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Rocky Flats Environmental Technology Site

4-I53-ENV-OPS-FO.35

REVISION 1

SYSTEM NORMAL OPERATIONS ULTRAVIOLET/HYDROGEN PEROXIDE OXIDATION AND GRANULAR ACTIVATED CARBON SYSTEMS CONSOLIDATED WATER TREATMENT FACILITY

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RMRS Vice President, Environmental Restoration | Print Name | Date

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Data Management and Reporting Services
Environmental Operations Management
Waste Management
Industrial Hygiene
Occupational Safety
Quality Assurance
Radiological Health and Engineering

USE CATEGORY 3

ORC review not required

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1 PURPOSE

This procedure provides operating instructions for the Ultraviolet/Hydrogen Peroxide Oxidation System (UV/H_2O_2 System) and the Granular Activated Carbon (GAC) Unit which are located in Building 891 of the Consolidated Water Treatment Facility (CWTF)

2 SCOPE

This procedure applies to all Environmental Operations Management employees and subcontractors

This procedure addresses normal operations of the UV/H_2O_2 System and the GAC Unit

3 OVERVIEW

The CWTF is comprised of Building 891 and trailers T-900A and T-900B The CWTF treats contaminated water from the following sources

- OU-1 ground water
- OU-2 surface water
- Decontamination water from the Main Decontamination Facility and from the Protected Area Decontamination Facility,
- Other ER waters (e g , purge water and waters from other special ER projects)

The UV/H_2O_2 System and GAC Unit are located in Building 891 The UV/H_2O_2 oxidation process and the GAC Unit are the first and second unit processes within Building 891 and are used for the removal of organic contaminants The UV/H_2O_2 oxidation process oxidizes the organic constituents using 50% H_2O_2, which is a strong oxidizer, and UV light The UV light catalyzes the oxidation reaction by converting the peroxide to a hydroxyl radical, thus making it a more effective oxidant

Under automatic operation the UV/H_2O_2 unit takes untreated water from Influent Tanks T-201 or T-202 In addition to treating water from Influent Tanks T-201 or T-202, water stored in any of the three 159,000-gallon Effluent Tanks (T-205, T-206, T-207) can also be recirculated to the UV/H_2O_2 system for additional treatment as described in 4-I51-ENV-OPS-FO 33, Treated Effluent Recirculation, CWTF

Effluent from the UV/H_2O_2 oxidation process can be routed either to the GAC Unit for further organic contaminant removal, or directly to the Ion Exchange Surge Tank T-203 which is located on the south side of Building 891 The GAC Unit is constructed of a welded heavy steel shell with top and bottom dished heads, and is completely lined with polyethylene The GAC Unit contains 3000 pounds of granular activated carbon The valves which direct water from the UV/H_2O_2 System to the GAC Unit and the valves which are used to by-pass the GAC Unit are manually operated only There is no automatic operation of the GAC unit The Ion Exchange Surge Tank T-203 receives and stores water from the UV/H_2O_2 System until it is pumped to the ion exchange process

3 **OVERVIEW (continued)**

The Peroxidation Systems, Inc (PSI) Perox-Pure™ Organic Destruction Process Model CWB 240/360 UV/H_2O_2 treatment system is designed to treat up to 30 gpm of contaminated water The UV/H_2O_2 treatment system consists of two 340-gallon stainless steel reactor chambers, and power and control panels mounted on a single skid The two reactor chambers can be equipped with a total of 16 UV lamps Feed pumps, a flowmeter pressure gauges, and temperature gauges are included as part of the UV/H_2O_2 unit A skid-mounted H_2O_2 feed module consisting of a 500-gal tank (Tank T-120) and two metering pumps is also provided as part of the UV/H_2O_2 System

The current Perox-Pure™ treatment system design operating conditions are as follows

- Process flow rate is 10 to 30 gpm
- Maximum allowable process water inlet temperature is 117 °F
- Maximum allowable temperature of the process water as it is treated in the oxidation chambers is currently set at 120 °F because of down-stream unit process restrictions
- Operating pressure is 3 to 15 psig, protected by a rupture disc rated at 15 psig
- Power requirement is 240 kW

