

## APPENDIX 5

Standard Drywell Subsurface Disposal Facility

Heritage Glen Retention Facility

Long Term Water Quality Assessment Program (Rocky Bay)

Water Quality Assessment Program (Squally Creek Detention Facility)

**Pierce County Public Works & Utilities  
Water Resources  
Water Quality Assessment Program**

**Heritage Glen Retention Facility**

**Quality Assurance Project Plan  
Revised October 1997**

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## **PROJECT DESCRIPTION**

### **Historic Information**

Heritage Glen Stormwater Retention Facility was constructed by Pierce County in 1995 to reduce flooding within the Heritage Glen Drainage Basin. The Heritage Glen Drainage Basin is a pothole consisting of approximately 110 acres with development on 85 acres. It is located south of 136th Street East and lies mainly east of 11th Avenue Court East to approximately 116th Avenue East. According to the Soil Survey of Pierce County, the SCS soil classification of the area is generally type A (Indianola type soils). All of the existing storm water facilities within the basin are percolation systems primarily due to the fact there is no outlet from the basin. The Heritage Glen Stormwater Retention Facility intercepts and retains stormwater from approximately 50 acres. The facility consists of two cells. Cell "A" operates as a sedimentation and wet pond trapping sediment and providing treatment before infiltration. The second cell, cell "B" infiltrates stormwater runoff into the ground. Cell "B" includes a 12" deep sand filter and an infiltration trench to utilize a deeper soil layer of dense sandy gravel with a higher infiltration rate. Soil logs are attached in the appendix.

### **Project Objectives**

1. To monitor for the presence of illegal discharges or illicit connections.
2. To evaluate the effectiveness of this facility at removing pollutants from stormwater.

There are three sites at which the County will collect samples;

1. Flow paced stormwater samples at the inlet to the retention facility.

2. Flow paced stormwater samples taken from the outlet of cell "A".
3. Treated stormwater grab samples taken beneath the sand filter near the inlet of cell "B".

## **Design**

Flow paced stormwater samples will be taken utilizing ISCO 3700 Automated Composite samplers in conjunction with ISCO 4150 Area-Velocity Flow Meters. Sampling will be initiated by rain gauges and the detection of flow at the influent to the retention facility and effluent from cell "A" sample points. Flow paced storm water samples will be taken directly from the influent line entering the retention facility to characterize the types and quantities of pollutants entering the treatment system. Flow paced stormwater samples taken from the outlet of cell "A" will characterize the types and quantities of pollutants removed during the sedimentation phase of treatment. Subsurface grab samples taken from a shallow well constructed immediately below the sand filter in cell "B" will aid in characterizing the effectiveness of the retention facility at removing pollutants prior to infiltration to groundwater. Sampler will consist of a teflon coated or stainless steel pan placed under the geo-membrane immediately below the sand filter. This sampler will be wrapped with the same filter fabric used in the construction of cell "B". The sample will be collected utilizing a peristaltic pump with Tygon tubing. Once per year influent sampling will include the full range of NPDES sample analytes. If sampling indicates levels of concern with organic parameters sampling frequency for those parameters will be reevaluated.

Stormwater sample constituents are anticipated to be typically distributed. Coefficient of variation values from the Portland NPDES Part 2 range from 1.5 for dissolved copper to 0.2 for orthophosphate with an average coefficient of variation of 1. BMPs such as this are designed primarily to remove suspended solids, therefore the coefficient of variation for suspended solids (0.4 from the Portland NPDES Part 2 application) will be used to determine when a statistically representative number of samples have been collected and analyzed. Therefore, the number of samples required to estimate the mean to a tolerance of 50% of the 90% confidence level is 12. To allow for uncertainty in expectations of the parent distribution, sampling difficulties, the expectation of some samples to be unrepresentative, and other factors this number will be increased to 16. The taking of no more than one sample per month during the rainy season and two samples during the dry season over the course of 18 to 24 months should be sufficient to estimate the pollutants distribution, providing that the distribution reasonably fits the above criteria. Evaluation of data will be continuous throughout the monitoring period and if necessary duration of sampling efforts will be extended to insure statistically useful data.

