Environmental Field Sampling

Wastewater

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Introduction

- The most precise and accurate analytical measurements are worthless and even detrimental if performed on a sample that was improperly collected and stored or was contaminated in the process (OEPA, 1978).

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Overview

- The sample must be:
  - Representative of the material being examined
  - Uncontaminated by the sampling technique or container
  - Of adequate size for all laboratory examinations
  - Properly and completely identified
  - Properly preserved
  - Delivered and analyzed within established holding times

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Types of Samples: NPDES Frequency Definitions

- **Weekly** sample collection requirements
  - OEPA defined weeks
    - Week 1 – days 1 thru 7
    - Week 2 – days 8 thru 14
    - Week 3 – days 15 thru 21
    - Week 4 – days 22 thru 28

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Types of Samples:
NPDES Frequency Definitions cont'd

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Week 1	1	2	3	4	5	6	7
Week 2	8	9	10	11	12	13	14
Week 3	15	16	17	18	19	20	21
Week 4	22	23	24	25	26	27	28
	29	30	31				

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Types of Samples: NPDES Frequency Definitions cont'd

- **Quarterly** (4 times per year)
  - March, June, August, December
- **Semi-annual** (2 times per year)
  - June & December
- **Annual** (1 time per year)
  - September

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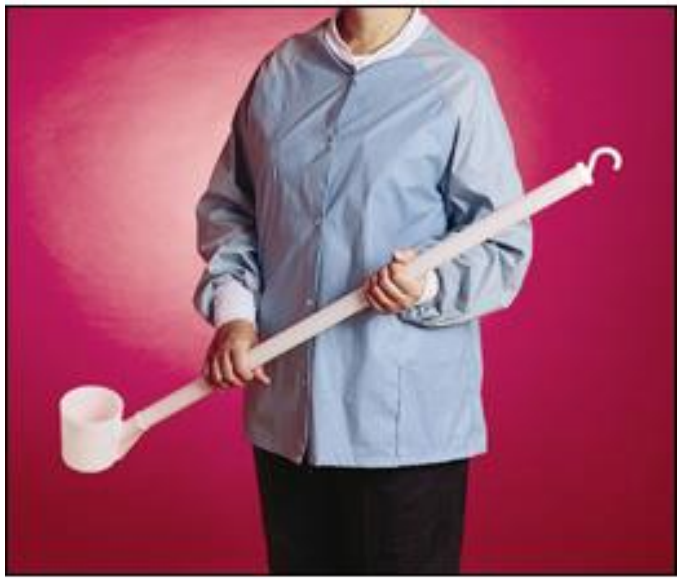
Grab Sampling



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Types of Samples: Grab

- A grab sample is defined as an individual sample collected over a period of time not exceeding 15 minutes.
- Grab samples represent only the condition that exists at the time the wastewater is collected (USEPA, 1977)
- Typical grab sampling is required for parameters such as chromium hexavalent, cyanide, oil and grease, pH, total phenols, residual chlorine, bacterial analyses, and volatile organics

Composite Sampling

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Types of Samples: Composite

- Prepared by combining a series of grab samples over known time or flow intervals.
- Shows the average composition of flow over a set time or flow period
- Can be collected manually and mixed together
- Can be collected by automatic sampling equipment
- All Composite samples should be identified as to the method of sampling collection, duration of composite (e.g. 24 hours), and frequency of the sampling (e.g. every 2 hours)

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Types of Samples: Composite

- Twenty-four hour composite samples are to be used in NPDES compliance
- A 24-hour composite sample, using a minimum of four (4) grab samples, must be used unless otherwise specified at 40 CFR Part 136
- Typical composite sampling is required for parameters such as biochemical oxygen demand (BOD), suspended solids, ammonia, and total phosphorus

Types of Samples
GRAB vs. Composite

- May be collected in the field and composited in the laboratory if the compositing procedure produces results equivalent to results produced by arithmetic averaging of the results of anaylsis of individual grab samples. (EPA Method 1664A).

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Sampling Guidelines

- Applicants must collect samples of effluent and analyze such samples for pollutants in accordance with analytical methods approved under 40CFR Part 136, unless otherwise specified in the existing permit.

