RMRS Rocky Mountain Remediation Services, LLC
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PROCEDURE

CONSOLIDATED WATER TREATMENT FACILITY
CHEMICAL CLEANING OPERATIONS

RMRS/OPS-PRO-CWTF.168
Revision 0
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APPROVED: _____
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1.0 PURPOSE

This procedure describes the administrative and operations steps used at the Rocky Flats Environmental Technology Site (RFETS) for chemical cleaning operations for the Microfiltration (MF) system of the Consolidated Water Treatment Facility (CWTF). The operating instructions include detailed descriptions and instructions for safe chemical cleaning operations.

This procedure implements the requirements for chemical cleaning of the microfiltration membranes in the MF treatment system at the CWTF. This procedure was established to ensure that the chemical cleaning of the microfiltration membranes in the treatment system is accomplished in a uniform and safe manner.

2.0 SCOPE

This procedure applies to all Water Operations employees and subcontractor personnel.

This document supersedes *Chemical Cleaning Operations Consolidated Water Treatment Facility*, 4-I60-ENV-OPS-FO.42.

This procedure addresses the following topics:

- Chemical cleaning of microfiltration membrane filtration section
- Transfer and treatment of cleaning solutions
- Operator actions in the event of plugged modules.

3.0 OVERVIEW

The Microfiltration treatment system, a subsystem of the Consolidated Water Treatment Facility, consists of a chemical precipitation system, a microfiltration membrane system, chemical handling equipment, pumps and a pH neutralization system for treated effluent. The treatment

system is contained in two trailers (T900A and T900B) located south of the 891 Treatment Facility and is designed to process approximately 40-70 gallons per minute (gpm) of contaminated water. The microfiltration membrane system is located in Trailer T900A.

The microfiltration system includes an integral cleaning unit for filter membrane cleaning. The cleaning unit consists of a cleaning tank, water flush tank, and cleaning pump.

Periodic cleaning of the microfiltration membranes is part of normal operating procedures. Routine chemical cleaning to restore filtration flow rate is part of the treatment system's operating schedule. The cleaning cycle varies, depending upon precipitation and the quality of the influent water to the system. Cleaning may also be required following an operational upset or inadvertent excursions from the normal operating conditions. Chemical cleaning is required if the system is not operated within a 72 hour period.

4.0 LIMITATIONS AND PRECAUTIONS

- Operators shall be trained in the safe handling of all reagents used during chemical cleaning operations of the microfiltration system.
- All operators shall receive training on the requirements of the Consolidated Water Treatment Facility Health and Safety Plan (HASP).
- Operators should be aware of potential pressure build up in transfer lines due to contained, spent cleaning solutions.

5.0 PREREQUISITE ACTIONS

5.1 Field Preparation

CWTF Responsible Manager/Designee

[1] Ensure that the cleaning operations are logged on the Plan of the Day (POD).

Lead Operator/Operator

[1] Ensure that the system is shut down in accordance with RMRS/OPS-PRO-CWTF.167, Consolidated Water Treatment Facility, System Normal Operations Chemical Precipitation /

Microfiltration Process (successor to 4-I59-ENV-OPS-FO.41).

[2] Ensure that the level in the CONCENTRATION TANK TK-8 is at the low limit (less than 50% full). This provides sufficient tank capacity to accept a solids flush and the spent cleaning solution.

[3] Ensure that the cleaning tanks contain the appropriate cleaning solution(s) as prepared in accordance with RMRS/OPS-PRO-CWTF.171, Consolidated Water Treatment Facility, Chemical Handling and Mixing Operations (successor to 4-I63-ENV-OPS-FO.45).

Health and Safety Specialist

[1] Conduct a safety briefing in accordance with the requirements of the HASP covering chemical cleaning operations prior to the chemical cleaning of the microfiltration membranes.

6.0 INSTRUCTIONS

6.1 Chemical Cleaning

Lead Operator/Operator

[1] Verify that all appropriate prerequisite actions in Section 5 have been completed.

[2] Log each chemical cleaning cycle on the CWTF Cleaning Log Sheet in Appendix 1.

[3] Don the appropriate Personal Protective Equipment (PPE) as required in the HASP.

[4] Turn on the air compressor by placing the Compressor Panel C-1 control switch in T900B to AUTO.

[5] Perform the following to prepare for chemical cleaning:

[A] Verify the following pump control switches on the T900A control panels are OFF:

- FP-1 (FEED PUMP)
- CP-1 (CLEANING PUMP)
- TP-11-1 (FILTRATE TRANSFER PUMP)
- PP-8-1 (PROCESS PUMP)
- MP-11-1 (ACID METERING PUMP)

[B] Verify the following manual valves in T900A are CLOSED:

- MV-902
- MV-903
- MV-904
- MV-905
- MV-906
- MV-907
- MV-921
- MV-929

[C] Verify NEUTRALIZATION TANK TK-11 contains at least 56.6 in. of water.

