APPENDIX L

Generalized O&M Manual for DPE

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OPERATION AND MAINTENANCE MANUAL
COOPER DRUM
CATALYTIC OXIDIZER

Draft

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CATALYTIC OXIDIZER

SOIL VAPOR EXTRACTION SYSTEM

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ABBREVIATIONS AND ACRONYMS

ADAV	auto dilution air valve
AWS	air/water separator
bgs	below ground surface
BMS	burner management system
CSA	Canadian Standards Association
dBA	decibels A-scale
DTSC	California Department of Toxic Substances Control
ECS	emission control system
EPA	United States Environmental Protection Agency
ESD	emergency shutdown
FM	Factor Mutual
HCl	hydrochloric acid
HF	hydrofluoric acid
Hz	Hertz
ID	induction draft
in-Hg	inches of mercury
kW	Kilowatt
mA	milliamp
MDAV	manual dilution air valve
MSDS	material safety data sheet
NaOH	sodium hydroxide
O&M	operations and maintenance
P&ID	process flow and instrumentation diagram
PFD	process flow diagram
PLC	programmable logic controller
ppmv	parts per million by volume
PVC	polyvinyl chloride
scfm	standard cubic feet per minute
SVE	soil vapor extraction
SVM	soil vapor monitoring
UL	Underwriter's Laboratory
UV	ultraviolet

ABBREVIATIONS AND ACRONYMS (Continued)

VAC	volts alternating current
VEW	vapor extraction well
VGAC	vapor-phase granular-activated carbon
VOC	volatile organic compound
w.c.	water column
°F	degrees Fahrenheit

1.0 INTRODUCTION

This operation and maintenance (O&M) manual provides instructions for the proper operation of the soil vapor extraction (SVE) system at the Cooper Drum location. This manual is intended to be used with other documents prepared pursuant to the overall remediation efforts at this site. This section provides an introduction to the site, a general description of the SVE system, and a summary of the manual's organization.

1.1 Project Description

Cooper Drum is located at 9316 South Atlantic Avenue in South Gate, Los Angeles County, California. It is identified as EPA ID CAD 055753370. The site consists of 3.3 acres of mixed residential, commercial, and industrial land use, and is located approximately 10 miles south of Los Angeles and approximately 1600 feet west of the Los Angeles River (Figure 1-1).

The SVE system, a catalytic oxidizer, is designed to be installed at the Cooper Drum location in order to promote accelerated cleanup of the site. The SVE system for Cooper Drum was designed by URS in accordance with plans approved by Environmental Protection Agency (EPA), and the California Department of Toxic Substances Control (DTSC).

1.2 General Process Description

Soil gases are extracted through dual-phase extraction wells where the groundwater is removed by a submersible pump and sent through the groundwater advanced oxidation process (for detailed information see the Groundwater O & M Manual). The vapor is extracted from the wells using a positive displacement blower, then routed through piping, where the flows are then directed to the catalytic oxidizer. Table 1-1 lists the screened intervals of the soil vapor monitoring (SVM) and SVE wells at this site. The depth to groundwater at the site is approximately 50-60 feet below ground surface (bgs). Cooper Drum also has several SVM piezometers for collecting soil gas samples to monitor SVE system effectiveness in remediating vadose zone soils. Figure 1-2 illustrates the location of the SVE extraction wells, and SVM piezometers. Additional extraction and monitoring wells may be added to the system as the removal action progresses.

The Cooper Drum SVE process facility is designed to extract up to 250 standard cubic feet per minute (scfm) of soil gas from the vapor extraction wells at vacuum levels up to 8 inches of mercury (in-Hg). The extracted soil gas is treated in an emission control system (ECS) consisting of:

- An air/water separator (AWS) to remove entrained water from the influent vapor for each system;
- A blower to induce the vacuum at the vapor extraction well for each system;
- A thermal oxidizer to destroy volatile organic compounds (VOCs);
- A quench/neutralization chamber to cool and neutralize hot acid gases (hydrochloric acid [HCl] and hydrofluoric acid [HF]) generated during oxidation of halogenated VOCs for the thermal oxidizer;
- A caustic scrubber to remove any residual acid gas prior to emission to the atmosphere for the thermal oxidizer; and

The catalytic oxidizer is designed to destroy a minimum of 99 percent of the VOCs extracted from the vapor extraction wells. The caustic quench and scrubber are designed to remove greater than 99 percent of the HCl and HF generated by the destruction of VOCs in the oxidation system.

The process flow diagrams (PFDs) and equipment layout are presented as part of Appendix A. Process sampling locations are shown on the PFDs.

1.3 Purpose and Scope of this Manual

This manual consists of O&M information for the catalytic oxidizer SVE system, system components, operating procedures, preventive maintenance, monitoring and reporting. Design drawings are included in Appendix A. Any person operating the system(s) should be thoroughly familiar with the contents of the manual, must be experienced in the operation of this type equipment, and must receive specific training in equipment operation. Every aspect of the system O&M cannot be covered in the manual. Therefore, it is important that operators are experienced and qualified to operate this type of system.

