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PLN-5503	Uniform Federal Policy Quality Assurance Project Plan for the Luckey FUSRAP Site Remediation Project Luckey, Ohio Sampling and Analysis Plan	4
Document Number	*Title*	*Revision*

[redacted]	Date: 03/19/20	Title: Project Engineer
	Date: 03/19/20	Title: Project Chemist
	Date: 03/19/20	Title: Program Manager
	Date: 03/19/20	Title: Project Manager

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☐	Mark this space if the change to the document only adds text or figures to the document.
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Cite page numbers and sections that are added, deleted, or revised by this change. Where text or figures are added or revised, provide the additional text or figures or the revised text in the space provided below.

Remove Worksheet #11 – Water Management in its entirety (pages 40 – 45) and replace with revised Worksheet #11 in Attachment A (below).

Remove Worksheet #17 – Water Management in its entirety (pages 134 & 135) and replace with revised Worksheet #17 in Attachment B (below).

Remove Worksheet #15 – Matrix: Water in its entirety (pages 128 & 129) and replace with revised Worksheet #15 in Attachment C (below).

Note: *Only non-intent changes can be made utilizing the ICN process.*
This form is retained as a record upon completion.

Attachment A

Quality Assurance Project Plan Worksheet #11: Project/Data Quality Objectives

(UFP-QAPP Manual, Section 2.6.1)
(EPA 2106-G-05, Section 2.2.6)

Specific procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal QC, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this document and in task-specific standard operating procedures (SOPs).

Water Management

1. Problem Statement

Soils at the Luckey FUSRAP Site are contaminated from historical beryllium processing operations. A Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigation characterized site conditions and determined the nature and extent of contamination (USACE 2000). The investigation identified the site as having materials contaminated with FUSRAP-related COCs, and a subsequent feasibility study (USACE 2003) identified cleanup goals and evaluated remediation alternatives.

The six FUSRAP COCs found to pose unacceptable risks to human health are Be, Pb, Ra-226, Th-230, U-234, and U-238. The remedial action selected in the record of decision (ROD) (USACE 2006) includes the excavation of contaminated soils to achieve established cleanup goals for these COCs. Excavated soils will be shipped for disposal at an off-site, licensed/ permitted disposal facility.

During remediation, water coming in contact with contaminated areas and excavations will be treated before on-site reuse or off-site discharge. Wastewater management activities will include collecting, treating, reusing, testing, and discharging treated water in accordance with the WMP (USACE 2018a).

The following DQOs have been identified for this activity:

1. Verify that treated effluent water from the wastewater treatment system meets standards for on-site reuse or off-site discharge.
2. Verify that the wastewater treatment system is operating within the expected parameters.

2. Study Goal

The study goal is to determine whether treated wastewater from the Luckey Site meets standards for on-site reuse or off-site discharge. The wastewater treatment decision process is shown in Figure 4A and Figure 4B based on routine system operation and batch system operation, respectively.

The principal study questions (PSQs) to be answered to address the decision statements are:

- PSQ-1: Does treated wastewater from the Luckey Site comply with established discharge limits?
- PSQ-2: Is the wastewater treatment system operating within expected parameters?

Wastewater analytical results will be compared to the substantive discharge limits identified in Table 10A, Table 10B, and Table 11, as applicable.

The resulting alternative actions (AA-) for PSQ-1 are either:

- AA-1: Continue off-site discharge or on-site reuse of the treated wastewater.
- AA-2: Stop off-site discharge or on-site reuse of treated wastewater and evaluate the sample result to determine the necessary corrective action.

The resulting alternative actions (AA-) for PSQ-2 are either:

- AA-1: Continue off-site discharge or on-site reuse of the treated wastewater.
- AA-2: Revise wastewater treatment system operations or perform maintenance if the system is not operating within expected parameters.

3. <u>Information Inputs</u>

During both routine system operation and batch system operation, samples will be collected from the sample port on the process effluent line after the last element of the treatment process. This port is immediately prior to the point that water enters the effluent storage tanks. Wastewater treatment performance samples will be collected at various points throughout the system, as necessary.

4. <u>Study Boundaries</u>

Study boundaries include the following spatial and operational boundaries, schedule and temporal boundaries, and target analytes:

- <u>Spatial and operational boundaries</u>: The Luckey Site wastewater treatment system is shown in Figure 4A and Figure 4B for routine system operation and batch system operation, respectively. During both routine system operation and batch system operation, samples will be collected from the sample port on the process effluent line after the last element of the treatment process. This port is immediately prior to the point that water enters the effluent storage tanks. Various points throughout the process will be utilized to collect performance testing samples.

