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Date Prepared: 02/06/96

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TOTAL PAGES:

BHI-DC-010 (10/94)

200-UP-1 PILOT-SCALE GROUNDWATER TREATMENT SYSTEM OPERATING PROCEDURES

Revision No. 2

Issue Date _____

Author: F. W. Gustafson — Date 1/30/96

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9613401.0529

BHI-OP-00010
Rev. 2

200-UP-1 Pilot-Scale Groundwater Treatment System Operating Procedures

Author
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Date Published
January 1996

HANFORD

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Bechtel Hanford, Inc.
Richland, Washington

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to describe the procedures for operating the 200-UP-1 Groundwater Treatment System for the removal of uranium, technetium, and carbon tetrachloride from groundwater in the 200 West Area. Procedures for performing routine activities, including ion exchange (IX) resin changeout, filter changeout, and system dewatering, have been included as part of this operating procedure (OP). Operation of the treatment system must also comply with all applicable radiation work permits and site safety plans.

1.2 Scope

The treatment system is located within the boundary of the 200-UP-1 Operable Unit southeast of the U Plant near the U-17 Crib in 200 West Area. The treatment system is being operated in accordance with the requirements of the 200-UP-1 IRM Proposed Plan. The treatment system includes:

- Extraction well(s) from which the contaminated groundwater is obtained
- Return well(s) for reinjecting treated groundwater to the aquifer
- Two 20,000-gal storage tanks, one for storage of influent (contaminated groundwater) and one for storage of treated effluent
- A 10,000-gal process water tank that provides water for chemical makeup (if required) and other ancillary uses
- An influent pump station with prefilters and control panel for pumping water through the treatment system into the effluent storage tank
- A process treatment station with main process control panel
- An effluent pumping station with filters and control panel for pumping treated effluent to the return well.

The overall system is connected with a series of 2-in. high-pressure hoses fitted with quick disconnect fittings and power and signal cables. The treatment system utilizes 480-VAC, three-phase power to energize system pumps and is also transformed to 240/120-VAC single-phase for powering ancillary equipment.

The treatment system is capable of being operated 24 hours/day, 7 days/week with limited operator control. A programmable logic controller is used to monitor critical operating parameters and shut the system down in case of abnormal conditions.

1.3 Pre-Startup Check

If the system has been modified, ensure that the appropriate acceptance test has been performed on new components. Acceptance test results are to be documented in the Field Logbook.

Refer to the Process Flow Diagrams (drawing numbers 0200W-DD-JOOO3, 0200W-DD-J0031, and 0200W-DD-J0035) for system operations.

1.3.1 Safety and Readiness Walkthrough

Perform a safety and readiness walkthrough (a physical inspection) of the system, including the storage tanks, extraction and return wells, hoses, process system, and annunciator panel, to verify that the system is functional, properly connected, and ready for safe operation. If discrepant conditions are found, note them in the logbook and on discrepancy log sheet and correct before startup. In checking the hoses, perform a walkdown of the hoses connecting the system following the flow from the extraction well pump to the disposal well to verify integrity:

- Extraction well pump discharges to the Influent Storage Tank inlet manifold
- Influent Storage Tank outlet manifold to the Influent Pump skid suction
- Influent Pump skid discharge to the Process System skid inlet manifold
- From the Inlet manifold to the lead IX column inlet (at top for down flow), then from the bottom of the lead IX column to the inlet (top) of the polish IX column
- From the polish IX column to the inlet of the granular activated carbon (GAC) skid #1
- From the outlet (bottom) of GAC skid #1 to the inlet of GAC skid #2
- GAC skid #2 outlet to the Effluent Storage Tank inlet
- Effluent Storage Tank outlet to the Effluent Pump skid suction
- Effluent Pump skid discharge to the disposal well.

1.3.2 Valves

Verify that all valves are closed [assuming that neither the extraction well(s) nor the effluent pumping system is operating; if so, see Section 1.3.5], including sample valves, and verify that electrical switches are in off (or open) positions.

1.3.3 Influent and Effluent Filter Assemblies

Verify that filter housing assemblies are closed and that filters are ready to accept flow.

1.3.4 Pressure Instruments

Verify that the pressure gauges and differential pressure instruments for monitoring differential pressures of the influent and effluent filters, the activated carbon skids, and the IX columns are operable. In

addition, verify that the influent and effluent storage tank sight gauges or level transmitters/indicators are operable.

1.3.5 Valving

Ensure that all valving associated with the system being started (either the extraction, treatment, or injection systems) are in the closed position. Note: These valves are normally closed when the system has been manually shut down. Verifying all valves are closed prior to startup ensures the operator is familiar with the system configuration prior to startup.

2.0 STARTUP AND OPERATION

To start operations, the individual systems (extraction, treatment, and injection) are to be configured by manually aligning ball valves. Sight level gauges and/or tank level indicators on the Influent and Effluent Storage Tanks, pressure gauges, flowmeters, and differential pressure instruments are used for controlling system processes.

If starting the extraction well, system valves are to be aligned for flow from the Extraction Well Pump(s) to the Influent Storage Tank. When a sufficient volume of extracted groundwater is in the Influent Storage Tank (typically 10 ft), the treatment system is brought on-line using an Influent Pump to move water through a minimum of two filter columns, through two IX columns in series flow, through two GAC treatment system in series flow, and out to the Effluent Storage Tank. When a sufficient volume of treated effluent is in the Effluent Storage Tank (typically 10 ft), the injection system is started by pumping water from the effluent storage tank through a minimum of two canister filters and into the return well.

The system utilizes level controls and flow controls with interlocks to prevent overflowing the tanks, protect pumps from loss of flow, warn of breached hoses, and monitor well levels. Differential pressure instrumentation is used on the filters and IX columns to alarm on high differential pressures, indicating the need for changing filters or backwashing or changing media in the columns.

If the extraction well pumps are operating, skip Section 2.2. If the treatment system is operating, skip Section 2.3. If the injection system is operating, skip Section 2.4.

Tank levels should be maintained at approximately 10 ft, and each of the systems (extraction, treatment, injection) operated at the same flow rate to ensure the treatment system does not shut down as a result of high or low water levels in either of the storage tanks.

2.1 Electrical Power

If the entire treatment system is restarted after a complete shut down, energize power to the control panel by actuating the main control disconnect switch. Only power to the individual pumps to be operated is to be turned on at the disconnect switches located near the pumps.

2.2 Start Extraction Well Pump(s)

Open the following valves for operation of extraction well (all other valves in extraction well system are to be closed):

BV-1, BV-2, BV-5, BV-6, BV-7, BV-8, BV-17 (or BV-18 and BV-19 if rotameter loop is to be used), and BV-22.

Valve BV-8 is used to control the flow rate from extraction well. When starting well, open BV-8 approximately 50%.

2.2.1 Valve MBV-1

Open Motor-Operated Ball Valve MBV-1 by pressing the MBV-1 reset button and setting the MBV-1 switch to the Manual position.