1.4 Design Drawings

Appendix A includes all design drawings for the SVE system.

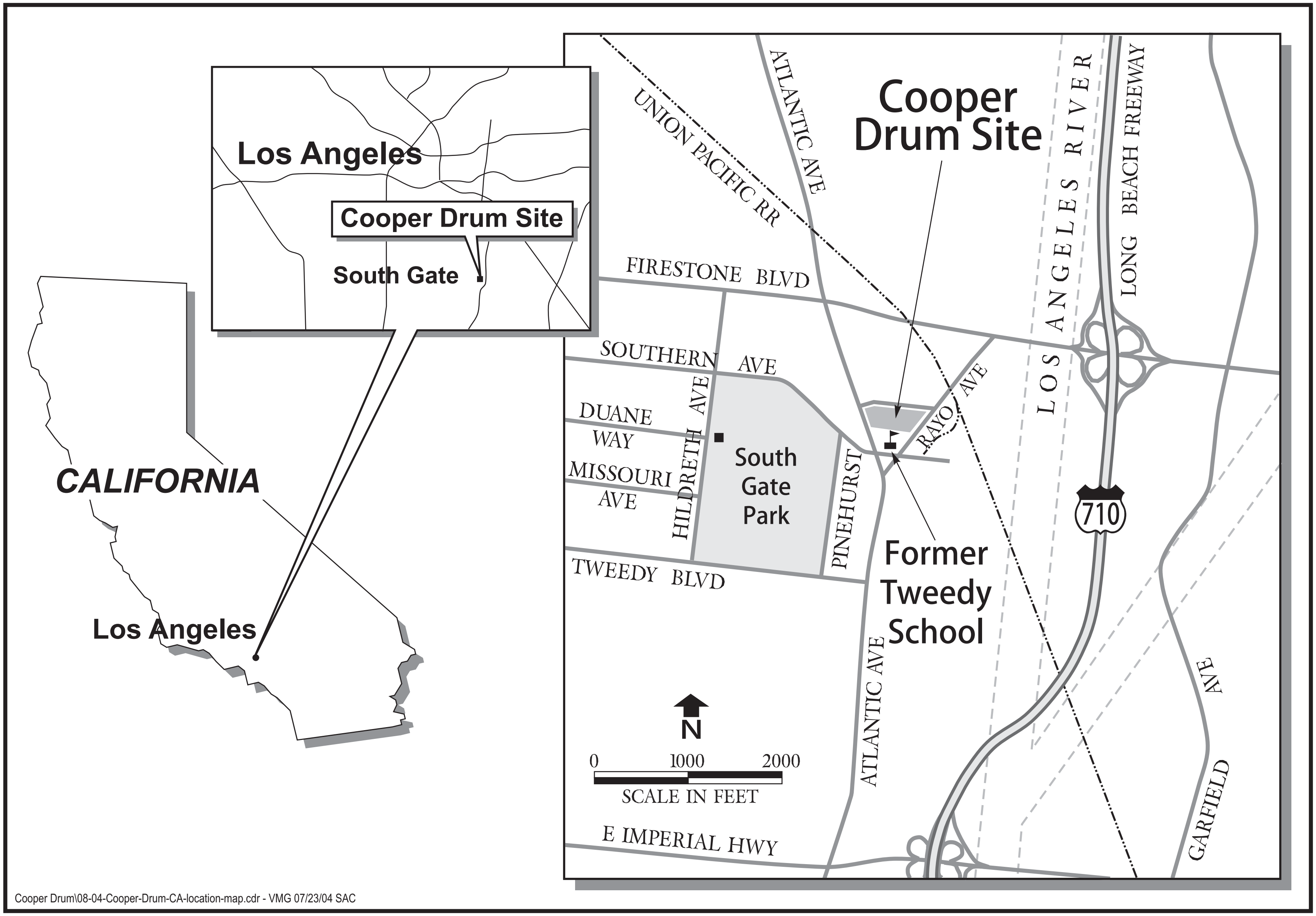

Figure 1-1. Site Location Map

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Site Map and Piping Layout

Figure 1-2

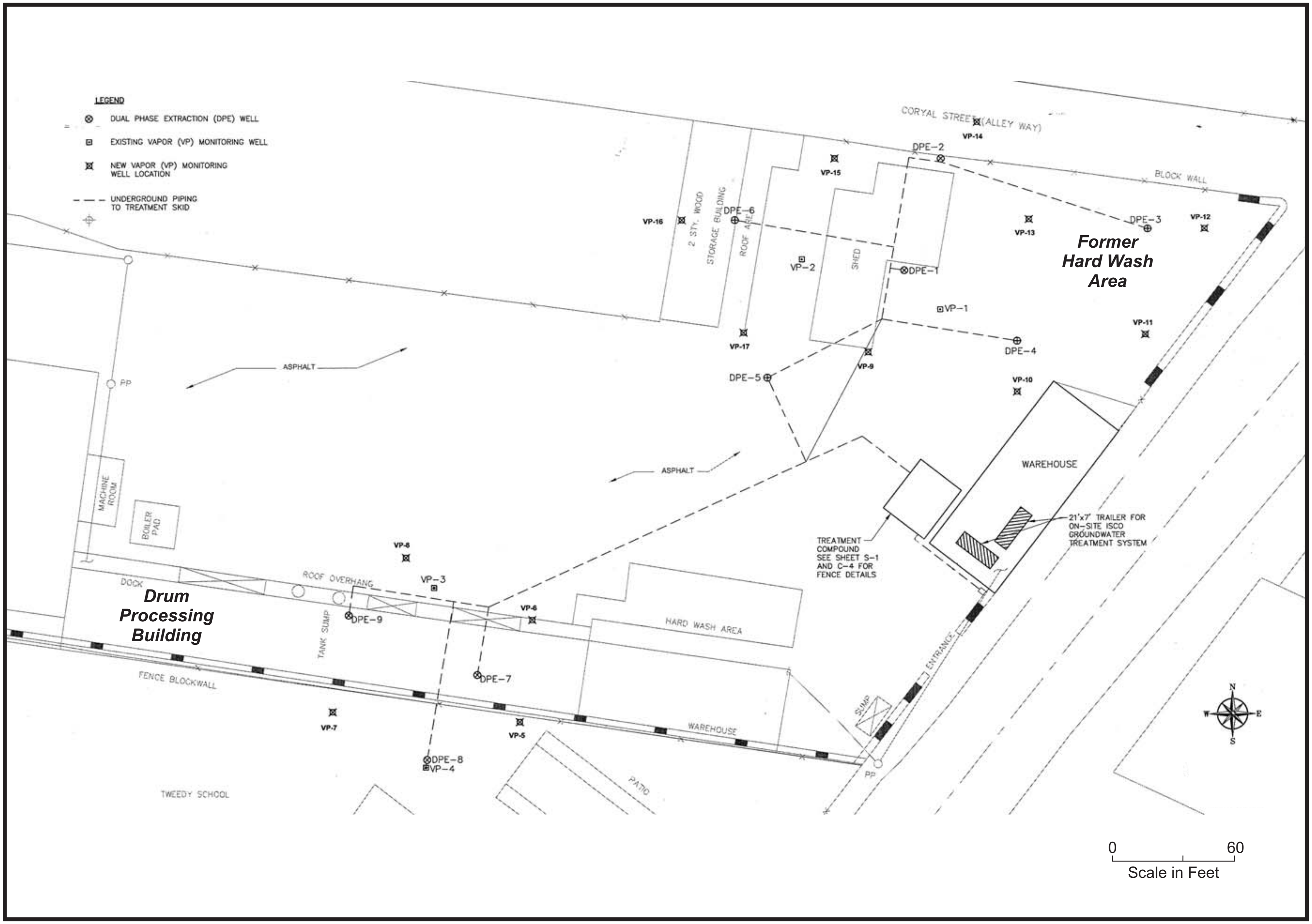

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TABLE 1-1

Current Wells at Cooper Drum, and Well Details

Well/Piezometer Number	Well Type	Screened Interval(s) (feet bgs)
DPE-1	DPE	8-43
DPE-2	DPE	10-30, 30-48
DPE-3	DPE	10-30, 30-48
DPE-4	DPE	10-30, 30-48
DPE-5	DPE	10-30, 30-48
DPE-6	DPE	10-30, 30-48
DPE-7	DPE	8-48
DPE-8	DPE	10-30, 30-48
DPE-9	DPE	10-30, 30-48
VP-1	VP	9-10, 19-20, 29-30
VP-2	VP	9-10, 19-20, 29-30
VP-3	VP	9-10, 19-20, 29-30
VP-4	VP	9-10, 19-20, 29-30
VP-5	VP	9-10, 19-20, 29-30
VP-6	VP	9-10, 19-20, 29-30
VP-7	VP	9-10, 19-20, 29-30
VP-8	VP	9-10, 19-20, 29-30
VP-9	VP	9-10, 19-20, 29-30
VP-10	VP	9-10, 19-20, 29-30
VP-11	VP	9-10, 19-20, 29-30
VP-12	VP	9-10, 19-20, 29-30
VP-13	VP	9-10, 19-20, 29-30
VP-14	VP	9-10, 19-20, 29-30
VP-15	VP	9-10, 19-20, 29-30
VP-16	VP	9-10, 19-20, 29-30
VP-17	VP	9-10, 19-20, 29-30

bgs = below ground surface
DPE = dual-phase extraction
VP = soil vapor monitoring

2.0 PROCESS COMPONENTS

The major SVE system process components are described in the following sections. The operating procedures for the SVE system can be found in Section 3.0.

2.1 Vapor Extraction Wells

The SVE system can extract soil gas through 14, 4- and 6-inch-diameter extraction wells. The casing for each well is Schedule 40 polyvinyl chloride (PVC), and the screen slot size is 0.020 inch.

The vapor streams from the wells are plumbed to the SVE system, where they manifold together into a common pipe. Instrumentation for measuring temperature, vacuum, and differential pressure is located in each well as the well piping enters the piping manifold. Aboveground piping is 4-inch-diameter Schedule 80 PVC, painted for increased ultraviolet (UV) light resistance.