## **Schedule**

Samples will be taken monthly during the wet season (Nov-Apr) and twice during the dry season if possible. Sampling will be conducted Monday thru Thursday only.

Samples will be delivered to the laboratory within four hours of collection or if sampling is performed after normal business hours they will be delivered the next morning.

## **PROJECT ORGANIZATION**

Responsibility Name Organization Phone

Project Manager: Heather Kibbey Pierce County 798-3043

Sampling Leader: John Collins Pierce County 798-3000

Data Entry: John Collins Pierce County 798-3000

Laboratory Coordinator: John Collins Pierce County 798-3000

## **DATA QUALITY OBJECTIVES**

### **Precision and Bias**

Precision may be evaluated by using test replicates both in laboratory analyses and field sampling. Bias will be minimized by following testing protocols in *Standard Methods for the Examination of Water and Wastewater* (Standard methods) and Puget Sound Water Quality Authority's *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound*. During each sampling occasion, a field replicate will be taken.

### **Representativeness**

Representativeness will be addressed by collecting samples during storm events that meet specific parameters. An acceptable storm will have had at least an twenty-four hour dry (i.e., less than 0.01" total rainfall) antecedent period, and will have more than 0.25" of rain over six hours. An acceptable sample will have been collected during the whole storm event or the first six hours. After a storm event is sampled, the timing of the sampling relative to the storm intensity and duration will be reviewed. If the sample is unrepresentative, it will be rejected.

The grab samples will preferably be taken during the middle of the sampling event. Temperature, dissolved oxygen, conductivity and pH will be measured in the field.

### **Completeness**

Sampling at consistent sites, adhering to sampling protocols, and using accepted field methods, will aid in providing complete data sets during this program.

## **SAMPLING PROCEDURES**

Standard Operating procedures will be followed as outlined in the EPA's *NPDES Storm Water Sampling Guidance Document (1992)* and the Puget Sound Water Quality Authority's *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound*. Stormwater samples will be collected with clean, decontaminated equipment. DO, conductivity, temperature and pH will be measured in the field at the time of sample collection. Field instruments will be calibrated in accordance with manufacturer's instructions.

Each sample container will be labeled with indelible ink prior to sample collection and will include sample number, date and time of collection, sampling location code and correct sample preservation if appropriate. During sample collection, the field crew will complete Field Collection Forms. The Field Collection forms document the sample number, location, sampling method, sample conditions and observations.

When full, sample containers will be immediately placed in the cooler, packed with ice, and delivered to the laboratory within 4 hours, if sampling is conducted after normal business hours they will be delivered the next morning.

Upon transfer of sample possession to the laboratory, a chain-of-custody form will be signed by the persons transferring custody of the sample containers. Upon receipt of the samples at the laboratory, the condition of the samples will be recorded by the receiver. Chain-of-custody records will be included in the analytical report prepared by the laboratory. Table 1 lists the containers, preservation methods, and holding times for each parameter.

## **ANALYTICAL PROCEDURES**

All constituents will be analyzed by an accredited laboratory except dissolved oxygen, temperature, pH, and conductivity which will be determined in the field. The analytical methods, source and method number and detection limits are listed in **Table 2**.

## **QUALITY CONTROL PROCEDURES**

Careful adherence to the established procedures for sample collection, preservation and storage will be followed by all field personnel as outlined in the EPA Storm Water Sampling Guidance's. Quality will be assured through laboratory procedures to verify calibration of instruments. Laboratory replicates for assessment of precision will be analyzed at no less than a 5% frequency of the total number of samples submitted to the lab. The analytical laboratory will analyze percent recovery of matrix spikes to help indicate accuracy and run standard solutions at a minimum frequency of 5% of the total samples submitted.