2.2.2 Control Panel

Verify that the following lights on the influent pumping station control panel or the main control center panel are not illuminated:

- Influent Storage Tank level, "High"
- Influent Storage Tank level, "High, High."

Refer to Section 7.0 if these indicator lights are illuminated.

2.2.3 Start Extraction Well Pump

Start Extraction Well Pump by holding in the appropriate "Start" pushbutton until flow is established. Watch for flow on FIT-1A and makeup of flow switch FS-1A. Release the pushbutton once flow is established. If flow cannot be established, refer to step 2.2.7.

2.2.4 MBV-1 Selector Switch

Switch MBV-1 selector switch to the Auto position.

2.2.5 Set Flow Rate

Use throttle valve BV-8 to set flow rate from extraction well to desired level.

2.2.6 Control Panel

Verify that the following lights on the influent pumping station control panel or the main control center panel are not illuminated:

- Influent Storage Tank Level, "High"
- Extraction Well Level Low, LSL-1A
- FS-1A
- Influent Storage Tank Level, "High High."

Refer to Section 7.0 if these indicator lights are illuminated.

2.3 Start Treatment System

2.3.1 Ball Valve Configuration

The ion-exchange treatment system may be operated under three possible configurations, depending upon which column is designated lead, polish, and reserve. The ball valves to be opened for operating under each configuration are described below. The operator shall verify the system configuration before positioning of valves for operation. The configuration being used will be documented in the Field Logbook and noted on the startup checksheet (Figure 2.1).

Regardless of which configuration is used, the following ball valves shall be opened.

- BV-23, BV-29, BV-43, BV-44, BV-45, BV-50, BV-95, BV100, BV-141, BV-147, BV-150, BV-155, BV-156, BV-161, BV-169, BV-170, BV-171, BV-172, and BV-173. In addition, a minimum of two filter columns must be valved open. Open BV-35 and BV-39 for column F-1A, BV-36 and BV-40 for column F-1B, BV-37 and BV-41 for column F-2A, and BV-38 and BV-42 for column F-2B.

- If running Influent Pump P-2A, fully open BV-31 and open BV-32 approximately 50%. BV-32 is used to control the flow rate (and operating pressures) of the treatment system when operating P-2A.

- If running Influent Pump P-2B, fully open BV-33 and open BV-34 approximately 50%. BV-34 is used to control the flow rate (and operating pressures) of the treatment system when operating P-2B.

Configuration 1: Tank 2 is lead, tank 3 is polish, and tank 4 is reserve. For operations using this configuration, open BV-51, BV-54, BV-55, BV-58, BV-61, BV-64, BV-65, BV-68, BV-90 and BV-91.

Configuration 2: Tank 3 is lead, tank 4 is polish, and tank 2 is reserve. For operations using this configuration, open BV-61, BV-64, BV-65, BV-68, BV-71, BV-74, BV-75, BV-78, BV-91 and BV-92.

Configuration 3: Tank 4 is lead, tank 2 is polish, and tank 3 is reserve. For operations using this configuration, open BV-71, BV-74, BV-75, BV-78, BV-51, BV-54, BV-55, BV-58, BV-90 and BV-92.

2.3.2 Motor-Operated Ball Valves

Open motor-operated ball valve MBV-2 by pressing the MBV-2 reset button and setting the MBV-2 switch to the auto position.

Open motor-operated ball valve MBV-3 by pressing the MBV-3 reset button and setting the MBV-3 switch to the auto position.

Figure 2.1. 200-UP-1 Startup Checklist.

200-UP-1 STARTUP CHECKLIST

SYSTEMS STARTED
Extraction _____
Treatment _____
Injection _____

DATE _____

OPERATOR(S)
_____
_____
_____

TASK	OPERATOR INITIALS/DATE	COMMENTS/DISCREPANCIES
Pre-Startup Check (Section 1.3) Safety walk through Instrumentation Check Valving		
Energize Power for Operations		
Extraction System Startup (Section 2.2) Valving Alignment Tank level check Start Pump Set MBV-1 to auto Set flow rate Interlock/pressure checks		
Treatment System Startup (Section 2.3) Valving Alignment Tank level check Start Pump Set MBV-2 and MBV-3 to auto Set flow rate Interlock/pressure checks		
Injection System Startup (Section 2.4) Valving Alignment Tank level check Start Pump Set MBV-4 to auto Set flow rate Interlock/pressure checks		

2.3.3 Start Influent Pump

Start either Influent Pump P-2A or P-2B by holding in the appropriate "Start" pushbutton until flow is established. Watch for and makeup of FS-2, FS-3, and FS-4. Release the pushbutton once flow is established. If flow cannot be established, refer to step 2.3.6.

2.3.4 Set Flow Rate

Use throttle valve (BV-32 for pump P-2A, or BV-34 for pump P-2B) and FIT-2 to set flow rate. **Flow rate shall not exceed 70 gal/min (required for a minimum contact time of 4 min). The pressure in the IX column shall not exceed 65 psig (these vessels are rated at 70 psig maximum).** These pressures are determined using PI-7 for tank 2, PI-10 on tank 3, and PI-13 on tank 4. PSH1 will shut the influent feed pumps down if 65 psig is exceeded upstream of the IX columns; PSH2 and PSH3 will shut the system down if the inlet pressure to the GAC columns exceeds 25 psig. FSH-7 will shut the system down if the treatment flow rate exceeds 70 gal/min.

2.3.5 Annunciator Panel

Verify that the following lights on the annunciator panel are not illuminated.

- Flow switch FS-2
- Flow switch FS-3
- Flow switch FS-4
- Flow switch high FSH-7
- Influent Storage Tank Level, "Low"
- Effluent Storage Tank Level, "High"
- Effluent Storage Tank Level, "High High."

Refer to Section 7.0 if these indicator lights are illuminated.

2.4 Start Effluent Pump

When the Effluent Storage Tank has a sufficient volume of treated effluent (approximately 10 ft), an Effluent Pump is started as follows to discharge the treated effluent into the selected disposal well.

2.4.1 Ball Valves

The following ball valves (BV) are to be positioned before startup of the Effluent Pump(s).

- If running Effluent Pump P-5A, open BV-101, BV-105, BV-108, BV-116, BV-117, BV-130, BV-132, BV-135, and GV-134. Open BV-110 approximately 75% (this valve is used to control the flow rate when operating pump P-5A).

- If running effluent pump P-5B, open BV-101, BV-105, BV-109, BV-116, BV-117, BV-130, BV-135, and GV-134. Open BV-111 approximately 75% (this valve is used to control the flow rate when operating pump P-5B).

In addition, a minimum of two filter columns must be valved open (all four filters are used under normal operating conditions). Open BV-112 and BV-114 for columns F3A and F3B, BV-113 and BV-115 for columns F4A and F4B.

- Once the injection system has been started, close BV-132 and open BV-112 (this will create a siphon effect in the injection line.