2.2 Extraction Skid

This section describes typical components found at the Cooper Drum catalytic oxidizer system.

2.2.1 Air/Water Separator

The extracted soil vapor piping contains entrained condensation resulting from the moisture in the soils and fluctuating ambient temperatures. The AWS traps any liquid droplets by using centrifugal-baffled force entry. The separator vessel has a 70-gallon reservoir capacity for temporarily storing accumulated liquids. Appropriate fittings, valves, level indicator (sight glass), and high-level safety interlock allow for liquid-level indication, water removal, and automatic shutdown, when necessary. Component information for the AWS vessel is shown in Table 2-1.

TABLE 2-1

Typical Air/Water Separator General Component Information

Volumetric capacity	250 scfm
Operating pressure	2 to 12 in-Hg vacuum
Pressure drop at maximum flow conditions	0.5 in-Hg
Entrained liquid holding capacity	70 gallons
Instrumentation	Provided with an ultrasonic level indicator
Entrained liquid removal	Automatic, initiated by an ultrasonic level indicator

in-Hg = inches of mercury
scfm = standard cubic feet per minute

AWS liquids are discharged to the Groundwater Treatment Plant as needed. A level switch controls automatic pump down of AWS liquids. A high-level switch detects high liquid levels in the AWS tank and initiates a system shutdown if the AWS liquids are not adequately pumped from the AWS vessel.

2.2.2 Typical Dilution Air Valves

Automatic and manual dilution air valves are used at the Cooper Drum catalytic oxidizer SVE system.

Auto Dilution Air Valve

An auto dilution air valve (ADAV) is used during startup of the oxidation chamber. During the run step, the ADAV modulates to maintain 250-scfm of airflow to the oxidizer. The ADAV is a 3-inch motor-activated butterfly valve. During the purge step, the ADAV opens to allow a flow of approximately 250 scfm to the oxidation chamber. In the shutdown step, the ADAV shuts off flow to the oxidation chamber at temperatures below the set point.

Manual Dilution Air Valve

A manual dilution air valve (MDAV) is a 2-inch ball valve that can be used to provide ambient air to the system while the vapor extraction wells (VEWs) are isolated.

2.2.3 Typical Vacuum Blower and Drive Motor

A skid-mounted, motor-driven rotary lobe vacuum blower extracts the soil vapors from the extraction wells. The blower is designed for a flow rate of 250 scfm, with inlet conditions at 8.0 in-Hg vacuum and 70 degrees Fahrenheit (°F). Design blower outlet conditions are 250 scfm at approximately 35 inches of water column (w.c.) and 110°F. This design outlet temperature allows for interchange between thermal oxidation and carbon adsorption technologies. Vacuum system component information is shown in Table 2-2.

TABLE 2-2

Typical Vacuum System General Component Information

Design volumetric capacity	250 scfm
Inlet vacuum	2 to 12 in-Hg
Discharge pressure	35 inches water column
Motor horsepower	15
Motor type	TEFC
Dilution air inlet capacity	~250 scfm
Accessories	Discharge silencer Metal sound enclosure
Safety features	Vacuum relief valve, low and high-pressure switches, and thermal protection switch

in-Hg = inches mercury
scfm = standard cubic feet per minute
TEFC = totally enclosed, fan-cooled

The vacuum blower has a discharge silencer to reduce noise levels to less than 75 decibels A-scale (dBA). In addition, the MDAV allows the process stream oxygen level to be adjusted as necessary.

The fan-cooled electric motor (480 volts alternating current [VAC], three-phase, 60 Hertz [Hz]) provides the motive force vacuum blower operation using a single-groove v-belt. The v-belt provides a smoother and quieter operating vacuum blower and motor. The entire SVE unit (blower and motor) is enclosed in a weatherproof sound enclosure.

2.3 Typical Catalytic Oxidizer

The extracted soil vapor may be directed through the catalytic oxidizer, where contaminants are destroyed before discharge to the air. The thermal oxidizer system is skid-mounted, along with associated process piping, instrumentation, control panel, and quench and scrubber system. A programmable logic controller (PLC) and Honeywell Burner Control are used to control operations and provide process status readings.

The 550-650 °F oxidation temperature is sustained by heat retention within the oxidizer walls. Supplemental fuel (natural gas) is used during initial startup until the programmed oxidation temperature is achieved. Natural gas also is premixed (controlled by the PLC) into the process stream to maintain the hydrogen-to-halogen ratio for complete oxidation of chlorinated compounds. The thermal oxidizer provides at least 99 percent VOC destruction, or 1 part per million by volume (ppmv) total VOC in the oxidizer exhaust, whichever is least restrictive (though 99.99 percent and ≤1 ppmv are typical). Table 2-3 presents thermal oxidizer and quench/ neutralization chamber general component information. Table 2-4 presents system design concentrations.

