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PROGRAM MANAGER FOR
ROCKY MOUNTAIN ARSENAL

ROCKY MOUNTAIN ARSENAL

INTERIM RESPONSE ACTION

BASIN F LIQUID INCINERATION PROJECT

DRAFT FINAL

SUBMERGED QUENCH INCINERATOR STARTUP PLAN

JULY 1992

PREPLACED REMEDIAL
ACTION CONTRACT -
CONTRACT NO. DACW-45-90-D-0015

U.S. ARMY CORPS
OF ENGINEERS
OMAHA DISTRICT

WESTON
MANAGERS DESIGNERS CONSULTANTS

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THE OBJECTIVE OF THE STARTUP PLAN IS TO DESCRIBE THE PROCEDURES THAT WILL BE USED TO PREPARE THE SQI SYSTEM EQUIPMENT TO A POINT OF OPERATIONAL READINESS. THIS DOCUMENT DISCUSSES PLANNED ACTIVITIES FROM MECHANICAL COMPLETION OF THE SQI FACILITY THROUGH TESTING OF THE SYSTEM PRIOR TO THE TRIAL BURN. THE MAJOR COMPONENTS OF THE STARTUP PROCESS INCLUDE: EQUIPMENT CHECKOUT, SURROGATE TESTING, AND SHAKEDOWN TESTING. THIS PLAN DOES NOT DISCUSS OPERATING PROCEDURES RELATING TO STARTING THE SQI FACILITY.

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COMMERCE CITY, COLORADO

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OVERVIEW

1.1 INTRODUCTION

In accordance with the Federal Facility Agreement, the Program Manager, Rocky Mountain Arsenal (PMRMA) is in the process of implementing the Basin F liquid Interim Response Action (IRA). As part of this action, the U.S. Army Corps of Engineers (USACE) has tasked Roy F. Weston, Inc. (WESTON) to design, construct, and initially operate a submerged quench incineration (SQI) facility at the Rocky Mountain Arsenal (RMA) in Commerce City, Colorado. The SQI is a proprietary incineration system developed by T-Thermal, Inc., in Conshohocken, Pennsylvania, and will be used to treat approximately 10.5 million gallons (MG) of Basin F liquid (wastewater).

As part of WESTON's engineering effort, four operational plans have been developed to outline activities relating to the startup, testing, and operation of the SQI facility. These plans include:

- SQI Startup Plan
- SQI Trial Burn Plan
- SQI Operation and Maintenance Manual
- SQI Chemical Data Acquisition Plan

The latter three plans have been developed under separate cover.

Comments received on the draft SQI Startup Plan from PMRMA, USACE, Shell, U.S. EPA Region VIII, and the State of Colorado have been incorporated into this document where appropriate. The individual comments with accompanying responses are presented in Appendix A.

1.2 OBJECTIVE OF THE STARTUP PLAN

The objective of the Startup Plan is to describe the procedures that will be used to prepare the SQI system equipment to a point of operational readiness. This document discusses planned activities from mechanical completion of the SQI facility through testing of the system prior to the trial burn. The major components of the startup process include the following:

- Equipment Checkout - System components will be thoroughly checked for proper installation, operation, and safety to verify operational readiness.
- Surrogate Testing - Upon completion of equipment checkout, the SQI will be initially tested using water. After water testing, a series of surrogate feed materials will be introduced to the system. Adjustments will then be made to the system where necessary (i.e., mechanical adjustments and/or modifications to operating parameters).
- Shakedown Testing - After successful completion of surrogate testing, the progressive introduction of waste to the SQI will commence. Successful testing includes meeting the prescribed objectives for a given test. The main purpose of shakedown testing is to bring the SQI to a point of operational readiness within limitations considered most likely to comply with performance standards.

This plan does not discuss operating procedures relating to starting the SQI facility. All pertinent operating procedures are included in the SQI Operation and Maintenance Manual.

1.3 PROCESS REVIEW

The processes to be used in the destruction of the Basin F liquid hazardous compounds include high-temperature oxidation followed by high-energy scrubbing for particulate emission control and caustic scrubbing for acid mist absorption of the exhaust gases. The principal equipment associated with the thermal destruction system includes the following:

- A submerged quench incinerator (SQI).

- A high-energy venturi scrubber for particulate emission control.
- A packed tower caustic scrubber for acid fume control.
- A computerized process monitoring and control system (PMCS).

Support/auxiliary process components associated with the SQI facility include the following:

- A Basin F liquid transfer system.
- Day (feed) tanks and a wastewater feed system.
- A caustic storage, dilution, and transfer system.
- A brine storage and transfer system.
- A continuous emissions monitoring (CEM) system.
- A steam generation and distribution system.
- An emergency power system.

A schematic flow diagram for the SQI facility is presented in Figure 1-1. A more detailed process description can be found in the SQI Operation and Maintenance Manual.

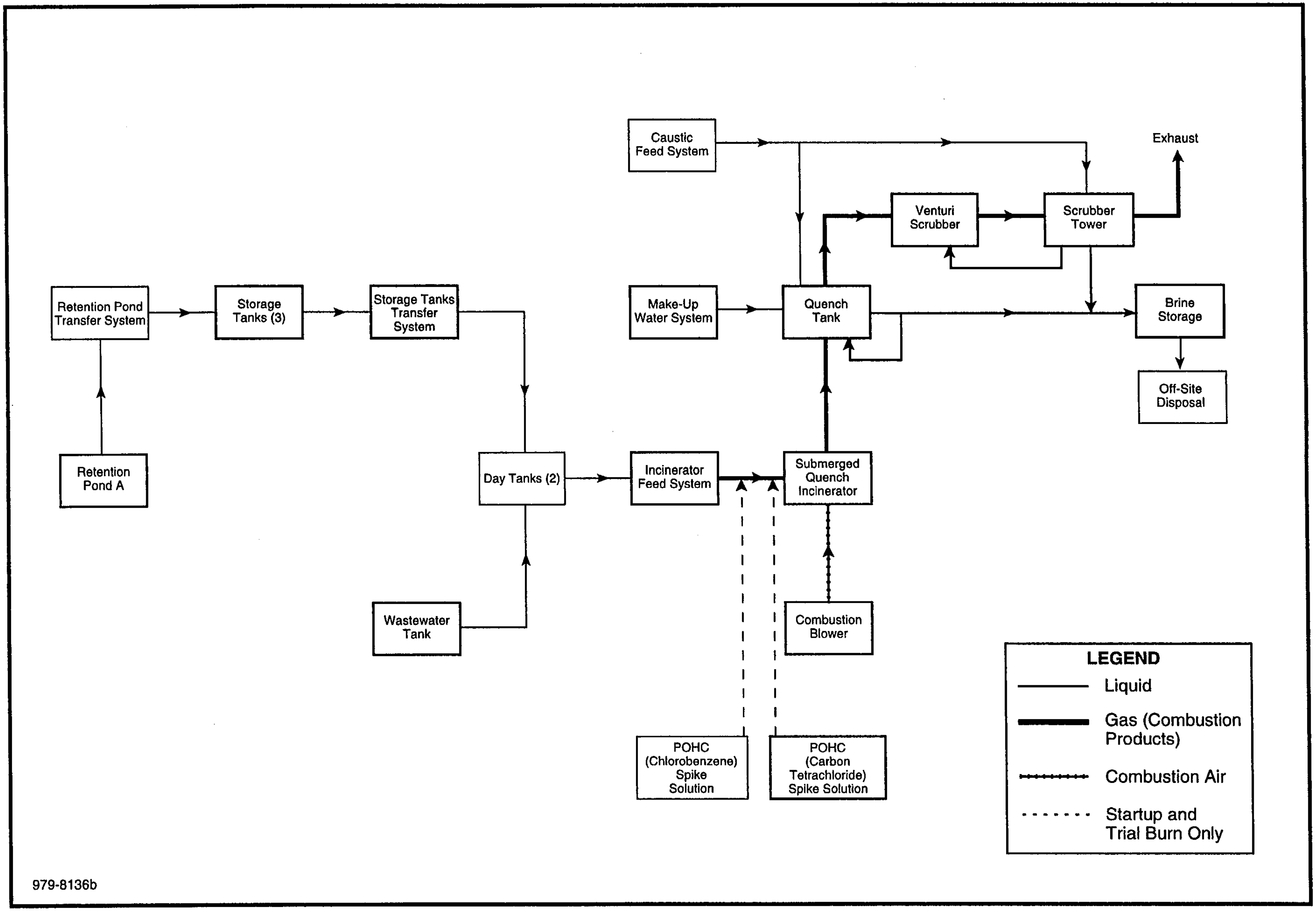

FIGURE 1-1 PROCESS FLOW SCHEMATIC DIAGRAM

SECTION 2
STARTUP PERSONNEL

The personnel requirements for startup of the SQI facility include the technical staff to check out the facility equipment as well as the routine staff for operation and maintenance of the SQI during surrogate and shakedown testing. The personnel requirements associated with each of these phases of startup vary significantly. Organization charts for equipment checkout and operation and maintenance of the SQI are included as Figures 2-1 and 2-2, respectively.

2.1 PERSONNEL FOR EQUIPMENT CHECKOUT

On-site personnel during equipment checkout of the SQI facility will be responsible for determining the operability of the individual components within the system. Process components will be evaluated prior to system initiation. A field crew will evaluate the process components to verify that installation has been performed properly and that the equipment is fit for operation.

Supervision of all equipment checkout activities will be provided by WESTON under the USACE direction. The individuals responsible for equipment checkout of the SQI facility are discussed in the following subsections.

2.1.1 Construction Superintendent

The Construction Superintendent, Mr. Joseph Borucki, P.E., has overall responsibility for mechanical completion of the SQI facility. The Construction Superintendent will be located in WESTON's West Chester, Pennsylvania, headquarters. Primary tasks performed by the Construction Superintendent include monitoring the schedule, budget, and technical progress of equipment checkout as well as keeping the client fully informed of project progress. Difficulties that cannot be resolved on-site will be handled by the Construction Superintendent.

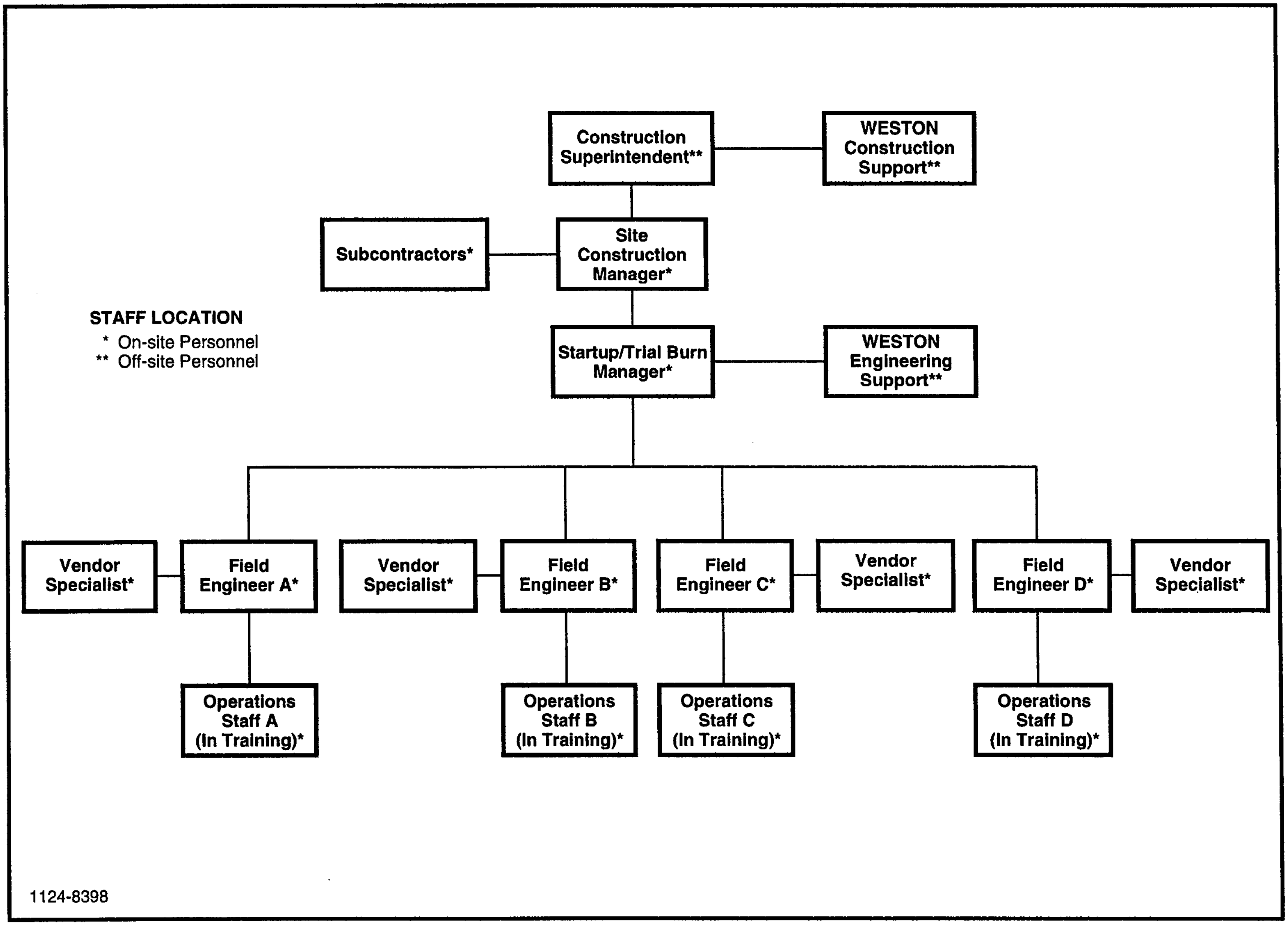

FIGURE 2-1 PROJECT STAFF FOR EQUIPMENT CHECKOUT OF THE SQI

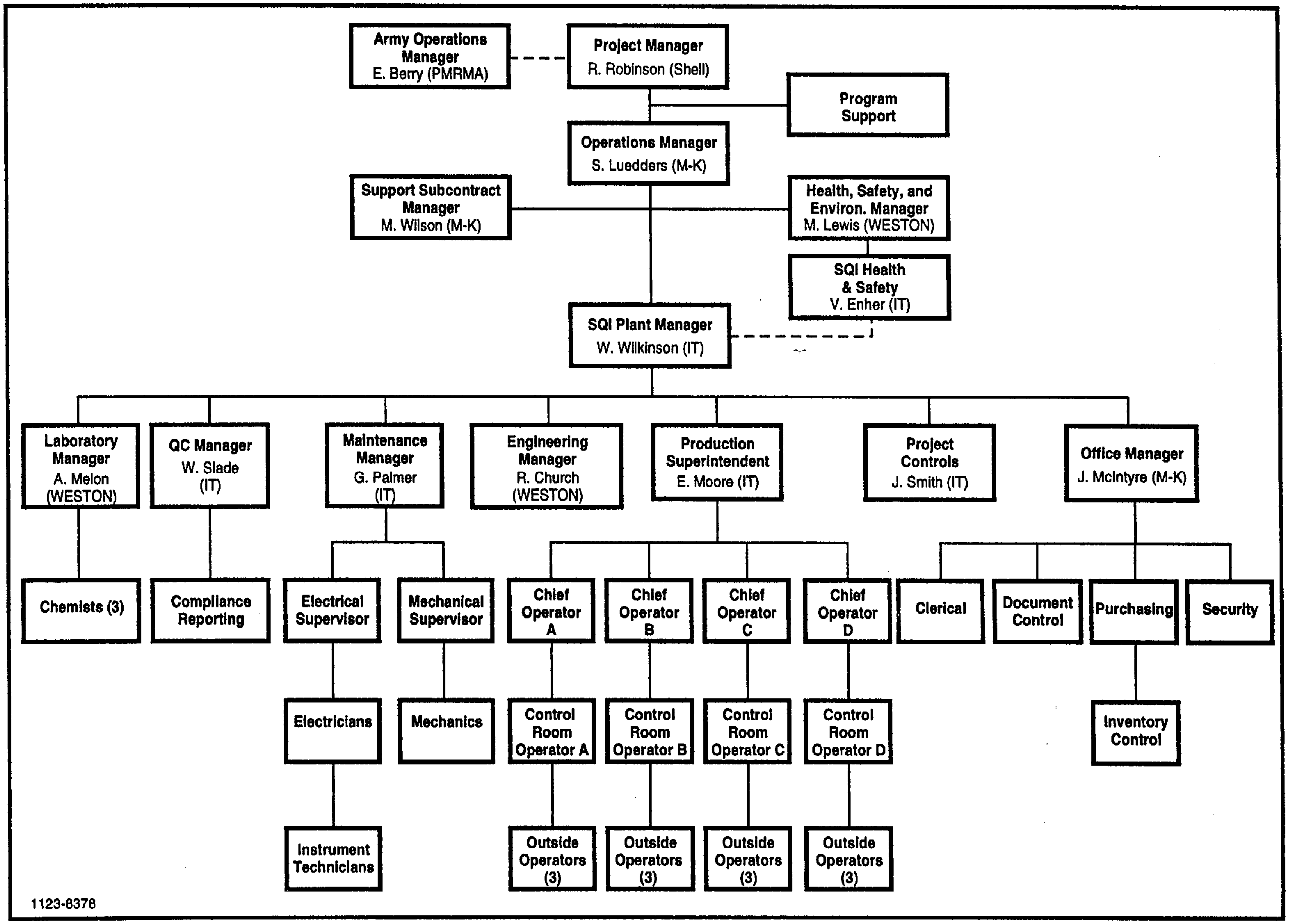

FIGURE 2-2 ON-SITE OPERATIONS AND MAINTENANCE STAFF FOR SURROGATE AND SHAKEDOWN TESTING

2.1.2 Site Construction Manager

The Site Construction Manager, Mr. Peter Welsh, has the overall responsibility for all on-site activities associated with equipment checkout of the SQI facility. The Site Construction Manager has the authority to resolve discrepancies that develop on-site. However, the Construction Superintendent will be advised of any serious problems. Primary duties of the Site Construction Manager include tracking equipment deliveries, installations, and checkouts; monitoring subcontractors and vendor representatives on-site; and performing the financial and administrative activities associated with equipment checkout. The Site Construction Manager will report directly to the Construction Superintendent.

2.1.3 Startup/Trial Burn Manager

The Startup/Trial Burn Manager, Ms. Kathy Andrews, has the technical responsibility of verifying that each process component has been properly installed and tested and will perform correctly during operation. The Startup/Trial Burn Manager will supervise each of the field crews actually performing the equipment checkout activities and will be responsible for developing lists of items that must be completed prior to system startup (i.e., punch lists). The Startup/Trial Burn Manager will report directly to the Site Construction Manager and will receive engineering support from WESTON's West Chester, Pennsylvania, headquarters.

2.1.4 Equipment Checkout Field Crew

The Equipment Checkout Field Crew will be responsible for field verification, i.e., confirming that process components have been properly installed and tested. Each field crew will consist of the following individuals:

- Field Engineer
- Routine Operations Staff
- Vendor Specialist (as needed)

The Field Engineer will act as the crew chief and will supervise equipment checkout activities. The Field Engineer will report the status of each process component checked out directly to the Chief Startup Engineer. Operational personnel will also be available to familiarize themselves with individual process components and how these components are maintained during operation. Vendor specialists may be needed when a particular process component has a lengthy or difficult inspection and/or testing protocol. Vendor representatives from T-Thermal and Modicon (the computerized process control system supplier) will be available full-time during equipment checkout and startup. Continuous emissions monitoring (CEM) equipment manufacturers, as well as other specialty equipment manufacturers, may also be required on-site for extended periods during startup.

Problems identified by the Equipment Checkout Field Crews will be relayed to the Chief Startup Engineer as soon as possible. At the end of each working day, the Chief Startup Engineer will develop a list of equipment checkout deficiencies that have been identified. This list will then be reviewed with the Site Construction Manager, and action items will be delegated to construction personnel for correction of deficiencies.

2.2 PERSONNEL FOR SURROGATE AND SHAKEDOWN TESTING

As construction activities come to an end and operational testing begins, overall site authority will be "turned over" from the Site Construction Manager to the Site Plant Manager. As surrogate testing begins, operational responsibility of the SQI plant belongs to the SQI management team (i.e., PMRMA, Shell, WESTON, M-K, and IT). On-site personnel during surrogate and shakedown testing will be responsible for the proper operation and maintenance of the SQI facility. Personnel requirements for surrogate and shakedown testing are expected to be similar to the requirements for routine operation of the SQI. Because the SQI will operate continuously, staffing will be required 24 hours a day, 7 days a week. However, the majority of the on-site personnel will work the day shift only. The staffing requirements outlined in Figure 2-2 are anticipated. They may, however, need to be adjusted to meet operational requirements.

The individuals responsible for surrogate and shakedown testing of the SQI are discussed in the following subsections.

2.2.1 SQI Plant Manager

The SQI Plant Manager, Mr. William Wilkinson, P.E., of IT Corporation, will be on-site during surrogate and shakedown testing and will be responsible for all aspects of SQI operation, including the following aspects of the project:

- Facility production
- Facility maintenance
- Quality assurance and safety
- Administration and finance
- Maintenance of existing Basin F liquid storage facilities

The SQI Plant Manager is responsible for establishing work schedules and responsibilities for all site personnel as well as maintaining an interface with the SQI management team and other regulatory personnel. The SQI Plant Manager has the authority to resolve all discrepancies that develop on-site during system startup activities.

2.2.2 Production Superintendent

The Production Superintendent, Mr. Edward Moore of IT Corporation, has the responsibility of maintaining proper operation of the SQI facility 24 hours a day, 7 days a week. In order to accomplish this, four rotating shifts of production personnel will be used to operate the SQI facility. Each shift will contain the following personnel:

- Chief Operator
- Control Room Operator
- Field Operators (3)

The Chief Operator will be responsible for proper operation of the SQI facility during a particular shift. The Chief Operator will also act as the Safety Monitor and will be trained accordingly. The Chief Operator has the authority to make operating modifications as necessary. The Control Room Operator has the responsibility of monitoring the automated process control system within the control room. The Field Operators are responsible for minor maintenance of the SQI facility, including all necessary electrical modifications/ maintenance and routine calibration of necessary instruments. The Field Operators are also responsible for monitoring the logistics of caustic and brine handling.

2.2.3 Engineering Manager

The Engineering Manager, Mr. Richard Church of WESTON, is responsible for any engineering/design modifications that may be necessary during the course of operations. The Engineering Manager will have access to the engineering resources available throughout WESTON. The on-site staff under the Engineering Manager has not been decided to date. However, off-site engineering support is available as needed.

2.2.4 Maintenance Manager

The Maintenance Manager, Mr. George Palmer of IT Corporation, is responsible for scheduling routine maintenance and responding to unexpected incidents to keep operations running smoothly. The Maintenance Manager is also responsible for directing subcontractor repair work. The maintenance staff working under the Maintenance Manager includes the following:

- Mechanical Supervisor
- Electrical Supervisor
- Mechanics
- Electricians
- Instrument Technicians

The Mechanical and Electrical Supervisors monitor mechanical and electrical subcontractors and also monitor maintenance and repair work. The Mechanics and Electricians are responsible for repairing/replacing equipment and developing and completing maintenance records. Instrument technicians will be on-site during the day shift to perform preventive maintenance and repairs.

2.2.5 Quality Control Manager

The Quality Control Manager, Mr. W. Slade of IT Corporation, has the responsibility of assuring that the work performed on-site is of the highest quality practicable. Quality control concerns focus on laboratory analyses, health and safety activities, maintenance of records, and compliance reporting. The Quality Control Manager will work closely with all other task managers to assure that the plant is operating efficiently and within regulatory compliance.

2.2.6 Laboratory Manager

The Laboratory Manager, Mr. Anthony Melon of WESTON, is ultimately responsible for the generation of reliable laboratory data. The Laboratory Manager is also responsible for maintaining the laboratory schedule, ensuring that technical requirements are understood by the laboratory, and advising the necessary on-site personnel of all variances. It is the Laboratory Manager's responsibility to see that all tasks performed in the laboratory are conducted according to the requirements of the CDAP.

2.2.7 Project Control

Project control and scheduling will be performed by Mr. J. Smith of IT Corporation and include developing monthly performance reports as well as tracking project status (i.e., milestones achieved). Primavera Project Planner will be used as the key project control and scheduling tool.

2.2.8 Office Manager

The Field Office Manager, Mr. J. McIntyre of Morrison Knudsen Corporation, is responsible for managing the administrative aspects of the project. Duties overseen by the Office Manager include:

- Daily site correspondence.
- Development and maintenance of a document control system.
- Purchase of the necessary equipment and supplies needed to operate the SQI facility properly.
- Plant security.

The Office Manager reports directly to the Site Project Manager.

2.2.9 Support Subcontract Manager

The Support Subcontract Manager, Mr. Marty Wilson of Morrison Knudsen Corporation, is responsible for the administration of all necessary support subcontracts. These support subcontracts include brine handling activities, caustic supply activities, brine disposal activities, railroad track repairs, snow removal, etc.

2.2.10 Health, Safety, and Environment Manager

The Health, Safety, and Environment Manager, Mr. Mickey Lewis of WESTON, is responsible for the planning, execution, and auditing of the overall project safety policy. He will be responsible for implementing contingency planning if necessary, including interfacing with RMA safety personnel. The Health, Safety, and Environment Manager has the authority to halt SQI operations for safety reasons. Health and safety concerns are discussed in detail in the Site Safety and Health Plan (Appendix B of the SQI Operation and Maintenance Manual).

SECTION 3
EQUIPMENT CHECKOUT

As construction activities move toward completion, checkout of the mechanical and electrical equipment associated with the SQI facility will commence. Punch lists will be developed for primary process components as well as for groups of secondary components (i.e., valves). Equipment checkout will consist of evaluating process components against specific punch lists. Checklists will identify critical installation/operation criteria that must be addressed prior to operation of the SQI with the Basin F liquid.

The various areas and equipment of the SQI will be checked for mechanical completion and commissioned in an established sequence. The sequence will begin with the utility system and end with the waste transfer system. Figure 3-1 illustrates the checkout sequence.

Four teams of startup personnel (as discussed in Section 2.1) will be responsible for the mechanical and electrical checkout of the system. Each team will be primarily responsible for the checkout of a specific portion of the facility. However, teams will be rotated to familiarize checkout personnel with other portions of the plant. Primary responsibilities are assigned as follows:

- Startup Team A - Basin F liquid storage and transfer system (Area 100).
- Startup Team B - SQI and air pollution control system (Area 200).
- Startup Team C - Brine and caustic handling system (Area 300).
- Startup Team D - Facility support systems (boiler, compressor, etc.) (Area 400).

Each of the four field teams will consist of four or five field personnel headed by a Field Engineer. It is the responsibility of the Field Engineer to identify any remaining action items that need to be addressed for a given piece of equipment. These action items will be

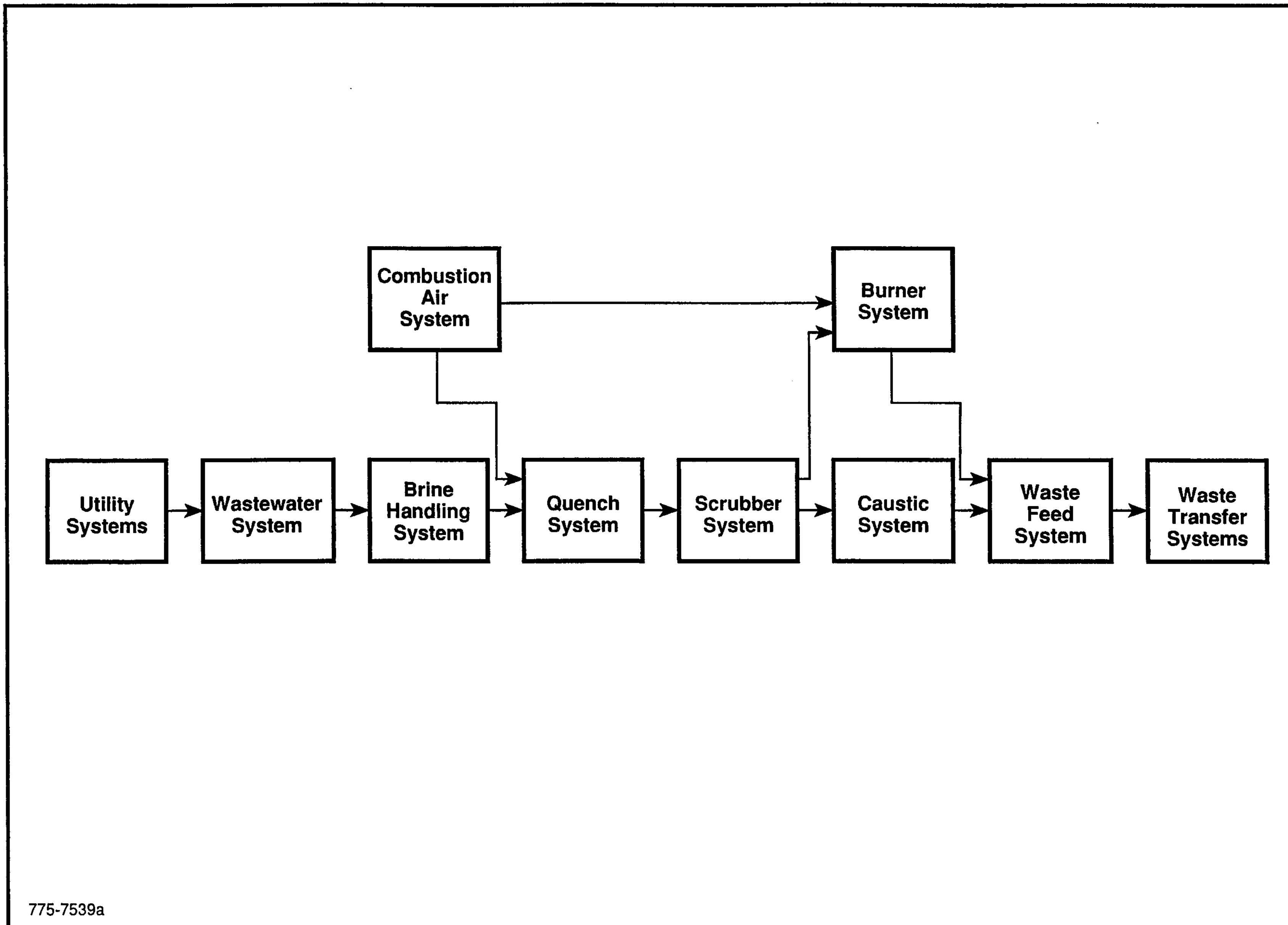

FIGURE 3-1 SEQUENCING DIAGRAM FOR TESTING OF SQI PROCESS AREAS

relayed to the Startup/Trial Burn Manager, who will meet with the Site Construction Manager and the appropriate subcontractors to correct any deficiencies.

3.1 PREPARATION OF EQUIPMENT CHECKOUT PUNCH LISTS

Preparation of the punch lists to be used on-site during equipment checkout will begin many months prior to startup activities. Once a piece of equipment (mechanical or electrical) has been specified, vendor information will be obtained and development of the punch list for that piece of equipment will proceed. Punch list preparation will be an ongoing process over the subsequent months as process equipment is selected. A list of the mechanical and electrical equipment that will require checkout is included as Appendix B. Typical equipment punch lists to be used during equipment checkout are presented in Appendix C. The final punch lists to be used on-site will be tailored according to specific pieces of equipment as vendor information becomes available. Punch lists for the individual subsystems outlined in Figure 3-1 will be bound together as part of the checkout manual for that particular SQI subsystem.

Once developed, punch lists will be reviewed with vendor representatives and installation subcontractors. Modifications to punch lists will be made as necessary prior to equipment checkout.

3.2 EQUIPMENT INSPECTION AND TESTING

After a piece of equipment (mechanical or electrical) has been installed, it will be inspected and tested to confirm that installation has been performed properly and that the equipment is fit for operation. Each item on the equipment checkout punch list will be evaluated. The Field Engineer will be responsible for signing the punch list to affirm that the given piece of equipment is in good working order. If deficiencies are found, they will be noted on the punch list and called to the attention of the Startup/Trial Burn Manager.

Members of the operating staff will be present during all equipment checkout inspections in an attempt to familiarize themselves with the operating aspects of the process components.

SECTION 4
INTRODUCTION OF SURROGATE MATERIAL

4.1 OBJECTIVE OF SURROGATE TESTING

The primary objective of surrogate testing is to demonstrate that all components within the SQI facility are operating properly prior to the initiation of testing using the Basin F liquid. System testing will be performed in phases; different portions of the process will be tested using different surrogates. Any required process modifications will take place during surrogate testing. Successful surrogate testing will precede shakedown activities, which will include the destruction of actual Basin F liquid.

4.2 SELECTED SURROGATES

The SQI facility will be tested initially using a series of four surrogates, including:

- Water (H_2O)
- H_2O, Sodium Chloride (NaCl), and Sodium Sulfate (Na_2SO_4)
- H_2O, NaCl, Na_2SO_4, and Ammonium Chloride (NH_4Cl)
- H_2O, NaCl, Na_2SO_4, NH_4Cl, and Methanol (CH_3OH)

These surrogates were chosen because they simulate the characteristics of the Basin F liquid, but are relatively non-toxic. Table 4-1 is a comparison of the concentrations of each surrogate to Basin F liquid concentrations.

Upon completion of equipment checkout, testing of the major process systems will commence using water (H_2O). Initial testing of the SQI facility using water (planned feed rate of 10 gpm) will be to demonstrate that process equipment and instrumentation are operating properly.

Table 4-1

Comparison of Concentrations of Each Surrogate to Concentrations of Basin F Liquid

Parameter	Units	Surrogate Concentrations	Basin F Liquid Concentration
Surrogate No. 1			
-H_2O	%	100	40-50
Surrogate No. 2			
-H_2O	%	85	40-50
-Sodium (Na^+)	%	5.4	3.8
-Chloride (Cl^-)	%	6.1	13.8
-Sulfate (SO_4^{2-})	%	3.5	2.5
Surrogate No. 3			
-H_2O	%	75	40-50
-Sodium (Na^+)	%	5.4	3.8
-Chloride (Cl^-)	%	12.7	13.8
-Sulfate (SO_4^{2-})	%	3.5	2.5
-Ammonium (NH_4^+)	%	3.4	3.6 (as N)
-Heating value	Btu/lb	125	1,765
Surrogate No. 4			
-H_2O	%	58	40-50
-Sodium (Na^+)	%	5.4	3.8
-Chloride (Cl^-)	%	12.7	13.8
-Sulfate (SO_4^{2-})	%	3.5	2.5
-Ammonium (NH_4^+)	%	3.4	3.6 (as N)
-Methanol (CH_3OH)	%	17	0
-Heating value	Btu/lb	1,670	1,765

After successful testing operations using water, additional testing will be performed using a 10% sodium chloride (NaCl) and 5% sodium sulfate (Na_2SO_4) solution. This surrogate contains sodium and sulfate concentrations similar to those typically found in the Basin F liquid, and will be used to evaluate nozzle performance. A third surrogate consisting of 10% sodium chloride, 5% sodium sulfate, and 10% ammonium chloride in solution will be tested after successful startup testing using Surrogate No. 2. The combination of these salts contain sodium, chloride, sulfate, and ammonium concentrations similar to those found in the Basin F liquid. Testing with Surrogate No. 3 will also evaluate nozzle performance as well as verify pH conditions within the quench tank and packed tower. As a final evaluation during surrogate testing, a fourth surrogate consisting of 10% sodium chloride, 5% sodium sulfate, 10% ammonium chloride, and 17% methanol in solution will be prepared for treatment. The difference between Surrogate No. 3 and Surrogate No. 4 is the addition of methanol, which will be added to simulate the heating value of the Basin F liquid. Testing with Surrogate No. 4 will evaluate nozzle performance, monitor particulate and acid gas control, as well as verify burner response and carbon monoxide emissions.

Anticipated values and control limits of process operating parameters to be maintained during SQI testing are presented in Table 4-2. Actual process parameters used during the trial burn and routine operation will be based upon results of startup testing.

4.3 SEQUENCE OF SURROGATE TESTING

The duration of testing using each surrogate is scheduled to be approximately 2 weeks. This duration may increase or decrease slightly depending on the number and complexity of system modifications required during testing with each surrogate.

4.3.1 Surrogate No. 1 - H_2O

Startup testing will begin with the processing of potable water (non-softened). The primary reasons for testing with water are as follows:

Table 4-2

Anticipated Process Operating Parameters To Be Maintained During Startup Testing[a]

Parameter	Event		
	Bringing SQI On-Line Using Natural Gas	Surrogate Testing	Shakedown Testing
Waste Feed Rate			
- Minimum feed rate (gpm)	NA	1.7[b]	1.7
- Maximum feed rate (gpm)	NA	17[b]	17
- Maximum metals feed rate (lb/hr)			
- Antimony[e]	NA	NA	6.90E-2
- Arsenic[f]	NA	NA	1.64E-1
- Barium[e]	NA	NA	1.10E+1
- Beryllium[e]	NA	NA	9.50E-4
- Cadmium[e]	NA	NA	1.30E-3
- Chromium[f]	NA	NA	5.32E+1
- Lead[f]	NA	NA	2.10E-2
- Mercury[e]	NA	NA	6.90E-2
- Silver[e]	NA	NA	6.90E-1
- Thallium[e]	NA	NA	6.90E-2
POHC Spike Solution[c] Rate (lb/hr)	NA	NA	40.4
Auxiliary Fuel (natural gas) Rate (scfm)	407	407	407
Maximum thermal duty in SQI chamber (10^6 Btu/hr)	24.4	25.0	44.1
Combustion Conditions			
- Minimum gas residence time (sec)	2	2	2
- Minimum temperature (°F)[d]	1,700	1,700	1,700
- Maximum temperature (°F)	2,100	2,100	2,100
- Minimum scrubber exhaust oxygen (% dry volume)	3	3	3
- Minimum Compressor Outlet Pressure (psig)[d]	<70	<70	<70
- Minimum Feed Nozzle Pressure (total) (psig)[d]	<50	<50	<50
Pollution Control Conditions			
- Maximum quench exhaust temperature (°F)	225	225	225
- Maximum scrubber exhaust temperature (°F)	185	185	185
- Minimum quench tank pH	5	5	5
- Minimum scrubber pH[d]	6	6	6
- Maximum venturi differential pressure (inches of water)	95	95	95

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Table 4-2

Anticipated Process Operating Parameters To Be Maintained During Startup Testing[a] (continued)

Parameter	Event		
	Bringing SQI On-Line Using Natural Gas	Surrogate Testing	Shakedown Testing
Pollution Control Conditions (continued)			
- Minimum venturi differential pressure (inches of water)[d]	60	60	60
- Minimum venturi recycle flow rate (gpm)	215	215	215
- Minimum packed tower water flow rate (gpm)	300	300	300
Emission Criteria			
- Maximum carbon monoxide (CO) corrected for 7% oxygen (O_2) over one hour rolling average (ppm)	100	100	100
- Minimum hydrochloric acid (HCl) removal efficiency (%)	NA	99	99
- Maximum particulate concentration (grains/dscf) corrected to 12% carbon dioxide (CO_2)	0.10	0.10	0.10
- Minimum POHC DRE (%)	NA	NA	99.99

Notes:

[a]This table is also included as Table 4-2 of the Trial Burn Plan.
[b]No Basin F liquid. Only surrogate solutions listed in Table 4-1 under surrogate testing.
[c]Chlorobenzene and carbon tetrachloride will be mixed according to the ratio of quantities calculated in Subsection 4.4 and fed into the SQI system.
[d]Instantaneous waste feed cutoff with pre-alarm for operator alert.
[e]Metals feed rate based on limits (Tier I) extracted from "Guidance on Metals and Hydrogen Chloride Controls for Hazardous Waste Incinerators," U.S. EPA, 1989.
[f]Metals feed rate based on a risk assessment (Tier III) including emissions modeling performed by WESTON (Human Health Risk Assessment, Volume I, July 1989). The emissions levels developed within the risk assessment have been used to back-calculate a feed rate.
NA = Not applicable.

- Verification of equipment and instrument operation.
- Testing of emergency shutdown procedures (interlock system).
- Calibration of temperature, pressure, and flow controls.

4.3.1.1 Verification of Equipment Operation

Verifying the operability of system equipment and instrumentation is the initial task of startup operations. Process vessels, sumps, and piping will be filled with water to test for leakage. Pumps, valves, and meters will also be subjected to performance evaluations. Any leakage points in the system will be corrected, and any remaining punch list items as identified during mechanical completion will be addressed before progressing to Surrogate No. 2 testing.

Once all ancillary process equipment have been tested, the combustion chamber will be fired with natural gas and the refractory curing process will begin. The main purpose for curing the incinerator chamber or any other piece of refractory-lined process equipment prior to making it operational is to remove the residual moisture in the brick, mortar, and castable. The moisture must be removed at a moderate rate so that steam is not generated within the lining. Steam generation can rupture the lining and cause the refractory to fracture.

The general and recommended practice is to heat the SQI combustion chamber slowly, raising the temperature gradually and in specified increments. As the temperature is increased, it is held at certain levels for specified lengths of time. It is desirable that the plant be in position to raise the temperature to process levels and go into production when the curing process is complete. The entire curing process has to be coordinated and a close check must be kept on all the temperature-indicating devices in the system to ensure that temperatures at any point do not exceed equipment capabilities. Details on the procedures to be followed during the curing process can be found in the SQI Operations and Maintenance Manual.

Process water will be used for Surrogate No. 1 testing activities. Water will be pumped to the two 14,000-gallon day tanks located adjacent to the SQI building. From the day tanks, water will be pumped to the combustion chamber. Because water has no heating value, the feed rate to the SQI will be considerably less than the 17 gpm of Basin F wastewater anticipated during routine operations. A feed rate of 7 to 10 gpm can be expected during water testing. Assuming a 10-gpm feed rate, a full day tank will support 24 hours of continuous testing. Testing with Surrogate No. 1 will be continuous for approximately 2 weeks. No brine is expected to be generated during Surrogate No. 1 testing.

4.3.1.2 Emergency Shutdown Procedures

The testing of emergency shutdown procedures is a major concern during surrogate testing with water. Each of the system interlocks is identified in Figure 4-1 and will be tested to demonstrate that it will initiate a corrective/protective action when an upset condition is encountered. The majority of the interlocks relate to burner and waste feed cut-offs.

For each of the interlocks identified in Figure 4-1, the following interlock testing procedure will be performed as part of Surrogate No. 1 testing, assuming that all alarms are in a non-alarm state as verified by the annunciator panel:

- Interlock testing will be initiated by the control room operator. Testing will begin by bypassing specific interlocks so that the system will not shut down should this interlock be tripped.
- Do not bypass more than one interlock at a time. Also, do not bypass any interlock for a period of longer than 60 seconds.
- Input a simulated alarm signal into the field element of concern. The associated alarm light will illuminate on the annunciator panel and the annunciator alarm horn will sound.
- Silence the alarm horn by depressing the annunciator panel "Acknowledge" pushbutton. The panel light of the tested interlock will flash.