2.4.2 Annunciator Panel

Verify that the following annunciator lights on the annunciator panel are not illuminated:

- Disposal Well level, "High"
- Effluent Storage Tank level, "Low."

2.4.3 Pumps P-5A/P-5B

Start either effluent pump P-5A or P-5B by holding in the appropriate "Start" pushbutton until flow is established. Watch for flow on FIT-3 and makeup of FS-5 and FS-6. Release the pushbutton once flow is established. Use throttle valve BV-110 for pump P-5A or BV-111 for pump P-5B, to set desired flow rate. If flow cannot be established, refer to step 2.4.4.

2.4.4 Annunciator Lights

Verify that the following annunciator lights on the annunciator panel are not illuminated:

- Disposal Well Level, "High"
- Effluent Storage Tank Level, "Low"
- FS-5
- FS-6.

Refer to Section 7.0 if these indicator lights are illuminated.

2.4.5 Startup Check Sheet

The startup check sheet (Figure 2.1) shall be completed each time the extraction, treatment, and/or injection systems are started. The completed check sheet shall be placed in the field logbook and a copy provided to the 200-UP-1 Task Lead as soon as practicable.

2.4.6 Operational Data and Summary Sheets

The operational data sheet (Figure 2.2) shall be completed at a minimum of two times per normal work day at approximately 8 A.M. and 3 P.M. A new operational data sheet shall be used each time the treatment system column configuration is changed. The data summary sheets (Figure 2.3) shall be complete at the end of each shift (after the second set of operational readings has been recorded).

These sheets shall be placed in the field logbook and a copy provided to the 200-UP-1 Task Lead every Thursday by 10 A.M. (or the next working day if Thursday is a holiday) or as soon as practicable.

CONFIGURAITON 1 ___
CONFIGURATION 2 ___
CONFIGURATION 3 ___

200-UP-1 OPERATIONAL DATA SHEET

		SYSTEM FLOW RATES			SYSTEM POINT PRESSURES										
DATE	TIME	FIT-1A	FIT-2	FIT-3	PI-18	PI-1	PI-2	PI-4	PI-7	PI-10	PI-13	PI-22	PI-32	PI-14	PI-19

Figure 2.2. 200-UP-1 Operational Data Sheet. (sheet 1 of 2)

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CONFIGURAITON 1 ___
CONFIGURATION 2 ___
CONFIGURATION 3 ___

200-UP-1 OPERATIONAL DATA SHEET

DATE	SYSTEM DIFFERENTIAL PRESSURES							EXTRACTION FLOW (GAL) TOTALIZER	INJECTION FLOW (GAL) TOTALIZER	INFLUENT TANK LEVEL (ft)	EFFLUENT TANK LEVEL (ft)	OPERATOR INITIALS
	PDIT-1	PDIT-2	PDIT-3	PDIT-4	PDIT-7	PDIT-8	PDIT-6					

Figure 2.2. 200-UP-1 Operational Data Sheet. (sheet 2 of 2)

PUMP AND TREAT OPERATIONAL DATA SUMMARY FOR THE _____ O.U.

OPERATIONAL DATA	THURDSAY	FRIDAY	WEEKEND	MONDAY	TUESDAY	WEDNESDAY	SEVEN DAY TOTAL
DATE							
HOURS OF EXTRACTION (gallons)							
HOURS OF TREATMENT (gallons)							
HOURS OF INJECTION (gallons)							
VOLUME EXTRACTED (gallons)							
VOLUME INJECTED (gallons)							
TIME OF AM READINGS							
TIME OF PM READINGS							
OPERATOR INITIALS							

RECORD ALL OPERATIONAL HOURS TO THE NEAREST 15 MINUTE INCREMENT
TABLE SHOULD BE UPDATED UPON COMPLETING PM READINGS
THE OPERATIONAL DAY BEGINS AT 3:PM (data logged for a Tuesday begins at 3:00 pm on Monday and ends at 3:00 pm on Tuesday)
PM readings should be taken as near to 3:00 pm as possible (on normal workdays))

Figure 2.3. Data Summary Sheets. (sheet 1 of 2)

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Figure 2.3. Data Summary Sheets. (sheet 2 of 2)

OPERATIONAL INFORMATION

WEEK OF:_____

THURSDAY	
FRIDAY	
SATURDAY	
SUNDAY	
MONDAY	
TUESDAY	
WEDNESDAY	

NOTE: RECORD ALL INFORMATION PERTINANT TO OPERATION OF THE TREATMENT SYSTEM. THIS INCLUDES ALL DOWNTIME (based on a 24hr/day clock), FILTER AND RESIN CHANGOUTS, COLUMN CONFIGURATION CHANGES, SAMPLING ACITIVITIES (include HEIS numbers, locations and date submitted to the laboratory).

2.5 Backwash Procedure

When new IX resin or GAC is loaded into the process columns and before it is placed into service, it must be backwashed to remove fines and color bodies. The process engineer may also schedule a column backwash to reduce the pressure drop across the column. When a backwash is to be done, the Treatment System (NOTE: The extraction/injection systems remain operating if tank levels allow) may be required to be shut down depending on the backwash configuration used. Two pumps are available for use for backwashing; the backwash pump (located on the Process Skid) and the gas motor-operated pump. Backwashing can only be performed if sufficient treated or clean water exists in the Effluent Storage Tank (approximately 3-5,000 gal) and there is sufficient storage capacity in the influent storage tank.

Backwashing is performed manually. To set up for backwash, perform the following.

NOTE: The GAC column should be filled 50-70% with GAC. After filling with GAC, it is advisable to fill the tank with water and allow the tank to soak overnight before backwashing operations begin.

2.5.1 Effluent Storage Tank Connection

Connect a hose from the Effluent Storage Tank (near BV-123) to the quick disconnect on the suction side of the backwash pump (or to the suction of the gas motor-operated pump).

2.5.2 Backwash Pump Connection

Connect a hose from the discharge of the backwash pump (or to the suction of the gas motor-operated pump) to the Process Manifold inlet, just upstream of FS-3 or to a portable rotometer. This will provide flow control for the backwash.

2.5.3 Column Connection

Connect a hose from the quick disconnect at the outlet of the manifold (just downstream of BV-50) or the outlet of the portable rotometer, to the bottom of the column to be backwashed (near BV-58, BV-68, BV-78, BV-171, or BV-173).

2.5.4 Backwash Solution

The backwash solution will be sent back through the Influent Filters or a portable filtration system, to remove solids and then into the Influent Storage Tank. If the treatment system influent filters and/or the outlet manifold to the influent storage tank are used, shut down the treatment system per section 3.0 of this procedure **(CAUTION: Be sure all portions of the treatment system have been depressurized prior to disconnecting any hoses)**. If using the influent filters, connect a hose from a quick disconnect at the top of the IX Column (or GAC skid) being backwashed to BV-29 at the inlet of the Influent Filters (flow will be through pumps P-2A or P-2B) and a hose from BV-45 (filter outlet) to an available inlet on the Influent Storage Tank. Note: If the outlet manifold on the influent storage tank is used, MBV-2 must be opened in the manual mode.