TABLE 2-3
Typical Catalytic Oxidizer and Quench/Neutralizer Chamber General Component Information

Maximum volumetric capacity	250 scfm
Concentration range	See Table 2-4
Minimum DRE	➢ 99 percent of total VOCs
Operating Temperature	550-650 °F
Burner rating	250,000 Btu/hr
Supplemental fuel	Natural gas
Accessories	pH monitoring and control Influent and effluent temperature elements Low and high temperature shutdown Low and high natural gas pressure shutdown Continuous recording of temperature and flow rate Low freshwater supply pressure shutdown Quench recirculation flow and pressure indication
Oxidizer material of construction	Ceramic – proprietary
Quench chamber material	Rolled alloys
Quench chamber cooling capacity	250,000 Btu/hr

Btu/hr = British thermal units per hour
DRE = destruction removal efficiency
scfm = standard cubic feet per minute
VOC = volatile organic compound
°F = degrees Fahrenheit

2.4 Quench and Scrubber System

Oxidation of chlorinated and fluorinated hydrocarbons in the thermal oxidizer system results in the formation of acid gases requiring neutralization. The acidic process stream enters a flooded quench assembly at approximately 550°F (Table 2-3). In the quench, the hot exhaust gases are quenched to below 200°F by injecting cool potable water and recirculated scrubber liquids into the hot thermal oxidizer exhaust. The quench design used is a flooded quench, which passes hot gases from the oxidizer through a water column for cooling.

Counter flow scrubbing of the process gases occurs during contact with the packing media and recirculated scrubber solution. The scrubber provides a minimum 99 percent removal efficiency for the acid gases. Scrubber general component information is presented in Table 2-5.

TABLE 2-4

SVE System Design Concentrations

Compound	Design Concentration (ppmv)
Acetone	87
cis-1,2 Dicloroethane	330
m,p-Xylene	100
Toluene	220
Trichloroethene	58
Total VOC's	1,100

ppmv = parts per million by volume
SVE = soil vapor extraction
VOC = volatile organic compound

TABLE 2-5

Scrubber General Component Information

HCl/HF removal efficiency for quench chamber and scrubber	> 99 percent
Instrumentation	Recirculation flow rate to scrubber Scrubber recirculation flow temperature Scrubber pH

HCI = hydrochloric acid
HF = hydrofluoric acid

The quench water drains to the scrubber sump and is recirculated through the quench chamber. The liquid level in the reservoir is maintained by the controlled addition of fresh water and discharge to the sanitary sewer.

Neutralization of the quench liquid is controlled by the pH controller as follows: the pH analyzer receives a signal from the pH sensor and converts the signal to a 4-to-20 milliamp (mA) output current (4 mA = 0 pH, 20 mA = 14 pH). The output signal drives the caustic metering pump stroke rate inversely proportional to the pH sensed at the quench/neutralization chamber. Thus, when the system pH drops below the control set point, input current to the caustic pump increases, which increases the caustic pump stroke rate and delivers more caustic to the quench/neutralization chamber sump. The pH set point is adjustable to account for specific site conditions; however, it is generally set between 6.0 and 5.8 with a 15-per-minute pulse rate. Conversely, when the system pH returns to the desired set point (or above), output current to the caustic pump drops, lowering the rate of caustic delivery to the quench/neutralization chamber sump; typical caustic pump set point is speed = 30, stroke = 35.

2.5 Caustic Storage and Injection System

Given the acidic condition of the thermal oxidizer effluent gases, the pH of the recirculated scrubber liquid also will become acidic during the scrubbing phase. A 25 percent solution of sodium hydroxide (NaOH) is metered into the scrubber liquid to maintain a design pH. The chemical metering pump automatically pumps NaOH from a 160-gallon storage tank into the scrubber recirculation loop as required to maintain pH during operation.

2.6 Scrubber Blowdown Treatment System

Given the evaporation of liquid mass during the quenching of thermal oxidizer effluent gases, potable water is added at a slightly higher rate than the evaporation rate to maintain an adequate sump liquid level for recirculation scrubbing. When excess water volume accumulates in the scrubber sump, the water discharges as overflow, through overflow piping, and the operating level in the recirculation loop is maintained. Water discharges from the scrubber to the sanitary sewer.

2.7 Instrumentation and Controls

The main control panel is the power distribution panel for the extraction system. The second control panel contains the control devices for the normal operation of the scrubber. A third panel (the vapor-phase granular-activated carbon [VGAC] panel) contains the controls for the pad sump pump and the pH controller.

The control system relies on a PLC and a microprocessor-based burner management system (BMS) to maintain flow and temperature in the catalytic oxidizer. Process flow and temperature are recorded on a digital chart recorder.

The burner management system is specifically for combustion systems. This controller directly supervises all combustion-related permissive and interlock devices, including pressure operating status, gas pilot operation, and main burner supervision. The controller is Factor Mutual (FM)-, Underwriter's Laboratory (UL)-, and Canadian Standards Association (CSA)-approved for combustion systems. Typically the burner controller uses an ultraviolet scanner for flame sensing.