Control Equipment	Interlocks	Natural Gas Pressure Low - Low	Natural Gas Pressure High - High	Oxygen Concentration Low	Burner Flame Failure	SQI Chamber Temp. High - High	SQI Chamber Temp. Low - Low	Chamber Temp. High	Combustion Air Pressure Low - Low	Incoming Steam Pressure Low - Low	C-201 Outlet Pressure Low - Low	SQI Chamber Pressure High - High	Waste Feed Pressure Low - Low	Domestic H_2O Pump Outlet Pressure Low	Domestic H_2O Pump Outlet Flow Low - Low	Quench Seperator Level Low - Low	Quench Seperator Level High - High	Quench Recycle Flow Low - Low	Venturi Spray Flow Low - Low	Scrubber Flow Low - Low	Venturi Inlet Temp. High - High	Waste Feed Pump Pressure Low - Low	DP Across Venturi High - High	Hot H_2O Purge Pressure Low - Low	Waste Feed Pump A Pressure Low	Waste Feed Pump A Fluid Level Low	Waste Feed Pump B Pressure Low	Waste Feed Pump B Fluid Level Low			Domestic Water Pump A Pressure Low	Domestic H_2O Pump A Fluid Level Low	Domestic H_2O Pump B Pressure Low	Domestic H_2O Pump B Fluid Level Low	DP Across Venturi Low	Scrubber Level Low - Low	Quench Recycle Pu	Qu	
		PSLL-08	PSHH-11	ASL-30	BSL-33A&B	TSHH-34	TSLL-34	TISH-35	PSLL-20	PSLL-02	PSLL-13	PSHH-31	PSLL-27A-E	PALL-38	FISLL-39	LSLL-50	LSHH-50	FISLL-57	LSLL-60	FSLL-65	TISHH-52A/B	PSLL-24	PDSHH-53	PSLL-22	PSL-85A	LSL-85A	PSL-85B	LSL-85B	NOT USED	NOT USED	PSL-61A	LSL-61A	PSL-61B	LSL-61B	PDSLL-53	LSLL-62	PSL-74A	LSL-74A	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Natural Gas Line Flow Control Valve	140 XV-10D/F	●	●	●	●	●		●	●	1	●	●			●	●	●	●			●		●													●			
Natural Gas Line Flow Control Valve	141 XV-10A/C	●	●	●	●	●		●	●	1	●	●			●	●	●	●			●		●													●			
Combustion Air Flow Control Relay	142 XY-17								●																														
Waste Feed Flow Control Valve Relay	143 XY-5																					▲			▲	▲	▲	▲											
Waste Feed Flow to Nozzle Control Valve Relay	144 XY-26	●	●	●	●	●	●	●	●	1	●	●	●		●	●	●	●	●	●	●	●	●	●											●	●			
Atomizing Air Flow to Nozzle Control Valve Relay	145 XY-66	●	●	●	●	●		●	●	1	●				●	●	●	●			●		●													●			
Atomizing Air Flow Control Valve Relay	146 XY-14										●																												
Steam Supply Control Valve Relay	147 XY-25									●																													
Domestic Water Supply Control Valve Relay	148 XY-37													▲	▲																▲	▲	▲	▲					
Domestic Water Supply to Quanch Tank Control Valve Relay	149 XY-40													●																									
Quench Recirculation Control Valve Relay	150 XY-87A																																						
Quench Recirculation Control Valve Relay	150- XY-87B																																						
20% Caustic Feed Control Valve Relay	151 XY-23																																						
Quench Recycle Flow Control Valve	152 XY-78A																	●																			●	●	
Quench Recycle Flow Control Valve	152 XY-78B																	●																					●
Scrubber/Venturi Recycle Flow Control Valve Relay	153 XY-79A																																						
Scrubber/Venturi Recycle Flow Control Valve Relay	153 XY-79B																																						
Combustion Air Fan Vent Control Valve Relay	154 XY-17A								●																														
Combustion Air Fan	155 B-201A															●					●																		
Emergency Air Blower	156 B-201B								○							●					●																		
Liquid Waste Feed Pump A	157 P-201A																					●			●	●													
Liquid Waste Feed Pump B	157 P-201B																					●					●	●											
Quench Recycle Pump A	158 P-202A																	●																			●	●	
Quench Recycle Pumps B	158 P-202B																	●																					●
Scrubber/Venturi Recycle Pump A	159 P-203A																																						
Scrubber/Venturi Recycle Pump B	159 P-203B																																						
Quench Recirculation Pump A	160 P-205A																																						
Quench Recirculation Pump B	160 P-205B																																						
Domestic Water Pump A	161 P-207A													●	●																●	●							
Domestic Water Pump B	161 P-207B													●	●																		●	●					
20% Caustic Feed Pump A	162 P-208A																																						
20% Caustic Feed Pump B	162 P-208B																																						

1. Only if atomizing steam is used to atomize waste feed.

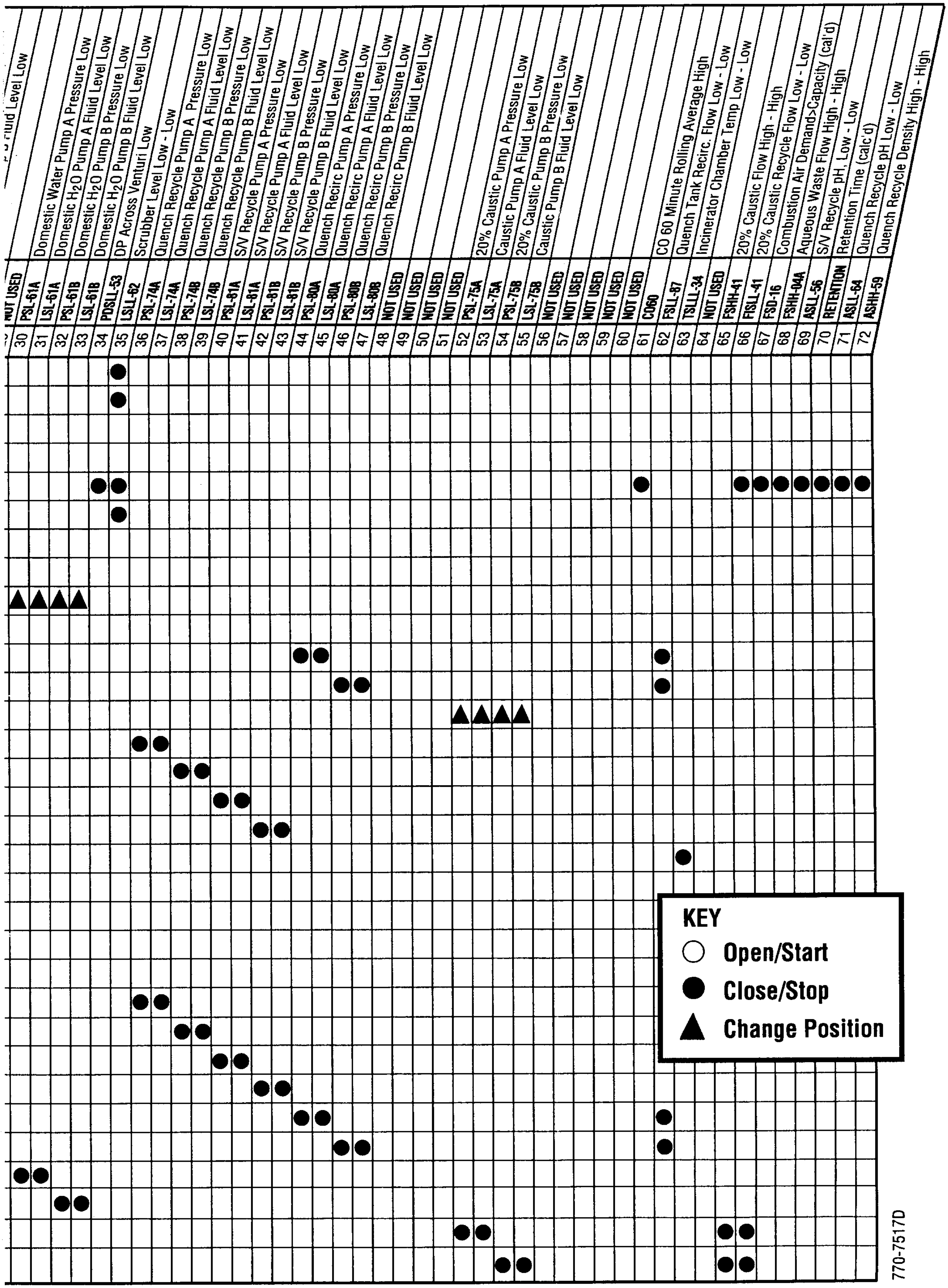

FIGURE 4-1 INTERLOCK MATRIX

Control Equipment	Interlocks	LAL-104 Wastewater TK-104 Level Low	LAHH-104 TK-104 Level High-High	LALL-105 Day Tank 105 Level Low-Low	LAHH-105 Day Tank 105 Level High-High	LAL-105 Day Tank 105 Level Low	LALL-106 Day Tank 106 Level Low-Low	LAHH-106 Day Tank 106 Level High-High	LAL-106 Day Tank 106 Level Low	LSL-101 Storage Tank 101 Level Low	LSH-101 Storage Tank 101 Level High	LSL-102 Storage Tank 102 Level Low	LSH-102 Storage Tank 102 Level High	LSL-103 Storage Tank 103 Level Low	LSH-103 Storage Tank 103 Level High	FSL-103 Waste/Day Tank Flow Low	LAH-84A Brine TK-202 Level High	LAL-84A Brine TK-202 Level Low	LAH-84B Brine TK-201 Level High	LAL-84B Brine TK-201 Level Low	TIC-104 TK-104 Heater Control	TIC-105 TK-105 Heater Control	TIC-106 TK-106 Heater Control	LSH-107 Purge H_2O Tank TK-107 Level High	LSL-107 TK-107 Level Low	TAL-204 TK-204 Temperature Low	TAL-203 TK-203 Temperature Low	LAH-204 50% Caustic Level High	LAL-204 50% Caustic Level Low	LAL-203 TK-203 Level Low	LAH-203 TK-203 Level High	LAL-205 20% Caustic Level Low	LAH-205 20% Caustic Level High	LAH-10
Liquid Waste Feed Pump A	P-201A			●		○	●																											
Liquid Waste Feed Pump B	P-201B			●		○	●																											
50% Caustic Transfer Pump A	P-211A																												●	●		○	●	
50% Caustic Transfer Pump B	P-211B																												●	●		○	●	
Pond A/Storage Transfer Pump A	P-101A										●		●		●																			
Pond A/Storage Transfer Pump B	P-101B										●		●		●																			
Storage/Day Tank Transfer Pump A	P-103A		●		●			●		●		●		●																				
Storage/Day Tank Transfer Pump B	P-103B		●		●			●		●		●		●																				
Wastewater/Day Tank Transfer Pump A	P-104A	●		●	●		●	●								●																		
Wastewater/Day Tank Transfer Pump B	P-104B	●		●	●		●	●								●																		
Brine Feed Pump A	P-206A																○	●	○	●														
Brine Feed Pump B	P-206B																○	●	○	●														
Process Water Transfer Pump A	P-209A																												●	●		○	●	
Process Water Transfer Pump B	P-209B																												●	●		○	●	
Storage TK-101 I/O Control Valve	MOV-101		●		●			●		●	●																							
Storage TK-102 I/O Control Valve	MOV-102		●		●			●				●	●																					
Storage TK-103 I/O Control Valve	MOV-103		●		●			●						●	●																			
20% Caustic Feed Pump A	P-208A																																	
20% Caustic Feed Pump B	P-208B																															●		
Wastewater TK-104 Inlet Control Valve	COV-104B		●							●		●		●																				
Wastewater TK-104 Outlet Control Valve	COV-104C	●			●			●								●																		
Wastewater/Day Tank Flow Control Valve	FCV-104	●			●			●																										
50% Caustic Flow Control Valve	FCV-209																												●	●		○	●	
Process H_2O Flow Control Valve	FCV-211																												●	●		○	●	
WW/Day Tank 105 Inlet Control Valve	COV-105A	●			●																													
Waste Flow TK-105 Inlet Control Valve	COV-105B		●		●					●		●		●																				
Day Tank 105 Outlet Control Valve	COV-105C			●		●																												
Liquid Waste Recycle/TK-105 C.V.	COV-105E																																	
Waste/Day Tank Control Valve	FCV-103	●								●		●		●																				
Purge Tank TK-107 H_2O Supply	MOV-107																							●	○									
Waste Flow/TK-106 Inlet Control Valve	COV-106A		●					●		●		●		●																				
Day Tank 106 Outlet Control Valve	COV-106B					○	●		●																									
WW/Tank 106 Inlet Control Valve	COV-106C	●						●																										
Liquid Waste Recycle/TK-106 C.V.	COV-106E						●																											
Purge Tank TK-108 H_2O Supply	MOV-108																																	
Process H_2O Storage TK-203 Level C.V.	LCV-203																													○	●			
Day Tank TK-106 Mixer	M-103																																	
Day Tank TK-105 Mixer	M-102					●		●																										
Wastewater Tank TK-104 Mixer	M-101	●																																

…ank TK-107 Level High / TK-107 Level Low / …-107

TK-204 Temperature Low	TK-203 Temperature Low	50% Caustic Level High	50% Caustic Level Low	TK-203 Level Low	TK-203 Level High		20% Caustic Level Low	20% Caustic Level High		Pumphouse #2 Sump Level High	Pumphouse #2 Sump Level Low	Purge Water Tank 108 Level Low	Purge Water Tank 108 Level High	Pump 101A/B Oper. Sensor Stopped	Pump 209A/B Oper. Sensor Running	Pump 209A/B Oper. Sensor Stopped	Pump 211A/B Oper. Sensor Stopped	Pump 211A/BOper. Sensor Running	Pump 103A/B Oper. Sensor Stopped	Pump 104A/B Oper. Sensor Stopped	Pump 201A/B Oper. Sensor Stopped	Pump 201A/B Oper. Sensor Running	Pump 206A/B Operation Sensor	Waste Flow to Day Tank Flow-Low	Waste Flow to Day Tank Flow	Brine Loading Permissive	Tank Car A Level High	Tank Car B Level High	Nozzle Cleanout H_2O Tank Pres.	SQI Evaporator Sump A Level High	SQI Evaporator Sump A Level Low	SQI Evaporator Sump B Level High	SQI Evaporator Sump B Level Low	Brine/Caustic Sump A Level High	Brine/Caustic Sump A Level Low	Brine/Caustic Sump B Level High	Brine/Caustic Sump B Level Low	Brine /Caustic Sump C Level High	Brine /Caustic Sump C Level Low	SQI Process Sump Level High	SQI Process Sump Level Low	Day Tank Level Sump High	Day Tank Sump Level Low	Utility Room Sump Level High	Utility Room Sump Level Low	Maint. Sump Level High	Maint. Sump Level Low	SQI Washdown & Maint. Level High	SQI Washdown & Maint. Level Low	Contaminated H_2O Level Low	Contaminated H_2O Level High	
TAL-204	TAL-203	LAH-204	LAL-204	LAL-203	LAH-203		LAL-205	LAH-205		LAH-109	LSL-109	LSL-108	LSH-108	OA-101A/B	OA-209A/B	OA-209A/B	OA-211A/B	OA-211A/B	OA-103A/B	OA-104A/B	OA-201A/B	OA-201A/B	OA-206A/B	FSL-103	FS-103	80	LS-90A	LS-90B	PS-206	LSH-401A	LSL-401A	LSH-401B	LSL-401B	LSH-402A	LSL-402A	LSH-402B	LSL-402B	LSH-402C	LSL-402C	LSH-403	LSL-403	LSH-404	LSL-404	LSH-405	LSL-405	LSH-406	LSL-406	LSH-407	LSL-407	LSL-408	LSH-408	
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FIGURE 4-1 INTERLOCK MATRIX (continued)

Control Equipment	Interlocks	LAL-104 Wastewater TK-104 Level Low	LAHH-104 TK-104 Level High-High	LALL-105 Day Tank 105 Level Low-Low	LAHH-105 Day Tank 105 Level High-High	LAL-105 Day Tank 105 Level Low	LALL-106 Day Tank 106 Level Low-Low	LAHH-106 Day Tank 106 Level High-High	LAL-106 Day Tank 106 Level Low	LSL-101 Storage Tank 101 Level Low	LSH-101 Storage Tank 101 Level High	LSL-102 Storage Tank 102 Level Low	LSH-102 Storage Tank 102 Level High	LSL-103 Storage Tank 103 Level Low	LSH-103 Storage Tank 103 Level High	FSL-103 Waste/Day Tank Flow Low
20% Caustic Dilution Tank 205 Mixer	M-201															
Brine Tank TK-201 Mixer	M-204															
Brine Tank TK-205 Mixer	M-205															
Brine TK-201 Recirc. Control Valve	COV-84D															
Brine TK-201 Inlet Control Valve	COV-84B															
Brine TK-201 Outlet Control Valve	COV-84F															
Brine TK-202 Recirc. Control Valve	COV-84C															
Brine TK-202 Inlet Control Valve	COV-84A															
Brine TK-202 Outlet Control Valve	COV-84E															
Brine Loading Arm A Atomizing Steam	COV-90A1															
Brine Loading Arm A Flush Water	SV-90A2															
Brine Loading Arm A Feed	COV-90A2															
Brine Recirculation Arm A	COV-90A1															
Brine Loading Arm B Atomizing Steam	SV-90B2															
Brine Loading Arm B Flush Water	SV-90B1															
Brine Loading Arm B Feed	COV-90B2															
Brine Recirculation Arm B	COV-90B1															
TK-104 Pad Heater	HP-104															
TK-105 Pad Heater	HP-105															
TK-106 Pad Heater	HP-106															
Tank TK-107 Heater (Purge H_2O)	TC-107															
TK-204 Pad Heater	HP-204															
TK-203 Pad Heater	HP-203															
Tank TK-108 Heater (Purge H_2O)	TC-108															
Pumphouse #2 Building Sump Pump	P-106		●													
SQI Evap. Area Sump Trans. Pump	P-401A		●													
SQI Evap. Area Sump Trans. Pump	P-401B		●													
Brine/Caustic Area Sump Trans. Pump	P-402A		●													
Brine/Caustic Area Sump Trans. Pump	P-402B		●													
Brine/Caustic Area Sump Trans. Pump	P-402C		●													
SQI Process Sump Transfer Pump	P-403		●													
Day Tank Sump Transfer Pump	P-404		●													
Utility Room Sump Transfer Pump	P-405		●													
Maintenance Area Sump Pump	P-406		●													
SQI Washdown & Main. Area Pump	P-407		●													
Contaminated H_2O Transfer Pump	P-408		●													
Loading Arm A Flush Timer	KIC-90A															
Loading Arm B Flush Timer	KIC-90B															
50% Caustic Pump Timer	KIC-211A/B															
Process H_2O Pump Timer	KIC-209															
Nozzle Cleanout H_2O Feed Pump	P-212															

Control Equipment	Interlocks	LAH-84A Brine TK-202 Level High	LAL-84A Brine TK-202 Level Low	LAH-84B Brine TK-201 Level High	LAL-84B Brine TK-201 Level Low	TIC-104 TK-104 Heater Control	TIC-105 TK-105 Heater Control	TIC-106 TK-106 Heater Control	LSH-107 Purge H_2O Tank TK-107 Level	LSL-107 TK-107 Level Low	TAL-204 TK-204 Temperature Low	TAL-203 TK-203 Temperature Low	LAH-204 50% Caustic Level High	LAL-204 50% Caustic Level Low	LAL-203 TK-203 Level Low	LAH-203 TK-203 Level H
20% Caustic Dilution Tank 205 Mixer	M-201															
Brine Tank TK-201 Mixer	M-204				●											
Brine Tank TK-205 Mixer	M-205		●													
Brine TK-201 Recirc. Control Valve	COV-84D			○	●											
Brine TK-201 Inlet Control Valve	COV-84B	○		●	○											
Brine TK-201 Outlet Control Valve	COV-84F				●											
Brine TK-202 Recirc. Control Valve	COV-84C	○	●													
Brine TK-202 Inlet Control Valve	COV-84A	●	○	○												
Brine TK-202 Outlet Control Valve	COV-84E		●													
Brine Loading Arm A Atomizing Steam	COV-90A1															
Brine Loading Arm A Flush Water	SV-90A2															
Brine Loading Arm A Feed	COV-90A2	●		●												
Brine Recirculation Arm A	COV-90A1	○		○												
Brine Loading Arm B Atomizing Steam	SV-90B2															
Brine Loading Arm B Flush Water	SV-90B1															
Brine Loading Arm B Feed	COV-90B2	●		●												
Brine Recirculation Arm B	COV-90B1	○		○												
TK-104 Pad Heater	HP-104					●										
TK-105 Pad Heater	HP-105						●									
TK-106 Pad Heater	HP-106							●								
Tank TK-107 Heater (Purge H_2O)	TC-107									●						
TK-204 Pad Heater	HP-204										●					
TK-203 Pad Heater	HP-203											●				
Tank TK-108 Heater (Purge H_2O)	TC-108															
Pumphouse #2 Building Sump Pump	P-106															
SQI Evap. Area Sump Trans. Pump	P-401A															
SQI Evap. Area Sump Trans. Pump	P-401B															
Brine/Caustic Area Sump Trans. Pump	P-402A															
Brine/Caustic Area Sump Trans. Pump	P-402B															
Brine/Caustic Area Sump Trans. Pump	P-402C															
SQI Process Sump Transfer Pump	P-403															
Day Tank Sump Transfer Pump	P-404															
Utility Room Sump Transfer Pump	P-405															
Maintenance Area Sump Pump	P-406															
SQI Washdown & Main. Area Pump	P-407															
Contaminated H_2O Transfer Pump	P-408															
Loading Arm A Flush Timer	KIC-90A															
Loading Arm B Flush Timer	KIC-90B															
50% Caustic Pump Timer	KIC-211A/B													●	●	
Process H_2O Pump Timer	KIC-209													●	●	
Nozzle Cleanout H_2O Feed Pump	P-212															

770-7517F

…107 Level Low
TK-204 Temperature Low
TK-203 Temperature Low
50% Caustic Level Low
50% Caustic Level High
TK-203 Level Low
TK-203 Level High
20% Caustic Level Low
20% Caustic Level High
Pumphouse #2 Sump Level High
Pumphouse #2 Sump Level Low
Purge Water Tank 108 Level Low
Purge Water Tank 108 Level High
Pump 101A/B Oper. Sensor Stopped
Pump 209A/B Oper. Sensor Stopped
Pump 209A/B Oper. Sensor Running
Pump 211A/B Oper. Sensor Stopped
Pump 211A/BOper. Sensor Stopped
Pump 103A/B Oper. Sensor Running
Pump 104A/B Oper. Sensor Stopped
Pump 201A/B Oper. Sensor Stopped
Pump 201A/B Oper. Sensor Stopped
Pump 206A/B Oper. Sensor Running
Pump 206A/B Operation Sensor
Waste Flow to Day Tank Flow Low
Waste Flow to Day Tank
Brine Loading Permissive
Tank Car A Level High
Tank Car B Level High
Nozzle Cleanout H_2O Tank Pressure
SQI Evaporator Sump A Level High
SQI Evaporator Sump A Level Low
SQI Evaporator Sump B Level High
SQI Evaporator Sump B Level Low
Brine/Caustic Sump A Level High
Brine/Caustic Sump A Level Low
Brine/Caustic Sump B Level High
Brine/Caustic Sump B Level Low
Brine /Caustic Sump C Level High
Brine /Caustic Sump C Level Low
SQI Process Sump Level High
SQI Process Sump Level Low
Day Tank Level Sump Level Low
Day Tank Sump High
Utility Room Sump Level Low
Utility Room Sump Level High
Maint. Sump Level Low
Maint. Sump Level High
SQI Sump Level Low
SQI Washdown & Maint. Level High
SQI Washdown & Maint. Level Low
Contaminated H_2O Level Low
Contaminated H_2O Level High

TAL-204	TAL-203	LAH-204	LAL-204	LAL-203	LAH-203		LAL-205	LAH-205		LAH-109	LSL-109	LSL-108	LSH-108	OA-101A/B	OA-209A/B	OA-209A/B	OA-211A/B	OA-211A/B	OQ-103A/B	OA-104A/B	OA-201A/B	OA-201A/B	OA-206A/B	FSL-103	FS-103	80	LS-90A	LS-90B	PS-206	LSH-401A	LSL-401A	LSH-401B	LSL-401B	LSH-402A	LSL-402A	LSH-402B	LSL-402B	LSH-402C	LSL-402C	LSH-403	LSL-403	LSH-404	LSL-404	LSH-405	LSL-405	LSH-406	LSL-406	LSH-407	LSL-407	LSL-408	LSH-408	
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FIGURE 4-1 INTERLOCK MATRIX (continued)

- Return the field element to normal operating mode and depress the "Annunciator Reset" pushbutton. The interlock is back on-line.

Tables 4-3 and 4-4 list the permissive conditions that will trigger an interlock response (cutoff) associated with the waste feed and burner, respectively. In each of these tables, permissives are divided into environmental permit requirements and equipment protection requirements. Corrective actions to be taken if pre-alarm setpoints are exceeded are discussed in the SQI Operation and Maintenance Manual.

The bypassing of any interlock will be performed only with permission of the Production Superintendent. If permission is granted, the Production Superintendent must document the bypass in the operating logbook and sign and date the entry. If the Production Superintendent is not on-site, he or the SQI Plant Manager must be contacted by telephone. Verbal permission (documented in the operating logbook) must be granted prior to the bypassing of any interlock. If verbal permission to bypass an interlock is granted, the Production Superintendent or SQI Plant Manager must sign and date the operating logbook the following morning.

Prior to advancing beyond Surrogate No. 1 (water), a final test of the emergency shutdown devices will be performed as a check to ensure proper operation of emergency interlocks and equipment and to ensure a safe and orderly system shutdown.

4.3.1.3 Tuning of Indicator Controllers

The final phase of evaluations during water testing will be the initial calibration of process controllers.

The following is a list of indicator controllers that will be used and that require tuning during startup:

Table 4-3

Inadequate Conditions for Waste Feed*

Parameter	Tag Name	Condition for Automatic Waste Feed Shutoff
Low Oxygen	ASL-30	< 3% for longer than 1 min. (shutoff)
No Flame on Either Burner Fire Eye	BALL-33	Flameout (instantaneous shutoff)
High SQI Chamber Temperature	TSHH-34 TSH-34	> 2,100 °F (instantaneous shutoff) > 2,000 °F (pre-alarm setpoint)
Low SQI Chamber Temperature	TSLL-34 TSL-34	< 1,700°F (instantaneous shutoff) < 1,800°F (pre-alarm setpoint)
Low Compressor (C-201) Outlet Pressure	PSLL-13 PSL-13	< 70 psig (instantaneous shutoff) < 75 psig (pre-alarm setpoint)
Feed Nozzle Low Pressure	PSLL-27A thru E PSL-27A thru E	< 50 psig - subject to pressure @ lowest flow (shutoff) <55 psig (pre-alarm setpoint)
High DP across Venturi	PDSHH-53 PDSH-53	> 95 in. wc (instantaneous shutoff) > 92 in. wc (pre-alarm setpoint)
Low DP across Venturi	PDSLL-53 PDSL-53	< 60 in. wc for longer than 1 min. (shutoff) < 65 in. wc (pre-alarm setpoint)
High CO	AISH-70	> 100 ppm over a 1-hr rolling average (shutoff)
Scrubber pH	ASLL-56 ASL-56	< 6 (instantaneous shutoff) < 7 (pre-alarm setpoint)
SQI Retention Time	RETIM	< 2 sec for longer than 3 min.
Natural Gas Pressure Low	PSLL-08 PSL-08	< 6 psig (instantaneous shutoff) < 8 psig (pre-alarm setpoint)
Natural Gas Pressure High	PSHH-11 PSH-11	> 15 psig (instantaneous shutoff) > 12 psig (pre-alarm setpoint)
Low Combustion Air Pressure	PSLL-20 PSL-20	< 6 psig (instantaneous shutoff) < 6.5 psig (pre-alarm setpoint)
High Refractory Temperature	TISH-35A & B	> 2000°F (instantaneous shutoff)

Table 4-3

Inadequate Conditions for Waste Feed* (continued)

Parameter	Tag Name	Condition for Automatic Waste Feed Shutoff
Low Makeup Water Flow	FISLL-39	< 46 gpm for longer than 10 sec (shutoff)
	FISL-39	< 46 gpm for longer than 5 sec (pre-alarm setpoint)
Quench Separator Low Level	LSLL-50	< 21 inches (instantaneous shutoff)
	LSL-50	< 27 inches (pre-alarm setpoint)
Quench Separator High Level	LSHH-50	> 95 inches (instantaneous shutoff)
	LSH-50	> 89 inches (pre-alarm setpoint)
Low Quench Recycle Flow	FISLL-57	< 95 gpm for longer than 10 sec (shutoff)
	FISL-57	< 100 gpm (pre-alarm setpoint)
Low Venturi Throat Spray Flow	FSLL-60	< 130 gpm for longer than 1 min. (shutoff)
	FSL-60	< 150 gpm (pre-alarm setpoint)
Low Scrubber Flow	FSLL-65	< 270 gpm (instantaneous shutoff)
	FSL-65	< 290 gpm (pre-alarm setpoint)
High Venturi Inlet Temperature	TISHH-52	> 225 °F (instantaneous shutoff)
	TISH-52	> 205 °F (pre-alarm setpoint)
Low Waste Feed Pump Pressure	PSLL-24	< 50 psig (instantaneous shutoff)
	PSL-24	< 55 psig (pre-alarm setpoint)
Low Hot Water Purge Pressure	PSLL-22	< 90 psig for longer than 60 min (shutoff)
	PSL-22	< 92 psig (pre-alarm setpoint)
Low Scrubber Level	LSLL-62	< 18 in.(instantaneous shutoff)
	LSL-62	< 24 in.(pre-alarm setpoint)
Caustic Total Flow	FISLL-41	< 35 gpm (shutoff)
	FISL-41	< 40 gpm for longer than 1 min (pre-alarm setpoint)

*Table 4-3 includes all conditions that would result in a waste feed cutoff, including both environmental permit requirements and equipment protection requirements. Refer to Table 4-2 for the list of environmental permit requirements.

Table 4-4

Inadequate Conditions for Burner Operation*

Parameter	Tag Name	Condition for Automatic Feed Shutoff
Low Oxygen	ASL-30	< 3% for longer than 3 min (shutoff)
No Flame on Either Burner Fire Eye	BALL-33	Flameout (instantaneous shutoff)
High SQI Chamber Temperature	TSHH-34 TSH-34	> 2,100 °F (instantaneous shutoff) > 2,000 °F (pre-alarm setpoint)
Low Compressor (C-201) Outlet Pressure	PSLL-13 PSL-13	< 70 psig (instantaneous shutoff) < 75 psig (pre-alarm setpoint)
High DP across Venturi	PDSHH-53 PDSH-53	> 95 in. wc (instantaneous shutoff) > 92 in. wc (pre-alarm setpoint)
Natural Gas Pressure Low	PSLL-08 PSL-08	< 6 psig (instantaneous shutoff) < 8 psig (pre-alarm setpoint)
Natural Gas Pressure High	PSHH-11 PSH-11	> 15 psig (instantaneous shutoff) > 12 psig (pre-alarm setpoint)
High Refractory Temperature	TISH-35A & B	> 2,000°F (instantaneous shutoff)
Low Combustion Air Pressure	PSLL-20 PSL-20	< 6 psig for longer than 3 min (shutoff) < 6.5 psig (pre-alarm setpoint)
Low Makeup Water Flow	FISLL-39 FISL-39	< 46 gpm for longer than 10 sec (shutoff) < 46 gpm for longer than 5 sec (pre-alarm setpoint)
Quench Separator Low Level	LSLL-50 LSL-50	< 21 inches (instantaneous shutoff) < 27 inches (pre-alarm setpoint)
Quench Separator High Level	LSHH-50 LSH-50	> 95 inches (instantaneous shutoff) > 89 inches (pre-alarm setpoint)
Low Quench Recycle Flow	FISLL-57 FISL-57	< 95 gpm for longer than 10 sec (shutoff) < 100 gpm (pre-alarm setpoint)
High Venturi Inlet Temperature	TISHH-52 TISH-52	> 225 °F (instantaneous shutoff) > 205 °F (pre-alarm setpoint)
Low Scrubber Level	LSLL-62 LSL-62	< 18 inches (instantaneous shutoff) < 24 inches (pre-alarm setpoint)

*Table 4-4 includes all conditions that would result in a burner cutoff, including both environmental permit requirements and equipment protection requirements. Refer to Table 4-2 for the list of environmental permit requirements.

- AIC - 30
- AIC - 31
- AIC - 56
- AIC - 59
- AIC - 64
- AIC - 68
- AIC - 69
- AIC - 70
- AIC - 71
- AIC - 72
- FIC - 04
- FIC - 09
- FIC - 15A
- FIC - 15B
- FIC - 15C
- FIC - 15D
- FIC - 15E
- FIC - 16
- FIC - 22A
- FIC - 22B
- FIC - 22C
- FIC - 22D
- FIC - 22E
- FIC - 30
- FIC - 39
- FIC - 41A
- FIC - 48
- FIC - 57
- FIC - 60
- FIC - 62
- FIC - 65
- FIC - 76A
- FIC - 76B
- FIC - 76C
- FIC - 76D
- FIC - 76E
- FIC - 103
- FIC - 104
- FIC - 203
- FIC - 204
- FIC - 205
- FIC - 209
- FIC - 211
- LIC - 50
- LIC - 62
- PDIC - 53
- PIC - 18A
- PIC - 18B
- PIC - 18C
- PIC - 18D
- PIC - 18E
- PIC - 27A
- PIC - 27B
- PIC - 27C
- PIC - 27D
- PIC - 27E
- PIC - 28
- PIC - 45A
- PIC - 45B
- PIC - 45C
- PIC - 45D
- PIC - 45E
- TIC - 34
- TIC - 63
- TIC - 73

A description of each indicator controller and its operating range is provided in the SQI Operation and Maintenance Manual. Calibration procedures for each process function being controlled are also outlined in the SQI Operation and Maintenance Manual. Tuning parameters will be set to monitor and control items such as operating temperatures and liquid flow rates.

4.3.2 Surrogate No. 2 - H_2O, NaCl, and Na_2SO_4

Upon satisfactory operation of the SQI facility using Surrogate No. 1, testing will continue using a water, sodium chloride (10% by weight), and sodium sulfate (5% by weight) solution. The primary reasons for testing with such a solution are to observe nozzle performance and monitor for signs of unacceptable solids buildup in the system.

It is preferred that the sodium chloride and sodium sulfate solutions be premixed with water and transported to the SQI site in tanker trucks. This is because problems may be encountered in dissolving large quantities of salt into water within the day tanks. Laboratory studies performed by WESTON have indicated that vigorous mixing for several minutes is required to dissolve 10% weight sodium chloride into water. The sodium chloride and sodium sulfate solution will be pumped directly from the tanker truck to the day tanks. Assuming a 10-gpm feed rate, a full day tank will support 24 hours of continuous testing. It is anticipated that testing with Surrogate No. 2 will be continuous for approximately 2 weeks.

Both the feed surrogate and the brine blowdown will contain a salt concentration of approximately 15%; therefore, an attempt will be made to recycle the brine back to the day tanks for reuse as a surrogate feed. Brine recycling would minimize the volume of blowdown required for disposal as well as reduce the volume of prepared surrogate salts needed for testing.

4.3.2.1 Nozzle Performance

The performance of the feed nozzles to be used during routine operations will be evaluated during startup. The feed material will be injected through a series of five externally atomized nozzles located downstream of the burner flame. The design of the nozzles allows for atomization using either air or steam. The injector assembly that supports each nozzle consists of two concentric pipes: the inner pipe for the feed material, and the outer pipe for the atomizing media. Provisions have been made for air purging and hot-water flushing of the waste feed pipe and for steam flushing of the outer atomizing media pipe. It is anticipated that only air atomization of the nozzles will be required during testing and operation. Should steam atomization be necessary, process modifications would be required in addition to the necessary regulatory approvals.

Three sets of interchangeable feed injector assemblies (nozzles) are included in the design of the SQI:

- T-Thermal Multi-port (TEAT) nozzle
- Sonic nozzle
- Nittetu Chemical Engineering Company (NCEC) nozzle

Moreover, each nozzle assembly is designed to be removable while the incinerator remains in service.

Surrogate testing will begin with the T-Thermal Multi-port TEAT nozzle. The set of T-Thermal nozzles will be operated continuously over 24-hour periods. After 24 hours of operation, the nozzles will be taken off-line, cooled, and visually inspected for any solids buildup that may have formed during operation. Twenty-four hours of continuous operation has been set as a criterion for nozzle performance. This time period has been established as the minimum acceptable nozzle changeout frequency. If, after the 24-hour inspection, the T-Thermal nozzles appear to be in good working order, they will be subjected to longer operating periods (i.e., 48 hours) in an attempt to predict the nozzle changeout frequency. If the T-Thermal nozzles fail at some point during startup testing prior to 24 hours of continuous operation, discussions with the technical assistance team pertaining to a switch in nozzle type or nozzle operating conditions (i.e., length of purging, atomization media) will commence. If a decision to change nozzle types is reached, the T-Thermal nozzles will be replaced with the sonic nozzles. Performance testing of the sonic nozzles will be similar to the T-Thermal nozzle testing described above. The third nozzle type (NCEC) will be considered only if the T-Thermal and sonic nozzles prove to be unacceptable.

Once a specific nozzle type has proved to operate continuously for 24 hours or more on a regular basis, that nozzle type will be subjected to additional testing using other surrogate/ waste feeds. Should a nozzle type successfully complete surrogate testing but fail during one of the shakedown tests, startup activities would regress back to the initial surrogate testing using a new nozzle type. In other words, before a nozzle type is chosen for the trial burn, it will have successfully completed each surrogate and shakedown test outlined in this plan. All nozzle testing/experimentation will be done prior to trial burn activities to ensure that only one nozzle type is utilized during the trial burn and throughout operation.

4.3.2.2 Brine Disposal Criteria

Although the majority of the brine generated during testing with Surrogate No. 2 will be recirculated back into the day tanks for reuse, some brine will require storage and ultimately off-site disposal. Brine bled from the system will be stored in one of two 42,000-gallon tanks prior to disposal. The two holding tanks will operate in batch modes; that is, while one tank is discharging brine to tank trucks for disposal, the other is being filled with effluent brine from the SQI process. Each full brine holding tank will be sampled prior to disposal to monitor the chemical characteristics of the brine and to verify the acceptability of the brine for off-site disposal.

Brine samples will be collected from valves on the brine recycle line, as shown in Figure 4-2. Hand valves HV-438 and HV-439 (drain valves for pumps P-206A and P-206B, respectively) will be used for brine sample collection, depending on which pump is operational. During normal operations, both pumps will be operational, allowing either hand valve to be selected for sampling. Prior to sample collection, one sample jar volume of brine will be collected and recycled back into the brine storage tank or wastewater tank to purge the sample valve. After sample collection, the valve will be tightly closed and verification will be made that the valve is not leaking. All brine sampling activities will take place within areas of secondary containment. A summary of the sampling and analytical procedures for characterizing the brine is included as Table 4-5.

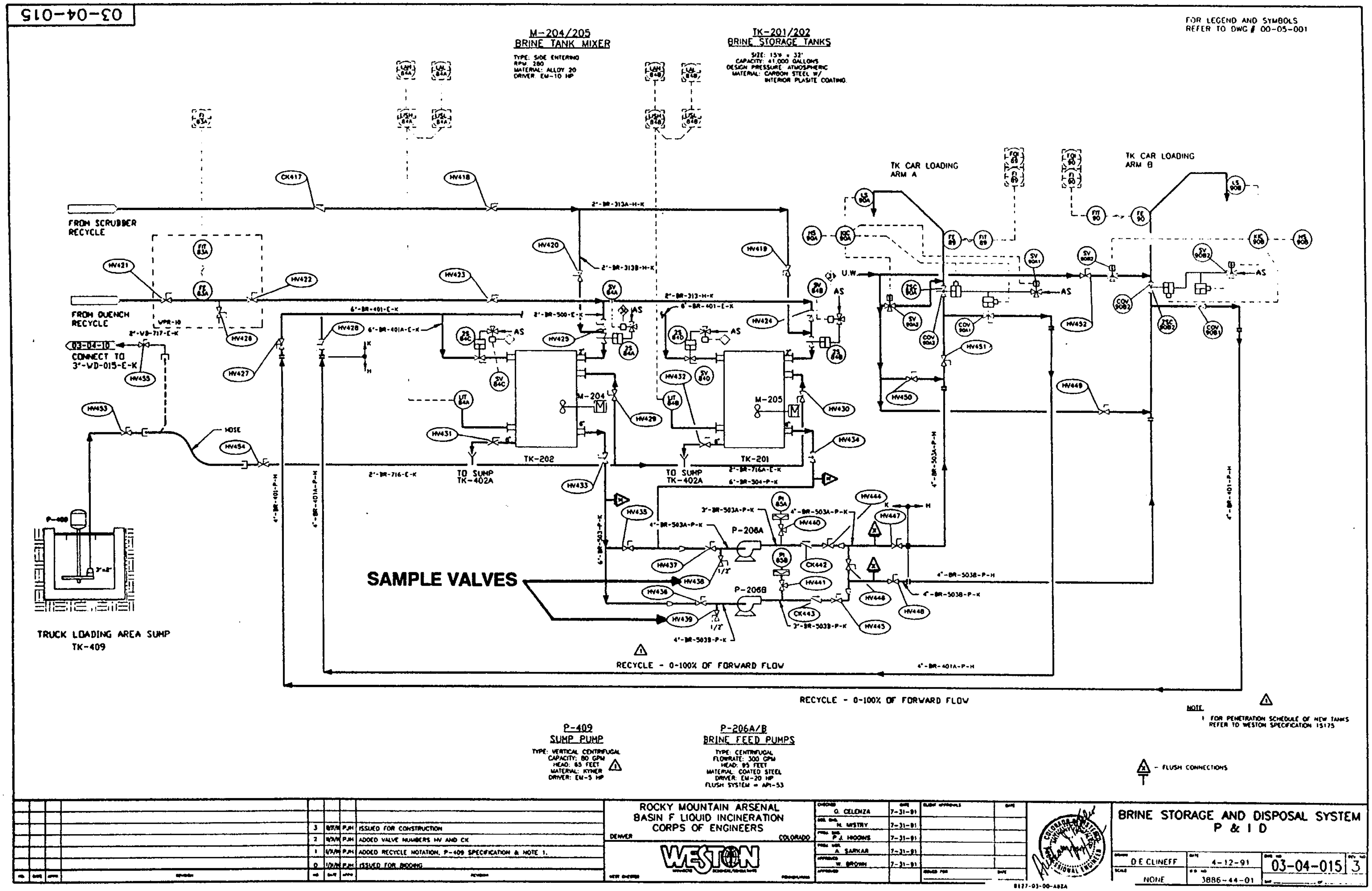

FIGURE 4-2 BRINE SAMPLING LOCATION

Table 4-5

Sampling Plan for Brine Evaluated During Surrogate Testing

Description:	Brine				
Test Objective:	Monitor the chemical characteristics of the brine				
Test No.:	Surrogate Nos. 2, 3, and 4				
Parameters:	Total Organic Carbon	Ammonia	Specific Gravity	pH	Sulfates
Sampling Method:	Fill appropriate sample jars from sample valve. Samples to be collected approx. every 12 hours.				
Sampling Extraction/ Analysis Method(s):	Method 9060	Method 330.3	ASTM D891A/B	Method 150.1	Method 375.4
Sampling Frequency:					
- Sample size	2 x 40 mL	500 mL	500 mL	100 mL	500 mL
- Field samples	1/full tank	1/full tank	1/full tank	1/full tank	1/full tank
- Site and trip blanks	0	0	0	0	0
- Lab blanks	1/batch[1]	1/batch	1/batch	1/batch	1/batch
- Blank spikes[2]	0	0	0	0	0
- Replicates[3]	1/batch	1/batch	0	0	1/batch
- Total samples analyzed	2/day[4]	2/day[4]	2/day[4]	2/day[4]	2/day[4]

Notes:

[1]A batch consists of a maximum of 20 samples.
[2]A blank spike, or method spike is a sample of laboratory reagent-grade water spiked with the analytes of interest that is prepared and analyzed with the associated sample batch.
[3]A replicate sample is obtained by splitting a field sample into two separate analyses and performing two separate analyses on the aliquots. Replicate sample analysis monitors precision.
[4]Approximation.

The detailed logistics of off-site disposal of the brine are currently being negotiated. The off-site treatment/storage/disposal (TSD) facility selected has developed a "fingerprint analysis" of the brine based on analytical samples. The "fingerprint analysis" will be used to monitor each batch of brine delivered to the off-site facility. Batches of brine that are not similar to the "fingerprint analysis" will be rejected by the off-site facility and will require resolution of discrepancies prior to disposal. Batches having serious discrepancies may be shipped back to RMA for additional treatment.

The "fingerprint analysis," as developed by the receiving TSD facility (including parameters to be monitored and expected concentration ranges), is outlined in Table 4-6.

Similar analytical parameters have been specified for brine samples analyzed on-site to minimize the acceptance problems that may occur off-site. No batches of brine will be shipped off-site until on-site analytical results confirm compliance with the "fingerprint analysis." Table 4-5 lists the analytes to be monitored on-site during surrogate testing. Because the exact concentrations of compounds being used during surrogate testing are known, an abbreviated "fingerprint analysis" can be used to monitor the quality of brine generated. The complete "fingerprint analysis" will be required once shakedown testing begins.

Throughout surrogate and shakedown testing, the blowdown rate will be varied in an attempt to minimize the amount of brine requiring off-site disposal. The brine blowdown rate is dependent on the solids content of the brine (i.e., a decrease in brine blowdown rate increases the solids content of the brine). As designed, brine will be blown down from the SQI at a rate of 27 gpm with a solids content of 15% (assuming a feed of 13 gpm of Basin F liquid).

Initial surrogate testing of the brine system will attempt to achieve a 15% solids content in the blowdown stream. The solids content will be monitored by in-line density analyzers located on the quench tank recirculation line. Initial blowdown rates will be considerably

Table 4-6

Outline of Brine "Fingerprint Analysis"

Parameter	Anticipated Range
TOC	≤200 mg/L
Specific Gravity	1.21
pH	6.5-7.5
Ammonia (NH_4 as N)	≤50 ppm
Total Cyanide (CN)	≤1 ppm
Metals - Arsenic - Barium - Mercury - Selenium - Thallium	 ≤2 ppm ≤1 ppm ≤1 ppm ≤1 ppm ≤1 ppm
Halides - Fluoride - Bromide	 ≤40 ppm ≤900 ppm
Salts - Potassium - Phosphorous (as PO_4) - Sulfates (as SO_4)	 ≤3,000 ppm ≤20,000 ppm ≤50,000 ppm

less than 27 gpm because the solids content of the surrogates only ranges from 15 to 25%. After successful operation of the process at a 15% solids content, the solids content will be increased in increments of 1% while the quench system is monitored. At each solids increment, the amount of solids collected within the quench tank vortex separator will be monitored to determine if crystallization of solids within the quench tank/separator is occurring. Also, during prolonged shutdowns, the quench tank and packed tower will be internally inspected for solids buildup and/or potential clogging.

Attempts to optimize the solids content of the brine will be performed throughout each phase of surrogate and shakedown testing. All brine solids content evaluation must be done prior to trial burn activities.

4.3.3 Surrogate No. 3 - H_2O, NaCl, Na_2SO_4, and NH_4Cl

Upon satisfactory operation of the SQI using Surrogate No. 2, testing will continue using a water, sodium chloride (10% by weight), sodium sulfate (5% by weight), and ammonium chloride (10% by weight) solution. The primary reasons for testing with this solution are the same as those mentioned for Surrogate No. 2, i.e., observing nozzle performance and monitoring for signs of unacceptable solids buildup in the system. Also, with the formation of acid gases from the destruction of ammonium chloride, verification of pH control in the quench tank and packed tower and of particulate in the stack gases will be performed.

The principal difference between Surrogates No. 2 and No. 3 is the addition of ammonium chloride to No. 3, which will double the chlorine load on the system as well as introduce ammonium into the system. The increased chlorine load will be representative of concentrations typically found in the Basin F liquid.

It is preferred that the ammonium chloride solution be premixed with water and transported to the SQI site in tanker trucks to be pumped directly to the day tanks. The sodium chloride/sodium sulfate solution will already be in the day tanks, having been recycled from

Surrogate No. 2 testing. Assuming a 10-gpm feed rate, a full day tank will support 24 hours of continuous testing. Testing with Surrogate No. 3 will be continual for approximately 2 weeks.

With the addition of ammonium chloride, additional sodium chloride will be produced within the quench tank that must be disposed of. Assuming that the blowdown rate remains constant at 15% salts, larger volumes of brine will require disposal because of the additional sodium chloride being generated. Some of the brine blowdown will be recycled back to the day tanks; however, an increased volume will require off-site disposal. Ammonium chloride will be added continuously to the recycled brine within the day tanks to reformulate Surrogate No. 3 for feeding to the SQI. Refer to Subsection 4.3.2.2 for specifics pertaining to brine disposal practices.