- <u>Schedule boundaries</u>: The study schedule requires integration with the overall project schedule contained within the site operations plan (USACE 2017b). The wastewater treatment system; analytical laboratory; and sampling, analysis, reporting, and notification procedures must be in place before site development or excavation activities that may collect water requiring treatment can be started.
- <u>Temporal boundaries</u>: During routine system operation, analytical results will be available after the treated water has been discharged off-site or reused on-site. During batch system operation, analytical results must be received, reported to the USACE, and approved by the USACE, prior to on-site reuse or off-site discharge.
- <u>Target analytes</u>: The analysis performed during routine system operation is outlined in Table 10A and Table 11. The analysis performed during batch system operation is outlined in Table 10A, Table 10B, and Table 11. The USACE must concur with any changes to the tables.

5. Analytical Approach

The analytical approach will support decision statements derived from the PSQs and the AAs:

- Decision Statement 1 (DS-1): During routine system operation, treated wastewater from the Luckey Site will be reused on-site or discharged off-site prior to the receipt of sample results. Grab samples will be collected as outlined in Worksheet #17 and compared to the discharge limits (maximum and monthly average) identified in Table 10A and Table 11. This data will be trended over time in order to ensure ongoing compliance with the discharge limits. In addition to the routine grab sampling, performance sampling for the wastewater treatment system occurs on an ongoing basis in order to ensure that the system is operating within its parameters. This data is also used for trending purposes to ensure ongoing compliance with the discharge limits.
- DS-2: During batch system operation, if sample results indicate that the treated wastewater from the Luckey Site meets the discharge limits, it will be reused or discharged off-site.
- DS-3: If treated wastewater from the Luckey Site does not meet the discharge limits, the water will be stored and retreated and/or the treatment process will be modified until the discharge limits are met.

The contract-required DoD-DOE Quality Systems Manual (DoD and DOE 2017), implemented by the laboratories, defines the analytical methods for the parameters listed in Table 10A, Table 10B, and Table 11. Those constituents that cannot be analyzed in the on-site laboratory will be sent to an off-site laboratory. Results from the off-site laboratory will be assessed using the same decision logic as for those determined in the on-site laboratory.

6. Performance/Acceptance Criteria

Measurement performance criteria are provided in Worksheet #12. All data will be evaluated to ensure that it is acceptable for the intended use. It will be verified, validated, and assessed for usability in accordance with the procedures specified in Worksheets #34 to #37. Data that does not meet required performance and acceptance criteria will be qualified according to Worksheet #28.

Data that meets usability criteria will be compared to discharge limits identified in Table 10A, Table 10B, and Table 11, as applicable. In this case, documentation will be prepared, notifications will be made in accordance with contract requirements, and the treated water will be reused on-site or discharged off-site. Data that do not meet usability criteria will be rejected and the sampling/analyses will be repeated (when necessary) until acceptable data quality has been obtained.

7. Plan for Obtaining Data

Grab samples will be collected from the sample port on the process effluent line after the last element of the treatment process. This port is immediately prior to the point that water enters the effluent storage tanks. Sampling procedures, containers, and preservation methods will be used in accordance with EPA SW-846 and the DoD-DOE Quality Systems Manual (DoD and

DOE 2017). Process monitoring samples may be collected prior to or at any point in the treatment process, as required to modify treatment system parameters to meet DS-3.

Sampling designs will be optimized throughout the course of the remediation, as analytical parameters, sampling and analysis frequency, and other considerations are revised to comply with USACE personnel/direction. Additional details on the sampling design and rationale are provided in Worksheet #17 and SOP-5524.

Table 10A. Summary of Luckey Non-radiological Parameters Used for Wastewater Discharge Acceptance Criteria for Routine and Batch System Operation

Compound/Parameter	**Treated Water Discharge Limit[1]**		
Inorganics	**Max. Conc.**	**Monthly Avg. Conc.**	**Unit**
Antimony	0.9	0.19	mg/L
Arsenic	0.34	0.1	mg/L
Barium	2	0.22	mg/L
Beryllium	0.37	0.044	mg/L
Cadmium	0.012	0.0048	mg/L
Chromium	3.7	0.1	mg/L
Copper	0.032	0.02	mg/L
Cyanide	0.022	0.0052	mg/L
Lead	0.37	0.019	mg/L
Mercury	1700	1.3	ng/L
Nickel	0.97	0.11	mg/L
Selenium	-	0.005	mg/L
Silver	0.0071	0.0013	mg/L
Thallium	0.079	0.017	mg/L
Zinc	0.25	0.25	mg/L
Other	**Max. Conc.**	**Monthly Avg. Conc.**	**Unit**
Ammonia (May 1 through October 31)	1.5	1	mg/L
Ammonia (November 1 through April 30)	5.52	4	mg/L
CBOD	15	10	mg/L
Fluoride	-	2	mg/L
pH	-	6.5 – 9.0	SU
TSS	45	30	mg/L
Dissolved Oxygen	-	5 (minimum)	mg/L
Flow Rate	-	M&R	MGD
Chlorine[2]	-	M&R	mg/L

Avg. average
Conc. concentration
M&R Monitor and Report
Max. maximum
MGD million gallons per day
mg/L milligrams per liter
ng/L nanograms per liter
SU standard unit

[1] Discharge limits provided via email correspondence from the USACE on 01/31/20, "FW: Luckey Site – New Treated Water Discharge Parameters and Limits."