The oxidizer, quench, and scrubber are controlled by a PLC. Typically the PLC is equipped with a screen that displays system status, process flow and instrumentation diagram (P&ID) and system shutdowns. The PLC provides the control logic for the oxidizer, including the BMS. Discrete thermocouple inputs are used to maintain the proper system temperature profile. The PLC interfaces operation of the oxidizer with the quench and scrubber by using discrete inputs to maintain quench and scrubber operating conditions while the oxidizer is running.

2.8 Auxiliary Control Panel

Typically an auxiliary control panel provides the system with site-specific controls. This panel contains the alarm interlocks for the pad sump level and pH. Table 2-6 lists the control components, set points, and operating conditions in the auxiliary panel.

2.9 Electrical

Electrical power to the site is supplied by overhead distribution system. The service is connected from a junction box using surface run, flexible, armored, three-conductor cable and underground conduit.

TABLE 2-6

Pad Sump Level/pH Alarms

Description	Manufacturer	Set Point/Limit	Normal Operating Conditions
pH probe	Signet	5–10	6–7
Sump level high-high	—	4 inches	dry

The catalytic oxidizer system electrical is distributed to the local control panel, and then to the pumps, blower, and instrumentation for the system.

Typical lighting consists of four halogen flood security lights, with photo-sensor controlled activation, that illuminate the vapor extraction equipment pad and the catalytic oxidizer system.

Two emergency stop devices (in addition to those integral to the process) located on the control panel and main power panel are connected to relays to initiate process shutdown. An autodialer is connected to the telephone system to provide alarm reporting to the emergency response phone.

3.0 OPERATIONS PROCEDURES

This section presents general procedures to start, operate, monitor, and shut down the thermal oxidizer system. Because operations will not always be routine, any person operating the system must be experienced in the operation of this type of equipment and must receive specific training.

3.1 Typical Catalytic Oxidizer System Startup and Operation Procedures

This section provides a brief startup and operation procedure for Catalytic Oxidizer system at the Cooper Drum site.

Typical startup sequence for this system comprises a few important steps. This section outlines the steps and directs the operator through the required actions to proceed from cold shutdown through processing soil vapor.

3.1.1 Prepare/Startup Step

This step prepares the system for startup. First, all automated fuel valves are closed and all rotating equipment are shut down. Power to the system also may be shut off at the extraction panel and the main electrical panel. Power to the sump/pH pad should be on, to prevent pad flooding.

The following sequence is performed by the operator to complete the **prepare** step:

1. Verify the vapor well isolation valve is closed.
2. Open the natural gas supply valves.
3. Open the scrubber discharge valve.
4. Open the eyewash supply valve.
5. Open the fresh water supply valve.
6. Verify the proper lubricating oil level in SVE blower; visually inspect for oil leaks.
7. Verify the proper water level in scrubber sump sight glass.
8. Verify the sodium hydroxide metering pump is on.
9. Open the sodium hydroxide isolation valve.
10. Verify the equipment pad sump pump is operational.
11. Verify power is available, i.e., the main breaker for extraction panel is switched on.
12. Reset the emergency shutdown (ESD) switch; reset interlocks.

Cold Start

The following **cold start** sequence is entered after the operator has performed the prepare step:

1. Turn main disconnect “ON” panel to the on position.
2. From the main screen, press F4 to verify alarm is reset.
3. Press F6 to start the scrubber recirculation pump.
4. Press F1 to start the blower and the induction draft (ID) fan. The panel view will indicate a status change.

5. Press F3 to reset "LIMITS." The panel view will indicate "LIMITS ARE NORMAL." The oxidizer will automatically go to a purge cycle for 60 seconds. After the oxidizer has completed the purge cycle, it will attempt to light the flame for 15 seconds. After completion of ignition, the panel view will indicate "BURNER ON."
6. The catalytic oxidizer will heat up until it reaches its set point (approximately 550-650 °F) and opens the vapor well isolation valve.
7. Verify scrubber operations and fluid flows.
8. Verify operating temperatures and vapor flows.
9. Record the startup time and the blower hours on the STATS screen.

Hot Start

The following **hot start** sequence is performed after the system has been shut down for short period of time (approximately 2 hours or less):

1. From the main screen, press F4 to verify alarms are reset.
2. Press F6 to start the scrubber recirculation pump.
3. Press F1 to start the blower and the ID fan. The panel view will indicate a status change.
4. Press F3 to reset "LIMITS." The panel view will indicate "LIMITS ARE NORMAL." The oxidizer will automatically go to a purge cycle for 60 seconds. After the oxidizer has completed the purge cycle, it will attempt to light the flame for 15 seconds. After completion of ignition, the panel view will indicate "BURNER ON."
5. The oxidizer will heat up until it reaches its set point (approximately 1,550°F) and opens the vapor well isolation valve.
6. Verify scrubber operations and fluid flows.
7. Verify operating temperatures and vapor flows.
8. Record the startup time and the blower hours on the stats screen.

3.1.2 Shutdown Step

The shutdown step shuts the oxidizer down in a controlled manner, to purge the system of flammables and to ensure unsafe conditions do not develop or persist. This step is entered when maintenance is planned or if equipment or instrument problems occur in other steps.