4.3.3.1 Verification of pH Control

The pH control within the quench tank and packed tower will be verified during testing with Surrogate No. 3. Particular attention will be given to the quench tank, where salts will begin to accumulate in the quench water and require disposal. The quench tank blowdown rate is a function of the density of the solution in the quench recycle loop. Once the density of the quench recycle flow reaches 1.09 (a level corresponding to 15% solids (NaCl) solution at 80°C), quench blowdown will begin. Blowdown flow will be transferred to the brine storage facilities for off-site disposal or recycle. Caustic addition may be necessary to control pH within the quench tank. The pH of the quench water and scrubber blowdown will be continually monitored and adjusted as needed.

At no time during surrogate or shakedown testing should the pH of the quench or scrubber exceed 9 or fall below 6. If pH values are recorded outside of this range, modifications to the neutralization system will be performed to rectify the situation. Reasons for the problem and any modifications performed will be documented prior to additional surrogate or shakedown testing.

4.3.3.2 Nozzle Performance

The nozzle type that proved effective during Surrogate No. 2 testing will again be tested using Surrogate No. 3. The testing program will be similar to that discussed in Subsection 4.3.2.1. It is anticipated that the T-Thermal nozzle will be evaluated using successive surrogate solutions until it can be proven that the nozzle cannot operate properly. The nozzle performance testing will be similar throughout surrogate and shakedown testing, the only variation between tests being the feed material.

4.3.4 Surrogate No. 4 - H_20, NaCl, Na_2SO_4, NH_4Cl, and Methanol

Upon satisfactory operation of the SQI facility using Surrogates No. 1 through 3, a final test will be performed using a water, sodium chloride (10% by weight), sodium sulfate (5% by weight), ammonium chloride (10% by weight), and methanol (17% by weight) solution. The primary reasons for testing with this solution are as follows:

- Verification of burner response.
- Monitoring of carbon monoxide emissions.
- Measurement of particulate and HCl in exhaust gas.
- Observation of nozzle performance.

It is preferred that the methanol be transported to the SQI site in tanker trucks. The appropriate volumes of methanol and ammonium chloride will be transferred directly into the day tanks containing sodium chloride/sodium sulfate solution. Assuming a 17-gpm feed rate (increased from 10 gpm due to the increased heating value of Surrogate No. 4), a full day tank will support 14 hours of continuous testing. Testing with Surrogate No. 4 will be continual for approximately 2 weeks. Brine recycle/disposal activities will be similar to those discussed in Subsection 4.3.2.2 for Surrogate No. 2. The only addition will be the mixing of methanol with ammonium chloride in the recycled brine solution within the day tanks.

4.3.4.1 Verification of Burner Response

With the addition of methanol to the surrogate stream, the heating value of the solution is greatly increased. The heating value of Surrogate No. 4 is approximately 1,670 Btu/lb, which is similar to the heating value of the Basin F liquid. With the increase in heating value, the burner must respond by reducing the volume of natural gas needed to maintain a constant combustion chamber temperature. Testing will be performed by varying the flow rate of surrogate to the SQI while monitoring the burner responses to maintain a constant combustion chamber temperature. Proper burner response must be consistently observed before this testing can be considered successful. Testing is expected to last 2 to 3 days.

4.3.4.2 Monitoring of Carbon Monoxide Emissions

During testing with Surrogate No. 4, carbon monoxide (CO) concentrations in the stack gases will be monitored as an indicator of any upset condition within the combustion chamber. An attempt will be made to keep CO emissions consistently steady and below 50 ppm. Excessive or erratic CO concentrations are indicators of incomplete combustion within the SQI, possibly caused by nozzle problems. The reasons for unacceptable CO concentrations in the stack gas must be determined and corrected prior to proceeding with shakedown testing. CO concentrations will be measured by the CEM system.

4.3.4.3 Particulate/HCl Measurements

Monitoring for particulate and hydrochloric acid (HCl) will be performed to verify the efficiencies of the venturi scrubber (for particulate) and the packed tower scrubber (for HCl). Samples of the stack gases will be collected and analyzed during testing. Particulate and HCl samples will be collected according to EPA Method 0050. Particulate will be analyzed using EPA Method 5 procedures. HCl samples will be collected from the same EPA Method 0050 test train and analyzed using EPA Method 9057 (SW-846) procedures utilizing ion chromatography. The sampling approach for measuring particulate and HCl during surrogate testing will be similar to the approach used during the trial burn test program. Detailed sampling and analysis procedures can be found in the Trial Burn Plan. Table 4-7 outlines the sampling/monitoring plan for stack emissions during Surrogate No. 4 testing. It is estimated that two 2-hour stack gas samples will be collected and analyzed during testing with Surrogate No. 4.

Testing is expected to reveal that the SQI is emitting particulate well below the 0.10 grain/dscf limit (corrected to 12% CO_2). Testing is also expected to indicate that the HCl removal rate is greater than 99%. The HCl removal efficiency is calculated based on the chlorine feed to the SQI and the chlorine detected in the stack gases. Stack gas sample analyses for HCl measure total chlorine (i.e., HCl, salt water, etc.) and then report it as HCl. Therefore, the various forms of chlorine in the stack gases are not relevant because they are all factored into the HCl value.

All emissions sampling and monitoring will be conducted by WESTON personnel. The qualifications and experience summaries of WESTON's stack sampling personnel are included in Appendix D.

4.3.4.4 Nozzle Performance

Nozzle performance evaluations for Surrogate No. 4 testing will follow the same protocols identified in Subsections 4.3.2.1 and 4.3.3.2.

Table 4-7

Sampling Plan for Stack Gases Evaluated During Surrogate Testing

Description:	Stack discharge gases	
Test Objective:	Evaluate effectiveness of venturi and packed tower scrubbers	
Test No.:	Surrogate No. 4	
Parameters:	Particulate	HCl
Sampling Method:	Method 0050	Method 0050
Analytical Method:	Method 5	Method 9057
Sampling Protocol:		
- Sample size	>60 dscf	> 60 dscf
- Number of samples	2	2
- Site and trip blanks	1	1
- Blank spikes	1	1
- Blank spike dups	0	1
- Replicates	0	2
- Total samples analyzed	4	7

SECTION 5
INITIATION OF SHAKEDOWN ACTIVITIES

5.1 OBJECTIVE OF SHAKEDOWN TESTING

The primary objective of shakedown testing is to verify that the range of operating conditions (Table 4-2) will ensure compliance with performance standards. No shakedown activities will commence until successful surrogate testing has been completed. During the first shakedown test, the Basin F liquid will be fed to the SQI at an initial concentration of 25%. The remaining 75% of the feed stream will be water. Three successive tests will increase the Basin F liquid concentration in increments of 25%, with the final test treating 100% Basin F liquid. The testing parameters for each of the four shakedown tests will be similar to those evaluated during surrogate testing, with the addition of stack sampling for organics. A mini-burn will be performed during shakedown by spiking the 50% Basin F liquid wastestream with principal organic hazardous constituents (POHCs) to determine the destruction and removal efficiency (DRE) of the SQI. A second mini-burn will be performed by spiking the 100% Basin F liquid wastestream with POHCs to determine DRE. In addition, dioxin/furan analyses will be performed on the stack gas without POHC addition to evaluate the possibility of dioxin/furan formation caused by combustion of the Basin F liquid alone.

The critical operating parameters to be evaluated during shakedown testing include the following:

- Waste feed rate
- SQI combustion temperature
- Residence time
- Scrubber exhaust oxygen
- Quench tank pH
- Scrubber pH
- Venturi differential pressure
- Absorber water flow rate
- CO emissions

Table 4-2 identifies anticipated values for each of these operating parameters. Attempts to optimize each of these parameters (without exceeding the operating parameters listed in Table 4-2) will be made during each shakedown test, working toward a feed rate of 100% Basin F liquid. By the completion of shakedown testing (just prior to the trial burn), each of these operating parameters will be fine-tuned to a point where the system operates effectively and efficiently.

Nozzle performance is also a critical testing parameter during shakedown testing. Protocols for shakedown testing will be similar to those discussed in Subsection 4.3.2.1 for surrogate testing.

The duration of operating time allowed during shakedown is limited under 40 CFR Part 264 Subpart O (Incinerators). Specifically, 40 CFR Part 264.344 (Hazardous Waste Incinerator Permits) states that the period from initial introduction of hazardous waste into an incinerator to the initiation of the trial burn cannot exceed 720 operating hours. The EPA Regional Administrator may extend the duration of the shakedown period up to an additional 720 hours when good cause is demonstrated.

5.2 SEQUENCE OF SHAKEDOWN TESTING

Shakedown testing will be structured using a series of four Basin F liquid mixtures:

- Basin F liquid (25% by weight) and water.
- Basin F liquid (50% by weight) and water.
- Basin F liquid (75% by weight) and water.
- Basin F liquid (100% by weight).

The duration of shakedown testing for each waste mixture is scheduled to be approximately 2 weeks. The total number of operating hours will not exceed 720 hours. Table 5-1 lists the volumetric flow rates of both Basin F liquid and water required to develop the

Table 5-1

Summary of Shakedown Testing

Shakedown Test	Total Flow Rate (gpm)	Basin F Liquid Flow Rate (gpm)	Process Water (gpm)	Hours of Operation from One Full Day Tank[2]
No. 1 - 25% Basin F Liquid by Wt.[1]	13	3	10	18
No. 2 - 50% Basin F Liquid by Wt.	15	7	8	15
No. 3 - 75% Basin F Liquid by Wt.	17	12	5	14
No. 4 - 100% Basin F Liquid	19	19	0	12

Notes:

[1]Specific Gravity of the Basin F Liquid is 1.220.
[2]Day Tank Capacity = 14,000 gallons.

shakedown testing solutions. Assuming 720 hours of operation at a maximum feed rate of 19 gpm, the maximum volume of Basin F liquid to be treated during shakedown is 820,000 gallons.

5.2.1 Waste Feed No. 1 - 25% Basin F Liquid

Shakedown testing will begin with the processing of a 25% Basin F liquid and process water solution. The primary purpose of testing with Waste Feed No. 1 is to optimize system capacity and prove the ability to meet brine disposal criteria while monitoring the following:

- Critical operating parameters.
- Nozzle performance.
- Products of incomplete combustion (PICs) in the stack gas.
- Particulate and HCl in the stack.

Basin F liquid for testing will be pumped from the existing storage tanks to the day tanks located adjacent to the SQI building. Process water will also be added to the day tanks. It is expected that a feed rate of 13 gpm can be achieved using Waste Feed No. 1, based on a mixture of 10 gpm of process water and 3 gpm of Basin F liquid. Assuming a 13-gpm feed rate, a full day tank (14,000 gallons of Waste Feed No. 1) will support 18 hours of continuous testing.

5.2.1.1 Critical Operating Parameters

Many of the critical operating parameters initially evaluated during surrogate testing will be reevaluated in more detail during shakedown testing because of the addition of Basin F liquid. The parameters identified in Subsection 5.1 will be of most concern (target values and control limits for each are discussed in Table 4-2). Successful shakedown testing will require that process operating parameters fall within the expected range identified in Table 4-2, where applicable.

5.2.1.2 Nozzle Performance

The waste feed nozzles chosen as a result of surrogate testing will be reevaluated during each phase of shakedown testing. The selected nozzles will initially be tested using Waste Feed No. 1 and will be required to operate properly throughout all four shakedown tests. Testing criteria will be similar to those outlined for surrogate testing and are discussed in Subsection 4.3.2.1. During nozzle operation, the steadiness of combustion conditions (i.e., emissions of CO, CO_2, and O_2) will be monitored to evaluate nozzle performance. Also, after the nozzle is taken off-line and cooled, it will be inspected visually to determine the level of solids buildup that may have formed during operation.

5.2.1.3 PICs in Stack Gas

Monitoring of the stack gas for PICs will be performed to ensure adequate combustion of the waste and to prove that concentrations of organics in the exhaust gas will not interfere with DRE calculations. PIC monitoring will include sampling of the stack gas for volatile and semivolatile organic compounds. Stack gas samples for volatile organics will be collected using SW-846 Method 0030 (volatile organic sampling train (VOST)) and analyzed using SW-846 Method 8240. Semivolatile organic compounds samples will be collected using SW-846 Method 0010 and analyzed using SW-846 Method 8270. Table 5-2 outlines the sampling/monitoring plan for ensuring adequate combustion of the waste. Detailed sampling and analysis procedures can be found in the Trial Burn Plan. Only one stack gas sample (plus QC samples) will be collected and analyzed during testing with Waste Feed No. 1.

5.2.1.4 Particulate and HCl in Stack Gas

Monitoring for particulate and HCl emissions in the stack gas will be performed during shakedown testing (as it was for surrogate testing) to verify the efficiencies of the venturi scrubber (for particulate) and the packed tower scrubber (for HCl). Particulate and HCl

Table 5-2

Sampling and Analytical Plan During Shakedown to Ensure Adequate Combustion of the Waste

Description:	Stack discharge gases	
Test Objective:	Ensure adequate combustion of the waste	
Test No.:	Waste Feed No. 1	
Parameters:	Volatile organics	Semivolatile organics
Sampling Method:	Method 0030	Method 0010
Analytical Method:	Method 8240	Method 8270
Sampling Protocol:		
- Sample size	60 liters	> 106 dscf
- Number of samples	2 collected/1 analyzed	1
- Site and trip blanks[1]	1 set[2]	1 set[3]
- Train blanks	1	1
- Lab blanks	1	1
- Blank spikes	1	1
- Blank spike dups.	1	1
- Replicates	0	0
- Matrix spikes	All[4]	All[5]
- Total samples analyzed	6	6

Notes:

[1]Trip blanks only run if contamination problems found.
[2]Set includes Tenax/Tenax charcoal tube pair and HPLC water.
[3]Set includes solvents, filter, XAD-2 resin, and HPLC water.
[4]All samples spiked with CLP volatile organic analysis surrogates.
[5]All samples spiked with CLP semivolatile (SVOC) surrogates.

monitoring will be performed during each of the four shakedown tests. It is estimated that two stack gas samples (plus QC samples) will be collected and analyzed for each shakedown test performed.

Particulate and HCl samples will be collected using EPA Method 0050. Particulate will be analyzed using EPA Method 5. HCl samples will be analyzed using EPA Method 9057. Detailed sampling and analysis procedures can be found in the Trial Burn Plan. Table 5-3 outlines the sampling/monitoring plan for verification of scrubber performance. Testing is expected to verify that the SQI is emitting particulate at a rate of less than 0.10 grain/dscf (corrected to 12% CO_2) and removing HCl at a rate of greater than 99%. Calculation of the HCl removal efficiency is discussed in subsection 4.3.4.3.

5.2.1.5 Brine Disposal Criteria

With the initiation of shakedown testing, all brine generated as a result of the SQI process will be subject to off-site disposal (i.e., no recirculation back into the day tanks for reuse in testing). Brine management practices during shakedown are identical to those practices outlined in subsection 4.3.2.2 for surrogate testing. A summary of the sampling and analytical procedures for characterizing the brine during shakedown is included as Table 5-4. This sampling strategy matches the "fingerprint analysis" to be performed by the off-site TSD facility (see Table 4-6).

5.2.2 Waste Feed No. 2 - 50% Basin F Liquid

Upon satisfactory testing of the SQI facility using Waste Feed No. 1, shakedown testing will continue using a 50% Basin F liquid solution. The primary objective of Waste Feed No. 2 testing is to perform a mini-burn to determine the DRE and optimize operating temperatures of the SQI facility. Secondary objectives include monitoring critical operating parameters, evaluating nozzle performance, verifying scrubber performance, and

Table 5-3

Sampling and Analytical Plan During Shakedown to Verify Scrubber Performance

Description:	Stack discharge gases							
Test Objective:	Evaluate effectiveness of venturi and packed tower scrubbers							
Test Number:	Waste Feed No. 1		Waste Feed No. 2		Waste Feed No. 3		Waste Feed No. 4	
Parameters:	Particulate	HCl	Particulate	HCl	Particulate	HCl	Particulate	HCl
Sampling Method:	Method 0050	Method 0050	Method 0050	Method 0050	Method 0050	Method 0050	Method 0050	Method 0050
Analytical Method:	Method 5	Method 9057	Method 5	Method 9057	Method 5	Method 9057	Method 5	Method 9057
Sampling Protocol:								
- Sample size	>60 dscf	>60 dscf	>60 dscf	> 60 dscf	> 60 dscf	> 60 dscf	> 60 dscf	>60 dscf
- Number of samples	2	2	2	2	2	2	2	2
- Site and trip blanks	1	1	1	1	1	1	1	1
- Blank spikes	1	1	1	1	1	1	1	1
- Blank spike dups.	0	1	0	1	0	1	0	1
- Replicates	0	2	0	2	0	2	0	2
- Total samples analyzed	4	7	4	7	4	7	4	7

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Table 5-4

Sampling Plan for Brine Evaluated During Shakedown

Description:	Brine									
Test Objective:	Monitor the chemical characteristics of the brine									
Test Number:	Waste Feed Nos. 1, 2, 3, and 4									
Parameters:	Total Organic Carbon	Metals	Ammonia	Cyanide	pH	Specific Gravity	Bromide	Fluoride	Phosphorous	Sulfates
Sampling Method:	Fill appropriate sample jars from sample valve. Samples to be collected approximately every 12 hours.									
Sampling Extraction/ Analysis Method(s):	Method 9060	Method 3010/6010[1] and 7470[2]	Method 330.3	Method 335.2	Method 150.1	Method ASTM D891A/B	Method 320.1	Method 340.2	Method 365.2	Method 375.4
Sampling Frequency:										
· Sample size	2 x 40 mL	1 L	500 mL	500 mL	100 mL	500 mL	500 mL	500 mL	500 mL	500 mL
· Field samples	1/full tank	1/full tank	1/full tank	1/full tank	1/full tank	1/full tank	1/full tank	1/full tank	1/full tank	1/full tank
· Site and trip blanks	0	0	0	0	0	0	0	0	0	0
· Lab blanks	1/batch[3]	1/batch	1/batch	1/batch	1/batch	1/batch	1/batch	1/batch	1/batch	1/batch
· Blank spikes[4]	0	1/batch	0	0	0	0	1/batch	1/batch	1/batch	1/batch
· Replicates[5]	1/batch	1/batch	1/batch	1/batch	0	0	1/batch	1/batch	1/batch	1/batch
· Matrix spikes	0	1/batch	0	0	0	0	1/batch	1/batch	1/batch	1/batch
· Total no. of samples analyzed	2/day[6]	2/day[6]	2/day[6]	2/day[6]	2/day[6]	2/day[6]	2/day[6]	2/day[6]	2/day[6]	2/day[6]

Notes: [1]Method 6010 select metals include arsenic, barium, potassium, selenium, and thallium.
[2]Method 7470 includes mercury.
[3]A batch consists of a maximum of 20 samples.
[4]A blank spike, or method spike is a sample of laboratory reagent-grade water spiked with the analytes of interest that is prepared and analyzed with the associated sample batch.
[5]A replicate sample is obtained by splitting a field sample into two separate analyses and performing two separate analyses on the aliquots. Replicate sample analysis monitors precision.
[6]Approximation.

demonstrating the ability to meet brine disposal criteria (as discussed in Subsections 5.2.1.1 through 5.2.1.5).

Basin F liquid and process water for testing will be pumped to the SQI from the day tanks as discussed in Subsection 5.2.1. It is expected that a feed rate of 15 gpm can be achieved using Waste Feed No. 2. This feed rate will be comprised of 8 gpm of process water and 7 gpm of Basin F liquid. Assuming a 15-gpm feed rate, a full day tank (14,000 gallons of Waste Feed No. 2) could support 15 hours of continuous testing.

Mini-burn testing will consist of spiking the feed stream (Waste Feed No. 2) with two POHCs to determine the system DRE. The POHCs to be used during mini-burn activities as well as in the trial burn will be carbon tetrachloride and chlorobenzene. A total of six 8-hour tests will be conducted during the mini-burn. Two tests each will be run at combustion chamber temperatures of 1,750° F, 1,850° F, and 1,950° F. These temperatures may vary slightly depending on actual operating experience. For a given temperature, two 8-hour tests will be performed to establish the system DRE at that temperature. As shown in Tables 5-5 and 5-6, a total of 3.6 gallons of carbon tetrachloride and 29.7 gallons of chlorobenzene are required to demonstrate a DRE of greater than 99.99% over an 8-hour test period. This correlates to a spike feed rate of 0.008 and 0.062 gpm, respectively. The two POHC solutions will be introduced separately into the waste feed stream, as shown in Figure 5-1. POHC solutions will be stored in drums and pumped to the waste feed line using separate metering pumps. Low-flow metering pumps will be used to precisely monitor the volume of POHC solutions added to the waste feed.

Stack gas sampling for carbon tetrachloride and chlorobenzene will also be performed over each 8-hour test period in order to calculate DRE. For each mini-burn test, stack gas samples for carbon tetrachloride will be collected in accordance with SW-846 Method 0030 (VOST) and analyzed in accordance with Method 8240. Stack gas samples for chlorobenzene will be collected in accordance with Method 0010 and analyzed in accordance

Table 5-5

Determination of Carbon Tetrachloride Requirements to Demonstrate a Destruction and Removal Efficiency (DRE) of >99.99%

CARBON TETRACHLORIDE

1. POHC stack gas concentration:

$$Conc_{POHC} = \frac{POHC_{DL} \times 2.2046 \times 10^{-9}}{VM_{std}}$$

$$Conc_{POHC} = \frac{0.025 \times 2.2046 \times 10^{-9}}{0.6}$$

$$Con_{POHC} = 9.19 \times 10^{-11} \text{ lb/dscf}$$

2. POHC stack gas mass emission rate:

$$MR_{POHC} = Conc_{POHC} \times VS_{dscf} \times 60$$

$$MR_{POHC} = 9.19 \times 10^{-11} \times 11{,}000 \times 60$$

$$MR_{POHC} = 6.06 \times 10^{-5} \text{ lb/hr}$$

3. Amount of POHC required in feed to measure >99.99% DRE:

$$0.9999 = \frac{W_{in} - MR_{POHC}}{W_{in}}$$

$$W_{in} = 0.61 \text{ lb/hr}$$

6.1 lb/hr (with a factor of safety of 10)

= 0.008 gpm

4. Total quantity required during 8 hour test

$$V_{total} = 0.008 \times 60 \times 8$$

= 3.6 gal

Notes:

$Conc_{POHC}$	=	Stack gas concentration, pounds per dry standard cubic feet.
$POHC_{DL}$	=	Laboratory analytical detection limit of POHC, micrograms.
$2.2.046 \times 10^{-9}$	=	Conversion factor from micrograms to pounds.
VM_{std}	=	Sample volume at standard conditions, cubic feet.
VS_{dscf}	=	Average stack gas stream volumetric flow rate at standard conditions, cubic feet.
MR_{POHC}	=	Mass emission rate of POHC, pounds per hour.
60	=	Conversion from minutes to hours.
W_{in}	=	Mass feed rate of POHC in wastestream feed to incinerator.
$V_{(total)}$	=	Total quantity of POHC used per test.

Table 5-6

Determination of Chlorobenzene Requirements to Demonstrate a Destruction and Removal Efficiency (DRE) of >99.99%

CHLOROBENZENE

1. POHC stack gas concentration:

$$Conc_{POHC} = \frac{POHC_{DL} \times 2.2046 \times 10^{-9}}{VM_{std}}$$

$$Conc_{POHC} = \frac{25 \times 2.2046 \times 10^{-9}}{106}$$

$$Con_{POHC} = 5.20 \times 10^{-10} \text{ lb/dscf}$$

2. POHC stack gas mass emission rate:

$$MR_{POHC} = Conc_{POHC} \times VS_{dscf} \times 60$$

$$MR_{POHC} = 5.20 \times 10^{-10} \times 11{,}000 \times 60$$

$$MR_{POHC} = 3.43 \times 10^{-4} \text{ lb/hr}$$

3. Amount of POHC required in feed to measure >99.99% DRE:

$$0.9999 = \frac{W_{in} - MR_{POHC}}{W_{in}}$$

W_{in} = 3.43 lb/hr

34.3 lb/hr (with a factor of safety of 10)

= 0.062 gpm

4. Total quantity required during 8 hour test

V_{total} = 0.062 x 60 x 8

= 29.7 gal

Notes:

$Conc_{POHC}$	=	Stack gas concentration, pounds per dry standard cubic feet.
$POHC_{DL}$	=	Laboratory analytical detection limit of POHC, micrograms.
2.2.046 X 10^{-9}	=	Conversion factor from micrograms to pounds.
VM_{std}	=	Sample volume at standard conditions, cubic feet.
VS_{dscf}	=	Average stack gas stream volumetric flow rate at standard conditions, cubic feet.
MR_{POHC}	=	Mass emission rate of POHC, pounds per hour.
60	=	Conversion from minutes to hours.
W_{in}	=	Mass feed rate of POHC in wastestream feed to incinerator.
$V_{(total)}$	=	Total quantity of POHC used per test.

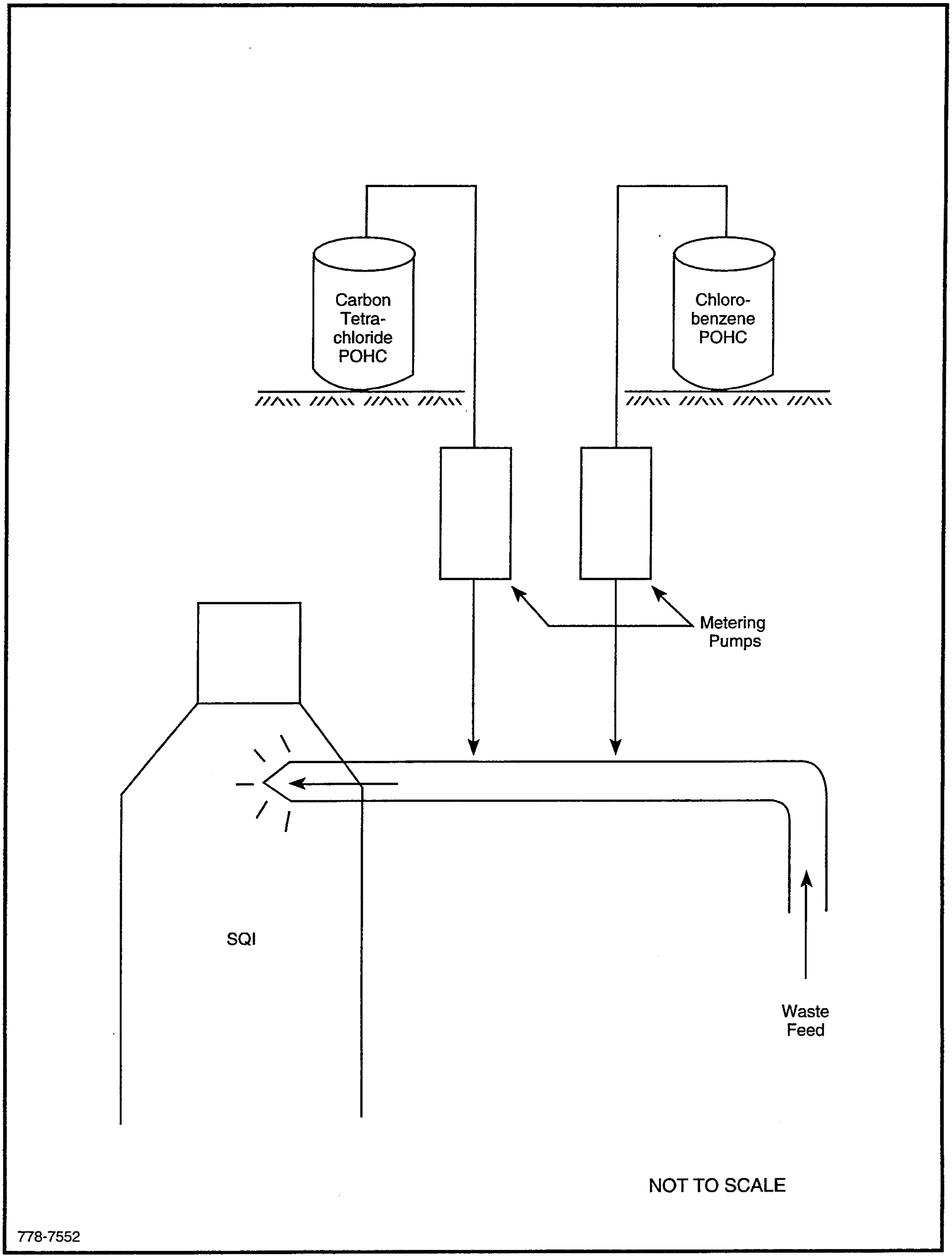

FIGURE 5-1 POHC DELIVERY SYSTEM SCHEMATIC

with Method 8270. Table 5-7 outlines the sampling/monitoring plan for all mini-burn activities. Detailed sampling and analysis procedures can be found in the Trial Burn Plan.

5.2.3 Waste Feed No. 3 - 75% Basin F Liquid

Upon satisfactory testing of the SQI facility using Waste Feed No. 2, shakedown testing will continue using a 75% Basin F liquid solution. The primary objective of Waste Feed No. 3 testing is to maximize brine concentrations at the optimal operating temperature. Additional objectives include continued evaluation of critical operating parameters, of brine disposal criteria, of the SQI nozzle system, and of the air pollution control system. Discussions pertaining to each of these evaluations are included in Subsections 5.2.1.1 through 5.2.1.5. Table 5-3 outlines the sampling and monitoring plan for verification of scrubber performance. Table 5-4 outlines the sampling and monitoring plan for characterization of the brine for disposal.

Basin F liquid and process water will be pumped to the SQI from the day tanks, as discussed in Subsection 5.2.1. It is expected that a feed rate of 17 gpm can be achieved using Waste Feed No. 3. This feed rate will be comprised of 5 gpm of process water and 12 gpm of Basin F liquid. Assuming a 17-gpm feed rate, a full day tank (14,000 gallons of Waste Feed No. 3) will support 14 hours of continuous testing.

5.2.4 Waste Feed No. 4 - 100% Basin F Liquid

Provided that Waste Feeds No. 1 through 3 have been successfully incinerated, the SQI will begin accepting 100% Basin F liquid. The primary objectives of Waste Feed No. 4 testing are to maximize throughput of the SQI and perform a second mini-burn. A second mini-burn will be performed with the following objectives:

Table 5-7

Sampling and Analytical Plan During Shakedown for Mini-Burn Testing Using 50% Basin F Liquid

Description:	Stack discharge gases	
Test Objective:	Ensure the destruction and removal efficiency of the SQI	
Test No.:	Waste Feed No. 2	
Parameter:	Carbon Tetrachloride	Chlorobenzene
Sampling Method:	Method 0030 (VOST)	Method 0010
Analytical Method:	Method 8240	Method 8270
Sampling Protocol:		
- Sample size	> 60 liters	> 106 dscf
- Number of samples[1]	12 collected/6 analyzed	6
- Site and trip blanks[2]	1 set[3]	1 set[4]
- Train blanks	1	1
- Lab blanks	1	1
- Blank spikes	1	1
- Blank spike dups.	1	1
- Replicates	0	0
- Matrix spikes	All[5]	All[6]
- Total samples analyzed	11	11

Notes:

[1]A total of six mini-burn tests will be performed. One gas sample will be analyzed for each POHC for each mini-burn test.
[2]Trip blanks only run if contamination problems found.
[3]Set includes Tenax/Tenax charcoal tube pair and HPLC water.
[4]All samples spiked with CLP volatile organic analysis surrogates.
[5]All samples spiked with CLP semivolatile (SOVC) surrogates.

- Determine the DRE of the SQI treating 100% Basin F liquid. Optimum operating parameters established during the initial mini-burn and subsequent testing will be duplicated for the second mini-burn. DRE will be determined by spiking the waste feed with carbon tetrachloride and chlorobenzene (POHCs) and then monitoring the stack gases for the presence of each POHC.

- Determine if dioxins/furans will be emitted in the stack gases from the destruction of 100% Basin F liquid. POHC solutions will not be added during these test runs.

- Quantify the concentrations of ammonia emissions generated by destruction of 100% Basin F liquid.

Additional system monitoring as discussed for Waste Feed No. 3 (Subsection 5.2.3) will be performed in addition to mini-burn activities (i.e., Tables 5-3 and 5-4).

A total of four 8-hour tests will be performed within the mini-burn for 100% Basin F liquid. Two tests will be dedicated to the determination of DRE, and two tests dedicated to dioxin/furan and ammonia analyses. The individual tests cannot be combined because of the use of POHCs in two of the four tests. Table 5-8 outlines the sampling and monitoring plan for activities relating to the second mini-burn.

Basin F liquid will be pumped to the SQI from the day tanks as discussed in Subsection 5.2.1. It is expected that a feed rate of 19 gpm (Basin F liquid only) can be achieved using Waste Feed No. 4. Assuming a 19-gpm feed rate, a full day tank (14,000 gallons of Basin F liquid) will support 12 hours of continuous testing.

Table 5-8

Sampling and Analytical Plan During Shakedown for Mini-Burn Testing Using 100% Basin F Liquid

Description:	Stack discharge gases			
Test Objective:	Establish DRE; evaluate dioxin/furan formation; monitor ammonia emissions			
Test Number:	Waste Feed No. 4			
Parameter:	Carbon Tetrachloride	Chlorobenzene	Dioxins/Furans	Ammonia
Sampling Method:	Method 0030 (VOST)	Method 0010	Method 23	Method 5[1]
Analytical Method:	Method 8240	Method 8270	Method 23	Method 350.3
Sampling Protocol:				
- Sample size	>60 liters	> 106 dscf	> 106 dscf	> 30 dscf
- Number of samples[2]	4 collected / 2 analyzed	2	2	2
- Site and trip blanks[3]	1 set[4]	1 set[5]	1 set[5]	1
- Train blanks	1	1	1	0
- Lab spikes	1	1	1	0
- Blank spikes	1	1	1	1
- Blank spike dups.	1	1	1	1
- Replicates	0	0	0	2
- Matrix spikes	All[6]	All[7]	All[8]	0
- Total samples analyzed	7	7	7	7

Notes: [1]Modified to include 1.0N H_2O_4 in impingers for collection of ammonia.
[2]Two samples will be analyzed for each of the parameters listed.
[3]Trip blanks only run if contamination problems found.
[4]Set includes Tenax/Tenax charcoal tube pair and HPLC water.
[5]Set includes solvents, filter, XAD-2 resin, and HPLC water.
[6]All samples spiked with CLP volatile organic analysis surrogates.
[7]All samples spiked with CLP semivolatile organic analysis surrogates.
[8]All samples spiked with 37 Cl-TCDD, 13Cl2-PeCDF 234, 13Cl2-HxCDF 478, 13Cl2-HxCDD 478, and 13Cl2-HpCDF 789.

SECTION 6

CRITERIA TO INITIATE TRIAL BURN TESTING

Preparation for trial burn testing will begin following successful surrogate and shakedown testing. Trial burn testing will focus on the following SQI process areas:

- Ability to meet stack gas emissions criteria.
- Ability to maintain continuous stable operations.
- Ability to meet brine disposal criteria.

Each of these trial burn testing criteria is discussed further in the following subsections.

6.1 ABILITY TO MEET STACK GAS EMISSIONS CRITERIA

The following emissions standards must be met for successful trial burn testing. These standards will have been met during some or all phases of startup testing. In particular, emissions standards must be met for the 100% Basin F liquid shakedown run.

- Destruction and Removal Efficiency (DRE) - A minimum POHC DRE of 99.99%.

- Particulate Emissions - A maximum particulate concentration of 0.10 grain/dscf (corrected to 12% CO_2).

- HCl Emissions - A maximum HCl emission rate of 4 lbs/hr, or an HCl removal rate greater than 99%, whichever is less stringent.

- Carbon Monoxide - A maximum 1 hour rolling average (corrected for 7% O_2) of 100 ppm in the combustion chamber.

Each of these emissions criteria must be met for successful trial burn testing.

6.2 ABILITY TO MAINTAIN CONTINUOUS STABLE OPERATIONS

As a result of startup testing, a set of optimum operating conditions will be established under which the SQI system can operate effectively and efficiently. These optimum operating conditions will include a maximum flow rate of waste to be treated at a given combustion chamber temperature and residence time. CEM ranges for CO, CO_2, and O_2 emissions will also be well established. During the trial burn, it must be proved that these optimum operating conditions can be maintained for extended periods of operation with a minimal amount of operator interference.

6.3 ABILITY TO MEET BRINE DISPOSAL CRITERIA

Brine will be generated throughout startup and trial burn testing. As brine is generated, it will be stored in holding tanks where it will be recycled (in the case of surrogate testing) or sampled prior to being shipped off-site for disposal (in the case of shakedown testing). As discussed in Subsection 4.3.2.2, brine analytical results must match a profile developed by off-site disposal facilities before being transported from RMA. Because large volumes of brine will be generated every day (i.e., 40,000 gpd), the logistics of sampling, analysis, and loading become very important. Brine must be transported off-site at a rate similar to the generation rate because of limited on-site brine storage capacity.

SECTION 7
STARTUP SCHEDULE

Startup activities are expected to begin in March 1992 with the preparation of equipment checkout punch lists. These punch lists will be developed, reviewed with subcontractors, and then revised between March and July of 1992. Mechanical completion of the SQI facility is scheduled for October 1992. Mechanical and electrical inspections will be performed between August and October 1992.

Surrogate testing will begin in late October 1992 and be completed by late November 1992. Approximately 2 weeks are allotted for each surrogate test.

Shakedown testing with the Basin F liquid will begin in December 1992. Mini-burn activities are scheduled for December 1992 (during Waste Feed No. 2 testing) and January 1993 (during Waste Feed No. 4 testing). Shakedown testing is scheduled for completion by the end of January 1993.

The startup schedule is shown in Table 7-1.

Table 7-1

Operational Plan Schedule of Events

Phase	Event	Tentative Schedule
Equipment Checkout	Mechanical Completion	Oct 92
	Hardware, Instrumentation, System, and Process Checks	Oct 92
	Startup of Combustion System	Oct 92
	Refractory Curing	Oct 92
Surrogate Testing	Surrogate Testing with:	
	- Water	Oct 92
	- Water, sodium chloride (NaCl) and sodium sulfate (Na_2SO_4)	Nov 92
	- Water, NaCl, Na_2SO_4 and ammonium chloride (NH_4Cl)	Nov 92
	- Water, NaCl, Na_2SO_4, NH_4Cl, and methanol (CH_3OH)	Nov 92
Shakedown Testing	Operation of SQI with:	
	- 25% Basin F Liquid	Dec 92
	- 50% Basin F Liquid	Dec 92
	- Miniburn with 50% Basin F Liquid	Dec 92
	- 75% Basin F Liquid	Jan 93
	- 100% Basin F Liquid	Jan 93
	- Miniburn with 100% Basin F Liquid	Jan 93
Trial Burn	3 Test Runs	Feb 93
Interim Operations	Initiation	Feb 93
	Trial Burn Report	May 93
	Regulatory Review	Jun 93
Routine Operations	Initiation	Jun 93

APPENDIX A

COMMENTS AND RESPONSES ASSOCIATED WITH THE DRAFT SQI STARTUP PLAN

PMRMA COMMENTS

Comment 1 - Page 2-2, Figure 2-1:

For Subcontractors on site, ensure that a T-Thermal and Modicon representative is available on site full time during equipment check out and start up.

Response 1:

The text will be revised to state that T-Thermal and Modicon will be present on-site full-time during equipment checkout and startup.

Comment 2 - Page 2-8, Section 2.2.6:

The manager and crew for the maintenance of the ponds, tanks, and wastepile could be part of the staff on hand for start up, trial burn, and operations. They need not be a whole separate staff.

Response 2:

The text and Figure 2-2 will be revised to incorporate the Basin F storage facilities field crew under the Maintenance Manager.

Comment 3 - Page 3-2, Section 3.2.:

It will be required that a Pre-Start Up Safety Review be conducted before the incinerator is operated in any way. This will be conducted by the Army and Shell. This is a standard requirement and any flaws noted in any aspect of the program will be reported to higher management of the Army and Shell.

Response 3:

Agree. A pre-startup safety review will be conducted by the Army and Shell prior to operation of the SQI. It was agreed in the startup plan review meeting that no text revision would be necessary.

Comment 4 - Page 4-1, last paragraph:

What is the planned feed rate of water on the first attempt?

Response 4:

A feed rate between 7 and 10 gpm is anticipated using Surrogate No. 1.

Comment 5 - Page 4-14, Section 4.3.2.3:

At the early stages of start-up, will nozzles be checked more than once every 24 hours? Also, 24 hours is listed as the criteria for nozzles being successful. This seems very short.

Response 5:

Nozzles will be expected to perform properly for at least 24 hours even in the early stages of startup. 24 hours has been established as the minimum acceptable nozzle changeout frequency. Nozzle performance beyond 24 hours will also be evaluated to predict the average and maximum nozzle changeout frequencies.

Comment 6 - Page 5-3, Table 5-1:

It is recommended that a pre-Trial Burn be performed before actual Trial Burn in order to be 100% confident that no problems will arise at the actual Trial Burn.

Response 6:

A second mini-burn will be performed just prior to the trial burn on 100% Basin F liquid in an attempt to gain additional operating experience and confidence.

Comment 7 - Section 3, Equipment Checkout:

Please clarify and explain that equipment checkout overlaps mechanical completion. Show a checkout network of activities to indicate the order or sequence of events in detail. This may be conceptual and modified based on actual conditions.

Response 7:

Mechanical completion is a milestone within the equipment checkout process signifying the completion of all construction related tasks and the start of operational testing. A sequencing diagram listing the order of checkout events will be included within Section 4 of the plan. Scheduling of checkout events will be provided at a later date.

Comment 8 - Section 7, Schedule:

a. Mechanical checkout three months out of phase.
b. Surrogate testing late and out of phase with schedule in Trial Burn Plan.
c. Shakedown Testing schedule three months out of phase with schedule in Trial Burn Plan.

Response 8:

The schedule will be revised based on discussions with PMRMA, USACE, and Shell.

Comment 9:

Trial Burn activity is now February, 1993, per comments to Trial Burn Plan.

Response 9:

Agree. The text will be revised to reflect this comment.

SHELL COMMENTS

General Comment:

- The document contains a sound overall approach for bringing the SQI to routine operations, but it does not contain a sufficient amount of detail to support the approach.

- The schedule for mechanical and electrical checkout, commissioning, and startup should be based on realistic expectations instead of near worst case assumptions. A realistic target for these activities is 4 months as opposed to the 8 months proposed in this plan. Since this is a startup of a new facility, complications may arise that affect the schedule in the future.

- The focus of most of the surrogate and shakedown runs should be to prove operability of the unit and not to perform excessive amounts of analytical work.

- Movement through the different stages of surrogate testing and shakedown should be based solely on accomplishment of previously established objectives instead of arbitrary estimates of how long the steps will take. Establishment of very specific criteria for these stages is critical to prevent unnecessary delays during startup.

Response:

The schedule will be revised based on discussions with PMRMA, USACE, and Shell.

The analytical work proposed for Surrogate Nos. 1, 2, and 3 have been deleted.

Movement through the different stages of surrogate and shakedown testing will be based upon accomplishment of the objectives stated in Section 4 (surrogate testing) and 5 (shakedown testing).

Comment 1 - Section 2.1:

Please describe the interface between the construction personnel, the maintenance personnel, and the checkout field crews for correcting problems discovered during the equipment checkout activities.

Response 1:

Problems identified by the equipment checkout field crews will be relayed to the chief startup engineer as soon as possible. At the end of each working day, the chief startup engineer will develop a list of equipment checkout deficiencies that have been identified. This list will then be reviewed with the site construction manager, and action items delegated to construction personnel for correcting the deficiencies.
Typically, maintenance personnel will be part of the equipment checkout field crews.

Comment 2 - Page 2-5, 1st Paragraph:

From our previous experience, vendor specialists for the continuous emissions monitors will probably be needed also.

Response 2:

CEM equipment manufacturers may also be required on-site for extended periods on time during startup. This will be noted in the text.

Comment 3 - Page 2-6, 1st paragraph:

Please add Shell to the list of parties that the plant manager has responsibility to interface with.

Response 3:

Shell will be included to the list of parties that the plant manager has responsibility to interface with.

Comment 4 - Page 3-1, 2nd paragraph:

The plan identifies four startup teams segregated by plant areas. The sequence and anticipated schedule for interfacing these equipment checkouts with the construction activities should be detailed. The extent of the organization required for these activities will be determined by the overlap of checkouts in the various areas and must be coordinated with the acceptance of subcontractors' work.

The document does not state the relative size of the four startup teams. The SQI area will require significantly more effort than the other areas and the sizes of the teams should reflect this.

How will operators receive field training outside of their assigned checkout area? Will they be rotated?

Response 4:

The manpower requirements and anticipated schedule for performing the equipment checkouts have not been finalized to date. The size of each checkout team is expected to consist of four or five individuals. The SQI area will require a larger time period to perform checkout; however, the size of each checkout team will be similar. Checkout teams will be rotated as needed to familiarize operations and maintenance personnel with the entire SQI facility.

Comment 5 - Page 3-2, Section 3.2:

Many of the activities identified will overlap with required Quality Control inspections as part of the construction effort. This interface should be explained as well as how the required Quality Control information obtained prior to the arrival of the startup teams will be used as part of the equipment checkout activities.

Response 5:

It is true that many of the equipment checkout activities will overlap with required QC inspections as part of the construction effort. This interface will be discussed at a later date and not within this plan.

Comment 6 - Page 4-1, last paragraph:

Prior to incinerator startup, the various areas of the facility will have to be started up and commissioned in an established sequence. Please provide this startup sequence and how it will interface with the construction completion priorities.

Response 6:

Figure 4-1 will be added to the Startup Plan outlining the sequence of commissioning activities.

Comment 7 - Page 4-2, Table 4-1:

Since sulfate is one of the more significant inorganic components of Basin F liquid and since it exhibits different behaviors from chloride, it should be added to Surrogates 2-4 in concentrations near that found in Basin F liquid (about 2%).