The 16 UV lamps can be configured within the two reactor chambers as necessary For instance the current lamp configuration is 15 lamps in the first reactor chamber and one lamp in the second reactor chamber All 16 UV lamps are normally operated when the influent flow rate is 30 gpm If the flow rate decreases, the number of UV lamps operating is manually decreased to prevent the water in the oxidation chamber from overheating which causes the system to shut down automatically At a flow rate of 10 gpm and 20 gpm, 6 and 11 lamps are operated, respectively The number of UV lamps may also be reduced to conserve energy based on influent organic contaminant concentrations Fewer lamps may be used if it is determined that volatile organic destruction is achieved The system shutdown temperature of 120 °F, which is the maximum allowable temperature for the Ion Exchange Surge Tank is pre-set and automatically controlled

A centrifugal splitter pump installed on the UV/H_2O_2 unit is used to dilute and split the peroxide feed to three points in the UV reactor chambers UV Reactor Chamber #1 has feed points at the bottom and middle of the reactor while UV Reactor Chamber #2 has only one feed point located in the middle of the reactor Water for dilution is provided by taking a small side stream of treated water, approximately 1 to 2 gpm, from a pipe tee at the UV/H_2O_2 unit effluent outlet and directing it to the splitter pump inlet Three rotameters are located inside a panel on the south of the drive enclosure, and the three rotameters are used to set the diluted hydrogen peroxide feed rate (gpm) to the three UV Reactor feed points The three rotameters feed the UV chambers as follows

- Rotameter #1 feeds to the bottom of UV Chamber #1
- Rotameter #2 feeds to the middle of UV Chamber #1
- Rotameter #3 feeds to the middle of UV Chamber #2

3 OVERVIEW (continued)

General H_2O_2 feed rate steps, which are based on knowledge gained through plant operation and manufacturer's guidelines, are listed in the following table

TABLE 1

STEP	ACTION TO BE TAKEN	COMMENTS
1	Approximate the H_2O_2 dosage and volumetric flow rate need based on the characteristics of the contaminated water	For routinely processed waters this dosage is based on knowledge gained through plant operation Refer to Appendix 1, Routinely Processed ER Waters 50% H_2O_2 Dosing Information For special ER waters refer to Appendix 2 Special ER Waters Dosing Chart For Use With 50% H_2O_2 Total Organic Carbon (TOC) may be utilized as a means of estimating necessary H_2O_2 dosage because it is an indicator of total oxidizable organic compounds TOC accounts for not only priority pollutants but also naturally occurring humic and fulvic substances
2	Set H_2O_2 metering pump for approximate volumetric flow rate needed	Utilize burette attached to T-120 to set needed volumetric flow rate
3	Set UV rotameters for a total flow of approximately 2 gpm	Ensure that the splitter pump does not cavitate
4	Sample and test for residual H_2O_2 The residual should be in the range of 1 to 3 mg/l	Use Quant strips to determine residual H_2O_2
5	Increase or decrease the volumetric flow rate of H_2O_2 as necessary	Adjust metering pump controls as appropriate

4 LIMITATIONS AND PRECAUTIONS

- Only one UV Process Feed Pump, P-301 or P-302, may be operated at a time If both pumps are selected, neither will operate
- Lamp ammeter readings greater than 8 amps indicate that the lamp surface may be touching a quartz tube In this case, the UV/H_2O_2 oxidation system shall be shut down, Locked-Out/Tagged-Out and allowed to cool The lamp shall then be rotated 180 degrees in the tube
- Exposure to UV light will cause damage to eyes and burns to unprotected skin Sight ports are provided for viewing of each lamp and quartz tube and each sight port consists of a quartz window covered by a blue plastic shield The plastic shield filters out UV light to allow a visual inspection without injury Do not remove the blue plastic shield from the sight port
- H_2O_2 is a strong oxidizer Proper safety precautions and personal protective equipment as described in the CWTF Health and Safety Plan shall be taken by operations personnel when handling H_2O_2

4 LIMITATIONS AND PRECAUTIONS (continued)

- If the discharge pressure on the H_2O_2 system does not reach 10 psig within one minute of the chosen H_2O_2 metering pump (Pump 1 or Pump 2) being started open the discharge pump bleed valve and allow the pump to run until H_2O_2 is flowing steadily in-line

5 PREREQUISITES

5 1 Planning and Coordination

CWTF Responsible Manager

[1] Ensure that treatment operations are listed on the Plan of the Day (POD) meeting

