Appendix A
Standard Operating Procedures (SOPs)

SOP 01 - General Groundwater System Startup

The following steps are the correct sequence of activities that are required to start up the Penta Wood groundwater system.

1. Ensure that manual valves are set appropriately. See Tables 3-1 and 3-2.
2. Check to make sure that all chemical feed systems have adequate supply of chemicals.
   - 2.1. Ensure that all pillow or isolation valves are in the correct position.
   - 2.2. Read tank levels from man-machine interface (MMI) for the ferric sulfate and caustic soda tanks to ensure that you have adequate supply of chemical.
   - 2.3. Check level of polymer in the active tote.
3. Ensure that the effluent valve (after T-16) is open and that the neutralization tank (T-16) can drain by gravity to the effluent line and the infiltration basin.
4. If required, adjust the dissolved air flotation (DAF) skimmer speed. This should not be required during normal operation, only when the system is starting up for the first time or if new waste streams are added to the system.
5. Ensure that setpoints are set correctly using the SETPOINTS screen at the MMI.
6. ***Ensure that the odorous air system is operating. This is a critical step for operator health and safety.***
   - 6.1. Open all odorous air isolation valves at each tank connected to the odorous air ventilation system. Check air inlets for all process tanks connected to the odorous air ventilation system and ensure that inlets have not been closed. Also check to ensure that all tank hatches have been closed as required.
   - 6.2. Put the odorous air fans in AUTO mode
     - 6.2.1. Odorous air fan (EF-26-1)
     - 6.2.2. Odorous air fan (EF-26-2)
   - 6.3. Ensure that odorous air fans are in operation prior to enabling any other equipment.
   - 6.4. Confirm at MMI that no LOW FLOW alarms are occurring.
7. Acknowledge all alarms in RS View. Check to ensure that alarms do not recur. If alarms are recurring, stop the startup until alarm conditions are addressed.
8. Ensure that hand switches on all devices are in AUTO mode. Confirm that the programmable logic controller (PLC) is reading that the devices are in AUTO mode using RS View.
9. Place the following devices in AUTO mode. ***Enable AUTO mode in this exact order.***
   - 9.1. Neutralization tank mixer (M-16-2)
   - 9.2. Caustic pump (P-22)
   - 9.3. Granular activated carbon (GAC) feed pump (P-15-3)
   - 9.4. DAF system (DAF-14) – YES IN AUTO (RECIRC PUMP)

9.5. Flocculant reaction tank mixer (M-13-2)

9.6. Coagulant reaction tank mixer (M-12-2)

9.7. Ferric sulfate pump (P-21)

9.8. Filtrate pump (P-20-3)

9.9. Equalization pump (P-11-2)

10. Confirm that mixers are operating.

11. To start a groundwater extraction well pump, the operator turns the hand switch on the motor control center (MCC) to the appropriate position (normally AUTO). The positions for the hand switch that are used for controlling the system components are marked as HAND, OFF, and AUTO.

HAND: Overrides the system automatic controls and allows the manual activation of system components. The HAND position should only be used at short intervals to prevent damage to system components.

OFF: Allows operator to deactivate system components, some of which may still be activated manually at the unit with the OFF switch enabled.

AUTO: Allows the components to operate by automatic controls. This option should always be used when available during normal system operation.

Start individual groundwater extraction wells one at a time by clicking the Pump (Water) start button located on the Well Control screen.

NOTE: Start one pump at a time and allow the effluent flow rate to stabilize before initiating operation of another pump. If too much water is added to the effluent pipe at once, an air lock may develop, causing water to be pumped out of the vent pipe.

- Recovery pump Well #2, RP-2
- Recovery pump Well #3, RP-3
- Recovery pump Well #4, RP-4
- Recovery pump Well #5, RP-5
- Recovery pump Well #6, RP-6
- Recovery pump Well #7, RP-7
- Recovery pump Well #10, RP-10
- Recovery pump Well #12, RP-12
- Recovery pump Well #13, RP-13
- Recovery pump Well #14, RP-14

SOP 02 - General Free Product System Startup

The following steps are the correct sequence of activities that are required to start up the Penta Wood free product system.

Prior to starting the free product pumps, check and set pump at proper depth. The pumps should be located 1 to 2 inches below the liquid surface in the well. Set the air pressure at the regulator located in the well vault. The pressure should be set to at least 1 pound per square inch (psi) for every 2 feet of total discharge head.

1. Ensure that manual valves are set appropriately. See Tables 3-1 and 3-2.
2. Check to make sure that all chemical feed systems have adequate supply of chemicals.
   - 2.1. Ensure that all pillow or isolation valves are in the correct position.
   - 2.2. Read tank levels from RS View for the ferric sulfate and caustic soda tanks to ensure that you have adequate supply of chemical.
   - 2.3. Check level of polymer in the active tote.
3. Ensure that the effluent valve (after T-16) is open and that the neutralization tank (T-16) can drain by gravity to the effluent line and the infiltration basin.
4. If required, adjust the dissolved air flotation (DAF) skimmer speed. This should not be required during normal operation, only when the system is starting up for the first time or if new waste streams are added to the system.
5. Ensure that setpoints are set correctly using the SETPOINTS screen from RS View.
6. ***Ensure that the odorous air system is operating. This is a critical step for operator health and safety.***
   - 6.1. Open all odorous air isolation valves at each tank connected to the odorous air ventilation system. See Table 3-1 for a list of valves.
   - 6.2. Check air inlets for all process tanks connected to the odorous air ventilation system and ensure that inlets have not been closed. Also check to ensure that all tank hatches have been closed as required.
   - 6.3. Put the odorous air fans in AUTO mode
     - 6.3.1. Odorous air fan (EF-26-1)
     - 6.3.2. Odorous air fan (EF-26-2)
   - 6.4. Ensure that odorous air fans are in operation prior to enabling any other equipment.
   - 6.5. Confirm on RS View that no LOW FLOW alarms are occurring.
7. Acknowledge all alarms in RS View. Check to ensure that alarms do not recur. If alarms are recurring, stop the startup until alarm conditions are addressed.
8. Ensure that hand switches on all devices are in AUTO mode. Confirm that the programmable logic controller (PLC) is reading that the devices are in AUTO mode using RS View.
9. Place the following devices in AUTO mode. ***Enable AUTO mode in this exact order.***