Since calcium can create plugging problems and since it is present in Basin F liquid (at relatively low levels), non-softened water should be used in mixing the surrogates.

Response 7:

Sulfate will be added to Surrogates 2-4 in the form of 5% (by weight) sodium sulfate. Non-softened water will be used in mixing the surrogates and waste feeds.

Comment 8 - Page 4-3, 1st paragraph:

See comments on objectives of various surrogate runs described below.

Response 8:

Delete as a result of Startup Plan review meeting with PMRMA, USACE, and Shell.

Comment 9 - Page 4-4 - 4-5, Table 4-2:

Referring back to our comments on the Trial Burn plan, this table should only contain those parameters that are expected to be limited based on the results of the trial burn (waste feed rate, residence time, destruction temperature, scrubber exhaust oxygen, quench and scrubber pH, venturi differential pressure, and absorber water flow rate). The anticipated value should be relabeled as the design value, and the control limits should be relabeled as the expected range in which the final value will fall. The text should state that the final value used during the trial burn will be based on results seen during startup and shakedown.

Combustion efficiency should be deleted from the table.

Design value for CO should be $<$ 100 ppm.

Response 9:

Table 4-2 will be modified to include only those parameters expected to be limited in the operating permit. The "Anticipated Value" will be relabeled as "Design Value", and the "Control Limits" will be relabeled as "Expected Range". The text will be revised to state that this is the entire list of parameters that are expected to be limited based upon their values during the trial burn. The final value used during the trial burn will be based on results seen during startup and shakedown.

Comment 10 - Page 4-6, last paragraph:

Water has no heating value.

Response 10:

The text will be revised to state that water has no heating value.

Comment 11 - Page 4-7, Section 4.3.1.2:

Interlock testing once per month after operation is initiated is described. Which critical interlocks and shutdowns will be tested as part of the startup activities. Will this interlock testing be part of the control system equipment and software checkout prior to surrogate testing?

Response 11:

Every interlock will be tested as part of the startup activities. Interlock testing will be part of the control system equipment and software checkout; however, interlocks will be tested manually, one by one.

Comment 12 - Page 4-8, Figure 4-1:

In general, the interlock matrix looks correct, but there are a few inconsistencies and several questions regarding the logic of some of the interlocks. Some of the fairly obvious errors are listed below, but a discussion with Weston/T-Thermal is needed to clarify most of the other questions that we have.

In some cases, a dot indicates the opening or closing of a valve or the turning off or turning on of a pump. Use of different symbols would clarify this uncertainty.

Interlock 10: B-201 should be C-201

Interlocks 24-27: There seems to be no reason to stop the waste from recirculating as long as the flow to the injectors is stopped.

Interlock 60: Quench Tank Recycle should be Quench Tank Recirculation

Interlock 62: Delete

Interlock 71: Delete

On high-high level in the day tanks, the outlet valve is shown closed on one tank and open on the other.

Flush timer indications for low level in TK-202 are in the wrong column.

On high level in the brine tanks, the recirculation control valve is shown closed on one tank and open on the other.

Description for LAH-203 should be TK-203 Level High.

Response 12:

Figure 4-1 will be revised to incorporate each of the comments listed above.

Comment 13 - Page 4-12, Table 4-3:

Please delete permissives for High THC and Combustion Efficiency. Why is a permissive needed for total caustic flow if there are permissives for scrubber and/or quench pH?

Response 13:

The permissives for high THC and combustion efficiency will be deleted. A permissive for total caustic flow was added as a result of the Haz-Op analysis based on concerns that the waste feed should be halted if a loss of caustic flow was experienced.

Comment 14 - Page 4-13, Section 4.3.2:

The primary objectives for this surrogate should be to observe nozzle performance and observe for signs of unacceptable solids buildup in the system. Essentially no acid gas will be generated so verification of pH control cannot be done and measurement of HCl (and particulate) is not necessary.

Specific criteria should be identified for movement to the next surrogate. For instance, a potential criterion for nozzle performance is that visual inspection reveals no significant solids buildup after "X" hours of continuous operation. For surrogates 2 and 3, combustion parameters such as CO concentration will not be indicative of nozzle performance since no CO can be produced by these surrogates (applies specifically to the statement made on Pages 4-14 - 4-16). From surrogate 4 on, the criterion for moving on to the next step might be expanded to include CO concentrations below "Y" ppm for "X" hours of continuous operation.

Response 14:

Agree. The primary objectives should be to observe nozzle performance. Because acid gases are not expected to be a concern, HCl and particulate analyses will be deleted from Surrogate No. 2. Specific criteria for successful test completion will be included within the text where applicable. For Surrogates 2 and 3, CO concentrations have been deleted as being indicative of nozzle performance; however, CO will be monitored during Surrogate 4 and all shakedown tests as an indicator of nozzle performance. CO concentration will be expected to remain below 50 ppm on a continuous basis.

Comment 15 - Page 4-13, Section 4.3.2.1:

Quench blowdown water from this and other surrogate runs is said to require disposal. This blowdown should be recycled to the day tanks for feed back into the incinerator. The salt water surrogate will be essentially unchanged in the blowdown except for perhaps an increase in salt concentration which can then be diluted back to 10%. The sodium chloride can continue to be recycled throughout all of the surrogate runs. Once ammonium chloride is added to the surrogate, additional sodium chloride will be produced that must be disposed of. However, some of the brine can be recycled with ammonium chloride (and methanol for surrogate #4) being added in the day tanks. This approach required the disposal of approximately 230,000 gallons of brine less than if all of the produced brine was sent for disposal.

Since the brine produced during the surrogate runs will not be a hazardous waste and will essentially be salt water, have other potential disposal sites been considered?

Caustic addition should not be required for surrogate #2 since no acid gas will be generated.

Response 15:

Agree. An attempt will be made to recycle as much of the brine generated during surrogate testing as possible. The 15% brine solution generated will be similar to the 15% salt surrogate solution being used as Surrogate No. 2, therefore recycling should be relatively straightfoward. With the addition of ammonium chloride and methanol for Surrogates No. 2 and 3, recycling of the brine becomes more complicated due to the required addition of ammonium chloride and/or methanol to the recycled brine prior to feeding to the SQI. Recycling the generated brine will result in a substantial savings in the amount of brine requiring off-site disposal.

Comment 16 - Page 4-14, last full sentence:

The air side of the nozzle is flushed with steam not air.

Response 16:

The text will be revised to incorporate this comment.

Comment 17 - Page 4-15, Table 4-2:

Particulate and HCl measurements need only be done for surrogate #4.

For these samples and others listed in the plan, full complements of QA/QC samples (as proposed in the trial burn plan) are proposed for the sampling activities during startup. Can some of these be eliminated and still leave the startup team with high confidence in the results?

Response 17:

Agree. Particulate and HCl measurements will only be performed during testing with Surrogate No. 4. WESTON feels that the QA/QC samples identified are required to compare the analytical data generated during startup with data generated during the trial burn.

Comment 18 - Page 4-16, 1st paragraph:

Twenty-four hours of continuous operation is mentioned as a criterion for nozzle performance. Is this number an example or the actual criterion? Whatever is chosen as the final criterion (at least for the shakedown runs) should be a number that can be lived with as a potential nozzle changeout frequency during routine operations.

Response 18:

A continuous operating period of twenty-four hours has been established as the minimum acceptable nozzle changeout frequency. The text will be revised to clarify this issue.

Comment 19 - Page 4-18, Section 4.3.4.2:

The combustion efficiency criterion should be replaced by a CO criterion of < 100 ppm in the stack gas.

Response 19:

As discussed in the Startup Plan review meeting between PMRMA, USACE, Shell, and WESTON, the combustion efficiency criterion will be replaced by a CO criterion of <50 ppm in the stack gas (as opposed to 100 ppm suggested initially).

Comment 20 - Page 4-18, Section 4.4.4.4:

Nozzle performance for this surrogate can include effects on combustion parameters such as CO.

Response 20:

Agree. CO can be used to monitor nozzle performance during testing with Surrogate No. 4. The text will be modified to reflect this.

Comment 21 - Page 5-1, Section 5:

This section should include more detail on the selection of nozzles and critical operating parameters. For nozzles, the following types of information should be included:

- Describe nozzles available for testing.
- Which nozzle will be tested first?
- What causes another nozzle to be tested?
- How will nozzle testing be mixed with testing of operating parameters?

For operating parameters, the following types of information should be included:

- Identify the parameters that will be "optimized" before the trial burn
- In what order will they be tested?
- Which ones will be set based on values of previously tested parameters?
- What response is used to evaluate the affects of changing a parameter (e.g., CO and DRE for temperature).
- When and how will the effects of varying TDS contents of the quench water be investigated?

The way in which these investigations fit into the different surrogate and shakedown runs should also be discussed.

Response 21:

A detailed discussion pertaining to nozzle selection and testing criteria will be presented in Subsection 4.3.2.1. Discussions pertaining to critical operating parameters will be included in Subsection 5.1.

Comment 22 - Page 5-2, Section 5.2.1:

Stack sampling for POHCs, HCl, and Particulate need only be done at 50% and 100% waste concentrations. Sampling for PICs need only be done at 50% waste. The focus for the 25% and 75% waste runs should be on process operability. The CEMs will provide feedback on combustion conditions (CO, TCH) and HCl. If operating difficulties arise during these steps, additional sampling can be added as needed.

Response 22:

As a result of the Startup Plan review meeting, the following samples will be collected for analysis during shakedown testing:

Waste Feed No. 1
Volatile organics (PIC analysis)
Semivolatile organics (PIC analysis
Particulate (Verify scrubber performance)
HCl (Verify scrubber performance)

Waste Feed No. 2
Particulate (Verify scrubber performance)
HCl (Verify scrubber performance)
Carbon tetrachloride (Determine DRE)
Chlorobenzene (Determine DRE)

Waste Feed No. 3
Particulate (Verify scrubber performance)
HCl (Verify scrubber performance)

Waste Feed No. 4
Particulate (Verify scrubber performance)
HCl (Verify scrubber performance)
Carbon tetrachloride (Determine DRE)
Chlorobenzene (Determine DRE)
Dioxins/Furans (Evaluate dioxin/furan formation)
Ammonia (Monitor ammonia emissions)

The text within Section 5 will be monitored t reflect these revisions.

Comment 23 - Page 5-3, Table 5-1:

Why is no differences in waste flow rate shown for Waste Feeds 3 and 4?

Response 23:

The waste flow rate for Waste Feed No. should be 19 gpm, instead of the 17 gpm presented in Table 5-1. This table will be modified accordingly.

Comment 24 - Page 5-3, Table 5-1:

Both POHCs, carbon tetrachloride and chlorobenzene, should be used during this miniburn.

Response 24:

Agree. The text will be modified to state that both POHCs will be used during miniburn activities.

Comment 25 - Page 5-9, 1st paragraph:

Please explain specifically how the POHC will be mixed with the waste?

Response 25:

The two POHC solutions will be introduced separately into the waste feed stream. POHC solutions will be stored in drums and pumped to the waste feed line using separate metering pumps. Low-flow metering pumps will be used to precisely monitor the volume of POHC solutions added to the waste feed. A figure will be added to the text identifying the POHC delivery system.

Comment 26 - Page 5-10, Table 5-3:

Why are there 23 VOST samples to be analyzed?

Response 26:

The tables within Section 5 will be revised to reflect the proper number of VOST samples to be analyzed.

<u>Comment 27 - Page 5-11, Section 5.2.4</u>:

A miniburn should be done at 100% waste at the conditions proposed for use during the trial burn. The stack gas should be analyzed for both POHCs, HCl, and Particulate. Since the trial burn will measure dioxins/furans in the stack gas while the POHCs are being added to the waste, two samples of dioxins/furans in the stack gas should be taken during this miniburn while the POHCs are not being added to the waste. This miniburn should be done early enough so that the results of the POHC, HCl, and Particulate sampling will be available before beginning the trial burn.

<u>Response 27</u>:

Agree. A second mini-burn will be performed using Waste Feed No. 4 (100% Basin F liquid) at the conditions proposed during the trial burn. The main objectives of the second mini-burn are to:

- Determine DRE.
- Evaluate dioxin/furan formation in the stack gas without POHC addition.
- Monitor ammonia emissions.

The text will be revised to include a detailed discussion of the second mini-burn.

<u>Comment 28 - Page 6-1, Section 6.1</u>:

The emissions criteria must be met for the 100% waste shakedown run (or 50% in the case of PIC emissions).

"Unacceptable" PIC concentrations should be specifically defined.

<u>Response 28</u>:

Agree. The text will be revised to state that emissions criteria must be met during shakedown testing with Waste Feed No. 4. Also, the bullet discussing unacceptable PIC concentrations will be deleted.

Comment 29 - Page 6-2, Section 6.2:

CEM ranges for CO, CO_2, and O_2 emissions will also be established.

A specific goal for "extended periods of operation" should be established.

Response 29:

Agree. CEM ranges will be established. The text will be revised to state this. Also, goals for extended periods of operation will be established between PMRMA, USACE, Shell, and WESTON; however, it was agreed upon in the Startup Plan review meeting that these goals would not be included within this document.

Comment 30 - Page 6-2, Section 6.3:

The criterion related to brine disposal was not described in the earlier section of the report. How and when will it be met? The brine produced from the shakedown runs need only be analyzed enough to have confidence that it will be accepted for disposal by the receiving facility. Detailed characterization of the brine will occur during the trial burn, as previously proposed.

Response 30:

Discussions relating to the acceptability of the brine for off-site disposal will be presented within Section 5. The brine generated during shakedown testing will only be analyzed enough to have confidence that it will be accepted for disposal by the receiving off-site facility.

Comment 31 - Page 7-1, 1st paragraph:

Construction schedule status reports have presented a Mechanical Completion date of October, 1992, not December, 1992.

Response 31:

The schedule within Section 7 will be revised to include a Mechanical Completion date of October 1992.

Comment 32 - Page 7-2, Figure 7-1:

The startup schedule should be based on realistic expectations and reflect early finish dates for planning of activities. The following schedule in considered a realistic target:

Mechanical/Electrical Checkout	4 weeks
Commissioning	2 weeks
Surrogate Runs	3 weeks
Shakedown Runs (waste)	6 weeks
Trial Burn	1 week
Total	16 weeks

Based on the Mechanical Completion date of early October, 1992 shown on the construction schedule, this startup schedule would lead to the commencement of routine operations in mid-January, 1993.

Response 32:

The startup schedule will be revised to match the schedule presented in the Trial Burn Plan.

Comment 33 - Page 4-14, Section 4.3.2.1

If a second nozzle must be tried during startup due to plugging of the T-Thermal nozzle, we suggest that it be the Sonic nozzle instead of the Nittetu nozzle since it is more different from the T-Thermal nozzle and the large waste opening should be much less prone to plugging.

Response 33:

Agreed. Because the Nittetu nozzle is similar to the T-Thermal nozzle, the Sonic nozzle will be tested before the Nittetu nozzle if the T-Thermal nozzle should fail. The large orifice for waste injection should make the sonic nozzle much less prone to plugging.

Comment 34 - Page 5-7, 3rd Paragraph:

The analytical profile for the brine is not "listed above".

Response 34:

Reference to the "analytical profile listed above" will be deleted.

Comment 35 - Page 5-15, Last Paragraph:

Two different flow rates of Waste Feed #4 are mentioned in successive sentences. The first should be 19 gpm instead of 17 gpm.

Response 35:

Agreed. The text will be modified to incorporate this comment.

Comment 36 - Page 7-2, Table 7-1:

Interim operations will follow the trial burn in February, 1993.

Response 36:

Agreed. Table 7-1 will be modified to include time for interim operations.

U.S. EPA REGION VIII COMMENTS

General Comment 1:

The Draft Trial Burn and Start Up Plans are well organized and comprehensive documents which present a logical outline and specified scope of work for completion of an Interim Remedial Action for destruction of Basin F liquids. Presently in the draft documents, there are a number of typographical errors, mistakes and lack of cross reference which give the appearance of an unfinished product and/or inadequate quality work. This should be corrected.

This project has proceeded at expedited pace, under a unique set of circumstances, for a hazardous waste incineration effort. The main procedural deviation is the allowance of design and construction of a stationary incinerator prior to the approval of final detailed design, operational parameters and trial burn plans.

Response 1:

Every effort will be made to eliminate grammatical mistakes within the plans.

General Comment 2:

The composition and physical properties of Basin F wastes are complex and variable. Review of waste data as reported by the several entities who have sampled and analyzed the material shows significant variability beyond laboratory or analysis protocol differences. Over the years there have been numerous "arguments" regarding the basic question "What is Basin F waste?" It is not unreasonable to conclude that the variability reflects stratification, lack of mixing, atypical chemistry, high salt concentration, sensitivity to environmental conditions (esp. temperature) etc. and that in fact, the variability is "real".

However, the reality of waste variability establishes a basic position which the Agency takes in (1) setting Test Burn objectives and scope and (2) in setting the key operating conditions established as "acceptable" for continuing incinerator operation. Waste variability (as reflected in the great spread in data) suggests that the material drawn from any portion of

Basin F can be different over time and, thus, that operating criteria should be set such that all plausible waste compositions will experience a destruction environment such as to protect the environment.

Response 2:

The selection of the POHCs considered the variability concerns of the waste mixture in that chlorobenzene and carbon tetrachloride represent a broad range of the thermal stability index and therefore, the difficulty of incineration. Basin F liquid does not contain any hazardous compounds in concentrations sufficient to demonstrate the 99.99% DRE in itself. No text revision is necessary.

General Comment 3:

The Trial Burn process is intended to demonstrate with a set of pre-agreed "acceptability" objectives, that a unit should be allowed to operate on a continuous basis. The approved operating conditions will include certain restrictions as to an "acceptable range" for a set of key process variables. If any of the key process variables moves outside the acceptable range, feed is cut off. In most cases, the key variables are surrogates for the substantive variables of excessive emissions which, owing to the difficulty of obtaining reliable continuous emission monitoring instrumentation, cannot be measured directly.

In this context, the operating conditions during the Trial Burn should include those to be set somewhere near the extremis levels. For example, if the Trial Burn is run at 2000° F and the low-temperature cut-off is set at 1600° F, and the waste constituents are such that their incinerability is "marginal," the unit may well qualify for DRE at the higher test temperature but fail at, say, a temperature of 1650° F where, under the approved operating conditions, the unit can continue to operate (and, possibly, save money on fuel expense).

A review of the "key process conditions" under which the unit will be qualified is given in Table 4-3, Page 4-9 and the selected "Inadequate Conditions for Waste Feed" in Table 9-1, Page 9-2.

EPA agrees with inclusion of all of the conditions set in Table 9-1 and, indeed, believe that several of the lower-end parameter values should be qualified as "adequate" in the Trial

Burn and included as conditions in the approved operating conditions. Key parameters include:

- Operating Temperature - Temperature is recognized as the dominant (but not only) key variable affecting DRE. For the more "refractory" organic compounds, 1700° F would be regarded as "marginal" whereas 1900° F is usually regarded as "safe". If the low temperature cut-off is set at 1700° F, the DRE should be confirmed at temperatures not too far above this .... say, 1750° F.

- Venturi Liquid-to-Gas Ratio - The collection efficiency of a Venturi scrubber is a function of both DP and the liquid-to-gas ratio (L/G). The Army intends to demonstrate performance at a defined DP but makes no mention of the corresponding L/G. A minimum Venturi flow rate is listed in Table 9-1 as a Class 1 "cutoff variable" but we suggest that the minimum L/G should be called out as a key parameter for continuing operation and the unit should be tested at the minimum. (Note, incidentally, that the Venturi liquid rate does not show in they system diagram in Figure 5-1 nor in the list of variables to be recorded). This is particularly important for Basin F waste incineration due to the potential for sub-micron "fume" formation which challenges collection in the Venturi. Note in this regard that although the Venturi "nominal DP is 90" w.g., the unit (per Table 9-1) can operate continuously at 60". The emissions should be qualified as acceptable at the lower limit of DP.

- Feed Rate - Feed rate is often seen as scaling "residence time' in that for a given O_2 level and for high heat content feed, feed rate is equivalent to heat release rate is equivalent to air supply rate is equivalent to flue gas rate which, in combination with combustion chamber volume, provides a measure of mean residence time. Here, the feed is energy deficient and the total heat release may scale more on the natural gas rate than to the feed rate. EPA was unable to confidently develop estimates of the inter-relationships operative in the Basin F incinerator case (due to the waste composition uncertainties noted above). This suggests that such an analysis is merited to assure that the right variable(s) are being sensed in concluding that continued operations are "in-range."

Further, for an incinerator of the type used here (where quenching occurs rapidly and there is no extended "afterburning zone") it is critical that not only should demonstrated minimum residence time criteria be met, but also that the mixing intensity in the combustion chamber should be maintained. Without adequate mixing, zones of air deficiency and/or low temperature may lead to inadequate organic destruction.

Mixing in incinerators of this type arises from several mechanisms including the rate and introduction means (e.g. swirl vanes) of air, secondary turbulence inducements (active systems such as secondary air or stream jets or passive systems such as baffles) and burner configurations and atomizing means and conditions. Since "mixing" is not an easily monitored variable, one must depend on using combustion process insights to identify process variables which may be used as a surrogate of "mixing". These include the pressure in supply air plenums, the pressure in the atomizing fluid (air or steam) supply and the integrity of the physical nozzles used for atomization. Further, a key parameter in assuring adequate mixing is the overall volumetric flow rate through the unit.

The Army intends to monitor and control (Table 9-1) the combustion air pressure, the atomizing air compressor (C-201) pressure, the (feed) pressure at the feed nozzle, and, presumably, will limit the feed rate to that used in the qualification tests. However, this set of parameters does not protect against:

- Low feed rates (imagine as a "worst case", a dribbling feed) which fails to generate the total gas flow rate needed to replicate the turbulence experienced in unit qualification.

- Use of steam atomization (said to be a process alternate but not, specifically, to be qualified in the Test Burn).

- Degeneration of the feed nozzle hardware such that spray pattern, droplet size etc. replicates Test Burn conditions. This problem is more than hypothetical based on experience with nozzle erosion and clogging in the limited test burns run in vendor facilities in the past.

To address these deficiencies, the Army should:

- Incorporate a "low feed" limit to operations and qualification of the unit under those conditions.

- Qualify the unit with steam atomization (or denial of the use of this alternate without re-test).

- Develop procedures and surrogate indicators to monitor atomization quality. These could, possibly, include:

    - Automatically replace nozzle tips at a periodicity based on operational experience;

    - Monitoring of flame radiation (which may well relate to the droplet size and burner mixing effectiveness);

    - Monitor "rate-of-rise" of, say, 1-minute average CO concentrations as an indicator of degrading atomization as a trigger to nozzle replacement.

<u>Response 3</u>:

Table 4-3 in the trial burn plan lists the process regulated parameters that are typically regulated in an operating permit. Tables 9-1 and 9-2 identify the waste feed and burner shutoff conditions that can occur based on environmental permit requirements and equipment protection. Table 4-3 is a subset of Table 9-1 and includes only those parameters that may affect environmental quality. This distinction will be better defined within Tables 9-1 and 9-2.

The trial burn will be performed at the lowest feasible operating temperature while still maintaining adequate DRE, based on testing performed during shakedown. This temperature is expected to be slightly above the low temperature cut-off. This minimum temperature set point established in the operating permit will be based on the mean trial burn temperature.

The trial burn will be performed at the lowest feasible venturi pressure differential while still achieving adequate particulate removal, based on testing performed during shakedown. The pressure drop is expected to be slightly above the low venturi pressure drop cut-off. The minimum differential pressure set point established in the operating permit will be based on the mean trial burn differential pressure.

A minimum liquid flow rate will be set for the venturi scrubber. A gas flow rate to the venturi scrubber will not be monitored.

The monitoring of mixing intensity within the combustion chamber cannot be routinely measured by commercially available instrumentation.

The two-fluid atomizing nozzles to be used will properly atomize low feed rates as well as high feed rates. The nozzles to be used can be operated within a wide range of flow rates, varying from virtually zero to 4.25 gpm. The nozzle design flow rate is 3.4 gpm, but the nozzles are more effective at lower feed rates because lower feed rates are easier to atomize. A "low feed" atomization test has been conducted by T-Thermal at 50% of the design flow rate, or 8.5 gpm. We do not agree the SQI should be qualified under low flow conditions.

The SQI will be qualified using air as the waste atomization medium. If steam atomization is required, modifications to the system would be required and regulatory approvals would be solicited.

Atomization quality will be monitored based on carbon monoxide (CO) emissions, as a result of T-Thermal's experience with previous test burns. Increases in CO concentrations over time would indicate a decrease in nozzle performance. Control room computer screens displaying each nozzle flow and pressure will also be monitored in an attempt to evaluate nozzle performance.

COLORADO DEPARTMENT OF HEALTH COMMENTS

General Comment 1:

We understand that the documents are draft documents and will be revised to incorporate comments received. Once finalized, any proposed changes to the operating conditions or procedures specified in the Start-up Plan or Trial Burn Plan, along with justification for the change, must be submitted to the regulatory agencies for review and approval prior to their implementation.

Response 1:

Any changes in the SQI testing program after the Startup Plan and Trial Burn Plan have been finalized, will be submitted to the regulatory agencies for approval.

General Comment 2:

Based on the trial burn results and report, operating conditions will be specified. The following limiting parameters should be finalized based on the Trial Burn Report:

- Maximum waste feed rate
- Minimum combustion temperature
- Maximum combustion gas velocity
- Minimum and maximum feed nozzle pressure
- Minimum compressor (C-201) outlet pressure
- Minimum combustion air pressure
- Use of nozzles tested during trial burn
- Use of air or steam for atomization
- Minimum quench separator level
- Maximum quench liquid specific gravity
- Minimum liquid pH for the packed tower
- Minimum liquid to gas ratio for the packed tower
- Minimum pressure drop across the venturi scrubber
- Minimum liquid to gas ratio for the venturi scrubber
- Maximum feed rate of each regulated heavy metal
- Maximum total feed rate of chlorine and chloride
- Maximum total feed rate of ash

Response 2:

The majority of the issues raised in this comment have already been addressed under EPA Trial Burn Comment 18. Those issues not included in EPA Comment 18 are discussed below:

- The maximum feed rate will be limited by trial burn activities.

- The maximum quench liquid specific gravity should be monitored to evaluate the performance of the quenching system, and is not recommended as a permit condition. It does not affect the ability of the incinerator to destroy the Basin F liquid.

General Comment 3:

A process for providing data to the regulatory agencies should be established. We recommend that this system include provisions which allow the regulatory agencies access to the monitoring data as it is collected. Access to all data collected during shake-down testing should be available to the State, including monitoring data, strip charts, etc. Copies of analytical results received from the laboratories should be provided. Potentially, a telemonitoring system could be provided which allows for direct electronic relay of the outputs of continuous monitoring devices to the regulatory agencies. The report does not specify when or how much of the collected shake-down data will be made available or will be reported to the regulatory agencies for review.

Response 3:

The process for providing timely accurate data to the State FTE and the ITO group will be through on-site representatives during trial burn activities. The Army will provide, on a timely basis, timely information to assure all parties that trial burn objectives are being achieved. The Army as Lead Agency has the obligation to assure that the data being dissiminated is accurate. The dissimination of raw data is viewed as misleading and could lead to uncoordinated conclusions. A detailed matrix of data distribution will be developed prior to start up to achieve a confidence factor that all responsible agencies are meeting their responsibility.

General Comment 4:

The objective of shakedown is not to develop a range of operating conditions that will allow the SQI to efficiently treat waste, as is stated on page 5-1. According to 6 CCR 1007-3, Sections 100.22(c)(1) and 344(c)(1), the operating requirements during shakedown must be those most likely to ensure compliance with the performance standards. This operational period is intended to be only the minimum time required, not to exceed 720 hours, to bring the incinerator to a point of operational readiness to conduct a trial burn. A set of operating conditions most likely to ensure compliance must be selected and specified in the plan. During the shakedown period, the SQI must be operated within this range of conditions. Optimization within this range of conditions is acceptable. The plans must specify the limits of the operating conditions which will be used. The parameters described in Table 4-3 of the Start-up Plan, as modified by comments received, would be acceptable limits for this range of conditions. Any alterations outside of this range of conditions must receive prior approval by the State.

Response 4:

Agreed. The objective of shakedown stated on Page 5-1 will be revised per this comment. The operating conditions outlined in Table 4-3 of the Startup Plan have been selected to ensure compliance with the performance standards, and will be optimized during shakedown.

General Comment 5:

All operational parameters must remain within the cutoff values specified during the shakedown and mini-burn periods. Limits should be specified for each of the parameters listed in comment 2 above. Should data collected demonstrate that optimum conditions occur outside of the conditions selected, prior regulatory approval must be received before altering operating conditions to exceed of the selected range.

Response 5:

Agreed. If operational data collected during shakedown demonstrate that optimum conditions occur outside of the conditions selected, regulatory approval will be required before altering specified operating conditions. It is expected that the regulatory responses will be prompt when needed.

General Comment 6:

All limiting conditions specified should be instantaneous cut-off requirements (except for CO rolling average after shake-down). Cut-off values specified in table 4-3 of the Start-up Plan and table 9-1 of the Trial Burn Plan should be specified as instantaneous values. Pre-alarm set points on waste feed cut-off operating parameters should be specified, and corrective actions to be taken if pre-alarm set-points are exceeded (e.g. cutback in feed rate), should be discussed.

Response 6:

Agree with the exception of the oxygen limiting condition. Because the oxygen analyzer is an extractive sampler, this parameter should not have an instantaneous cutoff as discussed in EPA Trial Burn Comment 18. Pre-alarm set points on waste feed cut-offs will be provided on Table 9-1. Corrective actions to be taken if pre-alarm set-points are exceeded will be included in the Operations and Maintenance Manual.

General Comment 7:

We are concerned that the plans do not limit nozzle testing. Potentially, should nozzle plugging occur during the latter stages of shake-down testing, nozzles which have not been tested during surrogate or lower percentages of Basin F feed could be utilized. The plans should specify procedures for conducting surrogate testing of any nozzles which may be used for Basin F injection. Alternately, should start-up progress to burning of Basin F liquid without testing the alternate nozzles, the alternate nozzle should no longer be available for use. We assume that all other operating conditions will remain as planned if alternate nozzles are used. This should be clarified. In addition, a separate trial burn using the alternate nozzle type will be necessary should the Army wish to maintain availability of a second nozzle type during or after trial burn.

Response 7:

Ideally, only one nozzle type will be required during startup/shakedown of the SQI facility. If no problems are encountered using this initial nozzle, no other nozzle types will be tested. If a nozzle passes startup testing but fails during shakedown, a new nozzle type will be selected and be required to complete the entire startup/shakedown testing sequence even if retesting is required.

General Comment 8:

The plans should provide estimates of quantities of Basin F liquid to be burned, and the estimated amount of time necessary during shakedown testing.

Response 8:

The Startup Plan will be revised to provide estimates of quantities of Basin F liquid to be burned.

General Comment 9:

The SQI should be operated at maximum test conditions using surrogate feed prior to using these conditions for burning of Basin F liquid. For example, the maximum Basin F feed rate should be matched by an equivalent maximum surrogate feed rate during surrogate testing. The 100% Basin F waste phase of shakedown should not be the first time 19 gpm is fed to the unit.

Response 9:

See response to EPA Trial Burn Comment 3.

General Comment 10:

The Start-up Plan does not discuss waste feed or brine sampling and analysis plans for shake-down or post trial burn operation. Waste feed and brine sampling and analysis plans should be provided and discussed, including information similar to that contained in Tables

5-1 and table 5-6 of the Trial Burn Plan. We may submit additional comments regarding brine sampling and analysis when the SQI Operations and Maintenance Manual is submitted for review.

Response 10:

Agreed. Waste feed and brine sampling and analysis protocols will be included in the revised Startup Plan.

General Comment 11:

Arrangements will be made by the regulatory agencies for volatile organic sampling train (VOST) Audit Cylinders for both Carbon Tetrachloride and Chlorobenzene. The State may wish to audit the sampling and analytical procedures during shakedown, trial burn, or post trial-burn. In addition, the State may wish to collect samples for independent analysis.

Response 11:

Agreed. Arrangements for analytical audits will be discussed and agreed upon during the coordination meeting prior to trial burn activities. No text modification required.

General Comment 12:

The Trial Burn Plan does not state when a trial burn report will be submitted to the regulatory agency. 6 CCR 1007-3, Section 100.22 (c)(2)(vii) states that a trial burn report must be submitted within 90 days from the completion of the trial burn.

Response 12:

See response to EPA Trial Burn Comment 7.

General Comment 13:

The Trial Burn Plan specifies that the trial burn will be run using one set of operating conditions. The routine operating limitations will be based upon the test results from this trial burn. Alterations in routine operating conditions will require an additional trial burn at the altered conditions.

Response 13:

Agreed.

Startup Plan, Comment 1, Page 1-2

The purposes of shakedown testing is not to define the operating limits of the system, or to prove the destruction and removal efficiency of the system (see comment 4 above). The discussion should be changed to reflect that shakedown is intended to bring the SQI to a point of operational readiness, within limitations considered most likely to comply with performance standards.

Response 1:

Page 1-2 will be revised to state that the purpose of shakedown testing is to bring the SQI to a point of operational readiness, within limitations considered most likely to comply with performance standards.

Startup Plan, Comment 2, Section 2

An appendix should be included which provides resumes of key personnel, including the stack testing crew. Details of the qualifications and experience of the stack testing organization should also be provided.

Response 2:

The credentials of key stack sampling personnel will be included as an appendix to the revised Trial Burn Plan.

Startup Plan, Comment 3, Table 4-3

The table titles should be clarified to indicate that the values specified are limits for automatic waste feed shut-off. Limiting conditions should be changed to instantaneous values. Pre-alarm values should be specified. The scrubber pH limitation should be revised to a pH of greater than five.

Response 3:

Agreed. See response to CDH General Comment 2, and EPA Trial Burn Comment 18.

Startup Plan, Comment 4, Page 4-20

The particulate standard discussion should be modified to reflect the 0.1 grain/dscf (corrected to 12% CO_2) limit contained in 5 CCR 1001-3 Regulation 1, III, B.2.a. A clarification should be provided regarding how the 99 percent removal of HCl is calculated. In order to calculate HCl removal efficiency, the chlorine feed rate must be specified. In addition, it may not be appropriate to assume that all of the chlorine contained in the Basin F liquid, including the inorganic chlorine, is available for conversion to HCl. It may be more appropriate to specify the four lb/hr HCl as the performance standard for HCl removal.

Response 4:

The particulate standard discussion will be revised appropriately. The HCl removal efficiency is calculated based on the chlorine feed to the SQI and the chlorine detected in the stack gases. Stack gas samples for HCl measure total chlorine (i.e., HCl, saltwater, etc.) and then report it as HCl, therefore the various forms of the chlorine in the stack gases are not relevant because they are all factored into the HCl value. The 4 lb/hr of HCl standard can not be used to replace the 99% removal standard.

Startup Plan, Comment 5, Page 5-2

The statement regarding optimizing parameters should be altered to reflect that conditions will be optimized within the limitations specified.

The discussion of nozzle performance should be revised as necessary (see comment 7).

Response 5:

Page 5-2 will be revised to state that operating parameters will be optimized within the ranges specified in the Start-up Plan. See response to CDH General Comment 7 for discussion on nozzle testing.

Startup Plan, Comment 6, Page 5-7

The text should be altered regarding the particulate standard and HCl standard (see 4-20 comment).

The text states that the brine will be sampled to ensure that batches of brine are consistent with the analytical profile listed above. It is not apparent where this refers to. Additional detail regarding brine disposal criteria, and sampling and analysis of brine should be provided. We may submit additional comments regarding brine sampling and analysis when the SQI Operations and Maintenance Manual, which is to discuss sampling and analysis, is received.

Response 6:

See response to CDH Startup Plan Comment 4 for discussion on particulate and HCl emissions standards.

Details regarding brine sampling, analysis and disposal criteria will be provided in the revised Startup Plan.

Startup Plan, Comment 7, Page 5-9

Since the limiting minimum combustion chamber temperature is specified at 1700° F, running tests at 1700° may cause excessive shutdowns if the temperature varies slightly. This decision should be re-evaluated.

Response 7:

The low temperature shakedown test will be run at 1725°F or the minimum obtainable temperature to avoid excessive shutdowns due to temperature variations.

Startup Plan, Comment 8, Page 5-14

Additional clarification regarding maximizing brine concentrations should be provided. Subsections 5.2.1.1 through 5.2.1.5 do not contain sufficient detail regarding brine disposal criteria, or criteria for optimizing maximum brine concentrations.

Use of the 100% Basin F feed is not be the appropriate point to first maximize throughput of the SQI (within the defined limitations). The anticipated throughput should first be demonstrated with surrogate testing, and potentially with smaller percentages Basin F liquid. Also, since the limiting feed rate is 19 gpm, testing at 19 gpm may cause shutdowns if flowrates vary.

Response 8:

See response to CDH General Comments 9 and 10.

Startup Plan, Comment 9, Page 6-1

This section states that the particulate analysis will be corrected to 12% CO_2 and 7% O_2. Please clarify this correction. A separate correction for CO_2 is necessary when applying the 0.1 grain/dscf standard. The 0.1 grain/dscf standard should be specified.

The HCl emission rate limitation should be clarified (see 4-20 comment).

Response 9:

See response to CDH Startup Plan Comment 4.

Startup Plan, Comment 10, Page 6-2

Brine disposal criteria should be clarified. Section 5.2.1.5 provides little detail regarding brine criteria or analysis. As discussed, brine management planning is important, and should be discussed in more detail.

Response 10:

Section 5 will be revised to include addition details regarding brine disposal criteria.

Startup Plan, Comment 11, Table 7-1

A time period for interim operation should be included after trial burn completion until the trial burn report is reviewed and approved by the regulatory agency, and routine operations begin. Operating conditions during the post trial burn phase must be the same as during the shakedown phase.

Response 11:

Table 7-1 will be revised to include a time period for interim operation.

APPENDIX B

SQI FACILITY EQUIPMENT LIST

APPENDIX B.1

MECHANICAL EQUIPMENT

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST – MECHANICAL

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
1	TANKS			
2	TK-101	Existing Waste Storage Tank	--	Pumphouse # 2
3	TK-102	Existing Waste Storage Tank	--	Pumphouse # 2
4	TK-103	Existing Waste Storage Tank	--	Pumphouse # 2
5	TK-104	Wastewater Tank	15175	SQI Day Tank Area
6	TK-105	Day Tank	15176	SQI Day Tank Area
7	TK-106	Day Tank	15176	SQI Day Tank Area
8	TK-107	Purge Water Tank	15176	Pumphouse # 1
9	TK-108	Purge Water Tank	15176	Pumphouse # 2
10	TK-109	Flush Water Drain Sump	--	Pumphouse # 2
11	TK-110	Drain Sump	--	Pumphouse # 1
12	TK-201	Brine Storage Tank	15175	SQI Brine/Caustic Area
13	TK-202	Brine Storage Tank	15175	SQI Brine/Caustic Area
14	TK-203	Process Water Storage Tank	15175	SQI Future Evaporator Area
15	TK-204	50% Caustic Storage Tank	15175	SQI Brine/Caustic Area
16	TK-205	20% Caustic Dilution Tank	15176	SQI Brine/Caustic Area
17	TK-206	Noz. Cleanout Water Diaphragm Tank	--	SQI Area @ Level 123'-1 1/2"
18	TK-401A	SQI Evaporator Area Sump	--	SQI Future Evaporator Area
19	TK-401B	Process Water Tank Area Sump	--	SQI Future Evaporator Area
20	TK-402A	Brine/Caustic Storage Sump	--	SQI Brine/Caustic Area
21	TK-402B	Brine/Caustic Storage Sump	--	SQI Brine/Caustic Area
22	TK-402C	Brine/Caustic Storage Sump	--	SQI Brine/Caustic Area
23	TK-403	SQI Process Area Sump	--	SQI Solids Handling Area
24	TK-404	Day Tank Area Sump	--	SQI Day Tank Area
25	TK-405	Utility Room Sump	--	SQI Boiler Room
26	TK-406	Maintenance Area Sump	--	SQI Maintenance Area
27	TK-407	SQI Washdown & Maint. Area Sump	--	SQI Open Crane Area
28	TK-408	Contaminated Water Holding Tank	--	North Exterior of Change House
29	TK-409	Unloading Area Sump	--	Truck Loading & Unloading Area
30	TK-410	Brine Supply	15561	SQI Boiler Room
31	TK-411	Chemical Treatment Stoarge	15561	SQI Boiler Room
32	TK-412	Feedwater Supply Storage	15561	SQI Boiler Room
33	TK-413	Steam Blowdown Separator	15561	SQI Boiler Room
34	TK-420	Diesel Fuel Storage	15561	Emergency Generator Area
35				
36				
37				
38				
39	PUMPS			
40	P-101A	Waste Transfer Pumps (PH #1)	11212	Pumphouse # 1
41	P-101B	Waste Transfer Pumps (PH #1)	11212	Pumphouse # 1
42	P-102	Purge Water Pump (PH #1)	11213	Pumphouse # 1
43	P-103A	Waste Transfer Pumps (PH #2)	11212	Pumphouse # 2
44	P-103B	Waste Transfer Pumps (PH #2)	11212	Pumphouse # 2
45	P-104A	Waste Transfer Pumps (Day Tank)	11212A	SQI Day Tank Area
46	P-104B	Waste Transfer Pumps (Day Tank)	11212A	SQI Day Tank Area
47	P-105	Purge Water Pump (PH #2)	11213	Pumphouse # 2
48	P-106	Sump Pump (PH #2)	11215	Pumphouse # 2
49	P-201A	Liquid Waste Feed Pump	T-T	SQI Day Tank Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST – MECHANICAL

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
50	P-201B	Liquid Waste Feed Pump	T-T	SQI Day Tank Area
51	P-202A	Quench Recycle Pump	T-T	SQI Solids Handling Area
52	P-202B	Quench Recycle Pump	T-T	SQI Solids Handling Area
53	P-203A	Scrubber/Venturi Recycle Pump	T-T	SQI Solids Handling Area
54	P-203B	Scrubber/Venturi Recycle Pump	T-T	SQI Solids Handling Area
55	P-205A	Quench Recirculation Pump	T-T	SQI Solids Handling Area
56	P-205B	Quench Recirculation Pump	T-T	SQI Solids Handling Area
57	P-206A	Brine Feed Pump	11212A	SQI Brine Holding Area
58	P-206B	Brine Feed Pump	11212A	SQI Brine Holding Area
59	P-207A	Domestic Water Pump	T-T	SQI Future Evaporator Area
60	P-207B	Domestic Water Pump	T-T	SQI Future Evaporator Area
61	P-208A	20% Caustic Feed Pump	T-T	SQI Brine/Caustic Area
62	P-208B	20% Caustic Feed Pump	T-T	SQI Brine/Caustic Area
63	P-209A	Dilution Water Transfer Pumps	11212A	SQI Future Evaporator Area
64	P-209B	Dilution Water Transfer Pumps	11212A	SQI Future Evaporator Area
65	P-211A	Caustic Transfer Pumps	11212A	SQI Brine/Caustic Area
66	P-211B	Caustic Transfer Pumps	11212A	SQI Brine/Caustic Area
67	P-212	Nozzle Cleanout Water Feed Pump	11214	SQI Future Evaporator Area
68	P-401A	SQI Evaporator Area Sump Pump	11313	SQI Future Evaporator Area
69	P-401B	SQI Evaporator Area Sump Pump	11313	SQI Future Evaporator Area
70	P-402A	Brine/Caus. Area Sump Transfer	11313	SQI Brine/Caustic Area
71	P-402B	Brine/Caus. Area Sump Transfer	11313	SQI Brine/Caustic Area
72	P-402C	Brine/Caus. Area Sump Transfer	11313	SQI Brine/Caustic Area
73	P-403	SQI Process Sump Transfer Pump	11313	SQI Solids Handling Area
74	P-404	Day Tank Sump Transfer Pump	11313	SQI Day Tank Area
75	P-405	Utility Room Sump Transfer Pump	11313	SQI Boiler Room
76	P-406	Maintenance Area Sump Transfer	11313	SQI Maintenance Area
77	P-407	SQI Wshdwn/Maint Area Sump Transfer	11313	SQI Open Crane Area
78	P-408	Contaminated Water Transfer Pump	11215	North Exterior of Change House
79	P-409	Unloading Area Sump Pump		Truck Loading & Unloading Area
80	P-411	Steam Generator Water Chemical Feed	15561	SQI Boiler Room
81	P-412A	Steam Generator Feed Pump	15561	SQI Boiler Room
82	P-412B	Steam Generator Feed Pump	15561	SQI Boiler Room
83	P-413	Hand Drum Pump	15561	SQI Boiler Room
84	P-414	Hand Drum Pump	15561	SQI Boiler Room
85				
86				
87				
88				
89	MIXERS			
90	M-101	Wastewater Tank Mixer	11353	SQI Day Tank Area
91	M-102	Day Tank Mixer	11353	SQI Day Tank Area
92	M-103	Day Tank Mixer	11353	SQI Day Tank Area
93	M-201	Caustic Dilution Tank Mixer	11353	SQI Brine/Caustic Area
94	M-204	Brine Tank Mixer	11353	SQI Brine/Caustic Area
95	M-205	Brine Tank Mixer	11353	SQI Brine/Caustic Area
96	M-401	Chemical Treatment Tank Mixer	15561	SQI Boiler Room
97				
98				