**Table 1- Containers, Preservatives and Holding Times for Parameters of Interest**

<b>Parameter</b>	<b>Container</b>	<b>Preservative</b>	<b>Holding Time</b>
Alkalinity	250 ml HDPE	none, 4° C	14 days
Temperature	none	none, 4° C	Performed in Field
pH	none	none, 4° C	Performed in Field
Conductivity	none	none, 4° C	Performed in Field
Total and Dissolved Metals (As, Cd, Cr, Cu, Ni, Pb, Zn)	500 ml plastic	none, 4° C	180 days
Mercury	from metals container	none, 4° C	28 days
Dissolved Oxygen	none	none, 4° C	Performed in Field
Biochemical Oxygen Demand	2 L plastic	none, 4° C	48 hours
Chemical Oxygen Demand	from BOD bottle	none, 4° C	48 hours
Total Suspended Solids	1 L plastic	none, 4° C	7 days
Turbidity	500 ml plastic	none, 4° C	48 hours
Hardness	from TSS bottle	none, 4° C	14 days
Total Phosphorus	500 ml brown plastic	none, 4° C	48 hours
Orthophosphorus	from TP bottle	none, 4° C	48 hours
Nitrate+Nitrite (NO <sub>2</sub> -N+NO <sub>3</sub> -N)	from TP bottle	none, 4° C	48 hours
Ammonia (NH <sub>3</sub> -N)	from TP bottle	none, 4° C	48 hours
Volatile Suspended Solids	1 L sterilized plastic	none, 4° C	7 days
Total Solids	1 L sterilized plastic	none, 4° C	7 days

**Table 1- Containers, Preservatives and Holding Times for Parameters of Interest**

Parameter	Container	Preservative	Holding Time
PAH	2.5L Amber Glass	.008NA2S2O3	14 days
BTEX	2 40mL VOA	none, 4° C	14 days
Chlorodane	1 L Amber Glass	none, 4° C	14 days
Diazinon	1 L Amber Glass	none, 4° C	14 days
Bis(2ethylhexyl)phalate	1 L Amber Glass	none, 4° C	14 days
Chloride	1 L Glass	none, 4° C	14 days
Fecal Coliform	250 mL Plastic	none, 4° C	24 hours

**Table 2 - Methods and Practical Quantification Limits**

Parameter	Methods	Units	PQL
Alkalinity	EPA 310.1	mg/l	1
Temperature	hand held meter	C	0.1
pH	hand held meter	pH units	0.1
Conductivity	hand held meter	µMHOSs	0.5
Metals (See below)	See below	mg/L	See Below
Mercury	EPA 7470	mg/L	0.002
Chemical Oxygen Demand	SM-5520-D	mg/L	3
Total Suspended Solids	SM-2540-D	mg/L	0.5
Turbidity	SM-2130-B	NTU	0.5
Hardness	SM-2340-C	mg/L	0.5
Total Phosphorus	SM-4500-P-B, E	mg/L	0.005
Orthophosphorus	SM-4500-P-F	mg/L	0.002
Nitrate+Nitrite (NO <sub>2</sub> -N+NO <sub>3</sub> -N)	SM-4500-NO <sub>3</sub> -F	mg/L	0.05

<b>Table 2 - Methods and Practical Quantification Limits</b>			
<b>Parameter</b>	<b>Methods</b>	<b>Units</b>	<b>PQL</b>
Ammonia (NH3-N)	SM-5500-NH3-H	mg/L	0.02
Volatile Suspended Solids	SM2540-E	mg/L	0.5
PAH's	EPA 3270	ug/l	1
Chlorodane	EPA 8080	ug/L	0.10
Diazinon	EPA 8141	ug/L	
Bis(2ethylhexyl)phalate	EPA 2720	ug/L	10
Chloride	EPA 330	mg/L	0.1
BTEX	EPA 8020	ug/l	1
Fecal Coliform	SM9221C	colonies/100mL	1

<b>Table 3 - Metals Methods and Practical Quantification Limits</b>		
<b>Metal</b>	<b>Method</b>	<b>PQL (mg/L)</b>
Cadmium T & D	EPA 7131	0.001
Chromium T & D	EPA 7191	0.010
Copper T & D	EPA 200.7	0.025
Nickel T & D	EPA 200.7	0.040
Lead T & D	EPA 200.7	0.050
Zinc T & D	EPA 7950	0.05
Mercury T & D	EPA 7470	0.002

The analytical laboratory will analyze samples using the recommended EPA methods or their equivalent. Data evaluations will include an assessment of the following:

\* Holding times for analyses

- \* Documentation and chain-of-custody procedures
- \* Contamination of field and laboratory blanks by problem chemicals
- \* Control limit for laboratory replicate and matrix spike results
- \* Control limits for blind field replicate results

If the QA review indicates that any of the QC checks do not meet data quality objectives, then the data will be qualified.