If a portable filtration system is used, connect a hose from the top of the column being backwashed to the inlet of the filters and from the outlet of the filters to an inlet on the influent storage tank.

2.5.5 New Media

Backwash new media in each column for approximately 1 to 2 hours. After 1 hour of backwashing, take a sample of the backwash water in a clear beaker/jar. Take sample from sample port located near BV-30 if influent filters are used (prior to filtering the backwash solution). If portable filter system is used, make sure a sample port is available upstream of filters. Backwash media until the solution turns clear (carbon fines, fractured resin beads, or color bodies contribute to the color). As stated above, this may require approximately 1,000 to 3,000 gal per column and may take approximately 1 to 2 hours. The backwash rate should be sufficient to expand the bed 30% to 50% and should require approximately 20 gal/min for both the IX resin and the GAC. **CAUTION: Be sure not to exceed the 65 psig pressure rating on the IX columns or the 25 psig pressure rating on the GAC columns.**

2.5.6 Normal Processing Water Flow

When backwash is complete, secure hoses and valves and make correct hose connections to allow establishing normal processing water flow as described in Section 1.3.

2.5.7 Documentation

Table 2.1 is provided to document these steps. A copy of the completed checklist is to be maintained in the field files.

2.6 System Dewatering Procedure

Routine maintenance activities and freezing weather conditions may require that system components be periodically dewatered. Removal of water from the system is accomplished using compressed air to push the water from the system into either the influent or effluent storage tanks. The separate stages of the system (extraction, process, and effluent pumping system) can be isolated from one another and therefore dewatered separately.

CAUTION: Do not exceed 50 psig air pressure when dewatering the system (or 25 psig when dewatering the GAC columns). Relieve the air pressure from the lines after dewatering the system(s) to ensure that freezing weather conditions/ice blockage do not create localized high-pressure areas that may injure maintenance or operating personnel. Do not use compressed air to blow out ice from a line.

2.6.1 Extraction Well Dewatering

- Extraction Well:
  - Connect air hose from compressor to air fitting located near BV-4. Turn on air compressor and pressurize air hose to 30-40 psig.
  - Ensure BV-3, BV-7, BV-8, BV-17 (or BV-18 and BV-19), BV-22, and MBV-1 are open. All other valves in extraction well system are to be closed (including BV-4).

Table 2.1. Backwash of IX Columns.

OPERATOR: _____ **DATE:** _____

	Backwash Checklist	Verified/Date
1.	Verify that sufficient backwash water is available for backwashing. (Shut down treatment system if necessary)	
2.	Connect a hose from the Effluent Storage Tank to the suction of the backwash pump (or the gas motor operated pump) as described in Section 2.6.1.	
3.	Connect a hose from the backwash pump (or gas pump) discharge to the inlet of the Process Manifold or portable rotometer as in Section 2.6.2. **Be sure all portions of the treatment system have been depressurized prior to disconnecting any hose.**	
4.	Connect a hose from the quick disconnect at the outlet of the process manifold or portable rotometer to the bottom of the column being backwashed as in Section 2.6.3.	
5.	Connect a hose from a quick disconnect at the top of the column being backwashed to the inlet of the Influent Filters or portable filters, and a hose from the filter outlet to an inlet manifold on the Influent Storage Tank.	
6.	Backwash new media at 20 gal/min for approximately 1 to 2 hours. (Refer to Section 2.5.5 of this procedure.) **Do not exceed 65 psig on IX columns or 25 psig on the GAC columns (monitor frequently).**	
7.	When backwash is complete, secure hoses and valves and make correct hose connections to allow establishing normal processing water flow as described in Section 1.3.	

- Slowly open BV-4, pressurizing extraction well manifold forcing the stagnant water into the influent storage tank. Once air is heard entering the tank, elevate the high-pressure flexible hosing beginning at the well head and working towards the influent manifold on the influent storage tank. Close BV-22 to prevent water from re-entering the lines.

- Relieve air pressure from system through the air vacuum valve by opening BV-2 and BV-6. Air pressure can also be relieved by releasing pressure at the air compressor through the line pressure regulator.

- Close BV-4 and disconnect air hose.

2.6.2 Process Treatment System

- Connect air hose from compressor to air fitting located near BV-30. Turn on air compressor and pressurize air hose to 30-40 psig.

- Ensure all ball valves on the process system that were open during processing are open, including MBV-2 and MBV-3. BV-30, BV-31, and BV-33 are to be closed.

- Slowly open BV-30, pressurizing the water line leading from the influent storage tank to the influent pumping station, forcing the stagnant water into the influent storage tank. Once air is heard entering the tank, elevate the high-pressure flexible hosing beginning at the influent pump skid, working towards the effluent manifold on the influent storage tank. Close BV-23 to prevent water from re-entering the line. Close MBV-2.

- Close BV-29 and BV-30. Open BV-31 if pump P-2A was used. Open BV-33 if pump P-2B was used. Slowly open BV-30, pressurizing the water line leading from the influent pumping station to the process treatment skid located in the tent. This forces the stagnant water from the line into the lead column and pushes the water displaced from the lead column through the system and into the effluent storage tank. Watch for flow on FIT-2. When no flow is seen, elevate the high-pressure flexible hosing beginning at the influent pump skid working towards the process tent. Once reaching the tent, place the elevated line on the stand located just outside the tent where the process line enters. This prevents any residual water from the hose inside the tent from collecting outside the heated environment. Close BV-30.

- Relieve air pressure from the air hose using the line pressure regulator on the compressor. Disconnect the air hose. Relieve the pressure in the system by opening BV-30. Use a poly hose to direct the pressure into a container. The air pressure can also be relieved from the system by opening the purge line located at the top of the lead column. Close BV-156.

- Connect air hose from compressor to air fitting located near BV-165. Turn on air compressor and pressurize air hose to 30-40 psig.

- Open BV-163, slowly open BV-165, pressurizing the water line leading from the GAC #2 skid to the effluent storage tank. Once air is heard entering the effluent storage tank, elevate the high-pressure flexible hosing beginning at the GAC #2 skid and working towards the effluent storage tanks influent manifold. Close BV-100 and MBV-3 to prevent water from re-entering the lines.

- Relieve air pressure from the air hose using the line pressure regulator on the compressor. Disconnect the air hose. Relieve the pressure in the system by opening BV-165. Use a poly hose to direct the pressure into a container.

2.6.3 Effluent Pumping Station

- Connect air hose from compressor to air fitting located near BV-107. Turn on air compressor and pressurize air hose to 30-40 psig.

- Ensure all ball valves on the effluent pumping system that were open during processing are open. BV-107, BV-108, BV-109, and BV-112 are to be closed.