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - MECHANICAL

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
99				
100	MECHANICAL			
101		Lab Trailer	13124	
102		Lunch Trailer	13126	
103		Stack	T-T	
104	B-201A	Incinerator Combustion Air	T-T	SQI Blower/Compressor Room
105	B-201B	Emergency Air Blower	T-T	SQI Blower Area @ 113'-1 1/2"
106	C-201	Atomizing Air Compressor	T-T	SQI Blower/Compressor Room
107	C-401A,B	Instrument Air Compressors	15152	SQI Boiler Room
108	DR-401	Air Dryer	15152	SQI Boiler Room
109	EG-401	Standby Electrical Generator	16263	Generator Area
110	F-201	Air Filter/Silencer for B-201A Inlet	T-T	SQI Blower Area @ 113'-1 1/2"
111	F-401	Coarse Filter	15152	SQI Boiler Room
112	F-402	Fine Filter	15152	SQI Boiler Room
113	F-403	Particulate Filter	15152	SQI Boiler Room
114	F-404	Fine Filtration	15152	SQI Boiler Room
115	F-405	Instrument Air Filter	15152	SQI Boiler Room
116	H-201	Nozzle Cleaning Water Heater	---	SQI Area @ Level 123'-1 1/2"
117	IN-201	Incinerator/Quench Tank	T-T	SQI Area Above 113'-1 1/2"
118	LV-24	Burner	T-T	SQI Area @ Level 153'-11 1/2"
119	L-101	Crane	14300	SQI Open Crane Area
120	R-201	Receiver for C-201	T-T	SQI Maintenance Area @ 100'-0"
121	SG-401	Steam Generation System	15561	SQI Boiler Room
122	SL-201	Outlet Silencer for B-201A	T-T	SQI Blower/Compressor Room
123	ST-202	Quench Recycle Strainer (Duplex)	T-T	SQI Solids Handling Area
124	ST-205	Quench Recirculation Strainer (Duplex)	T-T	SQI Solids Handling Area
125	S-201	Quench Separator	T-T	SQI Area @ Level 100'-0"
126	S-202	Venturi (and sump)	T-T	SQI Area Above 113'-1 1/2"
127	S-203	Vortex Separator	T-T	SQI Area @ Level 113'-1 1/2"
128	T-201	Scrubber Packed Tower	T-T	SQI Area Above 113'-1 1/2"
129	V-401	Air Receiver for Instrument Air	15152	SQI Boiler Room
130	V-403	Process Water Softener	15545	SQI Area @ Level 113'-0"
131	WS-401	Steam Generator Water Softener	15561	SQI Boiler Room
132				
133				
134				
135				

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - MECHANICAL

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
136	HVAC			
137	AHU-120	H&V Unit (MCC & Inst. Rooms)	--	SQI Maint. Area @ 123'-1 1/2"
138	CONV-120	Convector	--	SQI Stair Tower # 2
139	CONV-121	Convector	--	SQI Stair Tower # 3
140	CONV-122	Convector	--	SQI Stair Tower # 2
141	CONV-123	Convector	--	SQI Stair Tower # 3
142	CONV-124	Convector	--	SQI Stair Tower # 2
143	CONV-125	Convector	--	SQI Stair Tower # 3
144	CONV-126	Convector	--	SQI Stair Tower # 2
145	C-1	Convector	--	Control Bldg Instrument Room
146	EF-101	Exhaust Fan (Pump House #1)	--	Pumphouse # 1
147	EF-102	Exhaust Fan (Pump House #1)	--	Pumphouse # 1
148	EF-103	Exhaust Fan (Pump House #2)	--	Pumphouse # 2
149	EF-104	Exhaust Fan (Pump House #2)	--	Pumphouse # 2
150	EF-120	Boiler Room Exhaust Fan	--	SQI Maint Area @ 113'-1 1/2"
151	EF-123	Incinerator Area Exhaust Fan	--	SQI Area High Roof
152	EF-124	Incinerator Area Exhaust Fan	--	SQI Area High Roof
153	EF-125	Incinerator Area Exhaust Fan	--	SQI Area High Roof
154	EF-126	Incinerator Area Exhaust Fan	--	SQI Area High Roof
155	EF-200	Exhaust Fan	--	Switch House
156	EF-1	Ceiling Exhaust Fan	--	Control Building
157	EF-2	Ceiling Exhaust Fan	--	Control Building
158	EF-3	Ceiling Exhaust Fan	--	Change House
159	EF-4	Ceiling Exhaust Fan	--	Change House
160	EF-5	Ceiling Exhaust Fan	--	Change House
161	F-1	Heat Pump Air Handler	--	Control Building
162	HP-1	Heat Pump Condenser/Compressor	--	Control Building
163	HT-101A	Unit Heater	--	Pumphouse # 1
164	HT-101B	Unit Heater	--	Pumphouse # 1
165	HT-110A	Unit Heater	--	Pumphouse # 2
166	HT-110B	Unit Heater	--	Pumphouse # 2
167	HT-111	Electric Fin Tube Convector	--	Pumphouse # 1
168	HT-112	Electric Fin Tube Convector	--	Pumphouse # 2
169	HT-120	Unit Heater	--	SQI Area @ Level 100'-0"
170	HT-121	Unit Heater	--	SQI Area @ Level 100'-0"
171	HT-122	Unit Heater	--	SQI Area @ Level 100'-0"
172	HT-123	Unit Heater	--	SQI Area @ Level 100'-0"
173	HT-124	Unit Heater	--	SQI Area @ Level 100'-0"
174	HT-125	Unit Heater	--	SQI Area @ Level 100'-0"
175	HT-126	Unit Heater	--	SQI Area @ Level 100'-0"
176	HT-127	Unit Heater	--	SQI Area @ Level 100'-0"
177	HT-128	Unit Heater	--	SQI Area @ Level 100'-0"
178	HT-129	Unit Heater	--	SQI Area @ Level 100'-0"
179	HT-130	Unit Heater	--	SQI Area @ Level 100'-0"
180	HT-131	Unit Heater	--	SQI Area @ Level 100'-0"
181	HT-132	Unit Heater	--	SQI Area @ Level 100'-0"
182	HT-133	Unit Heater	--	SQI Area @ Level 100'-0"
183	HT-134	Unit Heater	--	SQI Area @ Level 113'-1 1/2"
184	HT-135	Unit Heater	--	SQI Area @ Level 113'-1 1/2"

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - MECHANICAL

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
185	HT-136	Unit Heater	--	SQI Area @ Level 113'-1 1/2"
186	HT-137	Unit Heater	--	SQI Area @ Level 113'-1 1/2"
187	HT-138	Unit Heater	--	SQI Area @ Level 113'-1 1/2"
188	HT-139	Unit Heater	--	SQI Area @ Level 113'-1 1/2"
189	HT-140	Unit Heater	--	SQI Area @ Level 113'-1 1/2"
190	HT-141	Unit Heater	--	SQI Area @ Level 113'-1 1/2"
191	HT-142	Unit Heater	--	SQI Area @ Level 113'-1 1/2"
192	HT-143	Unit Heater	--	SQI Area @ Level 113'-1 1/2"
193	HT-144	Unit Heater	--	SQI Area @ Level 113'-1 1/2"
194	HT-145	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
195	HT-146	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
196	HT-147	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
197	HT-148	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
198	HT-149	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
199	HT-150	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
200	HT-151	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
201	HT-152	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
202	HT-153	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
203	HT-154	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
204	HT-155	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
205	HT-156	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
206	HT-157	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
207	HT-158	Unit Heater	--	SQI Area @ Level 123'-1 1/2"
208	HT-159	Unit Heater	--	SQI Area @ Level 100'-0"
209	HT-200	Unit Heater	--	Switch House
210	RTU-2	Rooftop Heat Pump	--	Control Building
211	RTU-3	Rooftop Heat Pump	--	Change House
212	SF-121	Blower/Compressor Room Supply Fan	--	SQI Maint Area @ 123'-1 1/2"

APPENDIX B.2

VALVES

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
1	HV101	2" Gate;Brz;Scrd Jenkins 270U		Pumphouse No. 1
2	HV102	2" Ball;Brz;Scrd Marpac BR790-12-TT		Pumphouse No. 1
3	HV103	½" Plug;Tfe lined;Flgd Durco T-Line		Pumphouse No. 1
4	HV104	2" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 1
5	HV105	2" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 1
6	HV106	2" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 1
7	HV107	½" Plug;Tfe lined;Flgd Durco T-Line		Pumphouse No. 1
8	HV108	3/4" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 1
9	HV109	3/4" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 1
10	HV110	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		Pumphouse No. 1
11	HV111	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		Pumphouse No. 1
12	HV112	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		Pumphouse No. 1
13	HV113	½" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 1
14	CK114	2" Chck;Brz;Scrd Jenkins # 762-A		Pumphouse No. 1
15	HV115	2" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 1
16	HV116	½" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 1
17	HV117	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
18	CK118	2" Chck;Brz;Scrd Jenkins # 762-A		Pumphouse No. 1
19	HV119	2" Ball;PVC;Union Style;Asahi "Duo Bloc"		Pumphouse No. 1
20	CK120	2" Chck;Brz;Scrd Jenkins # 762-A		Pumphouse No. 1
21	HV121	2" Ball;CPVC;Union Style Asahi/America		Pumphouse No. 1
22	CK122	2" Chck;Brz;Scrd Jenkins # 762A		Pumphouse No. 1
23	HV123	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
24	CK124	2" Chck;Brz;Scrd Jenkins # 762A		Pumphouse No. 1
25	HV125	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
26	MOV107	2"		Pumphouse No. 1
27	PCV107A	2"		Pumphouse No. 1
28	PCV107B	2"		Pumphouse No. 1
29	CK126	2" Chck;PVC;Flgd Asahi/America		Pumphouse No. 1
30	HV127	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
31	HV128	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
32	HV129	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
33	HV130	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
34	HV131	3/4" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
35	HV132	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
36	HV133	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
37	HV134	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
38	HV135	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
39	HV136	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
40	HV137	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
41	CK138	2" Chck;PVC;Flgd Asahi/America		Pumphouse No. 1
42	HV139	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
43	HV140	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
44	HV141	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
45	HV142	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
46	HV143	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
47	HV144	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
48	HV145	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
49	HV146	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
50	HV147	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
51	HV148	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
52	HV149	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
53	CK150	2" Chck;PVC;Flgd Asahi/America		Pumphouse No. 1
54	HV151	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
55	HV152	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
56	HV153	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
57	HV154	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
58	HV155	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
59	HV156	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 1
60	HV157	1/4" Plug;DI TfeSleeve;Scrd V-11		Pumphouse No. 1
61	HV158	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
62	HV159	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
63	HV160	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
64	HV161	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
65	HV162	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
66	HV163	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
67	HV164	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
68	HV165	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
69	HV166	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
70	HV167	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
71	HV168	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
72	HV169	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
73	HV170	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
74	HV171	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
75	HV172	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
76	HV173	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
77	HV174	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
78	HV175	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
79	HV176	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
80	HV177	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
81	HV178	2" Gate;Brz;Type 1 CL/150;MSS SP-80		Overhead Pipeline Sight Glass
82	CK179	2" Chck;PVC;Flgd Asahi/America		Pumphouse No. 2
83	HV180	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
84	HV181	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
85	HV182	1" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
86	MOV101	2"		Pumphouse No. 2
87	HV183	3" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
88	HV184	3" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
89	HV185	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
90	CK186	2" Chck;Brz;Scrd Jenkins # 762A		Pumphouse No. 2
91	HV187	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
92	HV188	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
93	HV189	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
94	HV190	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
95	HV191	3" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
96	HV192	3" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
97	MOV102	2"		Pumphouse No. 2
98	HV193	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
99	CK194	2" Chck;Brz;Scrd;Jenkins # 762A		Pumphouse No. 2
100	HV195	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
101	HV196	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
102	HV197	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
103	HV198	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
104	HV199	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
105	HV200	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
106	CK201	2" Chck;PVC;Flgd Asahi/America		Pumphouse No. 2
107	HV202	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
108	HV203	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
109	HV204	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
110	HV205	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
111	HV206	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
112	HV207	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
113	HV208	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
114	HV209	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
115	HV210	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
116	HV211	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
117	HV212	½" Plug;Tfe Liend;Flgd Durco T-Line		Pumphouse No. 2
118	CK213	2" Chck;Brz;Scrd;Jenkins # 762A		Pumphouse No. 2
119	HV214	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
120	HV215	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
121	HV216	3/4" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
122	HV217	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
123	HV218	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
124	HV219	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
125	HV220	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
126	HV221	3/4" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
127	HV222	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
128	HV223	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
129	HV224	1" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
130	MOV103	2"		Pumphouse No. 2
131	HV225	3" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
132	HV226	3" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
133	HV227	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
134	CK228	2" Chck;Brz;Scrd Jenkins # 762A		Pumphouse No. 2
135	HV229	½" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 2
136	HV230	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
137	HV231	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
138	HV232	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
139	HV233	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
140	CK234	2" Chck;PVC;Flgd Asahi/America		Pumphouse No. 2
141	HV235	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
142	HV236	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
143	HV237	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
144	HV238	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
145	HV239	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
146	HV240	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
147	HV241	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
148	HV242	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
149	CK243	2" Chck;PVC;Flgd Asahi/America		Pumphouse No. 2
150	HV244	½" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST – VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
151	HV245	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
152	HV246	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
153	HV247	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
154	HV248	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
155	CK249	2" Chck;Brz;Scrd Jenkins # 762A		Pumphouse No. 2
156	HV250	2" Plug;Tfe Lined;Flgd Durco T-Line		Pumphouse No. 2
157	CK251	2" Chck;Brz;Scrd Jenkins # 762A		Pumphouse No. 2
158	PCV108	2"		Pumphouse No. 2
159	HV252	2" Gate;Brz Scrd Jenkins # 270U		Pumphouse No. 2
160	HV253	2" Ball;Brz;Scrd MarpacNo BR790-12-TT		Pumphouse No. 2
161	MOV108	2"		Pumphouse No. 2
162	HV254	2" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 2
163	HV255	2" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 2
164	HV256	2" Ball;Bonze;Scrd Marpac # BR790-12-TT		Pumphouse No. 2
165	PCV400	2"		Pumphouse No. 2
166	HV257	3/4" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 2
167	HV258	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		Pumphouse No. 2
168	HV259	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		Pumphouse No. 2
169	HV260	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		Pumphouse No. 2
170	CK261	2" Chck;Brz;Scrd Jenkins # 762A		Pumphouse No. 2
171	HV262	2" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 2
172	HV263	½" Ball;Brz;Scrd Marpac # BR790-12-TT		Pumphouse No. 2
173	HV264	½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
174	HV265	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
175	HV331	1" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
176	HV266	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
177	HV267	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
178	HV268	3/4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
179	HV269	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
180	FCV103	2"		SQI Day Tanks
181	HV270	2" Plug;Tfe Lined;Fldg Durco T-Line		SQI Day Tanks
182	HV271	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
183	HV272	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
184	HV273	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
185	CK274	2" Chck;PVC;Flgd Asahi/America		SQI Day Tanks
186	HV275	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
187	CK276	2" Chck;PVC;Flgd Asahi/America		SQI Day Tanks
188	HV277	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
189	CK278	2" Chck;PVC;Flgd Asahi/America		SQI Day Tanks
190	HV279	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
191	HV280	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
192	CK281	4" Chck;PVC;Flgd Asahi/America		SQI Day Tanks
193	HV282	4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
194	HV283	6" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
195	HV284	4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
196	HV285	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
197	HV286	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
198	HV287	1½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
199	HV288	3/4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
200	HV289	3/4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
201	HV290	3" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
202	HV291	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
203	HV292	½" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
204	HV293	½" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
205	HV294	½" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
206	HV295	½" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
207	CK296	1" Chck;PVC;Flgd Asahi/America		SQI Day Tanks
208	HV297	1" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
209	CK298	1" Chck;PVC;Flgd Asahi/America		SQI Day Tanks
210	HV299	1" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
211	CK300	1" Chck;PVC;Flgd Asahi/America		SQI Day Tanks
212	HV301	1" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
213	HV302	1" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
214	HV303	1" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
215	HV304	1" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
216	HV305	1" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
217	CK306	1" Chck;PVC;Flgd Asahi/America		SQI Day Tanks
218	HV307	1" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
219	HV308	4" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
220	HV309	6" Gate;Brz;Cl.150 MSS Sp-80		SQI Day Tanks
221	HV310	3" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
222	HV311	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
223	CK312	1" Chck;PVC;Flgd Asahi/America		SQI Day Tanks
224	HV313	1" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
225	HV314	4" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
226	HV315	6" Gate;Brz;Cl.150 MSS SP-80		SQI Day Tanks
227	HV316	3" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
228	HV317	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
229	HV318	2" Bfly;Cl.125 CI;Lug Type Keystone #122		SQI Day Tanks
230	HV319	2" Bfly;Cl.125 CI;Lug Type Keystone #122		SQI Day Tanks
231	HV320	2" Bfly;Cl.125 CI;Lug Type Keystone #122		SQI Day Tanks
232	HV321	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
233	HV322	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Day Tanks
234	HV323	2" Ball;Brz;Screwed Marpac BR790-12-TT		SQI Day Tanks
235	HV324	2" Ball;Brz;Screwed Marpac BR790-12-TT		SQI Day Tanks
236	COV104B	2"		SQI Day Tanks
237	COV104C	2"		SQI Day Tanks
238	FCV104	1"		SQI Day Tanks
239	COV105A	1"		SQI Day Tanks
240	COV105B	2"		SQI Day Tanks
241	COV105C	2"		SQI Day Tanks
242	COV105E	2"		SQI Day Tanks
243	COV106A	2"		SQI Day Tanks
244	COV106B	2"		SQI Day Tanks
245	COV106C	1"		SQI Day Tanks
246	COV106E	2"		SQI Day Tanks
247	HV325	6" Exist on Inlet/Outlet TK-101		Pumphouse No. 2
248	HV326	6" Exist on TK-101 (Drain Conn)		Pumphouse No. 2
249	HV327	6" Exist on Inlet/Outlet TK-102		Pumphouse No. 2
250	HV328	6" Exist on TK-102 (Drain Conn)		Pumphouse No. 2

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
251	HV329	6" Exist on Inlet/Outlet TK-103		Pumphouse No. 2
252	HV330	6" Exist on TK-102 (Drain Conn)		Pumphouse No. 2
253	HV332	6" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Process Water
254	HV333	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Process Water
255	HV334	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
256	HV335	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
257	HV336	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
258	HV337	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
259	HV338	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
260	HV339	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
261	HV340	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
262	HV341	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
263	HV342	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
264	HV343	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
265	HV344	1" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
266	HV345	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
267	HV346	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
268	HV347	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
269	HV348	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
270	HV349	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
271	HV350	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
272	HV351	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
273	HV352	4" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Process Water
274	LCV203	2"		SQI Process Water
275	HV353	4" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Process Water
276	HV354	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Process Water
277	HV355	2" Ball;Brz;Scrd Marpac # BR790-12-TT		SQI Process Water
278	HV356	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Process Water
279	HV357	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Process Water
280	HV358	1" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
281	HV359	1" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
282	HV360	½" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
283	HV361	½" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
284	CK362	1" Chck;Brz;Scrd Jenkins # 762-A		SQI Process Water
285	HV363	1" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
286	HV364	½" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
287	HV365	½" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
288	HV366	1" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
289	HV367	1" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
290	HV368	1" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
291	HV369	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Process Water
292	HV370	3" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Process Water
293	HV371	1" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
294	HV372	1" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
295	HV373	½" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
296	HV374	½" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
297	HV375	½" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
298	HV376	½" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
299	CK377	2" Chck;Brz;Scrd Jenkins # 762A		SQI Process Water
300	CK378	2" Chck;Brz;Scrd Jenkins # 762A		SQI Process Water

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
301	HV379	2" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
302	HV380	2" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
303	HV381	2" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
304	HV382	2" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
305	HV383	2" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
306	HV384	3/4" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
307	HV385	2" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
308	HV386	2" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
309	HV387	3/4" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
310	HV388	3" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
311	HV389	2" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
312	HV390	3" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
313	HV391	3" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
314	HV392	2" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
315	HV393	2" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
316	HV394	½" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
317	HV395	½" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
318	HV396	½" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
319	HV397	½" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
320	CK398	1½" Chck;Iron;Scrd Jenkins # 72		SQI Caustic Storage
321	CK399	1½" Chck;Iron;Scrd Jenkins # 72		SQI Caustic Storage
322	HV400	1½" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
323	HV401	1½" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
324	HV402	1½" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
325	HV403	1½" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
326	HV404	3/4" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
327	HV405	1½" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
328	FCV211	1½"		SQI Caustic Storage
329	FCV209	2"		SQI Caustic Storage
330	HV406	1½" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
331	HV407	1½" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
332	HV408	3/4" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
333	HV409	3" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
334	HV410	2" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
335	HV411	3" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
336	HV412	3" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
337	HV413	2" Plug;Ni-Resist;Flgd DeZurik # 124		SQI Caustic Storage
338	HV414	2" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
339	HV415	3/4" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
340	HV416	3" Ball;Brz;Scrd Marpac BR790-12-TT		SQI Process Water
341	CK417	2" Chck;PVC;Flgd Asahi/America		SQI Brine Storage
342	HV418	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
343	HV419	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
344	HV420	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
345	HV421	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
346	HV422	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
347	HV423	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
348	HV424	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
349	HV425	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
350	HV426	3/4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
351	HV427	4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
352	HV428	4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
353	HV429	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
354	HV430	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
355	HV431	6" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
356	HV432	6" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
357	HV433	6" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
358	HV434	6" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
359	HV435	6" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
360	HV436	4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
361	HV437	4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
362	HV438	½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
363	HV439	½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
364	HV440	½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
365	HV441	½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
366	CK442	3" Chck;PVC;Flgd Asahi/America		SQI Brine Storage
367	CK443	3" Chck;PVC;Flgd Asahi/America		SQI Brine Storage
368	HV444	3" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
369	HV445	3" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
370	HV446	4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
371	HV447	4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
372	HV448	4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Storage
373	HV449	4" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Brine Loading
374	HV450	4" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Brine Loading
375	HV451	4" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Loading
376	HV452	4" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Brine Loading
377	HV453	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Loading
378	HV454	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Loading
379	HV455	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Brine Loading
380	COV84C	6"		SQI Brine Storage
381	COV84A	2"		SQI Brine Storage
382	COV84D	6"		SQI Brine Storage
383	COV84B	2"		SQI Brine Storage
384	COV90A2	4"		SQI Brine Storage
385	COV90A1	4"		SQI Brine Storage
386	COV90B2	4"		SQI Brine Storage
387	COV90B1	4"		SQI Brine Storage
388	HV456	2½" Gate;Cl.125 CI;Flgd Jenkins # 651-A		SQI Boiler Area
389	HV457	1/8" Ball;Brz;Scrd;Worcester # 4211T		SQI Boiler Area
390	HV458	1/4" Ball;Brz;Scrd;Worcester # 4211T		SQI Boiler Area
391	HV459	2½" Gate;Cl.125 CI;Flgd Jenkins # 651-A		SQI Boiler Area
392	HV460	1/8" Ball;Brz;Scrd;Worcester # 4211T		SQI Boiler Area
393	HV461	1/4" Ball;Brz;Scrd;Worcester # 4211T		SQI Boiler Area
394	HV462	1½" Gate;Brz;Scrd;Jenkins # 270C		SQI Boiler Area
395	HV463	1" Gate;Brz;Scrd;Jenkins # 270C		SQI Boiler Area
396	HV464	1" Gate;Brz;Scrd Jenkins # 270C		SQI Boiler Area
397	HV465	1" Ball;Brz;Scrd Worcester # 4211T		SQI Boiler Area
398	HV466	½" Ball;Brz;Scrd Worcester # 4211T		SQI Boiler Area
399	HV467	1/4" Ball;Brz;Scrd Worcester # 4211T		SQI Boiler Area
400	HV468	½" Ball;Brz;Scrd Worcester # 4211T		SQI Boiler Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
401	HV469	1½" Gate;Brz;Scrd Jenkins # 270C		SQI Boiler Area
402	HV470	1½" Gate;Brz;Scrd Jenkins # 270C		SQI Boiler Area
403	HV471	1½" Gate;Brz;Scrd Jenkins # 270C		SQI Boiler Area
404	HV472	½" Ball;Brz;Scrd Worcester # 4211T		SQI Boiler Area
405	HV473	1½" Gate;Brz;Scrd Jenkins # 270C		SQI Boiler Area
406	HV474	1" Ball;Brz;Scrd Worcester # 4211T		SQI Boiler Area
407	HV475	1½" Pressure Regulator (Low Pressure)		SQI Boiler Area
408	HV476	1/4" Ball;Brz;Scrd Worcester # 4211T		SQI Sump TK-402A
409	HV477	1/4" Ball;Brz;Scrd Worcester # 4211T		SQI Sump TK-402B
410	HV478	1/4" Ball;Brz;Scrd Worcester # 4211T		SQI Sump TK-401A
411	HV479	1/4" Ball;Brz;Scrd Worcester # 4211T		SQI Sump TK-407
412	HV480	1/4" Ball;Brz;Scrd Worcester # 4211T		SQI Sump TK-402G
413	HV481	1/4" Ball;Brz;Scrd Worcester # 4211T		SQI Sump TK-401B
414	HV482	3/8" Ball;Brz;Scrd Worcester # 4211T		SQI Sump TK-403
415	HV483	1/4" Ball;Brz;Scrd Worcester # 4211T		SQI Sump TK-406
416	HV484	1/4" Ball;Brz;Scrd Worcester # 4211T		SQI Sump TK-405
417	HV485	1/4" Ball;Brz;Scrd Worcester # 4211T		SQI Sump TK-404
418	CK486	1½" Chck;CPVC;Slvnt Wld;Chemtrol Ball Ck		SQI Sump TK-402A
419	CK487	1½" Chck;CPVC;Slvnt Wld;Chemtrol Ball Ck		SQI Sump TK-402B
420	CK488	1½" Chck;CPVC;Slvnt Wld;Chemtrol Ball Ck		SQI Sump TK-401A
421	CK489	1" Chck;CPVC;Slvnt Wld;Chemtrol Ball Ck		SQI Sump TK-407
422	CK490	1" Chck;CPVC;Slvnt Wld;Chemtrol Ball Ck		SQI Sump TK-406
423	CK491	1" Chck;CPVC;Slvnt Wld;Chemtrol Ball Ck		SQI Sump TK-405
424	CK492	1½" Chck;CPVC;Slvnt Wld;Chemtrol Ball Ck		SQI Sump TK-402C
425	CK493	1½" Chck;CPVC;Slvnt Wld;Chemtrol Ball Ck		SQI Sump TK-401B
426	CK494	2" Chck;PVC;Flgd Asahi/America		SQI Sump TK-403
427	CK495	1½" Chck;PVC;Flgd Asahi/America		SQI Sump TK-404
428	CK496	1½" Chck;PVC;Flgd Asahi/America		SQI Sump TK-408
429	CK497	1½" Chck;PVC;Flgd Asahi/America		SQI Sump TK-408
430	HV498	1½" Ball;CPVC;Slvnt Wld;Hayward # SE		SQI Sump TK-402A
431	HV499	1½" Ball;CPVC;Slvnt Wld;Hayward # SE		SQI Sump TK-402B
432	HV500	1½" Ball;CPVC;Slvnt Wld;Hayward # SE		SQI Sump TK-401A
433	HV501	1" Ball;CPVC;Slvnt Wld;Hayward # SE		SQI Sump TK-407
434	HV502	1" Ball;CPVC;Slvnt Wld;Hayward # SE		SQI Sump TK-406
435	HV503	1" Ball;CPVC;Slvnt Wld;Hayward # SE		SQI Sump TK-406
436	HV504	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Sump TK-409
437	HV505	1½" Ball;CPVC;Slvnt Wld Hayward # SE		SQI Sump TK-402C
438	HV506	1½" Ball;CPVC;Slvnt Wld Hayward # SE		SQI Sump TK-401B
439	HV507	2" Plug;Tfe Lined;Flgd Durco T-Line		SQI Sump TK-403
440	HV508	1½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Sump TK-404
441	HV509	1½" Ball;PVC;Union Style Asahi/America		SQI Sump TK-408
442	HV510	1½" Ball;PVC;Union Style Asahi/America		SQI Sump TK-408
443	HV511	½" Ball;CPVC;Slvnt Wld Hayward # SE		SQI Sump TK-402A
444	HV512	½" Ball;CPVC;Slvnt Wld Hayward # SE		SQI Sump TK-402B
445	HV513	½" Ball;CPVC;Slvnt Wld Hayward # SE		SQI Sump TK-401A
446	HV514	½" Ball;CPVC;Slvnt Wld Hayward # SE		SQI Sump TK-407
447	HV515	½" Ball;CPVC;Slvnt Wld Hayward # SE		SQI Sump TK-406
448	HV516	½" Ball;CPVC;Slvnt Wld Hayward # SE		SQI Sump TK-405
449	HV517	½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Sump TK-409
450	HV518	½" Ball;CPVC;Slvnt Wld Hayward # SE		SQI Sump TK-402C

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
451	HV519	½" Ball;CPVC;Slvnt Wld Hayward # SE		SQI Sump TK-401B
452	HV520	½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Sump TK-403
453	HV521	½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Sump TK-404
454	HV522	½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Sump TK-408
455	HV523	½" Plug;Tfe Lined;Flgd Durco T-Line		SQI Sump TK-408
456	PCV402D	1/4" Air Pressure Control		SQI Sump TK-402A
457	PCV402D	1/4" Air Pressure Control		SQI Sump TK-402B
458	PCV402D	1/4" Air Pressure Control		SQI Sump TK-402C
459	PCV401D	1/4" Air Pressure Control		SQI Sump TK-401A
460	PCV401D	1/4" Air Pressure Control		SQI Sump TK-401B
461	PCV407D	1/4" Air Pressure Control		SQI Sump TK-407
462	PCV406D	1/4" Air Pressure Control		SQI Sump TK-406
463	PCV405D	1/4" Air Pressure Control		SQI Sump TK-405
464	PCV403D	3/8" Air Pressure Control		SQI Sump TK-403
465	PCV404D	1/4" Air Pressure Control		SQI Sump TK-404
466	LCV402D	1/4" Level Control		SQI Sump TK-402A
467	LCV402D	1/4" Level Control		SQI Sump TK-402B
468	LCV402D	1/4" Level Control		SQI Sump TK-402C
469	LCV401D	1/4" Level Control		SQI Sump TK-401A
470	LCV401D	1/4" Level Control		SQI Sump TK-401B
471	LCV407D	1/4" Level Control		SQI Sump TK-407
472	LCV406D	1/4" Level Control		SQI Sump TK-406
473	LCV405D	1/4" Level Control		SQI Sump TK-405
474	LCV403D	3/8" Level Control		SQI Sump TK-403
475	LCV404D	1/4" Level Control		SQI Sump TK-404
476	HV524	2" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
477	HV525	3/4" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
478	HV526	3/4" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
479	HV527	3/4" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
480	HV528	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
481	HV529	3/4" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
482	HV530	3/4" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
483	HV531	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
484	HV532	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
485	HV533	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
486	HV534	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
487	HV535	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
488	HV536	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
489	HV537	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
490	HV538	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
491	HV539	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
492	HV540	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
493	HV541	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
494	HV542	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
495	HV543	3/4" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
496	HV544	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
497	HV545	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
498	HV546	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
499	HV547	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
500	HV548	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
501	HV549	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
502	HV550	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
503	HV551	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
504	HV552	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
505	HV553	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
506	HV554	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
507	HV555	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Change House
508	PRV	3/4" Temp & Pressure Relief		Change House
509	PRV	3/4" Temp & Pressure Relief		Control Bldg.
510	HV556	1" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
511	HV557	3/4" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
512	HV558	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
513	HV559	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
514	HV560	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
515	HV561	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
516	HV562	3/4" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
517	HV563	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
518	HV564	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
519	HV565	3/4" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldv.
520	HV566	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
521	HV567	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
522	HV568	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
523	HV569	½" Gate;200 Lb Brz;Scrd Jenkins # 270V		Control Bldg.
524	HV570	10" Gate;Iron Body;MJ AWWA C500		D Street Main
525	HV571	10" Gate;Iron Body;MJ AWWA C500		D Street Main
526	HV572	6" Gate;Iron Body;MJ AWWA C500		Fire Hyd. So. SQI
527	HV573	6" Gate;Iron Body;MJ AWWA C500		Fire Hyd. West SQI
528	HV574	10" Gate;Iron Body;MJ AWWA C500		Main North of SQI
529	HV575	10" Gate;Iron Body;MJ AWWA C500		Main North of SQI
530	HV576	10" Gate;Iron Body;MJ Post Indicator		Fire Pump Area
531	HV577	6" Gate;Iron Body;MJ AWWA C500		Fire Hyd. North SQI
532	HV578	8" Gate;Iron Body;MJ AWWA C500		D Street Main
533	HV579	8" Gate;Iron Body;MJ AWWA C500		D Street Main
534	HV580	8" Gate;Iron Body;MJ AWWA C500		D Street Main
535	HV581	4" Gate;Cl.125 CI;Flgd Jenkins # 651-A		Meter Vault
536	HV582	4" Gate;Cl.125 CI;Flgd Jenkins # 651-A		Meter Vault
537	HV583	3" Gate;Cl.125 CI;Flgd Jenkins # 651-A		Meter Vault
538	HV584	1" Gate;Cl.150 Brz;Scrd MSS SP-80		Control Bdlg. Service
539	HV585	1" Gate;Cl.150 Brz;Scrd MSS SP-80		Lab Trailer Service
540	HV586	1" Gate;Cl.150 Brz;Scrd MSS SP-80		Lunch Trailer Service
541	HV587	2" Gate;Cl.150 Brz;Scrd MSS SP-80		Change House Service
542	HV588	6" Gate;Iron Body;Min AWWA C500		SQI Bldg. Service
543	HV589	4" Gate;Iron Body;Min AWWA C500		Truck Unloading Service
544	HV590	4" Gate;Cl.125 CI;Flgd Jenkins # 651-A		Truck Unloading Area
545	HV591	1-1/4" Ball;Brz;Scr Marpac # BR790-12-TT		Truck Unloading Area
546	HV592	3/4" Ball;Brz;Scr Marpac # BR-790-12-TT		Truck Unloading
547	HV593	2" Ball;Brz;Scrd Marpac # BR-790-12-TT		Truck Unloading
548	HV594	6" Gate;Cl.125 CI;Flg Jenkins # 651-A		D Street Main
549	HV595	6" Gate;Cl.125 CI;Flg Jenkins # 651-A		D Street Main
550	HV596	6" Gate;Cl.125 CI;Flg Jenkins # 651-A		SQI Bldg Service

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - VALVES

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
551	HV597	1" Gate;Brz;Scr Jenkins 270U		Emerg. Gen Storage Tk.
552	HV598	½" Gate;Brz;Scr Jenkins 270U		Emerg. Gen Storage Tk.

APPENDIX B.3

PIPING

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
1	HOSE			
2	3"-WK-001-N-	Hose on P&ID 01-04-001		Pond A
3				
4				
5				
6				
7	PIPING			
8	2"-WK-001-N-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
9	2"-WK-001-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
10	2"-WK-002-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
11	2"-WK-01A-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
12	½"-WK-010-N-M	Piping originating on P&ID 01-04-001		Pumphouse # 1
13	½"-WK-012-N-M	Piping originating on P&ID 01-04-001		Pumphouse # 1
14	2"-WK-003-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
15	2"-WK-004-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
16	2"-WK-005-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
17	2"-WK-006-E-L	Piping originating on P&ID 01-04-001		Piping Between Pumphouses
18	2"-WK-007-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
19	2"-WK-008-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
20	2"-WU-008-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
21	2"-WU-007-P-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
22	2"-WU-007-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
23	2"-WU-006-P-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
24	2"-WU-006-P-L	Piping originating on P&ID 01-04-001		Pumphouse # 1
25	3"-WU-004-P-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
26	2"-WU-005-P-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
27	3"-WU-003-P-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
28	3"-WU-009-N-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
29	2"-WU-003-N-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
30	2"-WU-010-N-D	Piping originating on P&ID 01-04-001		Piping into Pumphouse # 1
31				
32	2"-WK-030-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
33	2"-WK-031-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
34	2"-WK-033-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
35	2"-WK-032-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
36	2"-WK-029-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
37	2"-WK-028-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
38	2"-WK-020-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
39	2"-WK-21A-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
40	½"-WK-037-N-M	Piping originating on P&ID 02-04-002		Pumphouse # 2
41	½"-WK-035-N-M	Piping originating on P&ID 02-04-002		Pumphouse # 2
42	2"-WK-021-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
43	2"-WK-013-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
44	2"-WK-014-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
45	2"-WK-014-E-L	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
46	2"-WK-015-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
47	2"-WK-019-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
48	3"-WK-014-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
49	2"-WK-017-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
50	2"-WK-018-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
51	3"-WK-015-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
52	2"-WK-015-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
53	2"-WK-015-E-L	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
54	2"-WK-026-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
55	2"-WK-025-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
56	2"-WK-022-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
57	2"-WK-023-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
58	2"-WK-024-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
59	2"-WK-034-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
60	2"-WU-011-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
61	2"-WU-011-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
62	3"-WU-010-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
63	2"-WU-012-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
64	2"-WU-012-E-D	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
65	2"-WK-014-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
66	2"-WU-012-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
67	2"-WU-016-E-D	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
68	2"-WU-016-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
69	2"-WU-015-E-D	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
70	2"-WU-015-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
71	3"-WU-017-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
72	3"-WU-018-N-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
73	2"-WU-004-N-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
74	2"-WU-009-N-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
75	2"-WU-005-N-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
76	3"-WU-005-N-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
77	2"-WU-013-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
78	2"-WU-013-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
79	2"-WU-014-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
80	2"-WU-014-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
81	2"-WK-027-E-L	Piping originating on P&ID 02-04-002		Pipe From PH # 2 to Day Ta
82	2"-WK-035-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
83				
84	2"-WK-040-E-K	Piping originating on P&ID 03-04-001		SQI Area
85	2"-WK-041-E-K	Piping originating on P&ID 03-04-001		SQI Area
86	2"-WK-052-E-K	Piping originating on P&ID 03-04-001		SQI Area
87	3"-WD-008-N-K	Piping originating on P&ID 03-04-001		SQI Area
88	2"-WK-042-E-K	Piping originating on P&ID 03-04-001		SQI Area
89	1½"-WK-043-E-K	Piping originating on P&ID 03-04-001		SQI Area
90	2"-WK-044-E-K	Piping originating on P&ID 03-04-001		SQI Area
91	1"-WD-006-E-M	Piping originating on P&ID 03-04-001		SQI Area
92	1"-WD-009-E-M	Piping originating on P&ID 03-04-001		SQI Area
93	2"-WD-003-E-K	Piping originating on P&ID 03-04-001		SQI Area
94	2"-WK-002-E-K	Piping originating on P&ID 03-04-001		SQI Area
95	1"-WD-004-E-M	Piping originating on P&ID 03-04-001		SQI Area
96	1"-WD-005-E-M	Piping originating on P&ID 03-04-001		SQI Area
97	1"-WD-007-E-M	Piping originating on P&ID 03-04-001		SQI Area
98	1"-WU-008-E-D	Piping originating on P&ID 03-04-001		SQI Area
99	2"-WU-700-E-D	Piping originating on P&ID 03-04-001		SQI Area
100	1"-WU-700-E-D	Piping originating on P&ID 03-04-001		SQI Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
101	2"-WK-045-E-K	Piping originating on P&ID 03-04-001		SQI Area
102	2"-WK-046-E-K	Piping originating on P&ID 03-04-001		SQI Area
103	3"-WK-050-N-K	Piping originating on P&ID 03-04-001		SQI Area
104	3"-WK-051-N-K	Piping originating on P&ID 03-04-001		SQI Area
105	2"-VA-001-N-D	Piping originating on P&ID 03-04-001		SQI Area
106	3"-VA-001-N-D	Piping originating on P&ID 03-04-001		SQI Area
107	2"-VA-002-N-D	Piping originating on P&ID 03-04-001		SQI Area
108	2"-VA-003-N-D	Piping originating on P&ID 03-04-001		SQI Area
109	2"-WK-203-E-U	Piping originating on P&ID 03-04-001		SQI Area
110				
111	3"-XC-004-E-R	Piping originating on P&ID 03-04-009		SQI Area
112	4"-XC-004-E-R	Piping originating on P&ID 03-04-009		SQI Area
113	3"-XC-005-E-R	Piping originating on P&ID 03-04-009		SQI Area
114	2"-XC-006-E-R	Piping originating on P&ID 03-04-009		SQI Area
115	2"-XC-007-E-R	Piping originating on P&ID 03-04-009		SQI Area
116	1½"-XC-008-E-R	Piping originating on P&ID 03-04-009		SQI Area
117	1½"-XC-009-E-R	Piping originating on P&ID 03-04-009		SQI Area
118	1½"-XC-010-E-R	Piping originating on P&ID 03-04-009		SQI Area
119	3"-XB-011-P-R	Piping originating on P&ID 03-04-009		SQI Area
120	2"-WT-007-E-D	Piping originating on P&ID 03-04-009		SQI Area
121	2"-WT-006-E-D	Piping originating on P&ID 03-04-009		SQI Area
122	2"-WT-005-N-D	Piping originating on P&ID 03-04-009		SQI Area
123	3"-WT-003-N-D	Piping originating on P&ID 03-04-009		SQI Area
124	3"-WT-002-E-D	Piping originating on P&ID 03-04-009		SQI Area
125	4"-WT-008-E-D	Piping originating on P&ID 03-04-009		SQI Area
126	3"-WT-004-E-D	Piping originating on P&ID 03-04-009		SQI Area
127	1"-WT-708-E-D	Piping originating on P&ID 03-04-009		SQI Area
128	1"-WT-707-E-D	Piping originating on P&ID 03-04-009		SQI Area
129	4"-WT-001-E-D	Piping originating on P&ID 03-04-009		SQI Area
130	2"-WT-001-N-D	Piping originating on P&ID 03-04-009		SQI Area
131	2"-WU-001-E-D	Piping originating on P&ID 03-04-009		SQI Area
132	4"-WU-001-E-D	Piping originating on P&ID 03-04-009		SQI Area
133	6"-WS-001-E-D	Piping originating on P&ID 03-04-009		SQI Area
134	3"-WT-001A-N-D	Piping originating on P&ID 03-04-009		SQI Area
135	3"-WT-718-N-D	Piping originating on P&ID 03-04-009		SQI Area
136	1"-WU-002-N-D	Piping originating on P&ID 03-04-009		SQI Area
137	2"-WU-002-N-D	Piping originating on P&ID 03-04-009		SQI Area
138	2"-WU-710-N-D	Piping originating on P&ID 03-04-009		SQI Area
139	2"-WU-008-N-D	Piping originating on P&ID 03-04-009		SQI Area
140	2"-WU-008-E-D	Piping originating on P&ID 03-04-009		SQI Area
141	2"-WU-709-N-D	Piping originating on P&ID 03-04-009		SQI Area
142	3"-WS-003-N-D	Piping originating on P&ID 03-04-009		SQI Area
143	3"-WS-003-E-D	Piping originating on P&ID 03-04-009		SQI Area
144	2"-WS-008-N-D	Piping originating on P&ID 03-04-009		SQI Area
145	2"-WS-008-E-D	Piping originating on P&ID 03-04-009		SQI Area
146	2"-WS-711-N-D	Piping originating on P&ID 03-04-009		SQI Area
147	3"-WS-220-N-D	Piping originating on P&ID 03-04-009		SQI Area
148	2"-WS-220-N-D	Piping originating on P&ID 03-04-009		SQI Area
149	2"-WS-711A-N-D	Piping originating on P&ID 03-04-009		SQI Area
150	2"-WS-711B-N-D	Piping originating on P&ID 03-04-009		SQI Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
151	3"-WS-711C-N-D	Piping originating on P&ID 03-04-009		SQI Area
152	2"-WS-711C-N-D	Piping originating on P&ID 03-04-009		SQI Area
153	3"-XB-012-E-D	Piping originating on P&ID 03-04-009		SQI Area
154	2"-WU-001-N-D	Piping originating on P&ID 03-04-009		SQI Area
155				
156	1½"-AI-010-N-C	Piping originating on P&ID 03-04-010		SQI Area
157	3/4"-AI-020-N-C	Piping originating on P&ID 03-04-010		SQI Area
158	1½"-AI-020-N-C	Piping originating on P&ID 03-04-010		SQI Area
159	½"-AI-012-N-C	Piping originating on P&ID 03-04-010		SQI Area
160	1½"-AI-012-N-C	Piping originating on P&ID 03-04-010		SQI Area
161	1½"-AI-015A-N-C	Piping originating on P&ID 03-04-010		SQI Area
162	½"-AI-015A-N-C	Piping originating on P&ID 03-04-010		SQI Area
163	1½"-AI-019B-N-C	Piping originating on P&ID 03-04-010		SQI Area
164	½"-AI-019B-N-C	Piping originating on P&ID 03-04-010		SQI Area
165	1½"-AI-019A-N-C	Piping originating on P&ID 03-04-010		SQI Area
166	½"-AI-019A-N-C	Piping originating on P&ID 03-04-010		SQI Area
167	1"-WD-003A-E-N	Piping originating on P&ID 03-04-010		SQI Area
168	1"-WD-003B-E-N	Piping originating on P&ID 03-04-010		SQI Area
169	1"-WD-001A-E-N	Piping originating on P&ID 03-04-010		SQI Area
170	1"-WD-013-N-N	Piping originating on P&ID 03-04-010		SQI Area
171	1"-WD-011-N-N	Piping originating on P&ID 03-04-010		SQI Area
172	1"-WD-009-N-N	Piping originating on P&ID 03-04-010		SQI Area
173	1½"-AI-023-N-C	Piping originating on P&ID 03-04-010		SQI Area
174	½"-AI-023-N-C	Piping originating on P&ID 03-04-010		SQI Area
175	1½"-AI-022-N-C	Piping originating on P&ID 03-04-010		SQI Area
176	½"-AI-022-N-C	Piping originating on P&ID 03-04-010		SQI Area
177	3"-WD-015-N-K	Piping originating on P&ID 03-04-010		SQI Area
178	3"-WD-015-E-K	Piping originating on P&ID 03-04-010		SQI Area
179	4"-WD-015-N-K	Piping originating on P&ID 03-04-010		SQI Area
180	4"-WD-015-E-K	Piping originating on P&ID 03-04-010		SQI Area
181	1½"-WD-004A-E-N	Piping originating on P&ID 03-04-010		SQI Area
182	1½"-WD-004B-E-N	Piping originating on P&ID 03-04-010		SQI Area
183	1½"-WD-002A-E-N	Piping originating on P&ID 03-04-010		SQI Area
184	1"-WD-016-N-N	Piping originating on P&ID 03-04-010		SQI Area
185	1½"-WD-016-N-N	Piping originating on P&ID 03-04-010		SQI Area
186	3"-WD-016-N-N	Piping originating on P&ID 03-04-010		SQI Area
187	2"-WD-010-N-N	Piping originating on P&ID 03-04-010		SQI Area
188	1"-WD-012-N-N	Piping originating on P&ID 03-04-010		SQI Area
189	1"-WD-010-N-N	Piping originating on P&ID 03-04-010		SQI Area
190	1½"-AI-021-N-C	Piping originating on P&ID 03-04-010		SQI Area
191	½"-AI-021-N-C	Piping originating on P&ID 03-04-010		SQI Area
192	1½"-WD-014-E-L	Piping originating on P&ID 03-04-010		SQI Area
193	1½"-WD-014-E-K	Piping originating on P&ID 03-04-010		SQI Area
194	1"-WD-007-E-K	Piping originating on P&ID 03-04-010		SQI Area
195	1½"-WD-008-E-K	Piping originating on P&ID 03-04-010		SQI Area
196	1½"-WD-005-N-K	Piping originating on P&ID 03-04-010		SQI Area
197	2"-WD-006-N-K	Piping originating on P&ID 03-04-010		SQI Area
198	1½"-AI-015B-N-C	Piping originating on P&ID 03-04-010		SQI Area
199	½"-AI-015B-N-C	Piping originating on P&ID 03-04-010		SQI Area
200	1"-WD-001B-E-N	Piping originating on P&ID 03-04-010		SQI Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST – PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
201	1½"-WD-002B-E-N	Piping originating on P&ID 03-04-010		SQI Area
202	1"-WD-003C-E-N	Piping originating on P&ID 03-04-010		SQI Area
203	1½"-WD-004C-E-N	Piping originating on P&ID 03-04-010		SQI Area
204	1½"-AI-019C-N-C	Piping originating on P&ID 03-04-010		SQI Area
205	½"-AI-019C-N-C	Piping originating on P&ID 03-04-010		SQI Area
206	2"-WD-717-E-K	Piping originating on P&ID 03-04-010		SQI Area
207				
208	2½"-AI-001-N-C	Piping originating on P&ID 03-04-013		SQI Area
209	2½"-AI-002-N-C	Piping originating on P&ID 03-04-013		SQI Area
210	¼"-AI-013-N-C	Piping originating on P&ID 03-04-013		SQI Area
211	¼"-AI-012-N-C	Piping originating on P&ID 03-04-013		SQI Area
212	2½"-AI-003-N-C	Piping originating on P&ID 03-04-013		SQI Area
213	1½"-AI-004-N-C	Piping originating on P&ID 03-04-013		SQI Area
214	1"-AI-014-N-C	Piping originating on P&ID 03-04-013		SQI Area
215	¼"-AI-008-N-C	Piping originating on P&ID 03-04-013		SQI Area
216	1½"-AI-006-N-C	Piping originating on P&ID 03-04-013		SQI Area
217	1½"-AI-005-N-C	Piping originating on P&ID 03-04-013		SQI Area
218	1½"-AI-007-N-C	Piping originating on P&ID 03-04-013		SQI Area
219	1½"-AI-011-N-C	Piping originating on P&ID 03-04-013		SQI Area
220	4"-BR-503X-P-K	Piping originating on P&ID 03-04-013		SQI Area
221	6"-BR-503X-P-K	Piping originating on P&ID 03-04-013		SQI Area
222				
223	2"-BR-313B-H-K	Piping originating on P&ID 03-04-015		SQI Area
224	2"-WP-500-E-K	Piping originating on P&ID 03-04-015		SQI Area
225	6"-BR-401A-E-K	Piping originating on P&ID 03-04-015		SQI Area
226	6"-BR-401-E-K	Piping originating on P&ID 03-04-015		SQI Area
227	4"-BR-401-P-H	Piping originating on P&ID 03-04-015		SQI Area
228	4"-BR-401A-P-H	Piping originating on P&ID 03-04-015		SQI Area
229	2"-BR-716-E-K	Piping originating on P&ID 03-04-015		SQI Area
230	2"-BR-716A-E-K	Piping originating on P&ID 03-04-015		SQI Area
231	6"-BR-503-P-K	Piping originating on P&ID 03-04-015		SQI Area
232	6"-BR-504-P-K	Piping originating on P&ID 03-04-015		SQI Area
233	4"-BR-503A-P-K	Piping originating on P&ID 03-04-015		SQI Area
234	4"-BR-503B-P-K	Piping originating on P&ID 03-04-015		SQI Area
235	3"-BR-503A-P-K	Piping originating on P&ID 03-04-015		SQI Area
236	3"-BR-503B-P-K	Piping originating on P&ID 03-04-015		SQI Area
237	4"-BR-503A-P-H	Piping originating on P&ID 03-04-015		SQI Area
238	4"-BR-503B-P-H	Piping originating on P&ID 03-04-015		SQI Area
239				
240	6"-AP-107-N-C	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
241	4"-AP-113-N-C	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
242	18"-AP-105-N-C	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
243	18"-AP-185-N-C	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
244	10"-AP-105-N-C	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
245	10"-AP-107-N-C	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
246	8"-AP-107-N-C	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
247	8"-AP-108-N-C	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
248	1½"-AP-110-N-C	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
249	1½"-AP-109-N-F	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
250	14"-AP-105-N-C	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
251	10"-AP-106-N-C	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
252	3"-NG-101-N-F	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
253	2"-NG-101-N-F	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
254	1"-NG-104-N-F	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
255	3/4"-NG-104-N-F	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
256	½"-NG-101-N-F	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
257	3/4"-NG-112-N-F	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
258	1½"-NG-103-N-F	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
259	2"-NG-102-N-F	Piping orig. on P&ID 32-03-713-D sheet 1		SQI Area
260				
261	3"-AU-205-N-C	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
262	3"-AU-200-N-C	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
263	2"-AU-213-N-C	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
264	2"-WK-213-N-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
265	2"-WK-202-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
266	2"-WK-211-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
267	1½"-WK-202-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
268	2"-WK-201-E-K	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
269	2"-WK-201A-E-K	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
270	2"-WK-201B-E-K	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
271	2"-WK-201A-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
272	2"-WK-201B-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
273	2"-WK-201-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
274	1½"-WK-201-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
275	1"-WK-201-N-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
276	1½"-WK-201-N-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
277	1½"-WK-203-N-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
278	1"-WK-203B-N-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
279	1"-WK-203C-N-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
280	1"-WK-203D-N-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
281	1"-WK-203E-N-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
282	1"-WK-203A-N-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
283	1"-WK-204A-N-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
284	3"-AU-206-N-C	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
285	1"-AU-206B-N-C	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
286	1"-AU-206C-N-C	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
287	1"-AU-206D-N-C	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
288	1"-AU-206E-N-C	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
289	1"-AU-206A-N-C	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
290	1"-WK-207A-N-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
291	1"-ST-215A-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
292	1"-CS-216A-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
293	1"-ST-209A-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
294	1"-ST-209B-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
295	1"-ST-209C-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
296	1"-ST-209D-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
297	1"-ST-209E-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
298	3"-ST-209-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
299	3"-ST-208-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
300	1"-WT-707-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
301	2"-WT-216-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
302	2"-WT-217-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
303	1"-WT-217B-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
304	1"-WT-217C-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
305	1"-WT-217D-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
306	1"-WT-217E-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
307	1"-WT-217A-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
308	2"-WU-700-E-K	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
309				
310	3"-XB-306-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
311	3"-XB-306A-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
312	3"-XB-306B-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
313	2"-XB-306A-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
314	2"-XB-306B-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
315	2"-XB-306-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
316	1½"-XB-306-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
317	1"-XB-306-N-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
318	1"-XB-309-N-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
319	1½"-XB-306-N-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
320	1½"-XB-320-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
321	2"-XB-307-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
322	1"-XB-307-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
323	1"-XB-319-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
324	2"-WU-700-N-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
325	6"-BR-316-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
326	6"-BR-316A-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
327	6"-BR-316B-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
328	4"-BR-316-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
329	6"-BR-315-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
330	6"-BR-322-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
331	6"-BR-316-N-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
332	2"-BR-501-N-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
333	3"-WT-301-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
334	3"-WT-301A-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
335	3"-WT-301B-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
336	2"-WT-301A-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
337	2"-WT-301B-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
338	2"-WT-301-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
339	2"-WT-301-N-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
340	1½"-WT-303-N-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
341	1½"-WT-301-N-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
342	2"-WT-304-N-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
343	1"-WT-304-N-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
344	1½"-WT-318-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
345	1½"-WT-317-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
346	2"-WT-302-N-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
347	1"-WT-302-N-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
348	1"-WT-305-N-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
349	2"-BR-313-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
350	4"-BR-313A-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
351	2"-BR-313A-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
352				
353	4"-BR-313-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
354	1½"-BR-313-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
355	1½"-BR-417-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
356	4"-BR-416-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
357	4"-BR-416A-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
358	4"-BR-416B-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
359	1"-BR-416-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
360	2"-BR-416-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
361	1½"-BR-416-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
362	4"-BR-415-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
363	2"-BR-415-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
364	3"-BR-505-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
365	3"-BR-413-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
366	2"-BR-411-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
367	2"-BR-505-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
368	4"-BR-401-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
369	4"-BR-401A-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
370				
371	1½"-XB-320-H-R	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
372	1"-XB-320-H-R	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
373	1"-XB-321-H-R	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
374	4"-BR-503-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
375	3"-BR-504-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
376	4"-BR-506-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
377	8"-BR-501-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
378	8"-BR-501A-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
379	8"-BR-501B-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
380	6"-BR-501A-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
381	6"-BR-501B-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
382	6"-BR-501-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
383	3"-BR-501-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
384	2"-BR-501-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
385	2"-BR-502-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
386	2"-BR-507-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
387	4"-BR-505-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
388	3"-BR-503-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
389	2"-BR-510-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
390	1"-BR-510A-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
391	1"-BR-510B-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
392	1½"-BR-511-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
393	1"-BR-511A-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
394	1"-BR-511B-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
395	2"-BR-512-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
396				
397				
398				
399		10" Process Water Line		Rocky Mountain Arsenal
400		6" Process Water Line		Rocky Mountain Arsenal