9.1. Neutralization tank mixer (M-16-2)

9.2. Caustic pump (P-22)

9.3. Granular activated carbon (GAC) feed pump (P-15-3)

9.4. DAF system (DAF-14) – YES IN AUTO (RECIRC PUMP)

9.5. Flocculant reaction tank mixer (M-13-2)

9.6. Coagulant reaction tank mixer (M-12-2)

9.7. Ferric sulfate pump (P-21)

9.8. Filtrate pump (P-20-3)

9.9. Equalization pump (P-11-2)

10. Confirm that mixers are operating.

11. Place the following devices in AUTO mode. ***Enable AUTO mode in this exact order.***

11.1. Extraction Well Recovery Pumps

11.1.1. Recovery pump Well #2, RP-2

11.1.2. Recovery pump Well #3, RP-3

11.1.3. Recovery pump Well #4, RP-4

11.1.4. Recovery pump Well #5, RP-5

11.1.5. Recovery pump Well #6, RP-6

11.1.6. Recovery pump Well #7, RP-7

11.1.7. Recovery pump Well #10, RP-10

11.1.8. Recovery pump Well #12, RP-12

11.1.9. Recovery pump Well #13, RP-13

11.1.10. Recovery pump Well #14, RP-14

Light Non-aqueous Phase Liquid System General Startup (FROM ORIGINAL OPERATIONS & MAINTENANCE MANUAL)

The general sequence for system startup for the light non-aqueous phase liquid (LNAPL) recovery system is as follows:

1. To initiate air compressor operation, verify the air compressor hand switch on the motor control center (MCC) is in the AUTO position.

2. Turn the air compressor hand switch located on the air compressor control panel to the AUTO position.

3. Click the start button for the air compressor located on the Air Systems screen (Figure 2-4).

4. Check operation of air dryer and reset the Switching Failure alarm, if required.

5. Place individual free product recovery pumps in the AUTO mode by clicking the AUTO/MAN button under the Air (Oil) section of the Well Control screen (Figure 2-3). If required, input new pumping/resting times. The PLC will automatically open and close the appropriate solenoid valves to

operate the pneumatic free product pumps. The CALL button will be illuminated (green) on the Well Control screen when the solenoid is open.

6. Place the following LNAPL pumps in AUTO mode.
    - EW-04
    - EW-05
    - EW-06
    - EW-10
    - EW-12
    - EW-13
    - EW-14

SOP 03 - General Groundwater System Shutdown

The following steps are the correct sequence of activities that are required to shut down the Penta Wood groundwater system.

Short-term Shutdown

A short-term shutdown is defined as a shutdown with a duration of less than 2 or 3 days. If the system will be shut down for more than a few days, or in periods of extreme cold weather, please refer to the Long-term Shutdown Plan.

If any maintenance will be performed, or rotating or electrical equipment handled, LOCKOUT/TAGOUT procedures must be followed.

Long-term Shutdown

A long-term shutdown is intended to prepare the system for an extended period of time out of operation, in which freeze protection and other issues must be addressed. The Penta Wood Long-term Shutdown Plan should be referenced for long-term shutdown.

Normal Shutdown Procedures

Normal system shutdown can be accomplished in a number of ways, depending on the reasons for shutting the system down. Generally, however, the system should be shut down by turning off system components by clicking the appropriate buttons on the man-machine interface (MMI) screens (see Figures 2-1 through 2-9). System components will remain energized and ready for operation.

A routine shutdown procedure would consist of the following steps:

1. Turn the bioventing blower off by clicking the STOP button on the Air Systems screen (Figure 2-4).
2. Turn the individual extraction well pumps off by clicking the STOP button on the Well Control screen (Figure 2-3).
    - Place the following devices in MANUAL mode. ***Enable MANUAL mode in this exact order.***
        - Extraction Well Recovery Pumps
            - Recovery pump Well #3, RP-3
            - Recovery pump Well #4, RP-4
            - Recovery pump Well #5, RP-5
            - Recovery pump Well #6, RP-6
            - Recovery pump Well #7, RP-7
            - Recovery pump Well #10, RP-10
            - Recovery pump Well #11, RP-11
            - Recovery pump Well #12, RP-12
            - Recovery pump Well #13, RP-13

- Recovery pump Well #14, RP-14

3. Turn the fLNAPL recovery pumps off by first clicking the AUTO button on the Well Control screen (Figure 2-3). After clicking the AUTO button, the MANUAL button will appear as well as a new START/STOP button. Click on the STOP button to shut the air solenoid valve.

   - LNAPL Recovery Pumps
     - EW-04
     - EW-05
     - EW-06
     - EW-10
     - EW-12
     - EW-13
     - EW-14

4. The remaining equipment will automatically turn off and remain in the AUTO mode. If the shutdown is to repair or perform maintenance activities, the appropriate equipment hand switch should be placed in the OFF position and the piece of equipment deenergized at the motor control center (MCC). The MMI should be left running at all times.

Alternate Operating Procedures and Emergency Contingencies

Emergency Shutdown Procedures

If an emergency shutdown is needed, the following procedures should be followed:

1. Open the disconnect switches at the MCC for the air compressor, blower, groundwater extraction pumps, and oil/water separator pump.
2. Place the hand switches on the control panels for the oil/water separator and air compressor to the OFF position.
3. Close the valve on the outlet of the air dryer to stop the operation of the free product pumps and the oil transfer pump.
4. Close the ball valves on the groundwater and free product manifolds to prevent flow into the building.
5. Close the valve on the outlet of the carbon manifold to prevent flow to the infiltration basin.

If electrical power to the system needs to be disconnected, the main breaker on the MCC should be placed in the OFF position.

Alternate Operating Procedures

The bioventing and groundwater treatment systems are designed to operate continuously without operator attention. Each system is equipped with an automated shutdown control system that activates under abnormal conditions.

If a system shutdown occurs as the result of a protective action by the shutdown control system, an operator is notified by the autodialer. Alarms are acknowledged by the operator while connected to the autodialer. A log is kept of all shutdown events and corrective actions.

The system is designed to require an operator to correct any upset condition and restart the system onsite. This minimizes the potential for equipment damage, unsafe operation, or noncompliance operation that may result from automatic restart.

SOP 04 - General Free Product System Shutdown

The following steps are the correct sequence of activities that are required to startup the Penta Wood free product system startup.

Short-term Shutdown

A short-term shutdown is defined as a shutdown with a duration of less than 2 or 3 days. If the system will be shut down for more than a few days, or in periods of extreme cold weather, please refer to the Long-term Shutdown Plan.

If any maintenance will be performed, or rotating or electrical equipment handled, LOCKOUT/TAGOUT procedures must be followed.