[2] Discuss with the Lead Operator and Operator(s) the influent characteristics of the water to be processed It is possible to determine an approximate 50% H_2O_2 dosage need using either 1) Appendix 1, Routinely Processed ER Waters 50% H_2O_2 Dosing Information, or 2) Appendix 2 Special ER Waters Dosing Chart For Use With 50% H_2O_2

[3] Ensure that the treatment plant operators involved in the implementation of this procedure have appropriate training as detailed in the 1-10000-TUM Training User's Manual, and that the training is documented in accordance with 2-F94-ER-ADM-02 01, Training

[4] Ensure that the Lead Operator is certified as Class A, Industrial Waste Water Operators, and that all other Operators are certified at a minimum as Class C, Industrial Waste Water Operators (in accordance with Article 9 of Title 25, C R S 1973)

Lead Operator/Operator

[1] Attend a pre-shift safety briefing covering plant operations prior to the initiation of this procedure

Health and Safety Specialist

[1] Conduct a pre-shift safety briefing covering plant operations prior to the initiation of this procedure

6 INSTRUCTIONS

Because the GAC Unit is a manually operated system, the valve alignment for the GAC Unit should be set as specified in Section 6 1 prior to beginning UV/H_2O_2 automatic operation as specified in Section 6 2

6 1 GAC Unit - Manual Operation

Operator

[1] To bypass the GAC Unit and route water directly from the UV/H_2O_2 System to Ion Exchange Surge Tank T-203

[A] CLOSE V-170 Influent to the GAC Unit

[B] CLOSE V-171 Effluent from the GAC Unit

[C] OPEN V-172, GAC Unit Bypass

6 1 GAC Unit - Manual Operation (continued)

Operator

[D] OPEN HVA-203, Influent to T-203

[E] Proceed to Section 6 2 for automatic operation of the UV/H_2O_2 System

[2] To route water from the UV/H_2O_2 System to the GAC Unit

[A] CLOSE V-172 GAC Unit Bypass

[B] OPEN V-170, Influent to the GAC Unit

[C] OPEN V-171, Effluent from the GAC Unit

[D] OPEN HVA-203 Influent to T-203

NOTE *The GAC Unit is not currently equipped with a backwash system It is possible that with time fine particulates will accumulate within the GAC bed Particulate accumulation would increase the head loss across the GAC bed thereby increasing the pressure at the inlet of the GAC column The inlet of the GAC column (top of the GAC column) is equipped with a pressure gauge This pressure gauge will be monitored periodically throughout each GAC run and recorded on the CWTF UV/H_2O_2 and GAC Treatment Log Sheet (Appendix 3) If an increase in pressure is noted (which may occur over the course of several months) it may be necessary to field-fit a backwash system to the GAC column The GAC column is equipped with a Rupture Disk rated at 10 psi, and therefore the GAC column should not be operated if the inlet pressure gauge reads 8 psi or greater*

[E] Proceed to Section 6 2 for automatic operation of the UV/H_2O_2 oxidation system, and monitor GAC Unit operation using the CWTF UV/H_2O_2 and GAC Treatment Log Sheet (refer to Appendix 3 of this procedure)

6 2 UV/H_2O_2 System - Automatic Operation

Operator

[1] Record the starting totalizer reading from the flow meter located at the UV Process Feed Pumps P-301 and P-302 on the CWTF UV/H_2O_2 and GAC Treatment Log Sheet

[2] IF processing water from T-201, OPEN valve HVB-201, Effluent From T-201, or IF processing water from T-202 OPEN valve HVB-202 Effluent From T-202

[3] OPEN V-75, UV Basket Strainer Influent

[4] OPEN one set of pump isolation valves for the selected UV Process Feed Pump

[A] For P-301 OPEN HVA-301, P-301 Inlet and HVB-301, P-301 Outlet or

[B] For P-302 OPEN HVA-302 P-302 Inlet and HVB-302, P-302 Outlet

6 2 **UV/H_2O_2 System - Automatic Operation (continued)**

Operator

[5] Ensure that the following valves are CLOSED
- V-74, UV Influent Camlock
- V-76, Basket Strainer Camlock
- V-77, P-301, P-302 Effluent Camlock
- V-80, IX Bypass/Flowmeter to Effluent Tanks
- HV-501, Recirculation to UV
- HV-502, Recirculation to IX
- HV-503, Recirculation