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
401		6" Potable Water Line		Rocky Mountain Arsenal
402		4" Potable Water Line		Rocky Mountain Arsenal
403		2" Potable Water Line		Rocky Mountain Arsenal
404		1" Potable Water Line		Rocky Mountain Arsenal
405		6" Gas Line		Rocky Mountain Arsenal
406		8" Sanitary Sewer		Rocky Mountain Arsenal
407		4" Sanitary Sewer		Rocky Mountain Arsenal
408				
409		Cold Water Lines: 1/2", 3/4", and 1"		Change House & Control Bld
410		Hot Water Lines: 1/2" and 3/4"		Change House & Control Bld
411		Vent Lines: 1½", 2", 3", and 4"		Change House & Control Bld
412		Sanitary Lines: 1¼", 1½", 2", 3", and 4"		Change House & Control Bld
413				
414		1" CS Sch 80 ASTM A120 Fuel Oil Line		Emergency Generator
415				
416		4" Dirty Water Sewer Double Cont. Pipe		Change House
417		2" Lab Sink Sewer Double Cont. Pipe		Lab Trailer
418				
419	4"-WU-E-D	Piping shown on drawing 00-02-125		Loading/Unloading Area
420	2"-WU-E-D	Piping shown on drawing 00-02-125		Loading/Unloading Area
421	4"-WS-E-D	Piping shown on drawing 00-02-125		Loading/Unloading Area
422	2"-BR-E-K	Piping shown on drawing 00-02-125		Loading/Unloading Area
423	2"-BR-P-H	Piping shown on drawing 00-02-125		Loading/Unloading Area
424	3/4"-WU-E-D	Piping shown on drawing 00-02-126		Loading/Unloading Area
425	3"-BR-503B-P-H	Piping shown on drawing 00-02-126		Loading/Unloading Area
426	3"-BR-503A-P-H	Piping shown on drawing 00-02-126		Loading/Unloading Area
427				
428				
429				
430				
431	INSULATION			
432	2"-WK-001-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
433	2"-WK-002-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
434	2"-WK-01A-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
435	2"-WK-003-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
436	2"-WK-004-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
437	2"-WK-005-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
438	2"-WK-006-E-L	Piping originating on P&ID 01-04-001		Piping Between Pumphouses
439	2"-WK-007-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
440	2"-WK-008-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
441	2"-WU-008-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
442	2"-WU-007-P-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
443	2"-WU-007-P-K	Piping originating on P&ID 01-04-001		Pumphouse # 1
444	2"-WU-006-P-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
445	2"-WU-006-P-L	Piping originating on P&ID 01-04-001		Pumphouse # 1
446	3"-WU-004-P-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
447	2"-WU-005-P-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
448	3"-WU-003-P-D	Piping originating on P&ID 01-04-001		Pumphouse # 1
449				
450	2"-WK-030-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
451	2"-WK-031-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
452	2"-WK-033-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
453	2"-WK-032-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
454	2"-WK-029-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
455	2"-WK-028-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
456	2"-WK-020-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
457	2"-WK-21A-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
458	2"-WK-021-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
459	2"-WK-013-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
460	2"-WK-014-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
461	2"-WK-014-E-L	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
462	2"-WK-015-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
463	2"-WK-019-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
464	3"-WK-014-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
465	2"-WK-017-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
466	2"-WK-018-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
467	3"-WK-015-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
468	2"-WK-015-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
469	2"-WK-015-E-L	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
470	2"-WK-026-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
471	2"-WK-025-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
472	2"-WK-022-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
473	2"-WK-023-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
474	2"-WK-024-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
475	2"-WK-034-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
476	2"-WU-011-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
477	2"-WU-011-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
478	3"-WU-010-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
479	2"-WU-012-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
480	2"-WU-012-E-D	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
481	2"-WK-014-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
482	2"-WU-012-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
483	2"-WU-016-E-D	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
484	2"-WU-016-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
485	2"-WU-015-E-D	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
486	2"-WU-015-E-K	Piping originating on P&ID 02-04-002		Piping in Storage Tank Farm
487	3"-WU-017-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
488	2"-WU-013-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
489	2"-WU-013-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
490	2"-WU-014-P-D	Piping originating on P&ID 02-04-002		Pumphouse # 2
491	2"-WU-014-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
492	2"-WK-027-E-L	Piping originating on P&ID 02-04-002		Pipe From PH # 2 to Day Ta
493	2"-WK-035-P-K	Piping originating on P&ID 02-04-002		Pumphouse # 2
494				
495	2"-WK-040-E-K	Piping originating on P&ID 03-04-001		SQI Area
496	2"-WK-041-E-K	Piping originating on P&ID 03-04-001		SQI Area
497	2"-WK-052-E-K	Piping originating on P&ID 03-04-001		SQI Area
498	2"-WK-042-E-K	Piping originating on P&ID 03-04-001		SQI Area
499	1½"-WK-043-E-K	Piping originating on P&ID 03-04-001		SQI Area
500	2"-WK-044-E-K	Piping originating on P&ID 03-04-001		SQI Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
501	1"-WD-006-E-M	Piping originating on P&ID 03-04-001		SQI Area
502	1"-WD-009-E-M	Piping originating on P&ID 03-04-001		SQI Area
503	2"-WD-003-E-K	Piping originating on P&ID 03-04-001		SQI Area
504	2"-WK-002-E-K	Piping originating on P&ID 03-04-001		SQI Area
505	1"-WD-004-E-M	Piping originating on P&ID 03-04-001		SQI Area
506	1"-WD-005-E-M	Piping originating on P&ID 03-04-001		SQI Area
507	1"-WD-007-E-M	Piping originating on P&ID 03-04-001		SQI Area
508	1"-WU-008-E-D	Piping originating on P&ID 03-04-001		SQI Area
509	2"-WU-700-E-D	Piping originating on P&ID 03-04-001		SQI Area
510	1"-WU-700-E-D	Piping originating on P&ID 03-04-001		SQI Area
511	2"-WK-045-E-K	Piping originating on P&ID 03-04-001		SQI Area
512	2"-WK-046-E-K	Piping originating on P&ID 03-04-001		SQI Area
513	2"-WK-203-E-U	Piping originating on P&ID 03-04-001		SQI Area
514				
515	3"-XC-004-E-R	Piping originating on P&ID 03-04-009		SQI Area
516	4"-XC-004-E-R	Piping originating on P&ID 03-04-009		SQI Area
517	3"-XC-005-E-R	Piping originating on P&ID 03-04-009		SQI Area
518	2"-XC-006-E-R	Piping originating on P&ID 03-04-009		SQI Area
519	2"-XC-007-E-R	Piping originating on P&ID 03-04-009		SQI Area
520	1½"-XC-008-E-R	Piping originating on P&ID 03-04-009		SQI Area
521	1½"-XC-009-E-R	Piping originating on P&ID 03-04-009		SQI Area
522	1½"-XC-010-E-R	Piping originating on P&ID 03-04-009		SQI Area
523	3"-XB-011-P-R	Piping originating on P&ID 03-04-009		SQI Area
524	2"-WT-007-E-D	Piping originating on P&ID 03-04-009		SQI Area
525	2"-WT-006-E-D	Piping originating on P&ID 03-04-009		SQI Area
526	3"-WT-002-E-D	Piping originating on P&ID 03-04-009		SQI Area
527	4"-WT-008-E-D	Piping originating on P&ID 03-04-009		SQI Area
528	3"-WT-004-E-D	Piping originating on P&ID 03-04-009		SQI Area
529	1"-WT-708-E-D	Piping originating on P&ID 03-04-009		SQI Area
530	1"-WT-707-E-D	Piping originating on P&ID 03-04-009		SQI Area
531	4"-WT-001-E-D	Piping originating on P&ID 03-04-009		SQI Area
532	2"-WU-001-E-D	Piping originating on P&ID 03-04-009		SQI Area
533	4"-WU-001-E-D	Piping originating on P&ID 03-04-009		SQI Area
534	6"-WS-001-E-D	Piping originating on P&ID 03-04-009		SQI Area
535	2"-WU-008-E-D	Piping originating on P&ID 03-04-009		SQI Area
536	3"-WS-003-E-D	Piping originating on P&ID 03-04-009		SQI Area
537	2"-WS-008-E-D	Piping originating on P&ID 03-04-009		SQI Area
538	3"-XB-012-E-D	Piping originating on P&ID 03-04-009		SQI Area
539				
540	1"-WD-003A-E-N	Piping originating on P&ID 03-04-010		SQI Area
541	1"-WD-003B-E-N	Piping originating on P&ID 03-04-010		SQI Area
542	1"-WD-001A-E-N	Piping originating on P&ID 03-04-010		SQI Area
543	3"-WD-015-E-K	Piping originating on P&ID 03-04-010		SQI Area
544	4"-WD-015-E-K	Piping originating on P&ID 03-04-010		SQI Area
545	1½"-WD-004A-E-N	Piping originating on P&ID 03-04-010		SQI Area
546	1½"-WD-004B-E-N	Piping originating on P&ID 03-04-010		SQI Area
547	1½"-WD-002A-E-N	Piping originating on P&ID 03-04-010		SQI Area
548	1½"-WD-014-E-L	Piping originating on P&ID 03-04-010		SQI Area
549	1½"-WD-014-E-K	Piping originating on P&ID 03-04-010		SQI Area
550	1"-WD-007-E-K	Piping originating on P&ID 03-04-010		SQI Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST – PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
551	1½"-WD-008-E-K	Piping originating on P&ID 03-04-010		SQI Area
552	1"-WD-001B-E-N	Piping originating on P&ID 03-04-010		SQI Area
553	1½"-WD-002B-E-N	Piping originating on P&ID 03-04-010		SQI Area
554	1"-WD-003C-E-N	Piping originating on P&ID 03-04-010		SQI Area
555	1½"-WD-004C-E-N	Piping originating on P&ID 03-04-010		SQI Area
556	2"-WD-717-E-K	Piping originating on P&ID 03-04-010		SQI Area
557				
558	4"-BR-503X-P-K	Piping originating on P&ID 03-04-013		SQI Area
559	6"-BR-503X-P-K	Piping originating on P&ID 03-04-013		SQI Area
560				
561	2"-BR-313B-H-K	Piping originating on P&ID 03-04-015		SQI Area
562	2"-WP-500-E-K	Piping originating on P&ID 03-04-015		SQI Area
563	6"-BR-401A-E-K	Piping originating on P&ID 03-04-015		SQI Area
564	6"-BR-401-E-K	Piping originating on P&ID 03-04-015		SQI Area
565	4"-BR-401-P-H	Piping originating on P&ID 03-04-015		SQI Area
566	4"-BR-401A-P-H	Piping originating on P&ID 03-04-015		SQI Area
567	2"-BR-716-E-K	Piping originating on P&ID 03-04-015		SQI Area
568	2"-BR-716A-E-K	Piping originating on P&ID 03-04-015		SQI Area
569	6"-BR-503-P-K	Piping originating on P&ID 03-04-015		SQI Area
570	6"-BR-504-P-K	Piping originating on P&ID 03-04-015		SQI Area
571	4"-BR-503A-P-K	Piping originating on P&ID 03-04-015		SQI Area
572	4"-BR-503B-P-K	Piping originating on P&ID 03-04-015		SQI Area
573	3"-BR-503A-P-K	Piping originating on P&ID 03-04-015		SQI Area
574	3"-BR-503B-P-K	Piping originating on P&ID 03-04-015		SQI Area
575	4"-BR-503A-P-H	Piping originating on P&ID 03-04-015		SQI Area
576	4"-BR-503B-P-H	Piping originating on P&ID 03-04-015		SQI Area
577				
578	2"-WK-202-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
579	2"-WK-211-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
580	1½"-WK-202-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
581	2"-WK-201-E-K	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
582	2"-WK-201A-E-K	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
583	2"-WK-201B-E-K	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
584	2"-WK-201A-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
585	2"-WK-201B-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
586	2"-WK-201-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
587	1½"-WK-201-E-U	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
588	1"-ST-215A-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
589	1"-CS-216A-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
590	1"-ST-209A-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
591	1"-ST-209B-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
592	1"-ST-209C-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
593	1"-ST-209D-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
594	1"-ST-209E-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
595	3"-ST-209-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
596	3"-ST-208-H-E	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
597	1"-WT-707-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
598	2"-WT-216-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
599	2"-WT-217-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
600	1"-WT-217B-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST – PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
601	1"-WT-217C-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
602	1"-WT-217D-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
603	1"-WT-217E-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
604	1"-WT-217A-H-D	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
605	2"-WU-700-E-K	Piping orig. on P&ID 32-03-713-D sheet 2		SQI Area
606				
607	3"-XB-306-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
608	3"-XB-306A-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
609	3"-XB-306B-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
610	2"-XB-306A-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
611	2"-XB-306B-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
612	2"-XB-306-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
613	1½"-XB-306-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
614	1½"-XB-320-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
615	2"-XB-307-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
616	1"-XB-307-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
617	1"-XB-319-E-R	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
618	6"-BR-316-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
619	6"-BR-316A-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
620	6"-BR-316B-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
621	4"-BR-316-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
622	6"-BR-315-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
623	6"-BR-322-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
624	3"-WT-301-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
625	3"-WT-301A-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
626	3"-WT-301B-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
627	2"-WT-301A-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
628	2"-WT-301B-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
629	2"-WT-301-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
630	1½"-WT-318-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
631	1½"-WT-317-E-D	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
632	2"-BR-313-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
633	4"-BR-313A-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
634	2"-BR-313A-H-K	Piping orig. on P&ID 32-03-713-D sheet 3		SQI Area
635				
636	4"-BR-313-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
637	1½"-BR-313-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
638	1½"-BR-417-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
639	4"-BR-416-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
640	4"-BR-416A-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
641	4"-BR-416B-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
642	1"-BR-416-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
643	2"-BR-416-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
644	1½"-BR-416-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
645	4"-BR-415-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
646	2"-BR-415-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
647	3"-BR-505-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
648	3"-BR-413-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
649	2"-BR-411-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
650	2"-BR-505-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - PIPING

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
651	4"-BR-401-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
652	4"-BR-401A-H-K	Piping orig. on P&ID 32-03-713-D sheet 4		SQI Area
653				
654	1½"-XB-320-H-R	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
655	1"-XB-320-H-R	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
656	1"-XB-321-H-R	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
657	4"-BR-503-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
658	3"-BR-504-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
659	4"-BR-506-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
660	8"-BR-501-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
661	8"-BR-501A-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
662	8"-BR-501B-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
663	6"-BR-501A-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
664	6"-BR-501B-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
665	6"-BR-501-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
666	3"-BR-501-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
667	2"-BR-501-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
668	2"-BR-502-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
669	2"-BR-507-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
670	4"-BR-505-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
671	3"-BR-503-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
672	2"-BR-510-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
673	1"-BR-510A-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
674	1"-BR-510B-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
675	1½"-BR-511-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
676	1"-BR-511A-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
677	1"-BR-511B-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
678	2"-BR-512-H-K	Piping orig. on P&ID 32-03-713-D sheet 5		SQI Area
679				
680	4"-WU-E-D	Piping shown on drawing 00-02-125		Loading/Unloading Area
681	2"-WU-E-D	Piping shown on drawing 00-02-125		Loading/Unloading Area
682	4"-WS-E-D	Piping shown on drawing 00-02-125		Loading/Unloading Area
683	2"-BR-E-K	Piping shown on drawing 00-02-125		Loading/Unloading Area
684	2"-BR-P-H	Piping shown on drawing 00-02-125		Loading/Unloading Area
685	3/4"-WU-E-D	Piping shown on drawing 00-02-126		Loading/Unloading Area
686	3"-BR-503B-P-H	Piping shown on drawing 00-02-126		Loading/Unloading Area
687	3"-BR-503A-P-H	Piping shown on drawing 00-02-126		Loading/Unloading Area

APPENDIX B.4

ELECTRICAL EQUIPMENT

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST - ELECTRICAL

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
1	SG-101	Incoming 13.8 Kv Switch Gear	16361	Switch House
2	MCC 1A	Motor Control Center 1A	16480	SQI Area
3	MCC 1B	Motor Control Center 1B	16480	SQI Area
4	MCC 1C	Motor Control Center 1C	16480	SQI Area
5	MCC 1D	Motor Control Center 1D	16480	SQI Area
6	MCC 1E	Motor Control Center 1E	16480	Switch House
7	MCC 2	Motor Control Center 2	16480	Pumphouse # 1
8	MCC 3	Motor Control Center 3	16480	Pumphouse # 2
9	T-102	Transformer for Lighting Panel	16461	Pumphouse # 2
10	T-105	Transformer	16461	SQI Area at Level 113'-1½"
11	T-104	Transformer	16461	SQI Area at Level 113'-1½"
12	HP-104	Resistance Heater Pads	16855	Tank TK-104
13	HP-105	Resistance Heater Pads	16855	Tank TK-105
14	HP-106	Resistance Heater Pads	16855	Tank TK-106
15	HP-203	Resistance Heater Pads	16855	Tank TK-203
16	HP-204	Resistance Heater Pads	16855	Tank TK-204
17	DP-304	Space Heater Distribution Panel	16180	SQI Area
18	DP-305	Space Heater Distribution Panel	16180	SQI Area
19	DP-301	Space Heater Distribution Panel	16180	SQI Area
20	IH-101A	Bayonet Heater		Pumphouse # 1
21	IH-101B	Bayonet Heater		Pumphouse # 1
22	IH-102A	Bayonet Heater		Pumphouse # 2
23	IH-102B	Bayonet Heater		Pumphouse # 2
24	IH-103	Bayonet Heater	16855	Diesel Generator
25	T-101	Transformer for Lighting Panel	16480	Pumphouse # 1
26	U-501	Uniteruptable Power Supply	16611	SQI Area at Level 113'-1½"
27	T-501	Transformer, Lighting and Heating	16480	Control Building
28	T-601	Transformer, Lighting and Heating	16480	Change House
29	T-701	Transformer, Lighting and Heating	16480	Lab and Lunch Trailer
30	T-801	Transformer, Lighting	16480	Yard
31	DP-306	Space Heater Distribution Panel	16180	SQI Area
32	LP1	Pumphouse # 1 Lighting Panel	16160	Pumphouse # 1
33	LP2	Pumphouse # 2 Lighting Panel	16160	Pumphouse # 2
34	LP3	Change House Lighting Panel	16160	Change House
35	LP4	Control Building Lighting Panel	16160	Control Building
36	LP5	Lighting Panel	16160	SQI Area at Level 113'-1½"
37	LP6	Lighting Panel	16160	SQI Area at Level 113'-1½"
38	LP7	Lighting Panel	16160	SQI Area at Level 113'-1½"
39	LP8	Lighting Panel	16160	Switch House
40	"A"	Lighting Fixture, Pendant, HPS	16510	Various
41	"B"	Lighting Fixture, Pendant, HPS	16510	Various
42	"C"	Lighting Fixture, Overhead Steel	16510	Various
43	"D"	Lighting Fixture, Overhead Steel	16510	Various, Outdoors
44	"E"	Lighting Fixture, Ceiling	16510	Various
45	"F"	Lighting Fixture, Troffer	16510	Various
46	"G"	Lighting Fixture, Emergency	16510	Various
47	"H"	Lighting Fixture, Exit	16510	Various
48	"J"	Lighting Fixture, Wall	16510	Various, Stairwells
49	"K"	Lighting Fixture, Pole	16510	Various, Roadway
50	"L"	Lighting Fixture, Pole	16510	Various, Yard

electric.wk1

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT, EQUIPMENT LIST – ELECTRICAL

	TAG NO.	EQUIPMENT DESCRIPTION	SPEC. NO.	LOCATION
51	"M"	Lighting Fixture, Wall	16510	Various, Outdoors
52	"N"	Lighting Fixture, Pole	16510	Various, Parking Lot
53	"P"	Lighting Fixture, Bollard	16510	Various, Walkways
54	"Q"	Lighting Fixture, Conduit Mount	16510	Various, Outdoors
55	"T"	Lighting Fixture, Ceiling	16510	Various
56	——	Wire and Cable	16123	
57	——	Junction Boxes	16130	
58	——	Wiring Devices	16141	
59	——	Cabinets and Enclosures	16160	
60	T-201	Transformer, 13.8 Kv–480		Pumphouse # 1
61	T-301	Transformer, 13.8 Kv–480		Pumphouse # 2
62	T-MC 1A	Transformer Power to MCC 1A	16461	SQI Area
63	T-MC 1B	Transformer Power to MCC 1B	16461	SQI Area
64	T-MC 1C	Transformer Power to MCC 1C	16461	SQI Area
65	T-MC 1D	Transformer Power to MCC 1D	16461	SQI Area
66	T-MC 1E	Transformer Power to MCC 1E	16461	Switch House
67	W-104	Welding Receptacles		SQI Area at Level 113'-1½"
68	W-105	Welding Receptacles		SQI Area at Level 123'-1½"
69	W-106	Welding Receptacles		SQI @ El 142'-10½" & 153'-11½

APPENDIX B.5

INSTRUMENTATION

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P & ID: 03–04–015 BRINE SYSTEM

Function	Tag #	LOCATION	DCS/PLC I/O					
			TC	AC DI	DC DI	DO	AI	AO
FE	83A	Flow Element						
FIT	83A	Flow Transmitter, Tk. T–203					1	
FI	83A	DCS						
SV	84A	Solenoid Valve				1		
SV	84B	Solenoid Valve				1		
SV	84C	Solenoid Valve				1		
SV	84D	Solenoid Valve				1		
LIT	84A	Level Transmitter, Tk. T–203					1	
LSH	84A	DCS						
LAH	84A	DCS						
LSL	84A	DCS						
LAL	84A	DCS						
LIT	84B	Level Transmitter, Tk. T–202					1	
LSH	84B	DCS						
LAH	84B	DCS						
LSL	84A	DCS						
LSL	84B	DCS						
LSL	84D	DCS						
LAL	84B	DCS						
COV	90A	Loading Arm A Valve						
SV	90A1	Solenoid Valve–Brine Flow						
SV	90A2	Solenoid Valve–Flush Flow						
COV	90B	Loading Arm B Valve						
SV	90B1	Solenoid Valve–Brine Flow						
SV	90B2	Solenoid Valve–Flush Flow						
FE	89	Flow Element–Loading Arm A					1	
FIT	89	Flow Transmitter					10	
FI	89	DCS						
FQI	89	DCS						
FE	90	Flow Element–Loading Arm B						
FIT	90	Flow Transmitter					10	
FI	90	DCS						
FQI	90	DCS						
LS	90A	Level Switch–Loading Arm A						
LS	90B	Level Switch–Loading Arm B						
P206A		Brine Feed Pump		2	1	1		
P206B		Brine Feed Pump		2	1	1		
M204		Mixer TK–201		2	1	1		
M205		Mixer TK–201		2	1	1		

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P & I D: 01-04-001 PUMP HOUSE 1 & RETENTION POND

Function	Tag #	LOCATION	DCS/PLC I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
HS	101A	DCS						
PAH	101A	DCS						
PI	101A	DCS						
PS	101A	Transfer Pump, High Pressure (A)			1			
PIT	101A	Pressure Transmitter					1	
IH	101A/B	Immersion Heaters, Tk. T-107						
HS	101B	DCS						
PAH	101B	DCS						
PS	101B	Transfer Pump, High Pressure (B)			1			
FQI	107	Purge Water Totalizer						
LISH	107	High Water Level, Tk. T-107						
LISL	107	Low Water Level, Tk. T-107						
MOV	107	Water Supply Valve, Tk. T-107						
PI	107	Pressure Gauge, Purge Water						
TC	107	Temperature Control, Tk. T-107						
TE	107	Temperature Element, Tk. T-107						
TI	107	DCS						
TIT	107	Temperature Transmitter, Tk. T-107					1	
PCV	107A	Pressure Control Valve, Eye Wash Station						
PCV	107B	Pressure Control Valve, Purge Water Flow						
PAL	107	DCS						
PS	107	Safety Shower Pressure Low / Operate			1			
JT	506	SQI Building: Main KWH						1
JT	505	SQI Building: ME-IE KWH						1
MCC	1A				1			
MCC	1B				1			
MCC	1C				1			
MCC	1D				1			
MCC	1E				1			
GEN	1A	GENERATOR ON			1			
GEN	1B	GENERATOR MALFUNCTION			1			
P102		Rinse Water Pump, P-102			1	1		
P101A		Waste Water Pump, P-101A		2	1	1		
P101B		Waste Water Pump, P-101B		2	1	1		

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P & I D: 02–04–002 PUMP HOUSE 2 & STORAGE TANKS

Function	Tag #	LOCATION	DCS/PLC I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
HS	101	DCS						
LSH	101	DCS						
LSL	101	DCS						
LI	101	DCS						
LIT	101	Level Transmitter, Tk. T–101					1	
MOV/25	101	Outlet Valve, Tk. T–101			2	2		
HS	102	DCS						
LSH	102	DCS						
LSL	102	DCS						
LI	102	DCS						
LIT	102	Level Transmitter, Tk. T–102					1	
MOV/25	102	Outlet Valve, Tk. T–102			2	2		
IH	102A/B	Immersion Heaters, Tk. T–108						
HS	103	DCS						
LSH	103	DCS						
LSL	103	DCS						
LI	103	DCS						
LIT	103	Level Transmitter, Tk. T–103					1	
MOV/25	103	Outlet Valve, Tk. T–103			2	2		
PAH	103A	DCS						
PS	103A	Pressure Switch, P–103A Discharge			1			
PAH	103B	DCS						
PS	103B	Pressure Switch, P–103B Discharge			1			
FQI	108	Purge Water Totalizer						
LISH	108	Level Switch, High, Tk. T–108						
LISL	108	Level Switch, Low, Tk. T–108						
MOV	108	Water Inlet Valve, Tk. T–108						
PCV	108	Pressure Control Valve, Purge Water Flow						
PI	108	Pressure Gauge, Pump P–105 Discharge						
TC	108	Temperature Control, Tk. T–108						
TIT	108	Temperature Transmitter, Tk. T–108					1	
PIT	103A						1	
PIT	103C						1	
LAH	109	DCS						
LIT	109	Level Transmitter, Sump T–109					1	
LSL	109	Level Switch, Low, Sump T–109						
PI	109	Sump Pump, P–109						
PCV	400	Pressure Control Valve, Eye Wash Station						
PI	400	Press. Gauge, Pumps P–103A/B Suction Press.						
PS	400	Safety Shower Pressure			1			
PS	111			1				
P103A		Pump, P–103A		1	1	1		
P103B		Pump, P–103B		1	1	1		

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST - INSTRUMENTATION

P & I D: 02-04-002 PUMP HOUSE 2 & STORAGE TANKS

Function	Tag #	LOCATION	DCS/PLC I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
P106		Sump Pump, P-106			1			
P105		Purge Water Pump			1			

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST - INSTRUMENTATION

P & I D: 03-04-001 DAY TANK AREA

Function	Tag #	LOCATION	DCS/PLC I/O					
			TC	AC DI	DC DI	DO	AI	AO
FAL	103	DCS						
FIC	103	DCS						
FE	103	Flow Element, Waste Water						
FIT	103	Flow Transmitter, Waste Water					1	
FQI	103	DCS						
FS	103	DCS						
FCV	103	Control Valve, Waste Water						
FY	103	Transducer,I/P						1
FCV	104	Flow Control Valve						
FE	104	Flow Element, Waste Transfer						
FIC	104	DCS						
FIT	104	Flow Transmitter, Waste Transfer Flow					1	
FQI	104	DCS						
FY	104	Transducer, I/P						1
LIT	104	Level Transmitter, Tk. T-104					1	
LAH	104	DCS						
LAHH	104	DCS						
LAL	104	DCS						
LALL	104	DCS						
LI	104	DCS						
PI	104	DCS						
FE	104A	Flow Element, Decon. & Drain Water						
FIT	104A	Flow Transmitter, Decon. & Drain Water					1	
FQI	104A	DCS						
LCS	104	DCS						
PIT	104A	Pressure Transmitter, P-104A Discharge					1	
COV	104B	Inlet Valve, Tk. T-104		2		1		
HS	104B	DCS						
LCS	104B	DCS						
PIT	104B	Pressure Transmitter, P-104B Discharge					1	
COV	104C	Outlet Valve Tk. T-104		2		1		
TT	104						1	
TT	105						1	
TT	106						1	
HS	104C	DCS						
LCS	104C	DCS						
COV	104D	Inlet Valve, Tk. T-104			2	1		
HS	104D	DCS						
HS	104PA	DCS						
HS	104PB	DCS						
LAH	105	DCS						
LAHH	105	DCS						
LAL	105	DCS						
LALL	105	DCS						

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P & I D: 03-04-001 DAY TANK AREA

Function	Tag #	LOCATION	DCS/PLC I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
LCS	105	DCS						
LI	105	DCS						
LIT	105	Level Transmitter, Tk. T-105					1	
COV	105A	Inlet Valve, Tk. T-105		2		1		
HS	105A	DCS						
LCS	105A	DCS						
COV	105B	Inlet Valve, Tk. T-105		2		1		
HS	105B	DCS						
LCS	105B	DCS						
COV	105C	Outlet Valve, Tk. T-105		2		1		
HS	105C	DCS						
HS	105C	DCS						
LCS	105C	DCS						
COV	105D	Inlet Valve, Tk. T-105		2		1		
HS	105D	DCS						
LAH	106	DCS						
LAHH	106	DCS						
LAL	106	DCS						
LALL	106	DCS						
LCS	106	DCS						
LI	106	DCS						
LIT	106	Level Transmitter, Tk. T-106					1	
COV	106A	Inlet Valve, Tk. T-106		2		1		
HS	106A	DCS						
LCS	106A	DCS						
COV	106B	Outlet Valve Tk. T-106		2		1		
HS	106B	DCS						
LCS	106B	DCS						
COV	106C	Inlet Valve, Tk. T-106		2		1		
HS	106C	DCS						
LCS	106C	DCS						
COV	106D	Bypass Valve, Tk. T-105		2		1		
HS	106D	DCS						
HS	107	DCS						
PI	107	DCS						
PIT	107	Pressure Transmitter, P-107 Discharge				1		
TIC	104	Temperature controller TIC T-104						
TIC	105	Temperature controller TIC-T-105						
TIC	106	Temperature controller TIC T-106						
LSH	403D	Level Switch, High, Sump Tank, T-403			1			
LSH	404D	Level Switch, High, Sump Tank, T-404			1			
LSL	408D	Level Switch, Low, Sump Tank, T-408			1			
ZS	104B			2				
ZS	104C			2				

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P & I D: 03-04-001 DAY TANK AREA

Function	Tag #	LOCATION	DCS/PLC I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
ZS	104D			2				
ZS	105A			2				
ZS	105B			2				
ZS	105C			2				
ZS	105D			2				
ZS	106A			2				
ZS	106B			2				
ZS	106C			2				
ZS	106D			2				
ZS	105			2				
ZS	106			2				
MCC	1A	Switch Closed		1				
MCC	1B			1				
MCC	1C			1				
MCC	1D			1				
MCC	1E			[illegible]				
GEN	1A	Generator On		1				
GEN	1B	Generator Malfunction		1				
JT	505	SQI Building, ME–IE KWH					10	
JT	506	SQI Building, Main KWH					10	

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P & I D: 03-04-009 PROCESS WATER & CAUSTIC STORAGE

Function	Tag #	LOCATION	DCS/PLC/I/O					
			TC	AC DI	DC DI	DO	AI	AO
LAH	203	DCS						
LAL	203	DCS						
LSL	203	DCS						
LCS	203	DCS						
LCV	203	Level Control Valve, Tk. T-203		2		1		
LI	203	DCS						
LIT	203	Level Transmitter, Tk. T-203					1	
LAH	204	DCS						
LAL	204	DCS						
LI	204	DCS						
LIT	204	Level Transmitter, Tk. T-204					1	
TC	204	Temperature Control, Tk. T-204						
TCV	204	Control Valve,Temperature Tk. T-204					1	
TE	204	Temperature Element, Tk. T-204						
TI	204	DCS						
TIT	204	Temperature Transmitter, Tk. T-204					1	
LCSH	204	DCS						
LCSL	204	DCS						
FIC	205	DCS						
LAH	205	DCS						
LAL	205	DCS						
LI	205	DCS						
LIT	205	Level Transmitter, Tk. T-205					1	
TI	205	Temperature Indicator						
LCS	205A	DCS						
LCS	205B	DCS						
LCS	205C	DCS						
FCV	209	Control Valve, Dilution Water				1		
FE	209	Flow Element, Dilution Water						
FIT	209	Flow Transmitter, Dilution Water					1	
FY	209	Transducer, I/P						1
KIC	209A	DCS						
PI	209A	Pressure Gauge						
KIC	209B	DCS						
PI	209B	Pressure Gauge						
KIC	210A	DCS						
PI	210A	Pressure Gauge						
KIC	210B	DCS						
PI	210B	Pressure Gauge						
FCV	211	Control Valve, Caustic Flow				1		
FE	211	Flow Element, Caustic						
FIT	211	Flow Transmitter, Caustic					1	
KIC	211A	DCS						
PI	211A	Pressure Gauge						

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST - INSTRUMENTATION

P & I D: 03-04-009 PROCESS WATER & CAUSTIC STORAGE

Function	Tag #	LOCATION	DCS/PLC/I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
KIC	211B	DCS						
PI	211B	Pressure Gauge						
LSH	401DA	Level Switch, High Sump Tank Tk. T-401A			1			
LSH	401DB	Level Switch, High Sump Tank Tk. T-401B			1			
LSH	402DA	Level Switch, High Sump Tank Tk. T-402A			1			
LSH	402DB	Level Switch, High Sump Tank Tk. T-402B			1			
LSH	402DC	Level Switch, High Sump Tank Tk. T-402C			1			
LSH	407D	Level Switch, High Sump Tank Tk. T-407			1			
LSH	409	Level Switch, High Sump			1			
LSH	405	Level Switch, High Sump			1			
LSH	406	Level Switch, High Sump			1			

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST - INSTRUMENTATION

P & I D: 03-04-010 PROCESS DRAIN SYSTEM

Function	Tag #	LOCATION	DCS/PLC I/O TC	AC DI	DC DI	DO	AI	AO
LSH	401	Level Switch, High, Sump Tk. T-401						
LSL	401	Level Switch, Low, Sump Tk. T-401						
PCV	401	Pressure Control Valve, for P-401						
SV	401	Solenoid Valve, P-401						
LSH	402	Level Switch, High, Sump Tk. T-402						
LSL	402	Level Switch, Low, Sump Tk. T-402						
PCV	402	Pressure Control Valve, for P-402						
SV	402	Solenoid Valve, P-402						
LSH	403	Level Switch, High, Sump Tk. T-403						
LSL	403	Level Switch, Low, Sump Tk. T-403						
PCV	403	Pressure Control Valve, for P-404						
SV	403	Solenoid Valve, P-403						
LSH	404	Level Switch, High, Sump Tk. T-404						
LSL	404	Level Switch, Low, Sump Tk. T-404						
PCV	404	Pressure Control Valve, for P-405						
SV	404	Solenoid Valve, P-404						
LSH	405	Level Switch, High, Sump Tk. T-405						
LSL	405	Level Switch, Low, Sump Tk. T-405						
PCV	405	Pressure Control Valve, for P-405						
SV	405	Solenoid Valve, P-405						
LSH	406	Level Switch, High, Sump Tk. T-406						
LSL	406	Level Switch, Low, Sump Tk. T-406						
PCV	406	Pressure Control Valve, for P-406						
SV	406	Solenoid Valve, P-406						
LSH	407	Level Switch, High, Sump Tk. T-407						
LSL	407	Level Switch, Low, Sump Tk. T-407						
LSH	408	Level Switch, High, Sump Tk. T-408						
LSL	408	Level Switch, Low, Sump Tk. T-408						

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST - INSTRUMENTATION

P & I D: 03-04-013 INSTRUMENT AIR SYSTEM

FUNCTION	TAG #	LOCATION	DCS/PLC I/O TC	AC DI	DC DI	DO	AI	AO
F	401	Coalescing Filter, 5 Micron						
KIS	401	Blowdown Timer, Air Receiver V-401						
MOV	401	Blowdown Valve, Air Receiver V-401						
PAL	401	DCS						
PCS	401	DCS						
PI	401	Pressure Gauge, 0-150 psig						
PI	401	DCS						
PIT	401	Pressure Transmitter, Air Receiver V-401					1	
PRV	401	Pressure Relief Valve, @ 125 psig						
PI	401A	Pressure Gauge, 0-150 psig						
DR	401A/B	Drier, PSA Type, Dew Point = -40 deg F.						
F	402	Coalescing Filter, 0.5 Micron						
PI	402A	Pressure Gauge, 0-150 psig						
PI	402B	Pressure Gauge, 0-150 psig						
F	403	Particulate Filter, 1 Micron						
PI	403	Pressure gauge, 0-150 psig						
PI	404	Pressure Gauge, 0-150 psig						
TI	404	Temperature Indicator, 0-400 deg. F.						
PI	405	Pressure Gauge, 0-150 psig						
TI	405	Temperature Indicator, 0-400 deg. F.						