1. Place the following devices in MANUAL mode.
    1.1. LNAPL recovery pumps
        1.1.1. EW-04
        1.1.2. EW-05
        1.1.3. EW-06
        1.1.4. EW-10
        1.1.5. EW-12
        1.1.6. EW-13
        1.1.7. EW-14

SOP 05 – Coalescing Oil/Water Separator

Operational Procedures / Guidelines

Manually remove scum layer daily

To start the coalescing oil/water (COW) separator, the operator turns the hand switch on the COW separator control panel to the appropriate position (normally AUTO). This switch controls the operation of the oil pump solenoid valve. The operator must also place the hand switch for the COW separator effluent pump located on the motor control center (MCC) in the AUTO position. The positions for the hand switch that are used for controlling the system components are marked as HAND, OFF, and AUTO.

HAND: Overrides the system automatic controls and allows the manual activation of system components. The HAND switch should only be used at short intervals to prevent damage to system components.

OFF: Allows operator to deactivate system components, some of which may still be activated manually at the unit with the OFF switch enabled.

AUTO: Allows the components to operate by automatic controls. This option should always be used when available during normal system operation.

As the free product pumps fill the COW separator, the operation of the effluent and oil pumps is controlled by the appropriate level switches for each subsystem.

The COW is equipped with level switches and a control panel, which is connected to the programmable logic controller (PLC). The control panel operates the oil pump via a solenoid valve and also powers the water pump that pumps effluent water from the COW into the equalization tank (T-11). At times, the ball valve between the equalization tank and the coagulation tank becomes clogged; this needs to be inspected on a monthly basis and cleaned out.

SOP 06 – Granular Activated Carbon Vessels

Granular Activated Carbon Vessels Inspection and Maintenance Procedures

The activated clay and granular activated carbon (GAC) vessels are monitored for increases in vessel pressure by differential pressure gauges. The bag filter should prevent fouling of the media beds. The media beds will be replaced when breakthrough of compounds of concern (COCs) is detected through routine monitoring. The carbon will be removed and installed as a slurry. Ideally, new media should be hydrated for a minimum of 24 hours before being placed in service; however, it can be used immediately after installation.

The GAC vessels operate in series (i.e., primary and secondary vessels). Once breakthrough of COCs is detected, the carbon in the primary vessel is changed. After replacing the carbon, the primary vessel is now considered the secondary carbon vessel. The valves directing the flow through the carbon vessels should be repositioned to redirect the flow through the carbon vessels so that the carbon vessel with the new carbon is now the secondary carbon vessel.

SOP 07 – Draining Granular Activated Carbon and Prefilter Vessel

Operational Procedures / Guidelines

The following steps should be followed to drain the granular activated carbon (GAC) and prefilter vessel:

1. Two days before draining the GAC and prefilter vessels, pump out the underground storage tank. The underground storage tank must be empty to be able to hold the volume from the prefilter tank and lead GAC tank.
2. Shut down the treatment system.
3. Turn off the groundwater pumps, free product pumps, GAC pump and the filtrate pump on the system computer.
4. Isolate the prefilter by CLOSING the influent valve to the bag filters.
5. CLOSE both the influent and effluent valves to the prefilter.
6. OPEN both the air release valve and the bottom drain valve (3/4-inch valve located at the bottom of the vessel).
7. Ribbon all of the valves into non-operating position.
8. After the vessel is drained, leave the air release drain valves open. Inspect the vessel for obstructions by opening the hatch at the top of the vessel. CLOSE all of the valves on the GAC manifold to isolate the vessel.
9. When changing from the lead to the lag vessel, ribbon just the effluent valves.
10. OPEN both the air release valve and the bottom drain valve.
11. Ribbon all of the valves into non-operating position.
12. After the vessel is drained, leave the air release drain valves open. Inspect the vessel for obstructions by opening the hatch at the top of the vessel. CLOSE all of the valves on the GAC manifold to isolate the vessel.

Key Items

- Be sure to hold onto the hatch lid during the vessel inspection because it can be easily dropped inside the vessel, which can damage the liner.
- Make sure that the secondary containment is pumped down.

SOP 08 – Carbon Change-out Procedure

1. The carbon changeout subcontractor and lower-tier subcontractors must present training certificates to CH2M HILL prior to beginning work onsite. Current training certificates shall be provided for each task the employee will perform (i.e., current 40-hour and 8-hour refresher HAZWOPER training, forklift operator, confined space entry, etc). CH2M HILL will scan the certificates and retain for documentation. If training certificates are not present onsite for the employee, the employee will not be allowed to perform the work. If delays in the change-out completion are experienced as a result, the subcontractor will be responsible for delays in accordance with the liquidated damages provisions of the contract.
2. Subcontractor is responsible for providing its employees with the appropriate personal protective equipment (PPE) for contact with the spent carbon (an F032-listed hazardous waste). If the subcontractor does not use the required PPE, CH2M HILL may stop work until subcontractor implements the appropriate corrective measures.
3. The subcontractor is responsible for providing all tools and materials used for the carbon change-out. Tools used inside the carbon vessels must be used with care and be constructed of appropriate materials so as not to damage the epoxy coating lining the interior of the vessel.
4. The subcontractor shall place two inner liners inside the exterior supersac. Water-absorbent polymer sheets will be placed inside the innermost liner. The subcontractor shall fill the supersacks so that all carbon and retained water is fully contained within the two inner liners (not between the inner liners and the supersack). The inner liners must be sealed (i.e., zip-tied) so that there will be no leaking of carbon or liquids from the inner liner.
5. Supersacks must be filled so as not to damage the inner liners or supersack. No tools may be used that may result in damage to the inner liners or supersacks.
6. The subcontractor shall place the supersacks on solid-top pallets in good condition, as required by the contract. Protruding nails, splintered pallets, or other objects that can puncture the supersacks are not allowed and these pallets will be rejected. Subcontractor will be responsible for repackaging carbon if damage to the supersacks results from the subcontractor or lower-tier subcontractor's actions.
7. Supersacks must be staged in the area designated by CH2M HILL so that all sides of the supersacks are visible for inspection. CH2M HILL and the subcontractor will inspect the supersacks and approve their condition and method of storage prior to the subcontractor leaving the site. Damaged supersacks shall be repackaged by the subcontractor prior to the subcontractor leaving the site.
8. The subcontractor will discuss questions and comments concerning health and safety, carbon change-out requirements, or removal and storage of spent carbon with CH2M HILL's onsite representative.

I understand the above requirements and agree to comply with these requirements for the removal of spent carbon from carbon vessels, and packaging spent carbon for disposal.

Signature	Printed Name	Company	Date

All supersacks were inspected at the conclusion of the change-out and are in good condition.

