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Standard Operating Procedure

AMBL-621-A

Prepared:	February 10, 2006
Prepared by:	Terry E Baxter
Last Reviewed:	April 15, 2024
Last Revised:	August 11, 2025
Revised by:	Terry E Baxter

Wastewater Sampling (Manual Grab Samples)

METHOD SUMMARY

This SOP describes the procedures and considerations for manually collecting, grab type wastewater samples that are used for field screening, laboratory analysis, or experimental procedures.

ENVIRONMENTAL HEALTH AND SAFETY

Hazards Assessment: This method involves the collection of wastewater samples that can contain pathogenic (disease causing) organisms, chemical toxins and other dissolved chemicals and physical solids that may cause human health problems. The waterborne pathogens currently found in wastewater are potentially more resistant to antibiotics than these same pathogens just a decade ago and chemical toxins are now known to include heavy metals, pharmaceuticals, microplastics and a variety of industrial chemicals depending on upstream dischargers, and disinfection by-products if sampling occurs in the final effluent. Physical hazards include any solid materials that may be found in the raw wastewater, before and after screening and in the treated wastewater throughout the facility

Exposure to these pathogenic, chemical, and physical hazards can occur through the following pathways.

a. Respiratory exposure from inhaled droplets or aerosols resulting from mechanical or bubble aerators, and wastewater splashing occurring near the location of sampling or by using an improper sampling technique.
b. Direct skin or eye exposure from spillage during sampling or handling samples after sampling, and from those processes above that create wastewater droplets or aerosols.
c. Fomite exposure from direct contact with surfaces that are contaminated with wastewater. The specific surface contaminated will typically be any surface

found near where spillage or splashing may occur, or where wastewater droplets and aerosol may settle.

d. Ingestion exposure is considered unlikely, but it can occur and must be considered. Circumstances that could lead to some ingestion of wastewater would include but is not limited to wastewater from splashes reaching the mouth when sampling or transferring wastewater from one container to another, slipping and falling into a wastewater treatment pond where your face goes below the surface or the wastewater or splashes wastewater into your mouth while collecting a sample, and mouth pipetting wastewater, to name only a few.

Safety Equipment and Engineering Controls: If possible, prearrange with the treatment facility to know the location and ensure access to use the nearest eye wash, shower, or wash basin. When sampling from remotely located oxidation or treatment ponds that do not have a nearby eye wash, shower, or wash basin, take four or more liters of tap water and soap into the field for washing and rinsing areas of exposed skin. An alcohol-based hand sanitizer gel is also recommended. Collecting wastewater is considered a field activity and a first aid kit is required.

Personal Protective Equipment (PPE): When performing these procedures the following PPE are required.

- Eye protection (goggles, not glasses) and gloves (Nitrile or latex).
- N95 mask covering mouth and nose when aerosols or droplets are known to be present.

Review and follow the additional procedures regarding PPE in NAU's Environmental Health and Safety's Chemical Safety Standard Operating Procedure, Personal Protective Equipment and Apparel (1/30/2017) and Safety Glasses (1/30/2017).

Analysis-derived Wastes and Disposal: Wastes that are generated by this procedure and the appropriate method to be used for their disposal are summarized in the following table.

Waste Generated	Hazardous (Y / N)	Disposal
The remaining unused portion of wastewater sample	Y	Biological Hazard. Return excess sample volumes following field screening procedures to the source of collection. Return large sample volumes that will remain unused in the laboratory to a local wastewater treatment facility. Autoclave smaller sample volumes that will remain unused in the laboratory and dispose of according to local hazardous waste handling requirements.

METHOD DESCRIPTION

1.0 Introduction and Applicability

Collecting wastewater may be done to obtain sample volumes that are used for screening analysis completed on-site or transferred to a laboratory for analysis or collected in bulk and transferred to a laboratory for use in experimental studies. This procedure covers above ground manual grab sampling from open channels, basins, or ponds, from sample access hatches, or from sampling lines using valves or when overriding and pumping from an automatic sampler. This procedure is not intended for collecting samples from confined spaces such as tanks or sewerage system manholes.