- Slowly open BV-107, pressurizing the water line leading from the effluent pumping station to the effluent storage tank, forcing the stagnant water into the effluent storage tank. Once air is heard entering the tank, elevate the high-pressure flexible hosing beginning at the effluent pumping skid working towards the effluent manifold on the effluent storage tank. Close BV-101 and MBV-4 to prevent water from re-entering the line.

- Close BV-105 and BV-107. Open BV-108 if pump P-5A was used. Open BV-109 if pump P-5B was used. Slowly open BV-107, pressurizing the water line leading from the

effluent pumping station to the return well. This forces the stagnant water from the line into the return well. Watch for flow on FIT-3. When no flow is seen, elevate the high-pressure flexible hosing beginning at the effluent pump skid working towards the return well. Close BV-107.

- Relieve air pressure from the air hose using the line pressure regulator on the compressor. Disconnect the air hose. Relieve the pressure in the system by opening BV-107. Use a poly hose to direct the pressure into a container. The air pressure can also be relieved from the system using the air-vacuum valve located on the return well manifold or effluent filter skid by opening BV-132 or BV-112 (respectively).

2.7 Filter Changeout

The filters periodically require changeout of the filter elements (bags for influent filters or cartridges for effluent filters) when they become clogged with solids. This is evident by increasing differential pressure across the filters as measured by the differential pressure transmitters, which alarm at 30 psig differential. In general, when the filters are to be changed out, the process is shut down, valves are positioned, and residual water is blown out of the influent filter housings with the air compressor (not required for the effluent filters). This minimizes personnel contact with potentially contaminated solutions during the changeout procedure.

2.7.1 Influent Filter Changeout

NOTE: An RCT must be present whenever opening/breaching the system (per Radiation Work Permit [RWP]) upstream of the IX columns.

NOTE: After blowing out the water, be sure that all the air is bled out of the lines and verify that there is no pressure before opening filter housings.

- If the process is operating, follow procedures to shut down the process system.
- Be sure that MBV-2, BV-23 and BV-29 are closed.
- Dewater filter columns following blowout procedures for influent pumping station outlined in Section 2.6.
- Bleed all air pressure from filter column through port located near BV-30. Bleed air into a container to contain any residual water.
- Open filter column, remove filter, and place into a plastic bag. Radiological Control Technicians (RCT) may survey filter housing. Replace filters and securely close filter housings.

2.7.2 Effluent Filter Changeout

- If system is running, only change one set of filters at a time (filters 3A and 3B or 4A and 4B).
- Close ball valves located upstream and downstream of the filters being replaced (BV-112 and BV-114 for filters 3-A and 3-B; BV-113 and BV-115 for filters 4-A and 4-B).

- Bleed all pressure from filter columns through bleed valves located on top of filter housings. (A drip bucket should be placed beneath the filter columns.)

- Open filter column (Note: Filter will contain clean process water, drain as necessary into drip bucket), remove filter, and place into a plastic bag. Replace filters and securely close filter housings.

2.8 Ion Exchange Resin Changeout Procedure

Ion exchange resin changeouts will occur as scheduled by the field superintendent. Changeouts typically occur once the resin has been loaded to capacity with contaminants. The resin changeouts will be performed in accordance with the RWP prepared for the changeout and with the site safety plan and/or any specific safety permits deemed necessary by the site safety specialist or RCT.

Current permits and plans (latest revision, not expired):

- RWP for resin change
- Site safety plan
- Waste packaging requirements.

Tools and supplies:

- Scaffolding with ladders to hold workers

- Universal separator (modified drum lid)

- 4-in.-diameter PVC tubing approximately 6 ft in length

- Fittings necessary to attach vacuum hose to both vacuum and separator

- Two rolls of duct tape

- Minimum of six 10-mil reinforced polyethylene drum liners for 55-gal drums and six 90-mil drum liners

- Minimum of six 55-gal galvanized steel drums

- Drum labels as appropriate

- Radiological posting and rope, as required

- Laundry bags for used anti-Cs

- HEPA-filtered vacuum cleaner (DOP tested) with vacuum hose (2 @ approximately 15 ft)

- Extension cords to power vacuum (extension cords must be plugged into GFI equipped outlets)

- Vacuum nozzle tubing

- Minimum of two boxes/rolls of absorbent wipes
- Tools for cutting plastic.

2.8.1 Spent Resin Removal Process

A. Connect a flexible hose from the outlet (bottom) of the column to be dewatered to the process manifold inlet located near GV-1. (Note: A 2- by 1-in. reducer will be required to make this connection.) A portable site glass may be placed inline to view dewatering. Attach the air compressor hose to the air fitting located at the top of the column to be dewatered or to air fitting located on manifold attached to tank 3. (Note: Make sure the valve located immediately downstream of this fitting is closed.) Pressurize air hose to 50-60 psig. Close the 2-in. ball valve at the top of the tank and open the valves downstream of the column, excluding GV-1. This configuration will allow the water in the column to be forced through the process manifold and into the treatment system. Open the ball valve downstream of the air fitting. Open GV-1 to begin the dewatering process. Continue to provide air at approximately 50-60 psig for 10 minutes, or until air is seen in site glass.

B. Let the column sit overnight (column does not need to be depressurized). Verify that the column has been adequately dewatered by opening the sample port located at the bottom of column. (Place a container under sample port.) If a significant volume of water remains, repeat steps A and B. When the column has been sufficiently dewatered, bleed any residual pressure from the IX column into purgewater carboy (with drain line) attached to the same port utilized to dewater the column. Close all valves on the column and disconnect the flexible hose from the column outlet and process manifold inlet near GV-1.

NOTE: For best results, dewatering should be completed several days prior to vacuuming resin, because the drier the resin, the easier it is to vacuum.

C. Insert a plastic drop cloth below the column manway to collect any beads that may fall out of the column during the removal process. Remove all but one of the retaining bolts on IX column manhole cover (use a drip pan to contain any water that may drip out as bolts are loosened). With the remaining bolt loosened (but securely holding manway cover to column), push manway cover to the side until it is no longer blocking the manway. Secure the cover in this position using a nut and bolt through existing holes in the manway cover and manway flange on the column. Secure all bolts holding the cover in place.

D. Stock the drop cloth with all necessary equipment to perform bead removal (e.g., wrenches, sleeved vacuum hose, wipes, etc.).

E. The spent resin will be drawn into galvanized steel drums with 10-mil nylon reinforced polyethylene liners inside. A second 90-mil liner may be placed inside the 10-mil liner to help prevent the bag from collapsing when the vacuum is applied.

F. Utilizing a HEPA vacuum (with a collection drum in line upstream of the vacuum) remove as much of the spent resin beads as practicable. Drums should be located close together to minimize spills that may occur as the modified drum lid is being transferred.

NOTE: Operation of the HEPA vacuum, including changing the waste bag on the bottom, will be in accordance with instructions supplied with vacuum and applicable radiation work permits.