[D] Ensure the pH in TK-11 is 6.5 to 9.5 su. If the pH is outside of this range, see the Responsible Manager.

[E] Verify the following system automatic valves in T900A are OFF.

- AV-908
- AV-909
- AV-911
- AV-912
- AV-913
- AV-914
- AV-915
- AV-916
- AV-917
- AV-918
- AV-919
- AV-930
- AV-935

[F] Verify the CLEANING PUMP CP-1 discharge valve MV-910 is OPEN.

[G] Verify the CLEANING PUMP CP-1 control switch is OFF.

[6] Fill WATER FLUSH TANK TK-10 with clean water to prepare for solids flush by:

[A] Verify that AV-914 and AV-917 control switches are in HAND.

[B] Place the FILTRATE TRANSFER PUMP TP-11-1 control switch in HAND.

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[C] Visually monitor the level increase in TK-10.

[D] When the desired water level in TK-10 is obtained (approximately 250 gallons), THEN place the FILTRATE TRANSFER PUMP TP-11-1 control switch to OFF.

[E] Place the AV-914 and AV-917 control switches in OFF.

[7] Perform the following STEP 1 SOLIDS FLUSH (Solid back to TK-8) manual actions in sequence at the control panel in T900A:

[A] Place the control switch for the following valves in HAND:
- AV-908
- AV-913
- AV-918
- AV-930

[B] Place SEAL FLUSH WATER PUMP TP-11-2 in AUTO.

[C] Place the CLEANING PUMP CP-1 control switch in HAND and flush back to TK-8.

[D] **WHEN** TK-10 reaches low level (approximately 5"-6"), **THEN** place the CLEANING PUMP CP-1 control switch to OFF.

[E] Place the AV-913 control switch in OFF.

[F] Allow drain back to TK-10 for 30 min.

[G] Place the control switch for the following valves OFF.
- AV-918
- AV-930

[8] Fill CHEMICAL CLEANING TANK TK-9 with 250 gallons of clean water to prepare for chemical cleaning by: (switches are located on the T900A control panel)

[A] Verify that AV-914 and AV-915 control switches are in HAND.

[B] Place the FILTRATE TRANSFER PUMP TP-11-1 control switch in HAND.

[C] Visually monitor the level increase in TK-9.

[D] When the desired water level in TK-9 is obtained (approximately 250 gallons), THEN place the FILTRATE TRANSFER PUMP TP-11-1 control switch in the OFF position.

[E] Place AV-914 and AV-915 switches in the OFF position.

NOTE 1 *Chemical transfer may be done as described below in a drum transfer operation (Step 6.1 [8] through [10]) or may be transferred from the bulk hydrogen peroxide storage tank TK-120 in Building 891 (Step 6.1 [11].*

[9] An electric drum pump may be utilized to transfer hydrogen peroxide to TK-9. Transfer five to fifteen (5-15) gallons of hydrogen peroxide (normally 35%) to 250 gallons of water in TK-9 using the following steps:

NOTE 2 *The concentration of the hydrogen peroxide solution being prepared is at the Operator's discretion based upon process knowledge.*

[A] Open the TK-9 access lid.

[B] Place the electric drum pump in the opening at the top of the drum.

[C] Verify that the drum pump control switch is OFF.

[D] Attach the 1-inch polyethylene (poly) hose to the discharge of the drum pump.

[E] Run the poly hose from the drum pump into the TK-9 access lid opening.

[F] Plug the drum pump power cord into a 120V receptacle.

[G] Place the drum pump control switch to ON and pump the contents from the drums into TK-9.

[H] **WHEN** the drum is empty **OR** the required volume has been pumped, **THEN** place the drum pump control switch to OFF.

[10] Repeat steps [5] [A] through [G] until the proper amount of chemical is in TK-9.

[11] Rinse the drum pump stem, and flush the drum pump and hose into TK-9, after transferring chemical to TK-9 as follows:

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[A] Place drum pump into a five gallon rinse water bucket containing approximately 3 gallons of clean water.

[B] Run the poly hose from the drum pump into the TK-9 access lid opening.

[C] Use a squirt bottle filled with clean water to rinse the outer portion of the pump stem.

[D] Place the drum pump control switch to ON and pump the rinse water from the five gallon container into TK-9.

[E] **WHEN** the five-gallon container is empty, **THEN** place the drum pump control switch for the drum to OFF.

[F] Unplug the drum pump.

