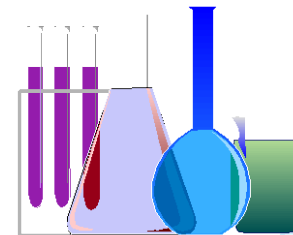
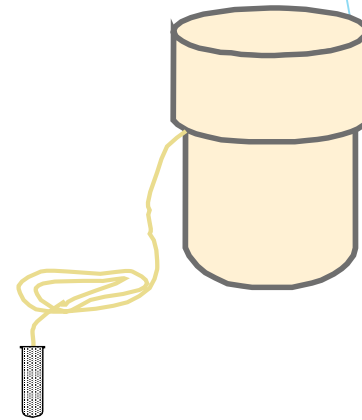

Sampling for NPDES wastewater discharges

Overview

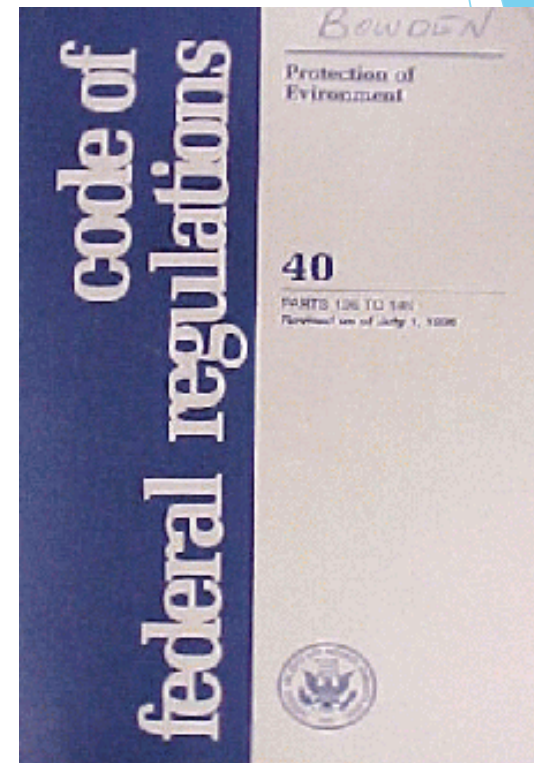
Objectives

- ▶ Review NPDES sampling regulations.
- ▶ Review composite and grab sampling requirements.
- ▶ Review in-situ measurements and continuous monitoring.
- ▶ Sample Documentation
- ▶ Common Deficiencies



NPDES Sampling Regulations

- ▶ NPDES Permit
- ▶ 40 CFR
 - ▶ -Part 122 (Record Keeping)
 - ▶ -Part 136 (Sample Handling)
- ▶ Standard Methods 23rd Ed.



General Requirements

- ▶ Samples must be representative.
- ▶ Sampling procedures must meet permit requirements.
- ▶ Proper containers and preservation must be utilized.



Automatic Sampler Uses

Process Sampling to
Verify Treatment Unit
Removals and
Loadings.



Automatic Sequential Sampler Uses



Sample Types

Composite Sample



Grab Sample



Composite Sample



- ▶ A sample collected over time, representing the average wastewater characteristics during the compositing period. (examples: BOD5, TSS, NH3-N)
 - ▶ Portable Samplers
 - ▶ Refrigerated Sampler

2 Types of Composite Samples

- ▶ Time Composite: A sample consisting of discrete samples collected at constant time intervals.
- ▶ Flow Proportional Composite: A sample consisting of discrete samples collected at a rate proportional to flow.

2 Common Methods of Collecting Flow Proportional Composite Samples

- ▶ **Automated Flow Proportioning:** Consists of equal sample volume at a rate proportional to the waste stream flow (e.g., 1 sample per 10,000 gallons of flow). Automatic sampler is paced by flow meter.
- ▶ **Manual Flow Proportioning:** Constant time interval between samples and sample volume proportional to flow at the time of sampling. Individual samples can either be collected manually or with a sequential automated sampler.

Automated Flow Proportional Composite Samples

Refrigerated Flow Paced Sampler with Internal Flow Meter

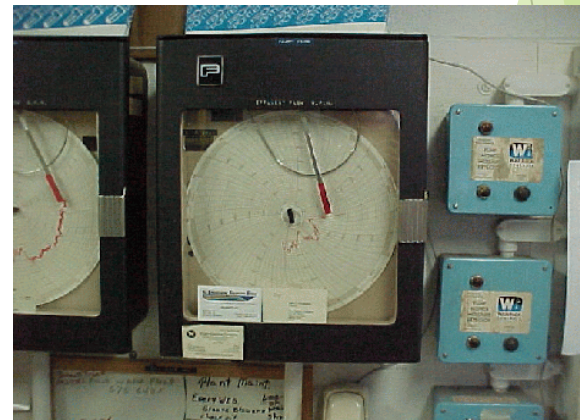


Portable Flow Paced Sampler with External Flow Meter



Manual Flow Proportioned Composite

- ▶ Sequential Base with 1-liter plastic container may be used to collect individual samples, or samples are collected manually.
- ▶ Facility flow recorder for instantaneous flow determinations. Sample volumes manually proportioned based on instantaneous flow at time of sample collection (e.g., 200 ml per mgd).