[2] Chlorine will be monitored only if being utilized in the wastewater treatment process.

Table 10B. Summary of Additional Luckey Non-radiological Parameters Used for Wastewater Discharge Acceptance Criteria for Batch System Operation

Compound/Parameter	Treated Water Discharge Limit[1]		
Organics	**Max. Conc.**	**Monthly Avg. Conc.**	**Unit**
Benzene	0.01	0.005	mg/L
2-Butanone (Methyl Ethyl Ketone)	-	M&R	mg/L
Carbon tetrachloride	0.01	0.005	mg/L
Chloroform	0.01	0.005	mg/L
1,4-Dichlorobenzene	0.057	0.0094	mg/L
1,2-Dichloroethane	0.01	0.005	mg/L
1,1-Dichloroethene	0.01	0.005	mg/L
cis-1,2-Dichloroethene	0.01	0.005	mg/L
trans-1,2-Dichloroethene	0.01	0.005	mg/L
Ethylbenzene	0.01	0.005	mg/L
Tetrachloroethene	0.01	0.005	mg/L
Toluene	10	5	mg/L
1,1,1-Trichloroethane	0.01	0.005	mg/L
1,1,2-Trichloroethane	0.01	0.005	mg/L
Trichloroethene	0.01	0.005	mg/L
Vinyl chloride	0.01	0.005	mg/L
Xylenes (total)	0.02	0.015	mg/L
Benzo(a)pyrene[2]	0.00054	0.00006	mg/L
Bis(2-ethylhexyl) phthalate	0.258	0.0084	mg/L
2,4-Dinitrotoluene	0.39	0.044	mg/L
Hexachlorobenzene[3]	-	0.00045	µg/L
Hexachlorobutadiene[4]	-	0.00024	mg/L
Hexachloroethane	-	0.0067	mg/L
2-Methylphenol (cresol)	0.047	0.019	mg/L
3-Methylphenol (m-cresol)	0.047	0.019	mg/L
Phenol	0.047	0.019	mg/L
Pyridine	0.048	0.020	mg/L
2,4,5-Trichlorophenol	-	M&R	mg/L
2,4,6-Trichlorophenol	0.039	0.0049	mg/L
PCBs (total)	-	0.000026[5]	µg/L

Avg. average
Conc. concentration
Max. maximum
mg/L milligrams per liter
µg/L micrograms per liter

[1] Discharge limits provided via email correspondence from the USACE on 01/31/20, "FW: Luckey Site – New Treated Water Discharge Parameters and Limits."

[2] The discharge limit for Benzo(a)pyrene is below the practical quantification limit (PQL) of 0.11 µg/L (0.00011 mg/L) provided with these discharge limits. Therefore, the PQL will be used for compliance with the discharge limit in accordance with Ohio Administrative Code (OAC) 3745-33-07 (C).

[3] The discharge limit for Hexachlorobenzene is below the PQL of 0.25 µg/L provided with these discharge limits. Therefore, the PQL will be used for compliance with the discharge limit in accordance with OAC 3745-33-07 (C).

[4] The discharge limit for Hexachlorobutadiene is below the PQL of 1.7 µg/L (0.0017 mg/L) provided with these discharge limits. Therefore, the PQL will be used for compliance with the discharge limit in accordance with OAC 3745-33-07 (C).

[5] The discharge limit for PCBs is below the PQL of 0.5 µg/L provided with these discharge limits. Therefore, the PQL will be used for compliance with the discharge limit in accordance with OAC 3745-33-07 (C).

Table 11. Discharge Acceptance Criteria for Radionuclides for Routine and Batch System Operation

Radionuclide[b]	**Nuclear Regulatory Commission (NRC) Effluent Limit[a] (pCi/L)**
Ra-226	60
Th-228	200
Th-230	100
Th-232	30
U-234	300
U-235	300
U-238	300

pCi/L picocuries per liter

a. U.S. NRC effluent limits for direct discharges to surface water (10 CFR 20, Appendix B, Table 2, Column 2) will be used, which are an order of magnitude more conservative than NRC's criteria for discharge to sewers for the above parameters. As low as reasonably achievable (ALARA) principles are implemented to treat water to the lowest reasonable level for radioactive constituents.

b. Total activity may be used to demonstrate compliance with radionuclide-specific release limits with regulatory/USACE approval.

