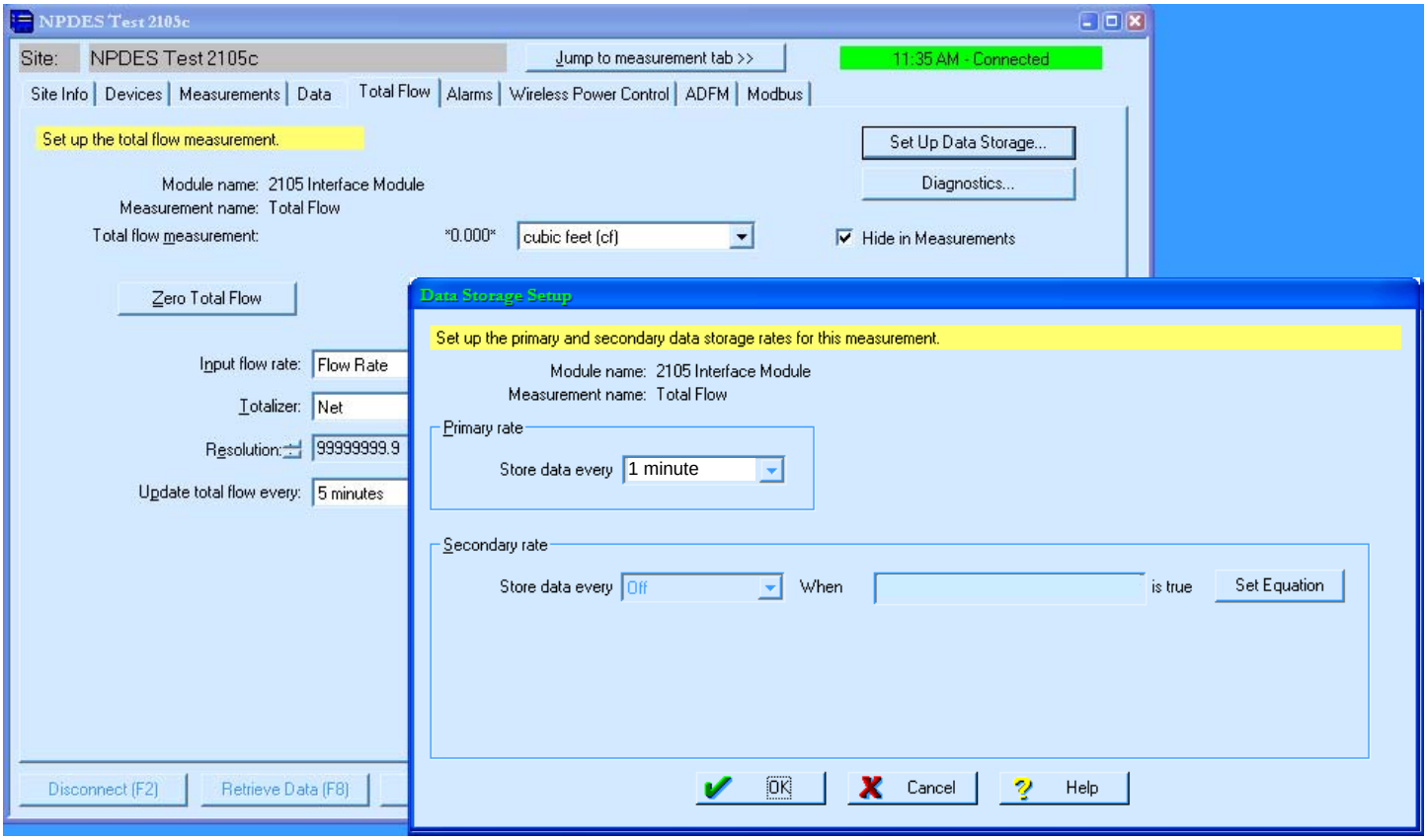
- Jump to measurements button → 4230 Level
    - Measurement: feet
    - Hide in measurements: unchecked
    - Set up data storage button
        - Data storage rate every: 5 minutes
        - OK button
    - Apply button



- Jump to measurements button → 4230 Flow Rate
    - Measurement: cubic feet per second
    - Hide in measurements: unchecked
    - Set up data storage button
        - Data storage rate every: 5 minutes
        - OK button
    - Apply

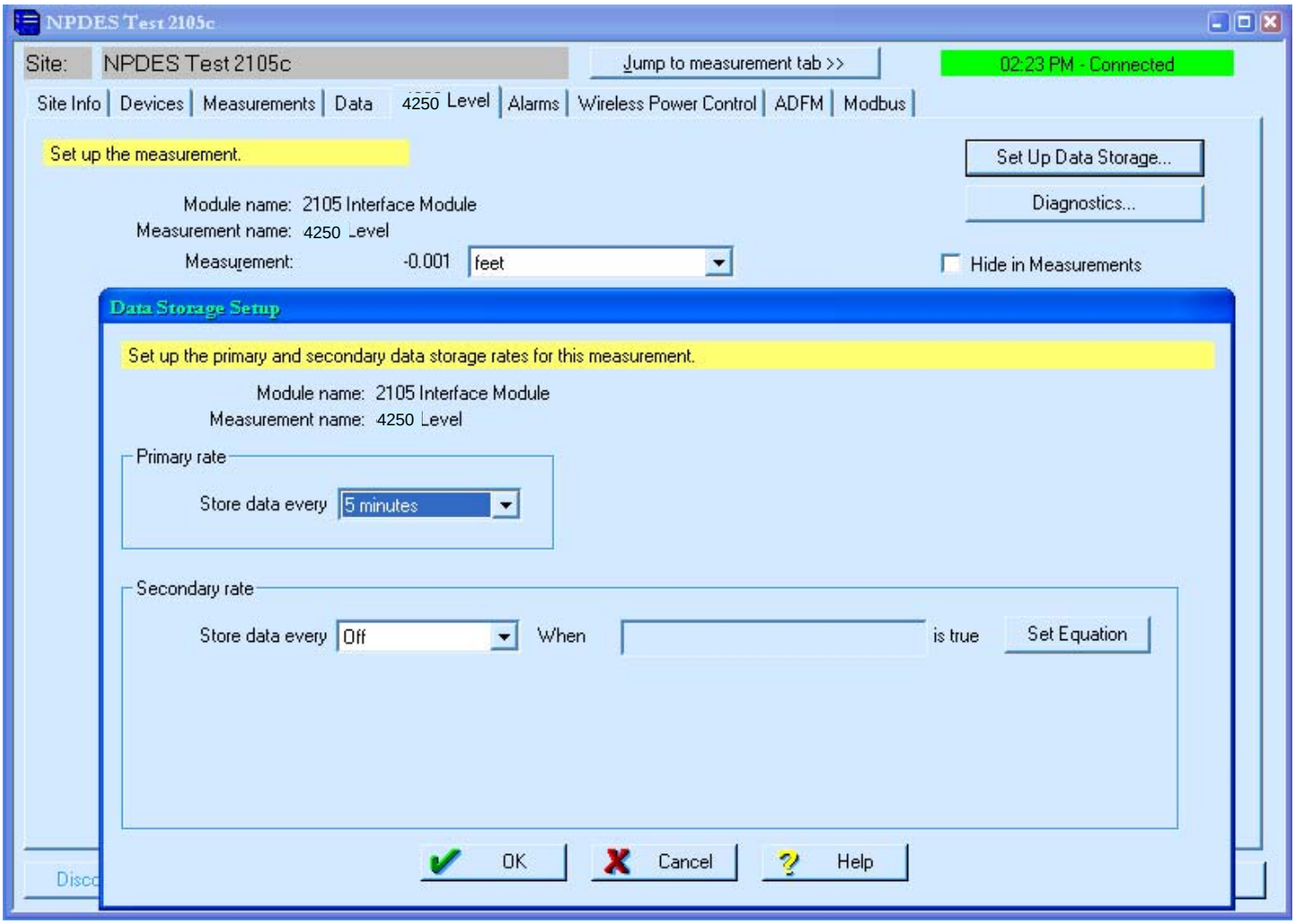


- Jump to measurements button → Total flow
    - Measurement: cubic feet
    - Hide in measurements: unchecked
    - Input flow rate: 4230 flow rate
    - Totalizer: net
    - Resolution: default
    - Update total flow every: 5 minutes
    - Set up data storage button
        - Primary storage rate, store data every: 1 minute
        - OK button
    - Apply

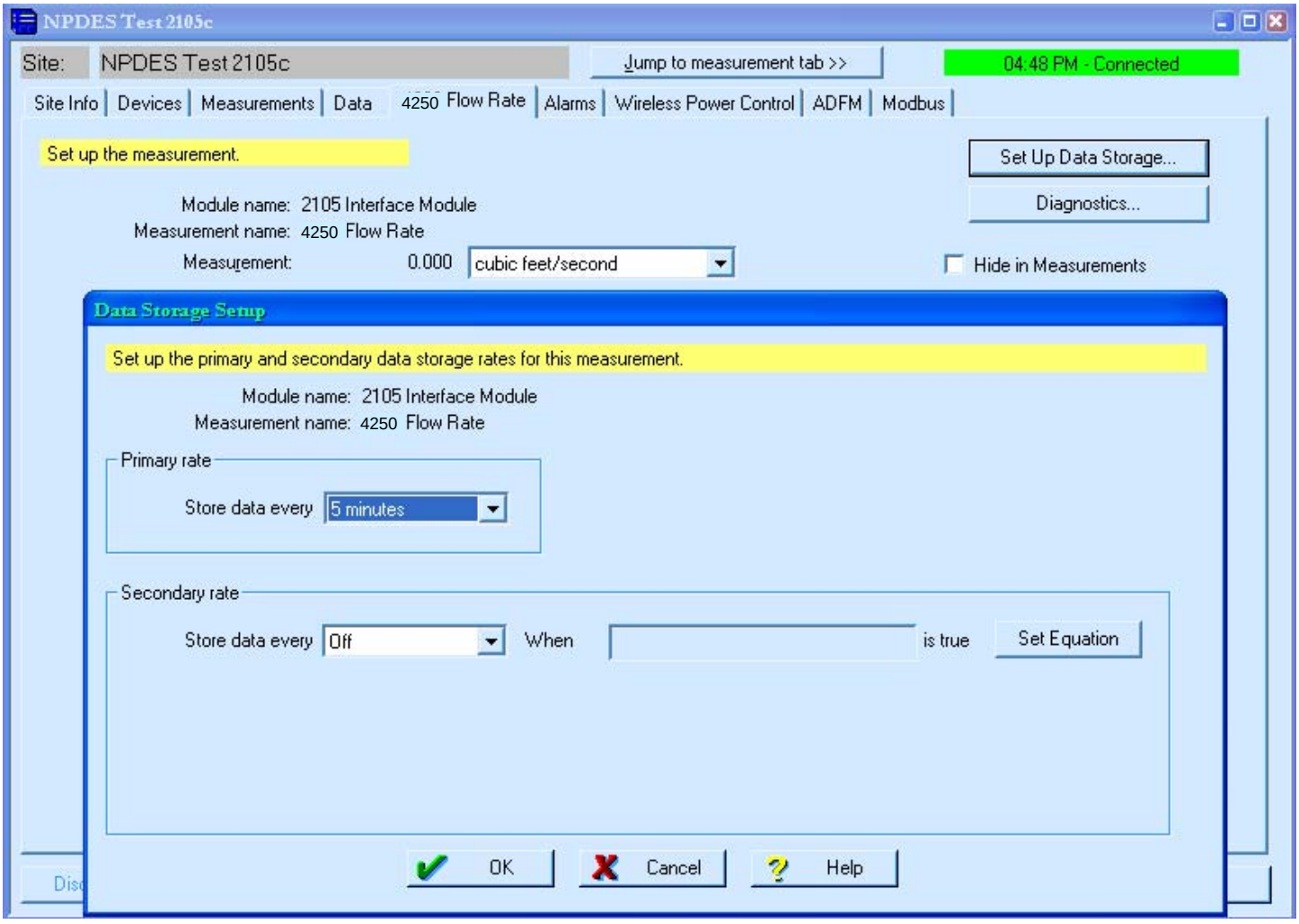


**Jump to Measurements Tab for 4250 Area Velocity**

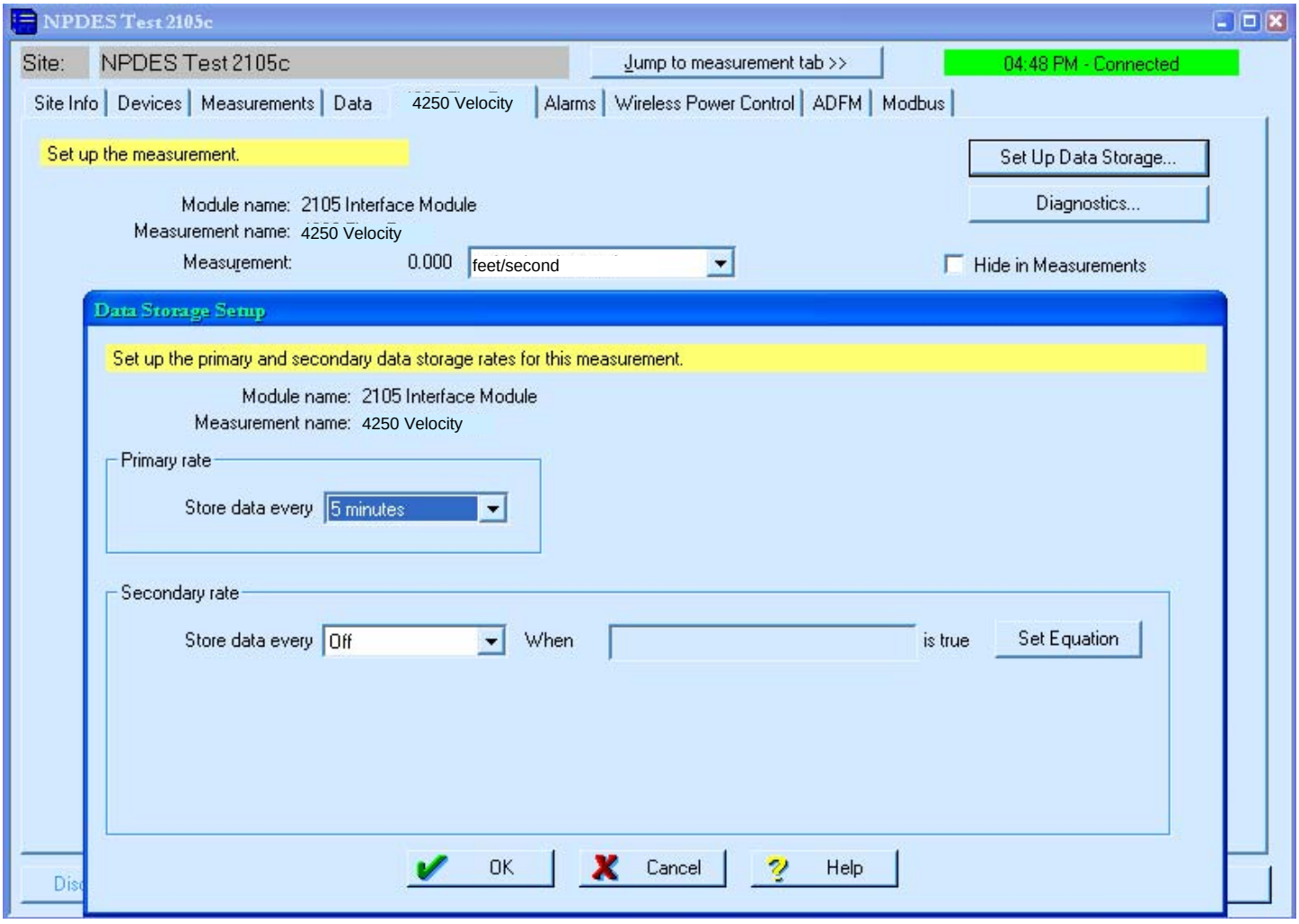
- Jump to measurements button → 4250 Level
    - Measurement: feet
    - Hide in measurements: unchecked
    - Set up data storage button
        - Data storage rate every: 5 minutes
        - OK button
    - Apply button



- Jump to measurements button → 4250 Flow Rate
    - Measurement: cubic feet per second
    - Hide in measurements: unchecked
    - Set up data storage button
        - Data storage rate every: 5 minutes
        - OK button
    - Apply

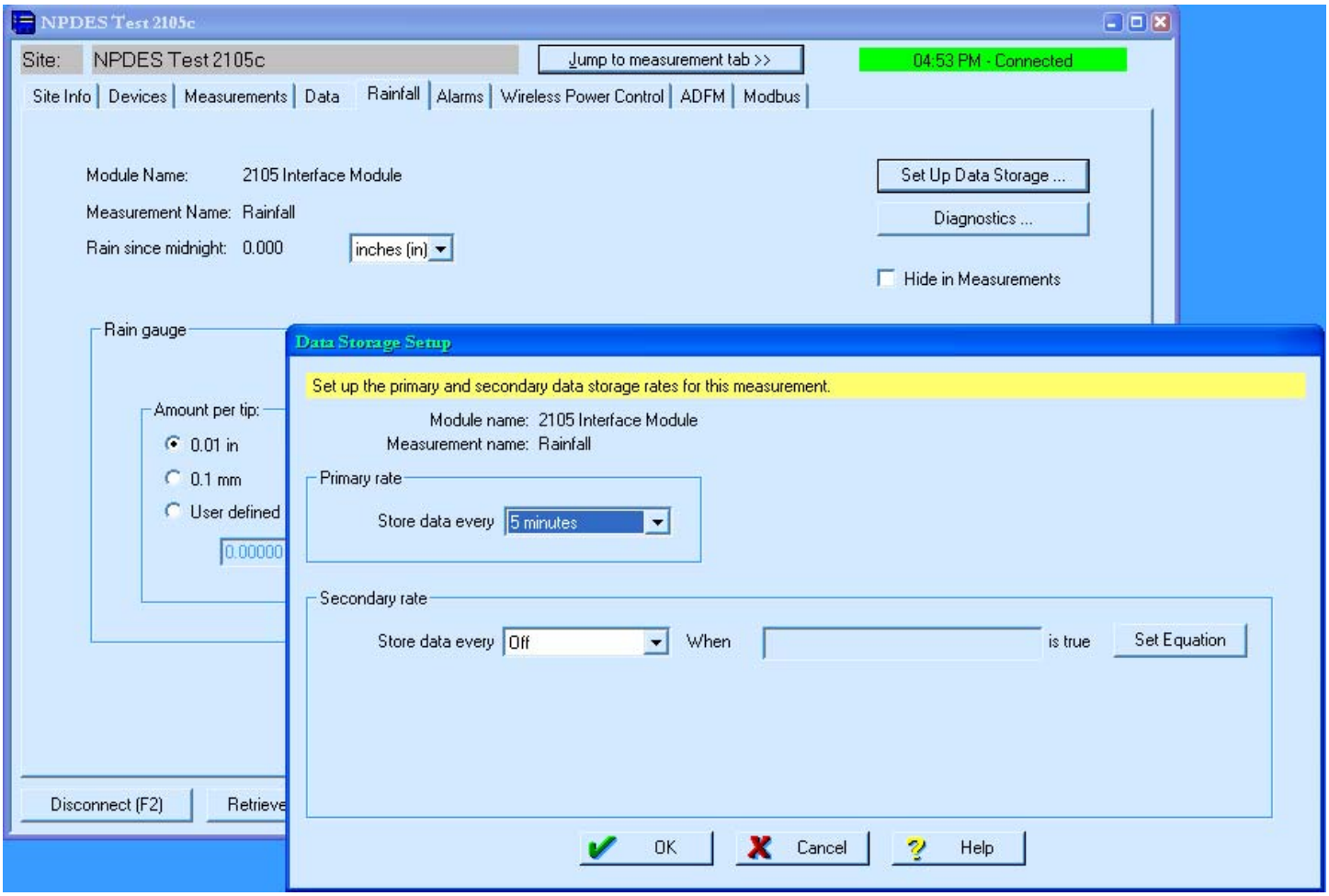


- Jump to measurements button → 4250 Velocity
    - Measurement: feet per second
    - Hide in measurements: unchecked
    - Set up data storage button
        - Data storage rate every: 5 minutes
        - OK button
    - Apply

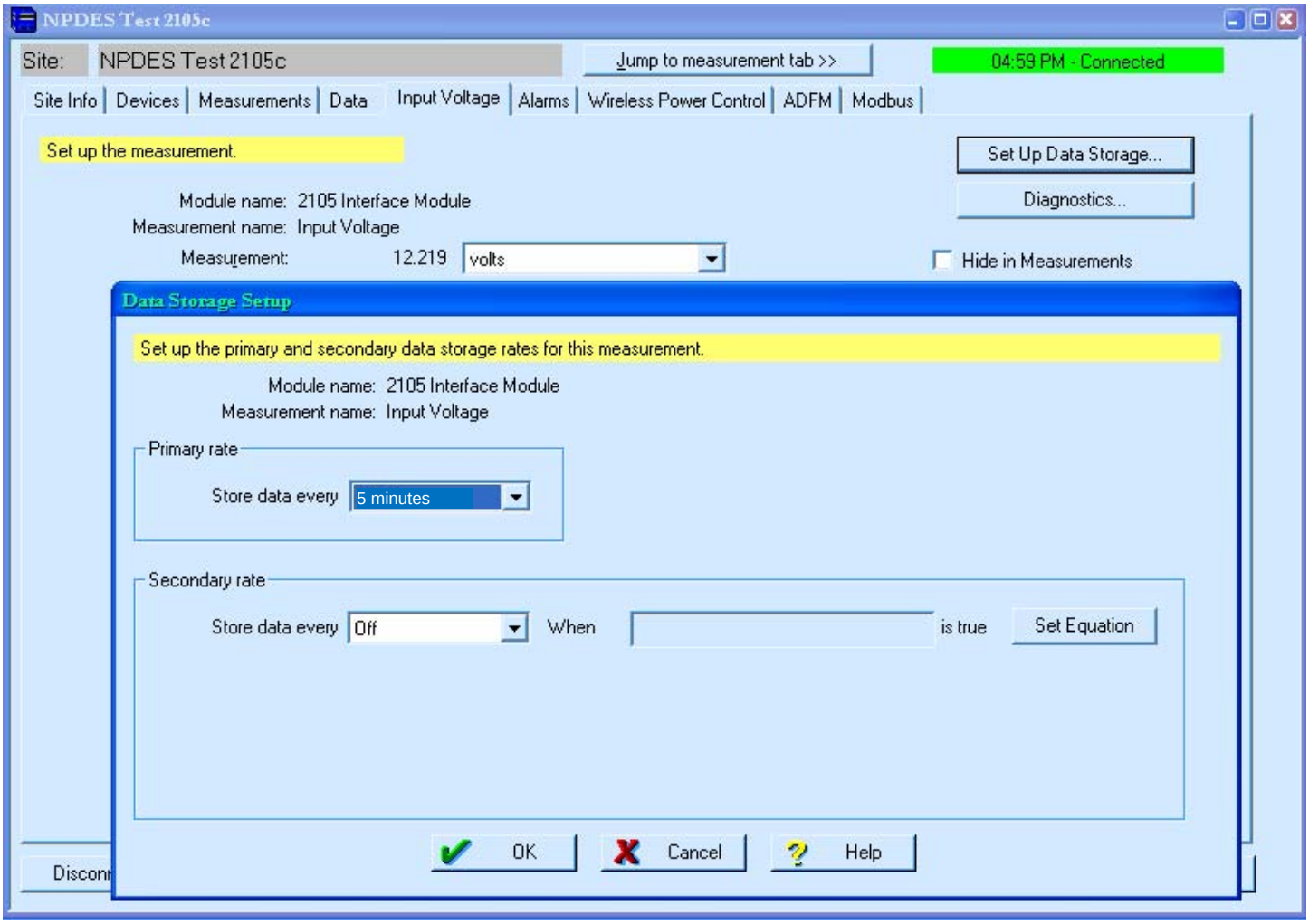


**Jump to Measurements Tab for Other Parameters**

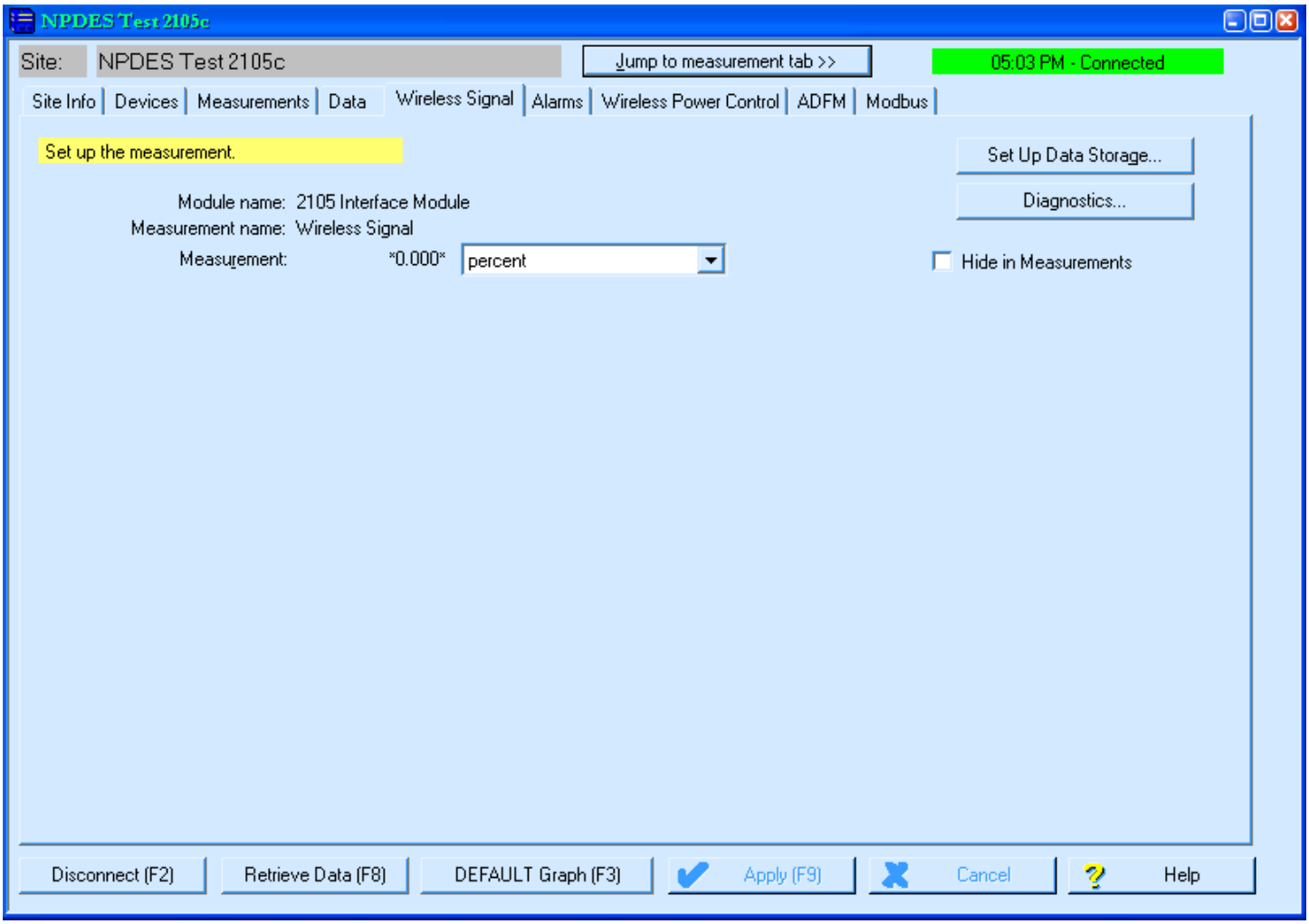
- Jump to measurements button → Rainfall (if rain gauge is present)
    - Rain since midnight: inches
    - Hide in measurements: unchecked
    - Amount per tip: 0.01 inches
    - Set up data storage button
        - Data storage rate every: 5 minutes
        - OK button
    - Apply



- Jump to measurements button → Input voltage
    - Measurement: volts
    - Hide in measurements: unchecked
    - Set up data storage button
        - Data storage rate every: 5 min.
        - OK button
    - Apply

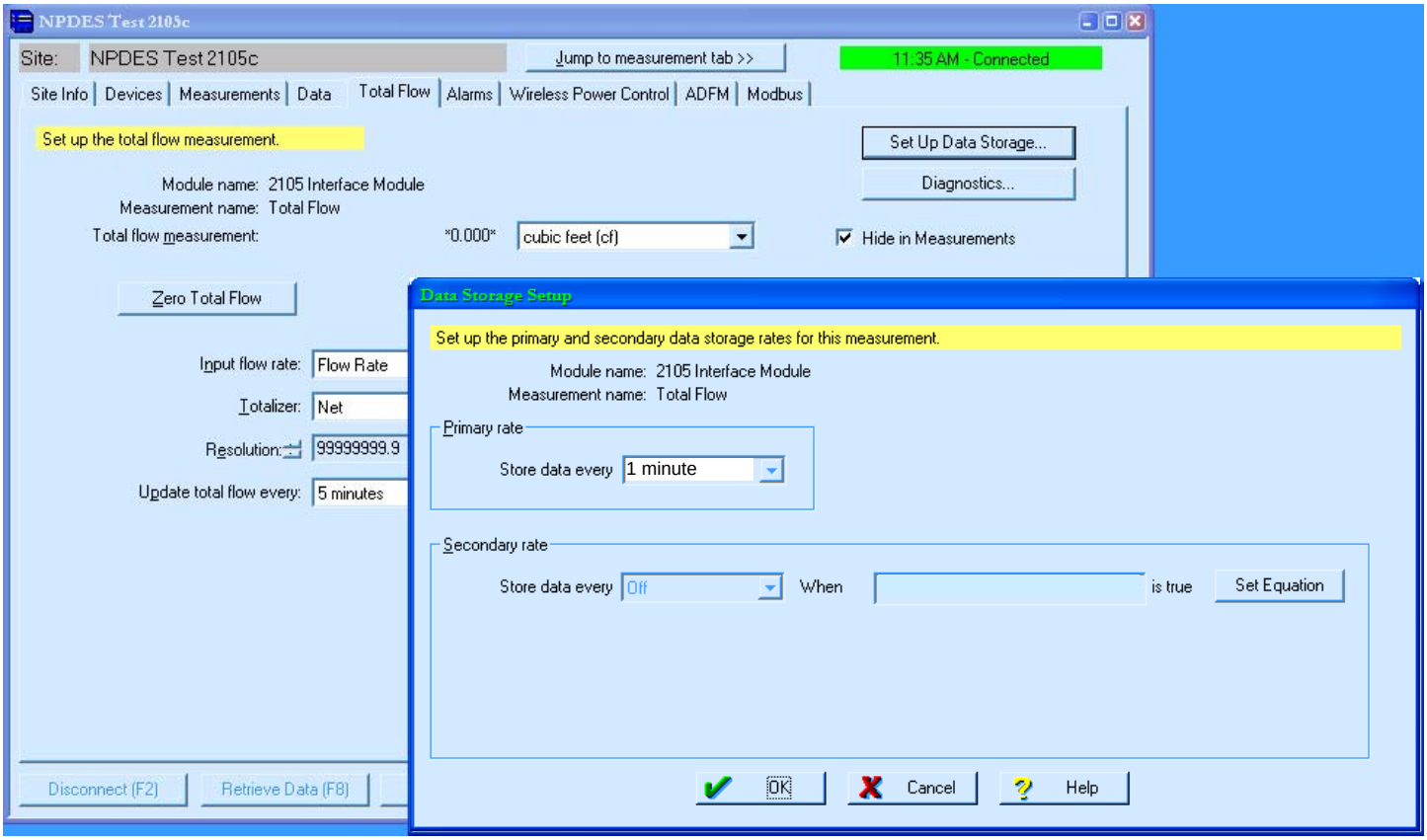


- Jump to measurements button → Wireless signal[5]
    - Measurement: percent
    - Hide in measurements: unchecked
    - Apply

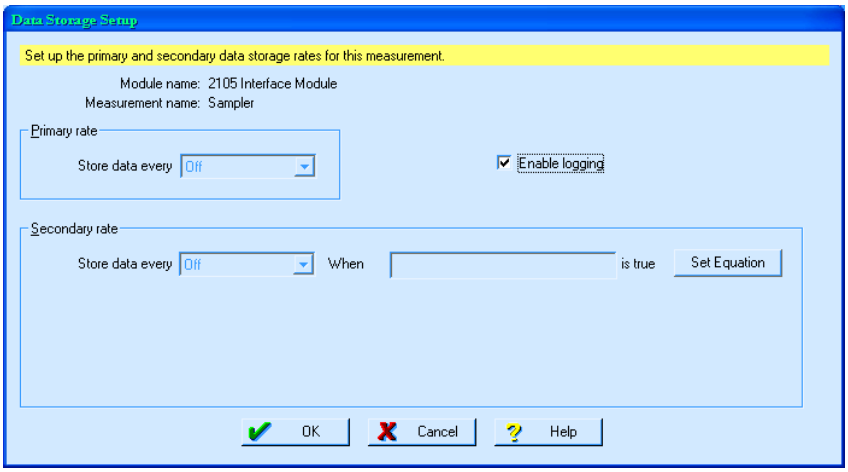


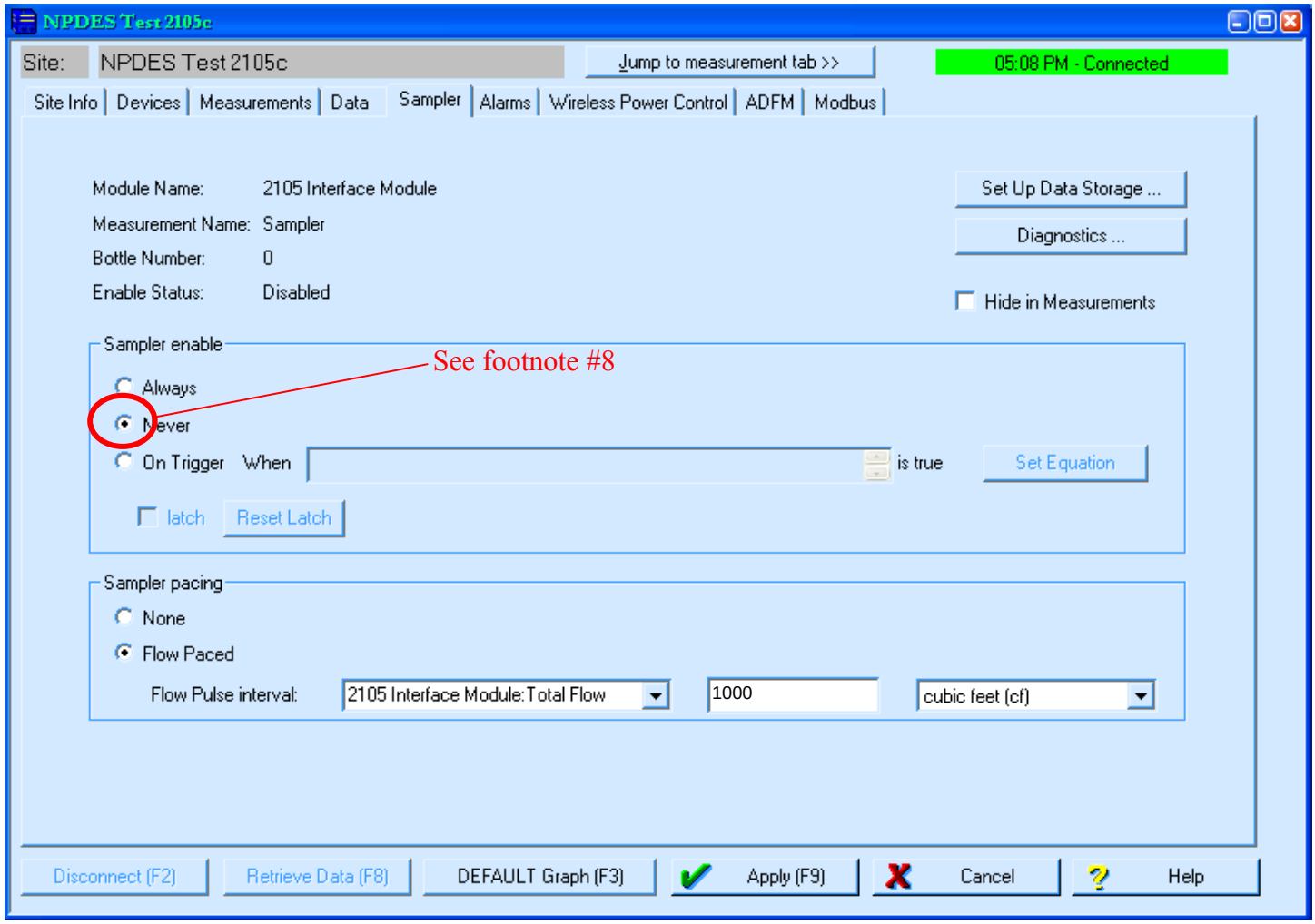

[5] Only viewable when connected to the 2105c directly. It will not display when connected via modem.

