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**Sanitary Lagoon Operable Unit**
**Sludge Characterization Work Plan**
**Remedial Investigation Addendum 3**

January 28, 2021

Dear Ms. Kuhn and Ms. Rippy:

Westinghouse has prepared the following work plan to characterize the sludge in the Sanitary Lagoon as per Section 3.6 of the ongoing Phase II Remedial Investigation (RI) Work Plan. This Phase II RI Work Plan was approved by the Department on October 14, 2020. A Sanitary Lagoon sludge characterization report will be submitted to the Department upon completion of the work plan.

Sincerely,

Cynthia Teague
Principal Environmental Engineer
Westinghouse Electric Company LLC
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Plan reviewed by:

Thomas Hutto, P.G.
GEL Engineering, LLC

Attachments:
Westinghouse Sanitary Lagoon Sludge Characterization Work Plan

# Westinghouse Sanitary Lagoon Sludge Characterization Work Plan

## 1. PURPOSE

As part of ongoing facility upgrades, Westinghouse plans to close the Sanitary Lagoon (Lagoon) (Figure 1) and replace it with a fully contained treatment system. This work plan establishes methods for collecting and analyzing sludge samples from the Lagoon in order to develop a radiological and chemical profile of the sludge for disposal and to estimate its volume. The data is essential for preparation of a separate Closure Plan that will be submitted in accordance with the Site's National Pollutant Discharge Elimination System (NPDES) permit requirements. The analytical results also will be used to identify constituents of potential concern (COPCs) that potentially could have impacted soil and groundwater underlying the Lagoon that will be further investigated under Consent Agreement 19-02-HW. This plan shall ensure the proper collection, handling, documentation, and evaluation of the sludge. Additional samples and analytical parameters not specified in this plan may be added as directed by the Westinghouse designated Environmental Manager.

## 2. OVERVIEW

The Sanitary Lagoon is a component of the Columbia facility wastewater treatment system. The Lagoon is approximately 240 feet (ft) by 240 ft and up to approximately 4 ft deep (including surface water and underlying sludge). The sludge is believed to be approximately 3 ft thick and has not previously been removed. The Lagoon was constructed of compacted clay in 1968 when the facility was built. In the 1970's, an activated sludge package plant was installed to treat the sanitary wastewater prior to discharge into the Lagoon.

Influent to the Lagoon includes sanitary wastewater from the Columbia facility. As a result, there is the potential that various COPCs, including radiological (Isotopic-Uranium [U], Technetium-99 [Tc-99]) parameters, could be present in the Lagoon sludge from the contaminated wastewater system input. The data proposed to be collected herein will facilitate the development and execution of a Closure Plan to permanently close the Lagoon.

## 3. HEALTH AND SAFETY

Activities will be conducted in a manner that minimizes potential impact to the health and safety of employees, the public and the environment. Proper health and safety precautions shall be observed when collecting samples in accordance with all requirements specified by the site *Health and Safety Plan*. Any questions regarding Health and Safety should be directed to the Environmental Manager.

## 4. SAMPLE EQUIPMENT AND SUPPLIES

- Sludge sample probe (PVC Pipe or equivalent)
- Scoop
- Bowl
- Sample Containers (Ziploc bags, or other sealable container)
- Field Logbooks
- Chain of Custody Forms (for specific Laboratory to be used)
- Writing utensils (indelible ink, black preferred)

- Decontamination Supplies
- Personal Protective Equipment (as required by the Radiation Work Permit (RWP)

## 5. QUALITY CONTROL

The objectives of the sampling and analysis are to generate sufficient information to:

1. determine the presence or absence and range of concentrations of COPCs in the sludge,
2. characterize the sludge as necessary for disposal, and
3. estimate the volume of sludge.

To ensure the defensibility and validity of the data, four types of field QC samples will be collected and analyzed. These QC samples will include the following:

- Field Duplicate (FD) samples - A minimum of 1 FD sample will be collected per 20 field samples. FD samples will be submitted "blind" to the laboratory with two different sample identifiers (IDs). The FD samples will be analyzed for the same parameters as the primary sample.
- Field Blank (FB) samples – A minimum of 1 FB samples will be collected during sampling for Target Compound List/Target Analyte List (TCL/TAL) samples as specified below. The FB samples will be analyzed for the EPA's TCL of volatile organic compounds (VOCs). The FB samples will consist of deionized water poured directly into sample vials contemporaneous with collection of the TCL/TAL samples.
- Rinsate Blank (RB) samples – One RB sample will be collected each day sampling equipment is reused in the field and field cleaned per the specifications in Section 6.2. RB samples will be collected from the final rinse of the sampling equipment after the cleaning procedure has been performed. The RB sample will be analyzed for the list of parameters being tested that day.
- Trip Blanks (TB) samples - A TB packaged in VOC sample vials will be provided by the laboratory. The sample vials will be transported to the site in sample coolers and returned to the laboratory unopened. The TB samples will be tested for TCL VOCs. Thus trip blanks will be included in only the sample coolers used to ship VOCs.