The **shutdown** step sequence is as follows:

1. From the main screen, press F8 to shut down burner; record the run time and the blower hours on the STATS screen.
2. After oxidizer cools below 200°F (temperature can be verified on the main screen of the panel view) press F2 to stop the blowers, and F7 to stop the scrubber recirculation pump.
3. Verify the vapor well isolation valve is closed.
4. Close the natural gas supply valves.
5. Close the scrubber discharge valve.
6. Close the fresh water supply valve

7. Verify the sodium hydroxide metering pump is off.
8. Close the sodium hydroxide isolation valve.
9. Verify power is not available, i.e., the main breaker on the extraction panel is switched off.

After shutdown, the operator pulls the local ESD button.

3.1.3 SVE System Emergency Shutdown and Response Guidelines

Emergency shutdown may be required under numerous circumstances (e.g., power failure, recirculation system piping leaks or fitting failure, sodium hydroxide system leakage, or a fire during normal operation).

The **emergency shutdown** sequence is as follows:

1. Verify site security.
2. Record the alarm on the panel view.
3. Reset the present alarm by pressing F4.
4. Scroll to “STATS” screen and record the run time and the blower hours.
5. Check the scrubber level (verify that the water is between the marks on the level indicator). If the scrubber level is too high, drain it back to between the marks on the level indicator. If the level is too low, verify the water supply.
6. Verify the all components are operational in the prepare step; if systems are okay, proceed to startup.
7. If all systems are not okay, proceed to the shutdown step, if possible.
8. If the shutdown step is not possible, turn off the natural gas supply and the sodium hydroxide isolation valve.
9. Verify scrubber recirculation pump status.
10. **DO NOT TURN OFF POWER OR WATER**.
11. Secure the site.

3.1.4 Planned and Unplanned Shutdowns

Several switches and sensors can initiate an automatic system shutdown if a process parameter exceeds a preset limit. These interlocks and the control logic are shown on the P&ID in Appendix A. In all cases, an alarm code will illuminate indicating each fault that was actuated, and the panel view will show a “first-out” indication of which interlock occurred first.

When a shutdown of one hour or more occurs, the operator must complete a Shutdown Log. This applies to planned shutdowns (e.g., for scheduled maintenance) and to unplanned shutdowns (e.g., automatic/emergency shutdowns). Information related to the time, cause, or corrective action(s), and any other observations related to the shutdown ,should be recorded on the log. Shutdown Logs also should be completed for short-duration shutdowns if an unusual cause of the shutdown occurs. The shutdown time can be determined by the run time and the blower hours on the stats screen on the panel view.

3.2 Typical Routine Operations/Monitoring

Routine operations generally consist of monitoring and adjusting the process conditions to assure continued operation in the desired configuration, replacing expendable materials (such as filter elements, checking liquid levels in tanks), and checking the system for abnormal conditions (such as leaks, abnormal noise, temperature, or vibration).

Routine operating and process monitoring data should be recorded on a site-specific SVE Process Data Sheet. All onsite activity will be recorded in a site-specific chronological logbook.

Some of the normal daily procedures for routine system operations includes:

1. Checking the oil levels in oil-lubricated pumps.
2. Checking the system for any leakage.
3. Checking for any abnormal noise, vibration, or temperature throughout the system (surfaces, bearings, etc.).
4. Checking the blowdown system operation.
5. Verifying that the digital chart recorder is operating properly.
6. Recording plant-operating data on the SVE Process Data Sheets; compare the data to previous data, and note trends or out-of-specification conditions.
7. Recording the “RUN TIME” prior to site departure.
8. At the end of each week, recording all motor hour-meter readings and utility meter readings to determine maintenance requirements and to document utility usage rates.
9. Performing area housekeeping as warranted.

3.2.1 Process Monitoring

Process monitoring is completed by recording the required data on a SVE process data sheet. A row of data should be recorded for each of these situations:

- Following a system startup;
- Following a significant change in operating conditions; or
- Any other time the operator believes the data should be recorded.

For a system shutdown of one hour or longer, the word “SHUTDOWN” should be written across a row on the form, and the date and time of the shutdown should be noted in the columns on the left. Similarly, the word “OPERATING” should be noted on a row along with the date and time when the system is brought back on line. The startup time should begin when soil gas processing from the vapor well(s) begins.

3.2.2 Process Control

Process control involves maintaining system operational parameters, such as operating temperatures, flows, and scrubber sump pH. Process control is performed by the PLC and requires little operator intervention. Design control specifications are described O&M Manual and in Sections 2.3 and 2.4 of this O&M Manual.

3.3 Typical Waste/Residuals Management

Process wastes that must be managed during SVE system operation, including:

- Scrubber blowdown;
- AWS liquids and conveyance pipe condensate; and
- Used lubricating oils.

Routine trash generated during operations can be considered non-hazardous and disposed of with general non-hazardous wastes.

4.0 MAINTENANCE

This section presents a maintenance management system to aid the operator in developing a routine preventive maintenance program. Proper equipment maintenance is essential for staff safety and effective and efficient facility operation.