[6] OPEN HVA-203, UV Effluent to T-203 and FCV-4, UV Influent Control

[7] Ensure that the UV/PEROXIDE TREATMENT UNIT breaker, UCP-2 is ON

NOTE *The breaker is located at the Motor Control Center (MCC) on the west wall in the Building 891 electrical room*

[8] Ensure that the UV/H_2O_2 local disconnect switches DISC UCP-2-1 and DISC UCP-2-2 are ON

NOTE *The disconnect switches are on the wall directly east of the UV/H_2O_2 system*

[9] Ensure that the breakers PDP UCP 2-1 and PDP UCP 2-2 are ON

NOTE. *The breakers are in the UV breaker panels adjacent to the UV Control Panel*

[10] Ensure that the selector switch for one of the Peroxide Feed System Pumps (Pump 1 or Pump 2) on the H_2O_2 module is ON

NOTE *Either PEROXIDE FEED SYSTEM PUMP 1 or PEROXIDE FEED SYSTEM PUMP 2 switch can be used for operation*

[11] Ensure that the other Peroxide Feed System Pump switch is OFF

[12] Ensure that V-82, H_2O_2 Outlet is OPEN

[13] Ensure that one set of H_2O_2 Pump isolation valves are OPEN

[A] For H_2O_2 P-1, OPEN V-84, H_2O_2 P-1 Influent and V-88, H_2O_2 P-1 Effluent or

[B] For H_2O_2 P-2 OPEN V-85 H_2O_2 P-2 Influent and V-90, H_2O_2 P-2 Effluent

[14] OPEN V-91 H_2O_2 Splitter Pump Influent

6 2 UV/H_2O_2 System - Automatic Operation (continued)

Operator

[15] OPEN the following valves
- V-111, Inlet H_2O_2 Rotameter 1
- V-112, Inlet H_2O_2 Rotameter 2
- V-113, Inlet H_2O_2 Rotameter 3
- V-114, Outlet H_2O_2 Rotameter 1
- V-115, Outlet H_2O_2 Rotameter 2
- V-116, Outlet H_2O_2 Rotameter 3

[16] Ensure that the SPLITTER PUMP selector switch on the UV Control Panel is ON

[17] Place P-301 or P-302 selector switch in AUTO for the UV Process Feed Pump selected in Step [4]

[A] Ensure that the other pump selector switch is OFF

NOTE 1 *The P-301 and P-302 selector switches are located at the Main PLC in the Building 891 electrical room*

NOTE 2 *If both UV Process Feed Pumps are selected, neither will operate*

[18] Ensure that the appropriate lamp switches on the UV Control Panel are ON

[19] Ensure that the lamp control switches for CHAMBER #1 and CHAMBER # 2 on the UV Control Panel are ON

[20] Ensure that the peroxide module switch on the UV Control Panel is ON

[21] Turn the CONTROL POWER switch on the UV Control Panel to START

NOTE 1 *The CONTROL POWER switch is spring-loaded, and returns to the original vertical position when released*

NOTE 2 *The UV Process Feed Pump selected in Step [17] and the hydrogen peroxide feed pump selected in Step [10] start when the CONTROL POWER switch is placed in START*

NOTE 3 *The lamps start automatically in groups of three when the CONTROL POWER switch is placed in START Time delays are set for each group to prevent all of the lamps from lighting at once Ammeters in the UV control panel indicate in the range of 7 to 8 amps when each lamp is operating properly*

6 2 **UV/H_2O_2 System - Automatic Operation (continued)**

[22] Monitor UV lamp currents by selecting the preferred chamber with the AMMETER SELECTOR, CHAMBER #1, CHAMBER #2 switch

NOTE 1 *If the indicated current for a lamp exceed 8 amps, the lamp surface may be touching a quartz tube*

NOTE 2 *Only lamps that have current readings greater than 8 amps require rotation*