G. Horse tail full drum liner and install permanent lid on drum. (This may be done upon filling of all the drums, no drums will be left open overnight.

NOTE: A drum dolly will used to move the full drums. The drums will be stored in an RMA until dispositioned.

H. Materials within the drop cloth will be decontaminated as necessary and released by health physics or packaged before removal.

2.8.2 New Bead Installation Process

A. Fill column with fresh beads using a clean container/bucket through the manhole. If any apparatus used to handle the new beads comes in contact with the inside of the column or manhole, the RCT will need to survey such items, as necessary. Fill column with resin to bottom of manhole (approximately 288 gal or 7- 5 cf. barrels).

B. Return manhole cover over manway and replace bolts. Tighten bolts until seal is formed between the manhole and manhole cover with the rubber gasket in between.

C. Utilize the HEPA vacuum to remove any IX beads that remain in the glovebag/dropcloth regardless of their origin (clean or spent) and dispose of them in the waste drums.

D. Remove drop cloth and package as required or dispose of as waste.

3.0 SYSTEM MONITORING PROCEDURES

The objectives of the system monitoring (sampling) are to (1) monitor for breakthrough in the lead columns (GAC and IX), (2) determine the overall efficiency of the treatment system at removing the target contaminants (uranium, technetium-99, and carbon tetrachloride), and (3) for designation of process wastes (i.e., spent IX resin). All sampling activities (described in detail in Sections 3.1 and 3.2) must conform with the following procedures found in BHI-EE-01, Volumes 1 and 2:

- EIP-1.5, Field Logbooks
- EIP-3.0, Chain of Custody
- EIP-3.1, Sample Packaging and Shipping
- EIP-4.1, Groundwater Sampling (as applicable).

In addition to these procedures, all sampling activities must conform with applicable RWP(s), site safety documents, and this procedure. Process monitoring samples are taken by field operations personnel and/or the person(s) performing the field screening analysis. Process efficiency sample and waste designation samples are taken by independent sampling personnel.

Process monitoring and/or efficiency samples are taken from established sampling ports when the system is operating. Sample ports are configured with two in-line ball valves. When a sample is taken, the upstream ball valve is opened approximately 25%. The second ball valve (located just upstream of the sample discharge port) is then used to control the flow rate from the sampling port. When taking a sample, the sample port is first purged into a plastic container or bucket for a minimum of 15 second to

ensure that no stagnant water is sampled. The sample bottles are then filled. Once sampling is completed, ensure that both ball valves are closed.

3.1 Process Monitoring

Process monitoring samples are taken to monitor system operations with regard to IX and GAC column breakthrough and operating efficiencies. Process monitoring samples must conform with the requirements of the applicable SAF. The uranium and carbon tetrachloride samples are analyzed onsite. The technetium-99 sample is sent to the 222-S Laboratory. Uranium and technetium-99 samples are to be taken from the treatment system influent (sample port located near BV-30) and lead column effluent (located at sample port on outlet manifold of lead column) every Tuesday and Thursday. Carbon tetrachloride samples are to be taken from the lead GAC skid inlet sampling port and the polish GAC skid outlet every Thursday. Additional samples may be required as determined by engineering. The technetium-99 samples shall be submitted to the 222-S Laboratory using a Request for Special Analysis form (RSA). Copies of all completed RSAs and chain of custodies shall be maintained in the field files. Enter sampling event information into field logbook and on the process sample log sheet provided by engineering. Include sampling information on the weekly operational data summary form.

3.2 Efficiency Sampling

Process efficiency samples are taken monthly (generally the first Thursday of the month, or as close to this date as practicable) to monitor treatment system efficiencies with regard to technetium-99, uranium, and carbon tetrachloride removal. Process efficiency samples must conform with the requirements of the applicable SAF. Efficiency samples are taken from the treatment system influent and effluent streams. The influent sample is taken from the sample port located near BV-30. The effluent sample is taken from the sample port located on the effluent side of the polish GAC column. All sampling event information is to be entered into the field logbook.

3.3 Waste Designation Sampling

Waste designation samples are taken as required for disposal of spent IX resin. Waste designation samples must conform with the requirements of the applicable SAF. The waste designation samples are taken each time a resin changeout is performed. A resin sample is taken directly from the resin bed upon removing the manway cover from the column. An additional sample is taken from the resin located within the bottom foot of the resin bed as the resin is removed from the column. All sampling event information is to be entered into the field logbook.

4.0 SYSTEM SHUTDOWN PROCEDURES

Shutdown of the treatment system involves turning pumps off, closing all ball valves, and dewatering the system if necessary. The power to all pumps shall be turned off at the disconnect located near each pump. If the entire treatment system is being shut down, deenergize the system and the main disconnect. For normal operations, the system will operate 24 hours/day and will only be shut down when maintenance activities are required. A walkdown of the system is made before closing the site to ensure that all ball valves are closed on non-operational systems.

5.0 INSTRUMENT CALIBRATION

Instrumentation utilized on the pilot-scale system requires periodic calibration to ensure it is operating as required. The instruments are calibrated according to the "200-UP-1 IRM Groundwater Treatment System Instrument Calibration Procedures," BHI-OP-00057. All instrument calibrations shall be documented in the field logbook.

6.0 LEVEL INTERLOCK CHECKLIST

This section describes testing of level interlocks. The interlocks shall be tested, at a minimum, every 120 days if operating.

6.1 Interlock Testing

Each interlock will be tested by shorting out the appropriate relays and verifying that each will stop the appropriate pump or close the appropriate valve.

6.2 Start Extraction Well Pump, P-1A, Restart after Each Test

LSL-1 (Low Level, Extraction Well)	Stop P-1A	_____	_____
LSH-1 (High Level, Influent Tank)	Stop P-1A	_____	_____
LSHH-1 (High-High Level, Influent Tank)	Stop P-1A	_____	_____
FS-1 (Low Flow, Extraction Pump)	Stop P-1A	_____	_____

6.3 Start Influent Pumps P-2A or P-2B, Restart after Each Test

LSL-2 (Low Level, Influent Tank)	Stop P-2A/B	_____	_____
LSH-2 (High Level, Effluent Tank)	Stop P-2A/B	_____	_____
LSHH-2 (High-High Level, Effluent Tank)	Stop P-2A/B	_____	_____
FS-2 (Low/No Flow, Influent Pumps)	Stop P-2A/B	_____	_____
FS-3 (No Flow, Hose to Process Skid)	Stop P-2A/B	_____	_____
FS-4 (No Flow, Hose to Effluent Tank)	Stop P-2A/B	_____	_____
FSH-7 (High flow in Process Skid)	Stop P-2A/B	_____	_____
PSH-1 (Pressure Switch High, Process Skid)	Stop P-2A/B	_____	_____
PSH-2 (Pressure Switch High, GAC #1 Skid)	Stop P-2A/B	_____	_____
PSH-3 (Pressure Switch High, GAC #2 Skid)	Stop P-2A/B	_____	_____

6.4 Start Effluent Pumps P-2A or P-2B; Restart after Each Test

LSH-3 (High Level, Return Well)	Stop P-5A/B	_____	_____
FS-5 (No Flow, Hose to Effluent Skid)	Stop P-5A/B	_____	_____
FS-6 (No Flow, Hose to Well)	Stop P-5A/B	_____	_____
LSL-3 (Low Level, Effluent Tank)	Stop P-5A/B	_____	_____

7.0 FAILSAFE MOTOR-OPERATED VALVE INTERLOCK CHECKLIST

The Failsafe Motor-Operated Ball Valves are located on the inlet and outlets of the Influent and Effluent Storage Tanks. The failsafe feature of Motor-Operated Ball Valves MBV-1, MBV-2, MBV-3, and MBV-4 is to prevent an uncontrolled discharge of the tank contents in the event of a breach in the system.