[G] Drain the transfer hose into TK-9, and store properly.

[H] Excess water may be poured directly into TK-9.

[12] To transfer two to five (2-5) gallons of 50% hydrogen peroxide from the bulk storage tank (T-120) in Building 891 to 250 gallons of water in TK-9 use the following steps:

NOTE 3 *The concentration of the hydrogen peroxide solution being prepared is at the Operator's discretion based upon process knowledge.*

[A] OPEN valve V-81, inlet to PEROXIDE TRANSFER PUMP MP-300-1.

[B] OPEN valve MV-9030 on discharge side of pump MP-300-1.

[C] OPEN MV-933 (chemical inlet) at TK-9.

[D] Ensure that valve MV-934 (chemical inlet) at TK-10 is CLOSED.

[E] Note the start level in T-120 and determine a finish level (marks on tape on the side of the tank) which will indicate that approximately two to five gallons of 50% hydrogen peroxide has been delivered to TK-9. **NOTE: 1 in.= 7.71 gal in T-120.**

[F] Place the switch on MP-300-1 to ON.

[G] Monitor the level in T-120 until the volume of chemical has been transferred.

[H] Place the pump switch to OFF, close valves V-81.

[13] Perform the following STEP 2 CHEMICAL CLEAN (Recirculation to TK-9) manual actions in sequence at the control panel in T900A:

[A] Place the control switch for the following valves in HAND:
- AV-908
- AV-909
- AV-912
- AV-915
- AV-916

[B] Verify SEAL FLUSH WATER PUMP TP-11-2 is in AUTO.

[C] Place the CLEANING PUMP CP-1 control switch in HAND.

[D] Recirculate cleaning solution for at least 10 minutes.

NOTE 4 *The cleaning period can be extended, depending on the degree of membrane fouling and filtrate flow rates, at the operator's discretion. .*

[E] After approximately 10 minutes, place the CLEANING PUMP CP-1 control switch in OFF.

[F] Place the AV-912 control switch in OFF.

[G] Allow drain back to TK-9 for approximately 30 minutes.

[H] Place the control switch for the following valves in OFF.
- AV-908
- AV-915
- AV-916

NOTE 5 *During cleaning there are 5 alarm conditions for which cleaning steps should be placed on hold until the abnormal condition is rectified. Any other alarm conditions will sound as in normal operation but will not affect the cleaning.*

- *Low seal water pressure (if CP-1 is running).*

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- *Concentration Tank TK-8 high level alarm.*
- *Chemical Cleaning Tank TK-9 high level alarm.*
- *Water Flush Tank TK-10 high level alarm.*
- *Neutralization Tank TK-11 level less than 56.6 inches.*

[14] Perform the following STEP 3 WATER FLUSH (Recirculation to TK-10) manual actions in sequence at the control panel in T900A:

[A] Place the control switch for the following valves in HAND:
- AV-914
- AV-917

[B] Place the FILTRATE TRANSFER PUMP TP-11-1 control switch in HAND and fill TK-10 to approximately 250 gallons.

[C] **WHEN** TK-10 reaches full level, **THEN** Place the FILTRATE TRANSFER PUMP TP-11-1 control switch in OFF.

[D] Place the AV-914 control switch in OFF.

[E] Place the control switch for the following valves to HAND:
- AV-908
- AV-913
- AV-917
- AV-918

[F] Verify SEAL FLUSH WATER PUMP TP-11-2 is in AUTO.

[G] Place the CLEANING PUMP CP-1 control switch in HAND.

[H] Recirculate cleaning solution for 3 minutes.

[I] After 3 min, place the CLEANING PUMP CP-1 control switch in OFF.

[J] Place the AV-913 control switch in OFF.

[K] Allow 30 min. for flush water to drain back to TK-10.

[L] Place the control switch for the following valves to OFF.

- AV-908
- AV-909
- AV-917
- AV-918

[15] Transfer TK-10 flush water by:

[A] **IF** transferring to TK-1, **THEN** OPEN valve MV-968, and CLOSE valve MV-969.

OR

[B] **IF** transferring to TK-2, **THEN** OPEN valve MV-969, and CLOSE valve MV-968.

[C] Place the control switch for the following valves in HAND:
- AV-911
- AV-913

[D] Place the CLEANING PUMP CP-1 control switch in HAND and pump rinse water from TK-10 to reaction TK-1 or TK-2.

This step may be accomplished as needed or the cycle may be interrupted at this point.

[E] **WHEN** TK-10 reaches low level (approximately 5"-6"), **THEN** place the CLEANING PUMP CP-1 control switch to OFF.