[A] **IF** the current for a lamp exceeds 8 amps,
THEN

- Turn OFF the UV system by placing the CONTROL POWER switch in STOP
- Lock-Out/Tag-Out the UV system
- Allow the lamps to cool and monitor the UV Effluent temperature gauge until it indicates 90 °F, or less
- Rotate the appropriate lamp 180 degrees in the tube
  - Open the enclosure doors to the chambers
  - Remove the bolts on the lamp end brackets
  - Remove the lamp end brackets
  - Rotate the lamp in the tube with an open end or adjustable wrench
  - Install the lamp end brackets
  - Install the bolts on the lamp end brackets
  - Close the enclosure doors to the chambers
- Remove the Lock-Out/Tag-Out
- Turn ON the UV system by placing the CONTROL POWER switch in START

[23] Adjust FCV-4 UV Influent Control to establish the desired feed rate of 30 gpm for normal operations

[24] Set the approximated 50% H_2O_2 flow rate need by utilizing the burette attached to T-120 and increasing or decreasing the hydrogen peroxide metering pump speed or stroke in accordance with the LMI Metering Pump Manual The approximate dosing requirements can be estimated utilizing information located in Appendix 1, Routinely Processed ER Waters 50% H_2O_2 Dosing Information, or Appendix 2, Special ER Waters Dosing Chart For Use With 50% H_2O_2

NOTE. *The LMI Metering Pump Manual is provided with the Peroxidation Systems, Inc Operation and Instruction Manual, and is in the Building 891 office*

[25] Monitor the process feed rate at the flowmeter located at UV Process Feed Pumps P-301 and P-302

NOTE. *Do not use the flowmeter located on the UV Control Panel*

[26] Record the UV Process Feed Pump and Metering Pump flow rates on the CWTF UV/H_2O_2 and GAC Treatment Log Sheet

[27] **IF** the peroxide system feed pump is air-bound as evidenced by no flow of peroxide **THEN** open the bleed valve on the chosen feed pump until the peroxide flows freely in-line

6 2 **UV/H_2O_2 System - Automatic Operation (continued)**

Operator

[28] Open the splitter pump rotameter panel to observe the peroxide solution dose to each injection point

[29] Set Rotameter #1, Rotameter #2, and Rotameter #3 as appropriate for an total flow rate of approximately 2 gpm and record the settings on the CWTF UV/H_2O_2 and GAC Treatment Log Sheet

NOTE 1. *The flow should be set at a rate adequate to prevent the splitter pump from cavitating, and the cited flow rate of 2 gpm is based on knowledge gained through plant operations*

NOTE 2· *The relative rotameter settings should be based on lamp configuration For instance the current lamp configuration is 15 lamps in Chamber #1 and 1 lamp in Chamber #2, and therefore the total H_2O_2 dosage is currently being routed to Chamber #1 using Rotameter #1 and Rotameter #2*

[30] Measure the residual peroxide in the effluent 1/2 hour after start-up, 1 hour after start-up, and every 1 hour thereafter using peroxide Quant strips

[A] Draw a sample from V-14, UV Effluent Sample Port

[B] Measure the residual peroxide using Quant strips

[C] Record the results on the CWTF UV/H_2O_2 and GAC Treatment Log Sheet

[D] Dispose of the sample in the building sump

[31] Increase or decrease the peroxide dose to the Chamber #1 and Chamber #2 injection points as appropriate to maintain approximately 1 to 3 mg/l residual H_2O_2 (sampled from V-14, UV Effluent Sample Port)

[A] Make note of all peroxide dose adjustments, adjusted metering pump flowrates and rotameter adjustments taken on the CWTF UV/H_2O_2 and GAC Treatment Log Sheet (refer to Appendix 3) The CWTF UV/H_2O_2 and GAC Treatment Log Sheets are maintained in the CWTF Building 891office

NOTE 1: *PSI normally operates their UV systems to maintain an H_2O_2 residual of 15 to 25 mg/l and acknowledges that downstream processes may necessitate limiting the H_2O_2 residual to much less than 15 mg/l At the CWTF it is necessary to limit the H_2O_2 residual from the UV/H_2O_2 system because of down-stream processes as follows 1) The greater the H_2O_2 residual concentration in the influent to the GAC Unit, the shorter the life of the GAC, and 2) Svbron Corporation, the manufacturer of the ion exchange resins in use at the CWTF recommends limiting oxidizer concentrations to less than 1 mg/l for Ionac A-641 to prevent degradation of the resin structure The first IX column at the CWTF contains Ionac A-641*