Automatic Composite Samplers

▶ 3 Common Types:

- ▶ Portable or Refrigerated Samplers with Peristaltic Pumps (ISCO, American Sigma).
- ▶ Pneumatic Vacuum Assisted Samplers (Manning).
- ▶ Continuous Automatic Samplers (Chicago Pump).

Peristaltic Pump Auto Sampler

Refrigerated Auto Sampler



Portable Sampler with Liquid Detector and Peristaltic Pump



Vacuum Assisted Auto Sampler

Manning Refrigerated Automatic Sampler





Flow-through Continuous Automatic Sampler





Automatic Sampler Components

Portable Sampler Programmer



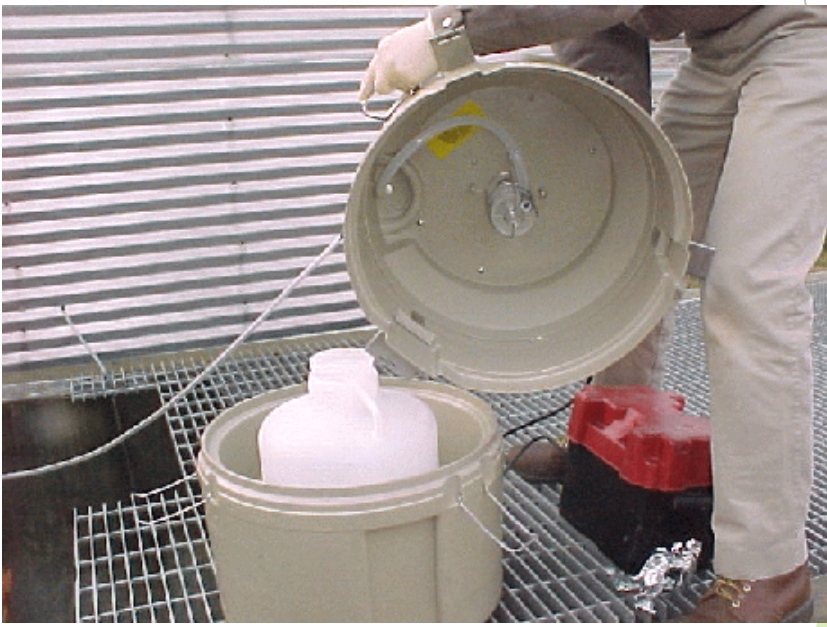
Liquid Detector and Peristaltic Pump





Automatic Sampler Components

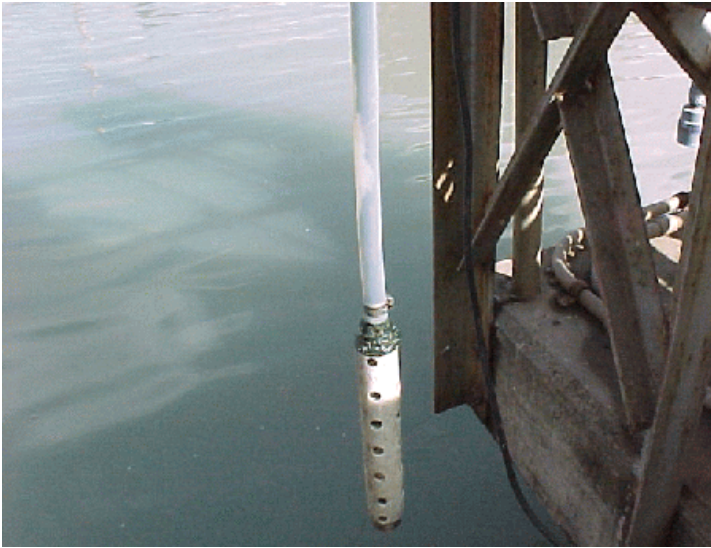
Composite Base with
4-gallon plastic
container, tube guide
assembly, and float.





Automatic Sampler Components

Strainer or Header
with Suction Line



Automatic Sampler Containers

3-gallon Glass
Container for Analyses
of Organic Compounds.



3-gallon Plastic Container
can be used for inorganics
and metals analyses.



Automatic Sampler Aliquot Volume

Manual Sampling Cycle to Measure and Verify Proper Aliquot Volume



Volume Requirement:
100 ml minimum



Sample Splitting



- ▶ The composite sample should be adequately mixed prior to sample splitting

Review of General Requirements for Composite Samplers

- ▶ Method should meet permit requirement (flow proportional versus time composite).
- ▶ Proper refrigeration ($\leq 6^{\circ}\text{C}$).
- ▶ Suction line should be positioned in well-mixed area (mid-stream, mid-depth).
- ▶ Purge cycle and proper intake velocity (2ft/sec).
- ▶ Proper tubing size (1/4-inch ID minimum) and material (tygon for inorganics and metals, teflon for organics).
- ▶ Aliquot volume at least 100 milliliters?