CH2M HILL Representative Signature	Subcontractor Representative Signature	Date

SOP 09 – Refilling Granular Activated Carbon Vessel

Operational Procedures / Guidelines

The following steps should be followed to refill the granular activated carbon (GAC) vessel:

FILL VESSEL WITH NEUTRALIZATION TANK WATER

1. Close drain valve at the bottom of the vessel.
2. Isolate the prefilter and GAC tanks not being filled.
3. Close backwash waste valve.
4. Open the backwash way (BWW) valve #5.
5. Close the BWW valve #4.
6. Open the air release valve.
7. Position the GAC valve on manifold so that you are filling the tank through the effluent line.
8. Isolate all other valves on the manifold.
9. Open potable water valve, located in the sample room.
10. Turn the backwash pump on and crack open the pump valve. You want the vessels to fill slowly. NOTE: The vessel is filling through the white, 6-inch piping.
11. Once water is present (water will flow out of air release valve), shut down the pump, close the pump valve, close BWW valve #5, open BWW valve #4, and close the potable water valve.
12. Soak the vessel for 24 hours.

    Prior to starting the system, make sure that all of the valves are positioned for normal operation.
13. Change the computer to read the new lead GAC number.

SOP 10 – Granular Activated Carbon Prefilter Backwash

Operational Procedures/Guidelines

1. Follow SOP 01 to turn off the treatment system. Confirm there is no flow into or out of the system.
2. Reconfigure valves to pump water from the neutralization tank into the prefilter as follows:
    a. Open valve labeled BW5 (by neutralization tank).
    b. Close valve labeled BW4 (by neutralization tank).
    c. Close valve labeled BW2 (by bag filter).
    d. Close valve labeled BW1 (by wall).
    e. Open valve labeled BW3 (by wall).
3. Go to the lab and gradually turn on the Service Water.
4. Partially open the backwash supply valve.
5. Turn on pump.
6. Check backwash sample tap water for presence of carbon. If carbon is present more than a few specs, close backwash supply valve by one notch. Continue testing throughout backwash to make sure carbon is not washing out.
7. Backwash until water in neutralization tank is drained to marked line on tank. This helps prevent drying of the pH probes.
8. When water has reached the marked line on the neutralization tank, turn off the backwash pump and close the backwash supply valve. Allow neutralization tank to refill to level of outlet to infiltration basin.
9. Repeat process up to two more times and as allowed by available space in filtrate tank. (Each backwash contributes 20 to 30% of tank volume depending on backwash flow speed). Flow from backwash supply valve can be increased as long as carbon is not washing out. Increase flow in small increments, one notch at a time.
10. After backwash is clean (up to three total backwashes), turn off the backwash pump and close the backwash supply valve.
11. Go to the lab and gradually turn off the Service Water.
12. Follow step #2 in reverse order.
    a. Close valve labeled BW3 (by wall).
    b. Open valve labeled BW1 (by wall).
    c. Open valve labeled BW2 (by bag filter).
    d. Open valve labeled BW4 (by neutralization tank).
    e. Close valve labeled BW5 (by neutralization tank).
13. Follow SOPs #1 and #2 to to re-start the system.

Key Items

- Make sure that all flows (groundwater, emulsified, and filtrate in Process #1) are zeroed and there is no pressure on the bag filters (Process #2) before beginning backwash.
- Make sure all the correct valves are open/closed to avoid dead-heading the pumps.

SOP 11 - Flocculent System

Operational Procedures/Guidelines

Make sure that Mixer M-13-2 is running and in AUTO mode. The control is on the personal computer (PC) in the control room and the mixer icon should be green. Click on the icon to verify that it is in AUTO mode.

Key Items

- Tank level will need to be above 25 percent for the mixer to run in AUTO mode.

SOP 12 - Autodialer Equipment

The autodialer is an electronic device that can automatically dial telephone numbers to communicate between any two points in the telephone, mobile phone, and pager networks. When an alarm occurs, the autodialer accesses the standard phone line to which it is connected, dials the appropriate phone numbers, and delivers the user's own pre-recorded voice message corresponding to those particular alarm conditions that are currently active.

The autodialer at Penta Wood is used to alert the necessary project team members about system shutdowns or alarm status. One of the project team members must respond to the system alarm within 24 hours by acknowledging the autodialer call. The project team member who acknowledged the autodialer call must determine the appropriate response to the shutdown or alarm conditions.

The following are procedures for programming the Penta Wood autodialer (Verbatim, Model V14539, Series VSS).

Phone Number Programming

Make a list of phone numbers that you would like to program, along with a person's name for each phone number. Program the system operator in designation spot number 01, the project manager is spot number 02, and engineering support at spot number 03.

2-Digit Phone Number Designation	Program Code	Phone Number (Including any necessary prefixes or area code)	Person
01	701		
02	702		
03	703		
04	704		
05	705		
06	706		
07	707		

1. **To put the autodialer in the PROGRAM mode:** Press the "Program" key. PROGRAM mode is indicated by the lighted PROGRAM light-emitting diode (LED) on the control panel. *All programming operations must be done with the unit in the PROGRAM mode.*
2. **To program the 1st phone number**: Press 701, then enter the phone number you would like the equipment to dial (see table above). Then press enter. Be sure to include any necessary area codes or "1" prefixes.
3. **To program additional numbers:** Follow Step 2 using 702, 703, and so on. A maximum of 16 phone numbers may be entered.
4. **To delete a phone number**: Enter the number of the appropriate program code, press the "decimal point" key, and hit enter. For example, to remove the 3rd number in the dialer, type 703. (as in decimal point) and press enter.
5. **To clear the system memory**: Press 9359 and enter.

6. **To finish programming:** Press the "Normal" key.

Testing the Autodialer

1. **To temporarily disarm the unit:** Press the "Disarm/Re-arm" key until the DISARM LED is flashing on the control panel
2. **To test alarms:** Physically trip each sensing device in turn (manipulate float switches, relays, etc.) and verify that the corresponding input channel LED lights on the front panel.
3. **To restore all of the sensors to their normal state**: Press the "Normal" key.
4. **To restore the unit to a ready condition:** Press the "Disarm/Re-arm" key to clear out the channel input LED and restore the unit to a ready condition.
5. **To clear the unit of all acknowledged alarms:** Press the "Disarm/re-arm" key twice. This clearing also occurs automatically after the alarm reset time has elapsed

Arming and Disarming the System

1. **To temporarily disarm the unit:** Press the "Disarm/Re-arm" key until the DISARM LED is flashing on the control panel.
2. **To restore the unit to a ready condition:** Press the "Disarm/Re-arm" until the NORM LED is lit on the control panel.

Acknowledging an Alarm Call

The alarm conditions that are monitored by site PLC have been arranged into the following four Alarm Call Groups (ACGs):

Channel 1 - Floor drain in old building or high drain sump in new building
Channel 2 - Granular activated carbon (GAC) pump interlock shutdown
Channel 3 - Influent interlock
Channel 4 - Free product interlock

When an alarm condition is present within the programmable logic controller (PLC), a signal is sent to the autodialer to call the entire list of programmed phone numbers, until the alarm is acknowledged by touch tone command or by a call back to the Verbatim autodialer.