- Jump to measurements button → Total flow
    - Measurement: cubic feet
    - Hide in measurements: unchecked
    - Input flow rate: 4230 flow rate
    - Totalizer: net
    - Resolution: default
    - Update total flow every: 5 minutes
    - Set up data storage button
        - Primary storage rate, store data every: 1 minute
        - OK button
    - Apply



- Jump to measurements button → Sampler[6,7]
    - Sampler enable: never[8]
    - Sampler pacing: flow paced
    - Flow pulse interval: 2105 interface module: total flow, 1000[9], cubic feet
    - Hide in measurements: unchecked
    - Apply
- Set up data storage button
    - Enable logging: checked
    - OK
- Apply

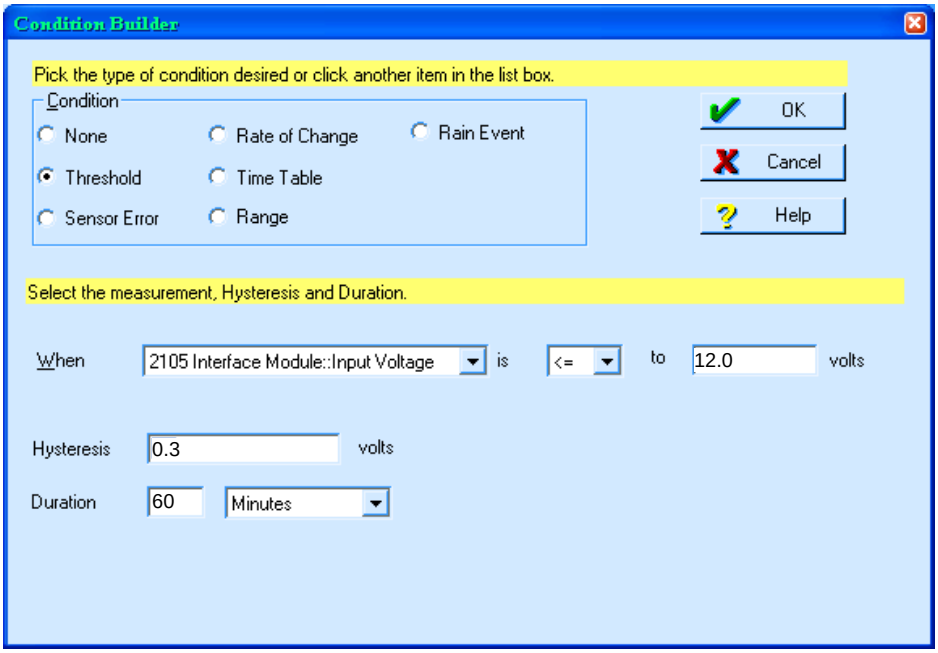


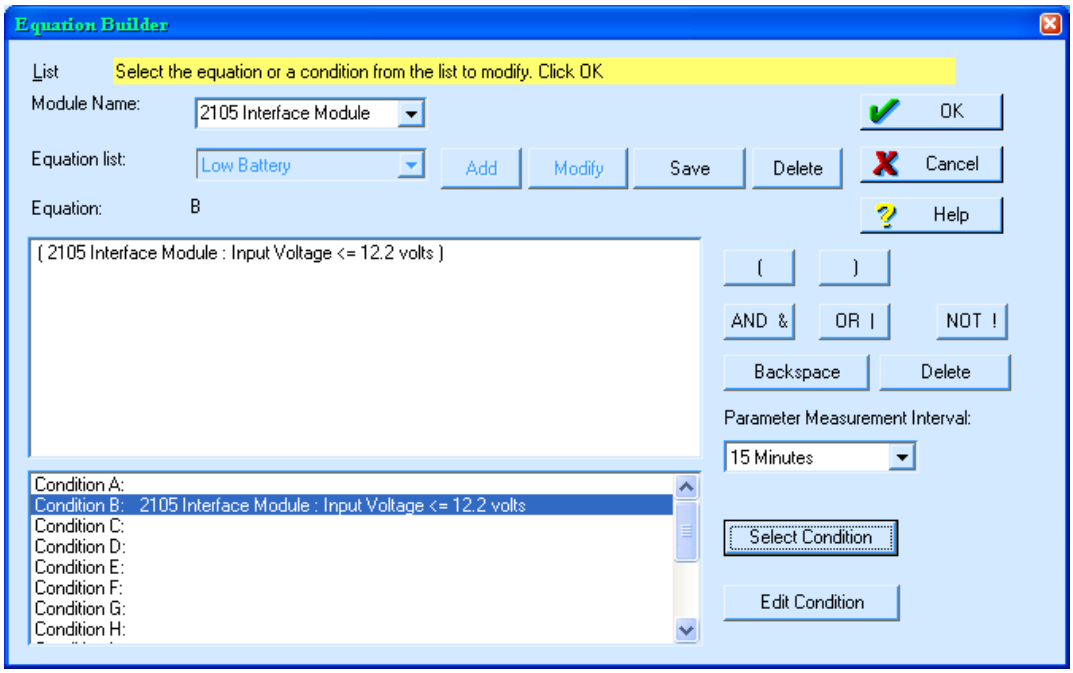

[6] Sample event punches will only be viewable when looking at web page or by graphing retrieved data.
[7] If using single bottle configuration, bottle number will always be 0.
[8] The enable feature will be modified before sampling events, as will event-specific triggers (based on projected rainfall).
[9] Default pacing will be 1,000 cf. Pulses will be counted by 6712 and will vary. Maximum entry on this screen ~ 3,100.

**Alarms Tab**

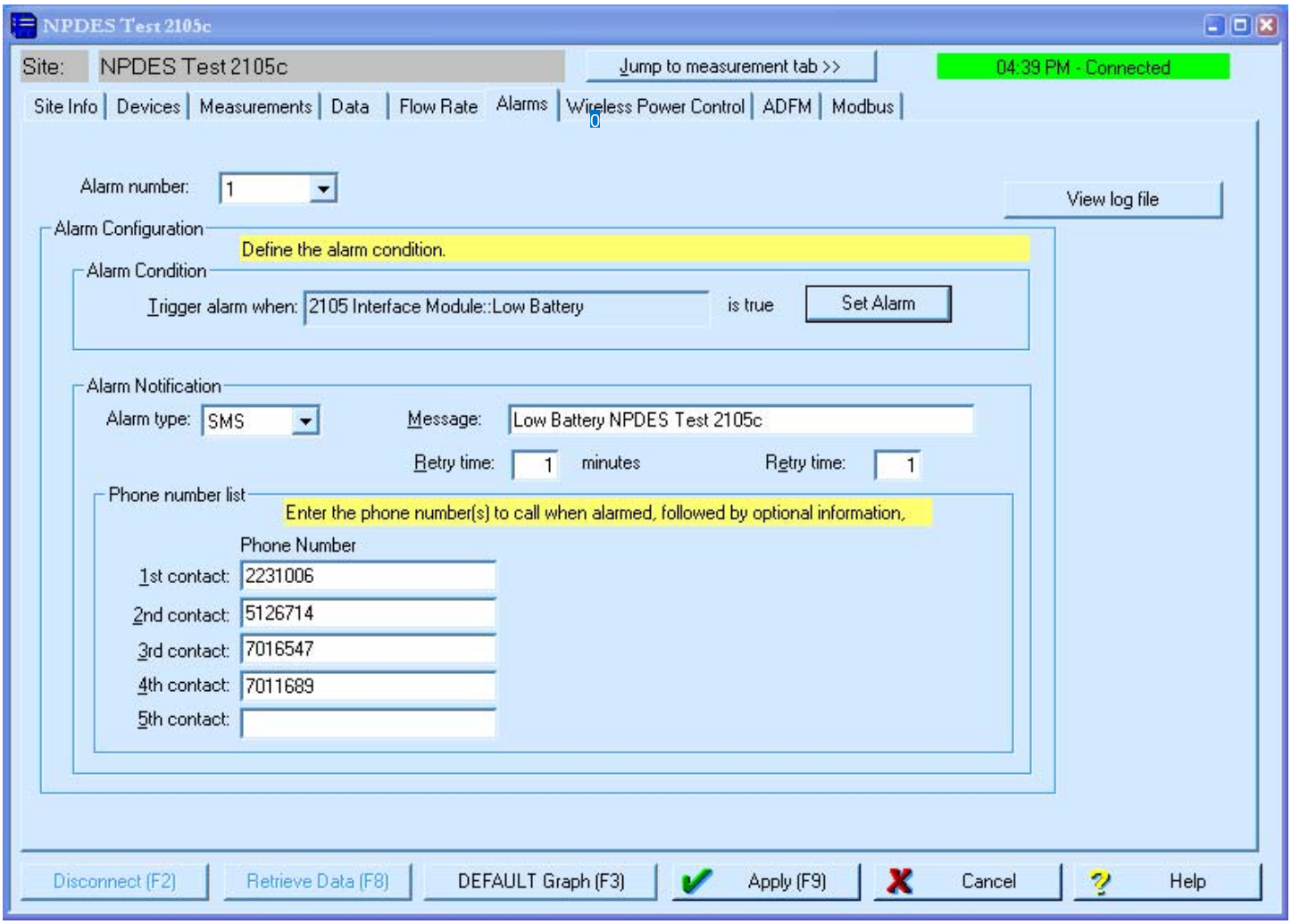
- Set alarm button
  - Select Condition [B]
  - Edit condition button
    - Threshold radio button
    - When: 2105 Interface module: Input voltage, <=, 12.0 volts
    - Hysteresis: 0.3 volts
    - Duration: 60 minutes
    - OK button




- Add button
- Equation name: “Low Battery”
- Highlight Condition [B]
- Parameter measure interval: 15 minutes
- Select condition button
- Save button
- OK button

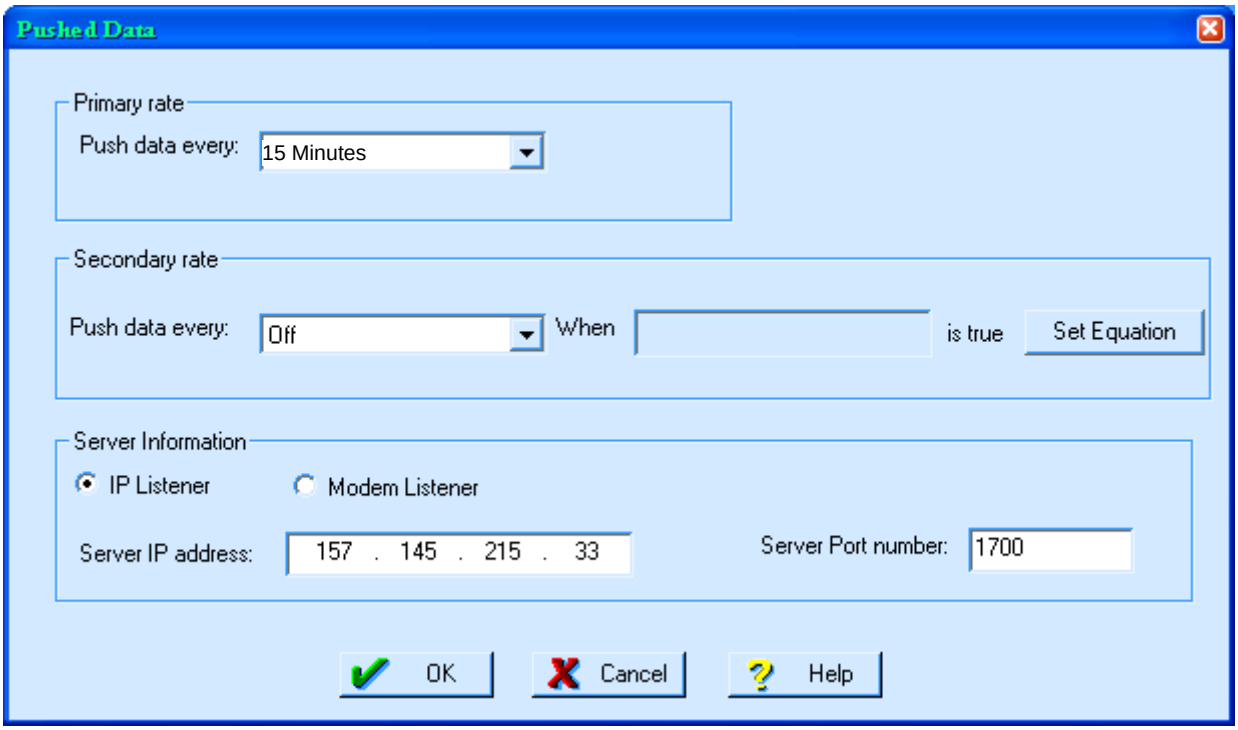


- Alarm number: 1
- Trigger alarm when: 2105 Interface Module::Low Battery is true
- Alarm type: SMS
- Message: Low battery [site]
- Retry time: 1 minute
- Retries: 1 12.0
- Enter contact numbers without hyphen
- Apply



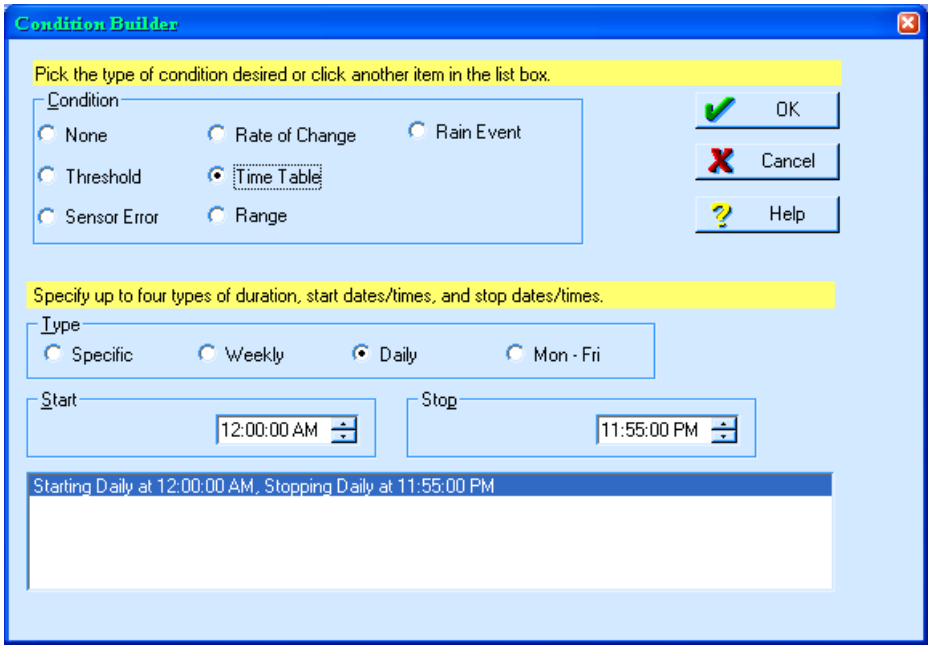
**Data Tab**

- Pushed data button
    - Primary rate: Push data every: 15 minutes
    - IP listener radio button
    - Server IP address: 157.145.215.33
    - Server port number: 1700
    - OK button
- Apply button

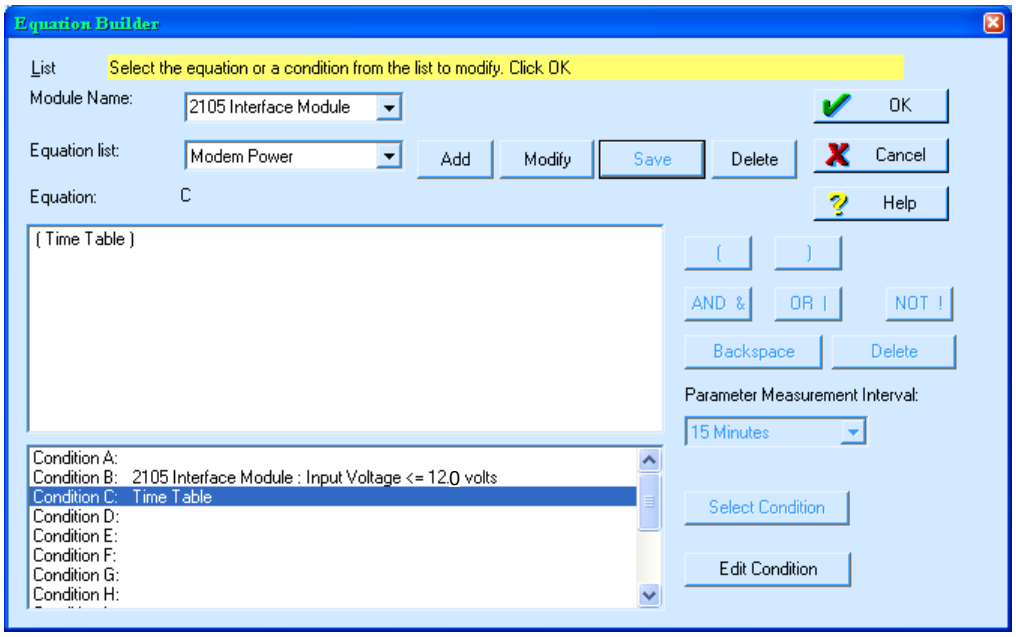


**Wireless Power Control Tab**

- Set equation button
  - Select Condition [C]
  - Edit condition button
    - Time table radio button
    - Daily radio button
    - Start: 12:00:00 AM
    - Stop: 11:55:00 PM
    - OK button

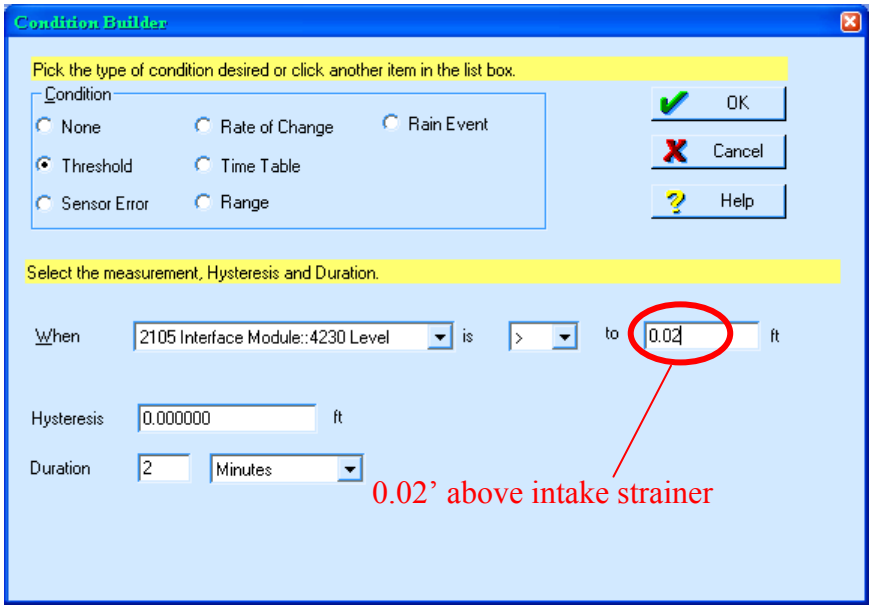



  - Add button
  - Equation name: “Modem Power”
  - Highlight Condition [C]
  - Parameter Measurement Interval: 15 minutes
  - Select condition button
  - Save button
  - OK button

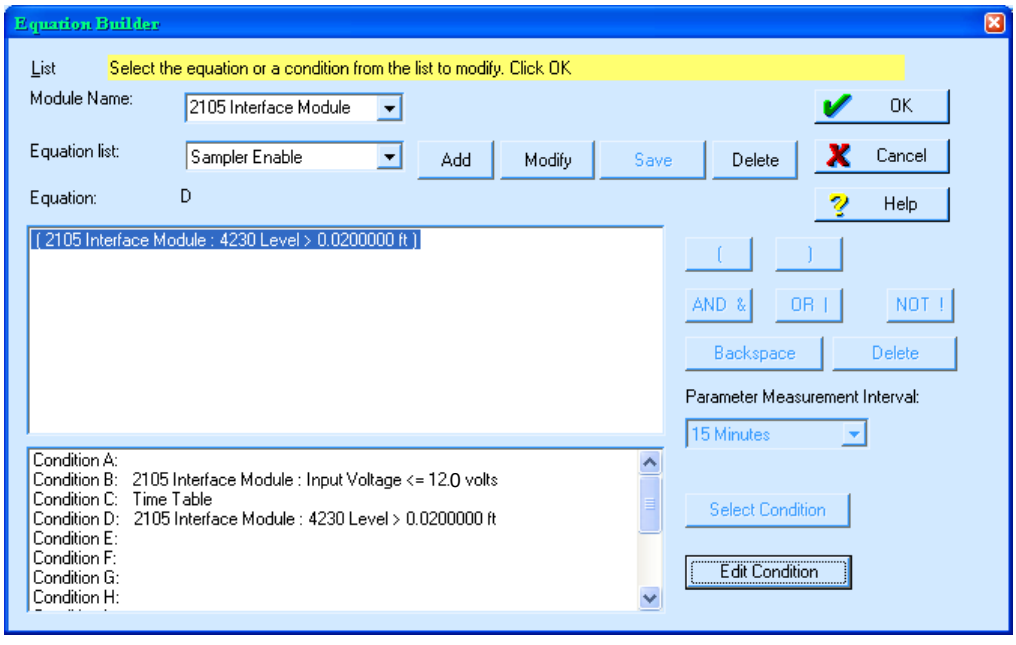


**Sampling Event Programming**

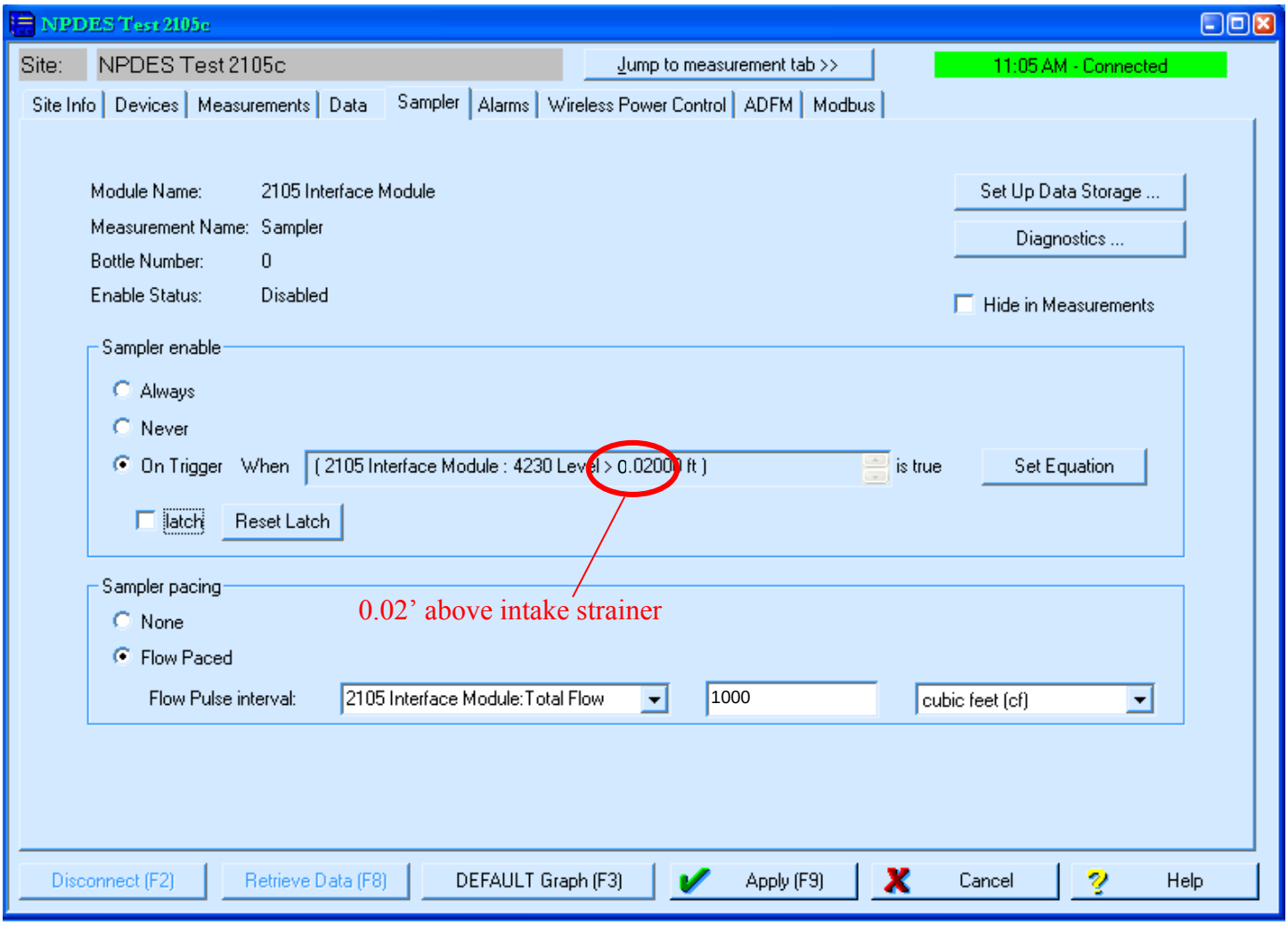
- Jump to measurements button → Sampler
  - On trigger radio button
  - Set equation button
    - Add button
    - Equation name: “Sampler Enable”
    - OK button
  - Select Condition [D]
  - Edit condition button
    - Threshold radio button
    - When: 2105 Interface module: 4230/4250 Level, >, [add 0.02’ to intake strainer elevation]
    - Duration: 2 minutes
    - OK button




  - Highlight Condition [D]
  - Select condition button
  - Save button
  - OK button



- Flow paced radio button
- Flow pulse interval: 2105 Interface module: total flow, [site- and event-specific trigger], cubic feet
- Apply button




Note: following completion of sampling event, disable sampler by clicking "never" radio button.

**Communication Problems**

If laptop cannot connect with 2105c:

Power down 2105 (carefully remove fuse), remove comm. cable, exit Flowlink 5.1, power up 2105c, install comm. cable, run Flowlink 5.1

# APPENDIX G

# DRY SEASON
# ALTERNATE MONITORING SITES

| Loc_ID | StationCode | Waterbody | Lat_DD | Long_DD | Lat_DMS | Long_DMS |
|---|---|---|---|---|---|---|
| Camarillo-2 | DRY-CAM2 | Edgemore Drain | 34.22368 | -119.06097 | 34° 13' 25.254" N | 119° 3' 39.485" W |
| Camarillo-3 | DRY-CAM3 | Mission Drain | 34.22376 | -119.05217 | 34° 13' 25.533" N | 119° 3' 7.810" W |
| Camarillo-4 | DRY-CAM4 | West Tributary Somis Drain | 34.22275 | -119.01616 | 34° 13' 21.890" N | 119° 0' 58.191" W |
| Camarillo-5 | DRY-CAM5 | Mission Oaks Drain | 34.22161 | -118.98240 | 34° 13' 17.810" N | 118° 58' 56.638" W |
| Fillmore-2 | DRY-FIL2 | Oriole Street Drain | 34.40056 | -118.93114 | 34° 24' 2.028" N | 118° 55' 52.099" W |
| Fillmore-3 | DRY-FIL3 | Robin Court Drain | 34.39876 | -118.93276 | 34° 23' 55.532" N | 118° 55' 57.933" W |
| Fillmore-4 | DRY-FIL4 | B Street Drain | 34.39118 | -118.92190 | 34° 23' 28.262" N | 118° 55' 18.837" W |
| Fillmore-5 | DRY-FIL5 | Central Ave. Drain | 34.39329 | -118.91287 | 34° 23' 35.851" N | 118° 54' 46.347" W |
| Moorpark-2 | DRY-MPK2 | Gabbert Canyon | 34.27907 | -118.91084 | 34° 16' 44.660" N | 118° 54' 39.019" W |
| Moorpark-3 | DRY-MPK3 | Moorpark SD #1 | 34.28555 | -118.86973 | 34° 17' 7.988" N | 118° 52' 11.026" W |
| Moorpark-4 | DRY-MPK4 | Happy Camp Canyon | 34.28632 | -118.86196 | 34° 17' 10.766" N | 118° 51' 43.068" W |
| Moorpark-5 | DRY-MPK5 | Miller Parkway Drain | 34.27868 | -118.87108 | 34° 16' 43.260" N | 118° 52' 15.901" W |
| Ojai-2 | DRY-OJA2 | Stewart Canyon | 34.43542 | -119.24792 | 34° 26' 7.527" N | 119° 14' 52.497" W |
| Ojai-3 | DRY-OJA3 | San Antonio Creek | 34.43468 | -119.24670 | 34° 26' 4.845" N | 119° 14' 48.119" W |
| Ojai-4 | DRY-OJA4 | East Ojai Drain | 34.44525 | -119.22934 | 34° 26' 42.912" N | 119° 13' 45.636" W |
| Ojai-5 | DRY-OJA5 | Senior Canyon | 34.44523 | -119.22922 | 34° 26' 42.829" N | 119° 13' 45.175" W |
| Oxnard-2 | DRY-OXN2 | Stroube Drain | 34.24326 | -119.18604 | 34° 14' 35.723" N | 119° 11' 9.727" W |
| Oxnard-3 | DRY-OXN3 | Ventura Road Drain | 34.23531 | -119.19659 | 34° 14' 7.108" N | 119° 11' 47.725" W |
| Oxnard-4 | DRY-OXN4 | Doris Drain | 34.21165 | -119.20806 | 34° 12' 41.955" N | 119° 12' 29.011" W |
| Oxnard-5 | DRY-OXN5 | Rice Road Drain | 34.15499 | -119.16596 | 34° 9' 17.977" N | 119° 9' 57.451" W |
| Port Hueneme-2 | DRY-HUE2 | Hueneme Drain Influent | 34.14383 | -119.19129 | 34° 8' 37.777" N | 119° 11' 28.656" W |
| Port Hueneme-3 | DRY-HUE3 | Bubbling Springs | 34.14491 | -119.19110 | 34° 8' 41.683" N | 119° 11' 27.951" W |
| Port Hueneme-4 | DRY-HUE4 | Hueneme Drain Influent | 34.14510 | -119.19113 | 34° 8' 42.348" N | 119° 11' 28.058" W |
| Port Hueneme-5 | DRY-HUE5 | Hueneme Drain Influent | 34.14616 | -119.19063 | 34° 8' 46.194" N | 119° 11' 26.260" W |
| Santa Paula-2 | DRY-SPA2 | Fagan Canyon | 34.34375 | -119.07756 | 34° 20' 37.514" N | 119° 4' 39.233" W |
| Santa Paula-3 | DRY-SPA3 | Peck Road Drain | 34.33453 | -119.08010 | 34° 20' 4.311" N | 119° 4' 48.364" W |
| Santa Paula-4 | DRY-SPA4 | Richmond Road Drain | 34.36672 | -119.05324 | 34° 22' 0.180" N | 119° 3' 11.663" W |
| Santa Paula-5 | DRY-SPA5 | Harding Park Drain | 34.35512 | -119.04841 | 34° 21' 18.443" N | 119° 2' 54.258" W |
| Simi Valley-2 | DRY-SIM2 | North Simi Drain | 34.27302 | -118.78552 | 34° 16' 22.858" N | 118° 47' 7.870" W |
| Simi Valley-3 | DRY-SIM3 | Erringer Drain | 34.26640 | -118.76118 | 34° 15' 59.043" N | 118° 45' 40.256" W |
| Simi Valley-4 | DRY-SIM4 | Dry Canyon | 34.26643 | -118.76042 | 34° 15' 59.161" N | 118° 45' 37.518" W |
| Simi Valley-5 | DRY-SIM5 | Tapo Canyon | 34.26606 | -118.74562 | 34° 15' 57.833" N | 118° 44' 44.221" W |
| Thousand Oaks-2 | DRY-THO2 | Arroyo Conejo | 34.18954 | -118.90658 | 34° 11' 22.348" N | 118° 54' 23.706" W |

| Loc_ID | StationCode | Waterbody | Lat_DD | Long_DD | Lat_DMS | Long_DMS |
|---|---|---|---|---|---|---|
| Thousand Oaks-3 | DRY-THO3 | South Branch Arroyo Conejo | 34.18804 | -118.90737 | 34° 11' 16.941" N | 118° 54' 26.528" W |
| Thousand Oaks-4 | DRY-THO4 | Lang Creek | 34.18124 | -118.87387 | 34° 10' 52.464" N | 118° 52' 25.930" W |
| Thousand Oaks-5 | DRY-THO5 | Thousand Oaks North Drain | 34.18047 | -118.87012 | 34° 10' 49.682" N | 118° 52' 12.448" W |
| Unincorporated-2 | DRY-UNI2 | Medea Creek (Oak Park) | 34.16864 | -118.76184 | 34° 10' 7.102" N | 118° 45' 42.611" W |
| Unincorporated-3 | DRY-UNI3 | Happy Valley Drain South (Mira Monte) | 34.42907 | -119.29462 | 34° 25' 44.664" N | 119° 17' 40.647" W |
| Unincorporated-4 | DRY-UNI4 | Arroyo Santa Rosa (Santa Rosa Valley) | 34.23355 | -118.91431 | 34° 14' 0.791" N | 118° 54' 51.528" W |
| Unincorporated-5 | DRY-UNI5 | Central Avenue Drain (El Rio) | 34.26153 | -119.16246 | 34° 15' 41.494" N | 119° 9' 44.866" W |
| Ventura-2 | DRY-VEN2 | Harmon Barranca | 34.25214 | -119.19476 | 34° 15' 7.702" N | 119° 11' 41.144" W |
| Ventura-3 | DRY-VEN3 | Clark Barranca | 34.26613 | -119.16428 | 34° 15' 58.062" N | 119° 9' 51.401" W |
| Ventura-4 | DRY-VEN4 | Prince Barranca | 34.27470 | -119.27792 | 34° 16' 28.929" N | 119° 16' 40.528" W |
| Ventura-5 | DRY-VEN5 | Dent Drain | 34.30426 | -119.30063 | 34° 18' 15.326" N | 119° 18' 2.257" W |

| | |
|---|---|
| **Lat_DD** | **Latitude_Decimal Degrees** |
| **Long_DD** | **Longitude_Decimal Degrees** |
| **Lat_DMS** | **Latitude_Degrees Minutes Seconds** |
| **Long_DMS** | **Longitude_Degrees Minutes Seconds** |
| **Datum** | **NAD 83 State Plane Zone 5** |

Ventura Countywide Stormwater Quality Management Program

# VENTURA COUNTYWIDE STORMWATER QUALITY MANAGEMENT PROGRAM

## Ventura Countywide Stormwater Monitoring Program

# DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURES (SOPs)

Watershed Protection District
VENTURA COUNTY

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# VENTURA COUNTYWIDE STORMWATER QUALITY MANAGEMENT PROGRAM

## Ventura Countywide Stormwater Monitoring Program

# DATA QUALITY EVALUATION STANDARD OPERATING PROCEDURES (SOPs)

# 1. INTRODUCTION

These data quality evaluation standard operating procedures describe the process by which water chemistry data produced by the Ventura County Stormwater Monitoring Program (Stormwater Monitoring Program) are evaluated. A Standard Operating Procedure (SOP) is a set of written instructions that documents a routine or repetitive activity followed by an organization. In this instance, the activity is the evaluation of water quality data, and the organization is the Ventura Countywide Stormwater Quality Management Program. The development and use of SOPs are an integral part of a successful quality control system as they provide individuals with the information necessary to perform a job properly, and facilitate consistency in the quality and integrity of a product or end-result. These SOPs describe both technical and administrative operational elements undertaken by the Stormwater Monitoring Program in carrying out its *Data Quality Evaluation Plan* (DQEP). Data quality evaluation is a multiple step process used to identify errors, inconsistencies, or other problems potentially associated with Stormwater Monitoring Program data. The DQEP provides a reference point from which a program-consistent quality assurance/quality control (QA/QC) evaluation can be performed. These SOPs act as a set of prescriptive instructions detailing in a step-by-step manner how the Stormwater Monitoring Program carries out the data evaluation and data quality objectives set fourth in the DQEP.

The overall data evaluation process includes four major components. The **preliminary data inspection** step occurs promptly when the data are received from the laboratory. This step is intended to identify sample handling and analysis problems that can still be corrected within analytical holding times. The **technical data validation** step includes a detailed assessment of reported environmental and QA/QC data including both externally (field-initiated) and internally (lab-initiated) generated QA/QC data. Technical data validation is intended to identify all missing data, as well as anomalous results – those

numeric values outside of a historically observed range. As with preliminary data inspection, the identification of missing and anomalous data needs to be addressed with a laboratory as soon as possible. The **QA/QC data evaluation** step compares QA/QC data results to specific data quality objectives (DQOs) to ascertain the lack of contamination, and degree of accuracy and precision under which a laboratory analyzed samples. The final phase in the process is the **environmental data qualification** step. Based on the outcome of the QA/QC data evaluation step, some environmental data records may require qualification in order to label a result as having been generated while some field and/or laboratory practice was "out-of-control" (i.e., the result was generated while one or more DQOs were not achieved). If the environmental data qualification step has identified any chronic or significant QA/QC inconsistencies, a request to verify and explain these exceedances is sent to the laboratory that generated these data. The end result of this multiple step process is the production of a validated and qualified data set that is ready for reporting and further analysis.

Each of the four main components of the Stormwater Monitoring Program's Data Quality Evaluation Plan is discussed in detail in the subsequent sections of this document. Step-by-step instructions on how District staff operationally implements the tenets of the DQEP are presented as individual, step-wise ***data quality evaluation tasks***. These SOPs are meant to be used in combination with the Stormwater Monitoring Program's *2005/06 Data Quality Evaluation Plan* and NPDES Stormwater Water Quality Database (Database). The DQEP should be relied upon to provide the background and conceptual details of data quality evaluation, whereas these SOPs should be used as a *hands-on guide* describing how the Stormwater Monitoring Program operationally performs data quality evaluation of the water quality data that are stored, managed, and analyzed in the Program's Database. To this end, Stormwater Monitoring Program guidance documents that can provide additional, useful information to the data quality evaluation process include the *NPDES Stormwater Water Quality Database User's Manual* and *Data Reporting Protocols*.

