

Heritage Glen Retention Facility

Quality Assurance Project Plan Revised February 1997

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PROJECT DESCRIPTION

Historic Information

Heritage Glen Stormwater Retention Facility was constructed by Pierce County in 1995 to significantly 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. All of the existing storm water facilities within the basin are percolation systems. The Heritage Glen Stormwater Retention Facility intercepts and retains stormwater from approximately 50 acres. The facility consists of two cells. The first cell, cell "A" operates as a sedimentation pond trapping sediment before entering the infiltration portion of the pond. The second cell, cell "B" infiltrates stormwater runoff into the ground. Construction of cell "B" includes an infiltration trench to utilize a deeper soil layer with a higher infiltration rate.

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.

Sites

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

1. Stormwater samples at the inlet to the retention facility.
2. Stormwater samples taken from the outlet of cell "A".
3. Treated stormwater samples taken from six inches 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 a rain gauge located adjacent to the pond. Surface 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. 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 indicate the overall effectiveness of the retention facility at removing pollutants prior to infiltration to groundwater. Samplers will consist of teflon coated or stainless steel pans placed six inches below the sand filter. These samplers will be wrapped with the same filter fabric used in the construction of cell "B". The sampler will be collected utilizing a peristaltic pump with Tygon tubing. Sample constituents are anticipated to be typically distributed with a coefficient of variation of 1. Therefore, the number of samples required to estimate the mean to a tolerance of 50% of the 80% confidence

level is 7. To allow for uncertainty in expectations of the parent distribution, equipment malfunction, the expectation of some samples to be unrepresentative and other factors this number will be increased to 12. The taking of one sample per month over the course of 16 to 18 months should be sufficient to estimate the pollutants distribution, providing that the distribution reasonably fits the above criteria.

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 preformed after normal business hours they will be delivered the next morning. Monitoring activities are projected to commence in November 1997 and continue thru April 1999.

PROJECT ORGANIZATION

<u>Responsibility</u>	<u>Name</u>	<u>Organization</u>	<u>Phone</u>
Project Manager	Heather Kibbey	Pierce County	798-4664
Sampling Leader	John Collins	Pierce County	798-4652
Data Entry	John Collins	Pierce County	798-4652
Laboratory Coordinator	John Collins	Pierce County	798-4652

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, 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 0.1" of rain over four 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 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)*. 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 instrument 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 two 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			
Parameter	Container	Preservative	Holding Time
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 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 ₂ -N+NO ₃ -N)	from TP bottle	none, 4 C	48 hours
Ammonia (NH ₃ -N)	from TP bottle	none, 4 C	48 hours
Volatile Suspended Solids	1 L sterilized plastic	none, 4 C	7 days
Oil and Grease	1 L glass	none, 4 C	28 days
Total Solids	1 L sterilized plastic	none, 4 C	7 days
Fecal Coliform	1 L sterilized plastic	none, 4 C	24 hours

Table 2 - Methods and Detection Limits

Parameter	Methods	Units	MDL
Temperature	hand held meter	C	0.1
pH	hand held meter	pH units	0.1
Conductivity	hand held meter	µMHOSs	0.5
Total Metals (See below)	ICP/cold vapor	mg/L	See Below
Mercury	cold vapor	mg/L	0.0002
Dissolved Oxygen (DO)	hand held meter	mg/L	0.5
Biochemical Oxygen Demand	SM-5210	mg/L	2
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 ₂ -N+NO ₃ -N)	SM-4500-NO ₃ -F	mg/L	0.05
Ammonia (NH ₃ -N)	SM-5500-NH ₃ -H	mg/L	0.02
Volatile Suspended Solids	SM2540-E	mg/L	0.5
Oil and Grease	SM5520-B	mg/L	2
Total Solids	SM2540-B	mg/L	0.5
Fecal Coliform	SM-9222 D	CFU/100 g	

Table 3 - Metals Methods and Detection Limits

Metal	Method	MDL (mg/L)
Arsenic (As)	ICP	0.05
Cadmium (Cd)	ICP	0.003
Chromium (Cr)	ICP	0.005
Copper (Cu)	ICP	0.004
Nickel (Ni)	ICP	0.02
Lead (Pb)	MS	0.03
Zinc (Zn)	ICP	0.005
Mercury (Hg)	Cold vapor	0.0002

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 re-sampling, 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.