Grab Sample



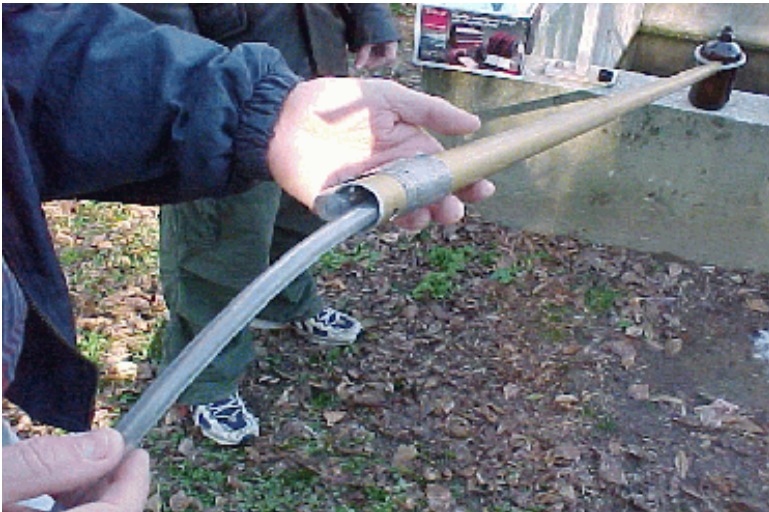
- ▶ An individual sample collected over a time period not exceeding 15 minutes, representing the wastewater characteristics at the time of sampling.
 - ▶ Grab sample from chlorine contact chamber.
 - ▶ Aeration Basin Sample

Grab Sampling Techniques

Metal conduit with bottle clamps can be used for inaccessible locations.



Grab Sampling Techniques



- ▶ Grab sampling device using tygon tubing and conduit.

Sample Preservation



- ▶ Chemical preservation should be verified to ensure the proper sample pH.

Common Sample Containers



Sample Containers and Preservation for Common Parameters

Parameter	Type	Preservation	Holding Time
BOD ₅	P/G	Cool, ≤6°C	48 hours
TSS	P/G	Cool, ≤6°C	7 days
Nutrients	P/G	Cool, ≤6 °C, H ₂ SO ₄ to pH<2	28 days
Metals	P/G	HNO ₃ to pH<2	6 months
Fecal Coli.	P/G	Cool, <10°C, 0.0008% Na ₂ S ₂ O ₃ ⁵	6 hours
pH	P/G	none	15 minutes
Diss. Oxygen	P/G	none	15 minutes
Res. Chlorine	P/G	none	15 minutes
Oil / Grease	Wide Mouth Glass with Teflon lined lid	HCL or H ₂ SO ₄ pH<2	14 days

Sample Documentation

- ▶ Records of monitoring shall include:
 - ▶ The date, exact place, and time of sampling or measurements;
 - ▶ The individual(s) who performed the analyses;
 - ▶ The date(s) analyses were performed;
 - ▶ The individuals who performed the analyses;
 - ▶ The analytical techniques or methods used;
and
 - ▶ The results of such analyses.

Sample Documentation and Chain of Custody



- ▶ Sample container should be marked or tagged with sampling station, location, date, time, analyte, and sampler.
- ▶ Chain-of-custody form should accompany sample and in addition to sample documentation, must show all persons handling samples from time of collection until delivery to the laboratory.

Common Sampling Deficiencies

- ▶ Samples not properly refrigerated ($\leq 6^{\circ}\text{C}$).
- ▶ Samples not properly preserved.
- ▶ Improper aliquot volume for automatic samplers (less than 100-ml minimum).
- ▶ Composite samples not collected proportional to flow (according to permit).
- ▶ Sample tubing not clean.
- ▶ Influent samples collected upstream of in-plant recycles.

Common Sampling Deficiencies

- ▶ The sample intake tubing was positioned along the wall of the chlorine contact chamber.
- ▶ An improper sample container was used for the collection of composite samples (3-gallon plastic for organic compounds).
- ▶ The temperature of the refrigeration unit for the automatic sampler was not documented.
- ▶ There was no documentation of sample collection times.

Common Sampling Deficiencies

- ▶ The NPDES samples were collected from one of two chlorine contact chambers.
- ▶ Samples for Oil and Grease were collected using a plastic container.
- ▶ **Samples for fecal coliform analyses were collected using a dipper, then transferred into a sterile container.**
- ▶ Samples for volatile organic compounds were collected using the peristaltic pump of the automatic sampler.

Quality Control Samples for NPDES Inspections

- ▶ **Split Sample:** A sample which has been portioned into two or more containers from a single sample container.
- ▶ **Equipment Rinse Blank:** A sample collected using organic-free water which has been pumped through the sampling equipment to determine if contaminants have been introduced by contact with the equipment.
- ▶ **Preservative Blank:** A sample that is prepared in the field and used to determine if the preservative was contaminated.
- ▶ **Trip Blank:** A sample which is prepared prior to the sampling investigation and is stored with the investigative samples throughout the trip.

Sampling Safety



- REFERENCES -

- ▶ 40 CFR, Parts 122 and 136.
- ▶ NPDES Compliance Inspection Manual, U.S. Environmental Protection Agency, EPA 300-B-94-014, September 1994.
- ▶ Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, US-EPA, November 2001.