This SOP document is written in such a manner as to provide District staff with useful information (denoted by the four-diamond ❖ symbol), as necessary, related to any given data quality evaluation task. Each **data quality evaluation task** is numbered in the order in which it is recommended that it be completed. Additionally, each task is presented with an ***Objective***, ***Evaluation***, ***Example***, ***Tools***, ***Corrective Action***, and ***Notes*** attribute. Furthermore, the arrow symbol (➢) is used to denote important facts and concepts presented in the ***Notes*** subsection. In as much as these SOPs represent the collective working knowledge and practices of District staff as they pertain to data quality evaluation, it is anticipated that these SOPs should and will change over time to reflect changes in the Stormwater Monitoring Program's activities, associated changes in the Data Quality Evaluation Plan, and improvements in laboratory analytical methods. To this end, these SOPs should be reviewed and updated as necessary by the Stormwater Monitoring Program to ensure their instructional relevance to current Program activities and practices.

# 2. PRELIMINARY DATA INSPECTION

The preliminary data inspection process occurs when laboratory reports are received following each monitoring event performed by the Stormwater Monitoring Program, as well as after any pre-season or mid-season QA/QC sampling. This first step in the data quality evaluation process involves comparing the data received from a laboratory against the analyses requested of the laboratory by the Stormwater Monitoring Program as specified on the chain of custody (C.O.C.) form that accompanies all water quality samples collected by the Stormwater Monitoring Program. It is important to check the reported data as soon as possible after the data are received from the laboratory in order to identify any gross errors that may have been committed in the sampling, analysis, and/or data reporting process. A laboratory must report its results in a timely fashion and these results must be reviewed immediately upon receipt to allow for re-analysis of questionable (i.e., out-of-range) results if deemed necessary. Any sample re-analysis or other corrective measure should be completed before sample holding times have elapsed. However, confirmatory re-analysis outside of holding times is allowable for some analytes. It is advised to discuss all sample reanalysis with the laboratory that analyzed the original sample before requesting re-analysis. Discrepancies between the data expected, based on the analyses requested, and the data received need to be addressed with a laboratory as soon as possible. The preliminary data inspection is not meant to identify every error or idiosyncrasy contained in an analytical data set, merely to identify gross data omissions and reporting errors, and confirm that analyses were performed within sample holding times. Preliminary data inspection includes checks for general laboratory report completeness, sample holding time compliance, detection limit compliance, analytical method compliance, and general data reporting errors. ***A general strategy to employ while performing preliminary data inspection is one that views a laboratory data report as a body of information that exhibits many expected patterns. The various assessments performed as part of the preliminary data inspection look to identify and correct deviations in these expected patterns.***

Because Stormwater Monitoring Program data can be submitted to the District by analytical laboratories in hard copy and electronic formats, certain data evaluation options are available to District staff depending on the format in which the District receives any given water quality data set. ***From an operational perspective, preliminary data inspection can and should begin as soon as data are received from an analytical laboratory. Additionally, data quality evaluation should be performed for a single monitoring event's worth of data at a time.***

- ❖ All hard copy data reports should necessarily be reviewed <u>before</u> they are entered into the Database via manual data entry screens in order to detect errors, irregularities, and omissions in a manner timely enough to allow for re-analysis of questionable results as necessary.

- ❖ Data reports submitted in an electronic format (either Microsoft Excel® or Microsoft Access®) can be reviewed *in place* by employing Excel's filtering feature or Access' filtering and querying functionality. District staff would

be required to create their own Access queries if choosing to evaluate water quality data within an Access file submitted by an analytical laboratory. Again, data should be reviewed in order to detect errors, irregularities, and omissions in a manner timely enough to allow for re-analysis of questionable results as necessary.

- Alternately, data submitted in an electronic format can be imported into the Database via the EDDIT feature prior to preliminary data inspection. Electronically submitted data that are imported into the Database should be processed to the extent that they are transferred to a **Temporary Results Table** (i.e., data are processed by and moved outside of the EDDIT feature) before preliminary data inspection tasks are performed. As stated above, this importation and subsequent review of data should occur in a manner timely enough to allow for re-analysis of questionable results as necessary.

Electronic data reports (typically referred to as **EDDs** – electronic data deliverables) imported into the Database for the purpose of evaluating the data within the database environment can be reviewed with the help of on-board data evaluation queries. These queries (labeled as **"recon"** and **"sop"** queries) exist in the Database to help District staff quickly and accurately review environmental and QA/QC data contained in **Temporary Results tables** – hence, the queries help District staff to carry out many of the data evaluation tasks specified in the DQEP. ***It should be noted that these queries were written to be used over and over during the course of evaluating water quality data for any given monitoring event performed by the Stormwater Monitoring Program. Furthermore, these queries are intended to be modified by District staff on an event-by-event basis, as necessary. To this end, specific querying actions of these SOP queries are not explicitly discussed in this document because the SQL (structured query language – pronounced "sequel") content (i.e., the code that tells a query what it should do) of any given query can and will change from one monitoring event to the next.***

- **"Recon"** (or reconnaissance) **queries** were created to primarily look at groups of information – such as the number of data records contained in a **Temporary Results Table** that belong to a particular classification of constituent. **Recon queries** do not return information from all data fields contained in a **Temporary Results Table**, only a subset of data fields. *Most* **recon queries** do not allow changes to be made when the query window is "open", thus no cascading changes are made to the actual data records contained in a **Temporary Results Table**. However, those **recon queries** denoted with a "D" (e.g., "reconC_qry_WCQA_01**D**_MS_AllResults") are *dynamically* linked to a particular **Temporary Results Table** when "open"; ***therefore, changing a result in the open query window will change the result in the data table.***

- ❖ **"Sop"** queries were created to look at all data fields of a data record that match certain user-defined query parameters. For example, a **sop query** could be "coded" (or written) to return only metals data records from a particular monitoring site. **Sop queries** are *dynamically* linked to a particular **Temporary Results Table** when "open"; ***therefore, changing a result in the open query window will change the result in the data table.***

## 2.1. Course Level Data Reconnaissance

**Objective:** The water quality samples collected during a monitoring event should have resulted in the generation of water chemistry data records – associated with specific monitoring sites – by those laboratories analyzing the samples.

**Evaluation:** Compare reported laboratory data with analyses requested on Chain of Custody form to confirm receipt of data with respect to:

- Monitoring Sites
- Sample Dates
- Sample Method
- Classifications
- Constituents
- Analyzing Laboratory

Often times a course level review of data can quickly reveal *missing* data records. Course level data reconnaissance is *primarily* concerned with the confirmation of receipt of <u>environmental</u> data records.

**Example:** Did the Stormwater Monitoring Program receive pesticide data from Calscience Environmental Laboratories, Inc., for the second wet weather monitoring event conducted in November of last year?

**Tools:** *Hard Copy Data* – Confirm receipt of data report and visually inspect for data of interest.
*Electronic Data* – Filter or query for specific data records.
***Existing Database Queries***

- See Section 7.1. (Course Level Data Reconnaissance Queries)
- Various **recon queries** exist in the Database for determining the presence (and number of records) or absence of particular types of data in **Temporary Results tables**. The names of all course level **recon queries** begin with "**reconC**". Query names also denote what general type of data they return – environmental data queries are labeled with "**WCE**", and QA/QC data queries are labeled with "**WCQA**". Finally, a query name possesses a numeric component that signifies the order in which the query should be executed (i.e., one would typically execute a query labeled "01" before a query labeled "02").

- Example reconC query: "reconC_qry_WCE_01_DataBySiteIDSampleDateEventRep" – the information contained in the query's name denotes that it returns environmental data ("WCE") grouped (primarily) by Site ID, Sample Date, and Event Representation.

**Corrective Action:** Notify appropriate analytical laboratory of missing environmental data records.

**Notes:** Pay close attention to the sites monitored and the particular analyses requested on a Chain of Custody form for a specific monitoring event.

Remember to look for patterns in the data and deviations from those patterns.

It is necessary to be familiar with the constituents a laboratory typically reports for any given analytical method it performs, being mindful of the fact that these constituents sometimes change over time. Creating some form of standard constituent list by laboratory and classification and/or analytical method will be necessary. This list should be reviewed and updated (as necessary) on an event-by-event basis.

## 2.2. Receipt of Environmental Data

**Objective:** Each environmental analysis requested for each water quality sample submitted to the laboratory should have resulted in the generation of an environmental data record contained in the laboratory data report. Requested environmental analyses that were not performed by the laboratory must be documented with the reason(s) for omission in a cover letter submitted with the laboratory report.

**Evaluation:** Compare reported laboratory data with analyses requested on Chain of Custody form.

**Example:** Did Calscience Environmental Laboratories, Inc., report each of the 10 pesticides it typically reports when analyzing a sample via EPA 8151A for each of the three monitoring sites evaluated during the last monitoring event?

**Tools:** *Hard Copy Data* – Visually inspect data report.
*Electronic Data* – Filter or query for specific data records.
***Existing Database Queries***

- See Section 7.2. (Environmental Data Evaluation Queries)
- Use **sop queries** to search for particular data records by (A) Laboratory and (B) Classification or Constituent.

**Corrective Action:** Notify appropriate analytical laboratory of missing environmental data records.

**Notes:** It is necessary to be familiar with the constituents a laboratory typically reports for any given analytical method it performs, being mindful of the fact that these constituents sometimes change over time. Creating some form of standard constituent list by laboratory and classification and/or analytical method will be necessary. This list should be reviewed and updated (as necessary) on an event-by-event basis.

## 2.3. Receipt of Field-Initiated QA/QC Data

**Objective:** Each field-initiated QA/QC analysis (e.g., equipment blank, field blank, field duplicate, field-initiated filter blank, travel blank, and MS/MSD analyses) requested for each water quality sample submitted to the laboratory should have resulted in the generation of a QA/QC data record contained in the laboratory data report. Requested field-initiated QA/QC analyses that were not performed by the laboratory must be documented with the reason(s) for omission in a cover letter submitted with the laboratory data report.

**Evaluation:** Compare reported laboratory data with analyses requested on Chain of Custody form. With the exception of MS/MSD samples, all analytes requested for environmental analysis should be present in field-initiated QA/QC results. A description of common QA/QC sample results is included in Table 1.

**Example:** Did CRG Marine Laboratories, Inc., report each of the 25 chlorinated pesticides it typically reports when analyzing a MS/MSD sample via EPA 625m?

**Tools:** *Hard Copy Data* – Visually inspect data report.
*Electronic Data* – Filter or query for specific data records.
***Existing Database Queries***

- See Section 7.3. (Field-Initiated QA/QC Data Evaluation Queries)
- Use **sop queries** to search for particular data records by (A) Laboratory, (B) QA/QC Sample Type, and/or (C) Classification or Constituent.

**Corrective Action**: Notify appropriate analytical laboratory of missing QA/QC data records.

**Notes**: It is necessary to be familiar with the constituents a laboratory typically reports for any given analytical method it performs, being mindful of the fact that these constituents sometimes change over time. Creating some

form of standard constituent list by laboratory and QA/QC sample type, classification, and/or analytical method will be necessary. This list should be reviewed and updated (as necessary) on an event-by-event basis.

- **MS/MSD Samples:** Note that it is common for certain analytes not to be included in standards prepared or purchased by a laboratory. For example, CRG typically reports 29 chlorinated pesticides when reporting environmental data results. However, the laboratory only reports 25 chlorinated pesticides when reporting MS/MSD results because the standard used to spike MS/MSD samples lacks four particular analytes. Certain *fine level* data reconnaissance queries – "**reconF**" queries – that may prove helpful in determining missing MS/MSD results are presented in Section 7.5. – Fine Level Data Reconnaissance Queries.

## 2.4. Receipt of Laboratory-Initiated QA/QC Data

**Objective:** All laboratory-initiated QA/QC analyses (e.g., method blanks, laboratory control spikes, etc.) that are typically reported by a given laboratory or those that are specifically requested by the Stormwater Monitoring Program should be contained in the laboratory data report. Commonly reported or specifically requested laboratory-initiated QA/QC analyses that were not included in a laboratory report must be documented with the reason(s) for their omission in a cover letter submitted with the laboratory data report.

**Evaluation:** Compare reported laboratory-initiated QA/QC data with expected laboratory-initiated QA/QC data based on those QA/QC data agreed to be reported by a laboratory. It is also useful to review those QA/QC data *historically* reported by a laboratory as a means of providing a second reference point. A description of common QA/QC sample results is included in Table 1.

**Example:** Did CRG Marine Laboratories, Inc., report each of the 13 metals method blanks it typically reports when analyzing a sample via EPA 200.8 (12 results) and SM 3500-Cr (1 result)?

**Tools:** *Hard Copy Data* – Visually inspect data report.
*Electronic Data* – Filter or query for specific data records.
***Existing Database Queries***

- See Section 7.4. (Laboratory-Initiated QA/QC Data Evaluation Queries)
- Use **sop queries** to search for particular data records by (A) Laboratory, (B) QA/QC Sample Type, and/or (C) Classification or Constituent.

**Corrective Action**: Notify appropriate analytical laboratory of missing QA/QC data records.

**Notes**: It is necessary to be familiar with the constituents a laboratory typically reports for any given analytical method it performs, being mindful of the fact that these constituents sometimes change over time. Creating some form of standard constituent list by laboratory and QA/QC sample type, classification, and/or analytical method will be necessary. This list should be reviewed and updated (as necessary) on an event-by-event basis.

**Table 1: Common QA/QC Sample Results and Associated Assessments**

| QA/QC Sample Result | QA/QC Assessment | Data Quality Objective |
|---|---|---|
| ***Contamination-related results*** | | |
| Equipment Blank | Assesses sample contamination introduced by sampling equipment (sampler tubing and sample bottles). | EB result < RL or PQL |
| Field Blank | Assesses sample contamination introduced during sample collection/handling process. | FB result < RL or PQL |
| Field-Initiated Filter Blank | Assesses sample contamination introduced by field filtration process. | FFLTRB result < RL |
| Travel Blank | Assesses sample contamination introduced during sample handling/transportation process | TB result < RL or PQL |
| Method Blank | Assesses sample contamination introduced by laboratory analytical process. | MB result < MDL |
| Lab-Initiated Filter Blank | Assesses sample contamination introduced by laboratory filtration process. | LFLTRB result < MDL |
| ***Accuracy-related results*** | | |
| Matrix Spike/Matrix Spike Duplicate Recovery | Assesses analytical process' ability to accurately evaluate concentration of analyte in an environmental matrix. | LL ≤ MS/MSD rec ≤ UL |
| Environmental Sample Surrogates Recovery | Assesses analytical process' extraction efficiency of organic compounds. | LL ≤ surrogate rec ≤ UL |
| LL = Laboratory-defined Lower Limit; UL = Laboratory- or Program-defined Upper Limit | | |

**Table 1: Common QA/QC Sample Results and Associated Assessments**

| QA/QC Sample Result | QA/QC Assessment | Data Quality Objective |
|---|---|---|
| ***Accuracy-related results -- continued*** | | |
| Laboratory Control Spike/Laboratory Control Spike Duplicate Recovery | Assesses analytical process' ability to accurately evaluate concentration of analyte in a "clean" laboratory matrix. | LL ≤ LCS/LCSD rec ≤ UL |
| ***Precision-related results*** | | |
| Field Duplicate RPD | Assesses repeatability in field sampling techniques through the collection and analysis of a Field Duplicate sample. | FD RPD ≤ UL |
| Laboratory Duplicate RPD | Assesses repeatability in laboratory's analytical process through analysis of a Laboratory Duplicate sample. | LD RPD ≤ UL |
| Matrix Spike RPD | Assesses analytical process' repeatability in accurately evaluating the concentration of an analyte in an environmental matrix. | MS RPD ≤ UL |
| Laboratory Control Spike RPD | Assesses analytical process' repeatability in accurately evaluating the concentration of an analyte in a "clean" laboratory matrix. | LCS RPD ≤ UL |
| LL = Laboratory-defined Lower Limit; UL = Laboratory- or Program-defined Upper Limit | | |

## 2.5. Sample Holding Time Compliance

**Objective:** All environmental samples, equipment blank, field blank, field-initiated filter blank, travel blank, and field duplicate samples should be prepared (where necessary) and analyzed within required preparation holding times and analysis holding times, respectively. Any sample holding times that were not met should be indicated in the laboratory data report for the affected sample result(s) with an explanation as to why holding times were exceeded.

**Evaluation:** The analysis and preparation dates included in a laboratory data report for all data records reported should be reviewed with consideration of when a sample was collected to *generally* determine if preparation (where necessary) and analysis holding times were met for all environmental and field-initiated QA/QC samples (including environmental samples,

equipment blank, field blank, field-initiated filter blank, travel blank, and field duplicate samples). Verify that reported *sample dates* are correct before determining various elapsed times. An *exact* determination of the elapsed time between sample collection and sample preparation and/or sample analysis will be made during the QA/QC data evaluation step discussed in Section 4. The sample holding times observed by the Stormwater Monitoring Program are provided in Section 6.1.

**Example:** Were dissolved mercury samples prepared within 48 hours of sample collection and analyzed within 90 days of sample preparation?

**Tools:** *Hard Copy Data* – Visually inspect data report.
*Electronic Data* – Filter or query for specific data records in order to make determination of elapsed time(s).
***Existing Database Queries*** – If environmental and QA/QC data have already been imported into the Database and currently reside in their respective **Temporary Results tables**, then execute the following "**reconF**" queries presented in Section 7.5. (Fine Level Data Reconnaissance Queries) in order to check appropriateness of sample, preparation, and analysis dates prior to checking for sample holding time violations:

1. reconF_qry_WCE_01D_SampleDate>PrepDate
2. reconF_qry_WCE_02D_SampleDate>AnalysisDate
3. reconF_qry_WCE_03D_PrepDate>AnalysisDate
4. reconF_qry_WCQA_04D_SampleDate>PrepDate
5. reconF_qry_WCQA_05D_SampleDate>AnalysisDate
6. reconF_qry_WCQA_06D_PrepDate>AnalysisDate

***Existing Database Functionality*** – If environmental and QA/QC data have already been imported into the Database and currently reside in their respective **Temporary Results tables** and any data entry issues identified by **reconF** queries 1 – 6 above have been corrected, then the Database's on-board **Holding Time Evaluation** routine can be used to check for sample holding time exceedances by executing the following steps:

1. Prepare data for holding time evaluation (see Section 6.1. – Prepare Data for Evaluation in the *Database User's Manual*).
2. Select data from specific monitoring event for holding time evaluation (see Section 6.2.1. – Select Environmental and QA/QC Data for Evaluation in the *Database User's Manual*).
3. Execute Steps 1 – 3 of the Database's Holding Time Evaluation (see Section 6.2.2. – Holding Time Evaluation in the *Database User's Manual*). **DO NOT** execute Steps 4 – 6 of the Holding Time Evaluation.
4. Review Holding Time Exceedances Report to determine if sample holding time exceedances exist.

**Corrective Action:** (A) Contact laboratory to correct data entry errors identified by *Existing Data Queries* described above; (B) Contact laboratory to determine if observed holding time exceedance(s) might be the result of inaccurate data reporting – edit errors as necessary to resolve exceedance issues; (C) Where exceedances are confirmed, inquire as to why samples were not delivered to a laboratory within holding times and/or why sample preparation and/or analysis did not occur within holding times; and (D) Take remedial actions to prevent future occurrences.

**Notes:** With regard to ***bacteriological*** analyses, the Stormwater Monitoring Program may use a sample holding time of 8 hours when evaluating sample holding time exceedances. The 8-hour limit is the sum of a 6-hour time period allowed for sample transport plus a 2-hour time period allowed for analysis preparation and initiation (i.e., "setting up" of the test). The Database currently uses this 8-hour sample holding time limit when evaluating bacteriological samples.

## 2.6. Detection and Quantitation Limit Compliance

**Objective:** The detection and quantitation limits included in a laboratory data report for all data records should meet or be lower than the levels agreed upon by the laboratory prior to sample submittal. Various regulatory mechanisms (water quality objectives, NPDES permits) indirectly dictate a maximum analytical quantitation limit for an analyte by virtue of promulgating a numeric water quality objective. It follows that a quantitation limit must be lower than a water quality objective for a particular analyte in order to reliably assess whether a detected concentration of the analyte is above or below the water quality objective. Furthermore, a detection limit must be lower than a water quality objective for a particular analyte in order to reliably access whether a non-detected concentration is below the water quality objective. A detection limit above a water quality objective is ineffective for comparing a non-detected water quality result against its water quality objective.

**Evaluation:** The detection and quantitation limits included in a laboratory report for all data records reported should be reviewed to determine if they meet or are lower than the levels agreed upon prior to sample submittal. The detection and quantitation limits observed by the Stormwater Monitoring Program are provided in Section 6.2.

**Example:** Were detection and quantitation limits for metals analyses met?

**Tools:** *Hard Copy Data* – Visually inspect data report.
*Electronic Data* – Filter or query for specific data records.

***Existing Database Queries*** – If environmental and QA/QC data have already been imported into the Database and currently reside in their respective **Temporary Results tables**, then execute the following "**reconF**" queries presented in Section 7.5. (Fine Level Data Reconnaissance Queries) in order to check appropriateness of reported detection limits:

1. reconF_qry_WCE_04_DL-Class-Lab
2. reconF_qry_WCQA_07_DL-Class-Lab

- The Database currently stores only a single detection or quantitation limit (MDL, RL, PQL, etc.) for each environmental and QA/QC sample record it manages. Therefore, the simultaneous comparison of a sample result and its associated detection (MDL) and quantitation (RL, PQL, DLR, etc.) limits for a particular constituent would only be possible through visual inspection of a hard copy or electronic laboratory report.

**Corrective Action:** (A) Contact laboratory to determine if larger-than-expected detection and/or quantitation limit(s) might be the result of inaccurate data reporting – edit errors as necessary to resolve issues; (B) In instances where samples were not diluted, inquire as to why detection and/or quantitation limits were elevated above agreed upon levels; and (C) Take remedial actions to ensure that future detection and quantitation limits will be met by the laboratory.

**Notes:** Exceedingly high levels of an analyte in solution or a "dirty" matrix often require that a sample be diluted prior to analysis. This sample dilution process results in elevated or *adjusted* detection and quantitation limits. The dilution of a sample, along with adjusted detection and quantitation limits, should be noted by the laboratory in its data report.

## 2.7. Analytical Method Compliance

**Objective:** The analytical methods employed and reported by a laboratory in its data report should match those methods agreed upon by the laboratory prior to sample submittal. The Monitoring and Reporting requirements of a NPDES permit often specify the analytical method to be employed and/or the quantitation limit to be achieved when evaluating the concentration of a particular constituent in a water quality sample.

**Evaluation:** The analytical methods included in a laboratory data report for all data records reported should be reviewed to determine if they match those agreed upon prior to sample submittal. The analytical methods observed by the Stormwater Monitoring Program are provided in Section 6.2.

**Example:** Were appropriate analytical methods employed to analyze water quality samples for metals?

**Tools:** *Hard Copy Data* – Visually inspect data report.
*Electronic Data* – Filter or query for specific data records.
***Existing Database Queries*** – If environmental and QA/QC data have already been imported into the Database and currently reside in their respective **Temporary Results tables**, then execute the following "**reconF**" queries presented in Section 7.5. (Fine Level Data Reconnaissance Queries) in order to check appropriateness of reported detection limits:

1. reconF_qry_WCE_04_DL-Class-Lab
2. reconF_qry_WCQA_07_DL-Class-Lab

**Corrective Action:** Contact laboratory to inquire why an alternate analytical method was employed to analyze a sample for a specific constituent. Determine that alternate method provides an equivalent analysis of the target analyte. Determine that alternate method achieved desired detection and quantitation limits. Ask laboratory to provide sample holding time information for alternate analytical method. If alternate analytical method is unacceptable, ask laboratory to re-analyze water quality sample if holding times have not yet been exceeded.

**Notes:** It is useful know what analytical methods have been *historically* employed to analyze for constituents monitored by the Stormwater Monitoring Program. Additionally, it is helpful to know why certain analytical methods once employed are no longer used – methods are typically "retired" when they've been replaced by more accurate ones that allow for the achievement of lower detection limits.

## 2.8. Common Data Reporting Errors

**Objective:** Laboratory data reports should be complete and free of typographical errors. In practice, even the most conscientious laboratory occasionally commits typographical errors and/or submits incomplete data reports. Before a laboratory data report can be considered *finalized* by the Stormwater Monitoring Program, it must be complete and error free. A finalized laboratory data report is the overall goal of the data validation and evaluation process.

**Evaluation:** Reviewing a laboratory data report for common data reporting errors during the current preliminary data inspection process is merely a continuation of the fine level data reconnaissance work already begun. A hard copy or electronic data report should be reviewed in a cursory

manner to detect omitted information and checked for the following common data reporting errors:

A. A numeric concentration is outside of its historic observed range.
B. An incorrect fraction is reported for a particular constituent.
C. An incorrect unit is reported for a particular constituent.
D. Non-detected results and their associated detection limits do not match (e.g., a sample result is reported as non-detect at 0.1 µg/L, while the sample's associated detection limit (MDL) is reported as 0.05 µg/L.
E. A dissolved concentration is greater than its corresponding total concentration.

Fraction, unit, and detection limit values observed by the Stormwater Monitoring Program are provided in Sections 6.1. and 6.2.

**Example:** Are the reported results of non-detected samples equal to their detection limits?

**Tools:** *Hard Copy Data* – Visually inspect data report.
*Electronic Data* – Filter or query for specific data records.
***Existing Database Queries*** – If environmental and QA/QC data have already been imported into the Database and currently reside in their respective **Temporary Results tables**, then execute the following "**reconF**" queries presented in Section 7.5. (Fine Level Data Reconnaissance Queries) in order to check a variety of common data reporting errors:

**A. A numeric concentration is outside of its historic observed range.**
**1.** reconF_qry_WCE_05_Results-Class-Lab
**2.** reconF_qry_WCQA_08_DupResults-Class-Lab (query returns only field and laboratory duplicate results)

**B. An incorrect fraction is reported for a particular constituent.**
**C. An incorrect unit is reported for a particular constituent.**
**3.** reconF_qry_WCE_04_DL-Class-Lab
**4.** reconF_qry_WCQA_07_DL-Class-Lab

**D. Non-detected results and their associated detection limits do not match.**
**5.** reconF_qry_WCE_06D_DL>Result
**6.** reconF_qry_WCE_07D_NDResult<>DL
**7.** reconF_qry_WCQA_09D_DL>Result
**8.** reconF_qry_WCQA_10D_NDResult<>DL

**E. A dissolved concentration is greater than its corresponding total concentration** (taking into account a generally accepted relative percent difference of 25% that may exist between dissolved and total fractions of the same water quality sample – for example, Selenium results).

**9.** reconF_qry_WCE_08D_FracComparison-Class-Lab (query returns only environmental records having either a "Dissolved" or "Total" Fraction value)

**10.** reconF_qry_WCQA_11D_FracComparison-Class-Lab (query returns only field and laboratory duplicate results having either a "Dissolved" or "Total" Fraction value)

**Corrective Action:** (A) Notify laboratory of any data identified as missing; (B) Contact laboratory to determine if observed data inconsistency might be the result of inaccurate data reporting; (C) Where data inconsistencies are confirmed to be the result of a data entry error, determine if a whole or partial hard copy laboratory report or EDD re-submittal is necessary; re-enter/import or edit data as necessary; (D) Where data inconsistencies are confirmed as valid, inquire with the laboratory as to the ability and appropriateness of re-analyzing affected sample(s) and/or follow up with a Program decision to further quality affected analytical result(s); and (E) Take remedial actions to prevent future occurrences.

**Notes:** As stated in earlier data evaluation task descriptions, a working knowledge of the Stormwater Monitoring Program's historic analytical data set is invaluable when evaluating a current single-event data set. If data appear inconsistent with expectations, don't hesitate to ask a laboratory about any perceived data reporting errors. Oftentimes the detection and notification of an inconsistency will prompt a laboratory to re-evaluate the way it prepares its data reports and share additional analytical information with the Stormwater Monitoring Program that only helps to further broaden the understanding of analytical processes and the data generated by them.

Errors, irregularities, and omissions identified in a laboratory data report during the preliminary data inspection process should immediately be reported to the laboratory for clarification or correction. This initial screening process can identify and correct a good number of errors that would otherwise cause problems further along in the data validation and evaluation process, or later if the data are used for higher-level analyses, such as compliance with water quality objectives or statistical analysis. Furthermore, the confirmatory re-analyses of a water quality sample for which an out-of-range result was originally reported can increase confidence in the integrity of the questionable data point provided the analysis can be re-run within – or in some cases, outside of – sample holding times. Finally, a more thorough preliminary data inspection will lead to more expeditious completion of all subsequent steps in the data validation and evaluation process. If the preliminary data inspection process is carried out by first importing electronically-formatted data into the Database and then employing the various on-board

**recon** and **sop queries** to review these data, then the subsequent **technical data validation** step will be made appreciably less demanding.

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# 3. TECHNICAL DATA VALIDATION

The technical data validation process is really a refinement and continuation of the preliminary data inspection step discussed in Section 2. The technical data validation step requires a thorough scrutiny, often on a record-by-record basis, of all environmental and QA/QC data reported by a laboratory. This data validation step should identify all missing and anomalous data contained in a laboratory data report. As with errors, irregularities, and omissions identified in the preliminary data inspection step, all inconsistencies found during technical data validation should immediately be reported to the laboratory for clarification or correction. A detailed review of any large data set by necessity requires some mechanism for efficiently and consistently examining the data for errors, irregularities, and omissions. The Stormwater Monitoring Program relies upon three data management tools it has developed to facilitate the technical data validation of its water chemistry data: the *Data Reporting Protocols* used by a laboratory to produce an EDD, the Database, and the *Standard Operating Procedures* presented in this document. The purpose of the technical data validation process is to ensure that a complete and error-free data set, comprised of environmental and QA/QC data, is available for assessment during the QA/QC data evaluation phase discussed in Section 4. The underlying goal of the entire sampling, analysis, and data reporting effort is to accurately describe water quality conditions monitored by the Stormwater Monitoring Program.

From an operational perspective, technical data validation begins as soon as data are hand-entered or automatically imported into the Database because the application employs numerous data completeness and data appropriateness routines that repeatedly evaluate data to make certain that the information that eventually resides in the Database's **Temporary Results Tables** complies with the application's numerous data constraints. Furthermore, technical data validation is meant to be performed on data that reside in the Database's **Temporary Results Tables**. The Database's manual and automatic data entry mechanisms initiate and direct compliance of data with the data reporting and formatting requirements of the Database as presented in the *Data Reporting Protocols*.

- While the **preliminary data inspection** process can be undertaken with data that exist in hard copy laboratory data reports, the **technical data validation** process *requires* that data be entered into the temporary side of the Database. Refer to Sections 4.4. – 4.7. of the *Database User's Manual* for instruction on how to enter environmental and QA/QC data into the Database through several data entry mechanisms.

- Assessing the completeness of a laboratory data report requires the data reviewer to confirm that (1) all required information associated with a single data record is present – a check known as a ***data population assessment***; and (2) all requested and required analytical results, both environmental and QA/QC, are included in the laboratory report – a check known as a ***data fulfillment assessment***.

- If the **preliminary data inspection** (see Section 2) was performed using on-board data evaluation queries and existing Database functionality to review data that reside in the Database's **Temporary Results tables**, then various errors, irregularities, and omissions associated with a particular data set were likely already identified, thus making the current **technical data validation** process less time-consuming.

**Table 2: Data Field Information to be included in Laboratory Data Reports**

| | |
|---|---|
| ***ENIVIRONMENTAL DATA RECORDS*** | |
| **Monitoring Site Name** | **Analytical Method** |
| **Sample Date** | **Detection Limit** |
| Preparation Date | **Detection Limit Type** |
| **Analysis Date** | **Laboratory Qualification (as necessary; otherwise database default value)** |
| **Constituent Name** | **Laboratory Qualification Notes (as necessary; otherwise database default value)** |
| **Fraction** | **Analytical Laboratory Name** |
| **Sign ("<", "=", "<")** | Laboratory Sample ID # |
| **Result** | QA/QC Batch ID # |
| **Units** | **Environmental Sample Notes (as necessary; otherwise database default value)** |
| ***QA/QC DATA RECORDS*** | |
| **Monitoring Site Name** | **Analytical Method** |
| **Sample Date** | **Detection Limit** |
| Preparation Date | **Detection Limit Type** |
| **Analysis Date** | **Laboratory Qualification (as necessary; otherwise database default value)** |
| **QA/QC Sample Type** | **Laboratory Qualification Notes (as necessary; otherwise database default value)** |
| **QA/QC Replicate Number** | Minimum QA Limit (as necessary) |
| **Constituent Name** | Maximum QA Limit (as necessary) |
| **Fraction** | **Analytical Laboratory Name** |
| **Sign ("<", "=", "<")** | Laboratory Sample ID # |
| **Result** | QA/QC Batch ID # |
| **Units** | **QA/QC Sample Notes (as necessary; otherwise database default value)** |
| ***Database-required data fields are represented in bold type.*** | |

**Table 3: Data Field Information to be generated by District**

| *ENVIRONMENTAL AND QA/QC DATA RECORDS* |
|---|
| **Monitoring Type** |
| **Flow Basis** |
| **Event Type** |
| **Sample Type (*environmental data only*)** |
| **Event ID** |
| **Sample Source** |
| **Sample Method (*environmental data only*)** |
| **Event Representation (*environmental data only*)** |
| **Constituent Classification** |
| **CAS Number** |
| **Result Type** |
| Program Qualification (*environmental data only – assigned by Program as necessary at the end of the data validation/evaluation process*) |
| Data Quality Objective Compliance (*QA/QC data only – assigned by Program as necessary at the end of the data validation/evaluation process*) |
| ***Database-required data fields are represented in bold type.*** |

## 3.1. Data Population Assessment

**Objective:** Every hard copy and electronic laboratory data report should contain a suite of information that is required to be provided by the laboratory; the data fields containing this information are listed in Table 2. Furthermore, **Temporary Results tables** should contain a compliment of additional sampling information required by the NPDES Stormwater Water Quality Database in order to completely satisfy all data reporting and data management objectives of the Stormwater Monitoring Program; the data fields containing this complimentary information are listed in Table 3.

**Evaluation:** To begin with, every hard copy and electronic laboratory data report should be reviewed to verify that each reported data record contains relevant information in those data fields listed in Table 2 – this review can occur at or before the time of data entry (manual or automatic). Secondarily, District data entry staff should make certain they have District-generated information at hand in order to appropriately populate those data fields listed in Table 3 – this confirmation should occur at or before the time of data entry (manual or automatic).

- ❖ From an operational perspective, District staff need be *primarily* concerned with possessing and understanding non-required database information (i.e., those data fields listed among Tables 2 and 3 that are not denoted by bold type) at the time of data entry because various Database constraints[1] will automatically prevent data records from being transferred into **Temporary Results tables** that lack required information or contain nonsensical information.

**Example:** Do all data records contained in the CRG Marine Laboratories, Inc., EDD possess a Preparation Date value? If not, does the absence of this information have an impact on sample holding time evaluation?

**Tools:** *Hard Copy Data* – Visually inspect data report to detect omissions at or before the time of data entry, followed by employing existing database functionality described below.
*Electronic Data* – Filter or query for data records to detect omissions at or before the time of data entry, followed by employing existing database functionality described below.
***Existing Database Functionality*** – Once data reside in **Temporary Results tables**, use the Database's **Water Chemistry Environmental Data Viewing/Editing Screen** (see Section 5.1. in the *Database User's Manual*) and **Water Chemistry QA/QC Data Viewing/Editing Screen** (see Section 5.2. in the *Database User's Manual*) to visually inspect data records for omissions by using screen's filtering and querying functionality.

**Corrective Action:** All data omissions found during data population assessment should immediately be reported to the laboratory for clarification or correction. Information not reported by the laboratory will require either (A) a re-submittal of the laboratory data report without any missing information, or (B) hand entry/data field updating by District staff as necessary.

**Notes:** District staff should rely on current chain of custody forms, knowledge of historic monitoring program, and knowledge of analytical water quality data when evaluating overall data population of a laboratory data report. In short, District staff should rely upon all knowledge, references, and tools – as necessary – that were used to perform the **preliminary data inspection** described in Section 2 of this document.

**Common Data Omissions and Improper Data Submittals**

- Lack of explicitly-reported Detection Limits.
- Inappropriate submittal of Detection Limits for QA/QC results that do not possess a Detection Limit (i.e., all recovery and RPD results).

[1] Database constraints in this context are primarily referring to all the required updating of look up tables that must occur prior to data entry, as well as the Database's notifications to the user of null values where null values are not permitted.

- Lack of Minimum and Maximum QA Limits where required.
- Inappropriate submittal of Minimum and Maximum QA Limits for QA/QC results that do not possess such limits (i.e., a Minimum QA Limit for a method blank or a RPD result).

## 3.2. Data Fulfillment Assessment

In addition to making a determination as to whether any given analytical data record contains all the information it should contain, the data reviewer must determine if all requested and required data records were provided by a laboratory. Generally speaking, *requested* data would be those analyses specified on the chain of custody form. Typically, these are environmental and field-initiated QA/QC analyses (e.g., equipment blank, field blank, field duplicate, field-initiated filter blank, travel blank, and MS/MSD analyses). Data records falling in the *required* category would be all laboratory-initiated QA/QC analyses that the Stormwater Monitoring Program compares against specific data quality objectives (DQOs) to ascertain the lack of contamination, and degree of accuracy and precision under which a laboratory analyzed the Stormwater Monitoring Program's water quality samples. A description of common QA/QC sample results and their associated assessments is included in Table 1. Data fulfillment assessments of these common QA/QC sample results are described in the subsections below in the order they are presented in Table 1.

- ❖ The following collection of data evaluation tasks are similar to those describe earlier in Section 2, with the exception that the following evaluations must be carried out with a greater degree of scrutiny so as to identify all missing environmental and QA/QC data records that should be included in any given laboratory data report. It follows that these evaluations will also employ many of the same *tools* employed during the preliminary data inspection process.