In addition to field QC samples, the laboratory analyzing the samples will conduct its internal QC procedures specific to each analytical method to evaluate analytical accuracy and precision relative to the sample matrices. Examples of laboratory QC samples include Matrix Spike (MS) and Matrix Spike Duplicate (MSD) samples, Laboratory Control Samples (LCS), and internal duplicate samples.

All laboratory data will be evaluated when the analytical data package is received from the laboratory. QC sample results, applicable spike recoveries, and calibration summaries will be evaluated against the method quality criteria and the data will be flagged with data qualifiers as necessary. Acceptance or rejection of the data will depend upon professional judgment and the comparison of outlier values against data quality objectives. If any data are rejected, an explanation will be given as to why, as well as any corrective actions that may be necessary.

## 6. SANITARY LAGOON SAMPLING

### 6.1. Overview

Sludge sampling will follow EPA guidance, as advised in EPA Region 4 Operating Procedure SESDPROC-200-R3, *Sediment Sampling*. This section provides a sampling overview followed by detailed procedures to be used for sampling. Deviations from the requirements specified in this plan must be authorized by the Environmental Manager and documented in the field logbook to allow re-creation of the modified process.

The Lagoon sludge is estimated to be up to approximately 3 feet thick above the clay liner and covered by approximately 1 foot of water. Care will be taken during sampling to avoid compromising the integrity of the clay liner. A push probe will be used to collect the sludge samples. A push probe is a PVC tube (or equivalent) that can be sealed on one end, leaving the other end open. The probe will be manually pushed into the sludge with the intent of reaching the sludge-clay interface; this depth will be determined in the field.

Once the probe has been advanced to the desired depth or as deeply as practical, the top of the probe will be sealed to create a vacuum lock to keep the sludge inside. The push probe will be removed, placed over a sample collection bowl, and the sealed end will be opened, releasing the vacuum lock to allow the sludge to empty into the sample bowl where it will be homogenized. Approximately 1 liter of sludge will be collected from each sample location, and it may be necessary to advance the sample probe several times to obtain that volume. At each sample location, the thickness of sludge and a description of it (color, odor, stratification, etc.) will be recorded, and any photographs taken will be noted. Each sample also will be field screened using beta/gamma sensitive radiological detectors and a Photo Ionization Detector (PID).

In the event that any of the clay liner is potentially collected in the probe, the practicality of separating the clay from the sludge to create a separate sample will be determined by the field crew. If separate samples of liner material can be collected, Westinghouse may elect to analyze them for select COPCs.

Samples will be collected using a grid system to ensure the sludge is fully and uniformly represented in the collected data. The Lagoon will be sub-divided into 25 separate grid squares using transect lines parallel and perpendicular to the sides of the Lagoon (Figure 1). Additional biased samples may be collected based on the judgement of the field sampling crew if unexpected conditions are encountered that would indicate the need for additional investigation. Furthermore, sample locations, may be adjusted in the field based on safety considerations. Efforts will be made to ensure that any location that is moved will still be in the same grid square to ensure that each grid has a representative sample.

All samples will be analyzed for U, Tc-99, Fluoride, Nitrate, and Ammonia. In addition, five samples will be analyzed for a more extensive parameter list. The more extensive analyses includes the full Toxicity Characteristic Leaching Parameters (TCLP) list and the EPA's Target Compound List/Target Analyte List (TCL/TAL) except for pesticides and herbicides (in both TCLP and TCL) since these parameters are not potentially present in the sludge. The sample locations and analytical parameters are provided in Table 1. The specific analytical methods and detection limits are included in Table 2.