NOTE 2· *Effluent from the UV/H_2O_2 system is routed either 1) through approximatelv 40 ft of pipe to the GAC Unit and then to the 10,000 gallon Ion Exchange Surge Tank T-203, or 2) directly to Ion Exchange Surge Tank T-203 H_2O_2 reacts quickly, and process knowledge indicates that the residual H_2O_2 in the influent to the first IX column is less than 1 ppm*

6 2 UV/H_2O_2 System - Automatic Operation (continued)

Operator

[32] Monitor the UV/H_2O_2 System hourly and record readings on the CWTF UV/H_2O_2 and GAC Treatment Log Sheet (Appendix 3)

NOTE 1 *When the level in T-203 reaches 7 7 ft, the UV/H_2O_2 System automatically shuts off The UV/H_2O_2 oxidation system may be manually restarted when the level in T-203 is 7 2 ft or less*

NOTE 2 *When the level in T-202 is lowered to 2 6 ft, the UV/H_2O_2 System automatically shuts off*

[33] **IF** an alarm occurs on the UV Control Panel,
THEN check system status and notify the Lead Operator

The system automatically shuts down on the following conditions
- Low Water Flow
- Peroxide Low Pressure
- Remote Shutdown
- Lamp Enclosure Moisture (Chamber #1 or Chamber #2)
- Lamp Enclosure Door Open (Chamber #1 or Chamber #2)
- Overpressure Relief Flow
- Lamp Drive Enclosure High Temperature (Chamber #1 or Chamber #2)
- High Water Temperature
- Influent Tank Low Level
- Effluent Tank High Level

[34] **WHEN** the UV/H_2O_2 oxidation system is to be shut off manually,
THEN turn the CONTROL POWER switch on the UV Control Panel to STOP

NOTE *The CONTROL POWER switch is spring-loaded, and returns to the original vertical position when released*

[35] CLOSE the following valves
- HVB-201 or HVB 202 as appropriate
- V-75
- HVA-301 or HVA-302 as appropriate
- FCV-4
- V-91
- V-111
- V-112
- V-113
- V-114
- V-115
- V-116
- HVA-203

[36] Record the ending totalizer reading from the flow meter located at the UV Process Feed Pumps P-301 and P-302 on the CWTF UV/H_2O_2 and GAC Treatment Log Sheet

7 POST-PERFORMANCE ACTIVITY

CWTF Responsible Manager

[1] Ensure that the original and one copy , as required, of the following quality assurance (QA) records are transmitted to the ERPD Project File Center (PFC) in accordance with 2-G18-ER-ADM-17 01, Records Capture and Transmittal

- Facilities Operations Log(s)
- Process Flow Data Log(s)
- CWTF UV/H_2O_2 and GAC Treatment Log Sheet
- CWTF Operations Log Book
- Qualification/Training Documentation
- Occurrence Reports

Submission of record copies to the ERPD PFC is in accordance with Administrative Record requirements as defined in 2-S65-ER-ADM-17 02, Administrative Record Document Identification and Transmittal

There are no non-QA records generated by this procedure

8 REFERENCES

LMI Metering Pump Manual

Peroxidation Systems, Inc Operation and Instruction Manual for perox-pure™ Model CWB 240/360, Ultraviolet Light/Hydrogen Peroxide Treatment System

Consolidated Water Treatment Facility (CWTF) Health and Safety Plan

1-10000-TUM, Training User's Manual

1-77000-RM-001, Records Management Guidance for Records Sources

2-F94-ER-ADM-02 01, Training

2-G18-ER-ADM-17 01, Records Capture and Transmittal

2-S65-ER-ADM-17 02, Administrative Record Document Identification and Transmittal

4-I51-ENV-OPS-FO 33, Treated Effluent Recirculation, CWTF

APPENDIX 1
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Routinely Processed ER Waters
50% H_2O_2 Dosing Information

Sources of Routine Water	Dosing Range (mls/minute of 50% H_2O_2)	Explanation
Influent Tanks with combined quantities of the following waters - OU1 groundwater - OU2 surface water - MDF/PADF water - Purge water - Rain water/snow melt pumped from containments	Usually operate in the range of 10 to 20 mls/minute to achieve an H_2O_2 residual of 3 mg/l (measured using Quant strips)	Routinely treated waters are often combined within influent tanks The required mls/minute to achieve a residual of 3 mg/l is dependent upon the relative quantities of combined influent waters In addition, on a monthly basis and with changes in season, there are normal variations in the concentrations of contaminants in the OU1 and OU2 source waters