[F] Place the control switch for the following valves in OFF:
- AV-911
- AV-913

[16] Monitor/adjust reaction tank(s) (TK-1 and/or TK-2) pH and ensure the tank(s) stays within the operating ranges in accordance with RMRS/OPS-PRO-CWTF.167, Consolidated Water Treatment Facility, System Normal Operations, Chemical Precipitation /Microfiltration Process (successor to 4-I59-ENV-OPS-FO.41).

[17] Verify that the following system automatic valves are in OFF:
- AV-908
- AV-909
- AV-911
- AV-912
- AV-913

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- AV-914
- AV-915
- AV-916
- AV-917
- AV-918
- AV-919
- AV-930
- AV-935

[18] Record all activities in the CWTF Operations LogBook.

6.2 Transfer of Cleaning Solutions

6.2.1 Transfer of Peroxide Cleaning Solution for Treatment

The cleaning solution in TK-9 is transferred by the Operator to Reaction Tank TK-1 **OR** TK-2 after use. This step may be performed during processing operations to control pH fluctuations in TK-1.

Lead Operator/Operator

[1] Verify that all appropriate prerequisite actions in Section 5 have been completed.

[2] Don the appropriate PPE as required in the HASP.

[3] Verify valve MV-910 is OPEN.

[4] **IF** transferring to TK-1, **THEN** OPEN valve MV-968, and CLOSE valve MV-969.

OR

[5] **IF** transferring to TK-2, **THEN** OPEN valve MV-969, and CLOSE valve MV-968.

[6] Verify the SEAL FLUSH WATER PUMP TP-11-2 control switch is in AUTO.

[7] Place the control switches for the following automatic valves in HAND:

[A] AV-911,

[B] AV-912 if transferring from TK-9.

[8] Place the CLEANING PUMP CP-1 control switch in HAND to pump solution to the reaction tank.

[9] Monitor reaction tank pH if the system is operating and ensure the tank stays within the operating range as specified in RMRS/OPS-PRO-CWTF.167, Consolidated Water Treatment Facility, System Normal Operations, Chemical Precipitation/Microfiltration Process (successor to 4-I59-ENV-OPS-FO.41).

[10] **WHEN** TK-9 reaches low level (approximately 5"-6"), **THEN** place the CLEANING PUMP CP-1 control switch to OFF.

[11] **IF** PROCESS PUMP PP-8-1 is **NOT** operating, **THEN** place the SEAL FLUSH WATER PUMP TP-11-2 control switch to OFF.

[12] Place the control switches for the following automatic valves in OFF:

[A] AV-911,

[B] AV-912 for TK-9 if placed in HAND in Step [7].

[13] In order to avoid the potential for pressure build-up of the peroxide solution in the piping, verify valve MV-968 (TK-1 inlet) is OPEN and valve MV-969 (TK-2 inlet) is CLOSED.

6.3 Plugged Modules

Lead Operator/Operator

[1] Inform the Responsible Manager that modules must be cleaned.

[2] Record all activities in the CWTF Operations Log Book.

7.0 POST-PERFORMANCE ACTIVITY

CWTF Responsible Manager/Designee

[1] Ensure that the original copy of the following quality-related records, as appropriate, are transmitted to the RMRS Records Center in accordance with RM-6.02, Records Identification, Generation, and Transmittal:

- Cleaning Log Sheet(s)
- CWTF Operations Log Book
- Work Packages, as required
- Qualification/Training Documentation, as required
- Occurrence Reports, as required

Submission of record copies to the RMRS Records Center will satisfy Administrative Record requirements.

There are no nonquality records generated by this procedure.

Management of all records is consistent with RMRS-DC-6.01, Document Control Program.

8.0 REFERENCES

Rocky Flats Environmental Technology Site, Consolidated Water Treatment Facility Health and Safety Plan

RM-6.02, Records Identification, Generation, and Transmittal

RMRS-DC-6.01, Document Control Program

RMRS/OPS-PRO-CWTF.167, Consolidated Water Treatment Facility, System Normal Operations, Chemical Precipitation/Microfiltration Process (successor to 4-I59-ENV-OPS-FO.41)

RMRS/OPS-PRO-CWTF.171, Consolidated Water Treatment Facility, Chemical Handling and Mixing Operations (successor to 4-I63-ENV-OPS-FO.45)

RMRS/OPS-PRO.142, Alarms Response Building 891

APPENDIX 1

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CONSOLIDATED WATER TREATMENT FACILITY
MICROFILTRATION UNIT CLEANING LOG

DATE	TIME	FIT-2 TOTAL GALLONS	FLOW RATE (GPM)		CLEANING SOLUTION (GALLONS)	CLEANING TIME	COMMENTS	OPER.
			BEFORE CLEANING	AFTER CLEANING	PEROXIDE			