**Table 1 – Sample Locations**

| SAMPLE GRID NUMBER | LOCATION TYPE | SAMPLE ANALYSIS |
|---|---|---|
| 1 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am, VOCs, and TCLP |
| 2 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 3 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 4 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 5 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am, VOCs, and TCLP |
| 6 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 7 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 8 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 9 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 10 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 11 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 12 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 13 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am, VOCs, and TCLP |
| 14 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 15 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 16 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 17 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 18 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 19 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 20 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 21 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am, VOCs, and TCLP |
| 22 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 23 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 24 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am |
| 25 | Systematic Grid Sample | Iso-U, Tc-99, F, N, Am, VOCs, and TCLP |

**Table 2 – Analytical Methods**

| Analysis | Method | Laboratory Requested Level (RL)* |
|---|---|---|
| Iso-U | DOE HASL 300 U-02-RC Mod | 1.0 pCi/g |
| Tc-99 | DOE HASL 300 Tc-02-RC Mod | 5.0 pCi/g |
| Fluoride | SW 9056A | 0.1 mg/L |
| Nitrate | SW 9056A | 0.1 mg/L |
| Ammonia | EPA 350.1 Mod/ SM 4500-NH3 B Mod | 0.25 mg/L |
| VOCs | SW8260B | Lowest achievable |
| TCL/TAL | SW846 8260B/8270B/6010C/7470A | Lowest achievable |
| TCLP | SW 1311/8260B/ 8270D/6010C/7470A | < TCLP Limits |

* The contract laboratories will make every effort to achieve the lowest possible detection limits. Please note that detection limits will vary based on the moisture content of the sludge samples as well as the chemical and physical consistency of the sample matrix.

### 6.2. Decontamination

Care will be used to avoid cross-contamination between sample locations. Decontaminated or new disposable sampling equipment and new, disposable gloves will be used for each sample collected. New gloves must be donned just prior to sample collection. Equipment that is reused will be cleaned between each sample location as follows:

1. Wash and scrub equipment with a non-phosphoric, laboratory grade detergent and tap water, until the sample equipment is visibly clean.
2. Rinse equipment with distilled or deionized water.
3. Rinse equipment with appropriate solvent rinse, such as isopropanol.
4. Perform a final rinse of the equipment with distilled or deionized water.
5. If immediate reuse is not planned, allow equipment to air dry outside the cleaning area, and then wrap the sampling equipment with aluminum foil after cleaning and until next use.

The liquids used in the cleaning procedures, which is one type of Investigation Derived Waste (IDW), will be collected and placed in an appropriate container for proper disposal. Each day that sampling equipment is cleaned and reused, a Field Rinsate blank sample will be collected from the final rinse of the sampling equipment after the cleaning procedure has been performed.

### 6.3. Sample Homogenization

With the exception of VOCs, samples from each location must be homogenized before being placed into the sample containers so that an aliquot representative of the desired interval is obtained. Samples shall be manually homogenized using a decontaminated stainless steel spoon or scoop and a stainless steel bucket or bowl. A disposable scoop and pan (plastic or aluminum) may also be used. Care will be taken to ensure that the sludge is mixed thoroughly. VOC samples will not be homogenized and will be collected per EPA Method 5035A as described below in Section 6.4.2.

### 6.4. Sample Collection

The samples will be collected from either from the bank of the Lagoon or from a boat, unless this proves impractical. Guide ropes will be used to navigate the boat to the designated sample location. If necessary, the Sample Technician may don hip-waders to access sample locations immediately next to the banks of the Lagoon, but only if the area can be traversed safely.

In addition to the samples specified in Table 1 and Figure 1, Westinghouse intends to collect five separate 5 gallon containers of Lagoon sludge for waste acceptance bench scale testing that may be required by the disposal facility and/or geotechnical testing necessary to formulate a closure plan. These containers may be collected and filled at any time during the sampling event.

#### 6.4.1. Sludge Sampling Using a Push Probe

At each designated location listed in Table 1 and Figure 1, perform the following steps:

1. Don clean gloves and assemble new, or decontaminated sample equipment, as required.
2. Place plastic sheeting around the work area, as necessary, to prevent equipment from coming in contact with potentially contaminated surfaces and to prevent the transfer of contaminated materials to uncontaminated areas.
3. At each specified sample location, advance the probe into the sludge until the clay liner is reached. Cap or seal the probe to create a vacuum lock.
4. Withdraw the probe carefully from the boring, place the open end over a new or decontaminated sample bowl or bucket, and uncap the end to release the vacuum lock.
   Note: Use caution when releasing the vacuum seal to minimize splashing of the probe contents.
5. Field screen the samples using a beta/gamma sensitive detector and a PID and record the appropriate information and observations about the sample location in the field logbook. Also note any photographs taken of the area, and the associated sample ID correlating to each photograph location. Note the thickness of sludge in the field logbook.
6. Assign a unique sample ID for the sample to be collected, and label all sample containers with the unique ID.
7. If VOC samples are to be collected, these samples will be collected per the methods in Section 6.4.2 and before collection of the other samples.
8. After any necessary VOC samples are collected, thoroughly homogenize the sample in accordance with Section 6.3.
9. Use a new or decontaminated stainless steel scoop or another appropriate utensil to collect the sample from the sample bowl. Fill any additional sample containers as necessary.