- ❖ In addition to the ***Objective***, ***Evaluation***, ***Example***, ***Tools***, ***Corrective Action***, and ***Notes*** attributes presented in Section 2, each **data quality evaluation task** presented in this section also includes a ***Data Reporting Frequency*** attribute. This attribute describes how frequently District staff should expect to encounter a particular water quality data result.

### 3.2.1. Environmental Results

**Data Reporting Frequency:** Environmental data are reported for all monitoring events.

**Objective:** A laboratory data report contains environmental data records for all analyses specified on a chain of custody form.

**Evaluation:** Review laboratory data report to confirm receipt of all environmental data records generated from analyses specified on a chain of custody form.

**Example:** Did MWH Laboratories, Inc., report all requested Glyphosate results?

**Tools:** ***Existing Database Queries***

- See Section 7.2 (Environmental Data Evaluation Queries); or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry Environmental Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.1. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all environmental data from each laboratory analyzing water quality samples for the Stormwater Monitoring Program based on analyses requested on chain of custody forms.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing environmental data records.

**Notes:** See *General Guidance* description above.

### 3.2.2. Equipment Blank Results

**Data Reporting Frequency:** Equipment blank data are typically generated and reported prior to the start of the monitoring season, or during the monitoring season as deemed necessary by the Stormwater Monitoring Program.

**Objective:** A laboratory data report contains equipment blank data records for all analyses specified on a chain of custody form.

**Evaluation:** Review laboratory data report to confirm receipt of all equipment blank data records generated from equipment blank analyses specified on a chain of custody form. Equipment blank analyses performed separately from environmental analyses should also possess their own compliment of QA/QC results including, at the very least, *method blank* results. If organic compounds are analyzed in equipment blank samples, then *surrogate equipment blank* and *surrogate method blank* results should also be provided by the laboratory. Each of these additional QA/QC sample results will need to be evaluated in addition to the equipment blank results.

**Example:** Did CRG Marine Laboratories, Inc., report equipment blank results for all requested metals analyses?

**Tools:** ***Existing Database Queries***

- See Section 7.3 (Field-Initiated QA/QC Data Evaluation Queries); or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all equipment blank data from each laboratory analyzing water quality samples for the Stormwater Monitoring Program based on analyses requested on chain of custody forms.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing equipment blank data records.

**Notes:** See *General Guidance* description above.

### 3.2.3. Field Blank Results

**Data Reporting Frequency:** Field blank data are generated and reported according to a QA/QC Sampling Schedule followed by the Stormwater Monitoring Program.

**Objective:** A laboratory data report contains field blank data records for all analyses specified on a chain of custody form.

**Evaluation:** Review laboratory data report to confirm receipt of all field blank data records generated from field blank or "blind" environmental analyses specified on a chain of custody form. Field blank samples are often submitted to a laboratory "blindly" under a fictitious monitoring location name.

**Example:** Did CRG Marine Laboratories, Inc., report field blank results for all requested conventional analyses?

**Tools:** ***Existing Database Queries***

- See Section 7.3 (Field-Initiated QA/QC Data Evaluation Queries); or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all field blank data from each laboratory analyzing water quality samples for the Stormwater Monitoring Program based on analyses requested on chain of custody forms.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing field blank data records.

**Notes:** See *General Guidance* description above.

### 3.2.4. Field-Initiated Filter Blank Results

**Data Reporting Frequency:** Very infrequent – filter blank data are generated and reported only as necessary.

**Objective:** A laboratory data report contains field-initiated filter blank data records for all analyses specified on a chain of custody form.

**Evaluation:** Review laboratory data report to confirm receipt of all field-initiated filter blank data records generated from field-initiated filter blank analyses specified on a chain of custody form.

**Example:** Did CRG Marine Laboratories, Inc., report field-initiated filter blank results for all requested metals analyses?

**Tools:** ***Existing Database Queries***

- See Section 7.3 (Field-Initiated QA/QC Data Evaluation Queries); or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all field-initiated filter blank data from each laboratory analyzing water quality samples for the Stormwater Monitoring Program based on analyses requested on chain of custody forms.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing field-initiated filter blank data records.

**Notes:** See *General Guidance* description above.

It should be noted that a field blank prepared for a dissolved constituent is equivalent to a field-initiated filter blank, and therefore various analytical laboratories and the Stormwater Monitoring Program may choose to not report this QA/QC sample result explicitly as a "filter blank"; rather as a field blank for a dissolved analyte. *A good, general rule of thumb to follow is to always enter QA/QC sample results into the Database as they are reported by an analytical laboratory (keeping in mind the Database's ability to recognize and "remember" synonyms for QA/QC Sample Types where appropriate).*

### 3.2.5. Travel Blank Results

**Data Reporting Frequency:** Very infrequent – travel blank data are generated and reported only as necessary.

**Objective:** A laboratory data report contains travel blank data records for all analyses specified on a chain of custody form.

**Evaluation:** Review laboratory data report to confirm receipt of all travel blank data records generated from travel blank analyses specified on a chain of custody form.

**Example:** Did CRG Marine Laboratories, Inc., report travel blank results for all requested trace organics analyses?

**Tools:** ***Existing Database Queries***

- See Section 7.3 (Field-Initiated QA/QC Data Evaluation Queries); or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all travel blank data from each laboratory analyzing water quality samples for the Stormwater Monitoring Program based on analyses requested on chain of custody forms.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing travel blank data records.

**Notes:** See *General Guidance* description above.

### 3.2.6. Method Blank Results

**Data Reporting Frequency:** Every monitoring event – method blank data are generated and reported for every constituent analyzed by the Stormwater Monitoring Program for every monitoring event it performs.

**Objective:** A laboratory data report contains method blank data records for all analyses specified on a chain of custody form.

**Evaluation:** Review laboratory data report to confirm receipt of all method blank data records generated from the environmental analyses specified on a chain of custody form.

**Example:** Did Calscience Environmental Laboratories, Inc., report method blank results for each constituent it analyzed via analytical method EPA 8151A?

**Tools:** ***Existing Database Queries***

- See Section 7.4 (Laboratory-Initiated QA/QC Data Evaluation Queries); or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all method blank data from each laboratory analyzing water quality samples for the Stormwater Monitoring Program based on analyses requested on chain of custody forms.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing method blank data records.

**Notes:** See *General Guidance* description above.

### 3.2.7. Laboratory-Initiated Filter Blank Results

**Data Reporting Frequency:** Very infrequent – filter blank data are generated and reported only as necessary.

**Objective:** A laboratory data report contains laboratory-initiated filter blank data records as necessary due to a laboratory's "in-house" filtration of water quality samples for which dissolved constituents were analyzed.

**Evaluation:** Review laboratory data report to confirm receipt of all laboratory-initiated filter blank data records generated from a laboratory's "in-house" filtration of certain water quality samples for which dissolved constituents were analyzed.

**Example:** Did Acme Laboratories, Inc., report laboratory-initiated filter blank results for dissolved mercury analyses?

**Tools:** ***Existing Database Queries***

- See Section 7.4 (Laboratory-Initiated QA/QC Data Evaluation Queries); or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all laboratory-initiated filter blank data submitted by a laboratory due to its "in-house" filtration of water quality samples for which dissolved constituents were analyzed.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing laboratory-initiated filter blank data records.

**Notes:** See *General Guidance* description above.

It should be noted that a method blank prepared for a dissolved constituent is equivalent to a laboratory-initiated filter blank, and therefore various analytical laboratories and the Stormwater Monitoring Program may choose to not report this QA/QC sample result explicitly as a "filter blank"; rather as a method blank for a dissolved analyte. *A good, general rule of thumb to follow is to always enter QA/QC sample results into the Database as they are reported by an analytical laboratory (keeping in mind the Database's ability to recognize and "remember" synonyms for QA/QC Sample Types where appropriate).*

### 3.2.8. Matrix Spike/Matrix Spike Duplicate Recovery Results

**Data Reporting Frequency:** Frequent – matrix spike/matrix spike duplicate results are generated and reported according to a QA/QC Sampling Schedule followed by the Stormwater Monitoring Program.

**Objective:** A laboratory data report contains matrix spike/matrix spike duplicate (MS/MSD) data records for most, if not all analyses specified for MS/MSD analysis on a chain of custody form.

**Evaluation:** Review laboratory data report to confirm receipt of all matrix spike/matrix spike duplicate (MS/MSD) data records generated from MS/MSD analyses specified on a chain of custody form.

**Example:** Did CRG Marine Laboratories, Inc., report each of the 25 chlorinated pesticides it typically reports when analyzing a MS/MSD sample via EPA 625m?

**Tools:** ***Existing Database Queries***

- See Section 7.3 (Field-Initiated QA/QC Data Evaluation Queries),
- reconF_qry_WCQA_01D_MS_AllResults; or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all matrix spike/matrix spike duplicate recovery data submitted by a laboratory based on knowledge of the MS/MSD results typically submitted by a particular laboratory.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing matrix spike/matrix spike duplicate data records.

**Notes:** See *General Guidance* description above.

**Less than expected MS/MSD results** – It is common for certain analytes not to be included in MS/MSD standards prepared or purchased by a laboratory. For example, CRG typically reports 29 chlorinated pesticides when reporting environmental data results. However, the laboratory only reports 25 chlorinated pesticides when reporting MS/MSD results because the standard used to spike MS/MSD samples lacks four particular analytes. Additionally, even though it is uncommon, sometimes a laboratory will only report a single matrix spike recovery result, and not a duplicate recovery result for a particular analyte.

**More than expected MS/MSD results** – Alternately, the Stormwater Monitoring Program may only request that a small number of constituents be analyzed by a particular laboratory, and in fact receive MS/MSD results for analytes not event evaluated by the Program. Under this scenario, the

laboratory is likely reporting *all* analytes contained in the spiking solution it used as a matter of course. *From an operational perspective, the Program need only enter into the Database those MS/MSD results associated with the environmental analyses requested on the chain of custody form.*

**Matrix spike results from an unknown matrix** – It is common for a laboratory to report MS/MSD results from any given water quality sample submitted by one of their client's. These MS/MSD results would be described as coming from a matrix of unknown provenance or origin, since the Stormwater Monitoring Program has no knowledge of the matrix – it is unclear if the matrix is stormwater, groundwater, wastewater influent, or any other water-based matrix analyzed by the laboratory. *While MS/MSD results from an unknown matrix provide a general evaluation of the accuracy of a specific analytical process that co-occurred with the analysis of the Stormwater Monitoring Program's water quality samples, they are <u>not</u> used to qualify the Stormwater Monitoring Program's environmental data, and therefore should <u>not</u> be entered into the Database.*

### 3.2.9. Environmental Sample Surrogate Recovery Results

**Data Reporting Frequency:** Every monitoring event – environmental sample surrogate recovery data are generated and reported for every monitoring event where water quality samples are analyzed for trace organic compounds.

**Objective:** A laboratory data report contains environmental sample surrogate recovery data records for all environmental samples analyzed for trace organic compounds as specified on a chain of custody form.

**Evaluation:** Review laboratory data report to confirm receipt of all environmental sample surrogate recovery data records generated from the analysis of environmental samples for trace organic compounds as specified on a chain of custody form. The Database classifies trace organic compounds in one of three classifications: Organic, PCB, or Pesticide. *Environmental sample surrogates are those results entered into the Database with the following QA/QC Sample Type value:*

**srgt environ, rec** (associated with environmental samples)

**Example:** Did Calscience Environmental Laboratories, Inc., report environmental sample surrogate recovery results for each water quality sample it analyzed via analytical method EPA 8151A?

**Tools:** ***Existing Database Queries***

- See Section 7.4 (Laboratory-Initiated QA/QC Data Evaluation Queries), and
- reconF_qry_WCQA_12_EnvSrgtRecovLimits; or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all environmental sample surrogate recovery data from each laboratory analyzing water quality samples for trace organic compounds as requested on chain of custody forms.
- Reference standard constituent list generated by laboratory and classification and/or analytical method. This list should include *surrogate*, as well as *target* analytes for those laboratories analyzing trace organic compounds for the Stormwater Monitoring Program.

**Corrective Action:** Notify appropriate analytical laboratory of missing environmental sample surrogate recovery records.

**Notes:** See *General Guidance* description above.

Surrogate compounds are spiked into environmental samples using a standard solution prepared or purchased by a laboratory similar to how a laboratory spikes MS/MSD samples. Depending on the particular surrogate spiking solution used by a laboratory, the surrogate compounds recovered in the analytical process may change over time. Typically, a laboratory would not change spiking solutions from one event to the next, but the spiking solution employed by any given laboratory could change from one monitoring season to the next.

❖ Environmental sample recoveries falling outside of their recovery range may or may not result in the qualification of environmental data. The Stormwater Monitoring Program needs to contact the laboratory on a case-by-case basis to inquire (A) what impact(s) *common or recurring* low or high environmental recoveries have on particular target analytes associated with these surrogate compound recoveries, and (B) how these exceedances might be resolved.

### 3.2.10. Lab Control Spike/Lab Control Spike Duplicate Recovery Results

**Data Reporting Frequency:** Every monitoring event – laboratory control spike/laboratory control spike duplicate results are generated and reported by laboratories for many – although not all – analyses they perform.

**Objective:** A laboratory data report contains laboratory control spike/laboratory control spike duplicate (LCS/LCSD) data records for many, if not all environmental analyses specified on a chain of custody form.

- ❖ Anywhere the term "LCS/LCSD" is used in this data quality evaluation task, the terms "SRM/SRMD" and "CRM/CRMD" can be substituted.

**Evaluation:** Review laboratory data report to confirm receipt of all laboratory control spike/laboratory control spike duplicate (LCS/LCSD) data records typically reported by a given laboratory in consideration of the environmental analyses specified on a chain of custody form.

**Example:** Did CRG Marine Laboratories, Inc., report all LCS and LCSD recovery results for the nutrient parameters it analyzes?

**Tools:** ***Existing Database Queries***

- See Section 7.4 (Laboratory-Initiated QA/QC Data Evaluation Queries); or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all laboratory control spike/laboratory control spike duplicate recovery data submitted by a laboratory based on knowledge of the LCS/LCSD results typically submitted by a particular laboratory.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing laboratory control spike/laboratory control spike duplicate data records.

**Notes:** See *General Guidance* description above.

**Less than expected LCS/LCSD results** – It is common for certain analytes not to be included in LCS/LCSD standards prepared or purchased by a laboratory. For example, CRG typically reports 6 conventional constituents when reporting environmental data results. However, the laboratory only reports LCS/LCSD results for Total Dissolved Solids.

Additionally, it is not uncommon for a laboratory to report only a single laboratory control spike recovery result, and not a duplicate recovery result for a particular analyte.

**More than expected LCS/LCSD results** – Alternately, the Stormwater Monitoring Program may only request that a small number of constituents be analyzed by a particular laboratory, and in fact receive LCS/LCSD results for analytes not event evaluated by the Program. Under this scenario, the laboratory is likely reporting *all* analytes contained in the spiking solution it used as a matter of course. *From an operational perspective, the Program need only enter into the Database those LCS/LCSD results associated with the environmental analyses requested on the chain of custody form.*

### 3.2.11. QA/QC Sample Surrogate Recovery Results

**Data Reporting Frequency:** Every monitoring event – QA/QC sample surrogate recovery data are generated and reported for every monitoring event where water quality samples are analyzed for trace organic compounds.

**Objective:** A laboratory data report contains QA/QC sample surrogate recovery data records, as necessary, based on the QA/QC samples analyzed in support of environmental analyses of trace organic compounds as specified on a chain of custody form.

**Evaluation:** Review laboratory data report to confirm receipt of all QA/QC sample surrogate recovery data records associated with QA/QC samples analyzed in support of environmental analyses of trace organic compounds as specified on a chain of custody form. The Database classifies trace organic compounds in one of three classifications: Organic, PCB, or Pesticide. *QA/QC sample surrogates include those results entered into the Database with the following QA/QC Sample Type values:*

**srgt equip blank, rec** (associated with equipment blanks)
**srgt field blank, rec** (associated with field blanks)
**srgt LCS, rec** (associated with lab control spikes)
**srgt LCS dup, rec** (associated with lab control spike duplicates)
**srgt matrix spike, rec** (associated with MS samples)
**srgt matrix spike dup, rec** (associated with MSD samples)
**srgt method blank, rec** (associated with method blanks)
**srgt travel blank, rec** (associated with travel blanks)

**Example:** Did CRG Marine Laboratories, Inc., report QA/QC sample surrogate recovery results for the various QA/QC samples analyzed in support of environmental samples analyzed for chlorinated pesticides via analytical method EPA 625m?

**Tools:** ***Existing Database Queries***

- Section 7.4 (Laboratory-Initiated QA/QC Data Evaluation Queries), and
- reconF_qry_WCQA_13_QAQCSrgtRecovLimits; or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all QA/QC sample surrogate recovery data from each laboratory analyzing water quality samples for trace organic compounds as requested on chain of custody forms.
- Reference standard constituent list generated by laboratory and classification and/or analytical method. This list should include *surrogate*, as well as *target* analytes for those laboratories analyzing trace organic compounds for the Stormwater Monitoring Program.

**Corrective Action:** Notify appropriate analytical laboratory of missing QA/QC sample surrogate recovery records.

**Notes:** See *General Guidance* description above.

Surrogate compounds are spiked into QA/QC samples using a standard solution prepared or purchased by a laboratory similar to how a laboratory spikes MS/MSD samples. Depending on the particular surrogate spiking solution used by a laboratory, the surrogate compounds recovered in the analytical process may change over time. Typically, a laboratory would not change spiking solutions from one event to the next, but the spiking solution employed by any given laboratory could change from one monitoring season to the next.

❖ While QA/QC sample surrogate recovery results are not used to qualify the Stormwater Monitoring Program's environmental data, common or recurring out-of-control results provide insight into potential analytical problems that should prompt communication with the laboratory for clarification as to why an analytical process is routinely out-of-control.

### 3.2.12. Field Duplicate Results

**Data Reporting Frequency:** Field duplicate data are generated and reported according to a QA/QC Sampling Schedule followed by the Stormwater Monitoring Program.

**Objective:** A laboratory data report contains field duplicate data records for all analyses specified on a chain of custody form.

**Evaluation:** Review laboratory data report to confirm receipt of all field duplicate data records generated from field duplicate or "blind" environmental analyses specified on a chain of custody form. Water quality samples collected as field duplicate samples are often submitted to a laboratory "blindly" under a fictitious monitoring location name. Together with their associated environmental results, field duplicate results will eventually be used by the Database to calculate field duplicate RPD results.

**Example:** Did Calscience Environmental Laboratories, Inc., report field duplicate results for all requested conventional analyses?

**Tools:** ***Existing Database Queries***

- See Section 7.3 (Field-Initiated QA/QC Data Evaluation Queries); or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all field duplicate data from each laboratory analyzing water quality samples for the Stormwater Monitoring Program based on analyses requested on chain of custody forms.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing field duplicate data records.

**Notes:** See *General Guidance* description above.

### 3.2.13. Laboratory Duplicate Results

**Data Reporting Frequency:** Laboratory duplicate data are generated and reported according to a QA/QC Sampling Schedule followed by the Stormwater Monitoring Program.

**Objective:** A laboratory data report contains laboratory duplicate data records for all analyses specified on a chain of custody form.

**Evaluation:** Review laboratory data report to confirm receipt of all laboratory duplicate data records specified on a chain of custody form. Together with their associated environmental results, lab duplicate results will eventually be used by the Database to calculate lab duplicate RPD results.

**Example:** Did CRG Marine Laboratories, Inc., report laboratory duplicate results for all requested metals analyses?

**Tools:** ***Existing Database Queries***

- See Section 7.4 (Laboratory-Initiated QA/QC Data Evaluation Queries); or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all laboratory duplicate data from each laboratory analyzing water quality samples for the Stormwater Monitoring Program based on analyses requested on chain of custody forms.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing laboratory duplicate data records.

**Notes:** See *General Guidance* description above.

**Laboratory duplicate data from another client's samples** – It is common for a laboratory to report laboratory duplicate results – and associated laboratory duplicate RPD values – from any given water quality sample submitted by one of their other clients. These results are commonly referred to as "unsolicited" laboratory duplicate data. These laboratory duplicate results have no association with any of the Stormwater Monitoring Program's environmental samples, and are <u>not</u> used to qualify any of the Program's environmental data when an unsolicited laboratory duplicate RPD value falls outside of its data quality objective (DQO). *While unsolicited laboratory duplicate results from someone else's water quality sample provide a general evaluation of the precision or repeatability of a specific analytical process that co-occurred with the analysis of the Stormwater Monitoring Program's water quality samples, they are <u>not</u> used to qualify the Stormwater Monitoring*

*Program's environmental data, and therefore should not be entered into the Database.*

### 3.2.14. Matrix Spike RPD Results

**Data Reporting Frequency:** Frequent – calculated matrix spike RPD results are generated and reported along with matrix spike/matrix spike duplicate results according to a QA/QC Sampling Schedule followed by the Stormwater Monitoring Program.

**Objective:** A laboratory data report contains calculated matrix spike RPD results for most, if not all analyses specified for MS/MSD analysis on a chain of custody form. In fact, a calculated matrix spike RPD result should exist for each pair of matrix spike/matrix spike duplicate results reported by a laboratory.

**Evaluation:** Review laboratory data report to confirm receipt of all calculated matrix spike RPD results generated from MS/MSD analyses specified on a chain of custody form.

**Example:** Did CRG Marine Laboratories, Inc., report matrix spike RPD results for each of the 25 chlorinated pesticides for which it reported MS/MSD results?

**Tools:**

***Existing Database Queries***

- See Section 7.3 (Field-Initiated QA/QC Data Evaluation Queries),
- reconF_qry_WCQA_01D_MS_AllResults; or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all matrix spike RPD results submitted by a laboratory based on knowledge of the MS/MSD results typically submitted by a particular laboratory.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing matrix spike RPD data records.

**Notes:** See *General Guidance* description above.

### 3.2.15. Lab Control Spike RPD Results

**Data Reporting Frequency:** Every monitoring event – calculated laboratory control spike RPD (LCS RPD) results are generated and reported along with laboratory control spike/laboratory control spike duplicate results for many – although not all – analyses a laboratory performs.

- ❖ Anywhere the term "LCS RPD" is used in this data quality evaluation task, the terms "SRM RPD" and "CRM RPD" can be substituted.

**Objective:** A laboratory data report contains calculated laboratory control spike RPD results for many, if not all environmental analyses specified on a chain of custody form. In fact, a calculated laboratory control spike RPD result should exist for each pair of laboratory control spike/laboratory control spike duplicate results reported by a laboratory.

**Evaluation:** Review laboratory data report to confirm receipt of all calculated laboratory control spike RPD results associated with each pair of LCS/LCSD results reported by the laboratory. In instances where a laboratory only reported a single LCS recovery result for a particular constituent, no LCS RPD can be calculated and hence should not have been reported.

**Example:** Did CRG Marine Laboratories, Inc., report all LCS RPD results for the nutrient parameters it analyzes?

**Tools:** ***Existing Database Queries***

- See Section 7.4 (Laboratory-Initiated QA/QC Data Evaluation Queries); or

***Existing Database Functionality***

- Visually confirm receipt of data records using **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality (see Section 5.2. in the *Database User's Manual*).

***General Guidance***

- Employ systematic scheme to confirm receipt of all laboratory control spike RPD results submitted by a laboratory based on knowledge of the LCS/LCSD results typically submitted by a particular laboratory.
- Reference standard constituent list generated by laboratory and classification and/or analytical method.

**Corrective Action:** Notify appropriate analytical laboratory of missing laboratory control spike RPD data records.

**Notes:** See *General Guidance* description above.

### 3.2.16. Additional QA/QC Sample Results

The Stormwater Monitoring Program's *Data Quality Evaluation Plan* discusses the purpose, use, and evaluation of a handful of more obscure QA/QC sample types including internal calibration blanks, stationary blanks, and internal calibration recoveries. Currently, these particular QA/QC sample types are not reported to the Program, and therefore not entered into the Database. Furthermore, the Database is not currently programmed to manage these particular QA/QC sample results. Among the three QA/QC sample types mentioned above, the only one to consider entering into the Database if it was reported to the Program would be a stationary blank result. If any new QA/QC sample type is received by the Stormwater Monitoring Program, it should be brought to the attention of the QA/QC Officer, Database Administrator, and Database programmer.

## 3.3. Data Integrity Assessment

The data population and data fulfillment assessments described above enable the Stormwater Monitoring Program to determine (1) if data records included in a laboratory data report are complete or *100% populated*, and (2) if all required data records – including environmental, field-initiated QA/QC, and laboratory-initiated QA/QC results – from all analyses requested on a chain of custody form were included in a laboratory data report. The final assessment undertaken as part of the technical data validation is a review of the integrity of the data records included in a laboratory data report. A 100% populated and fulfilled data set should not be considered ready for QA/QC data evaluation until an assessment of data integrity is made.

For the purpose of this discussion, data integrity refers to the *consistency*, *accuracy*, and *correctness* of the data. Data integrity can be thought of in terms of the old adage, "garbage in, garbage out". The purpose of the data integrity assessment is to keep the garbage out. The integrity of any data set can be compromised by data entry errors (e.g., initially, laboratory data entry errors, and secondarily, database data entry errors), errors that occur when data are transferred from one software application or computer to another, software bugs or viruses, and/or hardware malfunctions. The Stormwater Monitoring Program should assess the following four primary types of data integrity to ensure that they are not violated by the data records contained in a laboratory data report:

1. **Entity Integrity** – refers to the quality of information contained in individual data records.
2. **Domain Integrity** – refers to the quality of information contained in a data field.
3. **Referential Integrity** – refers to the quality of an entire data set, as well as the quality of the relationship between two or more data sets – such as the relationship between environmental and QA/QC data sets.
4. **User-defined Integrity** – refers to user-implemented and user-enforced "rules" that affect the nature or disposition of data. User-defined integrity rules are put in

place when entity, domain, and referential integrity rules cannot provide a desired constraint on a data value or record.

The "quality of information" mentioned above refers to an *expected* quality of data coming from a laboratory based on the laboratory's own standard data reporting practices and the Stormwater Monitoring Program's data reporting requirements. The Stormwater Monitoring Program implements data integrity using two mechanisms: the *Data Reporting Protocols* provided to analytical laboratories employed by the District, and the NPDES Stormwater Water Quality Database used by District staff to store, manage, and analyze the Stormwater Monitoring Program's water quality data. These two mechanisms provide numerous constraints on the nature of the water quality data managed by the Stormwater Monitoring Program. The *Data Reporting Protocols* act primarily to establish constraints on data reporting, and the Database acts primarily to enforce these constraints, as well as detect and correct errors stemming from violations of these constraints.

From an operational perspective, the **pre-data entry preparation of the Database** (see Section 4.2. – Lookup Tables: Data Entry and Updating in the *Database User's Manual*), the **preliminary data inspection** (see Section 2), the **data population assessment** (see Subsection 3.1), and the **data fulfillment assessment** (see Subsection 3.2) conducted thus far should have caught the lion's share of the potential issues related to the *consistency*, *accuracy*, and *correctness* of the data entered into the Database. When performed correctly, the pre-data entry preparation of the Database, along with the enforcement of numerous constraints by data entry screens and the EDDIT feature will prevent a "Total Coliform" result from existing in the Database with Units of "mg/L".

A data integrity assessment of the environmental and QA/QC data contained in their respective **Temporary Results tables** should include, but is not limited to the following categories of data integrity checks:

### 3.3.1. Entity Integrity Check

**Objective:** The information contained in an individual data record should be consistent with expectations for a particular constituent when simultaneously considering the information contained across multiple data fields of that record.

**Evaluation:** Confirm that the information contained in an individual data record is consistent with expectations when simultaneously considering the information contained across multiple data fields of that record.

**Example:** Were pesticide data reported in the correct units of "µg/L"?

**Tools:** ***Existing Database Functionality***

- Once data reside in **Temporary Results tables**, use the Database's **Water Chemistry Environmental Data Viewing/Editing Screen** (see Section 5.1. in the *Database User's Manual*) and **Water Chemistry QA/QC Data Viewing/Editing Screen** (see Section 5.2. in the *Database User's Manual*) to visually inspect data records.

***Existing Database Queries***

- Use **sop queries** to search for particular data records by (A) Laboratory and (B) Classification or Constituent.

***Custom Query***

- Write a custom query to view data records in a particular manner.

**Corrective Action:** Edit data record as necessary if sufficient information is available; otherwise contact appropriate analytical laboratory.

**Notes:** It is necessary to have an understanding of the nature and disposition of data historically reported by a given analytical laboratory, as well as how these data were historically entered into the Database.

### 3.3.2. Domain Integrity Check

**Objective:** The information contained in a particular data field should be consistent with the type or explicit value of information required for that data field as defined by the Stormwater Monitoring Program though the *Data Reporting Protocols* and inherent constraints of the Database.

**Evaluation:** Confirm that the information contained in a particular data field adheres to the type or explicit value of information required for that data field as specified in the *Data Reporting Protocols* and required by the Database.

**Example:** Were all Sample Date values for grab samples reported and entered into the Database correctly?

**Tools:** ***Existing Database Functionality***

- Once data reside in **Temporary Results tables**, use the Database's **Water Chemistry Environmental Data Viewing/Editing Screen** (see Section 5.1. in the *Database User's Manual*) and **Water Chemistry QA/QC Data Viewing/Editing Screen** (see Section 5.2. in the *Database User's Manual*) to visually inspect data records.

***Existing Database Queries***

- Use **sop queries** to search for particular data records by (A) Laboratory and (B) Classification or Constituent.

***Custom Query***

- Write a custom query to view data records in a particular manner.

**Corrective Action:** Edit data record as necessary if sufficient information is available; otherwise contact appropriate analytical laboratory.

**Notes:** It is necessary to have an understanding of the nature and disposition of data historically reported by a given analytical laboratory, as well as how these data were historically entered into the Database.

- ❖ Fortunately, the constraints placed upon data reporting through the use of the *Data Reporting Protocols* and the constraints placed upon data entry through pre-data entry preparation of the Database will catch most "mistakes" from making it as far as the **Temporary Results tables**.

### 3.3.3. Referential Integrity Check

**Objective:** The information contained in an environmental data set from a particular analytical laboratory should be congruent with the information contained in a QA/QC data set provided by the same laboratory.

**Evaluation:** Confirm that the information contained in a specific data field of an environmental data set matches the information contained in the same data field of the QA/QC data set.

**Example:** Do QAQCBatchID values for environmental data from a particular analytical laboratory match QAQCBatchID values for the associated QA/QC data reported by the same laboratory?

**Tools:** ***Existing Database Functionality***

- Once data reside in **Temporary Results tables**, use the Database's **Water Chemistry Environmental Data Viewing/Editing Screen** (see Section 5.1. in the *Database User's Manual*) and **Water Chemistry QA/QC Data Viewing/Editing Screen** (see Section 5.2. in the *Database User's Manual*) to visually inspect data records.

***Existing Database Queries***

- Use **sop queries** to search for particular data records by (A) Laboratory and (B) Classification or Constituent.

***Custom Query***

- Write a custom query to view data records in a particular manner.

**Corrective Action:** Edit data record as necessary if sufficient information is available; otherwise contact appropriate analytical laboratory.

**Notes:** It is necessary to have an understanding of the nature and disposition of data historically reported by a given analytical laboratory, as well as how these data were historically entered into the Database.

A review of a data set's referential integrity will reveal "orphaned" records contained in the Database. For example, District staff may find that a laboratory provided a method blank result for Titanium, when the Program did not request Titanium to be analyzed, nor did it receive any Titanium environmental data.

❖ Referential integrity issues not addressed at this step in the technical data validation process will likely be identified when performing the QA/QC data evaluation discussed in the following section, at which point all outstanding issues must be resolved.

### 3.3.4. User-Defined Integrity Check

**Objective:** The information contained in an individual data record, as well as the information presented across multiple data records should conform to various user-defined rules. These user-defined rules are meant to enforce constraints on data that are discussed in the *Data Reporting Protocols*, but are not explicitly enforced by the Database at the time of data entry. Furthermore, some "implied" constraints are never enforced by the Database, only by visual inspection and manual correction by the Database Administrator, QA/QC Officer, and/or District staff.

**Evaluation:** Confirm that all user-defined data reporting rules are followed by the data records contained in a laboratory report. A list of user-defined integrity checks is included in Table 4. This list should be expanded as necessary when additional user-defined integrity checks are performed to address specific laboratory reporting errors, irregularities, and omissions.

**Example:** Do all laboratory-qualified data posses both a shorthand laboratory qualification and a narrative description of that qualification?

**Tools:**

***Existing Database Functionality (see Table 4)***

- Once data reside in **Temporary Results tables**, use the Database's **Water Chemistry Environmental Data Viewing/Editing Screen** (see Section 5.1. in the *Database User's Manual*) and **Water Chemistry QA/QC Data Viewing/Editing Screen** (see Section 5.2. in the *Database User's Manual*) to visually inspect data records.

***Existing Database Queries (see Table 4)***

- Use **reconF queries** to search for particular groups of data.
- Use **sop queries** to search for particular data records by (A) Laboratory and (B) Classification or Constituent.

***Custom Query***

- Write a custom query to view data records in a particular manner.

**Corrective Action:** Edit data record as necessary if sufficient information is available; otherwise contact appropriate analytical laboratory.

**Notes:** It is necessary to have an understanding of the nature and disposition of data historically reported by a given analytical laboratory, as well as how these data were historically entered into the Database.

- ❖ Many of the user-defined data integrity checks listed in Table 4 were already performed during the course of reviewing the data for *common data reporting errors* (see Section 2.8).

**Table 4: User-Defined Data Integrity Checks**

| No. | User-Defined Data Integrity Checks / Database Functionality or Existing Database Query Assisting Check |
|---|---|
| 1 | Analytical results (both environmental and QA/QC) are reported in the units specified by the Stormwater Monitoring Program. |
| | **reconF_qry_WCE_04_DL-Class-Lab, reconF_qry_WCQA_07_DL-Class-Lab** |
| 2 | A sample concentration less than an associated detection limit is reported as a "non-detect" result at the detection limit. |
| | **reconF_qry_WCE_06D_DL>Result,**<br>**reconF_qry_WCE_07D_NDResult<>DL,**<br>**reconF_qry_WCQA_09D_DL>Result,**<br>**reconF_qry_WCQA_10D_NDResult<>DL** |
| 3 | Duplicate QA/QC results (matrix spike duplicate recovery, laboratory control spike duplicate recovery, etc.) are identified appropriately as duplicates. |
| | Use appropriate **sop queries** or **Water Chemistry QA/QC Data Viewing/Editing Screen** to verify completeness of any given QA/QC sample type. |
| 4 | Replicate QA/QC analyses are identified appropriately as replicates. |
| | Use appropriate **sop queries** or **Water Chemistry QA/QC Data Viewing/Editing Screen** to verify completeness of any given QA/QC sample type, along with hard copy and/or electronic laboratory reports. |
| 5 | A shorthand laboratory qualification is accompanied by a narrative description of the qualification. |
| | Use **Water Chemistry Environmental and QA/QC Data Viewing/Editing screens** to verify completeness of any given data record. |
| 6 | Environmental and QA/QC samples for which dilutions were made are reported with (A) appropriately elevated detection and quantitation limits, and (B) a note describing the dilution factor associated with the sample. |
| | **reconF_qry_WCE_06D_DL>Result,**<br>**reconF_qry_WCE_07D_NDResult<>DL,**<br>**reconF_qry_WCQA_09D_DL>Result,**<br>**reconF_qry_WCQA_10D_NDResult<>DL,**<br>Along with hard copy and/or electronic laboratory reports. |

**Table 4: User-Defined Data Integrity Checks – Continued**

| No. | User-Defined Data Integrity Checks / Database Functionality or Existing Database Query Assisting Check |
|---|---|
| **7** | Confirm that QA/QC data records appearing to fall below a minimum QA/QC limit (QALimitMin) were in fact entered into the Database without error. |
| | **reconF_qry_WCQA_14D_OutsideQALimitMin** |
| **8** | Confirm that QA/QC data records appearing to fall above a maximum QA/QC limit (QALimitMax) were in fact entered into the Database without error. |
| | **reconF_qry_WCQA_15D_OutsideQALimitMax** |
| **9** | QA/QC data records include information appropriate for specific QA/QC sample types (i.e., confirm that a "matrix spike, rec" result does not possess a detection limit, but does possess minimum and maximum QA/QC limits). |
| | Use appropriate **sop queries** or **Water Chemistry QA/QC Data Viewing/Editing Screen** to verify completeness of any given QA/QC sample type. |

Similar to the guidance provided earlier, all errors, irregularities, and omissions found during the data integrity assessment should immediately be reported to the laboratory for clarification or correction if District staff does not have sufficient information at hand to correct an issue. The *Data Reporting Protocols* and NPDES Stormwater Water Quality Database are indispensable tools to employ when conducting the data integrity assessment. The data reviewer should be familiar with water quality analytical data and the Stormwater Monitoring Program's management and usage of these data. A general strategy to employ while performing the technical data validation is one that views a laboratory data report as a rigorously standardized body of information that exhibits many expected patterns. The various assessments performed as part of the technical data validation look to identify and correct deviations in these expected patterns. Once the technical data validation is complete, both the environmental and QA/QC data are ready for further review under the QA/QC data evaluation discussed in the following section.