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Sampling Guidelines

- Key to the sampling program is field operations
  - Good Housekeeping
    - Documentation
    - QC Activities
  - Collection of Representative Samples
  - Proper Handling
  - Proper Preservation of samples
  - Appropriate Chain of Custody records

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Sampling Guidelines

Representative Sampling

- Primary goal of sampling
- Ensure sample represents flow stream being analyzed
- Site location
- Sampling techniques
- Quality assurance/ quality control plans developed

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Sampling Guidelines

- Collect samples for non-volatiles constituents at points where the sample stream or tank is well mixed
  - One-third the liquid depth from the channel bottom and midway across the channel between the point of maximum turbulence and the edge

Sampling Guidelines

- Samples collected for the analysis of volatile organic compounds (VOC) should be taken from areas of low turbulence to reduce the amount of entrapped air in the sample.
  - VOCs could be driven off to the atmosphere (as outgas) in turbulent sections of the flow stream
  - The “no head space” requirement for VOC sample containers, meaning no air space in the container, is important to ensure that all VOCs are kept in solution for proper analysis

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Sampling Guidelines

- Avoid taking samples at points where solids settling occur or floating debris is present.

  -These situations occur normally in quiescent areas, where the velocity of the flow has decreased.

- Avoid sampling non-representative deposits or solids accumulated on channel or tank walls.

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Sampling Guidelines

- Accessibility and safety are also important factors when selecting a sampling site.

  - Do not choose a sample site that is difficult to get to or can result in falls and injuries.

- Flush or purge sample lines for an adequate time period before taking the sample

  -Replace sample lines regularly to avoid the possibility of sediment buildup, which could cause erroneous results

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Sampling Guidelines

- Where samples are to be collected from flowing pipes, keep the sample lines as short as possible and with a minimum number of bends
- To ensure that the sample is representative, prevent settling by keeping samples thoroughly mixed throughout the collection and measurement procedure

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Defining the Procedures

- Standard Operating Procedures (SOP's)
  - What are they?
    - Documents outlining the procedures used by your facility.
      - Analytical SOP's
      - Field Sampling SOP's
      - Quality Systems SOP's
    - SOP's need to be part of a controlled system
      - Log of all SOP's
      - One current revision of each document
      - Revisions issued by QA or designated authority
      - SOP's should be numbered
      - SOP's need issue and revision dates

Sample Labeling

- Clearly define and mark sample containers for each location.
- Each sample container should be clearly labeled with
  - Date
  - Time
  - Sample location
  - Parameters to be analyzed
  - Person who collected the sample

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Sample Handling

- Successful implementation depends on capability to produce valid data and to demonstrate such validity
  - Sample identifications procedures are needed
  - Chain of custody procedures are needed
- Evidence gathered must be controlled

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Sample Handling

- Chain of Custody
  - A sample is under custody if:
    - It is in your possession, or
    - It is in your view, after being in your possession, or
    - It was in your possession and then you locked it up to prevent tampering, or
    - It is in a designated secure area
  - The field sampler is personally responsible for the care and custody of the samples collected until they are transferred

Sample Handling

- Chain of Custody
  - During transfer of possession of samples the involved persons relinquishing and receiving must:
    - Sign
    - Date
    - Note time of transfer on C of C

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Sampling Quality Control

Quality Control

- Field QC

  -Used to identify and control errors resulting from interferences and contamination.

  -Handled in the exact manner as any other environmental sample

  -Identical sampling devices, sampling protocol, storage containers, shipping procedures, and preservation techniques should be used

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Bottle Preservation

- If preservation is necessary, each sample shall be preserved prior to sample collection or within 15 minutes of collection
- Refrigerate the sample at 0-6°C* during collection unless specified otherwise

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Parameter Holding Times

- Samples should be analyzed as soon as possible after collection.
  - Times listed are the maximum times that samples may be held before start of analysis and still be considered valid
- Grab Sample:
  - Holding time begins at the time of collection
  - Date of collection is the day in which collection took place

Parameter Holding Times

- Composite Samples
  - Holding time begins at the time of the end of collection of the composite sample.
  - For a set of grab samples composited in the field or laboratory, the holding time begins at the time of collection of the last grab sample in the set.
  - Date of collection is the date of the one to two days of collection; e.g., November 14-15

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Parameter Hold Times

- Short Hold Times
  - pH — immediate
  - Residual Chlorine — immediate
  - Fecal Coliform — 6 hours
  - Chromium hexavalent — 24 hours
  - BOD — 48 hours
  - Nitrite — 48 hours
  - Total Coliforms (potable) — 30 hours

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Questions?

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