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P&ID: 32-03-713-D SUB-X INCINERATOR

Function	Tag #	LOCATION	DCS/PLC I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
PI	07A	PRESSURE GAUGE, NATURAL GAS						
PCV	06	PRESSURE CONTROL VALVE, NATURAL GAS (0–100%)						
PI	07B	PRESSURE GAUGE, NATURAL GAS						
PSLL	08	PRESSURE SWITCH: LOW LOW NATURAL GAS			1			
PSL	08	PRESSURE SWITCH: LOW NATURAL GAS			1			
FE	09	FLOW ELEMENT, NATURAL GAS						
FIT	09	FLOW TRANSMITTER, NATURAL GAS					1	
XV	10A	BLOCK VALVE, NATURAL GAS						
ZSC	10A	POSITION SWITCH: CLOSED			1			
XV	10B	BLOCK VALVE, NATURAL GAS						
ZSC	10B	POSITION SWITCH: CLOSED			1			
XV	10C	BLOCK VALVE, NATURAL GAS						
PI	07C	PRESSURE GAUGE, NATURAL GAS						
PSH	11	NATURAL GAS PRESSURE SWITCH: HIGH–HIGH			2			
PSHH	11	NATURAL GAS PRESSURE SWITCH: HIGH						
FCV	09	CONTROL VALVE, NATURAL GAS						
FY	09	TRANSDUCER I/P						
ZSL	09	POSITION SWITCH: LIMIT			1			
PI	07D	PRESSURE GAUGE, NATURAL GAS						
PCV	06B	PRESSURE CONTROL VALVE, NATURAL GAS						
PI	07E	PRESSURE GAUGE, PILOT GAS						
XV	10D	BLOCK VALVE, PILOT GAS						
XV	10E	BLOCK VALVE, PILOT GAS						
XV	10F	BLOCK VALVE, PILOT GAS						
PCV	06C	PRESSURE CONTROL VALVE, PILOT GAS						
FI	06C	FLOW INDICATOR, PILOT GAS						
PI	07F	PRESSURE GAUGE, PILOT GAS						
BI	33A	BURNER INDICATOR						
BI	33B	BURNER INDICATOR						
BE	33A	BURNER ELEMENT: PILOT			1	1	1	
BSL	33A	BURNER SWITCH LOW: PILOT						
BE	33B	BURNER ELEMENT: PILOT			1	1	1	
BSL	33B	BURNER SWITCH LOW: PILOT						
PDI	32	PRES. DIFF. INDICATOR: BURNER						
PIT	31	PRES TRANSMITTER: BURNER					1	
TE	34A	TEMPERATURE ELEMENT, SQI CHAMBER						
TE	34B	TEMPERATURE ELEMENT, SQI CHAMBER						
TE	34C	TEMPERATURE ELEMENT, SQI CHAMBER						
TE	35A	TEMPERATURE ELEMENT, REFRACTORY		1				

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P&ID: 32-03-713-D SUB-X INCINERATOR

Function	Tag #	LOCATION	DCS/PLC I/O					
			TC	AC DI	DC DI	DO	AI	AO
TISH	35A	TEMP SWITCH: HIGH				1		
TE	35B	TEMPERATURE ELEMENT, REFRACTORY		1				
XV	17A	BLOCK VALVE: COMBUSTION AIR INLET						
XY	17A	TRANSDUCER					1	
ZSC	17A	POSITION SWITCH: CLOSED				1		
ZSO	17A	POSITION SWITCH: OPEN				1		
PI	19	PRESSURE GAUGE: COMBUSTION AIR FLOW						
PSL	17	PRES SWITCH:LOW COMBUSTION AIR						
PSLL	17	PRES SWITCH:LOW-LOW COMBUSTION AIR						
XV	17	BLOCK VALVE: COMBUSTION AIR						
XY	17	TRANSDUCER				1		
ZSC	17	POSITION SWITCH: CLOSED			1			
ZSO	17	POSITION SWITCH: OPEN			1			
FE	16	FLOW ELEMENT: BURNER COMB AIR						
FIT	16	FLOW TRANSMITTER: BURNER COMB AIR					1	
FE	30	FLOW ELEMENT: CHAMBER COMB AIR						
FIT	30	FLOW TRANSMITTER: CHAMBER COMB AIR					1	
FCV	16	FLOW CONTROL VALVE: BURNER COMB AIR						
FY	16	TRANSDUCER I/P						
ZSL	16	POSITION SWITCH: LOW				1		
ZSH	16	POSITION SWITCH: HIGH				1		
FCV	30	FLOW CONTROL VALVE: CHAMBER COMB AIR						
FY	30	TRANSDUCER I/P						
ZSL	30	POSITION SWITCH: LOW				1		
ZSH	30	POSITION SWITCH: HIGH				1		
PSL	20	COMB. AIR PRESSURE SWITCH						
PSLL	20	COMB. AIR PRESSURE SWITCH				1		

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P&ID: 32–03–713–D SUB–X Incinerator

Sheet 2 of 6

Function	Tag #	LOCATION	DCS/PLC I/O					
			TC	AC DI	DC DI	DO	AI	AO
PI	22	PRESSURE GAUGE: HOT WATER LINE						
PSL	22	PRESSURE SWITCH: HOT WATER LOW						
PSLL	22	PRESSURE SWITCH: HOT WATER LOW–LOW			1			
XV	22	BLOCK VALVE: HOT WATER			1	1		
XY	22	TRANSDUCER				1		
ZSC	22	POSITION SWITCH: CLOSED			2			
ZSO	22	POSITION SWITCH: OPEN			2			
PDIT	29	PRESSURE DIFF. TRANSMITTER, WASTE FEED					1	
PI	28A	PRESSURE GAUGE: P–201A DISCHARGE						
PI	28B	PRESSURE GAUGE: P–201B DISCHARGE						
XV	5	BLOCK VALVE: WASTE FEED						
XY	5	TRANSDUCER						
ZSO	5	POSITION SWITCH: OPEN			1			
ZSC	5	POSITION SWITCH: CLOSED			1			
PIT	28	PRESSURE GAUGE: WASTE FEED					1	
PSL	24	PRESSURE SWITCH: WASTE FEED LOW						
PSLL	24	PRESSURE SWITCH: WASTE FEED LOW–LOW						
FE	04A	FLOW ELEMENT: WASTE FEED						
FIT	04A	FLOW TRANSMITTER: WASTE FEED					1	
XV	26	BLOCK VALVE: WASTE FEED						
XY	26	TRANSDUCER				1		
ZSO	26	POSITION SWITCH: OPEN			1			
ZSC	26	POSITION SWITCH: CLOSED			1			
XV	22A–E	BLOCK VALVE: WASTE FEED NOZZLE A–E			1			
XY	22A–E	TRANSDUCER				1		
ZSC	22A–E	POSITION SWITCH: CLOSED			2			
ZSO	22A–E	POSITION SWITCH: OPEN			2			
FE	22A–E	FLOW ELEMENT						
FIT	22A–E	FLOW TRANSMITTER: NOZZLE A–E					1	
FCV	22A–E	FLOW CONTROL VALVE: NOZZLE A–E						
FY	22A–E	TRANSDUCER						1
PIT	27A–E	PRESSURE TRANSMITTER: NOZZLE A–E					1	
FE	04B	FLOW ELEMENT (80% FLOW TO TK–105 AND 106))						
FIT	04B	FLOW TRNSMTR (80% FLOW TO TK–105 AND 106))						
PCV	28	PRES CNTRL VALVE:80% WASTE TO TK–105 & 106						
PY	28	TRANSDUCER						1
PI	12	PRESSURE GAUGE: ATOMIZING AIR						
PSL	13	PRESSURE SWITCH:LOW ATOMIZING AIR			1			
PSLL	13	PRESSURE SWITCH:LOW–LOW ATOMIZING AIR			1			
XV	14	BLOCK VALVE: ATOMIZING AIR			1			
XY	14	TRANSDUCER				1		
ZSO	14	POSITION SWITCH: OPEN			2			
ZSC	14	POSITION SWITCH: CLOSED			2			
XV	66	BLOCK VALVE: ATOMIZING AIR			1			
XY	66	TRANSDUCER				1		

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P&ID: 32-03-713-D SUB-X Incinerator

Sheet 2 of 6

Function	Tag #	LOCATION	TC	AC DI	DC DI	DO	AI	AO
			DCS/PLC I/O					
ZSC	66	POSITION SWITCH: OPEN			1			
ZSO	66	POSITION SWITCH: CLOSED			1			
FE	15A-E	FLOW ELEMENT A-E						
FIT	15A-E	FLOW TRANSMITTER: ATOMIZING AIR NOZZLE A-E					1	
PIT	18A-E	PRES TRNSMTR: ATOMIZING AIR NOZZLE A-E					1	
XV	21A-E	BLOCK VALVE: ATOMIZING AIR NOZZLE A-E			1			
XY	21A-E	TRANSDUCER				1		
ZSC	21A-E	POSITION SWITCH: CLOSED			2			
ZSO	21A-E	POSITION SWITCH: OPEN			2			
TI	01	TEMPERATURE GAUGE: SAT'D STEAM						
TW	01	THERMOWELL: SAT'D STEAM						
PI	45	PRESSURE INDICATOR:SAT'D STEAM						
PSL	02	PRESSURE SWITCH: SAT'D STEAM LOW			1			
PSLL	02	PRESSURE SWITCH: SAT'D STEAM LOW-LOW			1			
XV	25	BLOCK VALVE:SAT'D STEAM			1			
XY	25	TRANSDUCER				1		
ZSO	25	POSITION SWITCH: OPEN			2			
ZSC	25	POSITION SWITCH: CLOSED			2			
PI	45A-E	PRES GAUGE:ATOMIZING STEAM NOZZLE A-E						
PIT	45A-E	PRES TRANSM: ATOMIZING STEAM NOZZLE A-E					1	
FE	76A-E	FLOW ELEMENT: ATOMIZING STEAM NOZZLE A-E						
FIT	76A-E	FLOW TRANSM: ATOMIZING STEAM NOZZLE A-E					1	
LSL	85A	LEVEL SWITCH: P201A SEAL FLUSH LOW		1				
LSL	85B	LEVEL SWITCH: P201B SEAL FLUSH LOW		1				
PB		AQUEOUS WASTE PUSH BUTTON C-STAT		2				
PB		PUMP SELECT OVERRIDE P.B.		1				
		ATOMIZING AIR BYPASS TO WASTE SWITCH		1				
		SWITCH: TANK VAPOR		1				
		SWITCH: TANK VAPOR AUTO		1				
		SWITCH: TANK VAPOR CLOSED		1				

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST - INSTRUMENTATION

P&ID: 32-03-713-D SUB-X Incinerator

Sheet 3 of 6

Function	Tag #	LOCATION	DCS/PLC I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
PI	36A	PRESSURE GAUGE: P-207A DISCHARGE						
PI	36B	PRESSURE GAUGE: P-207B DISCHARGE						
XV	37	BLOCK VALVE:SOFTENED H2O						
XY	37	TRANSDUCER						
ZSC	37	POSITION SWITCH: CLOSED			1			
ZSO	37	POSITION SWITCH: OPEN			1			
PI	36C	PRESSURE GAUGE: SOFTENED H2O						
PSL	38	PRESSURE SWITCH:SOFTENED H2O LOW						
PSLL	38	PRESSURE SWITCH:SOFTENED H2O LOW-LOW						
FE	39	FLOW ELEMENT						
FIT	39	FLOW TRANSMITTER:QUENCH TANK MAKEUP H2O						
FCV	39	FLOW CONTROL VALVE:						
FY	39	TRANSMITTER: I/P						
ZSL	39	POSITION SWITCH:			1			
XV	40	BLOCK VALVE: QUENCH TANK MAKEUP H2O			1			
XY	40	TRANSDUCER				1		
ZSO	40	POSITION SWITCH: OPEN			2			
ZSC	40	POSITION SWITCH: CLOSED			2			
FE	48	FLOW ELEMENT: SCRUBBER MAKEUP						
FIT	48	FLOW TRANSMITTER: SCRUBBER MAKEUP					1	
FCV	48	FLOW CONTROL VALVE: SCRUBBER MAKEUP						
FY	48	TRANSDUCER: I/P					1	
FE	62	FLOW ELEMENT: SCRUBBER/VENTURI RECYCLE						
FISL	39	FLOW SWITCH: QUENCH MAKEUP H20 LOW			1			
FIT	62	FLOW TRANSMITTER: SCRUBBER/VENTURI RECYCLE					1	
PI	42A	PRESSURE GAUGE: P-208A DISCHARGE						
PI	42B	PRESSURE GAUGE: P-208B DISCHARGE						
XV	23	BLOCK VALVE: CAUSTIC FEED						
XY	23	TRANSDUCER						
ZSO	23	POSITION SWITCH: OPEN				1		
ZSC	23	POSITION SWITCH: CLOSED				1		
FE	41	FLOW ELEMENT:QUENCH TANK CAUSTIC FEED						
FIT	41	FLOW TRANSMITTER: QUENCH TANK CAUSTIC FEED					1	
ACV	64	CONTROL VALVE: QUENCH TANK CAUTIC FEED						
AY	64	TRANSDUCER: I/P						
ZSC	64	POSITION SWITCH: CLOSED						
ZSO	64	POSITION SWITCH: OPEN						
FE	41A	FLOW ELEMENT: 80% CAUSTIC STORAGE						
FIT	41A	FLOW TRANSMITTER: 80% CAUSTIC STORAGE					1	

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST - INSTRUMENTATION

P&ID: 32-03-713-D SUB-X Incinerator

Sheet 3 of 6

Function	Tag #	LOCATION	DCS/PLC I/O					
			TC	AC DI	DC DI	DO	AI	AO
FCV	41A	FLOW CONTROL VALVE: 80% CAUSTIC STORAGE						
FY	41A	TRANSDUCER: I/P					1	
PDIT	61	PRESSURE DIFFERENTIAL TRANSMITTER: QUENCH RECIRC					1	
PI	43C	PRESSURE GAUGE: P-205A DISCHARGE						
PI	43D	PRESSURE GAUGE: P-205B DISCHARGE						
XV	87A	BLOCK VALVE: QUENCH RECIRC LINE A						
XY	87A	TRANSDUCER						
ZSC	87A	POSITION SWITCH: CLOSED				1		
ZSO	87A	POSITION SWITCH: OPEN			1			
XV	87B	BLOCK VALVE: QUENCH RECIRC LINE B						
XY	87B	TRANSDUCER						
ZSC	87B	POSITION SWITCH: CLOSED				1		
ZSO	87B	POSITION SWITCH: OPEN				1		
FE	87	FLOW ELEMENT: QUENCH RECIRC						
FIT	87	FLOW TRANSMITTER: QUENCH RECIRC						
LSL	80A	LEVEL SWITCH: SEAL FLUSH LOW (P-205A)				1		
LSL	80B	LEVEL SWITCH: SEAL FLUSH LOW (P-205B)				1		
PSL	61A	PRESSURE SWITCH:P207A SEAL FLUSH PRESSURE LOW				1		
PSL	61B	PRESSURE SWITCH:P207A SEAL FLUSH PRESSURE LOW				1		
PSL	75A	PRESSURE SWITCH:P208A SEAL FLUSH PRESSURE LOW				1		
PSL	75B	PRESSURE SWITCH:P208B SEAL FLUSH PRESSURE LOW				1		
LSL	61A	LEVEL SWITCH:P207A SEAL FLUSH LEVEL LOW				1		
LSL	61B	LEVEL SWITCH:P207B SEAL FLUSH LEVEL LOW				1		
LSL	75A	LEVEL SWITCH:P208A SEAL FLUSH LEVEL LOW				1		
LSL	75B	LEVEL SWITCH:P208B SEAL FLUSH LEVEL LOW				1		

ROCKY MOUNTAIN ARSENAL MOUNTAIN, BASIN F LIQUID INCINERATION PROJECT

EQUIPMENT LIST – INSTRUMENTATION

P&ID: 32-03-713-D SUB-X Incinerator

Sheet 4 of 6

Function	Tag #	LOCATION	DCS/PLC I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
PI	47	PRESSURE GAUGE: QUENCH SEPARATOR ENTRANCE GAS						
TE	46	TEMPERATURE ELEMENT: QUENCH SEPERATOR	1					
TW	46	THERMOWELL: QUENCH SEPARATOR						
LIT	50	LEVEL TRANSMITTER: QUENCH SEPARATOR					1	
LSHH	50	LEVEL SWITCH: QUENCH SEPERATOR HIGH-HIGH			1			
LSLL	50	LEVEL SWITCH: QUENCH SEPERATOR LOW-LOW			1			
PDIT	55	PRES DIFF TRANSMITTER:QUENCH RECYCLE					1	
PI	43A	PRESSURE GAUGE: P-202A DISCHARGE						
PI	43B	PRESSURE GAUGE: P-202B DISCHARGE						
XV	78A	BLOCK VALVE:P-202A DISCHARGE						
XY	78A	TRANSDUCER						
ZSC	78A	POSITION SWITCH: CLOSED			1			
ZSO	78A	POSITION SWITCH: OPEN			1			
XV	78B	BLOCK VALVE:P-202B DISCHARGE						
XY	78B	TRANSDUCER						
ZSC	78B	POSITION SWITCH: CLOSED			1			
ZSO	78B	POSITION SWITCH: OPEN			1			
AE	59A	pH SENSOR						
AIT	59A	pH TRANSMITTER						
AE	59B	pH SENSOR						
AIT	59B	pH TRANSMITTER						
FE	57	FLOW ELEMENT:						
FIT	57	FLOW TRANSMITTER:QUENCH RECYCLE					1	
PI	57	PRESSURE GAUGE:QUENCH RECYCLE						
FCV	58	FLOW CONTROL VALVE:QUENCH RECYCLE TO BRINE TANKS						
FY	58	TRANSMITTER: I/P						
ZSL	58	POSITION SWITCH:						
PI	64C	PRESSURE GAUGE:SOFTENED DOMESTIC H2O						
PI	64A	PRESSURE GAUGE:SOFTENED DOMESTIC H2O						
PI	64B	PRESSURE GAUGE:SOFTENED DOMESTIC H2O						
AE	64A	pH SENSOR						
AIT	64A	pH TRANSMITTER: DOMESTIC H2O TO QUENCH SEPER .TOR					1	
AE	64B	pH SENSOR						
AIT	64B	pH TRANSMITTER: DOMESTIC H2O TO QUENCH SEPERATOR					1	
PI	49A	PRESSURE GAUGE: VENTURI SPRAY						
FE	60	FLOW ELEMENT: VENTURI SPRAY						

ROCKY MOUNTAIN ARSENAL MOUNTAIN, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST - INSTRUMENTATION

P&ID: 32-03-713-D SUB-X Incinerator
Sheet 4 of 6

Function	Tag #	LOCATION	DCS/PLC I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
FIT	60	FLOW TRANSMITTER: VENTURI SPRAY					1	
FCV	60	FLOW CONTROL VALVE: VENTURI SPRAY						
FY	60	TRANSDUCER: I/P						1
PI	49B	PRESSURE GAUGE: VENTURI SPRAY						
PI	49C	PRESSURE GAUGE:VENTURI SPRAY						
PI	49D	PRESSURE GAUGE:VENTURI SPRAY						
LSL	74A	LEVEL SWITCH: P202A SEAL FLUSH LOW			1			
LSL	74B	LEVEL SWITCH: P202B SEAL FLUSH LOW			1			
FISL	57	FLOW SWITCH: QUENCH RECYCLE FLOW LOW			1			
TW	63	THERMOWELL: VENTURI SUMP						
TE	63	TEMP ELEMENT: VENTURI SUMP						
TW	52A	THERMOWELL: QUENCH EXIT GAS						
TE	52A	TEMP ELEMENT: QUENCH EXIT GAS	1					
TW	52B	THERMOWELL: QUENCH EXIT GAS						
TE	52B	TEMP ELEMENT: QUENCH EXIT GAS	1					
PDIT	53	PRES DIFF TRANSMITTER: VENTURI					1	
P4	53	PRESSURE ELEMENT: VENTURI						1
P201A		LIQUID WASTE FEED PUMP A		1	57	2		
P201B		LIQUID WASTE FEED PUMP B		1	57	2		
B201A		COMBUSTION AIR FAN		1	57	1		
B201B		EMERGENCY AIR BLOWER		1	57	1		
C201A		ATOMIZING AIR FAN		1	57	1		
P202A		QUENCH RECYCLE PUMP A		1	5	2		
P202B		QUENCH RECYCLE PUMP B		1	5	2		
P203A		SCRUBBER/VENTURI RECYCLE PUMP A		1	5	2		
P203B		SCRUBBER/VENTURI RECYCLE PUMP B		1	5	2		
P205A		QUENCH RECIRCULATION PUMP A		1	5	2		
P205B		QUENCH RECIRCULATION PUMP B		1	5	2		
PSL85A		P-201A PRESSURE SWITCH: LOW			1			
PSL85B		P-201B PRESSURE SWITCH: LOW			1			
PSL74A		P-202A PRESSURE SWITCH: LOW			1			
PSL74B		P-202B PRESSURE SWITCH: LOW			1			
PSL81A		P-203A PRESSURE SWITCH: LOW			1			
PSL81B		P-203B PRESSURE SWITCH: LOW			1			
PSL80A		P-205 PRESSURE SWITCH: LOW			1			
PSL80B		P-205 PRESSURE SWITCH: LOW			1			

ROCKY MOUNTAIN ARSENAL MOUNTAIN, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST - INSTRUMENTATION

P&ID: 32-03-713-D SUB-X Incinerator

Sheet 4 of 6

Function	Tag #	LOCATION	DCS/PLC I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
TISH	52A	TEMP. SWITCH: QUENCH OUTLET TEMP. HIGH			1			
TISH	52B	TEMP. SWITCH: QUENCH OUTLET TEMP. HIGH			1			

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST - INSTRUMENTATION

P&ID: P&ID: 32-03-713-D SUB-X Incinerator
Sheet 5 of 6

Function	Tag #	LOCATION	DCS/PLC I/O TC	AC DI	DC DI	DO	AI	AO
PI	51A	PRESSURE GAUGE: DEMISTER FLUSH						
XV	54	BLOCK VALVE: DEMISTER FLUSH						
XY	54	TRANSDUCER		1	1			
ZSO	54	POSITION SWITCH: OPEN		2				
ZSC	54	POSITION SWITCH: CLOSED		2				
PI	51B	PRESSURE GAUGE: DEMISTER FLUSH						
FCV	56	FLOW CONTROL VALVE: 20% CAUSTIC TO SCRUBBER						
FY	56	TRANSDUCER: I/P					1	1
ZSC	56	POSITION SWITCH: CLOSED						
ZSO	56	POSITION SWITCH: OPEN						
FE	65	FLOW ELEMENT:20% CAUSTIC TO SCRUBBER						
FIT	65	FLOW TRANSMITTER:20% CAUSTIC TO SCRUBBER					1	
FCV	65	FLOW CONTROL VALVE: 20% CAUSTIC TO SCRUBBER						
FY	65	TRANSDUCER: I/P						2
LIT	62	LEVEL TRANSMITTER: SCRUBBER					1	
PDIT	66A	PRES DIFF TRANSMITTER: SCRUBBER					1	
PDIT	66B	PRES DIFF TRANSMITTER: SCRUBBER					1	
PI	82A	PRESSURE GAUGE: P-203A DISCHARGE						
PI	82B	PRESSURE GAUGE: P-203B DISCHARGE						
XV	79A	BLOCK VALVE: P-203A DISCHARGE						
XY	79A	TRANSDUCER						
FSLL	65	FLOW SWITCH: SCRUBBER RECYCLE FLOW LOW LOW			1			
ZSO	79A	POSITION SWITCH: OPEN			1			
ZSC	79A	POSITION SWITCH: CLOSED			1			
XV	79B	BLOCK VALVE: P-203B DISCHARGE						
XY	79B	TRANSDUCER						
ZSO	79B	POSITION SWITCH: OPEN			1			
ZSC	79B	POSITION SWITCH: CLOSED			1			
PI	56	PRESSURE GAUGE: DOMESTIC H2O TO SCRUBBER						
PI	56A	PRESSURE GAUGE: DOMESTIC H2O TO SCRUBBER						
PI	56B	PRESSURE GAUGE: DOMESTIC H2O TO SCRUBBER						
AE	56B	pH SENSOR: SCRUBBER/VENTURI RECYCLE						
AIT	56B	pH TRANSMITTER: SCRUBBER/VENTURI RECYCLE					2	
AE	56A	pH SENSOR: SCRUBBER/VENTURI RECYCLE						
AIT	56A	pH TRANSMITTER: SCRUBBER/VENTURI RECYCLE					2	
FI	56B	FLOW INDICATOR:SCRUBBER/VENTURI RECYCLE						
FI	56A	FLOW INDICATOR:SCRUBBER/VENTURI RECYCLE						
FCV	62	FLOW CONTROL VALVE: SCRUBBER/RECYCLE TO QUENCH						
FY	62	TRANSDUCER: I/P						2

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P&ID: P&ID: 32-03-713-D SUB-X Incinerator
Sheet 5 of 6

Function	Tag #	LOCATION	DCS/PLC I/O					
			TC	AC DI	DC DI	DO	AI	AO
AE	30	OXYGEN SENSOR: CEM						
AIT	30A	OXYGEN TRANSMITTER: CEM					1	
AIT	30B	OXYGEN TRANSMITTER: CEM					1	
AE	68	THC SENSOR: CEM						
AIT	68A	THC TRANSMITTER: CEM					1	
AIT	68B	THC TRANSMITTER: CEM					1	
AE	69	NOX SENSOR: CEM						
AIT	69A	NOX TRANSMITTER: CEM					1	
AIT	69B	NOX TRANSMITTER: CEM					1	
AE	70	CO SENSOR: CEM						
AIT	70A	CO TRANSMITTER: CEM					1	
AIT	70B	CO TRANSMITTER: CEM					1	
AE	71	SO2 SENSOR: CEM						
AIT	71A	SO2 TRANSMITTER: CEM					1	
AIT	71B	SO2 TRANSMITTER: CEM					1	
AE	72	HCL SENSOR: CEM						
AIT	72A	HCL TRANSMITTER: CEM					1	
AIT	72B	HCL TRANSMITTER: CEM					1	
AE	31	CO2 SENSOR: CEM					1	
AIT	31A	CO2 TRANSMITTER: CEM					1	
AIT	31B	CO2 TRANSMITTER: CEM						
TW	73A	THERMOWELL: SCRUBBER EXIT GAS	1					
TE	73A	TEMPERATURE ELEMENT: SCRUBBER EXIT GAS						
TW	73B	THERMOWELL: SCRUBBER EXIT GAS	1					
TE	73B	TEMPERATURE ELEMENT: SCRUBBER EXIT GAS						
TW	95A	THERMOWELL: STACK EXIT GAS						
TE	95A	TEMPERATURE ELEMENT: STACK EXIT GAS	1					
TW	95B	THERMOWELL: STACK EXIT GAS						
TE	95B	TEMPERATURE ELEMENT: STACK EXIT GAS	1					
LSL	81A	LEVEL SWITCH: P203A SEAL FLUSH LOW			1			
LSL	81B	LEVEL SWITCH: P203B SEAL FLUSH LOW			1			
ASH	70A	STACK LOW LEVEL HIGH						
ASH	70B	STACK LOW LEVEL HIGH						
ASL	30A	STACK 02 LEVEL LOW						
ASL	30B							
EF	126	INCINERATOR AIR EXHAUST FAN		2	1	1		
EF	120	BOILER ROOM EXHAUST FAN		2	1	1		
EF	122	MAINTENANCE AREA EXHAUST FAN		2	1	1		
EF	123	INCINERATOR EXHAUST FAN		2	1	1		

ROCKY MOUNTAIN ARSENAL, BASIN F LIQUID INCINERATION PROJECT
EQUIPMENT LIST – INSTRUMENTATION

P&ID: P&ID: 32-03-713-D SUB-X Incinerator
Sheet 5 of 6

Function	Tag #	LOCATION	DCS/PLC I/O					
				AC	DC			
			TC	DI	DI	DO	AI	AO
EF	124	INCINERATOR EXHAUST FAN		2	1	1		
EF	125	INCINERATOR EXHAUST FAN		2	1	1		
EF	127	COMPRESSOR ROOM EXHAUST FAN		2	1	1		
SF	121	COMPRESSOR ROOM SUPPLY FAN		2	1	1		
P408		CONTAMINATED H2 TRANSFER PUMP, P408		2	1			
MCC	1C	NORMAL XTFR SWITCH			1			
MCC	1C	EMERGENCY XTFR SWITCH			1			
JT501		MCC-1A KWH					1	
JT502		MCC-1B KWH					1	
JT503		MCC-1C KWH					1	
JT504		MCC-1D KWH					1	

APPENDIX C

TYPICAL EQUIPMENT PUNCH LISTS

APPENDIX C.1

TYPICAL PUMP/COMPRESSOR/BLOWER CHECKOUT PUNCH LIST

Date: 9 July 1992
Revision No.: 4

TYPICAL PUMP/COMPRESSOR/BLOWER CHECKOUT PUNCH LIST

Equipment Tag No. ______________________

Description ______________________

Plant Location ______________________

Manufacturer/Model No. ______________________

Checkout Personnel ______________________

Checkout Date ______________________

______ Equipment pad (foundation) inspected for cracks and uneven settling.

______ Anchor bolts firmly mounted.

______ External equipment bolts, screws, etc. are tight.

______ Inspection covers, motor guards, and fan and ductwork access doors have been closed and properly tightened.

______ Prior to compressor startup, air lines have been disconnected to all compressed air users.

______ Air lines bled prior to reconnecting.

______ Pneumatic fittings pressurized and checked for leaks.

______ Drive alignment has been checked and tolerances are within those specified by the manufacturer.

Reading 1 ______________

Reading 2 ______________

Reading 3 ______________

______ Piping is supported independently of the pump/compressor/ blower.

______ Rotation of the motor has been checked (bumped) before connecting the shaft coupling.

__________ Drive has been coupled.

__________ Lubricating oil equal to that specified by the manufacturer.

__________ Lubrication levels have been checked.

__________ Mechanical seals have been flushed and checked.

__________ Drive system has been manually rotated in both directions for freedom of movement.

__________ Stroke lengths of all metering pumps should be set to zero. After checking for correct "zero stroke" setting, the required stroke is set.

__________ Equipment connections tested for leaks.

__________ Equipment checked while operating for correct wheel rotation, excessive vibration, and unusual noise.

__________ Tag has been installed and dated on equipment.

Additional Descriptive Data and Comments ______________________________

____

____

____

____

____
Checkout Engineer Date

____
Chief Startup Engineer Date

APPENDIX C.2

TYPICAL TANK CHECKOUT PUNCH LIST

Date: 9 July 1992
Revision No.: 4

TYPICAL TANK CHECKOUT PUNCH LIST

Equipment Tag No. ______________________

Description ______________________

Plant Location ______________________

Manufacturer/Model No. ______________________

Checkout Personnel ______________________

Checkout Date ______________________

______ Tank pad (foundation) inspected for cracks and uneven settling.

______ Concrete floor and curbing for secondary containment (if applicable) structurally intact.

______ Tank spillage flows to the appropriate collection sump.

______ Tank internal linings (if applicable) are structurally intact without punctures, tears, or cracks. Seams have been inspected and tested.

______ The tank has been visually inspected for stress corrosion around weld seams, joints, and fixtures.

______ The tank has been visually inspected for cracks, buckles, bulges, and discolored paint which would indicate leakage. Cracks are normally found at nozzle connections, in welded seams and underneath rivets.

______ All valves in the tank system have been visually inspected to ensure that the seating surfaces are in good condition.

______ The tank has been water tested to evaluate leakage and test overfill controls and instruments including:

Flow Rate Controls ______
Level Controls ______
Temperature Gauges ______
Control Valves ______
Alarms and Interlocks ______
Analyzers ______

______ Tag has been installed and dated on tank.

Additional Descriptive Data and Comments ______________________

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____
Checkout Engineer Date

____
Chief Startup Engineer Date

APPENDIX C.3

TYPICAL VALVE/PIPE/FITTING/HOSE CHECKOUT PUNCH LIST

Date: 9 July 1992
Revision No.: 4

TYPICAL VALVE/PIPE/FITTING/HOSE/CHECKOUT PUNCH LIST

Equipment Tag No. ____________________

Description ____________________

Plant Location ____________________

Manufacturer/Model No. ____________________

Checkout Personnel ____________________

Checkout Date ____________________

____________ Process piping has been properly aligned and fully supported externally.

____________ Flanged pipe sections have been securely fastened with rubber gaskets between flanged ends.

____________ Piping site glasses have been installed where specified.

____________ Heat tracing has been included and is operational where specified.

____________ Pipe supports/racks are structurally sound.

____________ Piping has been water tested and is operational.

____________ Valve has been properly fastened on both the enter and exit ends.

____________ The valve range of motion has been manually tested.

____________ Electronic valve indicator controls have been tested.

____________ Valve has been water tested for flow accuracy and evidence of leakage.

____________ Hose has been inspected for punctures, cracks, or tears.

____________ Hose has been securely fastened and does not leak during water testing.

Date: 9 July 1992
Revision No.: 4

Additional Descriptive Data and Comments ______________________________

____

____

____

____

Checkout Engineer Date

Chief Startup Engineer Date

APPENDIX C.4

TYPICAL INSTRUMENT CHECKOUT PUNCH LIST

Date: 9 July 1992
Revision No.: 4

TYPICAL INSTRUMENT CHECKOUT PUNCH LIST

Instrument Tag No. ______________________________

Description ______________________________

Plant Location ______________________________

Manufacturer/Model No. ______________________________

Checkout Personnel ______________________________

Checkout Date ______________________________

__________ Instrument has been properly located and is securely fastened.

__________ Instrument range of motion has been manually tested.

__________ Field mounted control devices have been wired correctly.

__________ Electrical control circuits have been checked out.

__________ Instrumentation interlocks have been checked out.

__________ Instrument has been properly calibrated and the Instrument Calibration Record (attached) completed.

__________ Instrument has been water tested for measurement accuracy.

__________ Instrument tag has been installed and dated.

Additional Descriptive Data and Comments ______________________________

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____
Checkout Engineer Date

____
Chief Startup Engineer Date

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APPENDIX D

STACK SAMPLING TEAM QUALIFICATIONS AND EXPERIENCE

INTRODUCTION

All emissions testing to be performed in association with the startup and trial burn at RMA will be performed by WESTON's stack sampling team. This team, under the field direction of Mr. Jeffrey O'Neill, has many years of emissions testing experience, including startup and trial burn programs. Attached are the professional profiles of the stack sampling team personnel most likely to be involved with the SQI startup and trial burn. These professional profiles outline the credentials and experience summaries of the individual team members. Approximately 10 members of WESTON's stack sampling team will be required on-site during startup and trial burn activities.

PROFESSIONAL PROFILE

JEFFREY D. O'NEILL

Fields of Competence

Source emissions testing; continuous emission monitoring (CEM) surveys; ambient air sampling surveys; development of testing equipment; repair and calibration of apparatus; analyses of air pollution, wastewater, and soil samples; inflow and infiltration studies; stream surveys; municipal wastewater sewer inspection and construction; energy audits; meteorological instrumentation operation.

Experience Summary

- Sixteen years experience in the performance, direction, and scheduling of air contaminant measurement activities, including supervision of source emission testing, hazardous waste incineration trial burns, ambient air sampling, industrial hygiene sampling, fugitive and visible emissions evaluations for a variety of industrial clients and governmental agencies.

- Industrial experience in source emissions testing includes hazardous waste incinerators, fossil fuel-fired steam generators, municipal incinerators, resource recovery facilities, petroleum refineries and petrochemical plants, iron and steel mills, slag plants, experimental incinerators, intermediate boilers, industrial surface coating facilities, synthetic organic chemical plants, wood products facilities, pulp and paper mills, glass manufacturing plants, pharmaceutical facilities, stone crushing facilities, metal fabrication facilities, food processing facilities, clay processing plants, and uranium, copper, and bauxite ore processing plants.

- Specific duties relating to survey conduct are pre-test protocol or trial burn plan development, client coordination, project scheduling, planning and preparation, sampling and data handling, calculations of results and final report writing.

- Responsible for authorship of quality assurance/quality control plans for trial burn test programs.

- Experience in the performance and direction of wastewater sampling, conducting inflow and infiltration studies, and inspection and construction of municipal wastewater sewer systems.

- Experience in the analysis of air contaminants and wastewater samples. Also development, repair, and calibration of air pollution measurement equipment, including operation of ambient air and continuous emission monitoring equipment.

PROFESSIONAL PROFILE

JEFFREY D. O'NEILL
(continued)

Credentials

A.A.S. in both Environmental Engineering and Chemical Laboratory Analyses -- Delaware Technical and Community College (1974)
Source Sampling Seminar (RAC) -- Certificate
Source Evaluation Society (SES) -- Member
Visible Emissions Evaluation (EPA Method 9) -- Certificate
General Health and Safety Training (U.S. Department of Labor) -- Certificate

Key Projects

RCRA Trial Burn, Illinois Environmental Protection Agency, Chicago, IL, Project Team Leader. Responsible for supervising eight field team members during performance of a RCRA trial burn test program on a hazardous waste incinerator located at the Paxton Avenue lagoon site. Parameters measured at the incinerator stack location included particulates, hydrogen chloride, volatile organics, sulfur oxides, and metals. Responsible for development of test plan, field test supervision, data reduction, and report writing.

TSCA Trial Burn, Illinois Environmental Protection Agency, Beardstown, IL, Project Team Leader. Responsible for test plan development, field supervision, data reduction, and reporting during a TSCA Trial Burn Test Program at a PCB-contaminated soil site. Parameters measured at the hazardous incinerator stack included PCBs, volatiles, semivolatiles, particulates, hydrogen chloride, carbon monoxide, and total hydrocarbons.

Stack Emission Characterization Program, Westinghouse Materials Company of Ohio, Inc. (WMCO), Fernald, OH, Section Manager. Section Manager responsible for supervision of field team members during conduct of source emission testing programs at the Fernald, OH, facility. Approximately 12 individual sources were tested for the purpose of determining concentrations and mass rates of particulates and radionuclides.

Pilot Unit Emission Characterization Program, Hawthorne Army Ammunition Plant, USATHAMA, Project Team Leader. Supervised an emission characterization test program at an explosives decontamination pilot unit at the U.S. Army Hawthorne, NV, facility. The test program encompassed simultaneous measurements of explosives, particulates, oxides of nitrogen, total hydrocarbons, and carbon monoxide at two locations on the experimental unit. The data were utilized to evaluate the effectiveness of the unit to decontaminate explosives-contaminated equipment and to measure overall efficiency of the unit afterburner. Multiple test runs over a 3-week period were performed at varying conditions during the evaluation.

PROFESSIONAL PROFILE

JEFFREY D. O'NEILL
(continued)

Key Projects (continued)

Pilot Unit Trial Burn Evaluation, Savanna Army Depot, USATHAMA Savanna, IL, Sampling Survey Leader. Leader of a 10-member test team during trial burn test of an experimental rotary kiln incinerator located at a U.S. Army facility. The incinerator was designed to burn soils contaminated with explosive materials. Trial burn tests were conducted to measure particulates and explosives emissions at several points throughout the system and to calculate the explosive material destruction removal efficiency of the unit.

Refinery Emissions Characterization Program, Confidential Client, Project Leader. Responsible for the planning and conduct of all field efforts and data management activities on a source testing and analysis project for a confidential client to determine the emission parameters, size distributions, and chemical composition of particulates emitted from refinery process heaters, boilers, and FCCU regenerative sources. A total of 10 individual sources at 3 refineries throughout the United States were tested for this program.

New Source Performance Standards Emission Test Program, U.S. EPA, Project Leader. Project Leader on several task assignments over a 3-year period to collect particulate and particle size data to be used by U.S. EPA to develop new source performance standards in several industry categories.

Performance and Compliance Emission Test Program, Philadelphia Electric Company, Eddystone Units 1 and 2, Eddystone, PA, Project Leader. Responsible for the planning and execution of field effort and data management activities on a source performance/compliance evaluation on Eddystone Units 1 and 2 particulate and SO_2 scrubbing trains for Philadelphia Electric Company. Project involved simultaneous tests at 9 to 12 locations involving as many as 20 project team members. Numerous tests over a period of several months were performed at varying operating conditions during this evaluation program.

Performance Evaluation Test Program Greater Detroit Resource Recovery Facility, Project Leader. Onsite project leader during the conduct of a dioxin/furan emission test program on three resource recovery boiler trains. Simultaneous inlet and outlet testing of each boiler electrostatic precipitator was performed to evaluate reformation of PCDD/PCDF across the pollution control system. A total of three test runs were performed at each ESP inlet and at stack location. EPA 0010 test procedures were utilized with analysis by EPA method 8290.

PROFESSIONAL PROFILE

PAUL A. CLARKE

Registration

Certified Ambient Monitoring System Auditor, SLAMS Network

Fields of Competence

Source sampling for volatile organic compounds (VOC), priority pollutants, dioxins/furans and PCBs; ambient air sampling and air toxic surveys; continuous emission monitoring. Experienced in design, development, installation and operation, performance testing, system audits, and quality assurance programs. Test program development and execution for volatile organic compounds, dioxin/furans, PCBs, priority pollutants, and reduced sulfur compounds.

Experience Summary

- Thirteen years of experience in managing air quality sampling programs for emission compliance demonstration, methods development, ambient monitoring, and air toxic surveys.
- Project management experience including manpower and cost forecasting, proposal preparation, test protocol development, scheduling of personnel and equipment for fieldwork, direction of on-site sampling activities, and data reduction and preparation of final report.
- Development and design of CEM systems for source sampling and industrial compliance applications.
- Conducted sampling programs to measure VOC destruction efficiency at an automotive assembly plant's paint facilities.
- Optimized VOC capture efficiency at a number of commercial printing operations, metals coating facilities and car and truck assembly facilities.
- Conducted quality assurance audits for hazardous waste incineration trial burns.
- Experienced in sampling and analytical programs for municipal solid waste incinerators as Project Manager and as Quality Assurance auditor.

PROFESSIONAL PROFILE

PAUL A. CLARKE

(continued)

Credentials

M.S., Business Management — University of Akron (1986)
B.S., Chemical Engineering — Michigan Technological University (1978)
Air and Waste Management Association

Employment History

1986-Present	WESTON
1978-1984	PEI Associates, Inc.
1978-1979	Stewart Warner, South Wind Division

Key Projects

Municipal Solid Waste Resource Recovery Facility Emission Compliance Test program, York, PA, York Energy Systems, Project Manager. Conducted annual emission compliance test at a three unit mass burn municipal solid waste resource recovery facility. Each of the three flues were sampled in triplicate for particulate, arsenic beryllium, cadmium, nickel, lead, mercury, hexavalent chromium and dioxin/furans.

Multipoint Continuous Emission Monitoring Program, Confidential Client, Project Engineer. Prepared WESTON's mobile continuous emission monitoring laboratory and component continuous monitoring system and employed them in concert with extensive manual sampling methods in a multipoint emission characterization of a new source. Three sampling points were simultaneously monitored for the following compounds, total hydrocarbons, oxides of nitrogen, carbon monoxide, oxygen and carbon dioxide. One additional sampling point was simultaneously monitored for oxides of nitrogen. Sampling conditions varied from high temperature, high grain loading, to low temperature and saturated moisture.

Volatile Organic Compound (VOC) Capture and Destruction Efficiency Demonstration, Waltham, MA, Polaroid Corporation, Project Engineer. Conducted VOC emission test program to measure total and specific solvent capture and destruction efficiency for seven coating operations. Development phase served to enhance to pollution control system performance and the compliance phase demonstrated 100% VOC capture efficiency for the facility. Employed EPA Methods 25A and 18.

Automotive Paint Bake Oven Incinerator VOC Destruction Efficiency Demonstration, Linden, NJ, General Motor Corporation, C-P-C Linden Assembly Plant Project Engineer. Conducted VOC destruction efficiency tests using EPA Method 25 Byron version at five catalytic incinerations to demonstrate compliance with New Source Performance Standards.

PROFESSIONAL PROFILE

PAUL A. CLARKE
(continued)

Key Projects (continued)

Automotive Paint Bake Oven Incinerator VOC Destruction Efficiency Demonstration, Wilmington, DE, General Motors Corporation, C-P-C Wilmington Assembly Plant Project Engineer. Conducted VOC destruction efficiency test program using EPA Method 25A at a thermal incinerator to demonstrate vendor performance guarantee and emission compliance.

Automotive Assembly Plant - Main Body Topcoat Spray Booth and Bake Oven Emissions Inventory, General Motors BOD Linden Assembly Plant, Project Engineer. Developed a test plan and directed emission testing for a comprehensive side-by-side comparison of the actual spray booth and bake oven emissions, to the record-keeping protocol approved by the EPA. The test program included all portions of the MVMA protocol: panel tests; transfer efficiency booth/oven split; incinerator destruction efficiency. The emission testing included direct measurement of VOC emission from spray booth exhaust stacks.