Complete the following steps to acknowledge the alarm:

1. Wait to hear the prompting "warble" tone.
2. Enter into the touch tone phone '8' to get the status of the all alarms.
3. Enter into the touch tone phone either '1', '2', '3' or '4'. Commands "1, 2, 3 and 4" will acknowledge all alarms that are sent, even those that are not in their ACG.

Alternative Method (1)

1. Wait to hear the prompting "warble" tone.
2. Enter '9' into the touch tone phone. The Verbatim autodialer will say "Alarm is acknowledged, goodbye" and terminate the call.

SOP 13 - Neutralization System

Operational Procedures/Guidelines

1. Make sure that Mixer M-16-2 is running and in AUTO mode. The control is on the personal computer (PC) in the control room and the mixer icon should be green. Click on the icon to verify that it is in AUTO mode.
2. The pH probes AIT 12-1-1 and AIT 12-1-2 should be near the setpoint of 6.5 Click the toggle switch to use the probe closest to the setpoint. This switch is on the PC.
3. Click the Caustic Feed Pump icon on the PC to verify that it is set for AUTO. If not, change it to AUTO by clicking the auto switch.

Key Checks and Items

- Caustic feed pump will need to be run in MANUAL position after long system shutdowns and granular activated carbon (GAC) vessel carbon change-outs because of the slow response of the pump,
- Tank level will need to be above 25 percent for the mixer to run in AUTO mode.

SOP 14 – Light Non-aqueous Phase Liquid Recovery Pump Adjustment

Light non-aqueous phase liquid (LNAPL) recovery pumps are located in biovent wells in the area of the Corrective Action Management Unit (CAMU) where LNAPL is present. The inlet on the LNAPL recovery pumps is located at the top of the pump and must be fully submerged for the pump to operate. To maintain optimum LNAPL recovery, the LNAPL recovery pump depths should be adjusted monthly because of water table fluctuations, or any time the groundwater extraction pumps are shut down for more than 1 week but the LNAPL pumps continue to operate. Once per month, the depth to water (DTW) and depth to product (DTP) should be measured with an interface probe to confirm the LNAPL thickness and evaluate the depth at which the pump inlet should be set. Measurements and pump depth adjustments should be performed while the system is operating. However, if the system will be down for an extended period of time and the LNAPL pumps can continue to operate, measurements and pump depth adjustments will be made after the system has been off for 1 week, which allows the groundwater table to return to equilibrium. The attached data sheet is to be used to record the monthly LNAPL measurements.

Equipment List

- Interface Probe
- Decontamination Materials – Trisodium phosphate (TSP), methanol, deionized (DI) water, and paper towels
- Personal protective equipment (PPE) – Nitrile gloves, steel-toed boots, safety glasses

Monthly

1. Measure the depth to top of LNAPL and top of water using an oil/water interface probe. Record data on attached data sheet.
2. The LNAPL skimmer pump will stop cycling when removed from liquid. Using the winch located in the well vault, slowly lift the pump about an inch at a time until the pump stops cycling. Once the pump stops cycling, the pump inlet is located above any fluid in the extraction well. The pump may need to be raised and lowered a few times to confirm that it is just above the fluid in the extraction well.
3. If 0.5-foot (6 inches) of LNAPL or more was measured in the well, lower the LNAPL pump to 0.5-foot below the top of the LNAPL. If less than 0.5-foot of LNAPL was measured during the last monthly measurement, lower the LNAPL pump to 0.25-foot (3 inches) below the top of the LNAPL.
4. If needed, reset the air pressure at the regulator in the well vault. The pressure should be set to 100 pounds per square inch (psi).

LNAPL recovery pump depths should be adjusted monthly as described in the LNAPL Recovery Pump Adjustment SOP. Measurements of the DTP and DTW should be performed monthly to evaluate the product thickness in each well and assess if the LNAPL recovery pump inlets need to be adjusted to maximize the amount of LNAPL recovered.

Groundwater Extraction and Treatment System Status: Operating/Not Operating

		EW-04	EW-05	EW-06	EW-10	EW-12	EW-13	EW-14
Depth to Product (DTP)	ft							
Depth to Water (DTW)	ft							
Measured LNAPL Thickness	ft							
Groundwater Extraction Rate	gpm							
LNAPL Pump Operating		Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
LNAPL Pump Air Pressure	psi							

[1] If the measured LNAPL thickness was greater than 0.5-foot (6 inches), the pump should be set 0.5-foot (6 inches) below the top of LNAPL. If the measured LNAPL thickness was less than 0.5-foot (6 inches), the pump should be set at a depth 0.25-foot (3 inches) below the top of LNAPL.

Notes:

Signature: _____ Date: _____

SOP 15 - Float Storage

Operational Procedures/Guidelines

1. Make sure that the float tank mixer is running by clicking on the mixer icon on the programmable logic controller (PLC) program screen on the control room personal computer (PC) (The Flow Diagram icon should be green while running).
2. The diaphragm feed pump should be turned ON on days when the rotary drum vacuum filter (RDVF) is not running for a couple of hours, to prevent clogging. This is done on the RDVF PLC touch screen

SOP 16 - Rotary Drum Vacuum Filter

Operational Procedures/Guidelines

1. The day prior to running the rotary drum vacuum filter (RDVF), put ½ to 1 quart of polymer into float tank.
2. Review activity hazard analysis (AHA) and put on personal protective equipment (PPE) (nitrile gloves, dust mask, and safety glasses).
3. Turn RDVF room fan on slow at office motor control center (MCC).
4. Check percentage in float tank, approximately 50 percent or more. Check that there is air pressure out of float tank.
5. Make sure pan discharge is directed into waste bin and bin has appropriate hazardous waste labeled for date and bin number.
6. Check knife blade advance/washdown sensor is straight up and down. Check wash- down valve is closed (yellow arrows straight up and down).
7. On the control panel, check recirculation and vacuum with the following:
    a. Go to RECIRC SCREEN and turn RECIRC PUMP on HAND ("H"). Check pump is on, gauge has pressure, and that water is coming out into the recirculation tank.
    b. Go to PRECOAT SCREEN and turn VACUUM PUMP on HAND ("H"). Check water is coming out of blue discharge line into the recirculation tank.
    c. Turn each pump to OFF ("O") and AUTO ("A").
8. Go to MAIN SCREEN and push "All Switches to Auto."
9. Check mixer is running in diatomaceous earth (DE) mixing tank.
10. Open mixing tank fill valve and fill to black line on side of tank. Simultaneously add DE in proportion to amount in float tank (one bag DE per 10% in float tank).
11. Spray down area where DE was added with garden hose. Take care not to get water into air exhaust. Use hose to help mix clumps of DE.
12. When DE looks completely broken up and mixing and water is up to volume on side of tank, shut off water and mix for approximately 10 to 15 minutes.
13. Make sure DE is mixed by scraping bottom of tank for clumps and breaking them up.
14. Open red water valve quickly three times, and leave closed.
15. Open yellow valve from mix tank to roller pan.
16. On control panel MAIN SCREEN push "Start System."
17. Turn roller speed to 100 (all the way up).
18. From platform, check:
    a. Water is coming out of one small hose in recirculation tank.
    b. DE is flowing into pan.

c. When pan fills up to sensor, vacuum will turn on and DE filter will start to coat.
d. Check all four hoses/pipes into recirculation tank have water coming out.