# 4. QA/QC DATA EVALUATION

A fully validated analytical data set as produced by the technical data validation process (see Section 3) is ready to undergo additional scrutiny in the form of a QA/QC data evaluation. This evaluation is primarily concerned with field-initiated and laboratory-initiated QA/QC data results, with the exception of elapsed holding time information calculated for environmental data[2]. Similar to the technical data validation process, a detailed QA/QC evaluation requires some mechanism for efficiently and consistently examining a large, complex data set. The QA/QC data analysis routines programmed into the NPDES Stormwater Water Quality Database and the *QA/QC Exceedance Reports* generated from these analyses, along with guidance provided throughout this document and the *Data Quality Evaluation* Plan will enable District staff to efficiently perform a program-consistent QA/QC evaluation.

The extensive review of Stormwater Monitoring Program data performed up to this point – including preliminary data inspection and technical data validation – should have resulted in the production of environmental and QA/QC data sets residing in the Database's **Temporary Results tables** that are now ready for their final review within the context of QA/QC data evaluation. Since the Program's Database is used to perform the QA/QC data evaluation process, much of the technical detail described in the QA/QC Data Evaluation section (Section 4) of the *Data Quality Evaluation Plan* is programmed into the Database and does not need to be actively addressed by District staff. However, the Database's "shouldering" of much of this effort does not relieve District staff from the responsibility of understanding the concepts of QA/QC data evaluation presented in the DQEP and operationally carried out by the Database.

While QA/QC sample results are evaluated in order to compare them to their appropriate QA/QC limits and identify those results that fall outside of these limits, the QA/QC data evaluation process also provides a final opportunity to thoroughly review the Stormwater Monitoring Program's data to identify potential errors in a laboratory's reporting of analytical data and/or recognize any significant data quality issues that may need to be addressed. After this evaluation the Stormwater Monitoring Program is ready to qualify its environmental data as necessary based on the findings of the QA/QC assessment (see Section 5 – Environmental Data Qualification). Environmental sample results are qualified in order to provide the user of the data with information regarding the quality of the data. Depending on the planned use of the data, qualifications may help to determine whether or not the data are appropriate for a given analysis. In general, data that are qualified with anything other than an "R" (meaning a *rejected* data point) are suitable for most analyses. The Stormwater Monitoring Program's decision to reject any data record should be made in consideration of the guidance provided in the DQEP, the Program's historical handling of a similar suspect data point, and best professional judgment. Ultimately, the qualification(s) assigned to any given data record allow the downstream user of the data to assess the appropriateness of the data for a given use.

[2] Elapsed holding times are also calculated for the following field-initiated QA/QC samples: equipment blanks, field blanks, field-initiated filter blanks, travel blanks, and field duplicates.

The QA/QC Data Evaluation Flow Chart presented across Figures 1 – 3 describe the general checks necessary to completely assess the quality of environmental and QA/QC water chemistry results. The QA/QC data evaluation process begins with a calculation of elapsed holding times and a comparison to appropriate sample holding time limits. This evaluation is followed by assessments for contamination, accuracy, and precision of reported analytical data. Each of these latter three assessments begins with an evaluation of laboratory-initiated QA/QC samples followed by a review of field-initiated QA/QC samples. Laboratory-initiated QA/QC samples are evaluated first because internal, laboratory controlled processes must be determined to be "in-control" before examining contamination and sampling reproducibility issues present in field-collected samples that, in fact, could be affected by out-of-control laboratory processes. While the QA/QC data evaluation process presented in the *Data Quality Evaluation Plan* and programmed into the Database are designed to provide a program-consistent methodology for evaluating the quality of the Stormwater Monitoring Program's water quality data, the data evaluator and/or QA/QC Officer will sometimes need to rely on best professional judgment when considering "special cases" where prescribed data evaluation information does not exist or where data evaluation information and reported analytical data are in apparent conflict.

From an operational perspective, carrying out the QA/QC data evaluation process using the Database requires the user to sequentially perform **17[3] QA/QC data evaluation checks** programmed into the Database's **Water Quality Environmental and QA/QC Data Evaluation screens** – nine evaluations are supported by **Screen #1** and eight are supported by **Screen #2**. Detailed information on the design and use of these screens is included in Section 6. Data Evaluation and Qualification of the *NPDES Stormwater Water Quality Database User's Manual*. **Before beginning the QA/QC data evaluation process, it is important to keep the following issues in mind:**

- As mentioned in Section 2 (Preliminary Data Inspection), data quality evaluation should be performed for a single monitoring event's worth of data at a time. In fact, the QA/QC data evaluation process supported by the Database's **Water Quality Environmental and QA/QC Data Evaluation screens** requires that the user select data from a *single* monitoring event in order to start the evaluation process. This task consists of informing the Database that the user wants to evaluate environmental and QA/QC data from a particular monitoring event – for example, "2005/06-1" – as opposed to any other event's data that may reside in the **Temporary Results tables**.

- Prior to performing the **17 QA/QC data evaluation checks** supported by the Database, the user must first *prepare* environmental and QA/QC data for evaluation (see Section 6.1. – Prepare Data for Evaluation in the *Database User's Manual*). This task – let's call it **Step #A** – constitutes updating

[3] Seventeen is the maximum number of semi-automated QA/QC data evaluation routines that the Database is currently programmed to perform. The QA/QC data evaluation of any given monitoring event will likely require the user to perform fewer than 17 evaluations due to the absence of certain QA/QC sample types (e.g., travel blanks).

selected data records in **Temporary Results tables** that in turn notify the Database that these records are ready for QA/QC data evaluation.

- Once environmental and QA/QC data have been prepared for QA/QC data evaluation (**Step #A**) and a specific monitoring event has been chosen – let's call this **Step #B** – (see Section 6.2.1. – Select Environmental and QA/QC Data for Evaluation in the *Database User's Manual*), the environmental and QA/QC data records currently selected for review by the **17 QA/QC data evaluation checks** are in fact ***copies*** of the original data records contained in the **Temporary Results tables**.

- The evaluation of ***copies*** of original environmental and QA/QC temporary data records has one effect on the QA/QC data evaluation process: If the outcome of any of the **17 QA/QC data evaluation checks** prompts the user to discover some error, irregularity, and/or omission in a data record that triggers the editing or deletion of that record, then once changes to the data have been made, the user must again chose a specific monitoring event for QA/QC data evaluation – that is, the user must repeat **Step #B**. This action clears the "old copies" of the data in place for QA/QC data evaluation, and replaces them with "new copies" of the data – these new copies include any edits and/or deletions just made by the user.

- At the beginning of either a new monitoring season or the QA/QC data evaluation of the first event of a new monitoring season, the user must delete the contents of all **QA/QC Summary tables** by clicking on the **Delete All Summary Records command button** located on **QA/QC Evaluation Screen #2**. The Database provides the user with a message asking if the user is sure he wants to delete all QA/QC evaluation summary records contained in the various tables. The user has the choice to confirm or decline the deletion of records at this point.

- The various QA/QC summary tables mentioned in the following subsections are intended to be emptied at the beginning of each new monitoring season. During the course of the monitoring season these summary tables will be appended during each successive QA/QC data evaluation session until the final event of the monitoring season is processed. The various QA/QC summary reports should be printed out at the end of the season (or as necessary) to provide the Program with a summary of its data quality objective compliance record.

The execution of each of the Database's **17 QA/QC data evaluation checks** is presented in the following subsections in a prescriptive, step-by-step manner.

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**Figure 1: QA/QC Data Evaluation – Holding Time & Contamination Checks**

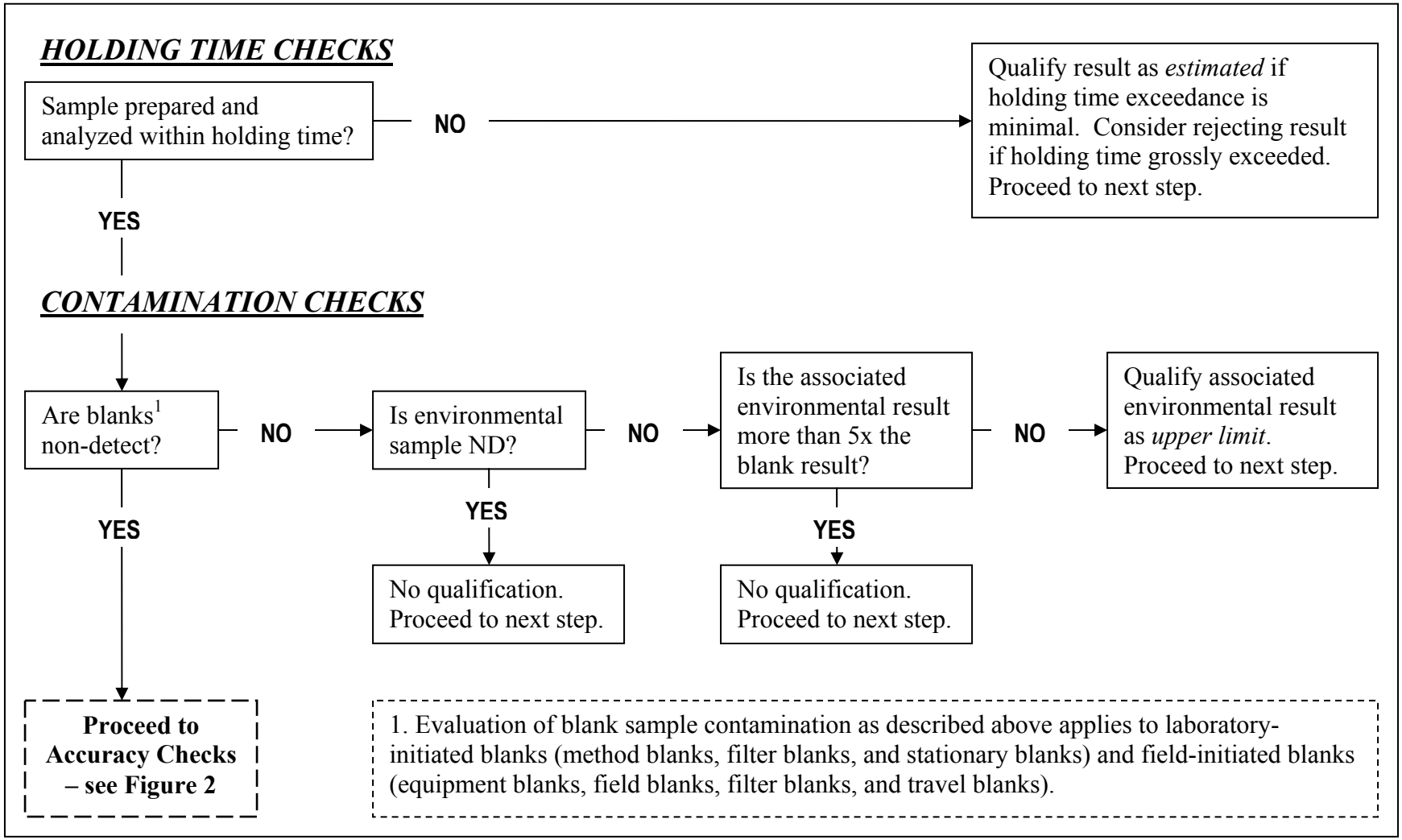


**Figure 2: QA/QC Data Evaluation – Accuracy Checks**

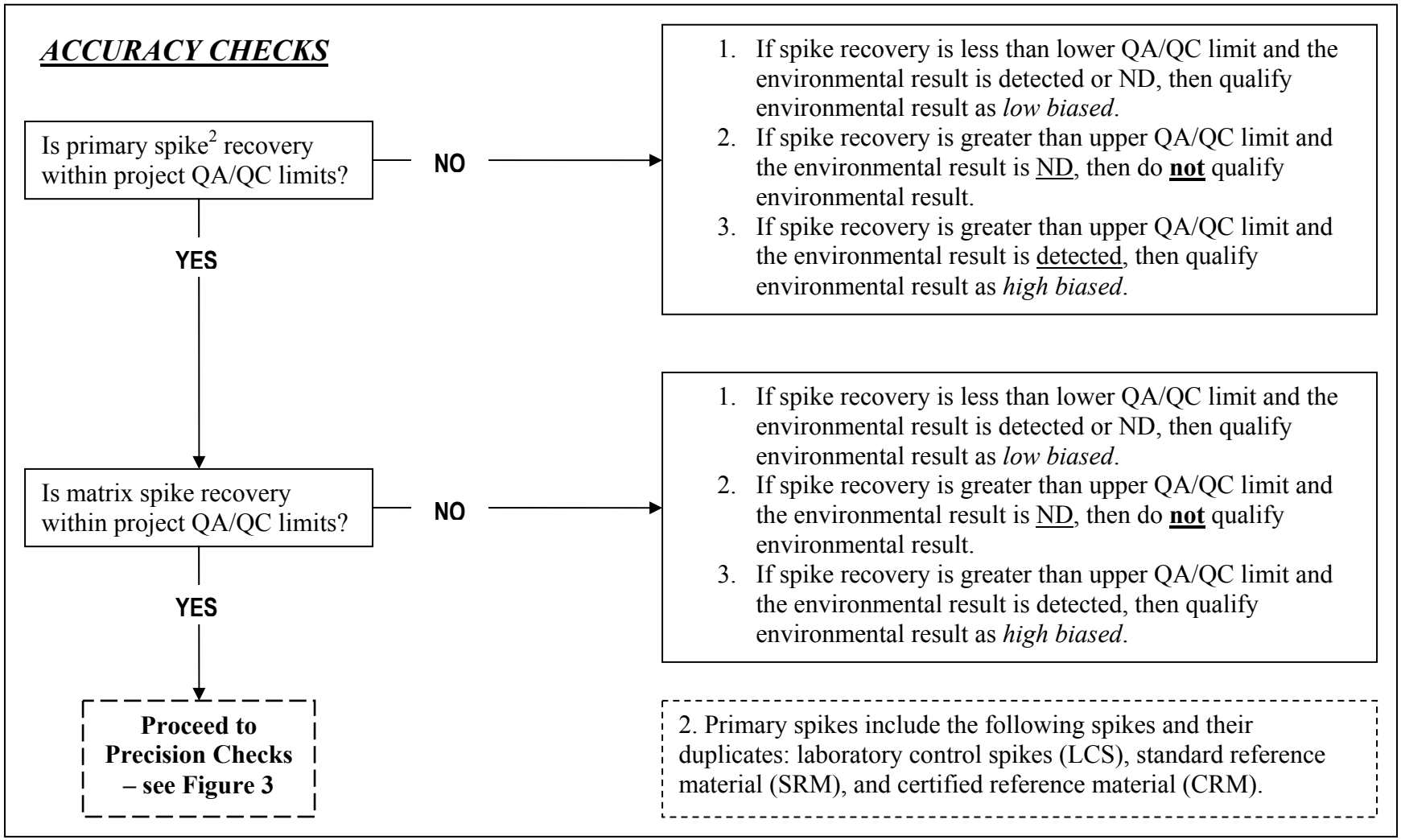
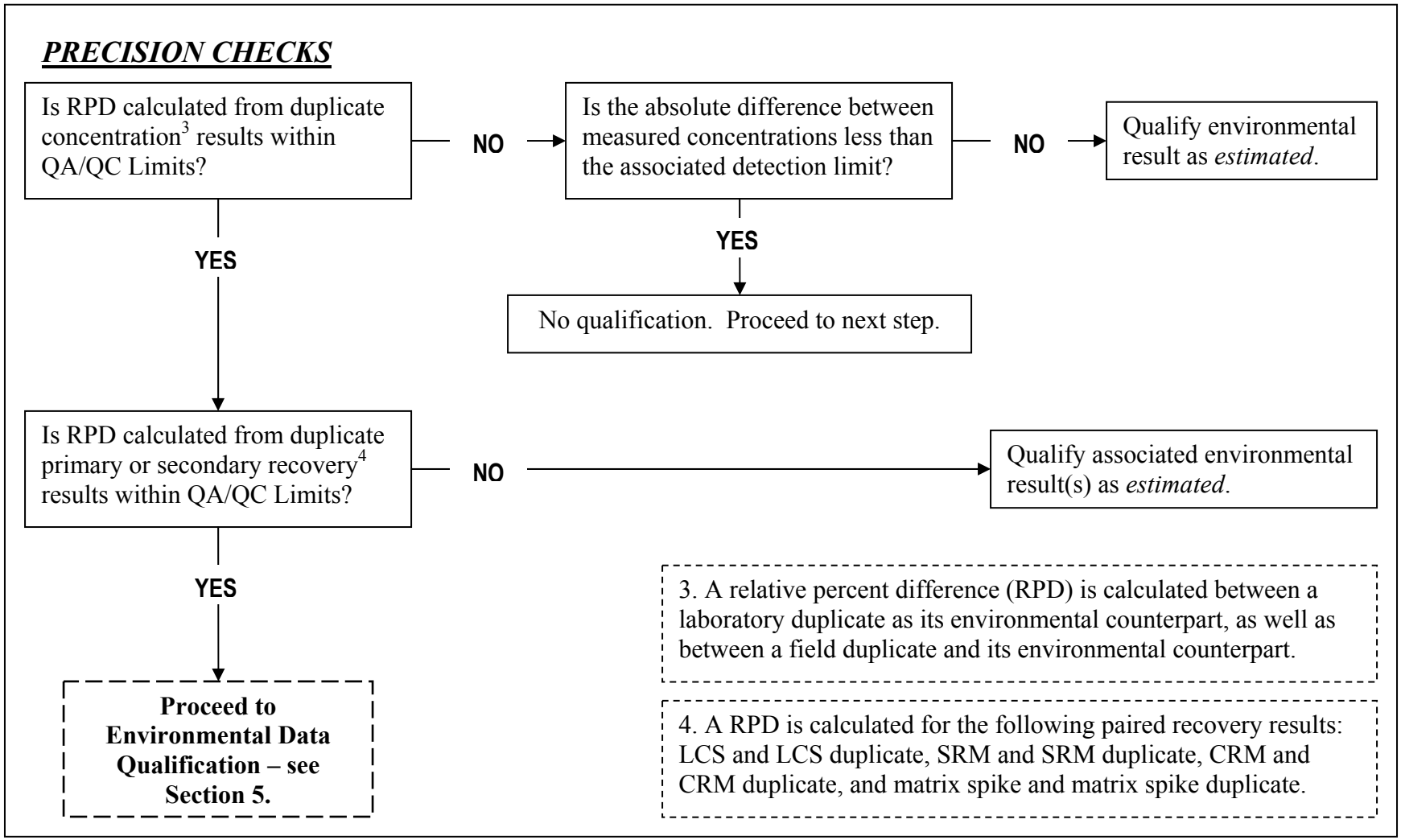


**Figure 3: QA/QC Data Evaluation – Precision Checks**



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## 4.1. Holding Time Evaluation

**Sample Types Evaluated:** environmental samples, equipment blanks, field blanks, field-initiated filter blanks, travel blanks, and field duplicates

***After having prepared data for QA/QC data evaluation and selected a specific monitoring event's data for processing, execute the following steps:***

1. Click the **View Holding Time Exceedances command button**. All water quality samples determined to exceed a sample preparation or sample analysis holding time will appear in the **Holding Time Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Holding Time Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update Holding Time Summary command button** to transfer the information contained in the report to the **Holding Time Summary table** (tblHTSummary).
5. The current contents of the Holding Time Summary table can be viewed by clicking on the **View Holding Time Summary command button**.

For additional information, refer to Section 6.2.2. – Holding Time Evaluation in the *Database User's Manual*.

## 4.2. Equipment Blank Evaluation

**Sample Type Evaluated:** equipment blanks

1. Click the **View Equipment Blank Exceedances command button**. All detected equipment blank results will appear in the **Equipment Blank Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.

4. Once satisfied with the contents of the **Equipment Blank Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update Equipment Blank Summary command button** to transfer the information contained in the report to the **Equipment Blank Summary table** (tblEBSummary).
5. The current contents of the Equipment Blank Summary table can be viewed by clicking on the **View Equipment Blank Summary command button**.

For additional information, refer to Section 6.2.3. – Equipment Blank Evaluation in the *Database User's Manual*.

## 4.3. Surrogate Equipment Blank Evaluation

**Sample Type Evaluated:** surrogate equipment blank recoveries

1. Click the **View SRGT Equip Blank Exceedances command button**. All surrogate equipment blank recovery results falling outside of their acceptance range will appear in the **Surrogate Equipment Blank Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Surrogate Equipment Blank Exceedances Report**, the user must (A) print out the report for later use and (B)click the **Update SRGT Equip Blank Summary command button** to transfer the information contained in the report to the **SRGT Equipment Blank Summary table** (tblSEBRSummary).
5. The current contents of the Surrogate Equipment Blank Summary table can be viewed by clicking on the **View SRGT Equip Blank Summary command button**.

For additional information, refer to Section 6.2.4. – Surrogate Equipment Blank Evaluation in the *Database User's Manual*.

## 4.4. Method Blank Evaluation

**Sample Type Evaluated:** method blanks

1. Click the **View Method Blank Exceedances command button**. All detected method blank results will appear in the **Method Blank Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Method Blank Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update Method Blank Summary command button** to transfer the information contained in the report to the **Method Blank Summary table** (tblMBSummary).
5. The current contents of the Method Blank Summary table can be viewed by clicking on the **View Method Blank Summary command button**.

For additional information, refer to Section 6.2.5. – Method Blank Evaluation in the *Database User's Manual*.

## 4.5. Surrogate Method Blank Evaluation

**Sample Type Evaluated:** surrogate method blank recoveries

1. Click the **View SRGT Method Blank Exceedances command button**. All surrogate method blank recovery results falling outside of their acceptance range will appear in the **Surrogate Method Blank Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Surrogate Method Blank Exceedances Report**, the user must (A) print out the report for later use and (B)click the **Update SRGT Method Blank Summary command button** to transfer the information contained in the report to the **SRGT Method Blank Summary table** (tblSMBRSummary).

5. The current contents of the Surrogate Method Blank Summary table can be viewed by clicking on the **View SRGT Method Blank Summary command button**.

For additional information, refer to Section 6.2.6. – Surrogate Method Blank Evaluation in the *Database User's Manual*.

## 4.6. Field Blank Evaluation

**Sample Type Evaluated:** field blanks

1. Click the **View Field Blank Exceedances command button**. All detected field blanks associated with environmental samples having measured concentrations less than five times the concentration measured in the field blank (i.e., detect field blank result > environmental results/5) will appear in the **Field Blank Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Field Blank Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update Field Blank Summary command button** to transfer the information contained in the report to the **Field Blank Summary table** (tblFBSummary).
5. The current contents of the Field Blank Summary table can be viewed by clicking on the **View Field Blank Summary command button**.

For additional information, refer to Section 6.2.7. – Field Blank Evaluation in the *Database User's Manual*.

## 4.7. Surrogate Field Blank Evaluation

**Sample Type Evaluated:** surrogate field blank recoveries

1. Click the **View SRGT Field Blank Exceedances command button**. All surrogate field blank recovery results falling outside of their acceptance range will appear in the **Surrogate Field Blank Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.

3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Surrogate Field Blank Exceedances Report**, the user must (A) print out the report for later use and (B)click the **Update SRGT Field Blank Summary command button** to transfer the information contained in the report to the **SRGT Field Blank Summary table** (tblSFBRSummary).
5. The current contents of the Surrogate Field Blank Summary table can be viewed by clicking on the **View SRGT Field Blank Summary command button**.

For additional information, refer to Section 6.2.8. – Surrogate Field Blank Evaluation in the *Database User's Manual*.

## 4.8. Travel Blank Evaluation

**Sample Types Evaluated:** travel blanks

1. Click the **View Travel Blank Exceedances command button**. All detected travel blanks (and stationary blanks) will appear in the **Travel Blank Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Travel Blank Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update Travel Blank Summary command button** to transfer the information contained in the report to the **Travel Blank Summary table** (tblTBSummary).
5. The current contents of the Travel Blank Summary table can be viewed by clicking on the **View Travel Blank Summary command button**.

For additional information, refer to Section 6.2.9. – Travel Blank Evaluation in the *Database User's Manual*.

## 4.9. Surrogate Travel Blank Evaluation

**Sample Type Evaluated:** surrogate travel blank recoveries

1. Click the **View SRGT Travel Blank Exceedances command button**. All surrogate travel blank recovery results falling outside of their acceptance range will appear in the **Surrogate Travel Blank Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Surrogate Travel Blank Exceedances Report**, the user must (A) print out the report for later use and (B)click the **Update SRGT Travel Blank Summary command button** to transfer the information contained in the report to the **SRGT Travel Blank Summary table** (tblSTBRSummary).
5. The current contents of the Surrogate Travel Blank Summary table can be viewed by clicking on the **View SRGT Travel Blank Summary command button**.

For additional information, refer to Section 6.2.10. – Surrogate Travel Blank Evaluation in the *Database User's Manual*.

## 4.10. Laboratory Control Spike Recovery Evaluation

**Sample Types Evaluated:** LCS, rec; LCS dup, rec; SRM, rec; SRM dup, rec; CRM, rec; and CRM dup, rec (all of these QA/QC sample types are generically referred to below as "LSC/LCSD" recoveries)

1. Click the **View Lab Control Spike Rec. Exceed. command button**. All LCS/LCSD recovery results falling outside of their acceptance range will appear in the **Lab Control Spike Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.

4. Once satisfied with the contents of the **Lab Control Spike Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update LCS Recovery Summary command button** to transfer the information contained in the report to the **Laboratory Control Spike Summary table** (tblLCSSummary).
5. The current contents of the Laboratory Control Spike Summary table can be viewed by clicking on the **View Lab Control Spike Recov. Summary command button**.

For additional information, refer to Section 6.2.11. – Laboratory Control Spike Recovery Evaluation in the *Database User's Manual*.

## 4.11. Surrogate Laboratory Control Spike Recovery Evaluation

**Sample Types Evaluated:** srgt LCS, rec and srgt LCS dup, rec

1. Click the **View SRGT Lab Control Spike Exceed. command button**. All surrogate LCS/LCSD recovery results falling outside of their acceptance range will appear in the **Surrogate Lab Control Spike Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Surrogate Lab Control Spike Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update SRGT Lab Control Spike Summary command button** to transfer the information contained in the report to the **Surrogate Laboratory Control Spike Summary table** (tblSLCSSummary).
5. The current contents of the Surrogate Laboratory Control Spike Summary table can be viewed by clicking on the **View SRGT Lab Control Spike Summary command button**.

For additional information, refer to Section 6.2.12. – Surrogate Laboratory Control Spike Recovery Evaluation in the *Database User's Manual*.

- ❖ It is possible that a laboratory analyzing trace organic compounds could employ standard reference material (SRM) or certified reference material (CRM) in place of LCS/LCSD samples. Furthermore, these SRM and CRM samples could include surrogate compounds. If the Stormwater Monitoring Program were ever to receive surrogate SRM and surrogate CRM recovery results, than a number of minor database updates would need to be made in

order to accommodate the entry and evaluation of these heretofore unreported QA/QC sample types.

## 4.12. Matrix Spike Recovery Evaluation

**Sample Types Evaluated:** matrix spike, rec, matrix spike dup, rec, and srgt environ, rec

1. Click the **View Matrix Spike Recov. Exceedences command button**. All MS/MSD and surrogate environmental recovery results falling outside of their acceptance range will appear in the **Matrix Spike Recovery Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Matrix Spike Recovery Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update Matrix Spike Recovery Summary command button** to transfer the information contained in the report to the **Matrix Spike Recovery Summary table** (tblMSRSummary).
5. The current contents of the Matrix Spike Recovery Summary table can be viewed by clicking on the **View Matrix Spike Recovery Summary command button**.

For additional information, refer to Section 6.2.13. – Matrix Spike Recovery Evaluation in the *Database User's Manual*.

- On a rare occasion the Stormwater Monitoring Program will receive a matrix spike recovery result from a laboratory that is reported as a negative number (e.g., "-169"). This negative numeric result is the product of an improper spiking of an environmental sample by the laboratory, and in fact leaves the matrix spike recovery result of no value to the Program. To this end, the negative matrix spike recovery result should be removed from the **QA/QC Temporary Results Table** and transferred to the **Rejected QA/QC Data Table** (tblRejectedDataWCQA) by executing the following query contained in the Database: "utl_qry_Transfer_RejectedDataWCQA".

## 4.13. Surrogate Matrix Spike Recovery Evaluation

**Sample Types Evaluated:** srgt matrix spike, rec and srgt matrix spike dup, rec

1. Click the **View SRGT Matrix Spike Exceedences command button**. All surrogate MS/MSD recovery results falling outside of their acceptance range will appear in the **Surrogate Matrix Spike Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Surrogate Matrix Spike Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update SRGT Matrix Spike Summary command button** to transfer the information contained in the report to the **Surrogate Matrix Spike Recovery Summary table** (tblSMSRSummary).
5. The current contents of the Surrogate Matrix Spike Recovery Summary table can be viewed by clicking on the **View SRGT Matrix Spike Summary command button**.

For additional information, refer to Section 6.2.14. – Surrogate Matrix Spike Recovery Evaluation in the *Database User's Manual*.

## 4.14. Laboratory Duplicate RPD Evaluation

**Sample Type Evaluated:** lab duplicate

1. Click the **View Lab Duplicate RPD Exceedences command button**. All lab duplicate RPD results greater than their data quality objective (DQO) – in this case, RPD result > *QA Limit Max* – will appear in the **Lab Duplicate RPD Exceedances Report** that is opened.

    - ❖ If the Database is unable to match a lab duplicate result with its appropriate environmental result or the lab duplicate result does not possess a *QA Limit Max* value, then the user will be provided with a message box stating that the Database encountered one or more "problematic lab duplicate records". The user is then prompted to view the problematic lab duplicate record(s) by clicking the **View Problematic Lab Duplicate Records command button** to gain additional information.

2. Review contents of the exceedance report, and inspect problematic records (if any are identified). If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory. Problematic records must be addressed and resolved before moving to Step #3.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Lab Duplicate RPD Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update Lab Duplicate RPD Summary command button** to transfer the information contained in the report to the **Laboratory Duplicate RPD Summary table** (tblLDSummary).
5. The current contents of the Laboratory Duplicate RPD Summary table can be viewed by clicking on the **View Lab Duplicate RPD Summary command button**.

For additional information, refer to Section 6.2.15. – Laboratory Duplicate RPD Evaluation in the *Database User's Manual*.

## 4.15. Field Duplicate RPD Evaluation

**Sample Type Evaluated:** field duplicate

1. Click the **View Field Duplicate RPD Exceedences command button**. All Database-calculated field duplicate RPD results greater than 30% will appear in the **Field Duplicate RPD Exceedances Report** that is opened.

    - If the Database is unable to match a field duplicate result with its appropriate environmental result, then the user will be provided with a message box stating that the Database encountered one or more "problematic field duplicate records". The user is then prompted to view the problematic field duplicate record(s) by clicking the **View Problematic Field Duplicate Records command button** to gain additional information.

2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory. Problematic records must be addressed and resolved before moving to Step #3.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must

again select a specific monitoring event's data for processing before starting again at Step #1 above.

4. Once satisfied with the contents of the **Field Duplicate RPD Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update Field Duplicate RPD Summary command button** to transfer the information contained in the report to the **Field Duplicate RPD Summary table** (tblLDSummary).
5. The current contents of the Field Duplicate RPD Summary table can be viewed by clicking on the **View Field Duplicate RPD Summary command button**.

For additional information, refer to Section 6.2.16. – Field Duplicate RPD Evaluation in the *Database User's Manual*.

- ❖ The 30% RPD data quality objective (DQO) is enforced by a single query – qry_FDExc – and is currently set by the Stormwater Monitoring Program at this level because the QA Limit Max (i.e., DQO) for field duplicate samples should be no more restrictive than the QA Limit Max for laboratory duplicate samples, and the Program's primary analytical laboratory, CRG Marine Laboratories, Inc., sets it laboratory duplicate RPD DQO at 30%. The Stormwater Monitoring Program can chose to lower its field duplicate RPD DQO as it sees fit (e.g., lowering the QA Limit Max to 25%).

## 4.16. Laboratory Control Spike RPD Evaluation

**Sample Types Evaluated:** LCS, RPD; SRM, RPD; and CRM, RPD (these three QA/QC sample types are generically referred to below as "LCS RPD" results)

1. Click the **View Lab Control Spike RPD Exceed. command button**. All LCS RPD results greater than their data quality objective (DQO) – in this case, RPD result > QA Limit Max – will appear in the **Lab Control Spike RPD Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Lab Control Spike RPD Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update Lab Control Spike RPD Summary command button** to transfer the information contained in the report to the **Laboratory Control Spike RPD Summary table** (tblLCSRPDSummary).

5. The current contents of the Laboratory Control Spike RPD Summary table can be viewed by clicking on the **View Lab Control Spike RPD Summary command button**.

For additional information, refer to Section 6.2.17. – Laboratory Control Spike RPD Evaluation in the *Database User's Manual*.

## 4.17. Matrix Spike RPD Evaluation

**Sample Type Evaluated:** matrix spike, RPD

1. Click the **View Matrix Spike RPD Exceedances command button**. All MS RPD results greater than their data quality objective (DQO) – in this case, RPD result > QA Limit Max – will appear in the **Matrix Spike RPD Exceedances Report** that is opened.
2. Review contents of report. If any results appear suspect, confirm their accuracy through review of hard copy laboratory reports, EDDs, and/or follow-up communication with the appropriate analytical laboratory.
3. Based on the review performed in the previous step, if edits and/or deletions are required to be made to environmental and/or QA/QC data, then the user must again select a specific monitoring event's data for processing before starting again at Step #1 above.
4. Once satisfied with the contents of the **Matirx Spike RPD Exceedances Report**, the user must (A) print out the report for later use and (B) click the **Update Matrix Spike RPD Summary command button** to transfer the information contained in the report to the **Matrix Spike RPD Summary table** (tblMSRPDSummary).
5. The current contents of the Matrix Spike RPD Summary table can be viewed by clicking on the **View Matrix Spike RPD Summary command button**.

For additional information, refer to Section 6.2.18. – Matrix Spike RPD Evaluation in the *Database User's Manual*.

- ❖ On a rare occasion the Stormwater Monitoring Program will receive a matrix spike RPD result from a laboratory that is reported as a negative number (e.g., "-75.3"). This negative numeric result is the product of an improper spiking of an environmental sample by the laboratory, and in fact leaves the matrix spike RPD result of no value to the Program. To this end, the negative matrix spike RPD result should be removed from the **QA/QC Temporary Results Table** and transferred to the **Rejected QA/QC Data Table** (tblRejectedDataWCQA) by executing the following query contained in the Database: "utl_qry_Transfer_RejectedDataWCQA".

## 4.18. QA/QC Sample Types Not Automatically Evaluated by Database

*Filter Blank* and *Stationary Blank* results can currently be entered into and managed by the Database, but cannot be evaluated by QA/QC data evaluation routines programmed into the **Water Quality Environmental and QA/QC Data Evaluation screens**. However, these two QA/QC sample types can be evaluated with regard to their compliance to their respective data quality objectives (DQO) by executing designated DQO exceedance queries. Table 5 lists those DQO compliance queries to be used for the evaluation of filter blank and stationary blank results. One query in the pair evaluates whether or not a QA/QC sample type result exceeds its DQO (e.g., sop_qry_DQOC_FilterBlankExc; "Exc" stands for exceedance) and the other query lists all QA/QC results matching the specific QA/QC sample type under evaluation (e.g., sop_qry_DQOC_FilterBlankTotal). In order to generate the information required for the upcoming **environmental data qualification** process (Section 5), the user must execute all query pairs listed in Table 5 and print out the results of both queries when the "Total" query returns one or more records.

**Table 5: Data Quality Objective Compliance Queries**

| QA/QC Sample Type | Name of DQO Compliance Query |
|---|---|
| filter blank<br>(field- and lab-initiated) | sop_qry_DQOC_FilterBlankExc<br>sop_qry_DQOC_FilterBlankTotal |
| stationary blank | sop_qry_DQOC_StationaryBlankExc<br>sop_qry_DQOC_StationaryBlankTotal |

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# 5. ENVIRONMENTAL DATA QUALIFICATION

A fully validated analytical data set (see Section 3) that has undergone a QA/QC data evaluation (see Section 4) is ready for the fourth and final step of the overall data evaluation process: **environmental data qualification**. From an operational perspective, the *QA/QC Exceedance Reports* generated by the NPDES Stormwater Water Quality Database from its QA/QC data analysis routines, the Database's designated Environmental Data Qualification Screen (see Section 6.3. – Assign Qualifications To Water Chemistry Environmental Data in the *Database User's Manual*), guidance presented in the *Data Quality Evaluation Plan*, and this document provide District staff with the means necessary to qualify the Stormwater Monitoring Program's environmental data. This section describes the data qualification process associated with holding time exceedances, as well as exceedances of individual data quality objectives (DQOs) associated with each QA/QC sample result evaluated by the Stormwater Monitoring Program. A tabularized summary of Program Data Qualification Codes employed by the Stormwater Monitoring Program is presented in Section 6.4.

This last step in the overall QA/QC data evaluation process, once completed, will produce and fully validated and qualified water chemistry data set that can be used by the District for satisfying its NPDES reporting requirements, assessing general water quality in the Ventura County watershed, evaluating the effects of various best management practices (BMPs) implemented by the Ventura Countywide Stormwater Quality Management Program, and answering any number of questions that can be posed with regard to surface water quality issues in Ventura County. The following subsections describe the steps that District staff must take to determine if (1) Stormwater Monitoring Program environmental data – and in some cases, QA/QC data – require qualification based on the outcome of any of the **QA/QC data evaluation checks** just performed (as described in the previous section), and (2) how to physically assign these qualifications to the appropriate data records. Each subsection also specifies a ***QA/QC Exceedance Report* (or query)** that must be used by District staff when determining if and how environmental data are to be qualified, as well as an **exceedance-qualification relationship** that describes how many environmental data records could be qualified based on a single DQO exceedance. Finally, each subsection contains the same tabularized information for each data quality objective exceedance evaluation that is presented in the *Data Quality Evaluation Plan*.