10. Log the following information onto the sample container, field logbook, and the Chain of Custody form:
    - Sample ID
    - Time and Date of sample collection
    - Analytical parameters for analysis (Iso-U, Tc-99, Fluoride, Nitrates, Ammonia, TAL/TCL, and TCLP as appropriate)
    - Initial(s) of the Sampler(s)
11. Any remaining sample not collected in a container will be returned to the Sanitary Lagoon.
12. All reusable sample equipment will be decontaminated in accordance with Section 6.2 prior to additional sample collection at a new location.

### 6.4.2. VOC Sample Collection

The following steps are only applicable to VOC sample collection at the specified locations for the TCL/TAL samples. VOC sample collection will be performed in a minimal amount of time, with the minimum practical physical disruption of the sample. When collecting field duplicates, use two co-located samples in the same manner as the parent sample.

1. Don new gloves and a new VOC sample kit.
2. Obtain an undisturbed sample by pushing the volumetric sampling device with a disposable syringe into freshly exposed surface and remove once filled.
3. Extract the 5 g aliquot plug after surface of the sludge has been exposed and transfer to a gas-tight vial to seal.
4. Extract a second 5 g aliquot plug and transfer to a gas-tight vial to seal to be kept on reserve for repeat analysis.
5. Ensure preservation by cooling at 4 °C ± 2 °C and maintain temperature for a hold time of 48 hours upon laboratory receipt.
6. Collect one 2 oz jar of sludge (> 10g) for percent moisture determination.
7. Continue with sample collection as described in Section 6.4.1 above.

### 6.5. Sample Analysis and Reporting

All samples collected will be logged on the appropriate Chain of Custody form, stored in a sample cooler, and sealed and secured when not under the custody of the sampling crew. The following preservation and hold times must be met for all samples:

- Chemical parameters cooled to below 4°C ± 2°C for preservation
    - Fluoride: hold time 28 days;
    - Nitrates: hold time 28 days for extraction, 48 hours from extraction to analysis;
    - Ammonia: hold time 28 days;
    - TCL VOCs: hold time 48 hours for preservation, 14 days for analysis;
    - TCL SVOCs: hold time 7 days for extraction, 40 days after extraction for analysis;
    - TAL Metals: hold time 6 months except 28 days for mercury;
    - TCLP: hold time 14 days VOCs/SVOCs, 6 months metals except 28 days for mercury.
- Radiological parameters (Iso-U, Tc-99), no preservation requirement, 180 day hold time

The laboratories utilized for this project will have National Environmental Laboratory Accreditation Program (NELAP) certification, as well as any appropriate SCDHEC certifications. The laboratories will be capable of achieving reporting limits appropriate for waste characterization and below applicable remediation goals to the extent achievable. The laboratory data reports will consist of complete data packages that will contain complete documentation of the laboratory data report, and will include the following:

- Case narrative identifying the laboratory analytical batch number
- Matrix and number of samples included
- Analyses performed
- Analytical methods used
- Descriptions of any problems or excursion from QC criteria and corrective actions taken

All laboratory analytical data will be reviewed and validated by project staff upon receipt to ensure completeness, and to compare the results to remedial guidelines as achievable. A characterization summary report will be prepared documenting field activities, laboratory analytical results, QC sample parameters, and validation of results. The data will also be used to determine appropriate potential means for sludge disposal as well as determine the potential for impacts to soil or groundwater underlying the Lagoon.

## 7. RECORDS

Records generated as a result of this procedure will be submitted to the designated electronic record storage system. Any photographs of the sample collection process, copies of the chain of custody forms, and copies of the field logbook pages will be retained onsite for future use.

## 8. REFERENCES

- *Guidance on Choosing a Sampling Design for Environmental Data Collection*, EPA QA/G-5S (December 2002)
- *Sediment Sampling,* Operating Procedure SESDPROC-200-R3, EPA Region 4, Science and Ecosystem Support Division (August 2014)
- *Description and Sampling of Contaminated Soils*, EPA/625/12-91/002 (November 1991)

**Figure 1 – Westinghouse Sanitary Lagoon Proposed Sampling Grid**