19. Go downstairs and check:
    a. Mixing tank has recirculation water coming in.
20. RDVF pump will turn on after approximately 2 minutes. Hear clicking and immediately shut off yellow valve from mixing tank to roller pan and turn roller speed to 40.
21. When roller is brown, go to FILTRATION SCREEN and turn "Knife Advance" to OFF ("O").
22. Manually advance knife blade into filter cake. As soon as it starts cutting, turn "Knife Advance" back to AUTO ("A"). Watch and make sure it is on automatic control and is cutting. If not, then call Maurer Power to check cutting motor and programmable logic controller (PLC), etc. Can do washdown and shutdown system or cut manually for duration of process.
23. Check flows and alarms on control panel about every ½ hour and rake the filter waste in the dumpster to distribute the material and to prevent backup on the chute. This should be done from the elevated platform to prevent injury to the wrist and elbow.
24. Listen for click from RDVF pump for duration of process. Pump occasionally will hiccup (stop pumping for a moment), but that is fine as long as it keeps pumping.
25. When float tank is almost pumped down and if DE remains on roller, then manually scrape DE from roller if necessary by turning knife advance to OFF again and turning blade manually. Six percent in tank is bottom, so do not let level go below that.
26. Hit lever to manually trigger washdown and check that washdown valve is opened (yellow arrows parallel to ground). Will not automatically trigger if float tank has been expended and there is still DE on the roller (see #25 to manually expend DE). Will automatically trigger if DE expended all the way. If washdown air valve does not open, shut off air and take apart valve to manually open. Will need to shut down system and call subcontractor support if valve needs repair.
27. Clean knife with broom and pan/roller with garden hose.
28. Break up DE in roller pan with garden hose. Clean both sides of knife blade. Wash off sensors. Make sure no DE remains on roller. When water is drained and the sprayers stop, spray garden hose directly in drain hole until it starts pushing back and the pump will stop automatically. Keep spraying with the hose for another few seconds.
29. Open red water valve all the way and let flush for 10 to 15 seconds and close valve.
30. Turn off RDVF room fan at office MCC.
31. If plant is off, restart per the SOP. Wait for turbidity and pH to balance on start up.

Dumpster Change-out

1. Open operations and maintenance (O&M) tracking tool. Put in date of waste stream and push "Create a Waste Stream."
2. Click "Filter Cake" as type and put bin number in the comments. Fill out fields and click "Create a Waste Stream."
3. Go into RDVF room and unlatch the bin and drain excess water.
4. **Coat inside of bin with antifreeze** (winter only).

5. Line bin with waste bag. Sealed seam is the bottom. Make sure bag is all the way down to the floor on outside of bin.
6. Make front holding wall by pulling up bag and duct taping to sides of bin.
7. For small bins, put cardboard wings on side of pan to make sure filter cake gets into pan.
8. Tape over flow hose in place in bin.

Maintenance Items

Daily Maintenance

1. Clean knife blade.
2. Clean level probes and insulators.
3. Clean filter cloth after each use and inspect for tears. Replace as needed.
4. Remove debris from filter pan with water hose.

Weekly Maintenance

1. Grease all corresponding fittings for the following items:
   - Drum Pillow Block Bearings
   - Filter Agitator Hanger Bearings
   - Bearing on Agitator Push Rods (both ends)
   - Drum Drive Chain and Sprockets
   - Jack Screws on Knife Advance
   - Johnson Joint
2. Verify that the seal water drip rate is about 1 drop per second on the Receiver and Filter Aid pumps.
3. Clean out the "Y" strainer on the vacuum pump cooling water line.

Monthly Maintenance

1. Inspect jack screw bellow boots to insure they are protected from dirt, dust, etc.
2. Check the rotary joint for carbon seal ring wear. If there is leakage, replace the seal ring as soon as possible.
3. Make sure that all fasteners remain tight. Internal seals/diaphragms should be checked for leakage around the shaft/diaphragms and replaced when necessary for the air- actuated valves.
4. Check the seal for leaks around the motor shaft for the receiver, recirculation, and filter aid pumps. If there are leaks, replace the seal. Check for loss of flow rate. If Yes, inspect pump for clogs or a worn impeller.
5. Check the spray nozzles for clogs.
6. Check for air and liquid leaks in and around the washdown pump.

Semiannual Maintenance

1. Oil should be changed in the filter agitator reducer every 6 months or after 2500 operating hours (whichever comes first).

2. The drum drive reducer's lubricant should be drained, flushed with mineral spirits, and refilled with fresh lubricant every 6 months or after 1500 operating hours (whichever comes first).

Miscellaneous Maintenance

1. The Asco solenoid valve should be cleaned when sluggish valve operation, excessive noise, or leakage occurs, while the proper voltage to the solenoid is supplied. Clean strainer or filter when cleaning the valve.
2. Vacuum pump maintenance is only needed when there is a mechanical seal failure, or when there is scale buildup. Replace seals when they fail and follow the De-scale procedure for excessive scaling in the Alar manual.

Key Items

- In case of emergency, go to control panel MAIN SCREEN and push "All Systems Off," or shut power off at the electrical panel next to thecControl panel.
- Be sure to perform all health and safety monitoring,
- When in the RDVF room, make sure ventilation system is running and/or garage doors are open,
- Wear proper gloves, safety glasses, and dust mask when handling dry DE.
- The dewatered sludge should have the consistency of unbaked brownie mix.
- Only a licensed and trained operator may use the forklift.