This procedure does not include determining the location and number of samples to be collected or procedures for selecting the appropriate container or the chemical preservatives required for some analytes. It is intended that this procedure supports a project sampling plan that contains the sampling design and details regarding the collection of representative samples that support the project's specific requirements.

2.0 Equipment

The equipment needed to collect grab samples of wastewater will depend on the sampling location and ease of access to the wastewater. Use professional judgement when selecting the appropriate equipment needed for any sampling event. Consult the project sampling plan for the specific equipment and procedures required by the project. Equipment used for manually collecting wastewater samples includes the following.

a. Sample containers of a size appropriate for the volume to be collected at each location. Use containers with wide-mouth openings when possible. Clean and label each container.

b. Dipper, bucket or bailer, or an open container attached to an extension pole, chain, or rope.

c. Funnel to avoid spillage when pouring a sample from the collection device. Use a funnel with a screen when larger solid debris will be removed from the sample prior to analysis or use.

d. Hand or battery powered pump, and tubing of adequate length to reach between the sample source and the sample container without introducing the risk of slipping or falling during collection.

e. Gloves, goggles, mask, or face shield as needed or determined necessary.

3.0 Reagents and Supplies Used During or Immediately After Collection

a. Consult the project sampling plan for regents used to preserve samples at the time of collection or used to perform screening analysis immediately after collection.

b. Wash water, soap, and sanitizer gel (60% or greater alcohol) when hand washing facilities are not available.

4.0 Procedures for Wastewater Treatment and Reclamation Facilities

Coordinate your sample collection activity in advance with the facility where samples will be collected and document the locations and equipment needed in a sampling plan.

Each facility will have a specific location where they typically collect samples and unless you need to collect them at locations that are uniquely different, use the locations recommended by the facility. The facility will also have its own sampling equipment and when made available use that equipment. However, always take your own sampling equipment as a backup.

If facility staff prefer to collect the sample, accompany them to assist with transferring the sample into your container. Wear gloves, safety goggles, and other PPE appropriate for the sampling location.

After collecting a sample, document the collection and store the sample as required by the sampling plan.

4.1 Raw Influent Wastewater (after bar screens)

Unless specified otherwise in the sampling plan it is recommended to collect samples, when possible, at a location that is upstream of any process return flows.

a. Collect the sample ideally directly in the sampling container or by using the appropriate equipment for the location and inspect the sample for any large materials that would interfere with the planned sample analysis or use.

b. Slowly transfer the sample into your container.

    1. Use a funnel to avoid spillage and when larger materials will be removed from the sample prior to analysis or use use a funnel with a screen.

    2. Dump the screenings on the screen back into the wastewater flow.

c. Tightly cap the container when approximately one-third to three-quarters full to allow for sample mixing.

d. Return any unused sample collected back into the wastewater flow.

4.2 Primary Sedimentation Effluent Wastewater

Ideally samples are collected directly in the sampling container, however that is not always possible for this location.

a. Collection from effluent weir.

   1. Position dipper, bailer or bucket in flow passing over the effluent weir into the effluent channel.
   2. Slowly transfer the sample into your container and use a funnel to avoid spillage.
   3. Tightly cap the container when approximately two-thirds to three-quarters full to allow for sample mixing.
   4. Return any unused sample collected to the effluent channel.

b. Collection from the autosampler directly into sample container.

   1. Unless you are trained by the facility, allow facility staff to operate the autosampler's pump.
   2. Position the container on a flat, stable surface and place or hold the sampling tube inside the container's mouth.
   3. Operate the pump until the container is approximately two-thirds full.
   4. Do not remove the sampling tube from the container until all flow coming from the tube has stopped. The final volume collected is no greater than three-quarters to allow for sample mixing.