## **PREVENTATIVE MAINTENANCE**

Instrument maintenance will be performed as necessary by the field crew. Maintenance can include visual inspection and removal of debris or obstructions.

## **DATA ASSESSMENT PROCEDURES**

When water quality data are received from the lab, the data will be reviewed for quality assurance and completeness. Data will be reported in the units specified for the particular method. For results in which the analyte was not detected, the results will be reported as less than the detection limit. If necessary, errors will be corrected and additional samples collected. The data will be entered into a database for storage, retrieval and manipulation. Information from the field notes and relevant data on land use, etc. will also be entered into the same database. The original analysis report from an accredited analytical laboratory will be retained indefinitely by Pierce County.

## **CORRECTIVE ACTION**

Corrective action measures will be taken as needed with either: (1) concerns associated sample collection, sample handling equipment failures, data processing, data management, and/or data analysis; and (2) non-conformance or non-compliance of the analytical laboratories with QA requirements.

The project manager will be kept informed of any major quality assurance problems. The project manager will be notified immediately by telephone should a field or laboratory quality assurance problem arise that may potentially jeopardize the use of the collected data. Corrective action will be taken by the project manager when field methods are determined to be inappropriate or analytical data found to be outside predetermined limits of acceptability. Corrective actions may include a procedural change, additional performance and system audits, meeting with laboratory personnel, retesting of existing samples or resampling, or in extreme cases obtaining a new laboratory contact. The project manager will be notified should procedural corrective action not be satisfactory. All data validation problems and solutions will be documented.

## **DATA REDUCTION and REVIEW**

All data received from the laboratory will be reviewed by Pierce County staff, who will check the material for omissions or errors. Examination of chain of custody documents will be part of this review.

## **REPORTING**

The data results will be reported as required under the provisions of the National Pollutant Discharge Elimination System's Municipal Stormwater Discharge Permit.

## **REFERENCES**

U.S. EPA, 1992. *NPDES Storm Water Sampling Guidance Document*. EPA 833-B-92-001, U.S. Environmental Protection Office, Office of Wastewater Enforcement and Compliance, Washington, DC.

Wa. State DOE, 1996. *Implementation Guidance for the Ground Water Quality Standards*. Washington State Department of Ecology, Water Quality Program, Watershed Management Section, Olympia, WA.

Puget Sound Water Quality Authority, 1996. *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound*. U.S. Environmental Protection Agency, Region 10, Office of Puget Sound, Seattle, WA.

## **APPENDIX**

- A. Area Map
- B. Heritage Glen Plan and Profile
- C. Soil test logs
- D. Sample Collection Form
- E. Cost estimation worksheet

# Long Term Water Quality Assessment Program

## Rocky Bay

### Quality Assurance Project Plan

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#### PROJECT DESCRIPTION

##### Historic Information

Rocky Bay is a large salt water estuary located in the Gig Harbor area of rural Pierce County. In 1996 as a result of continued high Fecal Coliform counts in testing conducted by the Tacoma Pierce County Health Department and the Washington State Department of Health, Rocky Bay was closed to the commercial and recreational harvesting of shellfish. As a result of this closure Pierce County formed a Shellfish Protection District as a required by State law and began monitoring and implementation of Best Management Practices in the watershed.

##### Project Objectives

1. To detect any significant changes from previously determined water quality conditions.
2. To determine if there are any significant deviations from contaminant levels of other similar rural creeks.
3. To monitor for the presence of illegal discharges or illicit connections.
4. To maintain a long-term storm water monitoring program that complements the ambient monitoring conducted by WDOH.