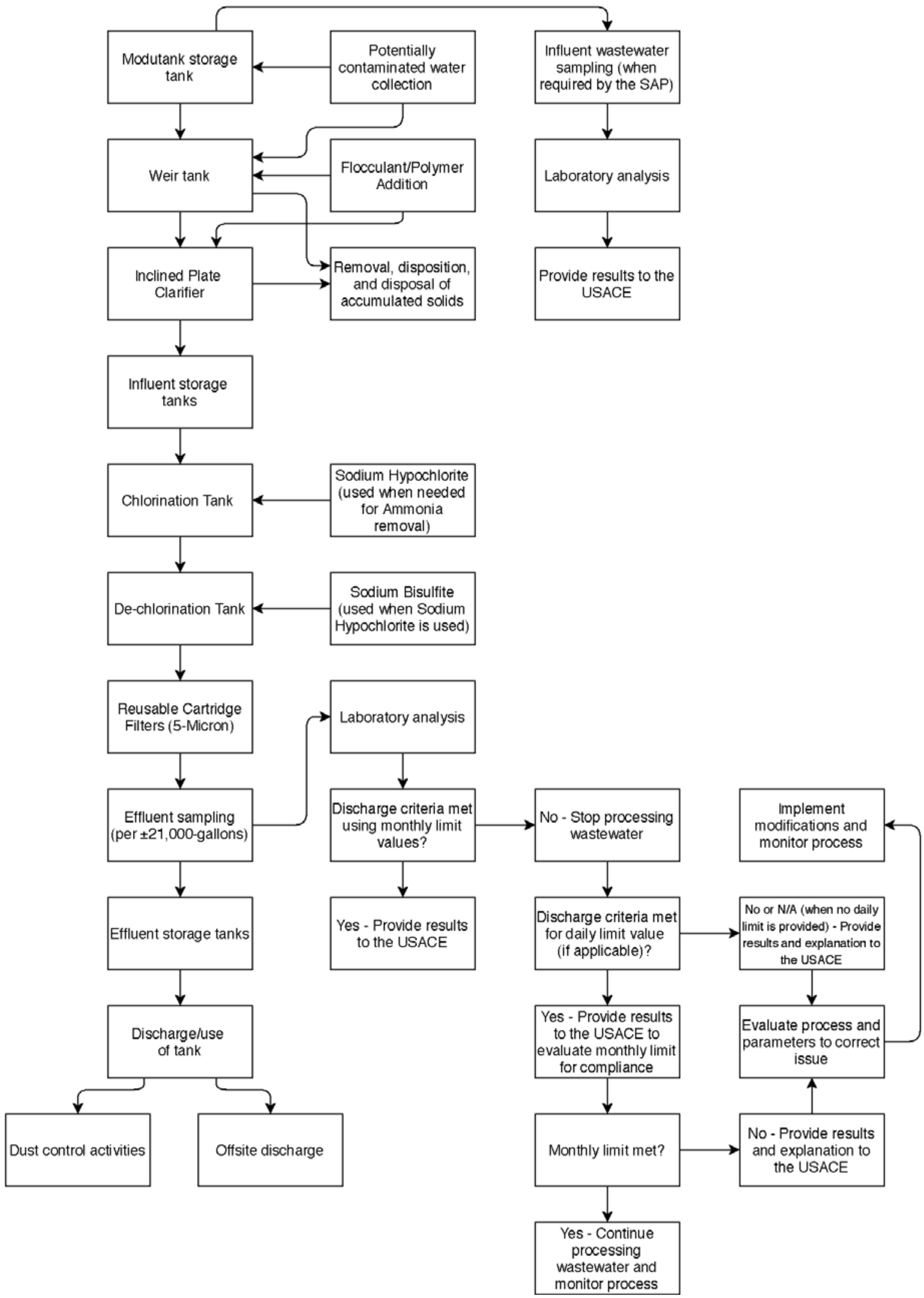

Figure 4A. Wastewater Treatment System Process Flow Diagram – Routine System Operation