This section only summarizes maintenance requirements and presents the basic concepts of maintenance scheduling. It is the plant operator's responsibility to maintain a safe and functioning facility and to schedule maintenance appropriately.

4.1 Typical Routine Preventive Maintenance

The SVE system pumps and blowers require preventive maintenance. For these components, routine preventive maintenance includes:

- Checking oil levels, replacing pump/blower lubricants, and greasing motor bearings as required, based on operating hours;
- Checking belt tensions and replacing belts as required; and
- Monitoring the operating equipment for excessive vibration or noise.

Hour-meter readings for each motor will be logged weekly in the Maintenance Schedule and Log; maintenance will be scheduled for each unit based on the hours operated and the manufacturer's recommended maintenance schedule (Table 4-1).

TABLE 4-1

Preventive Maintenance Schedule (Lubrication)

Component	Manufacturer-Recommended Lubrication Schedule	Lubrication Type
Blower Bearings (grease)	168 hours (weekly)	No. 2 Lithium
Blower Gear Box (oil change)	1,000 hours (monthly)	Mobil DTE BB or equivalent
Blower Motor	3,000 hours	Shell Dolium R or equivalent
ID Fan Bearings (grease)	1,500 hours	No. 2 Lithium

The lubricant type (Table 4-1) should be consistent with the manufacturer's recommended lubricant; if possible, a common manufacturer for lubricants is recommended to maintain a minimum inventory and to expedite the purchase of lubricants.

The operator should develop a schedule for preventive maintenance, based on the manufacturer's recommendations, which may include procedures requiring the shutdown of major process components. Other routine maintenance requirements may be developed as operating parameters dictate.

4.2 Typical Routine Operational and Maintenance Requirements

The maintenance schedule developed for this site includes the procedures presented in the following sections.

4.2.1 Daily (Monday through Friday)

- Conduct morning site visit.
- Conduct evening site visit.
- Check site security—locks, fence, gates.
- Inspect treatment plant site for any abnormal indicator light, noise, vibration, temperature, pressure, flow rate, leaks, or valve position. Any abnormal condition should be recorded in the field logbook and corrected immediately.
- Inspect sodium hydroxide injection system.
- Record operating data on a Process Data Sheet. Compare latest data to previous data. Note any unusual new data or trends.
- Verify any system or piping pressure drop.
- Remove AWS liquids if the liquid level is more than half way to the high-level alarm. Inspect AWS system for leaks, proper operation and pump as necessary.
- Record all pertinent field activity in field notebook.
- Clean up site area.

4.2.2 Weekly

- Complete daily tasks in Section 4.2.1.
- Record motor operating hours and compare to the next scheduled maintenance.
- Record panel hour meter, blower hour meter, electric kilowatt (kW) hour meter, natural gas meter (cubic feet), NaOH level (gallons), water totalizer (gallons), sewer totalizer (gallons), AWS totalizer (gallons).
- Lubricate blower bearings.
- Check condensate sumps, clean and inspect pad sumps, Y strainers; remove liquid as necessary.
- Clean pad sump and equipment area (as needed); empty trashcan.
- Drain low points drains.
- Inspect spill plan, spill kit and material safety data sheet (MSDS) binder.
- Calibrate sewer discharge pH probe.
- Check autodialer operation.

4.2.3 Monthly

- Complete tasks in Section 4.2.1 and Section 4.2.2.
- Replace dilution air filters (as needed), change PD blower oil (1,000 hours), calibrate scrubber pH probe.
- Inspect eyewash and shower operation, check for appropriate labeling and signage at sites, check fire extinguisher, verify that stack guy wires are tight and in good condition.
- Verify DRE sampling complete.

4.2.4 Quarterly

- Complete tasks in Section 4.2.1, Section 4.2.2 and Section 4.2.3.
- Check PD blower belt tension, check ID fan belt tension, inspect and clean piezometers.
- Perform a vibration analysis on all major rotating machinery components.
- Lubricate blower motor bearings.
- Lubricate ID fan bearings.
- Calibrate discharge high temperature switch.
- Sewer outfall sampling complete.

4.2.5 Semiannually

- Complete tasks in Section 4.2.1, Section 4.2.2, Section 4.2.3 and Section 4.2.4.
- Perform interlock testing.
- Inspect and tighten electrical connections.
- Inspect scrubber sump and packing.
- Grease PD blower motor (3,600 hours).
- Check specifications on ID fan motor winding current, and motor winding current.

4.2.6 Annually

- Complete tasks in Section 4.2.1, Section 4.2.2, Section 4.2.3, Section 4.2.4, and Section 4.2.5.
- Sewer Discharge Flow Calibration (performed in December).

5.0 REFERENCES

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EPA, 2004. Guidance on Surface Soil Cleanup at Hazardous Waste Sites: Implementing Cleanup Levels. May.

URS Group Inc.(URS), 2002. *Cooper Drum Remedial Investigation Feasibility Study Report.*

URS, 2004. *Cooper Drum Superfund Site Remedial Design Supplemental Field Sampling Results Technical Memorandum.* April

APPENDIX A

Cooper Drum Design Drawings

See Design Tab for Drawings