7.1 MBV-1, Manual Mode

A. Set MBV-l-Auto" switch to "Manual."
B. Verify that valve is open; then open panelboard circuit breaker for MBV-1.
C. Verify closure of valve on loss of power.

7.2 MBV-1, Automatic Mode

A. Set MBV-1 "Manual-Auto" switch to "Auto."

B. Open manual ball valves BV-2, BV-4, BV-6, and BV-7. Start Pump P-1A (Well Pump) and watch for MBV-1 to open.

C. Open panelboard circuit breaker for MBV-1 and verify closure of valve on loss of power.

D. Close panelboard circuit breaker to open valve; then shut off Well Pump P-1 and verify that valve closes when P-1 shuts down.

7.3 MBV-2, Manual Mode

A. Set MBV-2 "Manual-Auto" switch to "Manual."
B. Verify that valve is open; then open panelboard circuit breaker for MBV-2.
C. Verify closure of valve on loss of power.

7.4 MBV-2, Automatic Mode

A. Set MBV-2 "Manual-Auto" switch to "Auto."

B. Open the manual ball valves as noted in Section 2.3.1 for the respective pump P-2A or P-2B to ensure flow can be established; then start Influent Pump P-2A or P-2B (Note: These pumps are wired so that both cannot be started at the same time) and watch for valve to open.

C. Open panelboard circuit breaker for MBV-2 and verify closure of valve on loss of power.

D. Close panelboard circuit breaker to open valve; then shut off whichever pump is running, P-2A or P-2B, and verify that valve closes when pump shuts down.

7.5 MBV-3, Manual Mode

A. Set MBV-3 "Manual-Auto" switch to "Manual."
B. Verify that valve is open; then open panelboard circuit breaker for MBV-3.
C. Verify closure of valve on loss of power.

7.6 MBV-3, Automatic Mode

A. Set MBV-3 "Manual-Auto" switch to "Auto."

B. Open the manual ball valves as noted in Section 2.3.1 for the respective pump P-2A or P-2B to ensure flow can be established; then start Influent Pump P-2A or P-2B (Note: These pumps are wired so that both cannot be started at the same time) and watch for valve to open.

C. Open panelboard circuit breaker for MBV-3 and verify closure of valve on loss of power.

D. Close panelboard circuit breaker to open valve; then shut off whichever pump is running, P-A or P-2B, and verify that valve closes when pump shuts down.

7.7 MBV-4, Manual Mode

A. Set MBV-4 "Manual-Auto" switch to "Manual."
B. Verify that valve is open; then open panelboard circuit breaker for MBV-4.
C. Verify closure of valve on loss of power.

7.8 MBV-4, Automatic Mode

A. Set MBV-4 "Manual-Auto" switch to "Auto."

B. Open the manual ball valves as noted in Section 2.4.1 for the respective pump P-5A or P-5B to ensure flow can be established; then start effluent Pump P-5A or P-5B (Note: These pumps are wired so that both cannot be started at the same time) and watch for valve to open.

C. Open panelboard circuit breaker for MBV-4 and verify closure of valve on loss of power.

D. Close panelboard circuit breaker to open valve; then shut off whichever pump is running, P-A or P-5B, and verify that valve closes when pump shuts down.

8.0 EMERGENCY SHUTDOWN SWITCHES

The emergency shutdown switch (or switches) will shut the Treatment System down in case of an emergency. Items included on this emergency switch include the Well Pump, Influent Pumps, Effluent Pumps, and Failsafe Motor-Operated Valves (MBV-1, MBV-2, MBV-3, and MBV-4). The emergency shutdown system will be tested quarterly.

8.1 Verify System is Operating

Verify that Well Pump (P-1), Influent Pump (P-2A or 2B), Effluent Pump (P-5A or 5B) (if applicable) are running. Also verify that Failsafe Motor-Operated Valves are open.

8.2 Emergency Shutdown Switches

Actuate Emergency Shutdown Switch(es) and verify shutdown of pumps and closure of valves.

	ESS1	ESS2	ESS3
P-1A	_____	_____	_____
P-2A/2B	_____	_____	_____
P-5A/5B	_____	_____	_____
MBV-1	_____	_____	_____
MBV-2	_____	_____	_____
MBV-3	_____	_____	_____
MBV-4	_____	_____	_____

9.0 TROUBLE SHOOTING

9.1 Extraction Well Pumps

Extraction Well Pumps will not operate under conditions specified below.

A. Influent Storage Tank level is "High" or "High-High."

B. Extraction Well level is low.

C. Flowswitch FS-1A (for well pump P-1A) is not satisfied: There is no flow in the line from the well to the Influent Storage Tank.

9.2 Pump P-2A or P-2B

Either Pump P-2A or P-2B will not operate under conditions specified below.

A. Flowswitches FS-2, FS-3, or FS-4 not satisfied: There is no flow in the lines to the Influent Pumps or to the inlet manifold on the Process Skid, or to the Effluent Storage Tank.

B. Influent Storage Tank level is "Low."

C. Effluent Storage Tank level is "High."

D. Flowswitch FSH-7 is not satisfied, indicating a potential high flow situation through the treatment system. This alarm should only be triggered when pumps are operating, however.

9.3 Pump P-5A or P-5B

Either Pump P-5A or P-5B will not operate under the following conditions.

A. Disposal Well level is "High."

B. Effluent Storage Tank level is "Low."

C. Flowswitches FS-5 and FS-6 not satisfied: There is no flow in the lines from the Effluent Storage Tank to the Effluent Pumps or from the Effluent Pump(s) to the Disposal Well.

10.0 COLD WEATHER PROTECTION

This section covers the steps to be taken to minimize downtime and equipment damage resulting from freezing weather conditions. Items identified shall be performed monthly from October through March of each year.

All heating systems, including heat tracing, shall be maintained per the maintenance procedure included as Appendix A.

All hard-piped systems (i.e., carbon and/or galvanized steel) located outside of the tent have been heat traced with self-limiting heat trace systems. The heat tracing shall be inspected on a monthly basis at a minimum.