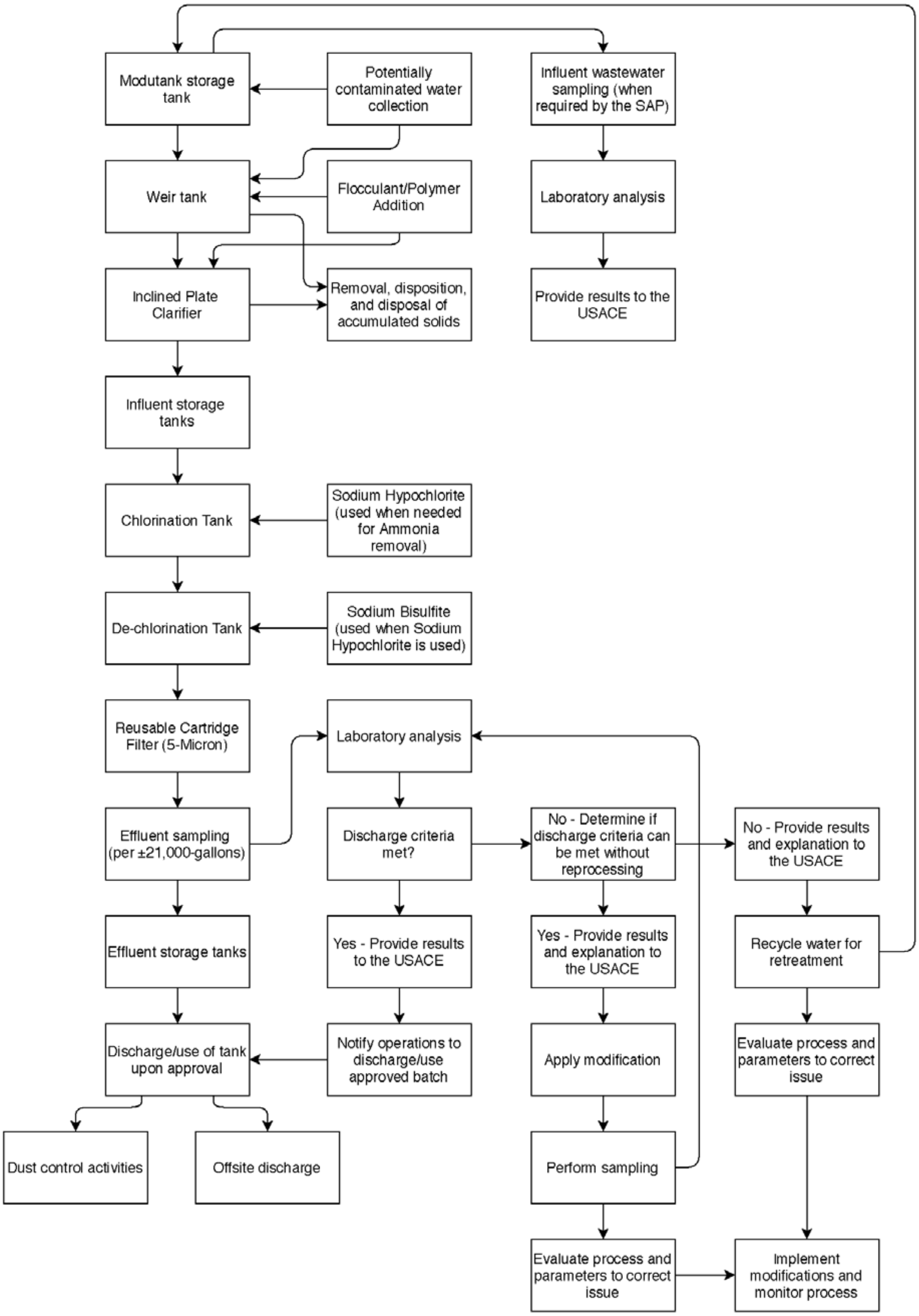

Figure 4B. Wastewater Treatment System Process Flow Diagram – Batch System Operation

Attachment B

Quality Assurance Project Plan Worksheet #17: Sampling Design and Rationale

(UFP-QAPP Manual, Section 3.1.1)
(EPA 2106-G-05, Section 2.3.1)

Water Management
Routine System Operation – Discharge *prior* to receipt of sample results

Based on Table 3-1 of the referenced source for this worksheet, *Guidance for Choosing a Sampling Design for Environmental Data Collection* (EPA 2002), the appropriate sampling approach is systematic sampling of the wastewater treatment system effluent. In the context of the EPA guidance, this selection is based on the need to determine when contamination is present (i.e., when COCs are present above discharge limits), over the time period of interest.

Routine System Operation

During routine system operation, a grab sample of treated effluent water will be collected once per ±21,000 gallons (i.e., one frac tank of volume) in accordance with Table 10A and Table 11 parameters, as described in Worksheet #11. Treated effluent water will be discharged off-site or reused on-site from the effluent storage tanks upon NWP receipt and review of Ammonia-Nitrogen analytical results during routine system operation. Receipt and review of Ammonia-Nitrogen is required unless otherwise directed by the USACE. NWP will provide water volume data (i.e., effluent tank volume) to the USACE at the time of discharge.

Analytical results, including water volume data (i.e., filled effluent tank volume), will be reported to the USACE once they are available and reviewed. Sample results will be submitted within 14 calendar days of sample collection, barring unforeseen issues with laboratory operations (instrumentation failures, data quality discrepancies, etc.). Analytical results will also be recorded in the project database.

This sampling approach was selected because the influent waters are well mixed in the Modutank (±245,000-gallon above-ground storage tank for collected wastewater storage) prior to treatment and significant characterization has occurred for these waters from previous influent sampling. Since the system does not operate continuously (i.e., 24/7), the sample day and time are expected to vary based on wastewater processing needs from week to week. When the wastewater treatment system is in operation, the volume of water stored in the frac tank will be recorded and provided with the treated effluent sample result. Additional details on the sampling procedure can be found in SOP-5524.