APPENDIX 2
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SPECIAL ER WATERS
DOSING CHART FOR USE WITH 50% HYDROGEN PEROXIDE (H2O2)

Influent TOC (mg/l = ppm)	x dose factor a/ =	Approximate 100% H2O2 Dosage Need b/ (mg/l)	Approximate 50% H2O2 Dosage Need c/ (mg/l)	Flow Rate of Water to be Processed (gpm)	Approximate 50% H2O2 Volumetric Flow Rate Need (ml/minute)
12 5	x 1 =	12 5	25	10	0 8
				15	1 2
				20	1 6
				25	2 0
				30	2 4
25	x 1 =	25	50	10	1 6
				15	2 4
				20	3 2
				25	4 0
				30	4 8 d/
37 5	x 1 =	37 5	75	10	2 4
				15	3 6
				20	4 8
				25	5 9
				30	7 1
50	x 1 =	50	100	10	3 2
				15	4 8
				20	6 3
				25	7 9
				30	9 5
62 5	x 1 =	62 5	125	10	4 0
				15	5 9
				20	7 9
				25	9 9
				30	11 9
75	x 1 =	75	150	10	4 8
				15	7 1
				20	9 5
				25	11 9
				30	14 3
87 5	x 1 =	87 5	175	10	5 5
				15	8 3
				20	11 1
				25	13 9
				30	16 6
100	x 1 =	100	200	10	6 3
				15	9 5
				20	12 7
				25	15 8
				30	19 0
125	x 1 =	125	250	10	7 9
				15	11 9
				20	15 8
				25	19 8
				30	23 8
150	x 1 =	150	300	10	9 5
				15	14 3
				20	19 0
				25	23 8
				30	28 5
175	x 1 =	175	350	10	11 1
				15	16 6
				20	22 2
				25	27 7
				30	33 3

a/ Manufacturer's Guideline Multiply the influent TOC ppm concentration by a factor of 1 5 to 2 to obtain an approximate H2O2 dosage need with a resultant 15 to 25 ppm residual Because of the need to limit the H2O2 residual to downstream processes the dose factor for the case of the CWTF will be set at 1 (less than the lower end of the manufacturer's guideline)

b/ Dosage = milligrams of 100% H2O2 to add to each liter of water to be processed (mg/l)

c/ Dosage = milligrams of 50% H2O2 to add to each liter of water to be processed (mg/l)

d/ Example (50 mg 50% H2O2/liter processed)x(1 liter/0 264 gal)x(1 ml/1 gram x SG 1 195)x(1 gram/1000 mg)x(30 gpm)=4 8 ml/minute

APPENDIX 3

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CONSOLIDATED WATER TREATMENT FACILITY
UV/H202 and GAC TREATMENT LOG

Date	Time	Process Flow Rate (gpm)	Oxidation Chamber Pressure		Temperature					No of Lamps in Operation		Are all lamp currents less than 8 amps? Y / N	50% H2O2 Flow Rate (mls/min)	50% H2O2 Dosage (mg/l = ppm)	H2O2 Pump Pressure (psig)	Rotameter Settings			Residual Peroxide (mg/l)	GAC Inlet Pressure c/ (psig)	Initials
			C #1 a/ (psig)	C #2 (psig)	Ambient (F)	Drive Enclosure C #1 (F)	Drive Enclosure C #2 (F)	Influent (F)	Effluent (F)	C #1	C #2					R #1 b/ (gpm)	R #2 (gpm)	R #3 (gpm)			

Remarks ______________________________
Remarks ______________________________
Remarks ______________________________
Remarks ______________________________

	Initials
Totalizer Start	
Totalizer End	
Total Run Time (minutes)	

a/ C #1 = UV Chamber #1 C #2 = UV Chamber #2
b/ R #1 = Rotameter #1 R #2 = Rotameter #2 R #3 = Rotameter #3
c/ If the GAC is not in use cross out this column and note in the remarks section that the GAC is not in use