The treatment facility is located inside an insulated tent that is heated with two 240-volt heaters. The insulation and heaters should also be checked periodically to ensure operation of the heaters and the integrity of the insulation.

For all process lines (the lines running between the storage tanks and the treatment system) exterior to the tent, enough high-pressure flexible hose must be available to run a second redundant line alongside the active line. If the system shuts down and one of these lines freezes, the redundant line can be connected in place of the frozen line. The frozen line can then be taken into the tent, allowed to thaw, and then drained.

The following checklist (Figure 10.1) is to be completed on a monthly basis. Questions concerning completion of the checklist should be directed to the individuals listed above.

Figure 10.1. 200-UP-1 Data Sheet Winterization Preventive Maintenance.

LOCATION	ACTIVITY	COMMENTS	INIT	DATE
1. Extraction Well Manifold	1. Inspect heat cable* 2. Test heat cable or verify function 3. Inspect insulation 4. Deenergize heat cable in April	1. 2. 3. 4.	1.__ 2.__ 3.__ 4.__	
2. Influent Tank:				
A. Manifolds	1. Inspect heat cable* 2. Test heat cable or verify function 3. Inspect insulation 4. Deenergize heat cable in April	1. 2. 3. 4.	1.__ 2.__ 3.__ 4.__	
B. Heating Pads(4)	1. Inspect each pad* 2. Test heat pad or verify function 3. Inspect insulation 4. Deenergize heat pad in April	1. 2. 3. 4.	1.__ 2.__ 3.__ 4.__	
3. Influent Pump Skid	1. Inspect heat cable* 2. Test heat cable or verify function 3. Inspect Insulation 4. Deenergize heat cable in April	1. 2. 3. 4.	1.__ 2.__ 3.__ 4.__	
4. Lunch and Lab Trailers	1. Inspect heater and verify function 2. Inspect filters, clean as necessary.	1. 2.	1.__ 2.__	
5. Process Tent	1. Inspect heaters and verify function 2. Inspect tent insulation.	1. 2.	1.__ 2.__	
6. Effluent Tank:				
A. Manifolds	1. Inspect heat cable* 2. Test heat cable or verify function 3. Inspect insulation 4. Deenergize heat cable in April	1. 2. 3. 4.	1.__ 2.__ 3.__ 4.__	
B. Heating Pads(4)	1. Inspect each pad* 2. Test heat pad or verify function 3. Inspect insulation 4. Deenergize heat pads in April	1. 2. 3. 4.	1.__ 2.__ 3.__ 4.__	
6. Effluent Pump Skid	1. Inspect heat cable* 2. Test heat cable or verify function 3. Inspect insulation 4. Deenergize heat cable in April	1. 2. 3. 4.	1.__ 2.__ 3.__ 4.__	

* Heat trace need only be inspected when insulation is removed for normal maintenance activities.

APPENDIX A
FREEZE PROTECTION PREVENTIVE MAINTENANCE PROCEDURE

1.0 PURPOSE AND SCOPE

This procedure provides a safe, uniform method to inspect and maintain freeze protection for Pump and Treat complex equipment, systems, and heaters during winter months.

2.0 REFERENCES

None.

3.0 PERSONNEL REQUIREMENTS

1. Craft, Electrician.
2. Operations Personnel (OP).
3. Health Physics Technician (HPT), as required.

4.0 PRECAUTIONS AND LIMITATIONS

1. If, during performance of this procedure, any of the following conditions are found, immediately stop work, place equipment in a safe condition, and notify Supervision:
   - Any equipment malfunction that could prevent fulfillment of its functional requirements.
   - Personnel error or procedural inadequacy that could prevent fulfillment of procedural requirements.
2. Contact Supervision for additional instructions if changing plant conditions affect work or delays in work extend past end of shift.
3. If any waste is generated during performance of this instruction, consult Facility/Plant/Area Hazardous Waste Coordinator for specific instructions to ensure compliance with BHI and DOE environmental standards, as applicable, for disposal.
4. Comply with BHI and plant/facility specific lock and tag or over-tagging requirements, as applicable. Refer to Work Package for specific Lock and Tag instructions.
5. Circuit cooler spray, Stores No. 16-0673-400 (for testing thermostats on heat cables).

5.0 SPECIAL TOOLS, EQUIPMENT, AND MATERIALS

1. Clamp-on ammeter.

6.0 PREREQUISITES

1. Obtain release from Operations management prior to beginning performance of this procedure.

2. If potential for radiological contamination exists, then request HPT perform survey prior to beginning maintenance, or prior to removal of equipment or component from installed location.

7.0 INSTRUCTIONS

1. WALKDOWN of each Pump and Treat complex shall be performed monthly (October through April) to identify any change, addition, or deletion to in-service or engineered equipment and RECORD changes or discrepancies on Data Sheet.

2. INSPECT exposed heat cables for frayed or cracked insulation.

3. INSPECT heat cables for loose or corroded wires.

4. INSPECT terminal lugs for loose or corroded wires.

5. SPRAY circuit cooler spray on heat cable thermostats until they come on to check for proper operation.

NOTE
Heat cable thermostats should energize at approximately 35°F (nominal).

6. ATTACH clamp-on ammeter AND CHECK heat cables and heaters for proper current draw, as applicable.

NOTE
Steps 7.7 - 7.18 refer to electric heater maintenance and shall be performed in October, prior to winter operation

7. TURN OFF heater (if operating) at the disconnect.

8. INSTALL locking device at the disconnect.

9. PERFORM zero energy check at the disconnect.

10. CHECK heater fuses for oxidation or deterioration.

11. CHECK wiring for signs of overheating.

12. CHECK fan motor to ensure that it is free turning and that there are no obstructions in the fan housing.

13. CHECK fan guard to ensure that it is secure.

14. REMOVE locking device from the disconnect.

15. ENERGIZE the heater.

16. REMOVE access panel and PERFORM amperage check on the heating elements.

17. RECORD amperage and COMPARE to the baseline amperage. IF amperage differs from the baseline by more that 5 amps, make note in comments section.

18. CHECK heater temperature control to ensure that it is in the comfortable range.

NOTE
Step 7.19 shall be performed in April, or at the end of the cold weather operation.

19. TURN OFF all electric heaters in the PUMP AND TREAT facility at the disconnect. USE Data Sheet 3 for all heater locations.

8.0 RESTORATION

Verify equipment restored by observing indications are consistent with expected conditions.

9.0 TESTING AND ACCEPTANCE

None.

10.0 DISPOSITION

1. Inform Maintenance and Operations Management preventive maintenance is complete.

2. Return Work Package to PIC or Maintenance Supervisor.

11.0 BIBLIOGRAPHY

BHI-SH-02, Safety and Health Procedures, "Tools and Equipment," "Personal Protective Equipment," and "Lock and Tag."

Radiological Control Manual, "Posting," and "Work Preparation."