## 5.1. Holding Time Exceedances

| | |
|---|---|
| **Sample Types Evaluated** | Environmental Samples, Equipment Blanks, Field Blanks, Field-Initiated Filter Blanks, Travel Blanks, and Field Duplicates |
| **Data Quality Objectives** | **For analyses requiring sample preparation:**<br>1. Elapsed time between sample collection and sample preparation < sample preparation holding time limit;<br>2. Elapsed time between sample preparation and sample analysis < sample analysis holding time limit<br>**For analyses not requiring sample preparation:**<br>Elapsed time between sample collection and sample analysis < sample analysis holding time limit |
| **Data Qualification Process** | Qualify all samples showing holding time exceedance(s) as *estimated*. |
| **Program Qualification** | EST-HT |
| **Corrective Action for Resolving Issue** | Inquiry as to why samples were not delivered to laboratory within holding times and/or why sample preparation and/or sample analysis did not occur within holding times. Take remedial actions to prevent future occurrences. |
| **Notes** | A sample showing more than one holding time exceedance need only be qualified once. |

**QA/QC Exceedance Report:** *Holding Time Exceedances Report*
**Exceedance-Qualification Relationship:** 1 – 1

1. All data records appearing in the *Holding Time Exceedances Report* must be assigned a Program Qualification of "EST-HT".

2. With regard to qualifying **environmental** data records (i.e., QA/QC Sample Type = "environmental"), District staff must use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*).

3. With regard to qualifying **QA/QC** data records, District staff must use the **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality to locate a specific record and then manually assign it a qualification in the **DQOComp** (data quality objective compliance) data field.

## 5.2. Equipment Blank Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Equipment Blanks |
| **Data Quality Objective** | r < RL |
| **Data Qualification Process** | None |
| **Program Qualification** | None specific to Equipment Blanks |
| **Corrective Action for Resolving Issue** | Examine field log. Identify and remove contamination source(s) through equipment cleaning or replacement. Reanalyze suspect samples. |
| **Notes** | The Stormwater Monitoring Program's equipment blanks consist of Carboy Blanks and Tubing Blanks. |
| r = analytical result as reported by laboratory | |

**QA/QC Exceedance Report:** *Equipment Blank Exceedances Report*
**Exceedance-Qualification Relationship:** n/a

Since this QA/QC sample type is not used to qualify environmental data, the report is only used to document exceedances. Equipment blank hits should be brought to the attention of the laboratory for clarification and correction. Ideally, any equipment blank hits observed prior to the beginning of the monitoring season would prompt re-cleaning of equipment and re-analysis of equipment blank samples for those constituents that were detected during the original equipment blank analysis.

## 5.3. Surrogate Equipment Blank Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Surrogate Equipment Blank Recoveries – *for trace organics analyses only* |
| **Data Quality Objective** | lower recovery limit ≤ r ≤ upper recovery limit |
| **Data Qualification Process** | If equipment blank results are not qualified by laboratory, contact lab to determine if and how out-of-control surrogate equipment blank recoveries affect target analytes. |
| **Program Qualification** | None – QA/QC surrogate recovery results are not used to qualify environmental data. |
| **Corrective Action for Resolving Issue** | Consult with laboratory. Identify and correct cause(s). Recalibrate and reanalyze any suspect samples or qualify suspect data. |
| **Notes** | None |
| r = analytical result as reported by laboratory | |

**QA/QC Exceedance Report:** *Surrogate Equipment Blank Exceedances Report*
**Exceedance-Qualification Relationship:** n/a

Since this QA/QC sample type is not used to qualify environmental data, the report is only used to document exceedances. Observed trends in equipment blank surrogate results outside of acceptance limits should be brought to the attention of the laboratory for clarification and correction.

## 5.4. Method Blank Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Method Blanks |
| **Data Quality Objective** | r < MDL |
| **Data Qualification Process** | Qualify affected environmental samples with measured concentrations < (r) x (5) as *upper limit*.<br>Affected samples are those analyzed in the same QA/QC Batch as the out-of-control method blank. |
| **Program Qualification** | UL-MB |
| **Corrective Action for Resolving Issue** | Contact laboratory to inquire about "in-house" contamination of method blank and potential need to re-determine MDL for affected analyte(s). |
| **Notes** | None |
| r = analytical result as reported by laboratory | |

**QA/QC Exceedance Report:** *Method Blank Exceedances Report*
**Exceedance-Qualification Relationship:** 1 – many

1. On a constituent-by-constituent basis, the Database multiplies the detected method blank result that appears in the *Method Blank Exceedances Report* by a factor of 5 to determine a **qualification threshold value** (**QTV**) for the constituent (e.g., if method blank Diethyl phthalate = 0.22; then the calculated QTV for Diethyl phthalate = 0.22 x 5 = 1.1).

2. All environmental samples of a particular constituent having a detected concentration less than the calculated **QTV** must be assigned a *Program Qualification* of "UL-MB".

3. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*). Make sure that the *QA Batch ID* value of the method blank result matches the *QA Batch ID* value of the environmental sample(s) selected for qualification.

4. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

## 5.5. Surrogate Method Blank Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Surrogate Method Blank Recoveries – *for trace organics analyses only* |
| **Data Quality Objective** | lower recovery limit ≤ r ≤ upper recovery limit |
| **Data Qualification Process** | If method blank results are not qualified by laboratory, contact lab to determine if and how out-of-control surrogate method blank recoveries affect target analytes. |
| **Program Qualification** | None – QA/QC surrogate recovery results are not used to qualify environmental data. |
| **Corrective Action for Resolving Issue** | Consult with laboratory. Identify and correct cause(s). Recalibrate and reanalyze any suspect samples or qualify suspect data. |
| **Notes** | None |
| r = analytical result as reported by laboratory | |

**QA/QC Exceedance Report:** *Surrogate Method Blank Exceedances Report*
**Exceedance-Qualification Relationship:** n/a

Since this QA/QC sample type is not used to qualify environmental data, the report is only used to document exceedances. Observed trends in method blank surrogate results outside of acceptance limits should be brought to the attention of the laboratory for clarification and correction.

## 5.6. Laboratory-Initiated Filter Blank Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Filter Blanks (laboratory-initiated) |
| **Data Quality Objective** | r < MDL |
| **Data Qualification Process** | Qualify affected environmental samples with measured concentrations < (r) x (5) as *upper limit*.<br>Affected samples are those dissolved constituents analyzed in the same QA/QC Batch as the out-of-control filter blank. |
| **Program Qualification** | UL-LFLTRB |
| **Corrective Action for Resolving Issue** | Identify and remove contamination source(s). Reanalyze suspect samples or qualify suspect data. |
| **Notes** | None |
| r = analytical result as reported by laboratory | |

**DQO Compliance Queries:** sop_qry_DQOC_FilterBlankExc
sop_qry_DQOC_FilterBlankTotal
**Exceedance-Qualification Relationship:** 1 – many

1. On a constituent-by-constituent basis, multiply the detected lab-initiated filter blank result that is returned by the DQO exceedance query (i.e., sop_qry_DQCO_FilterBlankExc) by a factor of 5 to determine a **qualification threshold value** (QTV) for the constituent (e.g., if Dissolved Zinc = 0.12; then QTV for Dissolved Zinc = 0.12 x 5 = 0.6).

2. All environmental samples of a particular constituent having a detected concentration less than the calculated QTV must be assigned a *Program Qualification* of "UL-LFLTRB".

3. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*). Make sure that the *QA Batch ID* value of the lab-initiated filter blank result matches the *QA Batch ID* value of the environmental sample(s) selected for qualification.

4. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

## 5.7. Stationary Blank Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Stationary Blanks |
| **Data Quality Objective** | r < MDL |
| **Data Qualification Process** | 1. **Detected stationary blank, detected field blank, and non-detect method blank:** Qualify data as necessary via Field Blank Exceedances.<br>2. **Detected stationary blank, detected method blank, and non-detect field blank:** Qualify data as necessary via Method Blank Exceedances.<br>3. **Detected stationary blank, detected field and method blanks:** Qualify data as necessary via both Field Blank Exceedances and Method Blank Exceedances.<br>4. **Detected stationary blank, non-detected field and method blanks:** No qualification necessary. |
| **Program Qualification** | None specific to Stationary Blanks (see above) |
| **Corrective Action for Resolving Issue** | Identify and remove contamination source(s). Reanalyze suspect samples or qualify suspect data. |
| **Notes** | None |
| r = analytical result as reported by laboratory | |

**DQO Compliance Queries:** sop_qry_DQOC_StationaryBlankExc
sop_qry_DQOC_StationaryBlankTotal

**Exceedance-Qualification Relationship:** n/a

Since this QA/QC sample type is not used to qualify environmental data, the report is only used to document exceedances. Stationary blank hits should be brought to the attention of the laboratory for clarification and correction.

## 5.8. Field Blank Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Field Blanks |
| **Data Quality Objective** | r < RL |
| **Data Qualification Process** | Qualify affected environmental samples with measured concentrations < (r) x (5) as *upper limit*.<br>Affected samples are those collected from the same location as the out-of-control field blank. |
| **Program Qualification** | UL-FB |
| **Corrective Action for Resolving Issue** | Identify and remove contamination source(s). Reanalyze suspect samples or qualify suspect data. |
| **Notes** | None |
| r = analytical result as reported by laboratory | |

**QA/QC Exceedance Report:** *Field Blank Exceedances Report*
**Exceedance-Qualification Relationship:** 1 – 1

1. The *Field Blank Exceedances Report* lists all of those detected field blank samples and their associated detected environmental samples where the detected environmental sample concentration is less than 5 times the detected field blank concentration. To this end, there is no need to calculate a **qualification threshold value** (QTV) for field blank results exceeding their DQO (r < RL). The Database automatically addresses and enforces the constraint that an affected environmental sample is one that is collected from the same location as the out-of-control field blank sample.

2. All environmental samples listed in the *Field Blank Exceedances Report* must be assigned a *Program Qualification* of "UL-FB".

3. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*). Make sure that the *Site ID* and *QA Batch ID* values of the field blank result match the *Site ID* and *QA Batch ID* values of the environmental sample selected for qualification.

4. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

## 5.9. Surrogate Field Blank Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Surrogate Field Blank Recoveries – *for trace organics analyses only* |
| **Data Quality Objective** | lower recovery limit ≤ r ≤ upper recovery limit |
| **Data Qualification Process** | If field blank results are not qualified by laboratory, contact lab to determine if and how out-of-control surrogate field blank recoveries affect target analytes. |
| **Program Qualification** | None – QA/QC surrogate recovery results are not used to qualify environmental data. |
| **Corrective Action for Resolving Issue** | Consult with laboratory. Identify and correct cause(s). Recalibrate and reanalyze any suspect samples or qualify suspect data. |
| **Notes** | None |
| r = analytical result as reported by laboratory | |

**QA/QC Exceedance Report:** *Surrogate Field Blank Exceedances Report*
**Exceedance-Qualification Relationship:** n/a

Since this QA/QC sample type is not used to qualify environmental data, the report is only used to document exceedances. Observed trends in field blank surrogate results outside of acceptance limits should be brought to the attention of the laboratory for clarification and correction.

## 5.10. Field-Initiated Filter Blank Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Filter Blanks (field-initiated) |
| **Data Quality Objective** | r < RL |
| **Data Qualification Process** | Qualify affected environmental samples with measured concentrations < (r) x (5) as *upper limit*.<br>Affected samples are those dissolved constituents collected from the same location as the out-of-control field-initiated filter blank. |
| **Program Qualification** | UL-FFLTRB |
| **Corrective Action for Resolving Issue** | Identify and remove contamination source(s). Reanalyze suspect samples or qualify suspect data. |
| **Notes** | None |
| r = analytical result as reported by laboratory | |

**DQO Compliance Queries:** sop_qry_DQOC_FilterBlankExc
sop_qry_DQOC_FilterBlankTotal
**Exceedance-Qualification Relationship:** 1 – 1

1. On a constituent-by-constituent basis, multiply the detected field-initiated filter blank result that is returned by the DQO exceedance query (i.e., sop_qry_DQCO_FilterBlankExc) by a factor of 5 to determine a **qualification threshold value** (QTV) for the constituent (e.g., if Dissolved Zinc = 0.12; then QTV for Dissolved Zinc = 0.12 x 5 = 0.6).

2. With regard to a particular constituent, an environmental sample that was collected at the same location as the field filtration was performed and has a detected concentration less than the calculated QTV must be assigned a *Program Qualification* of "UL-FFLTRB".

3. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*). Make sure that the *Site ID* and *QA Batch ID* values of the field-initiated filter blank result match the *Site ID* and *QA Batch ID* value of the environmental sample selected for qualification.

4. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

## 5.11. Travel Blank Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Travel Blanks |
| **Data Quality Objective** | r < RL |
| **Data Qualification Process** | **Four possible QA/QC data scenarios:**<br>1. **Detected travel blank, detected field blank, and non-detect method blank:** Qualify data as necessary <u>first</u> via Field Blank Exceedances. With regard to environmental samples not collected in combination with a field blank, qualify affected samples with measured concentrations < (r) x (5) as *upper limit*. Affected samples are those analyzed in the same QA/QC Batch as the out-of-control travel blank.<br>2. **Detected travel blank, detected method blank, and non-detect field blank:** Qualify data as necessary via Method Blank Exceedances.<br>3. **Detected travel blank, detected field and method blanks:** Qualify data as necessary via both Field Blank Exceedances and Method Blank Exceedances.<br>4. **Detected travel blank, non-detected field and method blanks:** Qualify affected samples with measured concentrations < (r) x (5) as *upper limit*. Affected samples are those analyzed in the same QA/QC Batch as the out-of-control travel blank. |
| **Program Qualification** | UL-TB |
| **Corrective Action for Resolving Issue** | Identify and remove contamination source(s). Reanalyze suspect samples or qualify suspect data. |
| **Notes** | Environmental samples assigned a qualification of "UL-FB" would not be assigned an additional qualification of "UL-TB". |
| r = analytical result as reported by laboratory | |

**QA/QC Exceedance Report:** *Travel Blank Exceedances Report*
**Exceedance-Qualification Relationship:** 1 – many

1. As the **Data Qualification Process** in the above tabularized summary describes, District staff must simultaneously consider field blank and method blank results when evaluating travel blank exceedances listed in the *Travel Blank Exceedances Report* generated by the Database. It might be easiest to work through each travel blank exceedance one-by-one and determine which one of the four possible QA/QC data scenarios presented above represents the analytical findings – on a constituent-by-constituent basis – of the current monitoring event's data.

**QA/QC Data Scenario #1**

2. **IF** the current analytical findings show that there exists a **detected travel blank**, a **detected field blank**, and a **non-detect method blank** for a particular constituent, **THEN** District staff must *first* qualify environmental data as necessary based on field blank exceedances (see subsection 5.8. above).

3. Secondarily, with regard to environmental samples not collected in combination with a field blank, District staff must compare the Database-calculated **qualification threshold value** (**QTV**) that appears in the *Travel Blank Exceedances Report* against associated, detected environmental sample results on a constituent-by-constituent basis to determine if the QTV is greater than or less than detected environmental results (e.g., if travel blank Dissolved Copper = 0.14; then the calculated QTV for Dissolved Copper = 0.14 x 5 = 0.7). All environmental samples of a particular constituent having a detected concentration less than the calculated QTV must be assigned a *Program Qualification* of "UL-TB".

   - ❖ Environmental samples assigned a *Program Qualification* of "UL-FB" would not be assigned an additional qualification of "UL-TB".

**QA/QC Data Scenario #2**

4. **ELSE IF** the current analytical findings show that there exists a **detected travel blank**, a **detected method blank**, and a **non-detect field blank** for a particular constituent, **THEN** District staff must qualify environmental data as necessary based on method blank exceedances (see subsection 5.2. above).

**QA/QC Data Scenario #3**

5. **ELSE IF** the current analytical findings show that there exists a **detected travel blank**, a **detected field blank**, and a **detected method blank** for a particular constituent, **THEN** District staff must qualify environmental data as necessary based on field blank exceedances (see subsection 5.8. above) and method blank exceedances (see subsection 5.2. above).

**QA/QC Data Scenario #4**

6. **ELSE IF** the current analytical findings show that there exists a **detected travel blank**, a **non-detect field blank**, and a **non-detect method blank** for a particular constituent, **THEN** District staff must compare the Database-calculated **qualification threshold value** (**QTV**) that appears in the *Travel Blank Exceedances Report* against associated, detected environmental sample results on a constituent-by-constituent basis to determine if the QTV is greater than or less than detected environmental results (e.g., if travel blank Dissolved Copper = 0.14; then the calculated QTV for Dissolved Copper = 0.14 x 5 = 0.7). All environmental samples of a particular constituent having a detected concentration less than the calculated QTV must be assigned a *Program Qualification* of "UL-TB".

**With Respect to All Data Qualification:**

7. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the Program Qualification (see Section 6.3. in the *Database User's Manual*). Make sure that the *QA Batch ID* value of the travel blank result matches the *QA Batch ID* value of the environmental sample(s) selected for qualification.

8. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

## 5.12. Surrogate Travel Blank Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Surrogate Travel Blank Recoveries – *for trace organics analyses only* |
| **Data Quality Objective** | lower recovery limit ≤ r ≤ upper recovery limit |
| **Data Qualification Process** | If travel blank results are not qualified by laboratory, contact lab to determine if and how out-of-control surrogate travel blank recoveries affect target analytes. |
| **Program Qualification** | None – QA/QC surrogate recovery results are not used to qualify environmental data. |
| **Corrective Action for Resolving Issue** | Consult with laboratory. Identify and correct cause(s). Recalibrate and reanalyze any suspect samples or qualify suspect data. |
| **Notes** | None |
| r = analytical result as reported by laboratory | |

**QA/QC Exceedance Report:** *Surrogate Travel Blank Exceedances Report*
**Exceedance-Qualification Relationship:** n/a

Since this QA/QC sample type is not used to qualify environmental data, the report is only used to document exceedances. Observed trends in travel blank surrogate results outside of acceptance limits should be brought to the attention of the laboratory for clarification and correction.

## 5.13. Laboratory Control Spike Exceedances

| | |
|---|---|
| **Sample Types Evaluated** | LCS, SRM, CRM Recoveries (generically referenced as LCS Recoveries) |
| **Data Quality Objective** | lower recovery limit ≤ r ≤ upper recovery limit |
| **Data Qualification Process** | **In instances where no matrix spike recovery results exist, or matrix spike recoveries are out-of-control:** Qualify affected environmental samples where a single LCS recovery result ($r_1$), both LCS ($r_1$) and LCSD ($r_2$) results, or the average of the LCS ($r_1$) and LCSD ($r_2$) results fall below or above acceptance range.<br>1. When r is < lower recovery limit, environmental samples are qualified as *low biased*.<br>2. When r is > upper recovery limit, detected* environmental samples are qualified as *high biased*. |
| **Program Qualification** | LB-LCSR or HB-LCSR (or "-SRMR" and "-CRMR") |
| **Corrective Action for Resolving Issue** | Identify and correct cause(s). Recalibrate and reanalyze suspect samples or qualify suspect data. |
| **Notes** | **In instances where "in-control" matrix spike recovery results exist for an analyte:** Matrix spike recovery results "trump" LCS recovery results. An environmental sample associated with "in-control" matrix spike results would not be qualified as *low biased* or *high biased* due to poor LCS recovery.<br>*Non-detected environmental samples are not assigned a "HB-LCSR" qualification because a high biasing of a non-detected result implies that the "true" concentration of an analyte in the sample is lower than otherwise expected, and further supports the designation of the analyte as non-detected at the reported detection limit. |
| r = analytical result as reported by laboratory | |
| $r_1$ = result of initial LCS recovery; $r_2$ = result of duplicate LCS recovery | |

**QA/QC Exceedance Report:** *Lab Control Spike Exceedances Report*
**Exceedance-Qualification Relationship:** 1 – many

**Single LCS Recovery Result Example**

1. When a single LCS (or SRM or CRM) recovery result is provide by an analytical laboratory, and that recovery result lies outside of its acceptance limits, then most (see exceptions noted below) environmental samples of a particular constituent will be assigned a *Program Qualification* of "LB-LCSR" or "HB-LCSR" (or "-SRMR" and "-CRMR") depending on whether the LCS recovery result falls below its lower DQO limit or above its upper DQO limit, respectively.

2. It is the responsibility of District staff to confirm that an identified, *single* out-of-control LCS recovery result is in fact not part of a pair of LCS/LCSD recoveries.

3. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*). Make sure that the *QA Batch ID* value of the LCS result matches the *QA Batch ID* value of the environmental sample(s) selected for qualification.

4. Exception #1 – If an environmental sample slated for qualification due to "out-of-control" LCS/LCSD recoveries is associated with "in-control" matrix spike recoveries, then the environmental sample would not receive qualification based on the "out-of-control" LCS/LCSD recoveries.

5. Exception #2 – Non-detected environmental samples are not assigned a "HB-LCSR" qualification because a high biasing of a non-detected result implies that the "true" concentration of an analyte in the sample is lower than otherwise expected, and further supports the designation of the analyte as non-detected at the reported detection limit.

6. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

**LCS/LCSD Recovery Results: Example #1**

1. When a **single** recovery result of a LCS/LCSD pair is "out-of-control", associated environmental samples may or may not require qualification. District staff must first average the "in-control" and "out-of-control" recovery results to determine if the **average recovery** falls within acceptance limits. If it is determined that the average recovery result lies outside of its acceptance limits, then most (see exceptions noted below) environmental samples of a particular constituent will be assigned a *Program Qualification* of "LB-LCSR" or "HB-LCSR" (or "-SRMR" and "-CRMR") depending on whether the average recovery result falls below its lower DQO limit or above its upper DQO limit, respectively.

2. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*). Make sure that the *QA Batch ID* values of the LCS/LCSD results match the *QA Batch ID* value of the environmental sample(s) selected for qualification.

3. Exception #1 – If an environmental sample slated for qualification due to "out-of-control" LCS/LCSD recoveries is associated with "in-control" matrix spike recoveries, then the environmental sample would not receive qualification based on the "out-of-control" LCS/LCSD recoveries.

4. Exception #2 – Non-detected environmental samples are not assigned a "HB-LCSR" qualification because a high biasing of a non-detected result implies that the "true" concentration of an analyte in the sample is lower than otherwise expected, and further supports the designation of the analyte as non-detected at the reported detection limit.

5. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

**LCS/LCSD Recovery Results: Example #2**

1. When **both** recovery results of a LCS/LCSD pair fall outside of their acceptance limits, then most (see exceptions noted below) environmental samples of a particular constituent will be assigned a *Program Qualification* of "LB-LCSR" or "HB-LCSR" (or "-SRMR" and "-CRMR") depending on whether the LCS recovery results falls below their lower DQO limit or above their upper DQO limit, respectively.

2. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*). Make sure that the *QA Batch ID* values of the LCS/LCSD results match the *QA Batch ID* value of the environmental sample(s) selected for qualification.

3. Exception #1 – If an environmental sample slated for qualification due to "out-of-control" LCS/LCSD recoveries is associated with "in-control" matrix spike recoveries, then the environmental sample would not receive qualification based on the "out-of-control" LCS/LCSD recoveries.

4. Exception #2 – Non-detected environmental samples are not assigned a "HB-LCSR" qualification because a high biasing of a non-detected result implies that the "true" concentration of an analyte in the sample is lower than otherwise expected, and further supports the designation of the analyte as non-detected at the reported detection limit.

5. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

## 5.14. Surrogate Laboratory Control Spike Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Surrogate LCS/SRM/CRM Recoveries (generically referenced as Surrogate LCS Recoveries) – *for trace organics analyses only* |
| **Data Quality Objective** | lower recovery limit ≤ r ≤ upper recovery limit |
| **Data Qualification Process** | If LCS recovery results are not qualified by laboratory, contact lab to determine if and how out-of-control surrogate LCS recoveries affect target analytes. |
| **Program Qualification** | None – QA/QC surrogate recovery results are not used to qualify environmental data. |
| **Corrective Action for Resolving Issue** | Consult with laboratory. Identify and correct cause(s). Recalibrate and reanalyze any suspect samples or qualify suspect data. |
| **Notes** | None |
| r = analytical result as reported by laboratory | |

**QA/QC Exceedance Report:** *Surrogate Lab Control Spike Exceedances Report*
**Exceedance-Qualification Relationship:** n/a

Since this QA/QC sample type is not used to qualify environmental data, the report is only used to document exceedances. Observed trends in laboratory control spike surrogate results outside of acceptance limits should be brought to the attention of the laboratory for clarification and correction.

## 5.15. Matrix Spike Exceedances

| | |
|---|---|
| **Sample Types Evaluated** | MS/MSD |
| **Data Quality Objective** | lower recovery limit ≤ r ≤ upper recovery limit |
| **Data Qualification Process** | Qualify affected environmental samples where a single MS recovery result ($r_1$), both MS ($r_1$) and MSD ($r_2$) results, or the average of the MS ($r_1$) and MSD ($r_2$) results fall below or above acceptance range. Affected samples are those collected from the same location as the out-of-control MS/MSD sample.<br>1. When r is < lower recovery limit, environmental samples are qualified as *low biased*.<br>2. When r is > upper recovery limit, detected* environmental samples are qualified as *high biased*. |
| **Program Qualification** | LB-MSR or HB-MSR |
| **Corrective Action for Resolving Issue** | Check SRM/CRM recovery to confirm compliance with its DQO. Attempt to correct matrix problem. Recalibrate and reanalyze suspect samples or qualify suspect data. |
| **Notes** | **One "in-control" and one out-of-control MS recovery:** As long as the average of the MS/MSD results fall within the acceptance range for the analyte, no qualification of environmental data is necessary.<br>**In instances where "in-control" MS/MSD recovery results and out-of-control LCS recovery results exist for an analyte:** Matrix spike recovery results "trump" LCS recovery results. An environmental sample associated with "in-control" matrix spike results would not be qualified as *low biased* or *high biased* due to poor LCS recovery.<br>*Non-detected environmental samples are not assigned a "HB-MSR" qualification because a high biasing of a non-detected result implies that the "true" concentration of an analyte in the sample is lower than otherwise expected, and further supports the designation of the analyte as non-detected at the reported detection limit. |
| r = analytical result as reported by laboratory | |
| $r_1$ = result of initial MS recovery; $r_2$ = result of duplicate MS recovery | |

**QA/QC Exceedance Report:** *Matrix Spike Exceedances Report*
**Exceedance-Qualification Relationship:** 1 – 1

- ❖ Verify that matrix spike exceedances listed in the *Matrix Spike Exceedances Report* are in fact from analyses performed on a Stormwater Monitoring Program's matrix.

- ❖ On rare occasion the Stormwater Monitoring Program will receive a matrix spike recovery result from a laboratory that is reported as a negative number (e.g., "-169"). This negative numeric result is the product of an improper spiking of an environmental sample by the laboratory, and in fact leaves the matrix spike recovery result of no value to the Program. To this end, the negative matrix spike recovery result should be removed from the **QA/QC Temporary Results Table** and transferred to the **Rejected QA/QC Data Table** (tblRejectedDataWCQA) by executing the following query contained in the Database: "utl_qry_Transfer_RejectedDataWCQA".

**Single Matrix Spike Recovery Result Example**

1. When a single matrix spike recovery result is provide by an analytical laboratory (*Note: it is very rare for a laboratory to only report a single matrix spike recovery result*), and that recovery result lies outside of its acceptance limits, then the environmental sample collected at the same location as the matrix spike sample will be assigned a *Program Qualification* (see exception noted below) – on a constituent-by-constituent basis – of either "LB-MSR" or "HB-MSR" depending on whether the matrix spike recovery result falls below its lower DQO limit or above its upper DQO limit, respectively.

2. It is the responsibility of District staff to confirm that an identified, *single* out-of-control matrix spike recovery result is in fact not part of a pair of MS/MSD recoveries.

3. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*). Make sure that the *Site ID* and *QA Batch ID* values of the matrix spike result match the *Site ID* and *QA Batch ID* values of the environmental sample selected for qualification.

4. Exception – Non-detected environmental samples are not assigned a "HB-MSR" qualification because a high biasing of a non-detected result implies that the "true" concentration of an analyte in the sample is lower than otherwise expected, and further supports the designation of the analyte as non-detected at the reported detection limit.

5. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

**MS/MSD Recovery Results: Example #1**

1. When a **single** recovery result of a MS/MSD pair is "out-of-control", the associated environmental sample may or may not require qualification. District staff must first average the "in-control" and "out-of-control" recovery results to determine if the **average recovery** falls within acceptance limits. If it is determined that the average recovery result lies outside of its acceptance limits, then the environmental sample collected at the same location as the matrix spike

sample will be assigned a *Program Qualification* (see exception noted below) – on a constituent-by-constituent basis – of either "LB-MSR" or "HB-MSR" depending on whether the average recovery result falls below its lower DQO limit or above its upper DQO limit, respectively.

2. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*). Make sure that the *Site ID* and *QA Batch ID* values of the MS/MSD results match the *Site ID* and *QA Batch ID* values of the environmental sample selected for qualification.

3. Exception – Non-detected environmental samples are not assigned a "HB-MSR" qualification because a high biasing of a non-detected result implies that the "true" concentration of an analyte in the sample is lower than otherwise expected, and further supports the designation of the analyte as non-detected at the reported detection limit.

4. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

**MS/MSD Recovery Results: Example #2**

1. When **both** recovery results of a MS/MSD pair fall outside of their acceptance limits, then the environmental sample collected at the same location as the matrix spike sample will be assigned a *Program Qualification* (see exception noted below) – on a constituent-by-constituent basis – of either "LB-MSR" or "HB-MSR" depending on whether the average recovery result falls below its lower DQO limit or above its upper DQO limit, respectively.

2. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*). Make sure that the *Site ID* and *QA Batch ID* values of the MS/MSD results match the *Site ID* and *QA Batch ID* values of the environmental sample selected for qualification.

3. Exception – Non-detected environmental samples are not assigned a "HB-MSR" qualification because a high biasing of a non-detected result implies that the "true" concentration of an analyte in the sample is lower than otherwise expected, and further supports the designation of the analyte as non-detected at the reported detection limit.

4. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

## 5.16. Surrogate Matrix Spike Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Surrogate MS/MSD Recoveries – *for trace organics analyses only* |
| **Data Quality Objective** | lower recovery limit ≤ r ≤ upper recovery limit |
| **Data Qualification Process** | If MS/MSD recovery results are not qualified by laboratory, contact lab to determine if and how out-of-control surrogate MS/MSD recoveries affect target analytes. |
| **Program Qualification** | None – QA/QC surrogate recovery results are not used to qualify environmental data. |
| **Corrective Action for Resolving Issue** | Consult with laboratory. Identify and correct cause(s). Recalibrate and reanalyze any suspect samples or qualify suspect data. |
| **Notes** | None |
| r = analytical result as reported by laboratory | |

**QA/QC Exceedance Report:** *Surrogate Matrix Spike Exceedances Report*
**Exceedance-Qualification Relationship:** n/a

- Verify that surrogate matrix spike exceedances listed in the *Surrogate Matrix Spike Exceedances Report* are in fact from analyses performed on a Stormwater Monitoring Program's matrix.

Since this QA/QC sample type is not used to qualify environmental data, the report is only used to document exceedances. Observed trends in matrix spike surrogate results outside of acceptance limits should be brought to the attention of the laboratory for clarification and correction.

## 5.17. Environmental Sample Surrogate Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Environmental Sample Surrogate Recoveries (QA/QC Sample Type = "srgt environ, rec") – *for trace organics analyses only* |
| **Data Quality Objective** | lower recovery limit ≤ r ≤ upper recovery limit |
| **Data Qualification Process** | If environmental results are not qualified by laboratory, contact lab to determine if and how out-of-control environmental sample surrogate recoveries affect target analytes. Qualify affected environmental samples as instructed by Program QA/QC Officer and/or laboratory.<br>1. When r < lower recovery limit, environmental samples are qualified as *low biased*.<br>2. When r > upper recovery limit, detected* environmental samples qualified as *high biased*. |
| **Program Qualification** | LB-SRGTR or HB-SRGTR |
| **Corrective Action for Resolving Issue** | Consult with laboratory. Identify and correct cause(s). Recalibrate and reanalyze any suspect samples or qualify suspect data. |
| **Notes** | *Non-detected environmental samples are not assigned a "HB-SRGTR" qualification because a high biasing of a non-detected result implies that the "true" concentration of an analyte in the sample is lower than otherwise expected, and further supports the designation of the analyte as non-detected at the reported detection limit. |
| r = analytical result as reported by laboratory | |

**QA/QC Exceedance Report:** *Matrix Spike Exceedances Report*
**Exceedance-Qualification Relationship:** 1 – many (within one environmental sample)

1. Environmental surrogates are typically added to environmental samples as two or more unique surrogate compounds. The *Matrix Spike Exceedances Report* lists those environmental surrogate compound recoveries that fall outside of their acceptance range. Note: it is uncommon for environmental surrogate recoveries to be "out-of-control"; however, out-of-control recoveries are occasionally observed.

2. If out-of-control environmental surrogate recoveries are observed, and "in-control" matrix spike recovery results do not exist for the environmental sample in question (see exception below), then District staff should contact the laboratory to inquire if and how out-of-control environmental surrogate recoveries affect target analytes. It is common for a laboratory to state that the occurrence of 50% or less out-of-control environmental surrogates has no effect on the confidence the laboratory has in the validity of the reported environmental sample results.

3. However, if a laboratory states that one or more out-of-control environmental surrogate recoveries in fact impacts its confidence in the validity of one or more reported environmental results, then the laboratory must specify which environmental result(s) should be qualified. The laboratory-identified constituents from the affected environmental sample would be assigned a *Program Qualification* of either "LB-SRGTR" or "HB-SRGTR" depending on whether the environmental surrogate recovery result falls below its lower DQO limit or above its upper DQO limit, respectively.

4. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*). Make sure that the *Site ID* and *QA Batch ID* values of the surrogate recovery result(s) match the *Site ID* and *QA Batch ID* values of the environmental sample selected for qualification.

5. Exception – If "in-control" matrix spike recovery information exists for the environmental sample possessing "out-of-control" environmental surrogate recoveries, then there is no need to qualify the environmental sample because "in-control" matrix spike recoveries (these being recoveries of *target* analytes) trump "out-of-control" environmental surrogate recoveries (these being recoveries of *non-target* analytes).

6. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

## 5.18. Laboratory Duplicate RPD Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Lab Duplicate concentration result via calculated Lab Duplicate RPD result |
| **Data Quality Objective** | RPD ≤ upper acceptance limit (typically, 20 – 30%) |
| **Data Qualification Process** | Qualify affected environmental samples as *estimated*. Affected samples are those belonging to the Stormwater Monitoring Program for which a duplicate laboratory analysis was performed. |
| **Program Qualification** | EST-LD |
| **Corrective Action for Resolving Issue** | Identify and correct cause(s). Recalibrate and reanalyze any suspect samples or qualify suspect data. |
| **Notes** | A duplicate laboratory analysis of a *non-Program* sample showing a RPD outside of the DQO would not impact any Program environmental results.<br>Bacteriological environmental and laboratory duplicate results are log-transformed prior to calculation of a RPD result. |
| RPD = relative percent difference (calculated by Database) | |

**QA/QC Exceedance Report:** *Lab Duplicate RPD Exceedances Report*
**Exceedance-Qualification Relationship:** 1 – 1

- ❖ Verify that lab duplicate RPD exceedances listed in the Lab Duplicate RPD Exceedances Report are in fact from analyses performed on a Stormwater Monitoring Program's environmental sample.

1. The *Lab Duplicate RPD Exceedances Report* lists those calculated lab duplicate RPD results that exceed the DQO (i.e., QA Limit Max) assigned to replicate analyses of a particular constituent by a specific analytical laboratory.

2. All environmental samples listed in the *Lab Duplicate RPD Exceedances Report* ***by reference*** must be assigned a *Program Qualification* of "EST-LD". Make sure that the *Site ID*, *Lab ID*, and *QA Batch ID* values of the lab duplicate RPD result match the *Site ID*, *Lab ID*, and *QA Batch ID* values of the environmental sample selected for qualification.

3. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*).

4. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

## 5.19. Field Duplicate RPD Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | Field Duplicate concentration result via calculated Field Duplicate RPD result |
| **Data Quality Objective** | RPD ≤ upper acceptance limit (typically, 20 – 30%) |
| **Data Qualification Process** | Qualify affected environmental samples as *estimated*. Affected samples are those collected from the same location as the out-of-control field duplicate sample. |
| **Program Qualification** | EST-FD |
| **Corrective Action for Resolving Issue** | Identify variability source and take action if possible. Reanalyze any suspect samples or qualify suspect data. |
| **Notes** | Bacteriological environmental and field duplicate results are log-transformed prior to calculation of a RPD result. |
| RPD = relative percent difference (calculated by Database) | |

**QA/QC Exceedance Report:** *Field Duplicate RPD Exceedances Report*
**Exceedance-Qualification Relationship:** 1 – 1

1. The *Field Duplicate RPD Exceedances Report* lists those calculated field duplicate RPD results that exceed the Program's DQO (currently set at 30%) assigned to duplicate analyses.

2. All **environmental** and **field duplicate** samples listed in the *Field Duplicate RPD Exceedances Report* must be assigned a *Program Qualification* of "EST-FD". Make sure that the *Site ID* and *QA Batch ID* values of the field duplicate RPD result match the *Site ID* and *QA Batch ID* values of the environmental sample selected for qualification.

3. With regard to qualifying **environmental** records, District staff must use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*).

4. With regard to qualifying actual **field duplicate** records, District staff must use the **Water Chemistry QA/QC Data Viewing/Editing Screen's** filtering and querying functionality to locate a specific record and then manually assign it a qualification in the **DQOComp** (data quality objective compliance) data field.

5. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

## 5.20. Laboratory Control Spike RPD Exceedances

| | |
|---|---|
| **Sample Types Evaluated** | LCS RPD, SRM RPD, CRM RPD (generically referenced as LCS RPD) |
| **Data Quality Objective** | RPD ≤ upper acceptance limit (typically, 10 – 30%) |
| **Data Qualification Process** | Qualify affected environmental samples as *estimated*. Affected samples are those analyzed in the same QA/QC Batch as the out-of-control LCS RPD result. |
| **Program Qualification** | EST-LCSRPD, EST- SRMRPD, EST-CRMRPD |
| **Corrective Action for Resolving Issue** | Identify and correct cause(s). Recalibrate and reanalyze any suspect samples or qualify suspect data. |
| **Notes** | None |
| RPD = relative percent difference (reported by laboratory or calculated Program) | |

**QA/QC Exceedance Report:** *Lab Control Spike RPD Exceedances Report*
**Exceedance-Qualification Relationship:** 1 – many

1. The *Lab Control Spike RPD Exceedances Report* lists those calculated laboratory control spike RPD results that exceed the DQO (i.e., QA Limit Max) assigned to the analytical precision assessment of a particular constituent by a specific analytical laboratory.

2. All environmental samples of a particular constituent that are associated with an "out-of-control" lab control spike RPD result (as listed in the *Lab Control Spike RPD Exceedances Report*) must be assigned a *Program Qualification* of "EST-LCSRPD" (or "EST-SRMRPD" or "EST-CRMRPD"). Make sure that the *QA Batch ID* value of the laboratory control spike RPD result matches the *QA Batch ID* value of the environmental samples selected for qualification.

3. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*).

4. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

## 5.21. Matrix Spike RPD Exceedances

| | |
|---|---|
| **Sample Type Evaluated** | MS RPD |
| **Data Quality Objective** | RPD ≤ upper acceptance limit (typically, 15 – 30%) |
| **Data Qualification Process** | Qualify affected environmental samples as *estimated*. Affected samples are those collected from the same location as the MS/MSD sample providing the out-of-control MS/MSD RPD result. |
| **Program Qualification** | EST-MSRPD |
| **Corrective Action for Resolving Issue** | Check SRM/CRM RPD to confirm compliance with its DQO. Attempt to correct matrix problem. Recalibrate and reanalyze suspect samples or qualify suspect data. |
| **Notes** | None |
| RPD = relative percent difference (reported by laboratory or calculated Program) | |

**QA/QC Exceedance Report:** *Matrix Spike RPD Exceedances Report*
**Exceedance-Qualification Relationship:** 1 – 1

1. The *Matrix Spike RPD Exceedances Report* lists those calculated matrix spike RPD results that exceed the DQO (i.e., QA Limit Max) assigned to the analytical precision assessment of a particular constituent by a specific analytical laboratory.

2. All environmental samples listed in the *Matrix Spike RPD Exceedances Report* ***by reference*** must be assigned a *Program Qualification* of "EST-MSRPD". Make sure that the *Site ID* and *QA Batch ID* values of the matrix spike RPD result match the *Site ID* and *QA Batch ID* values of the environmental sample selected for qualification.

3. Use the **Water Chemistry Environmental Data Qualification Screen** to locate the record(s) of interest and physically assign the *Program Qualification* (see Section 6.3. in the *Database User's Manual*).

4. If a data record already possesses a qualification, make sure that the assignment of the new qualification does not "overwrite" the existing qualification.

   - ❖ On a rare occasion the Stormwater Monitoring Program will receive a matrix spike RPD result from a laboratory that is reported as a negative number (e.g., "-75.3"). This negative numeric result is the product of an improper spiking of an environmental sample by the laboratory, and in fact leaves the matrix spike RPD result of no value to the Program. To this end, the negative matrix spike RPD result should be removed from the **QA/QC Temporary Results Table** and transferred to the **Rejected QA/QC Data Table** (tblRejectedDataWCQA) by executing the following query contained in the Database: "utl_qry_Transfer_RejectedDataWCQA".

# 6. LABORATORY ANALYTICAL REFERENCES

## 6.1. Sample Holding Times

| Classification | Constituent | Fraction | Sample Preparation Holding Time | Sample Analysis Holding Time |
|---|---|---|---|---|
| Anion | Bromide | n/a | -- | 28 days |
| Anion | Chloride | n/a | -- | 28 days |
| Anion | Perchlorate | n/a | -- | 28 days |
| Anion | Sulfate | n/a | -- | 28 days |
| Bacteriological | E. Coli | n/a | -- | 8 hours |
| Bacteriological | Enterococcus | n/a | -- | 8 hours |
| Bacteriological | Fecal Coliform | n/a | -- | 8 hours |
| Bacteriological | Fecal Streptococcus | n/a | -- | 8 hours |
| Bacteriological | Total Coliform | n/a | -- | 8 hours |
| Cation | Calcium | Dissolved | -- | 180 days |
| Cation | Calcium | Total | -- | 180 days |
| Cation | Magnesium | Dissolved | -- | 180 days |
| Cation | Magnesium | Total | -- | 180 days |
| Cation | Potassium | n/a | -- | 180 days |
| Cation | Sodium | n/a | -- | 180 days |
| Conventional | Alkalinity | n/a | -- | 14 days |
| Conventional | BOD | n/a | -- | 48 hours |
| Conventional | COD | n/a | -- | 28 days |
| Conventional | Conductivity | n/a | -- | ASAP |
| Conventional | Cyanide | n/a | -- | 14 days |
| Conventional | DO | n/a | -- | ASAP |
| Conventional | Hardness as CaCO3 | Dissolved | -- | 180 days |
| Conventional | Hardness as CaCO3 | Total | -- | 180 days |
| Conventional | pH | n/a | -- | ASAP |
| Conventional | Residual Chlorine | n/a | -- | 48 hours |
| Conventional | Temperature | n/a | -- | ASAP |
| Conventional | Total Dissolved Solids | n/a | -- | 7 days |
| Conventional | Total Organic Carbon | n/a | -- | 28 days |
| Conventional | Total Suspended Solids | n/a | -- | 7 days |
| Conventional | Turbidity | n/a | -- | ASAP |
| Hydrocarbon | Oil and Grease | n/a | -- | 28 days |
| Hydrocarbon | TRPH | n/a | -- | 28 days |

## 6.1. Sample Holding Times – Continued

| Classification | Constituent | Fraction | Sample Preparation Holding Time | Sample Analysis Holding Time |
|---|---|---|---|---|
| Metal | Aluminum | Dissolved | -- | 180 days |
| Metal | Aluminum | Total | -- | 180 days |
| Metal | Antimony | Dissolved | -- | 180 days |
| Metal | Antimony | Total | -- | 180 days |
| Metal | Arsenic | Dissolved | -- | 180 days |
| Metal | Arsenic | Total | -- | 180 days |
| Metal | Barium | Dissolved | -- | 180 days |
| Metal | Barium | Total | -- | 180 days |
| Metal | Beryllium | Dissolved | -- | 180 days |
| Metal | Beryllium | Total | -- | 180 days |
| Metal | Boron | Total | -- | 180 days |
| Metal | Cadmium | Dissolved | -- | 180 days |
| Metal | Cadmium | Total | -- | 180 days |
| Metal | Chromium | Dissolved | -- | 180 days |
| Metal | Chromium | Total | -- | 180 days |
| Metal | Chromium VI | Total | -- | 24 hours |
| Metal | Cobalt | Dissolved | -- | 180 days |
| Metal | Cobalt | Total | -- | 180 days |
| Metal | Copper | Dissolved | -- | 180 days |
| Metal | Copper | Total | -- | 180 days |
| Metal | Iron | Dissolved | -- | 180 days |
| Metal | Iron | Total | -- | 180 days |
| Metal | Lead | Dissolved | -- | 180 days |
| Metal | Lead | Total | -- | 180 days |
| Metal | Manganese | Dissolved | -- | 180 days |
| Metal | Manganese | Total | -- | 180 days |
| Metal | Mercury | Dissolved | 2 days | 90 days |
| Metal | Mercury | Total | -- | 90 days |
| Metal | Molybdenum | Dissolved | -- | 180 days |
| Metal | Molybdenum | Total | -- | 180 days |
| Metal | Nickel | Dissolved | -- | 180 days |
| Metal | Nickel | Total | -- | 180 days |
| Metal | Selenium | Dissolved | -- | 180 days |
| Metal | Selenium | Total | -- | 180 days |
| Metal | Silver | Dissolved | -- | 180 days |
| Metal | Silver | Total | -- | 180 days |
| Metal | Strontium | Dissolved | -- | 180 days |
| Metal | Strontium | Total | -- | 180 days |

## 6.1. Sample Holding Times – Continued

| Classification | Constituent | Fraction | Sample Preparation Holding Time | Sample Analysis Holding Time |
|---|---|---|---|---|
| Metal | Thallium | Dissolved | -- | 180 days |
| Metal | Thallium | Total | -- | 180 days |
| Metal | Tin | Dissolved | -- | 180 days |
| Metal | Tin | Total | -- | 180 days |
| Metal | Titanium | Dissolved | -- | 180 days |
| Metal | Titanium | Total | -- | 180 days |
| Metal | Vanadium | Dissolved | -- | 180 days |
| Metal | Vanadium | Total | -- | 180 days |
| Metal | Zinc | Dissolved | -- | 180 days |
| Metal | Zinc | Total | -- | 180 days |
| Nutrient | Ammonia as N | n/a | -- | 28 days |
| Nutrient | Nitrate + Nitrite as N | n/a | -- | 48 hours |
| Nutrient | Nitrate as N | n/a | -- | 48 hours |
| Nutrient | Nitrite as N | n/a | -- | 48 hours |
| Nutrient | Organic Nitrogen | n/a | -- | 28 days |
| Nutrient | Orthophosphate as P | Total | -- | 48 hours |
| Nutrient | Phosphate | Total | -- | 28 days |
| Nutrient | Phosphorus | Dissolved | -- | 28 days |
| Nutrient | Phosphorus | Total | -- | 28 days |
| Nutrient | TKN | n/a | -- | 28 days |
| Nutrient | Total Nitrogen | n/a | -- | 48 hours |
| Nutrient | Total Phosphorus | Dissolved | -- | 28 days |
| Nutrient | Total Phosphorus | Total | -- | 28 days |
| Organic | Methyl tert-butyl ether (MTBE) | n/a | -- | 14 days |
| Organic | All other organic compounds other than MTBE | n/a | 7 days | 40 days |
| PCB | All aroclor and congener PCBs | n/a | 7 days | 40 days |
| Pesticide | Glyphosate (analyzed via EPA 547) | n/a | -- | 14 days |
| Pesticide | All other pesticides other than Glyphosate | n/a | 7 days | 40 days |

## 6.2. Detection Limits

| Constituent | Method | Units | Detection Limit* | Quantitation Limit* |
|---|---|---|---|---|
| ***Anions*** | | | | |
| Bromide | SM 4500-Br | mg/L | 0.001 | 0.005 |
| Chloride | SM 4500-Cl E | mg/L | 0.01 | 0.05 |
| Perchlorate | EPA 314.0 | µg/L | 2 | 2 |
| ***Bacteriologicals*** | | | | |
| E. Coli | MMO-MUG | MPN/100 mL | 10 | 10 |
| Enterococcus | Enterolert | MPN/100 mL | 10 | 2 |
| Fecal Coliform | SM 9221 E | MPN/100 mL | 2 | RL |
| Total Coliform | MMO-MUG | MPN/100 mL | 10 | 10 |
| ***Conventionals*** | | | | |
| BOD | EPA 405.1 | mg/L | 1 | 1 |
| Conductivity | SM 2510 | µmhos/cm | 100 | 200 |
| Hardness as CaCO3 | SM 2340 B | mg/L | 1 | 5 |
| pH | EPA 150.1 | pH Units | 0.1 | 0.2 |
| Total Dissolved Solids | SM 2540 C | mg/L | 0.1 | 0.2 |
| Total Organic Carbon | EPA 415.1 | mg/L | 0.5 | 0.5 |
| Total Suspended Solids | SM 2540 D | mg/L | 0.1 | 0.5 |
| Turbidity | EPA 180.1 | NTU | 1 | 2 |
| ***Hydrocarbons*** | | | | |
| Oil and Grease | EPA 1664A | mg/L | 1 | 5 |
| TRPH | EPA 418.1 | mg/L | 0.01 | 0.01 |
| ***Metals*** | | | | |
| Aluminum | EPA 200.8m | µg/L | 1 | 5 |
| Arsenic | EPA 200.8m | µg/L | 0.1 | 0.5 |
| Cadmium | EPA 200.8m | µg/L | 0.1 | 0.2 |
| Chromium | EPA 200.8m | µg/L | 0.1 | 0.5 |
| Chromium VI | SM 3500-Cr | µg/L | 5 | 10 |
| Copper | EPA 200.8m | µg/L | 0.1 | 0.5 |
| Lead | EPA 200.8m | µg/L | 0.05 | 0.1 |
| Mercury | EPA 1631E | ng/L | 0.5 | 1 |
| Nickel | EPA 200.8m | µg/L | 0.1 | 0.5 |
| Selenium | EPA 200.8m | µg/L | 0.1 | 0.5 |
| Silver | EPA 200.8m | µg/L | 0.1 | 0.2 |
| Thallium | EPA 200.8m | µg/L | 0.1 | 0.5 |
| Zinc | EPA 200.8m | µg/L | 0.1 | 0.5 |
| *Nominal detection and quantitation limits before sample dilution for the 2004/05 stormwater monitoring season. | | | | |

## 6.2. Detection Limits – Continued

| Constituent | Method | Units | Detection Limit* | Quantitation Limit* |
|---|---|---|---|---|
| ***Nutrients*** | | | | |
| Ammonia as N | SM 4500-NH3 F | mg/L | 0.01 | 0.05 |
| Nitrate as N | EPA 300.0 | mg/L | 0.02 | 0.05 |
| Nitrite as N | EPA 300.0 | mg/L | 0.02 | 0.05 |
| Orthophosphate as P | EPA 300.0 | mg/L | 0.0075 | 0.01 |
| TKN | EPA 351.3 | mg/L | 0.1 | 0.1 |
| Total Phosphorus | SM 4500-P C | mg/L | 0.016 | 0.05 |
| ***Organics*** | | | | |
| 1,2,4-Trichlorobenzene | EPA 625m | µg/L | 0.01 | 0.05 |
| 1,2-Dichlorobenzene | EPA 625m | µg/L | 0.01 | 0.05 |
| 1,3-Dichlorobenzene | EPA 625m | µg/L | 0.01 | 0.05 |
| 1,4-Dichlorobenzene | EPA 625m | µg/L | 0.01 | 0.05 |
| 1-Methylnaphthalene | EPA 625m | µg/L | 0.001 | 0.005 |
| 1-Methylphenanthrene | EPA 625m | µg/L | 0.001 | 0.005 |
| 2,3,5-Trimethylnaphthalene | EPA 625m | µg/L | 0.001 | 0.005 |
| 2,4,6-Trichlorophenol | EPA 625m | µg/L | 0.05 | 0.1 |
| 2,4-Dichlorophenol | EPA 625m | µg/L | 0.05 | 0.1 |
| 2,4-Dimethylphenol | EPA 625m | µg/L | 0.1 | 0.2 |
| 2,4-Dinitrophenol | EPA 625m | µg/L | 0.1 | 0.2 |
| 2,4-Dinitrotoluene | EPA 625m | µg/L | 0.05 | 0.1 |
| 2,6-Dimethylnaphthalene | EPA 625m | µg/L | 0.001 | 0.005 |
| 2,6-Dinitrotoluene | EPA 625m | µg/L | 0.05 | 0.1 |
| 2-Chloronaphthalene | EPA 625m | µg/L | 0.05 | 0.1 |
| 2-Chlorophenol | EPA 625m | µg/L | 0.05 | 0.1 |
| 2-Methyl-4,6-dinitrophenol | EPA 625m | µg/L | 0.1 | 0.2 |
| 2-Methylnaphthalene | EPA 625m | µg/L | 0.001 | 0.005 |
| 2-Nitrophenol | EPA 625m | µg/L | 0.1 | 0.2 |
| 3,3'-Dichlorobenzidine | EPA 625m | µg/L | 0.05 | 0.1 |
| 4-Bromophenyl phenyl ether | EPA 625m | µg/L | 0.05 | 0.1 |
| 4-Chloro-3-methylphenol | EPA 625m | µg/L | 0.1 | 0.2 |
| 4-Chlorophenyl phenyl ether | EPA 625m | µg/L | 0.05 | 0.1 |
| 4-Nitrophenol | EPA 625m | µg/L | 0.1 | 0.2 |
| Acenaphthene | EPA 625m | µg/L | 0.001 | 0.005 |
| Acenaphthylene | EPA 625m | µg/L | 0.001 | 0.005 |
| Anthracene | EPA 625m | µg/L | 0.001 | 0.005 |
| Azobenzene | EPA 625m | µg/L | 0.05 | 0.1 |
| Benzidine | EPA 625m | µg/L | 0.05 | 0.1 |
| Benzo(a)anthracene | EPA 625m | µg/L | 0.001 | 0.005 |
| Benzo(a)pyrene | EPA 625m | µg/L | 0.001 | 0.005 |
| Benzo(b)fluoranthene | EPA 625m | µg/L | 0.001 | 0.005 |
| Benzo(e)pyrene | EPA 625m | µg/L | 0.001 | 0.005 |
| Benzo(g,h,i)perylene | EPA 625m | µg/L | 0.001 | 0.005 |
| *Nominal detection and quantitation limits before sample dilution for the 2004/05 stormwater monitoring season. | | | | |

## 6.2. Detection Limits – Continued

| Constituent | Method | Units | Detection Limit* | Quantitation Limit* |
|---|---|---|---|---|
| ***Organics -- continued*** | | | | |
| Benzo(k)fluoranthene | EPA 625m | µg/L | 0.001 | 0.005 |
| Biphenyl | EPA 625m | µg/L | 0.001 | 0.005 |
| Bis(2-chloroethoxy)methane | EPA 625m | µg/L | 0.05 | 0.1 |
| Bis(2-chloroethyl)ether | EPA 625m | µg/L | 0.05 | 0.1 |
| Bis(2-chloroisopropyl)ether | EPA 625m | µg/L | 0.05 | 0.1 |
| Bis(2-ethylhexyl)phthalate | EPA 625m | µg/L | 0.005 | 0.01 |
| Butyl benzyl phthalate | EPA 625m | µg/L | 0.005 | 0.01 |
| Chrysene | EPA 625m | µg/L | 0.001 | 0.005 |
| Dibenz(a,h)anthracene | EPA 625m | µg/L | 0.001 | 0.005 |
| Dibenzothiophene | EPA 625m | µg/L | 0.001 | 0.005 |
| Diethyl phthalate | EPA 625m | µg/L | 0.005 | 0.01 |
| Dimethyl phthalate | EPA 625m | µg/L | 0.005 | 0.01 |
| Di-n-butylphthalate | EPA 625m | µg/L | 0.005 | 0.01 |
| Di-n-octylphthalate | EPA 625m | µg/L | 0.005 | 0.01 |
| Fluoranthene | EPA 625m | µg/L | 0.001 | 0.005 |
| Fluorene | EPA 625m | µg/L | 0.001 | 0.005 |
| Hexachlorobenzene | EPA 625m | µg/L | 0.001 | 0.005 |
| Hexachlorobutadiene | EPA 625m | µg/L | 0.05 | 0.1 |
| Hexachlorocyclopentadiene | EPA 625m | µg/L | 0.05 | 0.1 |
| Hexachloroethane | EPA 625m | µg/L | 0.05 | 0.1 |
| Indeno(1,2,3-cd)pyrene | EPA 625m | µg/L | 0.001 | 0.005 |
| Isophorone | EPA 625m | µg/L | 0.05 | 0.1 |
| Methyl tert-butyl ether (MTBE) | EPA 8260B | µg/L | 1 | 1 |
| Naphthalene | EPA 625m | µg/L | 0.001 | 0.005 |
| Nitrobenzene | EPA 625m | µg/L | 0.05 | 0.1 |
| N-Nitrosodimethylamine | EPA 625m | µg/L | 0.05 | 0.1 |
| N-Nitrosodi-N-propylamine | EPA 625m | µg/L | 0.05 | 0.1 |
| N-Nitrosodiphenylamine | EPA 625m | µg/L | 0.05 | 0.1 |
| Pentachlorophenol | EPA 625m | µg/L | 0.05 | 0.1 |
| Perylene | EPA 625m | µg/L | 0.001 | 0.005 |
| Phenanthrene | EPA 625m | µg/L | 0.001 | 0.005 |
| Phenol | EPA 625m | µg/L | 0.1 | 0.2 |
| Pyrene | EPA 625m | µg/L | 0.001 | 0.005 |
| ***Aroclor PCBs*** | | | | |
| Aroclor 1016 | EPA 625m | µg/L | 0.01 | 0.02 |
| Aroclor 1221 | EPA 625m | µg/L | 0.01 | 0.02 |
| Aroclor 1232 | EPA 625m | µg/L | 0.01 | 0.02 |
| Aroclor 1242 | EPA 625m | µg/L | 0.01 | 0.02 |
| Aroclor 1248 | EPA 625m | µg/L | 0.01 | 0.02 |
| Aroclor 1254 | EPA 625m | µg/L | 0.01 | 0.02 |
| Aroclor 1260 | EPA 625m | µg/L | 0.01 | 0.02 |
| *Nominal detection and quantitation limits before sample dilution for the 2004/05 stormwater monitoring season. | | | | |

## 6.2. Detection Limits – Continued

| Constituent | Method | Units | Detection Limit* | Quantitation Limit* |
|---|---|---|---|---|
| ***Congener PCBs*** | | | | |
| PCB 018 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 028 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 031 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 033 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 037 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 044 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 049 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 052 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 066 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 070 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 074 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 077 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 081 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 087 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 095 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 097 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 099 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 101 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 105 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 110 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 114 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 118 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 119 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 123 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 126 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 128 + 167 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 138 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 141 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 149 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 151 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 153 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 156 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 157 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 158 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 168 + 132 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 169 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 170 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 177 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 180 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 183 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 187 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 189 | EPA 625m | µg/L | 0.001 | 0.005 |
| *Nominal detection and quantitation limits before sample dilution for the 2004/05 stormwater monitoring season. | | | | |

## 6.2. Detection Limits – Continued

| Constituent | Method | Units | Detection Limit* | Quantitation Limit* |
|---|---|---|---|---|
| ***Congener PCBs – continued*** | | | | |
| PCB 194 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 200 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 201 | EPA 625m | µg/L | 0.001 | 0.005 |
| PCB 206 | EPA 625m | µg/L | 0.001 | 0.005 |
| ***Pesticides*** | | | | |
| 2,4,5-T | EPA 8151A | µg/L | 0.5 | 0.5 |
| 2,4,5-TP (Silvex) | EPA 8151A | µg/L | 0.5 | 0.5 |
| 2,4-D | EPA 8151A | µg/L | 5 | 5 |
| 2,4-DB | EPA 8151A | µg/L | 5 | 5 |
| 2,4'-DDD | EPA 625m | µg/L | 0.001 | 0.005 |
| 2,4'-DDE | EPA 625m | µg/L | 0.001 | 0.005 |
| 2,4'-DDT | EPA 625m | µg/L | 0.001 | 0.005 |
| 4,4'-DDD | EPA 625m | µg/L | 0.001 | 0.005 |
| 4,4'-DDE | EPA 625m | µg/L | 0.001 | 0.005 |
| 4,4'-DDT | EPA 625m | µg/L | 0.001 | 0.005 |
| Aldrin | EPA 625m | µg/L | 0.001 | 0.005 |
| BHC-alpha | EPA 625m | µg/L | 0.001 | 0.005 |
| BHC-beta | EPA 625m | µg/L | 0.001 | 0.005 |
| BHC-delta | EPA 625m | µg/L | 0.001 | 0.005 |
| BHC-gamma (Lindane) | EPA 625m | µg/L | 0.001 | 0.005 |
| Bolstar | EPA 625m | µg/L | 0.01 | 0.02 |
| Chlordane-alpha | EPA 625m | µg/L | 0.001 | 0.005 |
| Chlordane-gamma | EPA 625m | µg/L | 0.001 | 0.005 |
| Chlorpyrifos | EPA 625m | µg/L | 0.005 | 0.01 |
| cis-Nonachlor | EPA 625m | µg/L | 0.001 | 0.005 |
| Dalapon | EPA 8151A | µg/L | 13 | 13 |
| Demeton-O | EPA 625m | µg/L | 0.01 | 0.02 |
| Diazinon | EPA 625m | µg/L | 0.005 | 0.01 |
| Dicamba | EPA 8151A | µg/L | 0.5 | 0.5 |
| Dichlorprop | EPA 8151A | µg/L | 5 | 5 |
| Dichlorvos | EPA 625m | µg/L | 0.01 | 0.02 |
| Dieldrin | EPA 625m | µg/L | 0.001 | 0.005 |
| Dimethoate | EPA 625m | µg/L | 0.005 | 0.01 |
| Dinoseb | EPA 8151A | µg/L | 2.5 | 2.5 |
| Disulfoton | EPA 625m | µg/L | 0.01 | 0.02 |
| Endosulfan sulfate | EPA 625m | µg/L | 0.001 | 0.005 |
| Endosulfan-I | EPA 625m | µg/L | 0.001 | 0.005 |
| Endosulfan-II | EPA 625m | µg/L | 0.001 | 0.005 |
| Endrin | EPA 625m | µg/L | 0.001 | 0.005 |
| Endrin aldehyde | EPA 625m | µg/L | 0.001 | 0.005 |
| Endrin ketone | EPA 625m | µg/L | 0.001 | 0.005 |
| *Nominal detection and quantitation limits before sample dilution for the 2004/05 stormwater monitoring season. | | | | |

## 6.2. Detection Limits – Continued

| Constituent | Method | Units | Detection Limit* | Quantitation Limit* |
|---|---|---|---|---|
| ***Pesticides – continued*** | | | | |
| Ethoprop | EPA 625m | µg/L | 0.01 | 0.02 |
| Fenchlorophos (Ronnel) | EPA 625m | µg/L | 0.01 | 0.02 |
| Fensulfothion | EPA 625m | µg/L | 0.01 | 0.02 |
| Fenthion | EPA 625m | µg/L | 0.01 | 0.02 |
| Glyphosate | EPA 547 | µg/L | 6 | 6 |
| Heptachlor | EPA 625m | µg/L | 0.001 | 0.005 |
| Heptachlor epoxide | EPA 625m | µg/L | 0.001 | 0.005 |
| Malathion | EPA 625m | µg/L | 0.005 | 0.01 |
| MCPA | EPA 8151A | µg/L | 500 | 500 |
| MCPP | EPA 8151A | µg/L | 500 | 500 |
| Merphos | EPA 625m | µg/L | 0.01 | 0.02 |
| Methoxychlor | EPA 625m | µg/L | 0.001 | 0.005 |
| Methyl parathion | EPA 625m | µg/L | 0.01 | 0.02 |
| Mevinphos | EPA 625m | µg/L | 0.01 | 0.02 |
| Mirex | EPA 625m | µg/L | 0.001 | 0.005 |
| Oxychlordane | EPA 625m | µg/L | 0.001 | 0.005 |
| Phorate | EPA 625m | µg/L | 0.01 | 0.02 |
| Tetrachlorovinphos (Stirofos) | EPA 625m | µg/L | 0.01 | 0.02 |
| Tokuthion | EPA 625m | µg/L | 0.01 | 0.02 |
| Toxaphene | EPA 625m | µg/L | 0.01 | 0.005 |
| trans-Nonachlor | EPA 625m | µg/L | 0.001 | 0.005 |
| Trichloronate | EPA 625m | µg/L | 0.01 | 0.02 |
| *Nominal detection and quantitation limits before sample dilution for the 2004/05 stormwater monitoring season. | | | | |

## 6.3. Data Quality Objectives for Laboratory Reporting of Analytical Concentrations

| LL = Lower Limit<br>UL = Upper Limit | LCS Recovery (%) | | Max. | Matrix Spike Recovery (%) | | Max. |
|---|---|---|---|---|---|---|
| **Constituent** | **LL** | **UL** | **RPD%** | **LL** | **UL** | **RPD%** |
| ***Anions*** | | | | | | |
| Bromide | -- | -- | -- | -- | -- | -- |
| Chloride | 70 | 130 | 30 | 70 | 130 | 30 |
| Perchlorate | 85 | 115 | 15 | 80 | 120 | 15 |
| ***Bacteriologicals*** | | | | | | |
| E. Coli | -- | -- | -- | -- | -- | -- |
| Enterococcus | -- | -- | -- | -- | -- | -- |
| Fecal Coliform | -- | -- | -- | -- | -- | -- |
| Total Coliform | -- | -- | -- | -- | -- | -- |
| ***Conventionals*** | | | | | | |
| BOD | -- | -- | -- | -- | -- | -- |
| Conductivity | -- | -- | -- | -- | -- | -- |
| Hardness as CaCO3 | -- | -- | -- | -- | -- | -- |
| pH | -- | -- | -- | -- | -- | -- |
| Total Dissolved Solids | 70 | 130 | 30 | -- | -- | -- |
| Total Organic Carbon | 80 | 120 | -- | 70 | 130 | 25 |
| Total Suspended Solids | -- | -- | -- | -- | -- | -- |
| Turbidity | -- | -- | -- | -- | -- | -- |
| ***Hydrocarbons*** | | | | | | |
| Oil and Grease | 70 | 130 | 30 | -- | -- | -- |
| TRPH | 70 | 130 | 30 | -- | -- | -- |
| ***Metals*** | | | | | | |
| Aluminum | 75 | 125 | 20 | 75 | 125 | 30 |
| Arsenic | 65 | 135 | 20 | 65 | 135 | 30 |
| Cadmium | 60 | 140 | 20 | 60 | 140 | 30 |
| Chromium | 75 | 125 | 20 | 75 | 125 | 30 |
| Chromium VI | 70 | 130 | 30 | 70 | 130 | 30 |
| Copper | 75 | 125 | 20 | 75 | 125 | 30 |
| Lead | 75 | 125 | 20 | 75 | 125 | 30 |
| Mercury | 79 | 121 | | 71 | 125 | 30 |
| Nickel | 75 | 125 | 20 | 75 | 125 | 30 |
| Selenium | 40 | 160 | 20 | 40 | 160 | 30 |
| Silver | 75 | 125 | 20 | 75 | 125 | 30 |
| Thallium | 75 | 125 | 30 | 75 | 125 | 30 |
| Zinc | 75 | 125 | 20 | 75 | 125 | 30 |
| Recovery acceptance ranges and RPDs achieved during 2004/05 stormwater monitoring season. | | | | | | |

## 6.3. Data Quality Objectives for Laboratory Reporting of Analytical Concentrations – Continued

| LL = Lower Limit<br>UL = Upper Limit | LCS Recovery (%) | | Max. RPD% | Matrix Spike Recovery (%) | | Max. RPD% |
|---|---|---|---|---|---|---|
| **Constituent** | **LL** | **UL** | | **LL** | **UL** | |
| ***Nutrients*** | | | | | | |
| Ammonia as N | 70 | 130 | 30 | 70 | 130 | 30 |
| Nitrate as N | 70 | 130 | 30 | 70 | 130 | 30 |
| Nitrite as N | 70 | 130 | 30 | 70 | 130 | 30 |
| Orthophosphate as P | 70 | 130 | 30 | 70 | 130 | 30 |
| TKN | 75 | 125 | -- | 75 | 125 | 20 |
| Total Phosphorus | 70 | 130 | 30 | 70 | 130 | 30 |
| ***Organics*** | | | | | | |
| 1,2,4-Trichlorobenzene | -- | -- | -- | 44 | 142 | 30 |
| 1,2-Dichlorobenzene | -- | -- | -- | -- | -- | -- |
| 1,3-Dichlorobenzene | -- | -- | -- | -- | -- | -- |
| 1,4-Dichlorobenzene | -- | -- | -- | 20 | 124 | 30 |
| 1-Methylnaphthalene | -- | -- | -- | 50 | 120 | 30 |
| 1-Methylphenanthrene | -- | -- | -- | 70 | 130 | 30 |
| 2,3,5-Trimethylnaphthalene | -- | -- | -- | 70 | 130 | 30 |
| 2,4,6-Trichlorophenol | -- | -- | -- | 37 | 144 | 30 |
| 2,4-Dichlorophenol | -- | -- | -- | 39 | 135 | 30 |
| 2,4-Dimethylphenol | -- | -- | -- | -- | -- | -- |
| 2,4-Dinitrophenol | -- | -- | -- | -- | -- | -- |
| 2,4-Dinitrotoluene | -- | -- | -- | 39 | 139 | 30 |
| 2,6-Dimethylnaphthalene | -- | -- | -- | 70 | 130 | 30 |
| 2,6-Dinitrotoluene | -- | -- | -- | -- | -- | -- |
| 2-Chloronaphthalene | -- | -- | -- | -- | -- | -- |
| 2-Chlorophenol | -- | -- | -- | 23 | 134 | 30 |
| 2-Methyl-4,6-dinitrophenol | -- | -- | -- | -- | -- | -- |
| 2-Methylnaphthalene | -- | -- | -- | 50 | 120 | 30 |
| 2-Nitrophenol | -- | -- | -- | 29 | 182 | 30 |
| 3,3'-Dichlorobenzidine | -- | -- | -- | -- | -- | -- |
| 4-Bromophenyl phenyl ether | -- | -- | -- | -- | -- | -- |
| 4-Chloro-3-methylphenol | -- | -- | -- | 22 | 147 | 30 |
| 4-Chlorophenyl phenyl ether | -- | -- | -- | -- | -- | -- |
| 4-Nitrophenol | -- | -- | -- | 0.1 | 132 | 30 |
| Acenaphthene | -- | -- | -- | 70 | 130 | 30 |
| Acenaphthylene | -- | -- | -- | 70 | 130 | 30 |
| Anthracene | -- | -- | -- | 70 | 130 | 30 |
| Azobenzene | -- | -- | -- | -- | -- | -- |
| Benzidine | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | 70 | 130 | 30 |
| Benzo(a)pyrene | -- | -- | -- | 70 | 130 | 30 |
| Benzo(b)fluoranthene | -- | -- | -- | 70 | 130 | 30 |
| Benzo(e)pyrene | -- | -- | -- | 70 | 130 | 30 |
| Recovery acceptance ranges and RPDs achieved during 2004/05 stormwater monitoring season. | | | | | | |

## 6.3. Data Quality Objectives for Laboratory Reporting of Analytical Concentrations – Continued

| LL = Lower Limit<br>UL = Upper Limit | LCS Recovery (%) | | Max. | Matrix Spike Recovery (%) | | Max. |
|---|---|---|---|---|---|---|
| **Constituent** | **LL** | **UL** | **RPD%** | **LL** | **UL** | **RPD%** |
| ***Organics – continued*** | | | | | | |
| Benzo(g,h,i)perylene | -- | -- | -- | 70 | 130 | 30 |
| Benzo(k)fluoranthene | -- | -- | -- | 70 | 130 | 30 |
| Biphenyl | -- | -- | -- | 50 | 120 | 30 |
| Bis(2-chloroethoxy)methane | -- | -- | -- | -- | -- | -- |
| Bis(2-chloroethyl)ether | -- | -- | -- | -- | -- | -- |
| Bis(2-chloroisopropyl)ether | -- | -- | -- | -- | -- | -- |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | 8 | 158 | 30 |
| Butyl benzyl phthalate | -- | -- | -- | 0.005 | 152 | 30 |
| Chrysene | -- | -- | -- | 70 | 130 | 30 |
| Dibenz(a,h)anthracene | -- | -- | -- | 70 | 130 | 30 |
| Dibenzothiophene | -- | -- | -- | -- | -- | -- |
| Diethyl phthalate | -- | -- | -- | 0.005 | 114 | 30 |
| Dimethyl phthalate | -- | -- | -- | 0.005 | 112 | 30 |
| Di-n-butylphthalate | -- | -- | -- | 1 | 118 | 30 |
| Di-n-octylphthalate | -- | -- | -- | 4 | 146 | 30 |
| Fluoranthene | -- | -- | -- | 70 | 130 | 30 |
| Fluorene | -- | -- | -- | 70 | 130 | 30 |
| Hexachlorobenzene | -- | -- | -- | -- | -- | -- |
| Hexachlorobutadiene | -- | -- | -- | -- | -- | -- |
| Hexachlorocyclopentadiene | -- | -- | -- | -- | -- | -- |
| Hexachloroethane | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | 70 | 130 | 30 |
| Isophorone | -- | -- | -- | -- | -- | -- |
| Methyl tert-butyl ether (MTBE) | 85 | 121 | 17 | -- | -- | -- |
| Naphthalene | -- | -- | -- | 50 | 120 | 30 |
| Nitrobenzene | -- | -- | -- | -- | -- | -- |
| N-Nitrosodimethylamine | -- | -- | -- | -- | -- | -- |
| N-Nitrosodi-N-propylamine | -- | -- | -- | 60 | 140 | 30 |
| N-Nitrosodiphenylamine | -- | -- | -- | -- | -- | -- |
| Pentachlorophenol | -- | -- | -- | 14 | 176 | 30 |
| Perylene | -- | -- | -- | 70 | 130 | 30 |
| Phenanthrene | -- | -- | -- | 70 | 130 | 30 |
| Phenol | -- | -- | -- | 5 | 112 | 30 |
| Pyrene | -- | -- | -- | 70 | 130 | 30 |
| Recovery acceptance ranges and RPDs achieved during 2004/05 stormwater monitoring season. | | | | | | |