SOP 17 - Bag Filter Change-out

Operational Procedures/Guidelines

1. The bag filters should be changed when the differential pressure reaches the maximum setpoint or when a backwash of the "GAC [granular activated carbon] Pre-Filter" has been performed.
2. Shut down the water treatment system according to the instructions in SOP 01.
3. Shut water off to bag filter closest to wall first (red valve), then isolate the bag by shutting the further red valve.
4. Release air on top of filter. Open orange or yellow valve on floor to drain floor sump.
5. Open top of filter (two screws). Some water will still be coming in.
6. Lift up and out. Pour down sump and pull out bag.
7. Replace with appropriately sized filter by folding 6 inches of rounded side of bottom and place into filter housing. Push metal ring down and secure.
8. Replace filter housing and put top back on. Make sure seal on top is even and tight.
9. Close air valve and orange drain valve.
10. Slowly open red water valve to bag filter closest to the wall, then slowly open red valve on the other side of the bag filter.
11. Follow the same procedure for the second bag filter.
12. Release air and open gauges. Close when you no longer hear a lot of air.
13. Spent bag filters in the draining drum should be placed into a properly labeled drum after water is drained from them (see Appendix D of the *Waste Handling Plan* [CH2M HILL 2013a]).

Key Items

- Make sure appropriate valves are closed to depressurize filter housings.

SOP 18 – Secondary Containment Pump Out

Operational Procedures/Guidelines

1. Shut down the free product pumps on the supervisory control and data acquisition (SCADA) system by clicking on each individual number pump (4, 5, 6, 10, 12, 13, and 14), and click stop.
2. Open the lid of the containment (it is the smaller of the two containments on the underground storage tank [UST]) that is located outside the man door in the granular activated carbon (GAC) building.
3. Install the sump pump to the grate located just inside the man door.
4. Open the yellow valve located on the east wall just on the other side of the bag filters.
5. Plug in the sump pump.
6. Monitor the pumping frequently to avoid running the pump dry. There is no float on the pump.
7. Once the containment is dewatered, unplug the pump, close the yellow valve. and remove the pump.
8. Restart the free product pumps by clicking on each individual pump and click START. Once the green indicator light is lit, the free product pumps are running. Click AUTO.

Key Items

- Monitor the pumping to avoid having the pump run dry.

SOP 19 - Coagulation System

Operational Procedures/Guidelines

1. Make sure that Mixer M-12-2 is running and in AUTO mode. The control is on the personal computer (PC) in the control room and the mixer icon should be green. Click on the icon to verify that it is in AUTO mode.
2. The pH probes AIT 12-1-1 and AIT 12-1-2 should be near the setpoint of 5.2. Click the toggle switch to use the probe closest to the setpoint. This switch is on the PC.
3. Click the ferric feed pump icon on the PC to verify that it is set for AUTO. If not, change it to AUTO by clicking the AUTO switch.

Key Items

- Ferric feed pump will need to be run in manual position after long system shutdowns and granular activated carbon (GAC) vessel carbon change-outs.
- Tank level will need to be above 25 percent for the mixer to run in auto mode.

SOP 20 - Bioventing System

The general sequence for system startup for the bioventing system is as follows:

1. Verify the 16-inch butterfly valve on the manifold inlet is completely open.
2. Verify blower damper is open.
3. Verify individual butterfly valves for each biovent well are open.
4. To initiate blower operation, verify the blower hand switch on the motor control center (MCC) is in the AUTO position.
5. On the Air Systems screen, click the START button for the blower.
6. Adjust the flow to each biovent well nest to the desired flow rate using the flow control valves.
7. Open and close the bypass valve, as necessary, to obtain the desired flow rates

The blower for the bioventing system is started in the same manner as the groundwater extraction wells. To start the blower, the operator turns the hand switch on the MCC to the appropriate position (normally AUTO). The positions for the hand switch that are used for controlling the system components are marked as HAND, OFF, and AUTO.

HAND: Overrides the system automatic controls and allows the manual activation of system components. The HAND switch should only be used at short intervals to prevent damage to system components.

OFF: Allows operator to deactivate system components, some of which may still be activated manually at the unit with the OFF switch enabled.

AUTO: Allows the components to operate by automatic controls. This option should always be used when available during normal system operation.

On the Air Systems screen, click the START button for the blower. Adjust the flow to each biovent well nest to the desired flow rate using the flow control valves. Each of the 8-inch lines can be set for a maximum of 500 standard cubic feet per minute (scfm) and the 6-inch lines can accept up to 200 scfm.

SOP 21 – Compressed Air System

To start the air compressor, the operator turns the hand switch on the air compressor control panel to the appropriate position (normally AUTO). The positions for the hand switch that are used for controlling the system components are marked as HAND, OFF, and AUTO.

HAND: Overrides the system automatic controls and allows the manual activation of system components. The HAND switch should only be used at short intervals to prevent damage to system components.

OFF: Allows operator to deactivate system components, some of which may still be activated manually at the unit with the OFF switch enabled.

AUTO: Allows the components to operate by automatic controls. This option should always be used when available during normal system operation.

After placing the air compressor in the AUTO mode, click the start button for the air compressor located on the Air Systems screen. Check operation of air dryer and reset the Switching Failure alarm, if required.

SOP 22 - pH Probe Calibration

Design Criteria

The pH probes are designed and used to control the amount of chemical to add to their respective tanks. pH probes are used in the coagulant reaction tank (T-12) to regulate the amount of ferric sulfate ($FeSO_4$) used to stabilize the pH. The neutralization tank (T-16) uses pH probes to regulate the amount of sodium hydroxide (NaOH) needed to bring the water up to setpoint pH prior to discharge. To ensure that the correct amount of chemical is being added to each tank, the pH probes need to be checked and calibrated on a regular basis.

Operational Procedures/Guidelines

The pH meters should be checked daily to ensure that they are still operating within 5 percent of each other.

1. View the Coagulant Tank screen and the Neutralization screen and check to see if both probes for each tank are reading within 5 percent of each other.
2. If they are not within 5 percent of each other, they should be calibrated.
3. If they are within 5 percent of each other, calibrate during their weekly calibration schedule.

Calibration is completed by following these steps:

a. Put on personal protective equipment (PPE).
b. Check monitor for which probe is in use.
c. Start by taking out the probe that is NOT IN USE.
d. Clean the probe and glass bulb carefully with deionized (DI) water and 10 percent methanol spray bottles and wipe clean with Kim wipes.
e. Dip probe in calibration solution (start with pH = 4).
f. When reading stabilizes, press "Shift" and "Cal Lo" simultaneously. Hit "Enter" and wait for pH readout to stop blinking.
g. Spray off with DI water and dip probe in calibration solution (pH = 7).
h. When reading stabilizes, press "Shift" and "Cal Hi" simultaneously. Hit "Enter" and wait for pH readout to stop blinking.
i. Go to computer monitor and switch probe in use to opposite probe.
j. Repeat Steps #3 through #8.
k. If one probe calibrates better than another, select this probe for use and troubleshoot calibration issues.