##### Sites

There are seven sites at which the County collects storm event samples;

1. Inlet end of a 12" culvert under a private road called Rocky Bay Ln., on the north side of the intersection of 116th and 186th Ave. KPN. Contributing area to this drainage is roughly the area north of 116th St. South of 180th Ave. Ct. KPN and west of Bliss-Cochrane.
2. The outlet into the bay of the drainage described above.
3. Inlet end of a 12 culvert under 186th, on the south side of the intersection of 116th and 186th Ave. KPN. The contributing area to this drainage is roughly the area south of

116th, north of a large swale approximately one half mile to the south and west of Bliss-Cochrane.

4. The outlet into the bay of the drainage described above.

5. A medium sized seasonal stream which passes under 186th. Sample point is on the east side of 186th. The contributing area for this drainage is a large area extending to the east past Bliss-Cochrane, to the South to 104th and to the north to 180th Ave. Ct.

6. The upstream portion of the seasonal creek described above. Sample point is on the west side of the road where it crosses under Bliss-Cochrane.

7. Mid channel at the mouth of Rocky Creek after it passes under SR302.

## **Design**

As a follow-up to more extensive sampling performed as part of the TPCHD study, the County collects at least eight surface water storm event samples at seven sites from the Rocky Bay watershed each year. This sampling frequency is based on the need to ensure that any significant changes from previously determined water quality conditions are detected, and as a means for detecting the presence of illegal discharges or illicit connections. In addition to its own monitoring activities, the County can use the data collected by WDOH, which has been collecting samples from Rocky Bay since 1975. The information from these monitoring activities can be useful in addressing the requirements of Section 303(d) of the Federal Clean Water Act, and for assessing the general water quality of the Bay. Information can also be useful for targeting source control activities.

## **Schedule**

One sample will be collected monthly from each station during the winter season to evaluate conditions during wet weather periods. Another sample will be attempted at each site during the summer season to evaluate conditions during periods of relatively dry conditions.

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## **PROJECT ORGANIZATION**

Responsibility Name Organization Phone

Project Manager

Sampling Leader

Data Entry

## **DATA QUALITY OBJECTIVES**

### **Precision and Bias**

Precision may be evaluated by using test replicates both in laboratory analyses and field sampling. Bias will be minimized by following testing protocols in *Standard Methods for the Examination of Water and Wastewater* (Standard methods) and published EPA methodologies. During each sampling occasion, one field replicate and two duplicates will be taken.

### **Representativeness**

Representativeness will be addressed by collecting samples during storm events that meet specific parameters. An acceptable storm will have had at least an eight hour dry (i.e., less than 0.1 total rainfall) antecedent period, and will have more than 0.1" of rain over four hours. An acceptable sample will have been collected during the first four hours. After a storm event is sampled, the timing of the sampling relative to the storm intensity and duration will be reviewed. If the sample is unrepresentative, it will be rejected.

Note that all samples will be collected as single grabs. Temperature, dissolved oxygen, conductivity and pH will be measured in the field.

### **Completeness**

Sampling at consistent sites, adhering to sampling protocols, and using accepted field methods, will aid in providing complete data sets during this program.

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## **SAMPLING PROCEDURES**

Sampling procedures will be followed as outlined in the EPA's *NPDES Storm Water Sampling Guidance Document* (1992). Stormwater samples will be collected with clean, decontaminated equipment. DO, conductivity, temperature and pH will be measured in the field at the time of sample collection. The field instruments will be calibrated using calibration procedures recommended by the manufacturer.

Each sample container will be labeled with indelible ink prior to sample collection and will include sample number, date and time of collection, sampling location code and correct sample preservation if appropriate. During sample collection, the field crew will

complete Field Collection Forms. The Field Collection forms document the sample number, location, sampling method, sample conditions and observations.

Sample containers will be kept closed and in a cooler on ice until each set is to be filled. When full, sample containers will be immediately placed in the cooler, packed with ice, and delivered to the laboratory within 4 hours.

Upon transfer of sample possession to the laboratory, a chain-of-custody form will be signed by the persons transferring custody of the sample containers. Upon receipt of the samples at the laboratory, the condition of the samples will be recorded by the receiver. Chain-of-custody records will be included in the analytical report prepared by the laboratory. Table two lists the containers, preservation methods, and holding times for each parameter.