## 6.3. Data Quality Objectives for Laboratory Reporting of Analytical Concentrations – Continued

| LL = Lower Limit<br>UL = Upper Limit | LCS Recovery (%) | | Max. RPD% | Matrix Spike Recovery (%) | | Max. RPD% |
|---|---|---|---|---|---|---|
| **Constituent** | **LL** | **UL** | | **LL** | **UL** | |
| ***Aroclor PCBs*** | | | | | | |
| Aroclor 1016 | -- | -- | -- | -- | -- | -- |
| Aroclor 1221 | -- | -- | -- | -- | -- | -- |
| Aroclor 1232 | -- | -- | -- | -- | -- | -- |
| Aroclor 1242 | -- | -- | -- | -- | -- | -- |
| Aroclor 1248 | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- |
| ***Congener PCBs*** | | | | | | |
| PCB 018 | -- | -- | -- | 65 | 135 | 30 |
| PCB 028 | -- | -- | -- | 65 | 135 | 30 |
| PCB 031 | -- | -- | -- | 65 | 135 | 30 |
| PCB 033 | -- | -- | -- | 65 | 135 | 30 |
| PCB 037 | -- | -- | -- | 65 | 135 | 30 |
| PCB 044 | -- | -- | -- | 65 | 135 | 30 |
| PCB 049 | -- | -- | -- | 65 | 135 | 30 |
| PCB 052 | -- | -- | -- | 65 | 135 | 30 |
| PCB 066 | -- | -- | -- | 65 | 135 | 30 |
| PCB 070 | -- | -- | -- | 65 | 135 | 30 |
| PCB 074 | -- | -- | -- | 65 | 135 | 30 |
| PCB 077 | -- | -- | -- | 65 | 135 | 30 |
| PCB 081 | -- | -- | -- | 65 | 135 | 30 |
| PCB 087 | -- | -- | -- | 65 | 135 | 30 |
| PCB 095 | -- | -- | -- | 65 | 135 | 30 |
| PCB 097 | -- | -- | -- | 65 | 135 | 30 |
| PCB 099 | -- | -- | -- | 65 | 135 | 30 |
| PCB 101 | -- | -- | -- | 65 | 135 | 30 |
| PCB 105 | -- | -- | -- | 65 | 135 | 30 |
| PCB 110 | -- | -- | -- | 65 | 135 | 30 |
| PCB 114 | -- | -- | -- | 65 | 135 | 30 |
| PCB 118 | -- | -- | -- | 65 | 135 | 30 |
| PCB 119 | -- | -- | -- | 65 | 135 | 30 |
| PCB 123 | -- | -- | -- | 65 | 135 | 30 |
| PCB 126 | -- | -- | -- | 65 | 135 | 30 |
| PCB 128 + 167 | -- | -- | -- | 65 | 135 | 30 |
| PCB 138 | -- | -- | -- | 65 | 135 | 30 |
| PCB 141 | -- | -- | -- | 65 | 135 | 30 |
| PCB 149 | -- | -- | -- | 65 | 135 | 30 |
| PCB 151 | -- | -- | -- | 65 | 135 | 30 |
| PCB 153 | -- | -- | -- | 65 | 135 | 30 |
| PCB 156 | -- | -- | -- | 65 | 135 | 30 |
| Recovery acceptance ranges and RPDs achieved during 2004/05 stormwater monitoring season. | | | | | | |

## 6.3. Data Quality Objectives for Laboratory Reporting of Analytical Concentrations – Continued

| LL = Lower Limit<br>UL = Upper Limit | LCS Recovery (%) | | Max. | Matrix Spike Recovery (%) | | Max. |
|---|---|---|---|---|---|---|
| **Constituent** | **LL** | **UL** | **RPD%** | **LL** | **UL** | **RPD%** |
| ***Congener PCBs – continued*** | | | | | | |
| PCB 157 | -- | -- | -- | 65 | 135 | 30 |
| PCB 158 | -- | -- | -- | 65 | 135 | 30 |
| PCB 168 + 132 | -- | -- | -- | 65 | 135 | 30 |
| PCB 169 | -- | -- | -- | 65 | 135 | 30 |
| PCB 170 | -- | -- | -- | 65 | 135 | 30 |
| PCB 177 | -- | -- | -- | 65 | 135 | 30 |
| PCB 180 | -- | -- | -- | 65 | 135 | 30 |
| PCB 183 | -- | -- | -- | 65 | 135 | 30 |
| PCB 187 | -- | -- | -- | 65 | 135 | 30 |
| PCB 189 | -- | -- | -- | 65 | 135 | 30 |
| PCB 194 | -- | -- | -- | 65 | 135 | 30 |
| PCB 200 | -- | -- | -- | 65 | 135 | 30 |
| PCB 201 | -- | -- | -- | 65 | 135 | 30 |
| PCB 206 | -- | -- | -- | 65 | 135 | 30 |
| ***Pesticides*** | | | | | | |
| 2,4,5-T | 30 | 130 | 30 | 30 | 130 | 30 |
| 2,4,5-TP (Silvex) | -- | -- | -- | -- | -- | -- |
| 2,4-D | 30 | 130 | 30 | 30 | 130 | 30 |
| 2,4-DB | 30 | 130 | 30 | 30 | 130 | 30 |
| 2,4'-DDD | -- | -- | -- | 56 | 129 | 30 |
| 2,4'-DDE | -- | -- | -- | 60 | 129 | 30 |
| 2,4'-DDT | -- | -- | -- | 39 | 130 | 30 |
| 4,4'-DDD | -- | -- | -- | 46 | 138 | 30 |
| 4,4'-DDE | -- | -- | -- | 69 | 116 | 30 |
| 4,4'-DDT | -- | -- | -- | 34 | 136 | 30 |
| Aldrin | -- | -- | -- | 45 | 128 | 30 |
| BHC-alpha | -- | -- | -- | 60 | 123 | 30 |
| BHC-beta | -- | -- | -- | 45 | 140 | 30 |
| BHC-delta | -- | -- | -- | 29 | 113 | 30 |
| BHC-gamma (Lindane) | -- | -- | -- | 59 | 110 | 30 |
| Bolstar | -- | -- | -- | 65 | 125 | 30 |
| Chlordane-alpha | -- | -- | -- | 64 | 117 | 30 |
| Chlordane-gamma | -- | -- | -- | 46 | 125 | 30 |
| Chlorpyrifos | -- | -- | -- | 65 | 125 | 30 |
| cis-Nonachlor | | | | 60 | 140 | 30 |
| Dalapon | -- | -- | -- | -- | -- | -- |
| Demeton-O | -- | -- | -- | 65 | 125 | 30 |
| Diazinon | -- | -- | -- | 65 | 125 | 30 |
| Dicamba | -- | -- | -- | -- | -- | -- |
| Dichlorprop | -- | -- | -- | -- | -- | -- |
| Recovery acceptance ranges and RPDs achieved during 2004/05 stormwater monitoring season. | | | | | | |

## 6.3. Data Quality Objectives for Laboratory Reporting of Analytical Concentrations – Continued

| LL = Lower Limit<br>UL = Upper Limit | LCS Recovery (%) | | Max. RPD% | Matrix Spike Recovery (%) | | Max. RPD% |
|---|---|---|---|---|---|---|
| **Constituent** | **LL** | **UL** | | **LL** | **UL** | |
| ***Pesticides – continued*** | | | | | | |
| Dichlorvos | -- | -- | -- | 65 | 125 | 30 |
| Dieldrin | -- | -- | -- | 46 | 125 | 30 |
| Dimethoate | -- | -- | -- | 65 | 125 | 30 |
| Dinoseb | -- | -- | -- | -- | -- | -- |
| Disulfoton | -- | -- | -- | 65 | 125 | 30 |
| Endosulfan sulfate | -- | -- | -- | 25 | 104 | 30 |
| Endosulfan-I | -- | -- | -- | 54 | 141 | 30 |
| Endosulfan-II | -- | -- | -- | 0.001 | 135 | 30 |
| Endrin | -- | -- | -- | 32 | 141 | 30 |
| Endrin aldehyde | -- | -- | -- | -- | -- | -- |
| Endrin ketone | -- | -- | -- | 50 | 130 | 30 |
| Ethoprop | -- | -- | -- | 65 | 125 | 30 |
| Fenchlorophos (Ronnel) | -- | -- | -- | 65 | 125 | 30 |
| Fensulfothion | -- | -- | -- | 65 | 125 | 30 |
| Fenthion | -- | -- | -- | 65 | 125 | 30 |
| Glyphosate | 70 | 130 | -- | -- | -- | -- |
| Heptachlor | -- | -- | -- | 43 | 122 | 30 |
| Heptachlor epoxide | -- | -- | -- | 56 | 122 | 30 |
| Malathion | -- | -- | -- | 65 | 125 | 30 |
| MCPA | -- | -- | -- | -- | -- | -- |
| MCPP | -- | -- | -- | -- | -- | -- |
| Merphos | -- | -- | -- | 65 | 125 | 30 |
| Methoxychlor | -- | -- | -- | 0.001 | 157 | 30 |
| Methyl parathion | -- | -- | -- | 65 | 125 | 30 |
| Mevinphos | -- | -- | -- | 65 | 125 | 30 |
| Mirex | -- | -- | -- | 56 | 123 | 30 |
| Oxychlordane | -- | -- | -- | 60 | 140 | 30 |
| Phorate | -- | -- | -- | 65 | 125 | 30 |
| Tetrachlorovinphos (Stirofos) | -- | -- | -- | 65 | 125 | 30 |
| Tokuthion | -- | -- | -- | 65 | 125 | 30 |
| Toxaphene | -- | -- | -- | -- | -- | -- |
| trans-Nonachlor | -- | -- | -- | 47 | 143 | 30 |
| Trichloronate | -- | -- | -- | 65 | 125 | 30 |
| Recovery acceptance ranges and RPDs achieved during 2004/05 stormwater monitoring season. | | | | | | |

## 6.4. Program Data Qualification Codes

| Data Qualification Code | Data Qualification Description |
|---|---|
| ***"Estimated" Qualifications*** | |
| EST | Result is estimated; numeric value below the RL and above the MDL. *The "EST" qualification code is assigned by the analytical laboratory that analyzed the sample, not by the Stormwater Monitoring Program.* |
| EST-CRMRPD | Result is considered "estimated" due to **CRM RPD** DQO exceedance. |
| EST-FD | Result is considered "estimated" due to **field duplicate** DQO exceedance. |
| EST-HT | Result is considered "estimated" due to **holding time** limit exceedance. |
| EST-LCSRPD | Result is considered "estimated" due to **LCS RPD** DQO exceedance. |
| EST-LD | Result is considered "estimated" due to **laboratory duplicate** DQO exceedance. |
| EST-MSRPD | Result is considered "estimated" due to **matrix spike RPD** DQO exceedance. |
| EST-SRMRPD | Result is considered "estimated" due to **SRM RPD** DQO exceedance. |
| ***"High Biased" Qualifications*** | |
| HB-CRMR | Result is considered "high biased" due to a **certified reference material recovery** greater than the established upper limit for the analyte. |
| HB-LCSR | Result is considered "high biased" due to a **laboratory control spike recovery** greater than the established upper limit for the analyte. |
| HB-MSR | Result is considered "high biased" due to a **matrix spike recovery** greater than the established upper limit for the analyte. |
| HB-SRGTR | Result is considered "high biased" due to an **environmental sample surrogate recovery** greater than the established upper limit for the analyte. |
| HB-SRMR | Result is considered "high biased" due to a **standard reference material recovery** greater than the established upper limit for the analyte. |
| ***"Low Biased" Qualifications*** | |
| LB-CRMR | Result is considered "low biased" due to a **certified reference material recovery** less than the established lower limit for the analyte. |

## 6.4. Program Data Qualification Codes – Continued

| Data Qualification Code | Data Qualification Description |
|---|---|
| ***"Low Biased" Qualifications -- continued*** | |
| LB-LCSR | Result is considered "low biased" due to a **laboratory control spike recovery** less than the established lower limit for the analyte. |
| LB-MSR | Result is considered "low biased" due to a **matrix spike recovery** less than the established lower limit for the analyte. |
| LB-SRGTR | Result is considered "low biased" due to an **environmental sample surrogate recovery** less than the established lower limit for the analyte. |
| LB-SRMR | Result is considered "low biased" due to a **standard reference material recovery** less than the established lower limit for the analyte. |
| ***"Upper Limit" Qualifications*** | |
| UL-FB | Result is considered an "upper limit" of its true concentration due to **field blank** DQO exceedance (i.e., field blank contamination). |
| UL-FFLTRB | Result is considered an "upper limit" of its true concentration due to **field-initiated filter blank** DQO exceedance (i.e., filter blank contamination). |
| UL-LFLTRB | Result is considered an "upper limit" of its true concentration due to **laboratory-initiated filter blank** DQO exceedance (i.e., filter blank contamination). |
| UL-MB | Result is considered an "upper limit" of its true concentration due to **method blank** DQO exceedance (i.e., method blank contamination). |
| UL-TB | Result is considered an "upper limit" of its true concentration due to **travel blank** DQO exceedance (i.e., travel blank contamination). |

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# 7. DATABASE DATA EVALUATION QUERIES

## 7.1. Course Level Data Reconnaissance Queries

| Data Type Returned | Query Name[1] / Data Fields Returned |
|---|---|
| Environmental | **reconC_qry_WCE_01_DataBySiteIDSampleDateEventRep** |
| | Monitoring Type, Flow Basis, Event Type, Site ID, Event ID, Sample Date, Sample Source, Event Rep, Sample Method, and Replicates |
| Environmental | **reconC_qry_WCE_02_DataBySiteIDClass** |
| | Site ID, Event ID, Classification, and Replicates |
| Environmental | **reconC_qry_WCE_03_DataBySiteIDClass-Lab** |
| | Site ID, Event ID, Classification, Analyzing Lab, and Replicates |
| Environmental | **reconC_qry_WCE_04_DataByClassConstitDL-Lab** |
| | Event ID, Classification, Constituent, Fraction, Detection Limit, Analyzing Lab, and Replicates |
| Environmental | **reconC_qry_WCE_05_DataByClassConstitSampleMethod** |
| | Event ID, Classification, Constituent, Fraction, Sample Method, and Replicates |
| Environmental | **reconC_qry_WCE_06_DataByConstit-Class-Lab** |
| | Site ID, Event ID, Classification, Constituent, Fraction, Analyzing Lab, and Replicates |
| 1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) A hyphen ("-") separating two data field names in a query name signifies that the data field to the right of the hyphen requires the user to supply an input parameter (i.e., the user must instruct the query as to what sort of information it should return). | |

## 7.2. Environmental Data Evaluation Queries

| Laboratory | ***Classification* or Constituent** | **Query Name[1]** |
|---|---|---|
| Calscience | *Conventional* | sop_qry_WCE_Calscience_Conventionals |
| Calscience | MTBE | sop_qry_WCE_Calscience_MTBE |
| Calscience | Perchlorate | sop_qry_WCE_Calscience_Perchlorate |
| Calscience | *Pesticide* | sop_qry_WCE_Calscience_Pesticides |
| CRG | *Anion, Conventional, Hydrocarbon, Nutrient* | sop_qry_WCE_CRG_GeneralChem |
| CRG | *Metal* | sop_qry_WCE_CRG_Metals |
| CRG | *Organic* (Acid Extractables) | sop_qry_WCE_CRG_Org_AcidExtracts |
| CRG | *Organic* (Base Neutral Extractables) | sop_qry_WCE_CRG_Org_BaseNeutralExtracts |
| CRG | *Organic* (PAHs) | sop_qry_WCE_CRG_Org_PAHs |
| CRG | *PCB* | sop_qry_WCE_CRG_PCBs |
| CRG | *Pesticide* (Chlorinated) | sop_qry_WCE_CRG_Pest_Chlorinated |
| CRG | *Pesticide* (Organo-phosphorus) | sop_qry_WCE_CRG_Pest_Organophosphorus |
| *various* | Bacteriological | sop_qry_WCE_BacT |
| *various* | Glyphosate | sop_qry_WCE_Glyphosate |
| *various* | TKN | sop_qry_WCE_TKN |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) All *open* "sop" queries dynamically linked to a particular Temporary Results Table – changing a result in the open query window will change the result in the data table.

## 7.3. Field-Initiated QA/QC Data Evaluation Queries

| Laboratory | QA/QC Sample Type-*Classification* or Constituent | Query Name[1] |
|---|---|---|
| Calscience | All-*Conventional* | sop_qry_WCQA_Calscience_Conventionals |
| Calscience | All-MTBE | sop_qry_WCQA_Calscience_MTBE |
| Calscience | All-Perchlorate | sop_qry_WCQA_Calscience_Perchlorate |
| Calscience | All-*Pesticide* | sop_qry_WCQA_Calscience_Pesticides |
| CRG | Field Blank-*Anion, Conventional, Hydrocarbon, Nutrient* | sop_qry_WCQA_CRG_FB_GeneralChem |
| CRG | Field Blank-*Metal* | sop_qry_WCQA_CRG_FB_Metal |
| CRG | Field Blank-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_FB_OrgAcidExtracts |
| CRG | Field Blank-*Organic* (Base Neutral Extractables) | sop_qry_WCQA_CRG_FB_OrgBaseNeutralExtracts |
| CRG | Field Blank-*Organic* (PAHs) | sop_qry_WCQA_CRG_FB_OrgPAHs |
| CRG | Field Blank-*PCB* | sop_qry_WCQA_CRG_FB_PCB |
| CRG | Field Blank-*Pesticide* (Chlorinated) | sop_qry_WCQA_CRG_FB_PestChlorinated |
| CRG | Field Blank-*Pesticide* (Organo-phosphorus) | sop_qry_WCQA_CRG_FB_PestOrganophosphorus |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) All *open* "sop" queries dynamically linked to a particular Temporary Results Table – changing a result in the open query window will change the result in the data table.

## 7.3. Field-Initiated QA/QC Data Evaluation Queries – Continued

| Laboratory | QA/QC Sample Type-*Classification* or Constituent | Query Name[1] |
|---|---|---|
| CRG | Field Duplicate-*Anion, Conventional, Hydrocarbon, Nutrient* | sop_qry_WCQA_CRG_FD_GeneralChem |
| CRG | Field Duplicate-*Metal* | sop_qry_WCQA_CRG_FD_Metal |
| CRG | Field Duplicate-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_FD_OrgAcidExtracts |
| CRG | Field Duplicate-*Organic* (Base Neutral Extractables) | sop_qry_WCQA_CRG_FD_OrgBaseNeutralExtracts |
| CRG | Field Duplicate-*Organic* (PAHs) | sop_qry_WCQA_CRG_FD_OrgPAHs |
| CRG | Field Duplicate-*PCB* | sop_qry_WCQA_CRG_FD_PCB |
| CRG | Field Duplicate-*Pesticide* (Chlorinated) | sop_qry_WCQA_CRG_FD_PestChlorinated |
| CRG | Field Duplicate-*Pesticide* (Organo-phosphorus) | sop_qry_WCQA_CRG_FD_PestOrganophosphorus |
| CRG | MSD Rec-*Anion, Conventional, Hydrocarbon, Nutrient* | sop_qry_WCQA_CRG_MSD_GeneralChem |
| CRG | MSD Rec-*Metal* | sop_qry_WCQA_CRG_MSD_Metal |
| CRG | MSD Rec-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_MSD_OrgAcidExtracts |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) All *open* "sop" queries dynamically linked to a particular Temporary Results Table – changing a result in the open query window will change the result in the data table.

## 7.3. Field-Initiated QA/QC Data Evaluation Queries – Continued

| Laboratory | QA/QC Sample Type-*Classification* or Constituent | Query Name[1] |
|---|---|---|
| CRG | MSD Rec-*Organic* (Base Neutral Extractables) | sop_qry_WCQA_CRG_MSD_OrgBaseNeutralExtracts |
| CRG | MSD Rec-*Organic* (PAHs) | sop_qry_WCQA_CRG_MSD_OrgPAHs |
| CRG | MSD Rec-*PCB* | sop_qry_WCQA_CRG_MSD_PCB |
| CRG | MSD Rec-*Pesticide* (Chlorinated) | sop_qry_WCQA_CRG_MSD_PestChlorinated |
| CRG | MSD Rec-*Pesticide* (Organo-phosphorus) | sop_qry_WCQA_CRG_MSD_PestOrganophosphorus |
| CRG | MSRPD-*Anion, Conventional, Hydrocarbon, Nutrient* | sop_qry_WCQA_CRG_MSRPD_GeneralChem |
| CRG | MSRPD-*Metal* | sop_qry_WCQA_CRG_MSRPD_Metal |
| CRG | MSRPD-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_MSRPD_OrgAcidExtracts |
| CRG | MSRPD-*Organic* (Base Neutral Extractables) | sop_qry_WCQA_CRG_MSRPD_OrgBaseNeutralExtracts |
| CRG | MSRPD-*Organic* (PAHs) | sop_qry_WCQA_CRG_MSRPD_OrgPAHs |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) All *open* "sop" queries dynamically linked to a particular Temporary Results Table – changing a result in the open query window will change the result in the data table.

## 7.3. Field-Initiated QA/QC Data Evaluation Queries – Continued

| Laboratory | QA/QC Sample Type-*Classification* or Constituent | Query Name[1] |
|---|---|---|
| CRG | MSRPD-*PCB* | sop_qry_WCQA_CRG_MSRPD_PCB |
| CRG | MSRPD-*Pesticide* (Chlorinated) | sop_qry_WCQA_CRG_MSRPD_PestChlorinated |
| CRG | MSRPD-*Pesticide* (Organo-phosphorus) | sop_qry_WCQA_CRG_MSD_PestOrganophosphorus |
| CRG | MS Rec-*Anion, Conventional, Hydrocarbon, Nutrient* | sop_qry_WCQA_CRG_MS_GeneralChem |
| CRG | MS Rec-*Metal* | sop_qry_WCQA_CRG_MS_Metal |
| CRG | MS Rec-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_MS_OrgAcidExtracts |
| CRG | MS Rec-*Organic* (Base Neutral Extractables) | sop_qry_WCQA_CRG_MS_OrgBaseNeutralExtracts |
| CRG | MS Rec-*Organic* (PAHs) | sop_qry_WCQA_CRG_MS_OrgPAHs |
| CRG | MS Rec-*PCB* | sop_qry_WCQA_CRG_MS_PCB |
| CRG | MS Rec-*Pesticide* (Chlorinated) | sop_qry_WCQA_CRG_MS_PestChlorinated |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) All *open* "sop" queries dynamically linked to a particular Temporary Results Table – changing a result in the open query window will change the result in the data table.

## 7.3. Field-Initiated QA/QC Data Evaluation Queries – Continued

| Laboratory | QA/QC Sample Type-*Classification* or Constituent | Query Name[1] |
|---|---|---|
| CRG | MS Rec-*Pesticide* (Organo-phosphorus) | sop_qry_WCQA_CRG_MS_PestOrganophosphorus |
| All | Equipment Blank-All Classifications (Carboy Blank) | sop_qry_WCQA_EQB_Carboy_All |
| All | Equipment Blank-All Classifications (Tubing Blank) | sop_qry_WCQA_EQB_Tubing_All |
| All | Filter Blank-All Classes | sop_qry_WCQA_FLTRB_All |
| All | Travel Blank-All Classes | sop_qry_WCQA_TB_All |
| *various* | All-*Bacteriological* | sop_qry_WCQA_BacT |
| *various* | All-Glyphosate | sop_qry_WCQA_Glyphosate |
| *various* | All-TKN | sop_qry_WCQA_TKN |
| Non-Calscience, Non-CRG | All QA/QC Sample Types-All Classes | sop_qry_WCQA_OtherLabs_FieldQAQC_All |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) All *open* "sop" queries dynamically linked to a particular Temporary Results Table – changing a result in the open query window will change the result in the data table.

## 7.4. Laboratory-Initiated QA/QC Data Evaluation Queries

| Laboratory | QA/QC Sample Type-*Classification* or Constituent | Query Name[1] |
|---|---|---|
| Calscience | All-*Conventional* | sop_qry_WCQA_Calscience_Conventionals |
| Calscience | All-MTBE | sop_qry_WCQA_Calscience_MTBE |
| Calscience | All-Perchlorate | sop_qry_WCQA_Calscience_Perchlorate |
| Calscience | All-*Pesticide* | sop_qry_WCQA_Calscience_Pesticides |
| CRG | LCS Dup Rec-All Classes | sop_qry_WCQA_CRG_LCSDupRec_All |
| CRG | LCS Rec-All Classes | sop_qry_WCQA_CRG_LCSRec_All |
| CRG | LCS RPD-All Classes | sop_qry_WCQA_CRG_LCSRPD_All |
| CRG | Lab Dup-*Anions, Conventional, Hydrocarbon, Nutrient* | sop_qry_WCQA_CRG_LD_GeneralChemSolicit<br>sop_qry_WCQA_CRG_LD_GeneralChemUnsolicit |
| CRG | Lab Dup-*Metal* | sop_qry_WCQA_CRG_LD_Metal |
| CRG | Lab Dup-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_LD_OrgAcidExtracts |
| CRG | Lab Dup-*Organic* (Base Neutral Extractables) | sop_qry_WCQA_CRG_LD_OrgBaseNeutralExtracts |
| CRG | Lab Dup-*Organic* (PAHs) | sop_qry_WCQA_CRG_LD_OrgPAHs |
| CRG | Lab Dup-*PCB* | sop_qry_WCQA_CRG_LD_PCB |
| CRG | Lab Dup-*Pesticide* (Chlorinated) | sop_qry_WCQA_CRG_LD_PestChlorinated |
| CRG | Lab Dup-*Pesticide* (Organo-phosphorus) | sop_qry_WCQA_CRG_LD_PestOrganophosphorus |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) All *open* "sop" queries dynamically linked to a particular Temporary Results Table – changing a result in the open query window will change the result in the data table.

## 7.4. Laboratory-Initiated QA/QC Data Evaluation Queries – Continued

| Laboratory | QA/QC Sample Type-*Classification* or Constituent | Query Name[1] |
|---|---|---|
| CRG | Method Blank-*Anions, Conventional, Hydrocarbon, Nutrient* | sop_qry_WCQA_CRG_MB_GeneralChem |
| CRG | Method Blank-*Metal* | sop_qry_WCQA_CRG_MB_Metal |
| CRG | Method Blank-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_MB_OrgAcidExtracts |
| CRG | Method Blank-*Organic* (Base Neutral Extractables) | sop_qry_WCQA_CRG_MB_OrgBaseNeutralExtracts |
| CRG | Method Blank-*Organic* (PAHs) | sop_qry_WCQA_CRG_MB_OrgPAHs |
| CRG | Method Blank-*PCB* | sop_qry_WCQA_CRG_MB_PCB |
| CRG | Method Blank-*Pesticide* (Chlorinated) | sop_qry_WCQA_CRG_MB_PestChlorinated |
| CRG | Method Blank-*Pesticide* (Organo-phosphorus) | sop_qry_WCQA_CRG_MB_PestOrganophosphorus |
| CRG | Env Surrogate-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_SrgtEnv_OrgAcidExtracts |
| CRG | Env Surrogate-*Organic* (PAHs) | sop_qry_WCQA_CRG_SrgtEnv_OrgPAHs |
| CRG | Env Surrogate-*Pesticide* | sop_qry_WCQA_CRG_SrgtEnv_Pesticides |
| CRG | Equip. Blank Surrogate-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_SrgtEQB_OrgAcidExtractskj |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) All *open* "sop" queries dynamically linked to a particular Temporary Results Table – changing a result in the open query window will change the result in the data table.

## 7.4. Laboratory-Initiated QA/QC Data Evaluation Queries – Continued

| Laboratory | QA/QC Sample Type-*Classification* or Constituent | Query Name[1] |
|---|---|---|
| CRG | Equip. Blank Surrogate-*Organic* (PAHs) | sop_qry_WCQA_CRG_SrgtEQB_OrgPAHs |
| CRG | Equip. Blank Surrogate-*Pesticide* | sop_qry_WCQA_CRG_SrgtEQB_Pesticides |
| CRG | FB Surrogate-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_SrgtFB_OrgAcidExtracts |
| CRG | FB Surrogate-*Organic* (PAHs) | sop_qry_WCQA_CRG_SrgtFB_OrgPAHs |
| CRG | FB Surrogate-*Pesticide* | sop_qry_WCQA_CRG_SrgtFB_Pesticides |
| CRG | LCS Surrogate-All Classes | sop_qry_WCQA_CRG_SrgtLCS_All |
| CRG | MB Surrogate-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_SrgtMB_OrgAcidExtracts |
| CRG | MB Surrogate-*Organic* (PAHs) | sop_qry_WCQA_CRG_SrgtMB_OrgPAHs |
| CRG | MB Surrogate-*Pesticide* | sop_qry_WCQA_CRG_SrgtMB_Pesticides |
| CRG | MS Surrogate-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_SrgtMS_OrgAcidExtracts |
| CRG | MS Surrogate-*Organic* (PAHs) | sop_qry_WCQA_CRG_SrgtMS_OrgPAHs |
| CRG | MS Surrogate-*Pesticide* | sop_qry_WCQA_CRG_SrgtMS_Pesticides |
| CRG | Travel Blank Surrogate-*Organic* (Acid Extractables) | sop_qry_WCQA_CRG_SrgtTB_OrgAcidExtracts |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) All *open* "sop" queries dynamically linked to a particular Temporary Results Table – changing a result in the open query window will change the result in the data table.

## 7.4. Laboratory-Initiated QA/QC Data Evaluation Queries – Continued

| Laboratory | QA/QC Sample Type-*Classification* or Constituent | Query Name[1] |
|---|---|---|
| CRG | Travel Blank Surrogate-*Organic* (PAHs) | sop_qry_WCQA_CRG_SrgtTB_OrgPAHs |
| CRG | Travel Blank Surrogate-*Pesticide* | sop_qry_WCQA_CRG_SrgtTB_Pesticides |
| All | Filter Blank-All Classes | sop_qry_WCQA_FilterBlank_All |
| All | Stationary Blank-All Classifications | sop_qry_WCQA_StationaryBlank_All |
| All | Travel Blank-All Classes | sop_qry_WCQA_TravelBlank_All |
| *various* | All-*Bacteriological* | sop_qry_WCQA_BacT |
| *various* | All-Glyphosate | sop_qry_WCQA_Glyphosate |
| *various* | All-TKN | sop_qry_WCQA_TKN |
| Non-Calscience, Non-CRG | All QA/QC Sample Types-All Classes | sop_qry_WCQA_OtherLabs_FieldQAQC_All<br>sop_qry_WCQA_OtherLabs_LabQAQC_All |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) All *open* "sop" queries dynamically linked to a particular Temporary Results Table – changing a result in the open query window will change the result in the data table.

## 7.5. Fine Level Data Reconnaissance Queries

| Data Type Returned – *Utility* | Query Name[1] / Data Fields Returned |
|---|---|
| Environmental – *Date Confirmation #1* | **reconF_qry_WCE_01D_SampleDate>PrepDate** |
| | Site ID, Event ID, Sample Date, Prep Date, Classification, Constituent, Fraction |
| Environmental – *Date Confirmation #2* | **reconF_qry_WCE_02D_SampleDate>AnalysisDate** |
| | Site ID, Event ID, Sample Date, Analysis Date, Classification, Constituent, Fraction |
| Environmental – *Date Confirmation #3* | **reconF_qry_WCE_03D_PrepDate>AnalysisDate** |
| | Site ID, Event ID, Prep Date, Analysis Date, Classification, Constituent, Fraction |
| Environmental – *DL + Method Confirmation* | **reconF_qry_WCE_04_DL-Class-Lab** |
| | Event ID, Classification, Constituent, Fraction, Units Detection Limit, Method, and Analyzing Lab |
| Environmental – *Numeric Concen.* | **reconF_qry_WCE_05_Results-Class-Lab** |
| | Site ID, Event ID, Classification, Constituent, Fraction, Sign, Result, Units, Detection Limit, and Analyzing Lab |
| Environmental – *DL Confirm. #1* | **reconF_qry_WCE_06D_DL>Result** |
| | Site ID, Event ID, Sample Date , Classification, Constituent, Fraction, Sign, Result, Detection Limit, Detection Limit Type, and Analyzing Lab |
| Environmental – *DL Confirm. #2* | **reconF_qry_WCE_07D_NDResult<>DL** |
| | Site ID, Event ID, Sample Date , Classification, Constituent, Fraction, Sign, Result, Detection Limit, Detection Limit Type, and Analyzing Lab |
| Environmental – *Fraction Comparison* | **reconF_qry_WCE_08D_FracComparison-Class-Lab** |
| | Site ID, Event ID, Classification, Constituent, Fraction, Sign, Result, and Analyzing Lab |
| QA/QC – *MS/MSD confirmation* | **reconF_qry_WCQA_01D_MS_AllResults** |
| | Site ID, Event ID, QA/QC Sample Type, Constituent, Fraction, Result, Detection Limit, QA Limit Min, QA Limit Max, Analyzing Lab, and Count |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) A hyphen ("-") separating two data field names in a query name signifies that the data field to the right of the hyphen requires the user to supply an input parameter (i.e., the user must instruct the query as to what sort of information it should return); (C) queries including the letter "**D**" in their names signify that an open query is dynamically linked to a particular Temporary Results Table and changing a result in an open query window will change the result in the data table.

## 7.5. Fine Level Data Reconnaissance Queries – Continued

| Data Type Returned – *Utility* | Query Name[1] / Data Fields Returned |
|---|---|
| QA/QC – *MS/MSD confirmation* | **reconF_qry_WCQA_02_MS_GroupedResults** |
| | Site ID, Event ID, Constituent, Fraction, and Replicates |
| QA/QC – *MS/MSD recovery limits* | **reconF_qry_WCQA_03_MS_MSRecLimits** |
| | Constituent, Fraction, QA Limit Min, QA Limit Max, and Replicates |
| QA/QC – *Date Confirmation #1* | **reconF_qry_WCQA_04D_SampleDate>PrepDate** |
| | Site ID, Event ID, Sample Date, Prep Date, Classification, Constituent, Fraction |
| QA/QC – *Date Confirmation #2* | **reconF_qry_WCQA_05D_SampleDate>AnalysisDate** |
| | Site ID, Event ID, Sample Date, Analysis Date, Classification, Constituent, Fraction |
| QA/QC – *Date Confirmation #3* | **reconF_qry_WCQA_06D_PrepDate>AnalysisDate** |
| | Site ID, Event ID, Prep Date, Analysis Date, Classification, Constituent, Fraction |
| QA/QC – *DL + Method Confirmation* | **reconF_qry_WCQA_07_DL-Class-Lab** |
| | Event ID, QA/QC Sample Type, Classification, Constituent, Fraction, Units Detection Limit, Method, and Analyzing Lab |
| QA/QC – *Numeric Concen.* | **reconF_qry_WCQA_08_DupResults-Class-Lab** |
| | Site ID, Event ID, QA/QC Sample Type, Classification, Constituent, Fraction, Sign, Result, Units, Detection Limit, and Analyzing Lab (query returns only field and laboratory duplicate results) |
| QA/QC – *DL Confirmation #1* | **reconF_qry_WCQA_09D_DL>Result** |
| | Site ID, Event ID, Sample Date , QA/QC Sample Type, Classification, Constituent, Fraction, Sign, Result, Detection Limit, Detection Limit Type, and Analyzing Lab |
| QA/QC – *DL Confirmation #2* | **reconF_qry_WCQA_10D_NDResult<>DL** |
| | Site ID, Event ID, Sample Date , QA/QC Sample Type, Classification, Constituent, Fraction, Sign, Result, Detection Limit, Detection Limit Type, and Analyzing Lab |
| QA/QC – *Fraction Comparison* | **reconF_qry_WCQA_11D_FracComparison-Class-Lab** |
| | Site ID, Event ID, QA/QC Sample Type, Classification, Constituent, Fraction, Sign, Result, and Analyzing Lab |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) A hyphen ("-") separating two data field names in a query name signifies that the data field to the right of the hyphen requires the user to supply an input parameter (i.e., the user must instruct the query as to what sort of information it should return); (C) queries including the letter "**D**" in their names signify that an open query is dynamically linked to a particular Temporary Results Table and changing a result in an open query window will change the result in the data table.

## 7.5. Fine Level Data Reconnaissance Queries – Continued

| Data Type Returned – *Utility* | Query Name[1] / Data Fields Returned |
|---|---|
| QA/QC – *Environ Srgt Recovery Limits* | **reconF_qry_WCQA_12_EnvSrgtRecovLimits** |
| | QA/QC Sample Type, Constituent, Fraction, QA Limit Min, QA Limit Max, Analyzing Lab, and Replicates |
| QA/QC – *QA/QC Srgt Recovery Limits* | **reconF_qry_WCQA_13_QAQCSrgtRecovLimits** |
| | QA/QC Sample Type, Constituent, Fraction, QA Limit Min, QA Limit Max, Analyzing Lab, and Replicates |
| QA/QC – *All Results < QALimitMin* | **reconF_qry_WCQA_14D_OutsideQALimitMin** |
| | Site ID, Event ID, Sample Date, QA/QC Sample Type, Classification, Constituent, Fraction, Sign, Result, Units, Detection Limit, Detection Limit Type, QA Limit Min, Analyzing Lab, and Lab ID |
| QA/QC – *All Results > QALimitMax* | **reconF_qry_WCQA_15D_OutsideQALimitMax** |
| | Site ID, Event ID, Sample Date, QA/QC Sample Type, Classification, Constituent, Fraction, Sign, Result, Units, Detection Limit, Detection Limit Type, QA Limit Max, Analyzing Lab, and Lab ID |

1. (A) SQL content of any query subject to change on an event-by-event basis – Review SQL before executing query; (B) A hyphen ("-") separating two data field names in a query name signifies that the data field to the right of the hyphen requires the user to supply an input parameter (i.e., the user must instruct the query as to what sort of information it should return); (C) queries including the letter "**D**" in their names signify that an open query is dynamically linked to a particular Temporary Results Table and changing a result in an open query window will change the result in the data table.