Key Items

- The system only needs to be shut off for the neutralization tanks pH probes for safety reasons.
- Calibration cups are attached to a broom handle so the operator can reach the appropriate buttons during calibration.

SOP 23 - Turbidimeter Cleaning

Operational Procedures/Guidelines

The turbidimeter should read 2 nephelometric turbidity units (NTUs) during normal system operation. The bag filter starts to clog more frequently when the turbidimeter reads greater than 5 NTU. The turbidimeter should be cleaned on a weekly basis

The turbidimeter is cleaned by following these steps:

1. Turn off the sample/turbidimeter pump and close the valve between the pump and the turbidimeter.
2. Remove the plug in the bottom of the turbidimeter and drain into a bucket.
3. Remove the top (light assembly) plate on the turbidimeter body, and the baffles.
4. Spray out the body with the water hose, capturing the rinse water in a bucket.
5. Clean the plate and baffles with the water hose.
6. Use kim wipes to clean the lenses and lamp if needed.
7. Re-assemble the unit.
8. Replace the plug.
9. Open the valve.
10. Turn the pump back on.
11. The drained water can be placed into the dissolved air flotation (DAF) pump tank.

Key Items

- Make sure that the pump is off while valves are closed; this will prevent damage to the pump.
- If the turbidimeter does not return to its normal reading of 2 NTU, check the pH on the coagulant tank and the probes on the polymer tank.

SOP 24 - Polymer Tank Water Level Probe Cleaning

Operational Procedures/Guidelines

The polymer mixing tank water level probes should be checked daily for polymer coating.

If coating is present, use the following steps to remove the polymer from the probes:

1. Start when water level is low.
2. Turn off the mixer.
3. Spray off the probes with water hose with the jet nozzle.
4. Remove any dried or concentrated polymer chunks, using a cup.
5. The removed polymer chunks can be used in the float tank.
6. Turn on the mixer and watch for floating polymer chunks.

A thorough cleaning of the probes should be done once a month following these steps:

1. Turn off the polymer mixer and feed pumps
2. Unscrew the water level probe assembly and remove from the tank.
3. Place probes in the bucket.
4. Remove the polymer from the probes.
5. Rinse with water hose.
6. Replace probe and tighten into place.
7. Turn on polymer mixer and feed pumps.
8. The removed polymer can be put into the float tank.

Key Items

- Not turning off the pumps and mixer could cause injury.
- Care should be taken not to spill polymer because it is very slippery.
- Keep lids closed to prevent insects from clogging the polymer system.

SOP 25 - Starting the System from Alarm Status

Operational Procedures/Guidelines

The following steps should be taken to restart the treatment system:

1. Find and correct reason(s) for the alarm(s).
    - Check alarm history screen
    - Check system alarm screen
    - Check Operation Data (an Access file that tracks system performance)
2. Adjust pH setpoints (e.g., pH low limit may have to be changed if the pH is too low).
3. Manually lower tank levels if they are too high.
4. Manually run mixers if tank is too low.
5. If a loss of power has occurred, manually restart the air compressors and dryers at the units themselves. Also, the dissolved air flotation (DAF) programmable logic controller (PLC) will show an emergency stop light on the front of the unit. Press the Emergency Stop reset button followed by the Central Alarm reset button.
6. The free product pumps will turn on automatically when the free product interlock is cleared.
7. Check all motors, pumps, etc. and make sure they are running in AUTO mode.
8. Restart the groundwater pumps and monitor all parts of the system carefully.
9. Place equalization and filtrate pumps in AUTO mode (they will shut down whenever there is an interlock, and will not restart automatically).
10. Reset any changed setpoints to their standard position.

Key Items

- It is important to physically inspect all pieces of equipment when a shutdown has occurred, to properly resolve the system alarm.

SOP 26 - Equalization System

Operational Procedures/Guidelines

1. Make sure that Mixer M-11-3 is running and in AUTO mode. The control is on the personal computer (PC) in the control room and the mixer icon should be green. Click on the icon to verify that it is in AUTO mode.
2. The equalization pump should also be running in AUTO mode. This is also verified by clicking on the pump icon.

Key Items

- Tank level will need to be above 25 percent for the mixer to run in AUTO mode.

SOP 27 – Dissolved Air Flotation Unit Filling and Draining

Operational Procedures/Guidelines

The following steps should be taken to conduct a dissolved air flotation (DAF) unit drain or fill:

1. Lower the filtration tank to a minimal level; this provides storage for draining the DAF system.

Note: The DAF unit drains into the sump tank and the sump pump transfers fluid to the filtration tank.

2. Place the filtration pump and mixer to OFF on the supervisory control and data acquisition (SCADA) system. This will prevent filling the DAF unit with dirty water during startup after cleaning.
3. SHUTDOWN the treatment system on SCADA.
4. OPEN V-2505 (sand valve). This is located at the DAF control panel.
5. Monitor the sump level. Periodically open and close Valve 2505 to maintain the sump fluid level below the alarm level.

Note: The flocculation tank drains into the DAF unit.

6. Once the DAF unit is drained, leave V-2505 OPEN.
7. OPEN V-2508 (sludge valve). This is located at the DAF control panel.
8. Monitor the sump level. Periodically open and close Valve V-2508 to prevent a sump high-level alarm.
9. Once the DAF unit is drained, leave V-2508 OPEN and power wash the DAF interior, including the float skimming equipment.
10. CLOSE both V-2505 and V-2508 valves. Start filling the DAF unit and flocculation tanks with potable water.
11. Once the water level reaches the top of the grates, START the treatment process.
12. Check for proper air flow and pressure by observing the bubble pattern in the DAF fluid. The target air flow is achieved when a fine bubble pattern (< 0.25 inches in diameter) is observed. Pay particular attention to the polymer dosage for the next 1 to 2 hours following the DAF fill, in order to confirm that a new float blanket has been formed.
13. Check the DAF effluent turbidity and adjust the polymer dose as needed to achieve normal operation.
14. When the filtration tank fluid level is > 35 percent in the tank, turn the mixer ON. This will prevent heavy solids from settling, which will eliminate clogging of the filtrate pump.
15. Once the system is operational, place the filtrate pump in AUTO.
16. Turn OFF the mixer before the tank level reaches < 35 percent to prevent equipment damage.

Float removed from the DAF by the skimmer will drop into a float hopper. When the amount of float in the hopper reaches a predetermined level, a level monitor will actuate a float transfer pump to convey the float to the float storage tank equipped with a mechanical mixer. During any shutdown (short-term

or long-term), the hopper will need to be washed down. Washdown will occur automatically when the DAF is in SHUTDOWN mode. Spray down the hopper with a hose until the pump is no longer running and the hopper is partially filled with fresh water.