4.3 Activated Sludge Mixed Liquor

Ideally samples are collected directly in the sampling container, however that is not advised for this location.

a. Collect the sample using the appropriate equipment for the location.

b. Slowly transfer the sample by pouring into a wide mouth container or use a funnel when spillage is possible.

c. Tightly cap the container when approximately two-thirds to three-quarters full to allow for sample mixing.

d. Return any unused sample collected into the aeration basin.

4.4 Secondary Clarifier Effluent Wastewater

Ideally samples are collected directly in the sampling container, however that is not always possible for this location.

a. Collection from effluent weir.
    1. Position dipper, bailer or bucket in flow passing over the effluent weir into the effluent channel.
    2. Slowly transfer the sample into your container and use a funnel to avoid spillage.
    3. Tightly cap the container when approximately two-thirds to three-quarters full to allow for sample mixing.
    4. Return any unused sample collected to the effluent channel.
b. Collection from the autosampler directly into sample container.
    1. Unless you are trained by the facility, allow facility staff to operate the autosampler's pump.
    2. Position the container on a flat, stable surface and place or hold the sampling tube inside the container's mouth.
    3. Operate the pump until the container is approximately two-thirds full.
    4. Do not remove the sampling tube from the container until all flow coming from the tube has stopped. The final volume collected is no greater than three-quarters to allow for sample mixing.

4.5 Reclaimed Wastewater (pre-chlorination)

a. INTENTIONALLY LEFT BLANK – TO BE ADDED NEXT UPDATE

4.6 Final Effluent Wastewater

The location for collecting final effluent wastewater is often considered the location where the facility collects NPDES samples. This may not be the most appropriate location.

More generally, the point where flow is discharged into the natural environment is defined as the final effluent. Flow that is discharged into a constructed or otherwise engineered wetland or natural-inspired treatment system is not considered the final effluent under this definition.

Because this location may be where a discharge flows into a natural waterway, visit the site before collecting any samples to identify any safety hazards or access issues that need to be considered (sharp stream banks, overgrown vegetation, muddy or shallow inundated areas, etc.). This should be done when developing the sampling plan.

a. Collect the sample from the end of the discharge pipe or channel using the appropriate equipment for the location. Collect the sample directly into the container when possible.
b. Slowly transfer the sample into your container and use a funnel to avoid spillage.
c. Tightly cap the container when approximately one-third to three-quarters full to allow for sample mixing.
d. Return any unused sample collected into the natural flow channel.

5.0 Procedures for Wastewater Treatment Ponds and Lagoons

Visit the pond or lagoon site before collecting any samples to identify any safety hazards or access issues that need to be considered (soft, slippery, or steep banks, overgrown vegetation, etc.). This should be done when developing the sampling plan.

Collection of representative samples from a wastewater pond or lagoon requires compositing several grab samples over a short period of time (approximately one hour) or a series of grab samples collected and analyzed routinely over a prolonged period (a month or more). Collection should occur well beyond arm's length away from the bank of the pond or lagoon.

a. Use a dipper on an extended or extendable pole to collect volumes of samples. The dipper's volume should be no more than 500 mL so that managing the dipper after the sample is collected is not too difficult.
b. Slowly transfer the sample into your container and use a funnel to avoid spillage.
c. Tightly cap the container when approximately one-third to three-quarters full to allow for sample mixing.
d. Return any unused sample collected into the pond or lagoon at the shoreline.

6.0 Quality Control Samples

Equipment blank samples are collected to document whether contaminants to be analyzed are introduced by the sampling equipment. This is most important when the equipment is cleaned and reused. Consult the project's sampling plan on the specific type and number of quality control samples to be collected.

7.0 References

Wastewater Sampling, Standard Operating Procedure, EPD Watershed Protection Branch, Georgia Environmental Protection Division, August 2020.

Wastewater Sampling, Operating Procedure, Laboratory Services and Applied Science Division, Region 4, USEPA, Athens, Georgia, April 22, 2023.