Performance Testing

Performance samples may be taken to verify that the wastewater treatment system is operating within its expected parameters and to trend changes in water quality characteristics. These samples will not represent water discharged off-site or reused on-site for dust suppression. These grab samples will be taken from sampling ports on the wastewater treatment system piping. The ports are situated before and after each treatment system component to allow for comparison sampling across the process train. Additional field sampling points may be utilized to collect process grab samples as deemed necessary. Depending on the sampling approach/method, these sample results are logged in daily check sheets, field log books, and/or the project database. Sample results for performance testing are retained in accordance with project records retention policies. These samples will be taken to target parameters of concern (e.g., Ammonia-Nitrogen in summer months) to verify wastewater treatment system performance with respect to these parameters. Field instruments, the on-site laboratory, or off-site laboratories may be used to analyze these samples to minimize the turnaround time for sample results.

1. **The physical boundaries for the area under study (include maps or diagrams).**

   The study area is the influent water storage tank (245,000-gallon modular storage tank – "Modutank"), the weir tank (18,000-gallon tank for flocculant mixing), the inclined plate clarifier, the flocculant/polymer dosing system, the influent storage tanks (two 21,000-gallon frac tanks), the enhanced ammonia removal system (chlorination system, de-chlorination system, aeration systems, and reusable cartridge filters) and the effluent storage tanks (four 21,000-gallon frac tanks).

2. **The time period being represented by the collected data.**

   The time period represented is the time for treatment of one effluent tank volume (i.e., every ±21,000 gallons).

3. **The descriptions and basis for dividing the site into sampling areas (decision units, exposure units, etc.) that support the decision statements documented on Worksheet #11.**

   The decision unit is derived from the decision statement, "reuse or discharge the treated water."

4. **The basis for the number and placement of samples within sampling areas.**

   The basis for number and placement of samples is the expected mixing occurring during collection of influent waters in the Modutank, resulting in a homogeneous liquid. As these waters are continuously mixed throughout the remainder of the wastewater treatment system process, a representative sample can be obtained by one grab sample during routine system operation. In addition to the treated effluent water sampling for compliance, the project team performs additional ongoing field and laboratory sampling to continuously monitor wastewater treatment system performance and to trend changes in water quality characteristics to ensure continuing compliance.

5. **If sample locations are specified in the QAPP, descriptions of how actual sample positions will be located once in the field. (Include maps or diagrams.)**

   Samples will be collected from the sample port on the process effluent line after the last element of the treatment process. This port is immediately prior to the point that water enters the effluent storage tanks. Various points throughout the process will be utilized to collect performance testing samples.

6. **If a sample cannot be collected where planned, the decision process for changing the location.**

   The decision process for changing sampling locations would be determined and conducted in conjunction with USACE personnel/direction.

7. **If sample locations will be determined in the field, the decision process for doing so.**

   Sample locations are not determined in the field.

8. **Contingencies in the event field conditions are different than expected and could have an effect on the sample design.**

   Contingencies in the event that field conditions are different than expected, affecting the sample design, would be discussed, evaluated, and the design modified in conjunction with USACE personnel/direction.

Quality Assurance Project Plan Worksheet #17: Sampling Design and Rationale

(UFP-QAPP Manual, Section 3.1.1)
(EPA 2106-G-05, Section 2.3.1)

Water Management
Batch System Operation – Discharge *after* receipt of sample results

Based on Table 3-1 of the referenced source for this worksheet, *Guidance for Choosing a Sampling Design for Environmental Data Collection* (EPA 2002), the appropriate sampling approach is systematic sampling of the wastewater treatment plant effluent. In the context of the EPA guidance, this selection is based on the need to determine when contamination is present (i.e., when COCs are present above discharge standards), over the time period of interest (i.e., per batch treated).

Batch System Operation

Batch system operation will be implemented under the following instances:

- When performing a change in the treatment process that would affect system performance.
- When a change in field conditions or work area occurs and it is anticipated that the influent water quality may be different.
- When directed to do so by the USACE.
- When analytical results present a data trend that indicates it would be prudent to do so.

Batch processing will be implemented, at minimum, at the beginning of a new Task Order (i.e., work area) and be performed for 10 treated effluent samples (i.e., batches) in accordance with the parameters in Table 10A, Table 10B, and Table 11, as described in Worksheet #11. Treated effluent water will not be discharged off-site or reused on-site from the effluent storage tanks until the sample results are received, reported to the USACE, and approved by the USACE during batch system operation.

During batch system operation, a grab sample of treated effluent water will be collected once per ±21,000 gallons of treated water (i.e., a batch). This sample will be collected from the sample port on the process effluent line after the last element of the treatment process. This port is immediately prior to the point that water enters the effluent storage tanks. Once 10 batches of treated water have been demonstrated to have consistently met the discharge limits and USACE approval has been obtained, the sampling of treated effluent water will continue to be one time per ±21,000 gallons and the wastewater treatment system will return to routine system operation.