Paint Shop VOC Emission Test Program, Springfield, OH, Navistar International Project Engineer. Conducted multi-phase VOC capture and destruction efficiency demonstration at the Navistar truck assembly facility to demonstrate and enhance VOC capture at air recirculating spray booth and destruction efficiency across the regenerative thermal incinerator. Correlated the incinerator efficiency to operating temperature and VOC load to the incinerator. Conducted capture efficiency studies that consisted of a mass balance for toluene sprayed from paint applicators in the spray booth and tracked through the recirculating capture system to quantify fugitive VOC losses. The compliance test portion included demonstration of the spray booths, bake ovens, and recirculation system as a total enclosure; direct measurement of the booth oven split and emissions from the sludge processing building. The test program employed EPA Methods 25, 25A, and on-site analyses.

VOC Capture and Destruction Efficiency Program, Greensburg, IN, James River Corporation, Project Manager. Conducted an emission test program to demonstrate VOC capture and destruction efficiency for the coating line pollution control system. The two-phase program consisted of a shakedown run using EPA Method 25A to verify system performance, followed by a compliance test run using the Byron version of EPA Method 25 with on-site analysis (Emission Measurement - WESTON).

Automotive Paint Bake Oven Emission Compliance Program, Tarrytown, NY, Tarrytown Assembly Plant, General Motors BOC, Project Manager. Conducted the VOC sampling and analytical portion of an emission test program designed to demonstrate compliance with NSPS emission regulations at the Main Body Topcoat Paint Bake Oven. The sampling was conducted according to EPA Method 25 modified to use the Byron sampling apparatus. Analysis for

PROFESSIONAL PROFILE

PAUL A. CLARKE
(continued)

Key Projects (continued)

methane and non-methane VOC was performed on-site. Sampling was conducted at 2 points simultaneously, at the inlet and outlet of the catalytic incinerator controlling emissions from the bake oven.

Automotive Primer Bake Oven Emission Compliance Program, Tarrytown, NY, Tarrytown Assembly Plant, General Motors BOC, Project Manager. Conducted the VOC sampling and analytical portion of the emission test program designed to demonstrate compliance with NSPS requirements at the Main Body Primer line bake oven. Sampling was conducted at the inlet and outlet of three separate incinerators controlling emissions from different zones of the primer bake oven. EPA Method 25 modified to use the Byron apparatus was employed. Analysis for methane and non-methane VOC was performed on-site.

Automotive Primer Bake Oven Emission Compliance Program, Linden, NJ, Linden Assembly Plant, General Motors BOC, Project Engineer. Conducted a sampling program to demonstrate emission rates from the bake oven exhaust associated with the ELPO coating line at the Linden facility. The test program employed the New Jersey Air Test Method 3.7, with on-line heated flame ionization analyzers to measure VOC concentrations.

Automotive Primer Dip Tank Emission Compliance Test, Linden, NJ, Linden Assembly Plant, General Motors BOC, Project Engineer. Conducted a sampling program to measure emissions from the ELPO Dip Tank enclosure exhaust stack and associated flash tunnel exhaust stack. The test program employed the New Jersey Air Test Method 3.7 with dual on-line heated flame ionization analyzers to simultaneously measure the VOC concentrations at the two locations.

Automotive Paint Bake Oven Emission Compliance Program, Bowling Green, OH, Bowling Green Assembly Plant, General Motors CPC, Project Engineer. Conducted a sampling and analysis program to measure VOC emission rates and destruction efficiency from four thermal incinerators used to control emissions from the paint shop bake ovens. The sampling was conducted according to EPA Method 25.

Emission Compliance Program for VOC Capture and Destruction Efficiency, Skippack, PA, Palmer International, Project Engineer. Conducted a VOC capture and destruction efficiency compliance test program for a single coating process. Destruction efficiency was demonstrated by EPA Method 25 - Byron version measurements at the inlet and outlet of the thermal incinerator. The system capture efficiency was demonstrated to be 100% according to flow measurement and calculation using EPA VOC Capture Guidelines.

Key Projects (continued)

Emission Compliance Program for VOC Capture and Destruction Efficiency, New Castle, DE, James River Corporation, Project Manager. Conducted a multi-phase test program to measure VOC capture and destruction efficiency for seven coating lines controlled by four catalytic incinerators. Each press and incinerator system was isolated and subjected to mass balance measurements using pure solvent coatings and real time measurement of specific and total VOC emissions. Capture system flow rates were adjusted to enhance performance. The program culminated with a compliance demonstration using EPA Methods 25A and 18 for real time measurement.

Publications

Clarke, P.A., Militana, L.M. and Virag, P.E. "An Evaluation of a Toxic Air Monitoring Performance Auditing Procedure for an Evacuated Canister Sampling System." Presented at the Air Pollution Control Association Annual Meeting, June 1989.

Clarke, P.A. and Cohen, A. "A Continuous Emission Monitoring System for a Transportable Hazardous Waste Incinerator." Presented at the Air Pollution Control Association Annual Meeting, June 1988.

Clarke, P.A., Dash, A.B. and Krick, K.L. "Combustion and Emission Monitoring of a Lime Kiln using Petroleum Coke as an Auxiliary Fuel." Presented at the Technical Association of the Pulp and Paper Institute Annual Meeting, 1987.

Clarke, P.A. and Corwin, T.K. "Field Application of a Personal Computer for Data Collection and Reduction." Presented at the Air Pollution Control Association Specialty Conference on Continuous Emission Monitoring, November 1981.

PROFESSIONAL PROFILE

TOM BERNSTIEL

Fields of Competence

Managing and performing source and ambient air test programs; analysis of volatile organic compounds (VOC) by gas chromatography; fugitive emissions; continuous emissions monitoring (CEM) systems.

Experience Summary

- Fourteen years diverse experience in performing and managing air test programs for ambient, fugitive and point sources.

- Participation in methods development with the Environmental Protection Agency (EPA) which contributed to promulgation of EPA's Reference Source Test Methods 7C "Alkaline permanganate/Colorimetric for NO_x," 25 "Total Gaseous Non-Methane Organics," 110 "Benzene" and 18 "VOCs by Gas Chromatography."

- Participation in developing the Chemical Manufacturers Association's (CMA) guidance document for estimating fugitive emissions.

Credentials

B.S., Chemistry -- Bloomsburg University (1976)
A.S., Biochemistry -- Spring Garden University (1974)
American Waste Management Association

Employment History

1990-Present	WESTON
1986-1990	BCM Engineers, Inc.
1984-1986	Environmental Consultant (Self-Employed)
1978-1984	Scott Environmental Technology, Inc.
1977-1978	Smithsonian Institute

Key Projects

Method Development, Various Locations, Johnson & Johnson, Manager. Developed and implemented sampling and analytical procedures for quantification of ethylene oxide from point sources and ambient air. The methods developed were used to collect information at eight production facilities nationwide.

Method Development, American Cyanamid, Manager. Developed and implemented sampling and analytical procedures for quantification of acrylamide emissions from stationary sources.

Key Projects (continued)

Air Quality Evaluation, New York, NY, Triborough Bridge and Tunnel Authority, Manager. Managed air quality evaluation in tunnels and at toll booths in and around New York City.

Air Emission Evaluation, Nationwide, EPA. Conducted an evaluation of benzene emissions from coking and secondary byproducts reclamation operations at six steel plants nationwide.

Methods Development, EPA. Participated in a comparison of EPA Reference Method 18 (VOC by Gas Chromatography), Method 25 (Total Gaseous Nonmethane Organics), and Method 25A (VOC using a Flame Analyzer) on an oil-fired liquid waste incinerator.

Emissions Evaluation, Texaco Transport, Inc. Participated in an investigation into the contribution of oxides of nitrogen (NO_x) from oil tanker engines to California coastal air basins.

Research Study, American Petroleum Institute, Lead Chromatographer. Participated in a study to determine the benzene emissions of late model automobiles with various catalyst type configurations with fuel benzene content.

Fugitive Emissions Study, Alabama Consortium of Chemical Manufacturers, Technical Director. Participated as Technical Director in a plant study to quantify fugitive emissions from the Chemical Manufacturers Association (CMA) national database which is being used to demonstrate problems associated with the use of Synthetic Organic Chemicals Manufacturer Association (SOCMA) factors developed by EPA to predict fugitive emissions.

Fugitive Study, THUMS - Long Beach Company. Technical Lead for bagging study using CMA Methodology. Study produced stratified emissions factors to define fugitive emissions from oil well head pump assemblies. Entire well assemblies were bagged to develop the emission factors.

Fugitive Emissions Management Project, IBM. Participated as Field Team Leader for the monitoring and installation phase. Project targeted approximately 20,000 components to be tagged with a specially designed bar coded identification tags. Routine remonitoring used a combination analyzer barcode reader and data logger.

Publications

Bernstiel, T. "Rigid Container Method for the Preparation of Gas Phase VOC Standards" Presented at the 1988 Conference on the Measurement of Toxic Substances. Published in the Proceedings of the Conference.

PROFESSIONAL PROFILE

PAUL M. MEETER

Fields of Competence

Source emissions testing; ambient air monitoring; hazardous waste incineration trial burn plans; test program/data quality assurance; site safety supervisor; ambient monitor auditing; industrial hygiene sampling; development of test protocols and monitoring plans; air toxics sampling.

Experience Summary

- Has 12 years professional experience in supervising source sampling programs utilizing EPA, NIOSH, and OSHA methods.
- Has 7 years extensive experience in preparation and evaluation of hazardous waste trial burn plans for state agencies and EPA.
- Five years experience as QA officer on emissions and ambient air monitoring projects, including independent third-party review of test plans, test reports and field sampling activities.
- Plans and supervises stack testing programs to meet state, EPA, and SARA requirements.
- Site safety supervisor, including site safety plan preparation.
- Preparation of test protocols, test reports, and monitoring plans.
- Computer-enhanced data reduction and validation.

Credentials

B.S., Physics -- Kutztown University (1980)
Air and Waste Management Association
WESTON Remedial Response Health and Safety Training
Hazardous Materials Field Operations Certification Level B-S

Employment History

1980-Present WESTON
1978-1979 Kutztown University Math and Science Tutor

PROFESSIONAL PROFILE

PAUL MEETER
(continued)

Key Projects

New Source Performance Characterization, Inland Steel Company, Field Team Leader. The objectives of this program were to characterize uncontrolled HCl emissions from the HCl pickling process and to quantify controlled emissions from, and the collection efficiency of the wet scrubber system. Simultaneous inlet and outlet testing was performed along with the collection of process operations data and scrubber influent and effluent samples. The overall program was designed to aide in the development of emission factors for HCl from typical rolled steel pickling lines as part of the WESTON contract with the EPA-EMB.

BIF Compliance Program, Rhone Poulenc Basic Chemicals, Technical Manager. Rhone Poulenc Basic Chemicals operates a sulfuric acid regeneration unit that utilizes hazardous waste for supplemental fuel. This facility currently operates under the Boilers and Industrial Furnaces Burning Hazardous Waste (BIF) regulations. Project activities to date have included development of a certification of pre-compliance document utilizing computer dispersion modeling and process removal efficiencies to estimate BIF metals, ash and chlorine feed rates that would result in stack emission compliance. The facility also submitted a compliance test plan in preparation for an emissions test program to verify compliance and allow the facility to continue to operate. The test plan provides detailed testing and analytical procedures along with operating conditions. Operations will continue after compliance until a Part B RCRA Trial Burn can be performed.

Trial Burn Quality Assurance, EPA-REAC, Superfund Sites, Lead Scientist. This contract included trial burn programs at ten separate Superfund sites. Responsibilities included technical evaluation of trial burn plans, observation and evaluation of trial burn testing activities, and technical review of trial burn reports. Projects have involved incineration of soils, liquids, sludges, and gases at several sites in EPA Regions II, IV, VIII, and X. WESTON is conducting these projects as part of the REAC contract with the EPA-ERT.

Confidential Client, Emissions Source Inventory and Comprehensive Sampling Program, Waynesboro, VA, Team Leader. This project extended over a 6-year period and involved an investigation and inventory of all process emission points, updating process emission point blueprints, process emissions sampling, and on-site sample analysis. Initially all emission sources were inventoried and major emission sources sampled in order to update facility permits. Many of the sampling efforts required extensive coordination with the operations of the specific production areas within the plant. Coordination of several sampling crews at various locations throughout the facility was required. Subsequent facility expansions required additional emissions sampling and blueprint updates. On-site analysis enabled the client to evaluate test results in relation to permit requirements on a daily basis.

PROFESSIONAL PROFILE

PAUL MEETER
(continued)

Key Projects (continued)

Evaluation of Comprehensive Emissions Monitoring Program, IBM, Inc., Burlington, VT, Lead Scientist. The existing program included process air sampling, stack emissions sampling, ambient air monitoring, meteorological monitoring, and evaluation of control devices. The primary objective was to evaluate the existing programs and recommend a comprehensive program that would combine all sampling activities into an organized and targeted schedule. The revised program was based on the need and usefulness of test data and provided a list of occurrences that would trigger additional test programs. A more cost effective and useful testing and monitoring schedule was recommended and subsequently enacted by IBM.

Hazardous Waste Incineration, Weston, Beardstown, IL, Field Team Leader. Performed several trial burn sampling programs on the hazardous waste incinerator operated by Weston in Beardstown, IL. Coordinated the sampling programs with facility operations and supervised the field sampling crew during sampling programs. The primary soil contaminant was PCB. Stack sampling methods utilized during the trial burn included EPA Methods 1,2,3,4,5, Modified Method 5, and VOST. The successful trial burn resulted in a TSCA permit for the WESTON incinerator.

Quality Assurance Audits, Confidential Client, Lead Scientist. Four ambient air monitoring stations were installed at locations indicated by computer modeling to be potential impact points for emissions from this pulp and paper mill. Immediately after start-up, and on a quarterly basis thereafter, an independent quality assurance audit was performed on each monitoring instrument. Meteorological parameters, sulfur oxides, and nitrogen oxides were monitored and independently audited. All four monitoring locators were audited for a 6-year period.

Source Emissions Test Programs, Field Team Leader. Field Team Leader on source emissions testing programs. Responsibilities included preparation of test protocols, sampling and analysis plans, coordination of test personnel, coordination of field activities, collection and reduction of test data and preparation of test reports. Performed hundreds of source emissions tests utilizing EPA, NIOSH, and OSHA methodologies at chemical plants, glass furnaces, power plants, refineries, cement plants, textile manufacturers, hazardous waste incinerators, pilot scale units, acid plants, computer manufacturing facilities, bakeries, steel mills, municipal solid waste incinerators, and air strippers. Clients include DuPont, IBM, USATHAMA, PECO, Pennsylvania Power, Keystone Cement, Lehigh Cement, Rollins Environmental, General Chemical, Atlantic States Pipe Co., Continental Baking, City of Detroit, City of Philadelphia, Gloucester County, Atlantic Pipeline, Kerr Glass, Essex Chemical, Exxon, Rohm and Haas, Mennen, Pfizer, and Rhone-Poulenc, among others.

International experience includes electrostatic precipitator and caustic scrubber testing in Alexandria, Egypt. Municipal solid waste incineration testing in Agen, France and Quebec, Canada. VOC emissions testing in Juncos, Puerto Rico.

PAUL MEETER
(continued)

Key Projects (continued)

Scrubber Evaluation and Compliance Program E.I. DuPont de Nemours, Inc., Field Team Leader. Supervisor of field sampling crew for the testing program. Program involved continuous monitoring for NO_x at multiple points across a five stage scrubbing system. In addition, stack emissions from the final stage scrubber were tested for particulate, ammonia, and NO_x. Each scrubber stage's efficiency and overall scrubber performance was determined. Based on the evaluation program, process changes were made that increased scrubber performance prior to the compliance test program.

Explosives Emission Testing Program, USATHAMA - Lead Scientist. Explosive testing on the exhaust of an air stripper was performed. The air stripper was processing water contaminated with volatile organics (VOCs) and explosives (2,4-DNT and 2,6-DNT). An EPA Method 5 sampling train was modified and designed specifically for the capture of explosives in air. Test data were presented to USATHAMA as part of an evaluation of the air stripper for groundwater remediation.

PROFESSIONAL PROFILE

SCOTT B. KIRKPATRICK

Registration

Engineer In Training

Fields of Competence

Source emission testing, preparation, maintenance, set-up and operation of air quality testing equipment. Data reduction and quality assurance of source emission results. Involvement in more than sixty projects performing over 200 test runs. Volatile organic compound (VOC) fugitive emission screening, tagging, and data management system development. Emission inventory and facility emission estimations.

Experience Summary

Over two years of experience in source emissions testing, compliance demonstration, process optimization, fugitive emission monitoring, computer enhanced data reduction, and validation. Source emissions testing encompasses a wide range of both the public and private sectors. Sources tested include hazardous and municipal waste incinerators, electric and steam-producing facilities, automotive assembly plant paint facilities, and a variety of chemical and paper producing plants.

Credentials

B.S., Mechanical Engineering -- Rose Hulman Institute of Technology (1990)
American Society of Mechanical Engineers

Employment History

1989-Present	WESTON
1986-1990	Rose Hulman Institute of Technology
1982-1990	Sun Designs
1983-1988	Chester County Council Boy Scouts of America

Key Projects

Hot Gas Trial Burn, Hawthorne, NV, Test Team Member. A trial burn which evaluated the performance of an explosives decontamination system. Sampling was performed at the outlet of the decontamination unit and the outlet of the afterburner. The purpose of the testing was to measure the destruction and removal efficiencies of the decontamination unit and the DRE of the afterburner device. Testing parameters included explosives, particulate, THC, CO, CO_2, and O_2. EPA methods utilized included EPA Method 5, Method 25A, Modified Method 5, and EPA Method 3A.

PROFESSIONAL PROFILE

SCOTT KIRKPATRICK
(continued)

Key Projects (continued)

Emissions Source Invention and Comprehensive Sampling Program, Waynesboro, VA, Confidential Client, Test Team Member. The project involved the updating of process emissions point blueprints, sampling of emission points, and on-site analysis. All emissions sources were inventoried and major emission sources sampled in order to update facility permits. Subsequent facility expansions required additional emissions sampling and blueprint updates. On-site analysis provided daily test results for permit comparison. A total of over 30 sources were sampled using EPA Method 18.

Fugitive Emissions Screening and Tagging Program, Confidential Client, NY, Project Team Leader, Field Team Leader. Participated in the screening, mapping and tagging of over 10,000 pumps, valves and flanges associated with VOC emissions. Test procedures and references included EPA Method 21 and RCRA regulations.

Fugitive Emissions Screening and Tagging Program, Giesmer, LA, Vulcan Chemicals, Project Team Leader, Field Team Leader. Participated in the screening, mapping and tagging of over 8,000 pumps, valves and flanges associated with VOC emissions. Test procedures and references included EPA Method 21 and RCRA regulations.

Automotive Primer Dip Tank Emission Compliance Test, General Motors BOC Linden Assembly Plant, Test Team Member. Conducted a sampling program to measure emissions from the ELPO Dip Tank enclosure exhaust stack and associated flash tunnel exhaust stack. The test program employed the New Jersey Air Test Method 3.7 with dual on-line heated flame ionization analyzers to simultaneously measure the VOC concentrations at the two locations (Emission Measurement - WESTON).

Relative Accuracy Program, Ebensburg, PA, Babcock & Wilcox, Test Team Member. Participated in testing for relative accuracy of stack monitors for SO_2 and NO_x. Tasks included testing, data reduction and data analysis.

PROFESSIONAL PROFILE

LANDIE O. FOWLER, JR.

Fields of Competence

Reference methods testing; instrument methods testing; data reduction and evaluation; TRS testing; emissions studies.

Experience Summary

Over 8 years of experience in source sampling and air quality testing. Performed over 250 source and ambient air tests for a diverse industrial clientele.

Credentials

B.S., Biology - Palm Beach Atlantic College (1980)
Source Evaluation Society

Employment History

1988-Present	WESTON
1981-1988	Sanders Engineering & Analytical Services, Inc.
1980-1981	Mobile Infirmary
1979-1980	Palm Beach Atlantic College

Key Projects

Involved in Testing Multiple Sources, Test Team Leader. Project involved testing for multiple parameters at a paper mill in Cantonment, Florida.

Testing Particulate Emissions, Leader. Performed tests in asphalt plants and chemical plants in Florida and Alabama.

Testing of Six Large Natural Gas-Fired Compressors. Tested for NO_x at a natural gas processing plant in Southwest Louisiana, using a TECO model 10A continuous emissions monitor.

Performed Numerous Precipitator Efficiency Tests. Performed tests in municipal solid waste recovery facilities, paper mills, and power plants for several different manufacturers in Louisiana, Alabama, Georgia, and Florida.

Particulate Emission Compliance Testing, Test Team Leader. Performed testing for major electric utility companies in both Alabama and Georgia.

PROFESSIONAL PROFILE

LANDIE O. FOWLER, JR.
(continued)

Key Projects (continued)

Particulate Emission Compliance Testing for Paper Mills, Mobile, AL, Test Team Leader.

TRS Testing at Paper Mill and Natural Gas Plant, Alabama.

SO_2 Testing at Natural Gas Processing Plants, Alabama and Mississippi, Director.

Environmental Impact Assessment. Performed an ongoing study involving collection of benthic water-column samples and beach and marsh samples for environmental impact assessment for a major oil company in Mobile Bay.

Precipitator Face Velocity Tests, Georgia and Alabama, Major Electric Utility Companies.

Testing for Lead and SO_2 at Lead-Smelting Plants, Alabama.

Formaldehyde and Ammonia Test in Chemical Plant, South Alabama.

PROFESSIONAL PROFILE

ALFRED R. BARBER

Fields of Competence

Emission source testing.

Experience Summary

Two years experience in source emissions testing, fugitive emissions surveys, ambient air sampling, industrial hygiene sampling and odor abatement technologies, as well as scrubber efficiency studies of organic vapors and non-organic particulates.

Several years of college and work related laboratory experience in wet chemistry.

Three months as team leader conducting a township tree inventory.

Instrumentation training: Stack samplers, continuous emission monitoring instrumentation, combustible gas indicators, photoionization detectors, flame ionization detectors, personal samplers, VOST samplers, and safety equipment.

Industry categories tested include: Petroleum refineries, diesel engine generators, surface coating operations, municipal solid waste and waste water facilities, glass melting furnaces, pilot facilities, textile and organic fiber plants, chemical plants, nuclear generating station.

Credentials

B. S., Environmental Studies - Stockton State College (1988)

A.S., Biology - Salem Community College (1986)

C.P.R., American Red Cross

Advanced Life Saving and Water Safety, American Red Cross

Certified Scuba Diver, NAUI

40 hr OSHA Hazardous Materials Training Certification

Employment History

1991 - Present	WESTON
1989 - 1990	Franklin Co. (Contracted to DuPont)
1988 -	Barnejat Township Shade Tree Commission

PROFESSIONAL PROFILE

ALFRED R. BARBER
(continued)

Key Projects

Kinsley Landfill, Deptford, N.J. Assisted with the conduct of a State Compliance Test for NO_x, SO_x, CO_2 & CO on a methane burning diesel generator.

Corning Glass, State College, PA. Assisted with the refitting of two MET stations.

PSE&G, N.J., Field Team Member. Conducting a community "Right to Know" survey of the chemical and hazardous materials contained onsite at Salem I & II and Hopecreek nuclear generating facility. Also participated in the mandatory site-specific RAD Worker training.

G. M., Linden, NJ., Field Team Member. Conducting VOC study of paint spray booths. Specific duties included ORSAT readings, flow measurements and moisture determination.

Coastal Aluminum, Williamsport, PA, Field Team Member. Conducting Method 5 particulate tests for oils. Testing included both a pre-compliance and a compliance phase. Duties included meter box operation, sample recovery, probe handling and flow determinations. The facility was used for milling aluminum.

Mrs. Pauls, Philadelphia, PA, Field Team Member. Conducting Method 5 tests for oils and grease. Study was used to increase efficiency of deep frier exhaust vents. Specific duties included meter box operation, sample recovery, probe handling and setup.

B.P., Marcus Hook, DE, Field Team Member. Conducting stack test at the refinery. Specific duties included meter box operation and ORSAT readings.

PP&L, Wilkes-Barre, PA. Field Team Member. Collecting ambient air samples for PCBs during remediation at an abandoned electrical sub-station. Specific duties included operation of Puff samplers, sample preparation and recovery as well as monitoring a MET station.

G.E., Logan, Ohio, Field Team Member. Conducting CEM studies of the vent gasses from a glass factory. Specific duties included moisture determinations and flow measurements.

PP&L, Dannville, PA, Field Team Member. Conducting Method 5 particulate studies on the exit ducts of the coal-fired generator. Tests were used to confirm results of previous studies. Specific duties include set-up and control room monitoring of test parameters.

PROFESSIONAL PROFILE

WILLIAM V. STRAUB

Registration

Certified Visible Emissions Evaluator, The Penn State University

Fields of Competence

Source emission testing, preparation, maintenance, set-up and operation of air quality testing equipment. Data reduction and quality assurance of source emission results. Laboratory extraction and preparation of environmental samples. Visible emissions observer pursuant to EPA Reference Method 9. Involvement in more than forty projects performing over 200 test runs.

Experience Summary

Over three years of experience in source emissions testing, compliance demonstration, process optimization, computer enhanced data reduction, and validation, and laboratory extraction. Source emissions testing encompasses a wide range of both the public and private sectors. Sources tested include hazardous and municipal waste incinerators, electric and steam-producing facilities, automotive assembly plant paint facilities, and a variety of chemical and paper producing plants.

Credentials

B.S., Civil Engineering -- Pennsylvania State University (1990)
American Society of Civil Engineers

Employment History

1987-Present	WESTON
1986-1987	Penn State University - Materials Research Lab
1984-1985	Downingtown Sr. High

Key Projects

Emission Compliance Program for VOC Capture and Destruction Efficiency, New Castle, DE, James River Corporation, Test Team Member. Participated in a multiphase test program to measure VOC capture and destruction efficiency for seven coating lines controlled by four catalytic incinerators. Each press and incinerator system was isolated and selected to mass balance measurements using pure solvent coatings and the real time measurement of specific and total VOC emissions. Capture system and flow rates were adjusted to enhance performance. The program culminated with a compliance demonstration using EPA methods 25A and 18 for real time measurement.

PROFESSIONAL PROFILE

WILLIAM V. STRAUB
(continued)

Key Projects (continued)

Emission Compliance Test Program, Bangor, ME, General Electric, Pennobscott Energy Resource Conversion Facility, Test Team Member. Participated in a compliance testing program testing for particulate, dioxins/furans, HCL, metals, SO_2, CO, and particle size determination. Test trains utilized include EPA Methods 5, 8, 12 and modified Method 3.

Emission Compliance Test Program, Bridgeport, NJ, Rollins Environmental, Test Team Member. Acted as a test team member at this hazardous waste incinerator. Compliance testing included particulate, SOx, NOx, and metals sampling utilizing EPA Methods 5, 8, 7E, and multimetals test trains.

Emissions Compliance Test Program, Adchem, NY, Test Team Member. Participated in a source emissions testing program of a solvent waste incinerator. Tests use of the Byron 401 Analyzer, and Model 90 sampling pumps for the purpose of Method 25A analysis, Method 3 analysis and volumetric flow rates.

Hot Gas Trial Burn, Hawthorne, NV, Test Team Member. A trial burn which evaluated the performance of an explosives decontamination system. Sampling was performed at the outlet of the decontamination unit and the outlet of the afterburner. The purpose of the testing was to measure the destruction and removal efficiencies of the decontamination unit and the DRE of the afterburner device. Testing parameters included explosives, particulate, THC, CO, CO_2, and O_2. EPA methods utilized included EPA Method 5, Method 25A, Modified Method 5, and EPA Method 3A.

Emissions Source Invention and Comprehensive Sampling Program, Waynesboro, VA, Confidential Client, Test Team Member. The project involved the updating of process emissions point blueprints, sampling of emission points, and on-site analysis. All emissions sources were inventoried and major emission sources sampled in order to update facility permits. Subsequent facility expansions required additional emissions sampling and blueprint updates. On-site analysis provided daily test results for permit comparison. A total of over 30 sources were sampled using EPA Method 18.

PROFESSIONAL PROFILE

PETER E. VIRAG

Fields of Competence

Continuous emissions monitoring and manual source testing; research, development, and operation of specified sampling equipment for resource and ambient monitoring; air toxics, air quality and meteorological monitoring, quality assurance, data processing/analysis, and instrument audits; technical writing; concepts and applications of synoptic meteorology.

Experience Summary

Team Leader for manual source testing, operation of WESTON's Continuous Emission Monitoring (CEM) system and Byron Method 25 analytical and sampling system. Have conducted several hundred emissions tests at numerous sources. Experience in air toxics, air quality, and meteorological monitoring design, development of protocols, operations, installation, quality assurance, and data processing/analysis. Dispersion modeling for PSD parameters. Applications of general meteorology related to environmental analyses.

Credentials

B.S., Earth and Atmospheric Science -- Rutgers University (1981)
American Meteorological Society
Air and Waste Management Association
WESTON Remedial Response Health and Safety Training
WESTON Project Management Training
EPA/AWMA Site-Specific Monitoring for Air Toxics Monitoring
Red Cross First Aid/CPR
WESTON Site Safety and Health Coordinator training

Employment History

1986-Present	WESTON
1981-1985	U.S. Air Force
1977-1981	WCBS-TV

Key Projects

Team Leader during numerous source testing projects. Projects include compliance testing and trial burns of RDF, cogeneration, and hazardous waste incineration facilities. Familiar with manual EPA source test methods including VOST, semi-VOST, particulate, and metals sampling trains.

Operates the WESTON Continuous Emission Monitoring system for compliance testing of RFD facilities and VOC testing of printing presses. Responsible for set-up and operation of CEM systems for the WESTON High Temperature Incinerator, the Low Temperature Thermal

PROFESSIONAL PROFILE

PETER E. VIRAG
(continued)

Key Projects (continued)

Treatment unit, and other pilot plants. Responsible for the operation of the mobile CEM on-board an oil rig supply ship during a NOX reduction monitoring program. Instrumental in the redesign and re-build of the mobile CEM. Designed and constructed WESTON's C^2MS, Continuous Component Monitoring System.

Team Leader for a two phase USATHAMA program on experimental systems for disposal of explosives contaminated equipment and raw explosives at the Hawthorne Army Ammunition Plant, Nevada. This involved systems specific CEM monitoring at several locations for 3 months and manual testing continuously for up to 20 hours. The second program involved designing, constructing, and operation both CEM and manual sampling systems that were controlled remotely from an underground bunker. Automatic manual sample train movement and coolert systems and remote CEM operations were designed in order for sampling to be conducted per ERA method requirements.

Independent source test observer for government and industry responsible for observing and validating procedures and reports. Projects include compliance and trial burn testing for hazardous waste incineration facilities, RDF, cogeneration, and fluidized bed generation facilities.

Team Leader and operator of the Byron EPA Method 25 sampling system. Responsible for collection and analysis of samples and preparation of reports.

Conducted testing on numerous incinerators (catalytic and thermal), printing presses, and paint ovens to determine destruction and capture efficiencies.

Team Leader for numerous air toxics monitoring projects. Responsible for design and implementation, set-up, operation, training of field personnel, and analysis of final results. Conducted monitoring operations at residential, industrial, and hazardous waste sites. Designed several air toxics monitoring systems to meet job specific monitoring requirements.

Designed and developed procedures and constructed equipment to conduct audits of EPA TO - 14 stainless steel canister samplers.

Performs field audits on various air toxics, air quality, and meteorological monitoring equipment.

Involved in data analysis, processing, quality assurance, and reporting for several air pollution and meteorological monitoring sites in Pennsylvania, New York, and Michigan. Responsible for site set-up, operations, equipment calibration, and maintenance.

Performs air dispersion modeling for air pollution parameters for power plant, industrial complexes, and hazardous waste sites.

PROFESSIONAL PROFILE

JOHN N. MILLS

Fields of Competence

Source emission testing, including preparation, maintenance, calibration, repair, setup, and operation of air quality testing equipment. Responsibilities include field team leadership, data reduction calculations, quality assurance, and reporting of source emission results.

Experience Summary

- Five years experience in source emission testing, fugitive emission surveys, and industrial hygiene sampling. Experience in source emission testing for a wide range of industrial clients and governmental agencies. Sources tested include hazardous and municipal waste incinerators; electric and steam-generating facilities; and a variety of petroleum, glass, and paper product production plants.

- Several years of diverse industrial and laboratory experience, including experimental chemical formulation and data evaluation.

- Instrumentation training: stack samplers; continuous emission monitoring instrumentation; combustible gas indicators; photoionization detector; flame ionization detector; infrared spectrophotometer; VOST, MMS, personal samplers; and safety equipment.

- Industry categories tested include: petroleum refineries; diesel engine generators; industrial sand dryer; surface coating operations; solid waste incinerators; fume incinerators; hazardous waste incinerators; glass melting furnaces; plastics manufacturing plants; pilot facilities; pulp and paper mills; pharmaceutical facilities; textile and organic fiber plants; resource recovery facilities; and stone crushing and metal fabricating processes.

Credentials

B.S., Environmental Biology -- University of Pittsburgh (1982)
EPA REM II Personal Protection and Field Investigation Training Course
Subcontractors' General Radiation Training (Department of Energy, Westinghouse Materials Company)
American Red Cross Certification in Cardiopulmonary Resuscitation and First Aid

PROFESSIONAL PROFILE

JOHN N. MILLS
(continued)

Employment History

1985-Present WESTON
1985 Sartomer Chemical
1984-1985 West Chester Chemical
1982-1984 Bonded Products

Key Projects

City of Philadelphia. Assisted in the conduct of source emission testing of the Northeast Municipal Waste Incineration Units. Samples were collected for particulates, metals, sulfur dioxide, dioxins/furans, and hexavalent chromium analyses.

Illinois EPA. Assisted in the TSCA PCB trail burn using WESTON's Transportable Thermal Destruction Unit (TTDU). Sampling was conducted for PCBs, dioxins/furans, volatile organics, nitrogen oxides, particulates, and total chloride.

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). Assisted in volatile organics emission testing at a low-temperature thermal stripping pilot plant at Letterkenny Army Depot. Sampling and analysis were conducted to determine how effectively solvents can be air-stripped out of contaminated soils. Responsibilities also included field evaluation of five portable chromatographs (PID and FID) for VOC monitoring at industrial waste sites.

Westinghouse Materials, Department of Energy, Fernald, OH. Acted as Field Team Leader in the conduct of an emission testing program of several sources for particulates, NO_x, and radionuclides.

Harbert-Triga, Agent France. Assisted in the testing of a municipal waste incinerator for particulates, metals, and volatile organics. Responsibilities included equipment preparation, sampling, sample recovery, sample analysis, data reduction, and quality assurance.

Energy Generating Facility, Wilmington, DE. Field Team Member of a four-phase testing program on four municipal waste incineration units.

Confidential Client, New Jersey. Assisted with the conduct of particulate; SO_x; NO_x; total reduced sulfur (TRS); total hydrocarbon (THC); and CO_2, O_2, and CO performance tests on an FCCU scrubber at an oil refinery. Duties included operation of control consoles, integrated gas sampler, and Orsat apparatus plus probe handling, sample recovery, and data reduction activities.

PROFESSIONAL PROFILE

JOHN N. MILLS
(continued)

Key Projects (continued)

Trofe Incineration, Inc., Mt. Laurel, NJ. Assisted with particulate, SO_2, CO, NO_x, HCl, TGNMO, heavy metals, BAP/PAH, and PCDD/PCDF tests for a solid/hazardous waste incineration system compliance test program. Duties included probe handling, Orsat analyses, and sample recovery.

Rollins Environmental Services (NJ), Inc., Bridgeport, NJ. Performed O_2 continuous emission monitoring performance and related tests at this hazardous waste incineration facility. Operated integrated lung sampling system and moisture train at a hot duct test site.

Formosa Plastics Corporation (DE), Inc., Delaware City, DE. Performed particulate, HCl, and vinyl chloride monomer (VCM) compliance tests on five product dryers and one fume incinerator. Responsibilities included operation of control console and integrated lung sampling system, sample recovery, and data management.

Cogeneration Management Company, Boston, MA. Assisted with the performance of a 4-month NO_x minimization program on six diesel engine generators. The program used both manual and continuous monitoring methods for NO_x, particulates, dioxins/furans, and total hydrocarbons.

Jesse Morie and Sons, NJ. Determination of gas velocity, volumetric flow rate, moisture content, and particulate emissions from an industrial sand dryer. Duties included operation of control console, Orsat analyses, and data management activities.

Keystone Cement Company, Bath, PA. Field Team Leader on one of two cement kiln stacks being tested for particulates, heavy metals, and volatile organic compounds. Responsibilities included preparation, execution, and data management during a five-stage sampling program to determine destruction efficiencies of different wastes introduced into the cement kilns.

Stone Container, Missoula, MT. Field Team Leader responsible for the sampling and supervision of a test team performing particulate and SO_x emission sampling on a lime kiln stack. Twenty-six tests were conducted to determine emission performance of the source during the program.

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). Assisted with a air emission survey for the hot gas decontamination project in Hawthorne, NV. Sampling was conducted to determine the destruction efficiencies of explosive compounds in the pilot hot gas decontamination unit.

PROFESSIONAL PROFILE

JOHN N. MILLS
(continued)

Key Projects (continued)

Navistar, Springfield, OH. Assisted with several air emission projects to characterize VOC emissions from truck painting spray booths. The program used FID analyzers for total hydrocarbons, along with a Byron GC analyzer to measure the total hydrocarbons or a carbon basis per EPA Method 25.

Greater Detroit Resource Recovery Authority, Detroit, MI. Assisted with the compliance testing of a municipal waste incinerator. Primary duties were observation of stack sampling contractors to ensure that testing was per EPA test methods and in the client's best interest. Duties also included assisting with review of the stack sampling contractor's emission test reports for the facility.

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). Field Team Member with the supplemental fuel project in Hawthorne, NV. Sampling was conducted to determine emissions from a boiler fired by fuel oil, supplemented with explosive compounds. Particulates, explosives, NO_x, total hydrocarbons, and carbon monoxide emissions from the boiler stack were characterized.

PROFESSIONAL PROFILE

SAMUEL W. LA MANNA, JR.

Registration

Certified Aircraft Electronics Specialist - USAF.
Certified Visible Emissions Evaluator

Fields of Competence

Source emission testing, preparation, maintenance, set-up and operation of air quality testing equipment. Data reduction and quality assurance of source emission results. Involvement in more than 35 projects performing over 200 test runs. Ambient air monitoring for airborne pollutants and meteorological data.

Experience Summary

One year of experience in source emissions testing, compliance demonstration, process optimization, visible emission monitoring, computer enhanced data reduction, and validation. Sources tested include landfill gas incinerators, electric and steam-producing facilities, automotive assembly plant paint facilities, bakery facilities and cement manufacturing facilities.

Employment History

1991-Present	WESTON
1990-1991	Advance Personnel Temporary Services, Inc.
1988-1990	United States Air Force
1986-1988	Morgan Corporation

Key Projects

Emission Testing, E.I. Dupont De Nemours, Deepwater, New Jersey, Test Team Member. Conducted emission tests on the Carbon Regeneration Furnace (FR311), following EPA methods 1, 2, 3A, Cr + 6, 7E, 8, 10, 0010, 0050, 101A and New Jersey Air Test Methods 3, 7, and 5.

Emission Testing, TTSI (Laskin/Poplar Oil Co.) Astabula, Ohio, Test Team Member. Participated in the stack emission testing for compliance on the transportable incineration system that treats a variety of solid, sludge, and liquid hazardous materials. The tests were preformed following EPA methods 1, 2, 3, MM5, 7E, 8, 10 MM18, 23, 25A, 26 and 0030.

Emission Testing, Pepperidge Farm, Norwalk, Connecticut, Test Team Member. Characterization of VOC emissions from the Roll and Bread line ovens following EPA Methods 1, 2, 3, 4 and 25A.

PROFESSIONAL PROFILE

SAMUEL W. LA MANNA, JR.
(continued)

Key Projects (continued)

Emissions Testing, Subaru-Isuzu, Lafayette, Indiana, Test Team Member. Determination of VOC destruction efficiency on a touch up paint line fume incinerator utilizing EPA Methods 1, 2, 3, 4 and 25A.

Emissions Testing, Occidental Chemical Company, Salisbury, Maryland, Test Team Member. Testing from the Calendar and Print Room coating lines following EPA Methods 1, 2, 3, 4 and 25A.

Emissions Testing, B&W, Ebensburg, PA, Test Team Member. Participated in the stack emissions testing for compliance on the power generation facility following EPA Methods 1, 2, 3, 4, 5, 7, and 25A.

Emissions Testing, Industrial Excess Landfill, Canton Ohio, Test Team Member. Participated in testing flare emissions for VOC and semi-volatile organics. Tasks include testing under a variety of flare operations to determine effects from various vapor extraction sources and flare temperature ranges.

Ambient Air Monitoring, Confidential Client, Niagara, NY, Test Team Member. Responsible for the operation and collection of ambient air samples for particulate and reactive gases.

PROFESSIONAL PROFILE

BOBBY BETTS

Fields of Competence

Performance of air quality testing; data evaluation, validation; report preparation and writing; metal fabrication and carpentry.

Experience Summary

- Over 5 years of experience in multiple testing parameters and non-routine tests.
- Participated in over 200 air testing projects including EPA standard reference method testing and performance specification testing on continuous emissions monitoring systems for TRS, SO_2, NO_x, O_2, and CO.
- Ambient air testing using NIOSH methods for a variety of industrial and government cliental.

Credentials

Completed Studies, Computer Science and Programming -- Enterprise State Junior College
Completed Studies, Quality Control Methods -- Opelika Technical College
Short Courses in Air Pollution Monitoring

Employment History

1983-Present	WESTON
1980-1983	Diversified Products Corporation
1979-1980	Auburn Welding & Crane
1977-1979	Rawls Corporation

Key Projects

Mercury Emission Test, Chemical Manufacturer, Test Team Leader. Specific responsibilities included preparation, sample collection, and data validation from several flammable sources. Additional testing requested after initial effort.

Auditing of Five Continuous Emission Monitoring Systems (CEMS) at a Pulp and Paper Mill, Test Team Leader. Specific responsibilities included relative accuracy testing for totally reduced sulfur and oxygen that led to the acceptance of all monitors.

Mill-Wide Emission Inventory at a Pulp and Paper Mill. Specific responsibilities included emission testing for particulate, nitrogen oxides, sulfur dioxide, oxygen, carbon monoxide, carbon dioxide, volatile organic compounds, and total reduced sulfur.

PROFESSIONAL PROFILE

BOBBY BETTS
(continued)

Key Projects (continued)

Lead Emissions for an Industrial Batteries Manufacturer, Test Team Leader. Specific responsibilities included project preparation, sample collection and recovery, data validation, and report preparation.

Performance Specification Testing for Sulfur Dioxide Emissions on a Recovery Furnace at a Pulp and Paper Mill. Specific responsibilities included project preparation, relative accuracy test, data reduction, and report preparation.

Sampling Noncondensible Gases and Volatile Organic Compounds at a Pulp and Paper Mill, Test Team Leader. Duties included project preparation, collection and analysis of gas samples, data reduction and validation, and report preparation.

Compliance Testing, Test Team Leader. Performed compliance testing for sulfur dioxide and total sulfur emissions from a coke furnace at a steel manufacturing plant. Duties included collection and analysis of gas samples and data validation.

In-House Testing, Test Team Leader. Testing for formaldehyde for a lithographic printing company. Specific responsibilities included project preparation, collection and analysis of samples, data reduction and validation, and report preparation.

Total Reduced Sulfur Compliance Test, Test Team Member. Performed tests at two oil refineries. Duties included project preparation, sample analysis, and data validation.

PROFESSIONAL PROFILE

ANDRE C. WILLIAMS

Fields of Competence

Source emission test technician; preparation, set-up, repair, maintenance, and operation of air quality testing equipment. Data reduction and quality assurance of source emission results. Laboratory extraction and preparation of environmental samples. Visible emission observer pursuant to U.S. EPA Reference Method 9.

Experience Summary

- One year of experience in source emission testing.
- Experience in Gas Stream composition utilized during the test program in accordance with EPA Method 3. Sources tested include hazardous and municipal waste incinerators, land-fill, and a variety of chemical and paper producing plants.

Credentials

Certified visible emission evaluator, Eastern Technical Associate. ETA

Certified OSHA training, first aid, instrumentation training, stack samplers, continuous emission monitoring instrumentation, photo ionization detector.

Employment History

1989-Present WESTON

1986-1989 Rollins Environmental Services (FS)

Key Projects

Emission Monitoring, Baltimore, MD, SCM, Technician. Technical assistance for emission program at SCM in Baltimore, Maryland. The project involved continuous monitoring emission using the O_2 analyzer, CO analyzer.

Fugitive Emission Testing, Bayway, NJ, Exxon Refinery Company, Technician. Technical assistance of a fugitive emission program for Exxon Refinery Company, Bayway, New Jersey. The project involved test of particulate, sulfuric acid.

Emission Monitoring, Philadelphia, PA, Chevron Refinery, Technician. Technical assistance of a year-long fugitive emission program. The project involved quarterly monitoring of over 3,000 valves, pumps, flange control valves, and various equipment for volatile organic compounds. In addition monitoring systems, inventory evaluation, repair and computer summarizations were completed on 16 various petrochemical units.

PROFESSIONAL PROFILE

ANDRE C. WILLIAMS
(continued)

Key Projects (continued)

Emission Testing, Test Team Member. As a test team member performed a source emission testing program of a solvent waste incinerator. Test included the Byron Model 401 analyzer, sample pumps, moisture determination Method 3 analysis and volumetric flow rate.

Incineration System Burn, Paxton Avenue Lagoons Site, EPA, Test Team Member. Performed a final trial burn for a transportable incineration system (TIS) at the Paxton Avenue Lagoons site. The project involved sampling, volatile organics, EPA Method 6, bag-house moisture, and determination of the particulate and HCl.

Exhaust Testing, Jersey City, NJ, Occidental Chemical, Technician. Conducted particle size testing on glass furnace exhausts stack utilizing an in-stack multi-stage impactor.

Compliance Test Program, Phillipsburg, NJ, Atlantic Pipe Company, Test Team Member. Responsible for operation of metals sampling train during conduct of multi-parameter compliance test program.