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## **ANALYTICAL PROCEDURES**

All constituents will be analyzed by a certified laboratory except dissolved oxygen, temperature, pH, and conductivity which will be determined in the field. The analytical methods, source and method number and detection limits are listed in Table 2.

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## **QUALITY CONTROL PROCEDURES**

Careful adherence to the established procedures for sample collection, preservation and storage will be followed by all field personnel as outlined in the EPA's *NPDES Storm Water Sampling Guidance* Document. Quality will be assured through laboratory procedures to verify calibration of instruments.

<b>Table 1 - Containers, Preservatives, and Holding Times for Parameters of Interest</b>			
<b>Parameter</b>	<b>Container</b>	<b>Preservative</b>	<b>Holding Time</b>
Temperature	none	none, 4 C	Performed in Field
pH	none	none, 4 C	Performed in Field
Conductivity	none	none, 4 C	Performed in Field
Fecal Coliform	250 ml sterilized plastic	none, 4 C	24 hours
Dissolved Oxygen	none	none, 4C	Performed in Field

Holding times are at 4C without preservatives added, with the exception of DO.

<b>Table 2- Methods and Detection Limits</b>			
<b>Parameter</b>	<b>Methods</b>	<b>Units</b>	<b>MDL</b>
Temperature	hand held	C	0.1
pH	hand held	pH units	0.1
Conductivity	hand held	mMHOSs	0.5
Fecal Coliform	SM-9222 D	CFU/100 ml	
Dissolved Oxygen	hand held meter	mg/ L	.01

The analytical laboratory will analyze samples using the recommended EPA methods contained in 40 CFR 136 or their equivalent. Data evaluations will include an assessment of the following:

- \* Holding times for analyses
- \* Documentation and chain-of-custody procedures
- \* Contamination of field and laboratory blanks by problem chemicals, as appropriate
- \* Control limit for laboratory replicate and matrix spike results, as appropriate
- \* Control limits for blind field replicate results, as appropriate

If the QA review indicates that any of the QC checks do not meet data quality objectives, then the data will be qualified.

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## **PREVENTATIVE MAINTENANCE**

Instrument maintenance will be performed as necessary by the field crew. Maintenance can include visual inspection and removal of debris or obstructions.

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## **DATA ASSESSMENT PROCEDURES**

When water quality data are received from the lab, the data will be reviewed for quality assurance and completeness. Data will be reported in the units specified for the particular method. For results in which the Analyte was not detected, the results will be reported as less than the detection limit. If necessary, errors will be corrected and additional samples collected. The data will be entered into a database for storage, retrieval and manipulation. Information from the field notes and relevant data on land use, etc. will also be entered into the same database. The original analysis report from Sound Analytical Laboratory will be retained indefinitely by Pierce County.

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## **CORRECTIVE ACTION**

Corrective action measures will be taken as needed with either: (1) concerns associated with sample collection, sample handling equipment failures, data processing, data management, and/or data analysis; and (2) non-conformance or non-compliance of the analytical laboratories with QA requirements.

The project manager will be kept informed of any major quality assurance problems. The project manager will be notified immediately by telephone should a field or laboratory quality assurance problem arise that may potentially jeopardize the use of the collected data. Corrective action will be taken by the project manager when field

methods are determined to be inappropriate or analytical data found to be outside predetermined limits of acceptability. Corrective actions may include a procedural change, additional performance and system audits, meeting with laboratory personnel, retesting of existing samples or resampling, or in extreme cases obtaining a new laboratory contact. The project manager will be notified should procedural corrective action not be satisfactory. All data validation problems and solutions will be documented.

### **Data Reduction and Review**

All data received from the laboratory will be reviewed by Pierce County staff, who will check the material for omissions or errors. Examination of chain of custody documents will be part of this review.

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### **REPORTING**

The data results will be reported as required under the provisions of the National Pollutant Discharge Elimination System's Municipal Stormwater Discharge Permit.

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### **REFERENCES**

U.S. EPA, 1992. *NPDES storm water sampling guidance document*. EPA 833-B-92-001, U.S. Environmental Protection Office, Office of Wastewater Enforcement and Compliance, Washington, DC.