Analytical results will be compared to the discharge limits in Table 10A, Table 10B, and Table 11, as described in Worksheet #11. Analytical results will be reported to the USACE once they are available and reviewed. Sample results will be submitted within 14 calendar days of sample collection, barring unforeseen issues with laboratory operations (instrumentation failures, data quality discrepancies, etc.). Analytical results will also be recorded in the project database. Additional details on the sampling procedure can be found in SOP-5524.

Performance Testing

Performance samples may be taken to verify that the wastewater treatment system is operating within its expected parameters and to trend changes in water quality characteristics. These samples will not represent water discharged off-site or reused on-site for dust suppression. These grab samples will be taken from sampling ports on the wastewater treatment system piping. The ports are situated before and after each treatment system component to allow for comparison sampling across the process train. Additional field sampling points may be utilized to collect process grab samples as deemed necessary. Depending on the sampling approach/method, these sample results are logged in daily check sheets, field log books, and/or the project database. Sample results for performance testing are retained in accordance with project records retention policies. These samples will be taken to target parameters of concern (e.g., Ammonia-Nitrogen in summer months) to verify wastewater treatment system performance with respect to these parameters. Field instruments, the on-site laboratory, or off-site laboratories may be used to analyze these samples to minimize the turnaround time for sample results.

1. **The physical boundaries for the area under study (include maps or diagrams).**

   The study area is the influent water storage tank (245,000-gallon modular storage tank – "Modutank"), the weir tank (18,000-gallon tank for flocculant mixing), the inclined plate clarifier, the flocculant/polymer dosing system, the influent storage tanks (two 21,000-gallon frac tanks), the enhanced ammonia removal system (chlorination system, de-chlorination system, aeration systems, and reusable cartridge filters), and the effluent storage tanks (four 21,000-gallon frac tanks).

2. **The time period being represented by the collected data.**

   The time period represented is the time for treatment of one batch, i.e., approximately one effluent tank volume (i.e., every ±21,000 gallons).

3. **The descriptions and basis for dividing the site into sampling areas (decision units, exposure units, etc.) that support the decision statements documented on Worksheet #11.**

   The decision unit (one effluent tank volume) is derived from the decision statement, "reuse or discharge the treated water batch."

4. **The basis for the number and placement of samples within sampling areas.**

   The basis for number and placement of samples is the expected mixing occurring during collection of influent waters in the Modutank, resulting in a homogeneous liquid. As these waters are continuously mixed throughout the remainder of the wastewater treatment system process, a representative sample can be obtained by one grab sample during batch system operation. This sample will be collected from the sample port on the effluent line after the last element of the treatment process. This port is immediately prior to the point that water enters the effluent storage tanks (i.e., frac tanks). In addition to the treated effluent water sampling for compliance, the project team performs additional ongoing field and laboratory sampling to continuously monitor wastewater treatment system performance and to trend changes in water quality characteristics to ensure continuing compliance.

5. **<u>If sample locations are specified in the QAPP, descriptions of how actual sample positions will be located once in the field. (Include maps or diagrams.)</u>**

   Samples will be collected from the sample port on the process effluent line after the last element of the treatment process. This port is immediately prior to the point that water enters the effluent storage tanks. Various points throughout the process will be utilized to collect performance testing samples.

6. **<u>If a sample cannot be collected where planned, the decision process for changing the location.</u>**

   The decision process for changing sampling locations would be determined and conducted in conjunction with USACE personnel/direction.

7. **<u>If sample locations will be determined in the field, the decision process for doing so.</u>**

   Sample locations are not determined in the field.

8. **<u>Contingencies in the event field conditions are different than expected and could have an effect on the sample design.</u>**

   Contingencies in the event that field conditions are different than expected, affecting the sample design, would be discussed, evaluated, and the design modified in conjunction with USACE personnel/direction.

Attachment C

Quality Assurance Project Plan Worksheet #15: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits (where applicable)

(UFP-QAPP Manual, Section 2.6.2.3 and Figure 15)

(EPA 2106-G-05, Section 2.2.6)

Matrix: Water

Table 52. Project Action Limits and Laboratory-Specific Detection/Quantitation Limits (Matrix: Water)

Method: Inorganics – EPA 6020 – ICPMS

Analyte	Limit (mg/L)	LOD (mg/L)	LOQ (mg/L)
Antimony	0.19	0.0005	0.005
Arsenic, Inorganic	0.1	0.00005	0.001
Barium	0.22	0.0002	0.005
Beryllium	0.044	0.00005	0.001
Cadmium	0.0048	0.00005	0.001
Chromium	0.1	0.00005	0.001
Copper	0.02	0.00005	0.001
Lead	0.019	0.0002	0.001
Nickel	0.11	0.0002	0.005
Selenium	0.005	0.00005	0.001
Silver	0.0013	0.00005	0.001
Thallium	0.017	0.0002	0.001
Zinc	0.25	0.0002	0.005

Method: Mercury in Water by EPA 1631 – Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry

Analyte	Limit (ng/L)	LOD (ng/L)	LOQ (ng/L)
Mercury	1.3	0.2	0.5

Method: HASL-300M – Alpha Spectroscopy modified with Eichrom columns

Analyte	Limit (pCi/L)	MDC (pCi/L)	DL (pCi/L)
Thorium-228	200	3	1.5
Thorium-230	100	3	1.5
Thorium-232	30	3	1.5
Uranium-234	300	3	1.5
Uranium-238	300	3	1.5
Radium-226	60	3	1.5

Table 52. (continued)

Method: Volatile Organics by EPA 8260 – Gas Chromatography/Mass Spectroscopy (GC/MS)

Analyte	Limit (mg/L)	LOD (mg/L)	LOQ (mg/L)
Benzene	0.005	0.0003	0.001
Carbon Tetrachloride	0.005	0.0003	0.001
1,2-Dichloroethane	0.005	0.0003	0.001
1,1-Dichloroethene	0.005	0.0003	0.001
cis-1,2-Dichloroethene	0.005	0.0003	0.001
trans-1,2-Dichloroethene	0.005	0.0003	0.001
Ethylbenzene	0.005	0.0003	0.001
Hexachlorobutadiene	0.00024	0.0003	0.001
Tetrachloroethene	0.005	0.0003	0.001
Toluene	5	0.0003	0.001
Chloroform	0.005	0.0003	0.001
1,1,1-Trichloroethane	0.005	0.0003	0.001
1,1,2-Trichloroethane	0.005	0.0003	0.001
Trichloroethene	0.005	0.0003	0.001
Vinyl Chloride	0.005	0.0003	0.001
Xylenes (Total)	0.015	0.0003	0.001

Method: Semivolatile Organics EPA 8270 – GC/MS

Analyte	Limit (mg/L)	LOD (mg/L)	LOQ (mg/L)
Benzo(a)pyrene	0.00006	0.0000292	0.0000974
Bis(2-ethylhexyl) Phthalate (BEHP and DEHP)	0.0084	0.000292	0.000974
2,4-Dinitrotoluene	0.044	0.00292	0.00974
Hexachloroethane	0.0067	0.00292	0.00974
2-Methylphenol (cresol)	0.019	0.00292	0.00974
3-Methylphenol (m-cresol)	0.019	0.00360	0.00974
Pyridine	0.02	0.00292	0.00974
2,4,5-Trichlorophenol	M&R	0.00292	0.00974
2,4,6-Trichlorophenol	0.0049	0.00292	0.00974

Analyte	Limit (µg/L)	LOD (µg/L)	LOQ (µg/L)
Hexachlorobenzene	0.00045	0.00602	0.0200

Method: Polychlorinated Biphenyls by EPA 8082 – GC/ECD

Analyte	Limit (µg/L)	LOD (µg/L)	LOQ (µg/L)
PCBs	0.000026	0.0328	0.0984

Method: Free Cyanide by EPA 335.2, 335.3, or 335.4 – Colorimetry

Analyte	Limit (mg/L)	LOD (mg/L)	LOQ (mg/L)
Cyanide (Total)	0.0052	0.00167	0.005

Table 52. (continued)

Method: Fluoride by EPA 340.2 – Ion Selective Electrode

Analyte	Limit (mg/L)	LOD (mg/L)	LOQ (mg/L)
Fluoride	2	0.02	0.1

Method: Ammonia by EPA 350.1 – Ammonia by Automated Colorimetry

Analyte	Limit (mg/L)	LOD (mg/L)	LOQ (mg/L)
Ammonia (May 1 through October 31)	1	0.017	0.05
Ammonia (November 1 through April 30)	4	0.017	0.05

Method: CBOD by SM5210B – Carbonaceous Biochemical Oxygen Demand

Analyte	Limit (mg/L)	LOD (mg/L)	LOQ (mg/L)
CBOD	10	1	2

Method: Chlorine by HACH 8370 – EPA DPD Method (HACH DR3900 Field Instrument)

Analyte	Limit (mg/L)	LOD (mg/L)	LOQ (mg/L)
Chlorine	M&R	0.001	0.002

Method: Dissolved Oxygen by HACH 10360 – Dissolved Oxygen by Luminescence (HACH LDO2 Field Probe)

Analyte	Limit (mg/L)	LOD (mg/L)	LOQ (mg/L)
Dissolved Oxygen	5 (minimum)	0.05	0.1

Method: pH Electromagnetic Measurement by SW-846 Test Method 9040C – PH

Analyte	Limit (SU)	LOD (SU)	LOQ (SU)
pH	6.5 – 9.0	N/A	N/A

mg/L milligrams per liter
ng/L nanograms per liter
pCi/L picocuries per liter
SU standard unit
µg/L micrograms per liter